PART 2

AIR POLLUTION CONTROL AND SOLID WASTES RECYCLING

HEARINGS

BEFORE THE

SUBCOMMITTEE ON PUBLIC HEALTH AND WELFARE

OF THE

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE HOUSE OF REPRESENTATIVES

NINETY-FIRST CONGRESS

FIRST AND SECOND SESSIONS

ON

H.R. 12934, H.R. 14960, H.R. 15137, and H.R. 15192

BILLS TO AMEND THE CLEAN AIR ACT TO AUTHORIZE APPROPRIATIONS TO CARRY OUT SUCH ACT THROUGH FISCAL YEAR 1973

H.R. 15848

A BILL TO AMEND THE CLEAN AIR ACT SO AS TO EXTEND ITS DURATION, PROVIDE FOR NATIONAL STANDARDS OF AMBIENT AIR QUALITY, EXPEDITE ENFORCEMENT OF AIR POLLUTION CONTROL STANDARDS, AUTHORIZE REGULATION OF FUELS AND FUEL ADDITIVES, PROVIDE FOR IMPROVED CONTROLS OVER MOTOR VEHICLE EMISSIONS, ESTABLISH STANDARDS APPLICABLE TO DANGEROUS EMISSIONS FROM STATIONARY SOURCES, AND FOR OTHER PURPOSES

(AND RELATED BILLS)

H.R. 15847

A BILL TO AUTHORIZE THE COUNCIL ON ENVIRONMENTAL QUALITY TO CONDUCT STUDIES AND MAKE RECOMMENDATIONS RESPECTING THE RECLAMATION AND RECYCLING OF MATERIAL FROM SOLID WASTES, TO EXTEND THE PROVISIONS OF THE SOLID WASTE DISPOSAL ACT, AND FOR OTHER PURPOSES

(AND RELATED BILLS)

DECEMBER 8, 9, 1969; MARCH 5, 16, 17, 18, 19, 20, AND APRIL 14, 1970

Serial No. 91–50

Printed for the use of the Committee on Interstate and Foreign Commerce

U.S. GOVERNMENT PRINTING OFFICE
43-933 WASHINGTON : 1970

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

HARLEY O. STAGGERS, West Virginia, *Chairman*

SAMUEL N. FRIEDEL, Maryland
TORBERT H. MACDONALD, Massachusetts
JOHN JARMAN, Oklahoma
JOHN E. MOSS, California
JOHN D. DINGELL, Michigan
PAUL G. ROGERS, Florida
LIONEL VAN DEERLIN, California
J. J. PICKLE, Texas
FRED B. ROONEY, Pennsylvania
JOHN M. MURPHY, New York
DAVID E. SATTERFIELD III, Virginia
BROCK ADAMS, Washington
RICHARD L. OTTINGER, New York
RAY BLANTON, Tennessee
W. S. (BILL) STUCKEY, Jr., Georgia
PETER N. KYROS, Maine
BOB ECKHARDT, Texas
ROBERT O. TIERNAN, Rhode Island
RICHARDSON PREYER, North Carolina
WILLIAM L. SPRINGER, Illinois
SAMUEL L. DEVINE, Ohio
ANCHER NELSEN, Minnesota
HASTINGS KEITH, Massachusetts
GLENN CUNNINGHAM, Nebraska
JAMES T. BROYHILL, North Carolina
JAMES HARVEY, Michigan
ALBERT W. WATSON, South Carolina
TIM LEE CARTER, Kentucky
G. ROBERT WATKINS, Pennsylvania
DONALD G. BROTZMAN, Colorado
CLARENCE J. BROWN, Ohio
DAN KUYKENDALL, Tennessee
JOE SKUBITZ, Kansas
FLETCHER THOMPSON, Georgia
JAMES F. HASTINGS, New York

W. E. WILLIAMSON, *Clerk*
KENNETH J. PAINTER, *Assistant Clerk*

Professional Staff

JAMES M. MENGER, Jr.
WILLIAM J. DIXON
ROBERT F. GUTHRIE
KURT BORCHARDT

SUBCOMMITTEE ON PUBLIC HEALTH AND WELFARE

JOHN JARMAN, Oklahoma, *Chairman*

PAUL G. ROGERS, Florida
DAVID E. SATTERFIELD III, Virginia
PETER N. KYROS, Maine
RICHARDSON PREYER, North Carolina
ANCHER NELSEN, Minnesota
TIM LEE CARTER, Kentucky
JOE SKUBITZ, Kansas
JAMES F. HASTINGS, New York

CONTENTS

PART 1

[1] Formerly Consumer Protection and Environmental Health Service.

ORGANIZATIONS REPRESENTED AT HEARINGS

Air Transport Association of America:
- Flynn, Roger, director, domestic operations.
- Humphreys, Robert R., assistant to the vice president, Federal affairs.
- Seybold, Leo, vice president.

American Medical Association:
- Barton, Frank W., director, Department of Environmental Health.
- Chapman, Dr. John S., chairman, Council on Environmental and Public Health.
- Peterson, Harry N., attorney, Department of Legislation.

American Motors Corp.:
- Adamson, John F., vice president, engineering and research.
- Bernitt, Elmer W., vice president, safety and quality assurance.
- Burke, Carl, assistant chief engineer, advance engineering and research.

American Petroleum Institute, Peter N. Gammelgard, senior vice president for public and environmental affairs.

Chamber of Commerce of the United States:
- Coffey, John J., senior associate, natural resources and environmental quality.
- Richey, Herbert S., member of the board and chairman, Natural Resources Committee.

Chrysler Corp.:
- Heinen, C. M., chief engineer, emissions control and chemical development.
- Terry, Sydney L., vice president of engineering.

Combustion Power Co., Inc.:
- Dell, William C., vice president.
- Smith, Dr. Richard, president.

Commerce Department:
- Caccispaglia, Frank C., Jr., Executive Secretary, Commerce Technical Advisory Board.
- Tribus, Dr. Myron, Assistant Secretary for Science and Technology.

du Pont de Nemours, E. I., & Co.:
- Diggs, Dr. Donald R., technical director, Petroleum Chemicals Division.
- Welch, E. E., Environmental Quality Committee.

Ethyl Corp.:
- Blanchard, Lawrence E., Jr., executive vice president.
- Hesselberg, Howard E., coordinator of air conservation.
- Hirschler, Daniel A., director of automotive research.

ORGANIZATIONS REPRESENTED AT HEARINGS—Continued

Ford Motor Co.:
- Jensen, Donald A., director, automotive emissions office.
- MacNee, James, associate counsel, office of general counsel.
- Misch, Herbert L., vice president—engineering.
- Taylor, Ross E., assistant chief engineer in charge of advance engineering, Engine Division.

General Motors Corp.;
- Bowditch, Dr. Fred W., director, emission control.
- Chenea, Dr. Paul F., vice president, research laboratories.
- Tuesday, Dr. Charles S., head, Fuels and Lubricants Department, Research Laboratories.

General Services Administration:
- Foote, William, Acting Deputy Commissioner for Transportation and Motor Operations.
- O'Mahoney, Hon. Robert M., Commissioner, Transportation and Communications Service.

Health, Education, and Welfare Department:
- Auerbach, Irwin L., Special Assistant for Legislative Affairs, National Air Pollution Control Administration, Environmental Health Service, [1] Public Health Service.
- Johnson, Charles C., Jr., Administrator, Environmental Health Service,[1] Public Health Service.
- Middleton, Dr. John T., Commissioner, National Air Pollution Control Administration, Environmental Health Service,[1] Public Health Service.
- Saperstein, Sidney, Assistant General Counsel.
- Steinfeld, Dr. Jesse L., Acting Surgeon General, Public Health Service, Deputy Assistant Secretary for Health and Scientific Affairs.
- Vaughan, Richard, Director, Bureau of Solid Waste, Environmental Health Service. [1]
- Veneman, Hon. John G., Under Secretary.

Interior Department:
- Dole, Hon. Hollis M., Assistant Secretary.
- Hayes, Earl T., Acting Director, Bureau of Mines.
- Rampacek, Carl, Acting Assistant Director for Minerals Research, Bureau of Mines.
- Watkins, J. Wade, Director of Petroleum Research, Bureau of Mines.

Manufacturing Chemists Association:
- Anthony, Myron V., chairman, Air Quality Committee.
- Johnson, Dr. Kenneth, staff engineer.

National Association of Secondary Material Industries:
- Merrigan, Edward L., attorney.
- Mighdoll, M. J., executive vice president.

National Coal Association, Joseph W. Mullan, director, air pollution control.

National Petroleum Refiners Association:
- Anderson, Thomas A., executive vice president, Quaker State Oil Refining Corp.
- Beadle, Buell W., vice president, research and development, Farmland Industries.
- Logan, Harry A., Jr., president, United Refining Co.
- McDuffie, Malcolm, president, Mohawk Petroleum Corp.
- O'Hara, Donald C., executive vice president, NPRA.
- Pruch, Henry, vice president, Kendall Refining Co.
- Voss, William C., vice president—administration, Northwestern Refining Co.

Standard Oil Co. of Indiana:
- Gunness, Robert C., president.
- Mallatt, Russell C., coordinator for air and water conservation.
- Spear, W. W., Washington representative.
- White, Dr. Philip C., general manager of research.

Universal Oil Products Co.:
- Gerhold, C. G., assistant to the president.
- Logan, John O., president.
- Thomas, W. H., Washington representative.

---

[1] Formerly Consumer Protection and Environmental Health Services.

AIR POLLUTION CONTROL AND SOLID WASTES RECYCLING

WEDNESDAY, MARCH 18, 1970

House of Representatives,
Subcommittee on Public Health and Welfare,
Committee on Interstate and Foreign Commerce,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice in room 2322, Rayburn House Office Building, Hon. Paul G. Rogers presiding (Hon. John Jarman, Chairman).

Mr. Rogers. The subcommittee will come to order. We are apologetic for the delay. There have been some meetings that the members had to attend.

But we have a member of the full committee here with us, so we will begin.

Our first witness today is our distinguished colleague, the Honorable Thomas S. Kleppe, Member of the Congress from North Dakota. We are delighted to have you and the committee will receive your testimony at this time. Your statement if you like will be made a part of the record at this point.

STATEMENT OF HON. THOMAS S. KLEPPE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NORTH DAKOTA

Mr. Kleppe. Thank you very much, Mr. Chairman and members of the committee. I have about an 11 minute statement that I would like to give.

Mr. Rogers. Certainly.

Mr. Kleppe. Mr. Chairman and members of the subcommittee, I appreciate this opportunity to appear before you in support of H.R. 15848, H.R. 12934, and other identical bills including H.R. 16040 introduced by me, to amend the Clean Air Act.

My testimony today relates exclusively to the advantages of combining gasoline with alcohol made from grain to produce a cleaner burning motor fuel. I believe a strong part of this direction could be made within the framework of the proposed amendments to the Clean Air Act.

On February 16, 1970 I wrote to President Nixon suggesting that he instruct Federal agencies affected to investigate the possibilities of utilizing the alcohol gasoline blend as a means of combatting air pollution.

Mr. Chairman, I ask unanimous consent that a copy of my letter to the President be inserted in the record at this point.

Mr. Rogers. Without objection it is so ordered.

(The letter referred to follows:)

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., February 16, 1970.

Hon. Richard M. Nixon,
President of the United States,
The White House,
Washington, D.C.

DEAR MR. PRESIDENT: A cleaner-burning motor vehicle fuel combing gasoline with alcohol made from grain may be an idea whose time has finally come.

I know you will recall this was one of the possibilities studied by the Commission on Increased Industrial Use of Agricultural Products which reported its findings to you, as President of the Senate, and to the Speaker of the House on June 15, 1957.

Then the principal objective was to expand markets for surplus farm products. The projected cost of producing alcohol from grain—perhaps 40 or 50 cents per gallon—led the Commission to concude that it would be "impracticable to recommend an alcohol motor-fuel program."

Economic utilization of surplus U.S. grains a problem as acute as it was in 1957. However, the urgent need to control air pollution—to regulate automobile emissions of carbon nomoxide and hydrocarbons—places the cost factor of converting grain to alcohol in a different perspective. Moreover, large-scale conversion of grain to alcohol could literally save gillions of dollars of farm program costs.

In the February 10 Message to Cougress on the Environmeut, you pointed out that "Most air pollution is produced by the burning of fuels. About half is produced by motor vehicles."

To implement the recommendations set forth in your Message, the Secretary of Health, Education, and Welfare submitted to the Congress on February 11 proposed amendments to the Clean Air Act which would empower him to "establish staudards respecting the chemical or physical properties of any (motor vehicle) fuel or fuel additive to assure that such fuel or fuel additive will not cause or contribute to emissions which would endanger the public health or welfare. . ".

Although the feasibility of belnding alcohol with gaoline obviously demands further study and re-evaluation, it seems to me there is a most challenging opportunity to attack both the problems of air pollution and agricultural surpluses. The Southwest Research Institute at San Antouio and Houston has done a considerable amount of research in this field. A copy of one of their reports (1964) is enclosed.

From experiments conducted there and elsewhere, over a considerable period, it would appear that:

1. The alcohol-gasoline blend will work satisfactorily in present-day automobile engines, without serious drawbacks in performance or economy.
2. A blend consisting of 25 percent 200-proof ethyl alcohol will reduce hydrocarbon emissions by as much as 50 percent, with some reduction of oxides of nitrogen under certain conditions.
3. The blend greatly reduces combustion chamber deposits and this should prolong engine life.

Although the blend does not provide a complete solution to the problem of air pollution created by motor vehicles, it could help to provide substantial relief, especially in the smog-saturated areas. Use of this product could be commenced on a limited basis, almost immediately. With some engine and carburetor modifications, higher performance standards could undoubtedly be obtained.

Even though new engine designs and improved exhaust control devices will come during the 1970's, millions of motor vehicles now on the road and to be built in the next few years will still be operating into the 1980's. The blend is primarily for these older vehicles.

It would appear on the basis of what we already know, that further immediate and greatly-expanded research in the alcohol-gasoline field is fully warranted. The mood and the money were not there in the past but they are today.

It seems to me that there are several important factors to be considered in connection with the cost of producing grain alcohol:

First, the 1971 Federal Budget projects costs of $3.8 billion for programs to strengthen farm prices and income. A sizeable part of this will go toward paying farmers for diverting or retiring acreage from production and to bolster the price of commodities harvested on planted acres. The cost of storing government-owned commodities is also heavy. Large-scale utilization of grain alcohol in motor fuels would not only eliminate present surpluses in fairly short order but would also make it possible to remove all acreage controls on such crops as corn and wheat. I believe that as much as 4 billion bushels of grain could be used annually in motor fuels. This would inevitably raise farm prices and free producers from controls. Most of the present farm program expenditures could be eliminated or drastically reduced, with perhaps only a minimum price guarantee remaining—a tool which would probably be infrequently, if ever, used. Farm income would increase sharply giving agricultural producers the real "parity" with other segments of the economy that they have never achieved.

Second, part of the savings in farm program costs could be used to subsidize the use of alcohol in motor fuels, if this became necessary.

Third, because alcohol is produced from the starch in grain, there would remain a large, high protein byproduct which could be utilized in many ways, including upgrading into food for human consumption. This is being done now in at least one Indiana plant. The value of this byproduct would hold down the cost of producing the alcohol and might largely offset it, if expanded markets were developed.

Fourth, for many years each succeeding Administration has sought, with only limited success, to develop new industries in rural areas. It would seem highly feasible to locate conversion plants where grain is actually produced.

I am enthusiastic over the possibilities of such a program. Because of the major role which the Department of Health, Education and Welfare will play in the area of future motor vehicle fuel specifications, I am also transmitting to Secretary Finch the thoughts incorporated here. It seems to me that this is an especially appropriate time to give thorough consideration to the promising possibilities of reducing air pollution and, at the same time, finding greatly-increased industrial use of surplus farm crops.

Sincerely,

TOM KLEPPE,
Member of Congress.

Mr. KLEPPE. There is nothing new about the basic idea. For many years it has been extensively discussed, studied and tested. Today with the great national interest in our total environment and with the serious air pollution caused by motor vehicle exhausts, especially in the big cities, it may be an idea whose time has finally come.

There is not any question that an alcohol gasoline blend will work efficiently in present day motor vehicles. It will measurably reduce hydrocarbon exhaust emissions by as much as 50 percen t some tests show. It will prolong engine life. It will provide extra power. Without a lead additive. It has long been used in other countries.

The obvious question is: Why aren't we using it? The answer, up to now has always been: Cost.

Back in the middle 1950's President Eisenhower appointed a commission to study increased industrial uses of agricultural products. Then the principal objective was to expand markets for surplus arm products. The projected cost of producing alcohol from grain led to the conclusion by the commission that it would be impracticable to recommend an alcohol motor fuel program.

The urgent need to control air pollution to regulate automobile emissions of carbon monoxide and hydrocarbons places the cost factor of converting grain to alcohol in a different perspective now. Moreover large scale conversion of grain to alcohol could literally save billions of dollars of farm program costs.

In his Message to Congress on the Environment the President pointed out that the most air pollution is produced by the burning of fuels. About half is produced by motor vehicles.

The proposed amendments to the Clean Air Act would empower the Secretary of Health, Education, and Welfare to establish standards respecting the chemical or physical properties of any (motor vehicle) fuel or fuel additive to assure that such fuel or fuel additive will not cause or contribute to emissions which would endanger the public health or welfare.

Even though new engine designs, more lead free gasoline, and improved exhaust control devices will come during the 1970's millions of motor vehicles now on the road and to be built in the next few years will be operating well into the 1980's. It would appear on the basis of what we already know, that immediate implementation of an alcohol gasoline program is fully warranted. We could begin on a limited basis almost overnight. The mood and the money were not there in the past but they are today.

I believe what is needed now to get a large scale alcohol gasoline fuel on the road is convincing proof that it can be done economically. We must look not only at the first cost of extracting alcohol from grain but also at the value of the high protein byproduct which remains as a food and feed source. We must consider what a cleaner burning lead free motor vehicle fuel would be worth from both a public and dollar standpoint.

We must consider the savings in farm program and price support costs which would result from the elimination of production controls and payments to farmers for diverting wheat and feed grain acreage. This would be in the neighborhood of $2 billion a year and there would be further savings of perhaps half a billion dollars in storage, interest and administrative costs borne by USDA.

In other words we must look at the many offsets against the cost of producing alcohol from grain. Viewed that way I am resaonably convinced that alcohol can be made from grain at relatively low cost—low enough to make it economical and practical as an automotive fuel.

Although the petroleum industry opposed this concept in the past for obvious reasons we have a far different situation today. Like it or not the industry will have to come up with a much cleaner burning and probably lead free fuel or alternative power sources will inevitably be developed.

The State of California is now buying automobiles powered with bottled gas. Battery powered automobiles (we had some years ago) are being considered again. Some say we should go back to the Stanley Steamer. And it has even been suggested, facetiously I an sure, that a 100 mile long extension cord could be hooked up to the dream car of the future.

Alcohol is also made from petroleum products. This certainly gives the petroleum industry a major stake in the development of alcohol-gasoline fuels. Moreover, the petroleum reserves of the United States are neither unlimited nor renewable. Alcohol from grain is, of course, a renewable resource.

Although industry now has the capacity for producing considerable amounts of alcohol, a mammoth expansion would be required to convert three or four billion bushels of grain into this form each year. Several hundred plants, costing several billions of dollars, would have to be constructed. If the petroleum industry shifts from tetraethyl-leaded gasolines to the more costly refining processes necessary to produce higher octane, non-leaded products, the transition would be at least as expensive.

The President of Union Oil Company says on this:

> Several years will be required to construct the needed new refining equipment. The total capital cost of installing new refining equipment nationwide to add seven octane numbers is estimated to be between $5 billion and $6 billion. Because of limited construction capacity, it is impossible for all major refineries to add such needed equipment in a time schedule that may be required by law.

So, I ask, why not go the other route? Why not start now with production of the alcohol-gasoline blend?

The implications of this for the Nation's farm economy would be enormous. For years we have sought to obtain new industries for rural areas. Certainly it would make sense to locate alcohol extraction plants where the grain is produced.

If we "freed up" our millions of retired acres for all-out grain production, both the farm economy and the total economy would get a much-needed boost. It would take more machinery, more gasoline (blended with alcohol), more fertilizer, more labor, more transportation, more of enverything that goes into farm production and the transportation and utilization of agricultural commodities.

It would open the way for tremendous increases in the development of higher yielding wheats and other grains which might not meet present-day milling standards but which would be entirely suitable for conversion into alcohol. I understand that right now there is advanced experimentation on a wheat-rye cross which could yield as much as 200 bushels per acre on a dryland farm.

There is no doubt in my mind that by putting our idle acres to work and, at the same time, utilizing more fully the higher-yielding grain varieties, the United States could easily produce the three billion or more bushels needed to meet motor vehicle fuel requirements. There would still be enough—a safe margin—to meet both domestic and export requirements.

As of January 31, 1970, Commodity Credit Corporation had under price support loan and under actual ownership, 1,762,399,000 bushels of free grains and 862 million bushels of wheat. Both of these totals are up substantially over a year earlier.

These quantities of grain are not all to be counted as surpluses. Conservatively, though, I would say about half of the totals could be so classified. In other words, we have more than enough grain available now to swamp existing facilities for converting grain to alcohol. By the time additional facilities were available, farm production could easily be increased sufficiently to keep them operating at full capacity.

I have received a few letters from people around the country who say it is criminal to talk about converting grain to motor vehicle fuel at a time when there are millions of hungry people in the United States and hundreds of millions throughout the world. If this be true, then it is also immoral to impose production restrictions on American farmers today. What I am proposing, essentially, is a program under which we would continue to supply at least as much food grain to our own people and to those around the world as we are today. The grain for alcohol would come from increased American production—from our idle acres and the higher-yielding crop varieties.

Right here, Mr. Chairman, if I might insert what I think of the possibilities of putting the drill in the ground and sowing wheat from section line to section line. The production capacities we have in rural America today are almost unlimited at this point.

Then there is the question of cost—both to the government and to the user of the alcohol-gasoline blend. When the "offsets" I mentioned are cranked into the equation, it seems to me that the government would gain, both in farm program savings and in the incalculable benefits which would result from cleaner air.

From the motorist's point of view, I don't believe that a 10- or 15-percent blend of grain alcohol with gasoline would cost him any more at the filling station than he is paying today. As a bonus, he would probably save a considerable number of dollars through the longer and more trouble-free operation of his automobile engine.

It seems to me that the transition to the alcohol-gasoline blend could be made in an orderly way, without disrupting the petroleum industry, the automotive industry or the farm economy. We could start now, in a limited way, with what we have available. There is time to smooth out the bumps in the road ahead before we get there. It will take some planning, some ingenuity and some determination. But it can be done.

I am encouraged by the support I have been receiving not only from the public but also from members of Congress, scientists and others concerned with the air pollution problem. This dream, so long held by American farmers, can now be brought to reality.

That concludes my statement, Mr. Chairman.

Mr. Rogers. Thank you very much, Mr, Kleppe, for an interesting statement, and I think this is the first time that we have had this proposition presented to the subcommittee. We will be glad to check into it.

Do you have any estimate of cost at all? I wondered if anyone had done a study on this as to what it would cost.

Mr. Kleppe. On this point at this time, Mr. Chairman, the thing that has held us back all the way is that from a petroleum-based product the actual processing cost for making alcohol is roughly 40 cents a gallon.

To make alcohol out of grain, it is 60 cents a gallon. Now, that is a 50-percent differential. This has been the hold-back. This was before the emotion and the deep concern regarding pollution. This is why I made such a point of the "offsets," of the savings involved in these other areas . This is why I believe the economics can be straightened out.

Mr. Rogers. As I understand it, you feel that a 10- to 15-percent proportion of alcohol in effect takes the place of the lead?

Mr. Kleppe. Yes. The reason I say this is because studies show that current automobile engines will handle this combination very well. If you get to a much richer blend—up to 25 or 30 percent—it is quite possible you would encounter serious starting problems in cold weather. You then would need a change in your engine device. This is the basis for the recommendation.

I might add, Mr. Chairman, that I have had many interesting letters from around the United States from people who are using this today, farmers and motorists. Interestingly enough, the power they get, the generation of power they get, in their vehicles is by their own testimony very outstanding.

Mr. Rogers. Thank you.

Dr. Carter.

Mr. Carter. Certainly I want to compliment the distinguished gentleman on his presentation here today. It is extremely interesting.

On the blending proposition, I had not thought of that. There has been work on using alcohol, itself, in the place of gasoline.

What is the formula for alcohol? Do you remember, Mr. Kleppe?

Mr. Kleppe. No, Congressman Carter; I cannot give you that. I don't know.

Mr. Carter. Do you know the reason why it is used?

Mr. Kleppe. The reason why it is used?

Mr. Carter. Yes, sir.

Mr. Kleppe. Of course, it is not used today except in a few instances. It would reduce the emission of pollutants in the air.

Mr. Carter. It is totally combustible, is it not?

Mr. Kleppe. That is correct.

Mr. Carter. It has no sulfur?

Mr. Kleppe. No residues.

Mr. Carter. I think you have a wonderful idea. I want to compliment you on your statement.

Mr. Kleppe. Thank you very much.

Mr. Rogers. Thank you so much for being with us. We appreciate your taking time.

Mr. Kleppe. Mr. Chairman, may I express my appreciation to you and thanks for scheduling me here. I do appreciate this time.

Mr. Rogers. Our next witness is another of our distinguished colleagues. We are delighted to have with us this morning a man who also has taken a great interest in the air pollution problem, the Honorable Abner J. Mikva of Illinois.

We are honored to have you and we will be pleased to receive your statement at this time.

STATEMENT OF HON. ABNER J. MIKVA, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. Mikva. Thank you, Mr. Chairman. I appreciate the opportunity to appear this morning to urge further expansion of Federal air pollution control programs.

For many years, Americans regarded air pollution as an aesthetic problem: it was dirty, it made our cities unsightly, it increased problems of keeping our homes and ourselves clean. Today, we know that air pollution is far more than a problem for the aesthetes—or even the effete; it is a threat to the very health and safety of our citizens.

I live in one of the most polluted Congressional Districts in the county, south side of Chicago, and south side of Cook County, part of the Indiana-Illinois complex.

A study which the National Air Pollution Control Administration made at my request of my Congressional District in Chicago showed that air pollution was significantly and for extended periods above the maximum safe level. Translated into laymen's terms, the levels of pollution in my area were causing trees and plants to drop their leaves, causing damage to property, and causing increased hospital admissions for, and deaths from respiratory diseases.

The research teams are researching the population in my District and they find distinct and specific linkages between the levels of air pollution and respiratory ailments and deaths.

In short, the grave concern and sense of urgency which many of our citizens are now expressing are fully justified. We are being choked by our own aerial garbage. In my District, breathing is more dangerous than smoking. Air pollution is killing us.

I know that there are now in effect Federal programs to deal with the problems of air pollution—both from stationary sources and from automobiles. But these programs do not go far enough. As to stationary sources, for example, there are now only ambient air quality standards—as opposed to emission standards—and even for these enforcement is left to the States. As to motor vehicle pollution, there are no Federal emission standards for used automobiles made before 1966, and the Federal Government has pre-empted States and cities from setting auto emission standards which are more stringent than Federal standards.

I think that totally ignores the problems that some localities have, such as mine, where we need stronger standards than might be needed in some of the rural areas of the country.

Finally, even when adequate standards exist, the enforcement by State and local governments has, with a few exceptions, been unsatisfactory. High standards which are not enforced and, in fact, are used by State and municipal con artists to kid the public. They are good for nothing.

The acceleration of citizen concern over the threat of air pollution should be a signal to us here in Congress. The efforts in the private sector, encouraging as they are, also are a signal. At present, the Congress is solidly behind both the people and industry—way behind. We must abandon the time tables and the "phase-in periods." We must begin to treat this problem with the urgency we felt about education after Sputnik and the ingenuity we used in getting to the moon. Our people want clean air and they are not going to wait. We ought to act like our lives depend on it, because they do.

AIR POLLUTION ABATEMENT ACT (H.R. 14844)

Last October, I introduced a bill which I believe can make a contribution to this subcommittee's consideration of how to attack air pollution from stationary sources. The Air Pollution Abatement Act would do four important things:

(1) It would make pollution which damages property, endangers health, or violates State or local law a Federal offense.

Now, there is a piggy-back feature I consider the most important of all. That is that those States and localities which have adopted standards which are stricter than anything we are prepared to adopt nationally would become a matter of Federal concern and Federal enforcement if the State and local governments failed to enforce them for various reasons.

(2) It would authorize setting of Federal emission standards by the Secretary of Health, Education, and Welfare.

(3) It would provide several kinds of remedies. The Secretary of Health, Education, and Welfare would have cease-and-desist powers against polluters exceeding the Federal emission standards. The

Government would also be authorized to seek injunctions and civil fines against polluters in Federal courts.

When other enforcement failed, private citizens would have a right of action to enjoin pollution in excess of permitted standards. The Secretary of Health, Education, and Welfare would have temporary emergency shut-down power over polluters during emergency climatic conditions which render pollution especially hazardous.

We had a serious condition late last year in Chicago. When I left last weekend, I believe there was a yellow alert which was the second highest level of concern but again in my area I am sure that hospital records will show that admissions for respiratory ailments went up and probably the death rate went up during that period.

All of these remedies, moreover, would be available to the Secretary, the U.S. Attorney, or private citizens to act against violation of any State or local air pollution law. Finally, (4) workers whose jobs are interrupted because of emergency shut-down or during the installation of air pollution control equipment would be eligible for special employment assistance payments to cover those periods.

I believe that the States ought to do what they can do, and we must do what they cannot do. I know of no subject that is more completely interstate than the air we try to breathe. Our present approach of Federal coordination of standards and State enforcement of them is not providing relief. Even when all regions have finally determined their standards, many States have neither the means nor the will to enforce the standards. Moreover, even if a State strictly enforces standards, it cannot build a wall to keep good air in and bad air out. In my district on Chicago's south side, much of our air pollution comes over the State line from the mills in Gary. Illinois could have the strictest enforcement in the Nation and my constituents would still be suffering.

Another reason that strict enforcement is unlikely is that it places additional financial burdens on business. When States are competing daily to attract new industry, it is unrealistic to expect that strict enforcement of antipollution regulations—which imposes financial burdens sometimes higher than taxes themselves—will occur.

You don't woo them with one hand and hit them over the head with a strict pollution standard and enforcement of those standards on the other.

It seems wasteful to have a patchwork of enforcement agencies and procedures throughout the Nation, with the expertise and qualifications of pollution-control personnel varying tremendously from State to State. Air pollution is decidedly an interstate problem. It requires an interstate solution: Federal standards, Federal enforcement, and private remedies in Federal courts when enforcement fails.

MOTOR VEHICLE POLLUTION CONTROL

Control of air pollution from stationary sources is only part of the battle, as this subcommittee certainly knows. It is estimated that 60 percent of all pollutants originate during the operation of internal combustion engines in automobiles. In densely populated metropolitan areas where auto use is concentrated, the percentage is probably even higher. Thus, if the air in our cities is to be breathable again, we must take decisive action to end motor vehicle pollution. What is both surprising and encouraging is that the automobile industry seems to be to be outpacing both the legislators and the regulators in some areas. But there are at least three steps that should, in my estimation, be taken to make Federal law an effective weapon to control motor vehicle pollution.

First, we should remove the present Federal preemption of State motor vehicle emission standards for new vehicles. Present law forbids States to set new auto emission standards which are more stringent than those promulgated under the National Emission Standards Act (title II of the Air Quality Act of 1967). Thus, Federal law is preventing States and local governments from going beyond Federal standards, even where special local conditions warrant more stringent controls. Given the rapid improvement in the state of the art, and in light of the high percentage of pollution in urban areas which derives from the automobile, this preemption is indefensible.

In my area, 60 percent of all pollution is caused by automobiles. We ought to be allowed to set stricter standards if either the State or local government decides they are necessary.

Second, the emission standards which the Secretary of Health, Education, and Welfare is authorized by the National Emission Standards Act to promulgate for new cars should be extended to cover used cars—cars made before 1966. This is an area where the automobile industry appears to be ahead of us. Just last week, General Motors Corp. announced that within a few months it would have an antipollution system adaptable to pre-1966 cars. This is a step in the right direction. But existence of such a system does not guarantee that everyone with a pre-1966 car will use the system. Nor does it guarantee that other manufacturers will produce such systems for their pre-1966 vehicles. National emission standards for pre-1966 vehicles are necessary.

I think we should make sure that we don't end up putting one company at a competitive disadvantage by imposing some standards. They should apply to all.

Both of the steps described above would be accomplished by H.R. 16013, a bill which I introduced on February 18, 1970, and which has been referred to the full committee.

Finally, there must be a Federal prohibition of the manufacture or use in interstate commerce of leaded gasoline. The reason a ban on leaded gasoline is so important is not only the amount of lead which emerges from the tailpipe as pollution. The real evil of leaded gasoline is that lead renders economically impractical the use of catalytic mufflers which already exist and which, except for the problems caused by leaded gasoline, could already effectively control most automobile pollution. Thus, without leaded gasoline, current technology is already capable of giving us automobiles with greatly reduced levels of pollution. The elimination of leaded gasoline can bring us within hailing distance of pollution-free automobiles.

I have introduced a bill, H.R. 16012, as have other members, to ban the introduction, transportation, or distribution of leaded gasoline in interstate commerce. Perhaps this straightforward approach is not the only way to solve the problem. Perhaps a phase-out period should be used. Perhaps subsidies or loans for the changeover of refineries to nonleaded gasoline production should be employed. I defer to this subcommittee's expertise on those matters. What I do believe, however, is that banning of leaded gasoline in the near future can make a tremendous contribution to reducing motor vehicle pollution. Given the condition of our filthy air, we cannot afford to deprive ourselves of that contribution.

Let me also say that the urban centers have an additional concern about leaded gasoline. We continue to be plagued by other lead excesses from old paint and old paint products. In the cities, "Old Paint" is not a favorite horse; it's a killer. The additional lead fumes from gasoline just add to what is already an intolerable level of lead pollution.

I want to say how grateful I am for the opportunity to appear here but, more important, for the fact that you are holding these hearings. I think the people of the country, especially in the urban areas, are looking to this Congress for leadership to give us the kind of standards and enforcement of the standards which will make air pollution an evil of the past.

I hope that I have been able to convey the sense of urgency which my constituents and I feel over the threat of air pollution. We have seen enough of technological delays and regulatory gradualism. We need action and we need it now.

Thank you for your time.

Mr. ROGERS. Thank you, Congressman Mikva, for a very excellent statement and the thoughts that you have given us certainly will be seriously considered by the committee when we begin to write the bill.

On your proposal about the workers, would this be normally done under your unemployment law?

Mr. MIKVA. It would be triggered under the unemployment compensation; that is correct. But it would be under the supervision of Health, Education, and Welfare because he would have to declare the kind of emergency shut-down or change-over that would trigger it.

Mr. ROGERS. I share your concern that we need to move faster and do more than we are doing. In fact, Dr. Barry Commoner testified before the committee yesterday and pointed up that we don't have too much time.

Thank you.

Dr. Carter?

Mr. CARTER. Very interesting, Mr. Mikva.

What section of Chicago did you say you represented?

Mr. MIKVA. The South Side of the City and the south suburbs. It includes some of the basic steels. U.S. Steel is there, a lot of steel fabricators; Republic Steel in the District.

Mr. CARTER. Do you go up to Maxwell Street?

Mr. MIKVA. No; that is north and west of me. There we have food pollution.

Mr. CARTER. Is it really polluted? There is a fish market.

Mr. MIKVA. This is excellent fish. I am teasing. Some of the food is sold on the street. The smell sometimes will titillate your nostrils or offend you, depending on whether the foods are being sold or not. It is a fascinating street, you know that.

Mr. CARTER. What respiratory diseases, in your opinion, are associated with air pollution?

Mr. MIKVA. I want to assure my distinguished colleage and a very eminent physicial that I am not trying to poach on his preserves or suggest that I am a medical expert, but I have talked to some physicians in the Chicago area, one by the name of Dr. Bertram Carnow, one of the leading authorities in the whole west, if not the whole country, on the relation of heart disease to pollution. He finds anything from asthma, bronchitis, pneumonia, heart disease, shows a relationship with the levels of pollutants in the air.

He is not yet ready to say that there is an "X" percentage increase in the death rate but he can mark the levels of pollution with the increases in death rate from time to time.

Mr. CARTER. Are there any associations between air pollution and lung cancer?

Mr. MIKVA. I am sure there must be, the ones he was talking about. I was not aware, for instance, of the heart disease and air pollution, that there was a relationship.

Mr. CARTER. There is a prominent physician in California recently that made that statement, at a medical meeting there. He gave a paper on this. This has been developed over a period of years. In fact, it is difficult to explain why the rate of lung cancer in England is twice as high as it in the United States, at the same time the percentage of those who smoke in England is much less than that in the United States.

Mr. MIKVA. Of course, as you know, Doctor, for a long time London was probably the most polluted city in the world. They have made tremendous progress lately.

Mr. CARTER. That is true. They use coke now which has made an improvement.

Thank you.

Mr. MIKVA. Thank you.

Mr. ROGERS. Mr. Nelsen.

Mr. NELSEN. No questions. Thank you.

Mr. ROGERS. Thank you very much. We appreciate your appearance.

We now have a panel from the National Petroleum Refiners Association:

Mr. William Voss, Vice President, Northwestern Refining Company.

Dr. Buell W. Beadle, Vice President, Farmland Industries, Inc.

Mr. Malcolm McDuffie, President, Mohawk Petroleum Corporation.

Mr. T. A. Anderson, Executive Vice President, Quaker State Oil Refining Corporation.

Mr. Harry A. Logan, Jr., President, United Refining Company.

Mr. Henry Pruch, Vice President, Kendall Refining Company.

Gentlemen, the committee welcomes you. We appreciate your presence.

Would you prefer to make a statement?

STATEMENTS OF DONALD C. O'HARA, EXECUTIVE VICE PRESIDENT, NATIONAL PETROLEUM REFINERS ASSOCIATION; MALCOLM McDUFFIE, PRESIDENT, MOHAWK PETROLEUM CORP.; BUELL W. BEADLE, VICE PRESIDENT, RESEARCH AND DEVELOPMENT, FARMLAND INDUSTRIES; WILLIAM C. VOSS, VICE PRESIDENT-ADMINISTRATION, NORTHWESTERN REFINING CO.; THOMAS A. ANDERSON, EXECUTIVE VICE PRESIDENT, QUAKER STATE OIL REFINING CORP.; AND HARRY A. LOGAN, JR., PRESIDENT, UNITED REFINING CO.; ACCOMPANIED BY HENRY PRUCH, VICE PRESIDENT, KENDALL REFINING CO.

Mr. O'HARA. Mr. Chairman, may I introduce myself?

I am Donald O'Hara, Executive Vice President of the National Petroleum Refiners Association.

We appreciate the committee's willingness to hear us this morning.

I hope you do not object to our using the platoon system. It seemed to be the easiest way to do it.

I was going to introduce the individuals, but you have already read the names.

Mr. ROGERS. I think it might be well to introduce each one at their position at the table.

Mr. O'HARA. The point we want to make is that in listening to the previous discussion before the committee and hearing the testimony of Dr. Middleton and others from Health, Education and Welfare, running through that is the theme that they have consulted from time to time with a few major oil companies about the problem of adapting themselves to changing specifications.

We feel they have overlooked a very important segment of the business which is the independent refiner. We find many people are not aware of how many independent refiners there are. There are in the United States 129 refining companies which operate 266 refineries. Of those, approximately 85 are what we usually refer to as independent refiners. They are scattered throughout the United States.

There are several in Mr. Dingell's area. There are several in Kentucky. There are several in Mr. Nelsen's area in Minnesota. There are a number in Mr. Skubitz's District in Kansas.

These refiners are scattered throughout the United States. They form an important part of the competitive situation in the oil industry. They are the chief suppliers of independent marketers and jobbers.

It has been the policy of Government, pushed by both the House and Senate Small Business Committees, to give these companies certain preferences. For example, they are given the right to import foreign oil under more favorable conditions than the major oil comcompanies are. They are given a special allocation in the purchase of jet fuel by the military services which has helped to preserve them as a source of supply widely dispersed.

The question before us right now is how these refineries would be affected by legislation changing the composition of gasoline. They are more than competent to speak for themselves on that point. So, I will introduce them again in order.

At the left is Mr. William Voss, Vice President of Northwestern Refining Company.

Next is Dr. Buell W. Beadle from Farmland Industries in Kansas City.

Then Mr. Harvey A. Logan, Jr., of United Refining Co. of Warren, Pa.

Down at the end, Henry Pruch, of the Kendall Refining Company of Bradford, Pennsylvania.

Tom Anderson, Executive Vice President of Quaker State Oil, Oil City, Pennsylvania, also was former Manager of their refinery in West Virginia.

At my right here is Mr. Malcolm McDuffie. Mr. McDuffie is President of the Mohawk Petroleum Corporation of Los Angeles, which operates a refinery in Bakersfield. Mr. McDuffie has become quite experienced at this because just about 10 days ago he appeared before Governor Reagan's panel in a discussion out there in Sacramento, California.

So, if it is agreeable with you, we will start with Mr. McDuffie.

Mr. ROGERS. Certainly. Proceed in any way.

STATEMENT OF MALCOLM McDUFFIE

Mr. McDUFFIE. Mr. Chairman, at the outset, I apologize for not having available for you a copy of my statement. Unfortunately, the United Airline stewardess knocked a glass of milk all over me and my statement last night and I only finished writing it this morning. I would like to submit a copy for the record when I can have it typed up later today.

Mr. ROGERS. That will be fine.

Mr. McDUFFIE. I am Malcolm McDuffie, President of Mohawk Petroleum Corporation, an independent, non-integrated small business, west coast gasoline refiner and marketer.

At our refinery near Bakersfield, California, we manufacture and distributed in 1969 some 88 million gallons of motor gasoline representing a significant source of market supply to the consumers of the California interior valley areas.

There are 11 independent refining companies in California which manufacture and sell motor gasoline, with total crude oil throughput capacity of 156,000 barrels per day. The replacement value of these refineries and their related facilities has been estimated by the Independent Refiners Association of California as in excess of $200 million.

These companies employ in the neighborhood of 1,500 people.

California is the largest gasoline-consuming State in the Nation. The California consumer has for years been served and protected by the existence of a viable competitive independent refining industry serving hundreds of independent distributors and jobbers.

Also, as the supplier of approximately 40 percent of the military jet fuel sold in the State, this well dispersed segment of the industry makes an important contribution to the national security as well as to the economy of the State.

For this reason, Mohawk and its 10 independent competitors have a critical interest in the proposals contained in H.R. 15848 and other legislation referred to here today which, if adopted, threaten the very survival of this important segment of the industry.

Testimony presented last week to this committee makes it abundantly clear that one of the principal objectives of the Department of Health, Education, and Welfare under the proposed legislation is the removal of lead from gasoline. I shall concentrate my remarks on that issue.

In this connection, on March 4th and 5th, as Don has mentioned to you, it was my good fortune to attend the two days of hearings conducted in Sacramento before the California Resources Board and its technical advisory committee, where I heard literally masses of testimony on this subject. In his closing remarks, Dr. A. J. Hagenschmidt, chairman of the air resources board and one of the world recognized authorities on air pollution, stated that in his opinion never before had there been gathered together such a concentration of money, power and brains in an effort to solve this problem.

I left this meeting with two overwhelming impressions.

First, that there are in truth honest and compelling arguments for as well as against lead in gasoline, that the technical evidence against lead is highly complex, controversial and conflicting, and, most important, that the indictment against lead is at this time only just that, an indictment.

There has not yet been a fair trial. The evidence is conflicting and not proved and there cannot yet in any fairness be a conviction.

My second overwhelming impression was somewhat shattering. It was the realization in view of the obviously conflicting testimony that all the incredible power, influence and adroitness of Detroit had been massed in an obvious attempt to foist onto the American consumer a colossal snow job based on the emotionally inspired and publicly popular theme, "Get the Lead Out."

Lead is to become the scapegoat. The oil industry is to finance its removal and the American consumer ultimately is to pay the bill. Along the way, gentlemen, lost in the shuffle, quite a few little people may be badly hurt.

Being a non-technical person, I shall make no attempt to evaluate the technical process and conditions of removing lead from gasoline. These aspects of the matter should remain in the hands of the highly, competent research and testing staffs of the automobile companies the petroleum and chemical industries and governmental agencies, all of whom are to be congratulated on the impressive progress they have already made in reducing automobile emissions.

Certainly my company is intensely interested in the ultimate achievement of our common goal, clean air. We feel confident that if given the opportunity, the combined efforts of these technical groups will result in a sane, intelligent solution to meet the emission standards proposed by the State and Federal Governments within the time schedules projected.

Please rest assured that should this coordinated effort reach the scientifically proved incontrovertible conclusion that in the combined best interests of all of us who breathe air and all of us consumers who spend our hard-earned dollars for cars and gasoline, that lead must be eliminated, then my company will meet the challenge gracefully even though it may pose problems so insurmountable as to necessitate termination of our refining operations.

So that you may better understand what I suggest by insurmountable problems, let me explain what elimination of lead could mean to a small California refiner like Mohawk.

In our present operation, we process 15,000 barrels a day of light gravity crude in our distillation units. Utilizing a 2,500 barrel a day unifiner and a 2,500 barrel a day catalytic platformer, along with various blending components which we must purchase from outsiders, we are producing approximately 6,200 barrels a day of gasoline with a clear pool research octane number of 85.2, a far cry from the reputed 90 octane pool number reported by Union Oil Company in Sacramento.

By selective blending of the yields from these facilities plus the addition of tetraethyl lead, we make 3,200 barrels a day of 100-plus octane premium and 3,000 barrels a day of 92 octane regular.

The cost of upgrading this gasoline with lead from 85.2 clear to 100-plus premium and 92 regular is an average cost of .67 cent a gallon. That is only two-thirds of one cent per gallon.

How much would it cost Mohawk to make this same quantity and quality of gasoline without lead? According to the widely accepted Bonner and Moore Study on the Economics of Manufacturing Unleaded Motor Gasoline, reported in 1967 under the sponsorship of the American Petroleum Institute, a refinery of our approximate size would require an investment in new and expanded refinery facilities of $10.5 million, more than three times the appraised fair market value of our entire refinery complex.

According to this report, the additional manufacturing cost per gallon of gasoline would be 3.9 cents, a figure more than six times our present two-thirds cent per gallon using lead.

It is highly unlikely that capital of this magnitude would be available to us. It is highly improbable that increased operating costs of this magnitude could be passed on to the consumer or absorbed by the company.

As has been succintly stated by the Western Oil and Gas Association in its summary report on the Bonner and Moore study, and I quote, "The ultimate effect of lead removal on the economic viability of small refining companies can only be surmised." Certainly a masterpiece of understatement.

Now, at this juncture it should be made clear that none of the west coast small refiners are opposed to nor do they question the right of the Federal Government to establish emission standards. What comes out of the tail pipe of our Nation's automobiles is of critical importance to the general welfare of all of us. But we most certainly do object to the Federal Government telling industry how to accomplish these requirements by giving a Federal agency the right to control the composition of the fuel that goes into the engine, as is provided for under H.R. 15848.

It seems to us that the natural forces of our free enterprise system provide the traditionally successful American way to accomplish the desired result without passing laws and thereby risking the creation of irreversible postures which later technical developments may prove to have been in the wrong direction.

In this connection, please keep some things in mind. Keep in mind the conflicting expert testimony such as that presented in Sacramento by Dr. R. W. Hearn, Director of the Petroleum Research Center, U.S. Bureau of Mines, who reported that unleaded gasoline could create more smog than leaded gasoline. I quote from Dr. Hearn's statement on testing conducted by the Bureau:

> Leaded and comparable quality prototype unleaded fuels yielded about equal amounts of emissions. This was true for both evaporative and exhaust losses. However, if the photochemical effect is considered, the fuel factor is shown to exert significant influence. The fuel alterations from leaded to unleaded changed emission characteristics so that the pollution effect was increased by as much as 25 percent.

And that is the Bureau of Mines speaking.

Keep in mind Detroit, which says lead must be removed to make possible the use of catalytic mufflers, by its own testimony does not have a catalytic muffler which will operate satisfactorily under normal consumer driving conditions on either leaded or unleaded gasoline.

Keep in mind that by its own recent announcements, Detroit has no plans to install catalytic devices on new cars before the 1975 model.

It is incomprehensible to me, then, how the automobile companies can demand the removal of lead now to make usable possibly something which is not even developed.

Keep in mind that several oil companies have already publicly declared their intentions to manufacture and offer for sale lead-free gasoline in the fall of 1970 to meet possible fuel requirements of the 1971 models. They did this in the true American tradition on their own volition and not because of prohibition or legislation.

Keep in mind Dupont's thermal manifold reactor and its particulate trap, Ethyl Corporations' lean reactor car and Mobil Oil's recently announced clean air cars, all of which are reported to be meeting 1975 emission standards using leaded fuel.

In view of these apparently successful developments which do not require unleaded fuel, how can anyone condemn, convict and sentence lead at this time?

So, gentlemen, let any decision regarding the elimination of lead be based only on incontrovertible scientific fact supported and proved by thorough research and testing and not on impulsiveness, emotion or political expediency.

Let us avoid any possibility of needlessly jeopardizing the jobs of people like Mohawk's 300 employees and thousands of their counterparts all over the country. And, most important, let us take no chance that the interests of millions of American consumers be short-changed until and unless we are positive of the necessity, in complete agreement on the solution and absolutely confident of the results.

Thank you very much.

Mr. ROGERS. Thank you very much, Mr. McDuffie.

May I interrupt just a minute?

I understand that our distinguished colleague from Minnesota has some of his constituents here observing the operation of this committee. I want them to know and I am sure all the members of the subcommittee share with me this feeling that he has been one of our most outstanding members who has done magnificent work on this committee.

Congressman Nelsen, would you like to introduce them?

Mr. NELSEN. Thank you, Mr. Chairman.

I have some 4–H Club members here. The ladies dressed in red are taking me to lunch, Paul. I appreciate that. We are pleased to welcome them to this committee.

You may leave any time you wish. I am sure you would like to stay a few minutes, and we are happy to have you. Don't be embarrassed if you wish to leave. I know you are meting out your time, and I am sure you have many things you want to see.

I can meet those of you who are joining me for lunch in my office about 12 o'clock.

Thank you very much.

Mr. Chairman, may I inquire of the witness?

Many years ago, when leaded gasoline was first available, for example, in an F–20 McCormick-Deering tractor the valves would hang up by lead deposits on the valve stems. Some engines could not be operated with a leaded fuel. Obviously at that time we had a white gasoline without lead.

Why is it so difficult to convert back to a non-leaded gasoline?

Mr. MCDUFFIE. As I stated, I am not technically oriented but there was a great deal of very interesting testimony in Sacramento on this very point that ran in the opposite direction. It was to the effect that the presence of lead in gasoline helped eliminate valve sticking, which, frankly, was news to me. So, I cannot comment on what the conditions were in the early tractors.

Mr. NELSEN. It was the design of the engine, of course, that made it different. In the early days, the engine was not designed to accommodate a leaded fuel. You would run an engine for half a day and the valves would be stuck. The head would have to be pulled and there would be deposits on the valve stem that would actually keep the valve from closing.

For this reason, we were buying clear gasoline in those days.

Mr. O'HARA. In view of the reference to the farm tractors and the presence of the 4–H Club, could we have our man from the farm co-op comment on that question?

Mr. NELSEN. That would be a good idea.

STATEMENT OF BUELL W. BEADLE

Mr. BEADLE. Thank you, Mr. Chairman.

I believe the practical answer to your question, Congressman, is the enormous change that has occured in gasoline formulations and equipment. The times you mentioned, and I remember them, did not have cleaning additives; they did not have detergents; they did not have things that would remove the varnish. So, you could get a build-up on your valves very, very easily.

Another part of this progress is that today's tractor is not like the one then, in terms of bearing tightness, high performance, high compression ratio, high horsepower. It demands a different kind of fuel.

What I am saying is that the whole chemistry of gasoline has pretty well changed since the time period to which you refer.

Mr. NELSEN. Isn't there one company that still makes a clear non-leaded gasoline?

Mr. BEADLE. Yes; there are some clear gasolines, Amoco.

Mr. NELSEN. I still have my F-20.

Thank you, Mr. Chairman.

Mr. ROGERS. Isn't one of the reasons that the automobile companies say that lead needs to be taken out is because it will impair the life of the catalytic mufflers and so forth?

Mr. BEADLE. Of the catalytic mufflers. Most catalysts are poisoned by lead. I use this term chemically speaking.

Mr. ROGERS. I understand from Amoco, that testified here, that with the use of their gasoline, the life of the automobile, the parts, at least, a number of them, and I thought they said the spark plugs, was doubled by getting the lead out. This was the testimony they gave us.

I thought maybe before we really got into questioning, perhaps it would be better to let everyone make a statement if it suits the committee. I think it might be better to get your statements on the record.

Mr. O'HARA. We will try to speed them up.

Dr. Beadle, do you want to go ahead?

Mr. BEADLE. Thank you.

Mr. Chairman, distinguished members of the committee: It is a real privilege to have this opportunity of appearing before you to make a statement on a subject of great interest to all of us.

My name, as you know now, is Buell Beadle. I am Vice President for Research and Development of Farmland Industries, Inc., a Farmers' Regional Supply Cooperative headquartered in Kansas City, Missouri. We operate refineries located at Coffeyville, Kansas; Phillipsburg, Kansas; Scottsbluff, Nebraska; and participate in the operation of a refinery at McPherson, Kansas. We are involved in the refining of about 100,000 barrels of crude oil daily. My purpose in being here today is to make a statement concerning the attitude of our company toward the present situation regarding the ramifications of certain actions being discussed with regard to motor fuels. Specifically I wish to discuss the impacts of a decision to remove lead from gasoline. I will address myself briefly both to the economic and the technical aspects.

Our company agrees to the establishment of orderly programs to combat pollution of man's environment. Our Board of Directors has adopted a resolution expressing the desire of Farmland Industries to cooperate in combating America's mounting pollution problem. As a company, we are actively working in accord with this resolution.

Our concern at this time is that a precipitous decision to require removal of lead from gasoline may not serve the best interests of the anti-pollution program, or the general public. Such a decision without the opportunity to determine its consequences can well throw both the petroleum industry and the automotive industry into a state of confusion and into the institution of programs which will at best be tremendously expensive. These expenditures will, of necessity, be paid ultimately by the consumer of the products manufactured. We should like to be reasonably sure that any decisions made, and any programs instituted, will contribute substantially to a solution of the pollution problem and thereby justify the expenditure of funds necessary to bring them about.

Because the petroleum and automotive industries have designed their operations and vehicles around leaded gasoline for many years, most of the data on performance and refinery operations have been concerned with lead-containing fuels. The withdrawal of lead will necessitate the change of refinery operations at a great expense to the industry.

Studies developed by Farmland Industries engineers show that with today's prices, the cost to our company to install equipment to manufacture and distribute lead-free gasoline will exceed $30,500,000. Prorating this to a national level, the cost to the petroleum industry to produce non-leaded gasoline will exceed four billion dollars. This amount could exceed six billion dollars because of competition for skilled construction labor, material supply problems and the general effect of a growing economy.

To complete the refinery construction required to meet non-leaded gasoline production demands, a leading process design company has indicated that a five-year construction program will be required. The petroleum industry is currently spending over $500,000,000 annually for conventional process equipment replacement, facilities upgrading, and refinery modernizing. To meet a five-year construction period on non-leaded gasoline equipment, an additional one billion dollars per year would be spent by the petroleum industry. This is a 200 per cent increase in construction activity. There is not enough skilled labor available to support a nationwide project of this magnitude.

It will be necessary to increase consumer gasoline prices by as much as three cents per gallon to cover increased manufacturing and distribution expenses.

The removal of lead will result in reduced gasoline production per barrel of crude oil by as much as 10 percent. To meet sales commitments, therefore, increased amounts of our dwindling supplies of crude oil must be used. On a national scale, this 10 percent loss in gasoline represents 1,095,000 barrels per day of additional crude oil. The foregoing does not represent all of the losses which would be incurred by producing nonleaded gasolines. It is estimated that the reduction in automobile engine compression ratios required to burn nonleaded gasolines, that is, from 9.5 to 8.5, will increase gasoline consumption by about 3.5 percent. This factor, too, will place increased demands upon crude oil availabilities.

Aside from the economics of producing nonleaded gasolines, the problems of compositional changes of the fuels must be considered. Based upon present technology, satisfactory nonleaded gasolines will contain appreciably higher amounts of chemicals known as aromatics. A recently published study by the U.S. Bureau of Mines Petroleum Research Center at Bartlesville, Oklahoma stated:

> The fuel alterations from leaded to nonleaded changed emission characteristics so that the pollution effect was increased by as much as 25 percent.

The problem of increased aromaticity of gasolines would not be of importance if and only if an economical method is currently at hand for converting unburned hydrocarbons and carbon monoxide to carbon dioxide and water, reducing nitrogen oxides, and reducing total particulate matter from automobile exhausts. Conflicting reports with regard to the availability of catalytic reactors, thermal reactors, exhaust gas recirculation systems, and particulate traps would suggest that some reconciliation of view points is in order.

One of the principal yardsticks used in measuring gasoline quality is that of octane numbers. To those in the automotive or petroleum refining industry, this means research octane numbers and/or motor octane numbers and/or road octane numbers, how the car performs. Non-leaded gasolines with high aromatic content, will result in gasolines with greater tendency to knock, more photochemical smog production, and poorer engine performance than leaded gasolines of equal research octane number. Processes must be developed which will give the consumer assurance that he can depend upon the fuel to perform satisfactorily in his car regardless of the fuel's "research octaine" rating.

The impact of producing non-leaded gasoline would not be restricted to the petroleum industry but would also affect the chemical, metals, and petrochemical industries. It has been estimated that the move would eliminate an annual gasoline additive market-valued at $400,000,000 for organolead compounds; $85,000,000 for associated chemical agents; and could result in the layoff of 8,000 to 10,000 production workers in the chemical and metals industries.

In summary, we believe that the arbitrary removal of lead from gasoline, without a complete technical justification, will result in gasoline of higher cost to the consumer, poorer engine performance, and no definite assurance that a substantial abatement of air pollution has been achieved. In fact, there is no conclusive evidence that, as a product of automobile emissions, tetraethyl lead in the atmosphere constitutes a health hazard.

In view of the conflicting reports from motor car manufacturers, lead manufacturers, and petroleum refiners, we believe that the interests of the American people will best be served if these conflicts are resolved before a decision is made.

We suggest that one effective way of resolving these conflicts is for the government representatives to meet jointly with representatives from the three types of industries mentioned. By the use of the technical talent in all these, areas, and the large amount of information which is available, an orderly and technically sound program can be developed, which will reduce air pollution at a cost which the public can afford, and which will allow independent refiners to continue to operate as an important and effective segment of the petroleum industry.

Gentlemen, I wish to thank you for your attention, and for the opportunity of making this statement to you.

Mr. Rogers. Thank you, Dr. Beadle.

Mr. O'Hara. I will next refer to Mr. Voss.

STATEMENT OF WILLIAM C. VOSS

Mr. Voss. Thank you, Don.

Mr. Chairman and members of the committee: My name is William C. Voss, and I am Vice President, Administration, of Northwestern Refining Company of St. Paul Park, Minnesota. In my position, I am responsible for coordinating finance, personnel, administration, and planning for our company.

Northwestern Refining Company is an independent, nonintegrated, single plant refiner with offices and refinery located at St. Paul Park, Minnesota. The company markets petroleum products throughout a 12-state Upper Midwest marketing area. We were the first refiner in Minnesota.

In addition to Northwestern's refinery, Minnesota has refineries at Pine Bend, Minnesota owned by the Great Northern Oil Company and Wrenshall, Minnesota owned by the Continental Oil Company. The Petroleum Division of Farmers Union Central Exchange, Inc. has its home offices in South St. Paul, Minnesota and serves many customers throughout the Upper Midwest, operating its refinery at Luarel, Montana.

Mr. ROGERS. What is your capacity?

Mr. VOSS. 44,000 barrels a day.

Mr. ROGERS. Thank you.

Mr. VOSS. In gasoline production, that amounts to, about, in our case, 24,000 barrels a day.

As citizens of one of the leading recreational States in the country, we are acutely sympathetic with the desire for taking whatever steps are necessary to secure the necessary protection of our environment—a primary concern of this committee and a concern highlighted by the President's message to Congress and to the Nation on February 10th. As a company operating within Minnesota and responsible for supplying needed petroleum products throughout our area, we are concerned not only with the objectives to be achieved in the protection of our environment but also with the means to be utilized. If improper means are utilized, the result could be the destruction of economic viability of companies like ours. We could suddenly become unable to operate and supply on a competitive basis the petroleum needs of the area.

Other witnesses before you have presented extensive testimony highlighting alternative methods presently available or expected to be available in the near future for dealing technologically with the problems of motor vehicle air pollution. Other witnesses have presented to you in some detail the unique economic and technological problems of a smaller petroleum refiner in adjusting and adapting to drastically changed product specification requirements. This testimony clearly indicates that the selection of alternatives to accomplish a common objective and the timing of implementation can have a drastic effect on the survival of independent refining companies.

I rely on the testimony of others to provide you with such technical and economic information. I rely on the judgments of this committee in setting final objectives and means of implementation. This is your responsibility which you will carry out.

With respect to the means for implementation, I would only emphasize that your selection of means and your decision with respect to reasonable transition periods can determine the survival of Northwestern Refining and other companies similarly situated, the smaller refining companies in the industry. Permitted to survive, we will continue to make an important contribution throughout the country to consumers and the economy generally.

Independent refiners are faced with substantial uncertainties as a result of the recommendations of the Cabinet Task Force report on oil imports just recently released. Refiners in our area are now faced with the additional adverse impact of import restrictions on our supplies of Canadian feedstocks. These are additional very material factors which we hope you will keep in mind as you progress your deliberations.

They are not the direct concern of this committee but they are relevant and we hope you will keep them in mind as you consider your action on the specific matter of motor vehicle pollution control.

Northwestern Refining Company would face an extremely difficult, if not impossible, requirement for change in our operations if confronted by any precipitous requirement of severely changed product specifications. We simply do not have the capability, the financial muscle and economic position, to accommodate overnight more drastic changes which our giant major competitors might readily accept.

Thank you very much for the privilege of making this appearance. If there are any questions you have which I might answer, I would be pleased to try.

Mr. ROGERS. Thank you, Mr. Voss.

If I can get on the record, what is the octane before adding lead at your refinery? What is your highest octane?

Mr. VOSS. Our pool octane is 86.9, I believe.

Mr. ROGERS. Do you refine more higher octane than that?

Mr. VOSS. That is the average octane of all of our components. Our highest octane that we are currently producing would be our alkylate production which I believe is approximately 96 octane.

Mr. ROGERS. 96 before adding lead? Would this be true at your operations?

Mr. BEADLE. That is a little bit high, I believe, for our highest. It varies with the type of crude you use. Our pool octane is about 85 or 86. Our premium could get up into the middle 90s.

Mr. ROGERS. 95, 96; somewhere in there?

Mr. BEADLE. Yes.

Mr. VOSS. Mr. Congressman, I would add, though, for your information that this high octane component represents only 10 percent of our total gasoline production.

Mr. ROGERS. Yes; I understand that, but you have the technique to do this, though.

Mr. VOSS. Yes. We are limited by the availibility of the feedstock for this process.

Mr. ROGERS. Thank you.

Mr. O'HARA. Mr. Anderson.

STATEMENT OF THOMAS A. ANDERSON

Mr. ANDERSON. Mr. Chairman and Committee Members: I am Thomas A. Anderson, Executive Vice President of Quaker State Oil Refining Corporation, Oil City, Pennsylvania.

Quaker State is a part of the Pennsylvania Grade Crude Oil Industry which represents a very small segment of the Nation's crude refining capacity. Our company processes 14,000 barrels of crude oil per day in three small refineries at Farmers Valley, Pennsylvania; Emlenton, Pennsylvania; and St. Marys, West Virginia. The largest of these plants can process only 6,000 barrels per day. Crude oil supply is purchased in western New York, western Pennsylvania, West Virginia and Ohio, in fact, just about in the heart of Appalachia. Gasoline marketing is confined to the same area.

Because of this small capacity, it is economically impossible for these plants to utilize the best methods for producing high octane gasoline such as isomerization, alkylation and catalytic cracking. The only working process available for use is catalytic reforming, which is being used in all of our plants. These existing units do not have the catalyst capacity or the hydrogen circulation necessary to increase clear octanes—in other words, lead-free octanes—higher than present operating levels. Our present pool is 85.4 octane.

Mr. ROGERS. What is your highest?

Mr. ANDERSON. The highest octane we make is 91 clear, without lead. When we operate on that basis, we have to reduce our throughput to about 75 percent in order to reach that level.

Mr. ROGERS. Twenty-five percent of your production would be the high?

Mr. ANDERSON. About 25 to 30 percent; that is right.

Mr. ROGERS. Thank you.

Mr. ANDERSON. Considerable time and major investment will be necessary to make changes to meet proposed levels of 91 clear and leaded premium. Historically, compression ratios have been increased regularly. We would expect that if we did adopt 91 clear that as soon as that level were established in four or five years the level would be up to 95 and then 97. Such increases, with the resultant demand for higher octane fuel, would soon make it economically impossible for our company to produce automotive gasoline.

We are just building a complete grass roots refinery in the northern panhandle section of West Virginia, 10,000 barrels a day. We had a thorough economic study made by Universal Oil Products Company. We asked them with the type of charge which we would have to our gasoline-making units, the type of units which we could economically afford to put in, what was the maximum octane we could reach. The maximum octane was between 95 and 96 clear. That is unleaded. That would be our limit that we could go economically.

Beyond that, to reach higher octanes, we would have so much loss in the production of gasoline that we couldn't get the type of price we would have to have to sell it. So, we would be out of the gasoline business.

The gasoline produced by Quaker State (approximately 60,000,000 gallons) is sold under our own brand name through over 500 retail outlets. A marketing approach which would make it necessary to install a third pump with tankage would entail capital expenditure of $2,500 per outlet, or approximately $1,250,000, which could only be recovered through increased prices. Some dealers could be forced out of business where their small volume wouldn't justify the expense.

The entire Pennsylvania Grade Crude industry refines only 38,000 barrels per day, through 10 small refineries—the largest of which processes only 10,000 barrels per day. Actually only three of the companies represented in the industry make gasoline. The rest of them make charge stocks which are processed by these three companies into gasoline. They all use essentially the same refining equipment for gasoline production, and a similar marketing approach as used at Quaker State. They would be affected in the same way.

The other companies have asked me to make that statement before this committee, that their operations would be affected in the same way as Quaker State.

We wish to close by stating that we certainly endorse the policy of creating clean air for our environment. We ask only that a decision to eliminate lead in gasoline be based upon a thorough investigation of the problem of air pollution, and that such elimination is found to be the best method of controlling automotive emissions. A thorough study should be made of all emission control devices capable of producing clean air. We understand that after burners have been developed which do not use catalyst, and would not be subject to lead contamination.

In line with that subject, I have seen the Dupont after burner in operation. I understand that Dupont is going to testify before your committee as to the efficiency of operation of their type of burner. They can operate whether gasoline is leaded or unleaded.

When a decision is reached regarding the emission levels necessary to protect man's environment, a time table should be established which would make it economically and mechanically feasible to meet these new requirements.

By that, I mean, as has been stated here before, if we had to go to a 91 octane pool and that is the pool octane which we would have to reach because it takes 91 clear octane to make a 99 octane leaded, engineering would have to be done, equipment would have to be ordered, and installation would have to be made.

With all companies going to the construction companies at the same time for this type of work, it would take us several years to get the necessary equipment to do this job.

I wish to thank the committee for the opportunity to appear before them and make this statement.

Mr. ROGERS. Thank you, Mr. Anderson. We appreciate your statement.

Mr. O'HARA. Mr. Chairman, Mr. Logan will be our last witness. I have asked him to make it brief because we don't want to overstay our welcome.

Mr. ROGERS. Take your time. We will be delighted to hear him.

STATEMENT OF HARRY A. LOGAN, JR.

Mr. LOGAN. Mr. Chairman, my name is Harry Logan. I am President of United Refining Company of Warren, Pennsylvania.

United Refining Company, incorporated in 1902, is engaged in refining and marketing of petroleum products, including premium and regular gasoline, kerosene, diesel fuels, home-heating oils, industrial fuels, paving and roofing asphalts and liquefied petroleum gas.

Our sales of gasoline in 1969 reached 166 million gallons and we collected from customers and transmitted to Federal, State and local governments almost $18 million in gasoline excise taxes.

Our crude oil supply is obtained from the Rocky Mountain and mid-continent regions, and not Pennsylvania.

Our current refining capacity is 20,000 barrels a day, and we are undergoing an expansion now to 25,000 barrels a day.

Gasoline, which is our most important product, is marketed through 300 service stations and a number of other retail outlets, as well as through distributors and commission agents all located in Pennsylvania, eastern Ohio and western New York. We are essentially a regional marketer and refiner of petroleum products with all of our gasoline output going to company-controlled outlets. Therefore, the question of how and under what circumstances unleaded gasoline is to be made available or might be made available to the motoring public is of crucial importance to our business as it will have a significant impact upon both parts of our enterprise.

If it is necessary to produce unleaded gasoline substantial additional refining facilities will have to be provided for, requiring extremley high new capital outlays.

In addition, very large expenditures for marketing may be required if we are compelled to distribute and sell to our customers a third grade of unleaded gasoline during a transitional period extending over the next few years and when there will still be a continuing demand for leaded gasoline which we are producing today.

We fully endorse the objectives of protection of the environment. There can be no doubt about this. But we submit that what we have witnessed in the last few weeks is a gigantic ploy on the part of the automobile industry involving an attempt to shift responsibility for pollution control to the oil industry.

It would suggest that this has proceeded in an emotional environment and that insufficient time has been allowed for the facts and data to be collected and accurately assessed.

We caution against any over-hasty reaction to the problem which we are considering today. Unless careful consideration is given to finding the most practical and workable solution, we are liable to be confronted with an unrealistic and accelerated time table for converting to unleaded gasoline, which will result in an expenditure for new refining facilities it from five to $6 billion for the petroleum industry as a whole—this is a staggering sum—plus an additional outlay of one billion to $2 billion for additional facilities for gasoline distribution.

These staggering costs would severely tax the entire industry and the impact would be felt most severely by the independents who lack the vast financial resources of their giant competitors.

Ultimately, of course, the costs will have to be passed on to the consumer in the form of sharply higher prices for gasoline.

We urge earnestly that full consideration be given to all factors surrounding this problem before any restrictive legislation is passed, which might place enormous burdens on the industry as a whole and, more particularly, on the independent refining segment and result in needlessly higher costs for motor fuel to the public.

Gentlemen, I would like to take the liberty of reading a paper which was sent to me in the mail by Houston Chemical Company, one of the manufactureres of antiknocks. It is entitled "Lead Antiknocks and Air Pollution".

The relation of the automobile to air pollution has received considerable publicity and part of this publicity has been directed against lead antiknocks.

Questions have been raised as to whether the concentration of lead in the atmosphere is harmful or likely to be in the future. Also, statements have been made that it will be difficult for the automotive industry to meet future emission standards with leaded fuel.

Based on many years of research and intensive study, we believe:

1. Smog will not be reduced by eliminating lead antiknocks.

The production of high octane non-leaded fuels would mean increase in aromatics and photochemically reactive emissions and would actually increase the amount of eye irritants in the atmosphere.

2. Substitution of non-leaded fuels for leaded gasoline may introduce new health hazards.

The increased aromaticity for non-leaded fuels may result in new and serious health hazards because of the exhaust products emitted.

3. There is no evidence that the use of lead antiknock is detrimental to public health.

Lead antiknocks have been comprehensively studied for over 40 years from the standpoint of public health.

Authorities in the field recognize that lead is widely distributed in everything on earth, including man. Approximately 90 percent of the body lead intake is via food and water. Only 10 percent is derived from the air we breathe.

Extensive studies of urban atmosphere and people exposed to it have shown no evidence of health problems due to the presence of lead in the air. These studies are continuing in cooperation with the U.S. Public Health Service.

4. Use of lead antiknocks conserve petroleum resources.

If lead antiknocks were not available, refinery operations would have to be modified to produce comparable octane quality fuel. For the United States this would mean a consumption of additional 250,000,000 barrels of crude oil per year.

5. Gasolines will cost more if lead antiknocks are eliminated.

It has been estimated by independent consultants that the cost for gasoline of same road performance would be increased two to seven cents per gallon, depending upon the size of the refinery. The smaller refineries could not remain in business. In addition, the petroleum refineries would be faced with a minimum additional capital expenditure of $4.5 billion.

6. Spectacular improvements have been made by the automobile industry in reducing emissions. It has already had an effect in lowering atmospheric pollution and will become even more effective as older uncontrolled cars are retired.

Officials of the automobile industry have expressed an opinion that present internal combustion engine offers the best means for solving the automotive phase of the problem. There are several prototype units under development which may permit the present engine to meet future emission standards.

In summary, we wholeheartedly endorse the national goal of improving the environment. Our efforts toward this goal should be based on established facts and should not be stamped in condemning proven products. Legislation based on emotions and unproven theories can result in unnecessary cost and inconvenience to the public and unnecessary expenditures to industry.

Mr. ROGERS. This is a fine presentation. We appreciate the trouble you have gone through to present it to the committee.

Mr. Nelsen?

Mr. NELSEN. Thank you, Mr. Chairman.

One thought occurs to me. I think some of the major companies that have unlimited resources have indicated that they will move in the direction of a nonlead fuel. The thought that strikes me is this, however; that the smaller refineries that make a great contribution in the field of competition might find themselves actually out of business due to their limited resources. Their competitive position would have been destroyed.

Is this a real factor that concerns you?

Mr. O'HARA. Very definitely so. We could not have put it any better if we had said it ourselves.

Mr. NELSEN. Thank you.

I am sure that we want to make every possible investigation to be sure that if nonleaded fuel would make a contribution to a better environment, we should move in that direction. We want to be very sure that it would actually make the contribution that some people state it should.

Now, I would like to comment about the afterburner.

I saw the experiment here. I learned, being a bit of a mechanic, myself, that in order to make this after burner work the carburetor has to be set at a richer mixture so the residue in the exhaust will provide the fuel for the after burner to work.

I then asked the representative of the Ford Motor Co. how this affects the mileage rate. Well, it is materially cut down. This, of course, would be a factor that the general public would soon be aware of and you would, of course, find that the product would not be widely used.

Thank you, Mr. Chairman.

Mr. ANDERSON. Could I make one comment on Mr. Nelsen's remark?

Mr. ROGERS. Surely.

Mr. ANDERSON. Along the comment about the efficiency of the automobile and mileage on the car, I might say, and we are not completed on the test but we have been testing three 1970 automobiles with regular gasoline, unleaded 91 octane gasoline. They did perform satisfactorily without knock. But they did have poorer acceleration and they had about 10 percent less mileage from our information to date.

This committee might want to ask more questions on that.

Mr. ROGERS. Mr. Skubitz.

Mr. SKUBITZ. Thank you, Mr. Chairman.

I would like to ask the gentlemen this question.

Mr. Kleppe this morning in his testimony said, "There isn't any question that an alcohol-gasoline blend will work efficiently in present-day motor vehicles. It will measurably reduce hydrocarbon exhaust emissions by as much as 50 percent. It will prolong engine life. It will provide extra power without lead additives."

Then he goes on to say, "From the motorists' points of view I don't believe that a 10 to 15 percent blend of grain alcohol with gasoline would cost him any more at the filling station than he is paying today."

Are you familiar with the use of alcohol as a blend and what has been your experience?

Mr. BEADLE. Yes, sir; I have been in and out of this subject for 35 years. The big problem has been the one of economics. I cannot give you quantitative data at this time simply because I don't have it. I know there are data.

Technologically, alcohol will blend with gasoline and burn effectively. As far as increased power is concerned, no; the molecule, and I don't want to get into chemistry here, but the molecule is partly burned already. That is why it makes it alcohol rather than a hydrocarbon. The characteristics of the exhaust emission I can't really say.

Where the program has always failed, though, and that was his last point, the price at the filling station, this is where the program has always failed and I am involved in some discussions on this problem now because it is an intriguing possibility.

If you consider, though, the economic impact of taking 60 or 80 cents, my figure for fermentation alcohol is higher than the Congressman's but he may be right—it depends on making a definitive study—when you take gasoline, though, and begin to dilute it with 60 cents or 80 cents material, I don't see how you can buy it at the same price if you are putting 10 percent in it.

The way I would figure, and I don't know exactly what taxes are in different States, but you can get down to somewhere around 20 cents or 25 cents for gasoline, you put 10 percent of an 80 cent material, you have added 6 cents. You took two off and added on. So I don't see how you could buy it for the same price. This is why the programs have failed.

Mr. SKUBITZ. If you were to substitute alcohol for ethyl how much would the ethyl cost and how would it compare with the cost of alcohol?

Mr. BEADLE. The alcohol will not raise the octane numbers that much. I am not evading your question. I believe someone mentioned this morning the cost of ethyl is two-thirds of a cent. Let us say there might be four or five cents differential.

Mr. SKUBITZ. The by-product from this could be used as a cattlefeed, could it not?

Mr. BEADLE. Yes.

Mr. SKUBITZ. That would be written off as one of the benefits.

Mr. BEADLE. This is being looked at. I don't know the economics. That goes in dollars per ton rather than cents per pound.

Mr. SKUBITZ. Remember years ago, Senator Schoeppel considered the use of alcohol as a method of getting rid of our wheat surplus. I know at that time it was said that the economics was against its use. Has it improved?

Mr. BEADLE. No, sir; fermentation alcohol is still made the way it used to be.

Now you have gains that, and I think this should be brought out for your information, it was alluded to this morning, this same alcohol can be made from petroleum sources at much lower cost. Now, if you start putting alcohol in gasoline, we can make it in the refinery, the same chemical molecule which by law is barred from being in vodka, but it is the same compound.

Mr. ROGERS. How cheap is that?

Mr. BEADLE. My figures are a year or two old. The figures that I have are that ethanol from petroleum would cost around 40 cents. By fermentation, the Congressman said 60; I had the figure of 80 cents; but it is higher by quite a bit.

Mr. ANDERSON. You might add that the ethanol from petroleum is made from the very highest constituents, too.

Mr. BEADLE. Yes; you would be taking away the high octane material to convert into alcohol. It is very intriguing. As I say, the economics have killed it every time.

Mr. SKUBITZ. That is all, Mr. Chairman.

Mr. ROGERS. What the committee is trying to do is to give some impetus to make some progress in the fight against air pollution. I am sure you are aware of this. We are not satisfied with what is being done by the Department or by the Government. We hope to fashion this legislation where we can make more progress.

Our committee, I think, has always been reasonable and realistic but we do want to make some gains and progress and we think it can be done through the legislative process.

Now, I am not sure that we can wait until incontrovertible evidence is developed. I think we may have to go with a preponderance of the evidence because I think if we waited until we got incontrovertible evidence we would never move, we would never do anything. Salk vaccine is a good example. We never would have authorized that being used to vaccinate people against polio if we had insisted on incontrovertible evidence because almost every scientific question has a pro and a con and some scientists will say, "Now, I don't agree with that."

So, I hope you will understand that the committee feels that we would not want to be bound by incontrovertible evidence. I don't think we can be.

Now, what responsibility does the oil company have in fighting air pollution? We have been told that lead inhibits the devices that can be placed on automobiles to reduce emissions and bring about a clearing up of those emissions from 90 to 97 percent.

Now, 60 percent of the air pollution problem of the country is the automobile. I think the automobile companies have joined you because they did want to have a part, I guess, in sharing in this problem, and I think this is true.

But, what is the responsibility of the oil companies? Have you done research in this? Have you had an effort made? Do the companies contribute, the major companies? Have they done any work in trying to eliminate this problem of the emissions, or do they feel that is the responsibility of the automobile companies alone to make the devices that will take out whatever the fuel may be composed of?

What do you feel is the oil companies responsibility?

Mr. O'HARA. I could make one brief statement.

You talk about the association where the companies have done a tremendous amount of research and several of them are scheduled to testify before you on that point. As far as the association, the principal association of the oil industry is the American Petroleum Institute. I understand the American Petroleum Institute is scheduled to testify.

I can say for our association we are not big enough, we have not done it. I do know the American Petroleum Institute has a fine program and they are scheduled to testify.

Mr. ROGERS. What do you think as individuals? You know we have the problem. Somehow it has to be solved and something is going to happen.

Now, if we can get devices that will clear up the air with leaded gasoline, this is fine; if it will do away with pollution. But if we can't, we are going to have to take some kind of steps. I think everybody recognizes that. We want to be realistic in approaching it and we don't want to put anybody out of business if we can avoid it

But I think there is a responsibility for some effort in each company in trying to do it. Now, we do have one company, Amoco, which is making the lead-free gasoline. They make high octane. I think for their regular they use lead.

Now, all of you presently have a pool octane of about 86. Probably with some investment you could bring that up to 91. We have the techniques; it is not too difficult to do that; is that right?

Mr. ANDERSON. We need the time.

Mr. ROGERS. I understand.

But this can be done. In fact, we are increasing the amount of octane in gas without adding lead every year almost, aren't we? The techniques are improving. I have seen the chart. Where we used to have 70 or so, and even below that, now we have brought it up to about 91, in some instances 95 and 96, without lead.

Now, the automobile companies are producing 16 to 20 percent of their automobiles that require high octane. All the rest they are going to modify. Even present-day cars could run on your 96, 97, almost regular gasoline. That is over your regular. It does not have to be but 86. 91, I guess, is what they really use.

So, this is possible right now. You can market regular gasoline right now for the cars without lead and certainly if they modify them you could.

So, this is possible without even a new marketing system being put in because you could use it as regular gasoline.

Now, if we develop enough technique, we can bring that octane up, like Amoco does now; it is possible with the current marketing system where you have high octane and regular. Now, some of you may be placed perhaps in only the regular markets. This might be so; I don't know. But I think the techniques are here and this is possible.

Now, I realize there may be some major adjustments and also there will be some cost. Amoco also tells us that it saves the consumer two to three to four cents to run non-leaded gasoline in his automobile because he does not have to buy new parts as often. The testimony they gave was that their gasoline increases mileage.

So, the committee is going to go into all of this thoroughly, but I don't know that it is as formidable a problem as we might think. Like someone suggested here, if you could get everybody together this would be good.

Now, I suggested that to the Secretary of Health, Education and Welfare over a month ago and he made no move. I told him I wondered why he was letting Reagan get ahead of him, both being from California.

Now, they did not have any trouble with antitrust laws but they are afraid here that they will have an antitrust problem. So, they are going this route, that they will write each individual company an individual letter and get their views. Then after they get that they can call you together. It seems to me this is a waste of time to go through that process; if he can call you together in California I don't know why they can't do it here. This is evidently a problem for them.

But I want to assure you that the committee is going to look into the problem very carefully.

We do appreciate the advice you have given us. We would like to feel free to call on you for additional information as we move along at any time. If you think there is something we should have, we will be glad to receive it. But I think we have somewhat of an analogous situation between the oil industry and the tobacco industry.

Even though the evidence was not incontrovertible the overwhelming viewpoint was that smoking does contribute to bad health. Air pollution contributes to bad health, and the opinion is that we have to do something about automobile emissions.

Now, they tell us the fastest and quickest way is to get the lead out and that the automobile companies can adjust. Now we will go into this and we are going to find out when the companies are to have their devices. We will go into that very carefully, too, because I know they say they are going to adjust their compression, which is nothing at all to do, as I understand it, not very difficult, in the '71 model. But I have not seen a statement and I want such a statement as to when the devices will be put on, so we understand that, too.

Mr. Anderson. Mr. Chairman, you mentioned American Oil Company and their unleaded premium gasoline.

I would like to say that they market that only in 25 states. They take the cream of all of their production to make that for the 25 states. I don't think even American could go nation-wide with it. I don't think they have the capacity at all.

Mr. Rogers. Perhaps if we got the other major companies to do that, to handle the 16 to 20 per cent of the production which requires high octane, and all the others go into regular, this might be possible.

Mr. O'Hara. Mr. Chairman, I would like to say that we endorse your idea of the Secretary of Health, Education, and Welfare or some other Government officeal calling a conference.

We are, as you are, amazed at the fact that they say they can't do this because of the antitrust laws because if they had the support of the Administration they should be able to do what is necessary to call that kind of conference.

I would like to add one other thing. I hope you will urge them to consider the position of the independent refiners.

Now, our information was that Health, Education, and Welfare was about to send a questionnaire only to a few major oil companies. I wrote them a letter yesterday and gave them names of some typical independent refiners and urged that they be included.

Mr. Rogers. If you will submit your list, I will see that the committee asks them that they consider them.

Mr. O'Hara. We will do that.

Mr. Rogers. Are there any other questions?

Mr. Skubitz. No.

Mr. Rogers. Thank you for being here. We appreciate it.

The committee stands adjourned until 10 o'clock tomorrow.

(Whereupon, at 12:15 p.m., the subcommittee adjourned, to reconvene at 10 a.m., Thursday, March 19, 1970.)

AIR POLLUTION CONTROL AND SOLID WASTES RECYCLING

THURSDAY, MARCH 19, 1970

House of Representatives,
Subcommittee on Public Health and Welfare,
Committee on Interstate and Foreign Commerce,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2322, Rayburn House Office Building, Hon. Paul G. Rogers presiding (Hon. John Jarman, chairman).

Mr. Rogers. The subcommittee will come to order.

We are continuing hearings on legislation affecting air pollution and solid wastes. We are honored to have our distinguished Chairman of the Full Committee with us this morning and we are delighted to call on him, to introduce our first witness.

The Chairman. I would like to have Mr. Herbert S. Richey take the witness chair, please. I would like to say a few words about this young man before he starts testifying before the committee.

Herb Richey, first of all, is a mining engineer. He started his career in West Virginia, working in the mines, as I understand it. If I am wrong, he can correct me.

Today, he is a member of the Advisory Board to the President of Wheeling College and President and Chairman of the Valley Camp Coal Company, one of the large coal companies in America, or in the world, for that matter.

He is a member of the Board of Directors of the National Chamber of Commerce, and I understand he is appearing here in two capacities; one to represent the National Chamber of Commerce.

He is Chairman of the Chamber's National Resources Committee. He has one of the largest mine supply equipment companies, and also, he has one of the largest mines in the industry in Upper Peninsula, Michigan.

One of the things I would like to say about him is, of course, that he is one of the young industrialists of America whose thoughts and his actions have been positive rather than negative. His philosophy is to go forward. His slogan is "Press On" and not "Stand Still",—to go on and see what we can do in bettering our ways of life and bettering his industry and bettering the community in which he lives and in which his companies are active.

I would like to say he has a son in Vietnam who is helping to fight this Nation's wars. He is one of the young men of the country who has made good.

We are very happy to have him as our guest this morning to testify before the committee. I am very happy to introduce to this committee Herbert Richey, President of the Valley Camp Coal Company.

Mr. ROGERS. Your statement will be made a part of the record and we are delighted to have you here. Proceed in any way you care to.

STATEMENT OF HERBERT S. RICHEY, MEMBER OF THE BOARD AND CHAIRMAN, NATURAL RESOURCES COMMITTEE, CHAMBER OF COMMERCE OF THE UNITED STATES; ACCOMPANIED BY JOHN J. COFFEY, SENIOR ASSOCIATE FOR NATURAL RESOURCES AND ENVIRONMENTAL QUALITY

Mr. RICHEY. Mr. Chairman and committee members, I appreciate the opportunity to appear before you to present this statement on behalf of the Chamber of Commerce of the United States. I am Herbert Richey, President of the Valley Camp Coal Company, Cleveland, Ohio. I serve on the Board of Directors of the National Chamber and as Chairman of the Chamber's Natural Resources Committee. Accompanying me is John J. Coffey, Senior Associate for Natural Resources and Environmental Quality, Chamber of Commerce of the United States.

Mr. ROGERS. Mr. Coffey, we are delighted to see you this morning.

Mr. RICHEY. First, I want to compliment the members of this committee for their dedication and determination to conserve the quality of our air. Your leadership, your inquiries and your consideration of the complex environmental factors, constitute a public service of the first order. The Air Quality Act of 1967 developed by this committee presented a strong, but reasonable program for the management of our air resources. Implementation of this program, unfortunately, has not been up to the expectations of this committee, the Congress, and all Americans.

The National Chamber shares the concern voiced by President Nixon in his Environmental Quality Message:

> This program (Clean Air Act) has been the first major Federal effort to control air pollution. It has been a useful beginning. But we have learned in the past two years that it has shortcomings. Federal designation jof air quality control regions, while necessary in areas where emissions from one state are polluting the air in another, has been a time-consuming process. Adjoining states within the same region often have proposed inconsistent air quality standards, causing further delays for compromise and revision. There are no provisions for controlling pollution outside of established air quality control regions. This means that even with the designation of hundreds of such regions, some areas of the country with serious air pollution problems would remain outside of the program.

The Air Quality Act of 1967 can be a most effective tool to accomplish the enhancement of our air resources, but the National Chamber agrees with the President that the inability of the Federal agencies implement this Act has resulted in the delay of remedial action necessary to solve air pollution problems. It is clear that several amendments to the Clean Air Act are necessary.

Contacts with the National Air Pollution Control Administration (NAPCA) over the 2½ years since the Air Quality Act was signed into law have revealed that its personnel are both dedicated and capable. The National Chamber commends the NAPCA staff, but stresses that the tasks assigned to NAPCA by the Air Quality Act, given the present budgetary and personnel restraints, have proven extremely difficult, if not impossible, to fulfill. Even assuming that the budget and the staff of NAPCA were expanded, the present tasks assigned offer a full program of work. The proposals before this committee to assign a substantially increased workload to NAPCA can only serve to overburden this agency and result in continued delays in the fight against air pollution. To accelerate air pollution control programs, there must be greater utilization of local and State air pollution agencies. The National Air Pollution Control Administration and the Department of Health, Education and Welfare cannot direct every program of air pollution control—not if we are to solve our pollution problems expeditiously. Federal authority should be to ensure that adverse air quality does not injure the public health, that a mechanism be established whereby state and local programs of air quality can be adopted, and that air pollution control programs proceed rapidly through enforcement of a timetable for action.

Specifically, the National Chamber proposes amendments to the Clean Air Act which would provide for:

The designation of air quality control regions—both intrastate as well as interstate—for all sections of the country. Primary responsibility for designation of intrastate regions would rest with state authorities, but, if no state action were taken, the Secretary of Health, Education, and Welfare would make these designations.

The promulgation of minimum national ambient air quality standards to protect the health of all Americans. Adequate data on the health effects of various air quality levels does not now exist. However, this should not deter the setting of minimum national ambient air quality standards to protect public health. The National Chamber urges that the Department of Health, Education, and Welfare, using the health data now available and the criteria issued by HEW under the Clean Air Act, proceed to promulgate these standards, after providing for review by all interested parties. This review will be extremely vital due to the lack of sufficient health data. Continuing research into the health effects of air quality levels will be necessary, and provision to amend these standards, based upon this research, should be included in the language of the Act.

The adoption by the States of regional air quality standards at least as stringent as the national public health standards. Following the designation of the air quality control regions and the final promulgation of the national minimum air quality standards by the Secretary, the basic procedure detailed in Section 108(c) of the Air Quality Act (the adoption of ambient air quality standards by the states) would apply. The regional public hearings to be held in accordance with Section 108 (c) prior to adoption of air quality standards by the states would consider the merits of establishing regional ambient air quality standards more stringent than the national standards, considering such factors as the public welfare, the existing technology, and the costs and benefits of various air quality levels. Since the local factors which comprise the "public welfare" of each region will differ, and since, in some cases, the national public health standards will not protect the "public welfare" of a particular region, each region must carefully consider the ambient air quality required for that region. The adoption of more stringent standards would proceed only with respect to those factors covered by any criteria issued by the Secretary in accordance with Section 107(b) and (c) of the Air Quality Act.

The streamlining of Federal approval of regional air quality standards.

Because many more regions will be created than was contemplated when the Air Quality Act was drafted, and because ambient air quality standards have been approved for only one region designated under the present Act, the Federal approval procedure should be streamlined, not expanded. Since the regional air quality standards must be at least as stringent as the national ambient air quality standards to protect public health, the Secretary can rapidly check the state-adopted standards to ensure compliance. The National Chamber recommends that the present detailed approval procedures of Section 108(c)(1), which includes that the Secretary must evaluate the implementation plans to achieve the air quality standards, be modified to eliminate this evaluation. Instead, the state(s) would submit, along with the regional standards and a means of enforcement, a timetable for the achievement of the national air quality standard. The Secretary would then review the standards, enforcement mechanism, and timetable, approving them if he determines that this "package" is consistent with the purposes outlined in Section 108(c)(i) of the Air Quality Act.

The expansion of Federal enforcement to intrastate violations of the national ambient air quality standard for public health.

In addition to the Federal authority detailed in the Air Quality Act, Federal enforcement action, as detailed in Section 108(c) 4(i), should be expanded to include intrastate situations where the ambient air quality be below the national ambient air quality standard. This would result in the elimination of Section 108(c) 4(ii).

The establishment, for non-stationary emission sources, of Federal emission standards.

Because of the inherent mobility of aircraft, vessels, and other vehicles, Federal authority, similar to the present Federal authority over motor vehicles, to establish emission standards for these sources should be enacted.

With the enactment of the above amendments, the Air Quality Act—a strong, sound approach to the nation's air pollution problems—will achieve the environmental goals anticipated by this committee when you drafted the Act in 1967.

To complement this Federal program, the National Chamber urges increased action by state and regional authorities. These actions will be necessary to meet the regional air quality standards (once approved by the Department of Health, Education and Welfare) and the timetable developed to schieve those standards. The states, singly, and, where appropriate, with other states through interstate compacts and/or air quality regions, should adopt specific emission limitations designed to meet the regional air quality standards. These emission limitations would be scheduled within a financially-achievable timetable and would be capable of being achieved technologically. These emission limitations, based upon the ambient air quality standards, would be best established by regional air quality control agencies, and then be adopted by the states. The limitations, enforceable under state law, would not be uniform emission limitations, but would vary from site to site to reflect the varied characteristics of each air region. Regional authorities are in a unique position to establish emission limitations which are responsive to local needs and to local topographical, meteorological, and geographical conditions. As previously stated, Federal enforcement authority, in addition to the emergency injunctive power already in the Clean Air Act, would occur in those cases where the national ambient air quality standards are violated and the state authority fails to act.

While continuous monitoring of each emission site is both impractical and unfeasible, these emission limitations would serve several useful purposes:

Each emission site would have a limitation which it would have to plan to meet. Since these limitations would be set individually to achieve the ambient air quality standards, and would be within the limits of existing technology, compliance with these limitations should proceed in an orderly fashion.

Each site could choose for itself the best method of meeting its emission limitation.

In cases where the regional air quality standards are violated, the regional authorities could check each emission site to determine noncompliance with the emission limitations and proceed with remedial action—judicial action, if necessary.

To encourage local action designed to manage environmental quality, the National Chamber has recently published, and distributed to local chambers of commerce, "Improving Environmental Quality—Business-led Action to Improve Water and Air Quality." This booklet, a copy of which is included along with this statement, has been designed to assist local chambers and other community groups to organize and implement effective air and water pollution control programs.

In this presentation of our proposed amendments to the Clean Air Act, many issues contained within the legislation now before this committee, have been covered. I would now like to briefly discuss several issues not previously mentioned in this testimony.

Motor Vehicle—Air Pollution Controls: The National Chamber does not, as a matter of policy, address itself to a problem specific to only one segment of industry. The industries concerned with the motor vehicles are better qualified to discuss these issues.

Regulation of Fuel Composition: Since the Section of H.R .15858 relates to regulation of all fuels used in tranaportation (not just motor vehicles), the National Chamber will address this issue.

The National Chamber is opposed to Federal regulation of fuel composition and additives. The establishment and enforcement of Federal emission standards for nonstationary sources (motor vehicles, aircraft, vessels, etc.) will enable all segments of industry involved with this problem to seek the most economic and practical method to achieve those standards. All alternative solutions could be explored: Higher-performance emission control devices; pollution-reducing fuel additives; engine modification; or, the altering of fuel composition.

Stationary Source Emission Standards: Much discussion occurred in 1967, when this committee considered the Air Quality Act, over the proposal to establish national emission standards. In view of the sound arguments opposing national emission standards presented at that time, the Air Quality Act was structured to authorize a study of the need for national emission standards. The report of this study, now completed, has never been publicly issued—but indications are that its original conclusions do not favor national emission standards. I will not belabor this committee with the arguments against national emission standards. The 1967 hearings record of this committee on the Air Quality Act contains sufficient testimony. The National Chamber is opposed to national emission standards because they are not responsive to the needs and demands of local conditions. The proposal (H.R. 15848) to add a new Section 112 to the Clean Air Act should be rejected at this time for two additional reasons:

If there is an imminent and substantial danger to health of persons, the Secretary can seek immediate injunctive relief under the authority of Section 108(k) of the Clean Air Act.

No action on the establishment of these standards should be taken until the release and evaluation of national emission standards study required by the Air Quality Act.

In summation, the National Chamber fully supports the Air Quality Act of 1967, but recognizes that delays in the administration of this Act at the Federal level have resulted in delays in solving this nation's air pollution problems. The amendments which we have offered are designed to overcome these delays by streamlining Federal action and by requiring strong state and regional action to improve the quality of our air resources.

That concludes our statement.

(The booklet referred to follows:)

IMPROVING ENVIRONMENTAL QUALITY

Business-led action to improve water and air quality

CHAMBER OF COMMERCE
OF THE UNITED STATES
WASHINGTON, D.C.

FOREWORD

Effective management of our air and water resources is becoming an increasingly difficult task. Concentrations of populations, outmoded facilities, and the concentration of many pollutants pose a threat to many communities across the nation. All of us share a common need for air and water and their many uses. All of us have a stake in bringing about sound management of these vital resources.

Coordinated business-led community action can be a successful device in providing the degree and quality of management that is required.

This brochure can assist local chambers of commerce and other community groups to organize and implement effective air and water pollution control programs.

ARCH N. BOOTH

IMPROVING ENVIRONMENTAL QUALITY

Business-led action to improve water and air quality

The following steps have been successfully used in other communities to develop air and water pollution control programs under chamber leadership.

COMMITMENT

After thorough discussion, the local chamber board of directors may want to adopt an affirmative policy on air or water quality control. (See Appendix B for an example of a policy statement on Environmental Pollution.) Such a policy statement can provide a framework within which an effective plan of action for air and/or water quality control can be undertaken.

ORGANIZATION

Environmental pollution is one of today's complex problems whose solution will require the coordination of a community's resources, and a concerted effort within the community to develop a consensus on priorities and solutions.

Several organizations, including the National Chamber, have developed materials which outline various possible approaches for organizing people and groups within a community for action on a community problem. (See Appendix F, page 21, for a listing of several of these programs, together with other reference material.)

A local chamber of commerce can implement an environmental pollution policy and initiate an action program by calling upon its board of directors and president to appoint an Environmental Quality Action Committee. Such a committee could be composed of businessmen and other key people in the community who have a direct interest and concern in the problem and who represent groups that do.

In defining "community" a regional approach might be necessary if the pollution problems to be tackled are caused by conditions well beyond your political boundaries. Several communities might be represented on your committee under such circumstances.

The key to the committee's success will be its ability to provide leadership and to get certain jobs done. Ability, interest and leadership potential are qualifications important to keep in mind in the selection of committee members.

The selection of a chairman will be a key decision. If possible, he should be from within the chamber membership. This will provide a logical basis for staff and office services.

The Environmental Quality Action Committee can be divided into subcommittees which can be assigned to investigate specific problems as the need arises such as the effectiveness of existing pollution control techniques and facilities, or the need for intergovernmental cooperation so as to achieve a regional basis for pollution control.

INVOLVEMENT

Essential to the success of an anti-pollution action program is involvement, at the earliest possible time, of groups representing all segments of the community sharing a concern for the problem.

Such groups might include:

CONSERVATION GROUPS

STATE POLLUTION CONTROL AGENCIES –
FEDERAL AGENCY REPRESENTATION

PARENT-TEACHER ORGANIZATIONS

CITY COUNCILS AND MAYORS –
COUNTY SUPERVISORS

YMCA – YWCA

CIVIC AND FRATERNAL GROUPS

YOUTH ORGANIZATIONS

BAR ASSOCIATIONS

NEWS MEDIA

LABOR UNIONS

ELECTED STATE OFFICIALS

If it is not possible to involve all of the groups listed above in your Action Committee structure, every effort should be made to keep them informed as to the objectives and proposed direction of the committee's activities.

The speakers' bureau is a widely used and effective technique in disseminating information and seeking public support. Some communities that have had experience and success with speakers' bureaus recommend that participants appear in teams of two or three with at least one team member being technically qualified to answer whatever questions may be raised.

Speaking engagements must be sought actively, but most communities have numerous civic groups seeking topical speakers and organized programs.

Once your committee has decided on an action program, a speakers' bureau may be used to promote the campaign. Here, speaking engagements have an additional advantage in that the press will often attend, if invited, thus adding to the visibility and understanding of the program.

Perhaps the best single medium for reaching a mass audience is the newspaper. Continued contact with the news media will give visibility to your program.

Providing the working press with notice of your meetings and, if possible, written agendas; assistance in arranging interviews with key committee members, and most important factual information presented in a manner that is topical are keys to successful relations with the news media. It is also important to remember that the press has deadlines it must meet. Advance copies of material to be presented or discussed will be appreciated by the reporters covering your meetings.

The broadcasting media, both radio and television, should be shown the same courtesy as the newspapers. Special accommodations may be necessary if broadcast media are invited to cover a function and should be provided for in advance.

IMPLEMENTATION

IDENTIFICATION

Once the Environmental Quality Action Committee has clearly defined the possible objectives of an action program, including a statement of the desired quality of the air and/or water to be achieved, the committee, through its subcommittees, will want to gather factual information, and if necessary statistics on all factors of the problem, including:

1. CAUSES AND SOURCE OF THE COMMUNITIES AIR AND/OR WATER POLLUTION AND THEIR INTERRELATIONSHIP.
2. SERIOUSNESS OF THE PROBLEM: COMMUNITY AWARENESS: CITIZEN CONCERN.
3. STATE AND LOCAL ORDINANCES WHICH REGULATE AIR AND WATER POLLUTION.
4. EXISTING GOVERNMENTAL ENVIRONMENTAL POLLUTION AGENCIES AND THEIR CAPABILITIES IN DEALING WITH THE PROBLEM.

5. AIR AND WATER POLLUTION ABATEMENT COSTS: WHAT IS BEING SPENT: WHAT SHOULD BE SPENT: BY WHOM.

The collection and condensation of known data will serve the purpose of defining possible courses of action, or make it clear that more research is needed.

For many of the topics the committee may want to invite technical experts to assist in the development of accurate data and information. Such experts may be drawn from the local industrial or academic communities. Federal technical assistance is an integral part in the majority of federal grant-in-aid programs. Independent consultants specializing in a particular field of environmental quality control may also be used.

REPORT

Each of the subcommittees, after a specified period of time, will be asked to submit a report of their findings. These reports will be the basis for developing action alternatives and should be distributed to all committee members for their study and review.

PRIORITIES

Once the information has been compiled and evaluated, specific problems can be defined and priorities set.

Substantial sources of air pollution might include household trash burning, open burning at refuse dumps, automotive exhausts, apartment, commercial or municipal incinerators, industrial discharges, electric generating stations, heating boilers, petroleum storage and refining, railroads, aircrafts and others.

Major causes of water pollution might be the discharge of raw or untreated domestic or industrial waste, inadequate treatment at industrial or municipal treatment plants, discharge of raw wastes with storm water where sanitary sewer systems are combined, and overloading of treatment facilities due to the entrance of surface ground water into poorly maintained sewer systems.

Knowledge of major sources of pollution is essential to effective control.

ACTION ALTERNATIVES

The action alternatives must be developed within the committee, and should be related to the defined objectives of the program and the subcommittee reports. These alternatives and their supporting rationale and data should be presented in equal detail to the committee for study and discussion. Permitting an interval between the presentation of the proposals and the decision would provide needed time to learn what the secondary effects of the proposals are and to ascertain that the desires and the needs of the public have been correctly assessed.

The analysis of each alternative should contain, if possible, an analysis of the consequences of the proposed action and an estimate of costs and benefits to be derived from the action.

Whatever the programs that are defined to receive required action, they must be identified by the local community and should not be adopted because some one group in the immediate community or in some other city found them desirable.

The following action programs are offered as suggestions for discussion:

AIR QUALITY STANDARDS – The Air Quality Act of 1967 delineates the responsibilities of federal, state and local governments in the management of our nation's air quality. Attached as Appendix E of these Guidelines is an outline of the process by which the Federal Government plans to implement the Act's provisions. This outline shows the areas of governmental responsibility, and the order of the steps to be taken by federal and state agencies. A check to determine whether or not the community has been included in one of the Federal Government's Air Quality Regions will provide information about the presence or absence of air quality standards. The committee's active participation in public hearings in the Air Quality Regions can be an effective means of action.

MUNICIPAL INCINERATION – A campaign to improve municipal waste disposal facilities may be needed. An improved incineration plant, or a land fill project in lieu of incineration may provide realistic alternatives to open burning, which is practiced by many municipalities. Support for a bond issue to pay for a municipal incineration facility would require broad public understanding of the problem.

LOCAL LAWS AND ORDINANCES – Statutes designed to control pollution can be strengthened. Many communities have "public nuisance" laws already on the books which can provide the necessary legal tools to control air or water pollution. States are also in the process of developing standards for air and water quality control. Legal devices, however, to be both realistic and effective, should seek to achieve a specific quality of the atmosphere or waters rather than seek to control emissions or a single pollutant. Those who will pay the costs for pollution abatement and those who will reap its benefits should be identified and considered in the development of standards or ordinances to control air or water pollution.

TRASH BURNING – This can become a major cause of air pollution. A community-wide campaign to eliminate private trash or leaf burning and support for local ordinances to control these activities have been effective in many communities.

AUTOMOBILE POLLUTION – This has been found a large factor in urban areas. Although dramatic auto exhaust pollution progress has been made with newer model automobiles being equipped with anti-pollution devices, older autos with uncontrolled engines continue to pollute the air. In addition, many commercial vehicles, such as buses, are major sources of pollution. Periodic motor vehicle inspection programs designed to eliminate or repair faulty vehicles will help. In states not yet having effective periodic motor vehicle inspections, community groups may want to seek establishment of such programs.

INDUSTRIAL POLLUTION – Discussion with local industry officials will provide necessary information about the extent of industrial air or water pollution in your area – and indicate what industry is doing about it. In many cases, industry has taken the lead in this area and their experience can be valuable to a total community effort. The extent of industrial pollution in your area will determine the amount of emphasis this issue is given.

LOCAL POLLUTION CONTROL AGENCY – The creation or modernization of a local agency charged with the responsibility of administering an air or water pollution control program may be necessary to assure that long range goals are met. Such a local agency could have three basic functions: policy making, enforcing air and water quality standards, and settling disputes between those within the community whose ultimate goals or means of achieving air and water quality control differ.

The policy making responsibilities of such an agency might include a determination of what programs will be necessary to most effectively achieve the desired quality of the community's air and/or water; a definition of individual, corporate and community responsibilities necessary to achieve that quality and the establishment of a plan of implementation which recognizes the community's environmental and economic interests.

Such an agency could also resolve differences within the community such as whether or not nature's own capacity to cleanse itself has been satiated in the locale or region, what time schedule should be utilized in implementing air or water quality standards, and evaluating the effectiveness of alternative pollution control programs.

LEGISLATIVE ACTION COMMITTEE – Such a committee can assist community leaders by keeping them informed as to: the content status and implications of federal and state legislation or administrative regulations, and as a vehicle to obtain available financial or technical assistance from federal or state agencies for additional research or construction of municipal waste treatment facilities.

PERSONNEL SHORTAGES – Availability of expert staff is a growing problem in both the air and water quality management fields. The local chamber might sponsor a high school seminar on air or water pollution to encourage students to consider these fields as a career. A scholarship fund is another way that young people can be encouraged to enter these fields.

MUNICIPAL WASTE WATER TREATMENT FACILITIES – In many communities these facilities are inadequate to handle increased input. Many systems, for example, combine storm and waste sewers so that increased storm waterflow causes waste water to enter water courses untreated.

Often the degree of treatment provided is inadequate and new municipal facilities are needed. Support for local bond issues to bring municipal facilities up-to-date can be an effective measure in many cases.

MUNICIPAL STAFF – Staff having responsibility for air or water quality management are often underskilled and part-time. If, for example, your community does not have a skilled staff to manage its municipal waste water facilities, it may be that the community's water quality problem stems from inadequate management. Some states operate training programs for plant operators. Such programs should be used.

If your committee identifies some of these programs are needed in your community, reference materials are available to help you set up your own program.

Most state chambers of commerce have made an effort to keep aware of materials which have been developed by other state chambers of commerce, as well as by local chambers. You may want to contact your state chamber for assistance. The National Chamber can also help in this respect.

APPENDIX A

WHERE TO WRITE FOR MORE INFORMATION

AIR

1. Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006*
2. Your state air pollution control agency. (See Appendix C)
3. National Air Pollution Control Administration, HEW, Arlington, Virginia 22203
4. Advisory Commission on Intergovernmental Relations, 726 Jackson Place, Washington, D.C. 20006
5. National Association of Counties Research Foundation, 1001 Connecticut Avenue, N.W., Washington, D.C. 20036
6. International City Managers' Association, 1313 East 60th Street, Chicago, Illinois

WATER

1. Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006*
2. Your state water pollution control agency (See Appendix D)
3. Federal Water Pollution Control Administration, Department of the Interior, Washington, D.C. 20242
4. Advisory Commission on Intergovernmental Relations, 726 Jackson Place, Washington, D.C. 20006
5. National Association of Counties Research Foundation, 1001 Connecticut Avenue, N.W., Washington, D.C. 20036
6. International City Manager's Association, 1313 East 60th Street, Chicago, Illinois

*For more information write or call:
John J. Coffey, Jr.
Senior Associate for
Natural Resources and Environmental Quality
Community and Regional Development Group
Chamber of Commerce of the United States
1615 H Street, N.W.
Washington, D.C. 20006
Area Code 202/659-6174

APPENDIX B

NATIONAL CHAMBER POLICY STATEMENT ON ENVIRONMENTAL POLLUTION

Pollution of our environment is the collective responsibility of all elements of society, reflecting the immediate result of our standard of living and a continuing demand for the new products and improved materials that an accelerating technology provides.

In producing, consuming, and using the products and materials which have become indispensable, we must dispose of the undesired, unconsumed, and unused portions. Due to the concentration of population and industry, disposing of these substances in localized situations may exceed the environment's natural capacity to cleanse itself.

Each such problem has complex and interdependent factors: esthetic, biological, technical and economic. Only through documented findings, comprehensive planning and intensive research can answers be found.

The technical and financial resources and talents of the people, of industry, and of governments of every jurisdiction must be marshalled to meet the challenges presented by air pollution, water pollution, and the disposal of solid waste. Only through such a joint approach can these combined forces, in partnership, manage our environment for the greatest net benefit to man and his total community.

ROLE OF INDUSTRY. Industry should acknowledge a sense of stewardship for the natural resources upon which our environment depends – air, land, and water. This involves sharing the mounting national concern for the quality of these resources as well as assisting to restore to acceptable levels those whose quality has suffered.

Industry has an obligation to recognize the impact of a growing population and its concentration. Acceptable resource management procedures of past years are no longer adequate and will be even less adequate in the years ahead.

Industry should assume leadership in jointly developing information from within the industrial community on which sound decisions can be based. The interaction of the components of environmental pollution are inextricably linked. Solutions must not aggravate other problems. Conflicting demands on multi-use resources must be reconciled.

It is essential that industry commit the technical and financial resources and talent needed to implement achievable improvement in our environment, as well as to undertake the basis and applied research programs that will provide for the continuing development of new concepts, methods and technology for managing the quality of our air, land, and water.

ROLE OF THE PUBLIC. There must be recognition of the individual's responsibility for the total problem and that acceptable solutions will entail substantial expenditures for the abatement of domestic and individually generated pollutants, applicable equally to land, air, and water.

The public is justified in expecting immediate abatement of health hazards and pollution that transcends any element of responsibility, but they should not expect simple and immediate solutions to all aspects of a complex problem. In the public's own interest, solutions must be justified technically and economically.

THE ROLE OF THE GOVERNMENT. It is the responsibility of government, or a combination of governments, at the level most appropriate to the problem, and with the participation of industry, to identify objectives, establish the assimilative capacities of receiving environments, enact standards, and seek agreement on timing.

Research priorities should be carefully identified. Those studies should be undertaken whose successful attainment will contribute substantially to alleviate pollution.

THE ROLE OF PARTNERSHIP. The essential ingredients for an attack on environmental pollution are communication, coordination, and cooperation. These must be shared in a responsible way by industry, the public, governments at every level, and the news media.

Research should be funded to develop technology for the reuse or the recycling of wastes. New, more efficient, and less costly ways must be found to do what we do now.

The long term effectiveness of pollution control programs demands that emphasis be on the performance of abatement facilities rather than on method. Studies need to be carried out which will demonstrate how we can re-orient present programs and policies to this end.

The economic impact from constructing required abatement facilities is so great and the benefits are so general that the costs should be shared by all parties to the partnership. Legislation needs to be enacted to provide additional tax credits and accelerated amortization for anti-pollution facilities that are required under present pollution control programs.

APPENDIX C

STATE AIR POLLUTION CONTROL AGENCIES

ALABAMA

Division of Radiological Health and Air Pollution Control, Bureau of Environmental Health, Department of Public Health, State Office Building, Montgomery, Alabama 36104 (205) 265-2341, ext. 2228.

ALASKA

Environmental Health Branch, Division of Public Health, Department of Health and Welfare, Pouch H, Juneau, Alaska 99801, 586-6311.

ARIZONA

Air Pollution Section, Division of Environmental Health, Department of Health, 14 N. Central Avenue, Phoenix, Arizona 85004, (602) 271-5306.

ARKANSAS

Arkansas Pollution Control Commission, 1100 Harrington, Little Rock, Arkansas 72202, (501) 371-1701.

CALIFORNIA

Bureau of Air Sanitation, California State Department of Public Health, 2151 Berkeley Way, Berkeley, California 94704, (415) 843-7900 ext. 215.

COLORADO

Colorado State Department of Public Health, Division of Air, Occupational and Radiation Hygiene, 4210 E. 11th Ave., Denver, Colorado 80220, (303) 388-6111, ext. 246.

CONNECTICUT

Environmental Health Services Division, Connecticut State Department of Health, 79 Elm Street, Hartford, Connecticut 06115, (203) 527-6341, ext. 813, 811, 2988.

DELAWARE

Delaware Water and Air Resources Commission, P. O. Box 916, Loockerman Street and Legislative Avenue, Dover, Delaware 19901, (302) 734-5711, exts. 470, 573.

FLORIDA

State Board of Health, Bureau of Sanitary Engineering, P. O. Box 210, 1217 Pearl Street, Jacksonville, Florida 32201, (305) 354-3961.

GEORGIA

Air Quality Control Branch, Georgia Department of Public Health, 47 Trinity Avenue, S.W., Atlanta, Georgia 30334, (404) MU 8-4033, ext. 401.

HAWAII

Air Sanitation Section, Health Engineering Branch, Environmental Health Division, Department of Health, P. O. Box 3378, Kinau Hale, Honolulu, Hawaii 96801, (808) 507-711, ext. 517.

IDAHO

Air Pollution Control, Engineering and Sanitation Division, Department of Health, Statehouse, Boise, Idaho 83701, (208) 344-5811, ext. 368.

ILLINOIS

Illinois Air Pollution Control Board, 616 State Office Bldg., 400 S. Spring Street, Springfield, Illinois 62706, (217) 525-6580.

INDIANA

Indiana Air Pollution Control Board, 1330 W. Michigan Street, Indianapolis, Indiana 46206, (317) 633-5467.

IOWA

Iowa State Department of Health, State Office Building, Des Moines, Iowa 50319, (515) 281-5345.

KANSAS

Industrial, Radiation and Air Hygiene Program, Environmental Health Services, Kansas State Department of Health, State Office Building, 10th and Harrison Streets, Topeka, Kansas 66612, (913) CE 5-0011, ext. 667.

KENTUCKY

Air Pollution Control Program, Kentucky Air Pollution Control Commission, 275 E. Main Street, Frankfort, Kentucky 40601, (502) 564-3382.

LOUISIANA

Louisiana Air Control Commission, c/o Air Control Section, Division of Engineering, Louisiana State Department of Health, P. O. Box 60630, New Orleans, Louisiana 70160, (504) 529-5231.

MAINE

Division of Sanitary Engineering, Department of Health and Welfare, Statehouse, Augusta, Maine 04330, (207) 622-7131, ext. 241.

MARYLAND

Division of Air Quality Control, Bureau of Resources Protection, Maryland State Department of Health, 2305 N. Charles Street, Baltimore, Maryland 21218, (301) 837-9000, ext. 8464, 8602.

MICHIGAN

Air Pollution Control Section, Division of Occupational Health, Department of Public Health, 3500 N. Logan Street, Lansing, Michigan 48914, (517) 373-1410.

MINNESOTA

Minnesota Pollution Control Agency, State Board of Health Building, University of Minnesota Campus, Minneapolis, Minnesota 55450, (612) 339-7751.

MISSISSIPPI

Mississippi Air and Water Pollution Control Commission, P. O. Box 827, Jackson, Mississippi 39205, (601) 948-3100.

MISSOURI

Missouri Air Conservation Commission, Box 1062, Jefferson City, Missouri 65101, (314) 636-2119.

MONTANA

Division of Air Pollution Control and Industrial Hygiene, State Department of Health, Cogswell Building, Helena, Montana 59601, (406) 442-3260, ext. 253.

NEBRASKA

Division of Air Pollution Control, Lincoln-Lancaster County Health Department, 2200 St. Marys Avenue, Lincoln, Nebraska 68502, (402) 432-7611.

NEW MEXICO

Division of Occupational Health-Air Pollution, Office of Environmental Factors, New Mexico Department of Public Health, 408 Galisteo Street, Santa Fe, New Mexico 87501, (505) 827-2473.

NEW YORK

Division of Air Resources, New York State Department of Health, 84 Holland Avenue, Albany, New York 12208, (518) 474-5030, 5031.

NORTH CAROLINA

Air Pollution Control Division, State of North Carolina, P. O. Box 9392, Raleigh, North Carolina 27603, (919) 829-3006.

NORTH DAKOTA

Environmental Health and Engineering Services, North Dakota State Department of Health, State Capitol, Bismarck, North Dakota 58501, (701) 223-8000, ext. 371.

OHIO

Division of Engineering, Ohio Department of Health, P. O. Box 118, Columbus, Ohio 43216, (614) 469-4470, 2390.

OKLAHOMA

Occupational and Radiological Health Section, Environmental Health Services, Oklahoma State Department of Health, 3400 N. Eastern, Oklahoma City, Oklahoma 73105, (405) GA 7-6561.

OREGON

Oregon State Sanitary Authority, Oregon State Board of Health, 1400 S.W. Fifth Avenue, P. O. Box 231, Portland, Oregon 97201, (503) 226-2161.

PENNSYLVANIA

Division of Air Pollution Control, Department of Health, P. O. Box 90, Harrisburg, Pennsylvania 17120, (717) 787-6547.

RHODE ISLAND

Division of Air Pollution Control, State Department of Health, Room 020, State Office Building, Providence, Rhode Island 02903, (401) 521-7100.

SOUTH CAROLINA

South Carolina Pollution Control Authority, Room 137, J. Marion Simms Building, 2600 Bull Street, Columbia, South Carolina 29201, (803) 758-5631, 5575.

SOUTH DAKOTA

Occupational and Radiological Health Section, Division of Sanitary Engineering, State Department of Health, Pierre, South Dakota 57501, (605) 224-5911, ext. 351.

TENNESSEE

Air Pollution Control Board, Industrial Hygiene Service, Department of Public Health, 727 Cordell Hull Building, Nashville, Tennessee 37219, (615) 224-5911, ext. 351.

TEXAS

Air Control Board, 1100 W. 49th Street, Austin, Texas 78756, (512) GL 3-6631, ext. 241.

UTAH

Environmental Health Section, Utah State Division of Health, 44 Medical Drive, Salt Lake City, Utah 84113, (801) 328-6111, 6121.

VERMONT

Industrial Hygiene Division, Vermont Department of Health, P. O. Box 607, 32 Spaulding Street, Barre, Vermont 05641, (802) 476-4071.

VIRGINIA

State Air Pollution Control Board, Room 902, Ninth Street, State Office Building, Richmond, Virginia 23219, (703) 770-2378.

WASHINGTON

Washington State Air Pollution Control Board, State Department of Health, 1510 Smith Tower, Seattle, Washington 98104, (206) MA 3-9080, ext. 227.

WEST VIRGINIA

West Virginia Air Pollution Control Commission, 4108 MacCorkle Avenue, S.E., Charleston, West Virginia 25304, (304) 348-2275.

WISCONSIN

Department of Natural Resources, Division of Resource Development, Room 421, State Office Building, Madison, Wisconsin 53702, (608) 266-3221.

WYOMING

Division of Industrial Hygiene, Department of Public Health, State Office Building, Cheyenne, Wyoming 82001, (307) 777-7511.

APPENDIX D

STATE WATER POLLUTION CONTROL ADMINISTRATORS

Neme and Address Aree Code Telephone

ALABAMA 205, 265-2341
Arthur N. Beck, Tachnical Sac.
Water Improvamant Commission
State Offica Building
Montgomery, Alabama 36104

ALASKA 907, 5B6-6311
John Scott McDonald, Commissionar
Alaska Dept. of Health & Walfare
Alaska Office Building
Junaeu, Alaska 99B01

ARIZONA 602, 271-5457
Edmund C. Gartha, Director
Division of Environmental Haalth
Stata Dapartment of Haalth
Haydan Plaza West
4019 North 33rd Avanue
Phoanix, Arizona B5017

ARKANSAS 501, 375-4438
S. L. Devies, Director
Arkansas Pollution Control Comm.
1100 Harrington Avanue
Littla Rock, Arkansas 72201

CALIFORNIA 916, 445-7971
Gaorge B. Maul, Chairman
Stata Water Resources Control Board
1416 Ninth Street
Sacramento, California 95814
Attn: Paul R. Bondarson, Chief
Water Quality Control Div.

COLORADO 303, 388-6111
Dr. R. L. Claere
Director of Public Haalth
Colorado Dapartment of Health
4210 East 11th Avanue
Danvar, Colorado B0220
Attn: Mr. Frank Rozich, Director
Watar Pollution Control Div.

CONNECTICUT 203, 527-6341
John J. Curry, Director
Stata Water Resources Commission
Room 223, Stata Office Building
650 Main Street
Hartford, Connecticut 06115

DELAWARE 302, 734-5711
John C. Bryson axt. 470-471
Exacutive Director
Delaware Air and Watar Rasources
Commission
Loockarman Straat and Legislative Ava.
Dover, Dalaware 19901

DISTRICT OF COLUMBIA 202, 629-3105
Malcolm Hope, Associata Director
for Environmantal Haalth
District of Columbia Department of
Public Haalth
300 Indiana Avenua, N.W.
Washington, D.C. 20001
Attn: Arnold Speiser, Chiaf
Watar Quality Control Div.

FLORIDA 305, 222-067B
Vincent D. Patton, Acting Director
Air & Watar Pollution Control Comm.
306 W. Jeffarson
Tallahassee, Florida 32301

GEORGIA 404, 688-4033
R. S. Howard, Jr., Exec. Secratary
Stata Watar Quality Control Board
47 Trinity Avenue, S.W.
Atlanta, Georgia 30334

HAWAII B08, 507-711
Shinji Soneda, Executiva Officar
Environmantal Haalth Division
Hawaii Dept. of Haalth
P. O. Box 337B
Honolulu, Hawaii 96801

IDAHO 208, 344-5811
Vaughn Anderson, Diractor
Englnaering & Sanitation Division
State Department of Healith

P. O. Box 640
Boise, Idaho 83701

ILLINOIS 217, 525-6580
G. W. Klassen, Technical Secretary
State Sanitary Water Board
State Office Building
400 South Spring Street
Springfield, Illinois 62706

INDIANA 317, 633-4420
Bluchar A. Poole, Technicel Sec.
Straam Pollution Control Board
1330 West Michigan Street
Indianepolis, Indiane 46207

IOWA 515, 281-5345
James F. Speers, M.D., M.P.H.
Commissionar of Public Heelth
State Department of Haalth
State Office Building
Das Moines, Iowa 50319
Attn: R. J. Schliakelmen, Director
Water Pollution Division

KANSAS 913, 235-0011
Dr. Hugh E. Dierker
State Health Officer
Kensas Stata Dapartment of Health
Topeka, Kansas 66612
Attn: J. Lee Mayes, Director
Environmentel Haelth Services

KENTUCKY 502, 564-3770
Relph C. Pickerd, Executive Dir.
Kentucky Weter Pollution Control Comm.
275 Eest Main Street
Frankfort, Kantucky 40601

LOUISIANA 504, 342-5797
R. A. Lafleur, Executive Sac.
Louisiane Stream Control Commission
P. O. Drawer FC, University Station
Baton Rouge, Louisiana 70803

MAINE 207, 623-4511
Raeburn W. Macdonald, Chiaf Engineer
Wetar & Air Environmental Improvement Commission
Stata House
Augusta, Maine 04330

MARYLAND 301, 383-3010
Jemes B. Coulter, Asst. Commissionar
Environmental Haelth Services
Stata Dapartment of Health
2305 N. Charlas Straet
Beltimora, Maryland 2121B

MASSACHUSETTS 617, 727-3270
Thomas C. McMehon, Director
Div. of Water Pollution Control
Department of Neturel Resources
Steta Office Bldg., Governmant Center
100 Cambridge Straat
Boston, Massachusetts 02202

MICHIGAN 517, 373-3560
Loring F. Oeming, Executive Sac.
Water Resources Commission
Station B, 200 Mill Street
Lansing, Michigan 48913

MINNESOTA 612, 339-7751
John P. Badalich, Director
Minnasota Pollution Control Agency
459 Board of Haalth Building
Univarsity Campus
Minneapolis, Minnesota 55440

MISSISSIPPI 601, 948-3010
Robert Wright, Executiva Sacretary
Mississippi Air and Weter Pollution
Control Commission
P. O. Box B27
Jackson, Mississippi 39205

MISSOURI 314, 635-9117
Jeck K. Smith, Executiva Secretary
Missouri Watar Pollution Board
P. O. Box 154
Jaffarson City, Missouri 65101

MONTANA 406, 442-3260
Claiborne W. Brinck, Secratary
Montana Water Pollution Council
Montana State Dapartmant of Haelth
Laboratory Building
Halana, Montane 59601

NEBRASKA 402, 473-1438
Lynn W. Thompson, M.D.
Director of Heelth
Stata Dapartmant of Health
State House Stetion, Box 94757
Lincoln, Nabraske 68509
Attn: Mr. T. A. Filipi, Director
Environmentel Heelth Services

NEVADA 702, 784-6241
Ernest G. Gragory, Diractor
Division of Health
State Dapartment of Haalth & Welfare
790 Sutro Street
Rano, Nevada 89502

NEW HAMPSHIRE 603, 225-6611
William A. Healy, Exec. Director
Water Supply & Pollution Control Comm.
60 South Spring Street
Concord, New Hampshire 03301

NEW JERSEY 609, 292-5383
Richard J. Sullivan, Director
Div. of Air and Clean Water
State Department of Health
P. O. Box 1540
Trenton, New Jersey 08625

NEW MEXICO 505, 827-2473
John R. Wright, Chief of Water
& Liquid Waste Section, and
Chairman, New Mexico Water Quality
Control Commission
New Mexico Health & Social Services
Department
P. O. Box 2348
Santa Fe, New Mexico 87501

NEW YORK 518, 474-2040
Dwight F. Metzler, Deputy Comm.
State Department of Health
84 Holland Avenue
Albany, New York 12208
Attn: John C. Haberer, Asst. Commissioner
Div. of Pure Waters

NORTH CAROLINA 919, 829-3006
Earle C. Hubbard, Assistant Director
Department of Water and Air Resources
P. O. Box 9392
Raleigh, North Carolina 27603

NORTH DAKOTA 701, 223-8000
Dr. James R. Amos
State Health Officer
State Department of Health
Bismarck, North Dakota 58501
Attn: W. Van Heuvelen, Chief
Environmental Health
& Engineering Services

OHIO 614, 469-2253
Dr. E. W. Arnold, Chairman
Water Pollution Control Board
State Department of Health
P. O. Box 118
Columbus, Ohio 43216

OKLAHOMA 405, 427-6561
Loyd F. Pummill, Chief
Environmental Health Service
State Department of Health
3400 North Eastern
Oklahoma City, Oklahoma 73111

OREGON 503, 226-2161
Kenneth H. Spies
Secretary and Chief Engineer
Oregon State Sanitary Authority
P. O. Box 231
Portland, Oregon 97207

PENNSYLVANIA 717, 787-2666
Walter A. Lyon, Director
Division of Sanitary Engineering
State Department of Health
P. O. Box 90
Harrisburg, Pennsylvania 17120

RHODE ISLAND 401, 521-7100
Dr. Joseph E. Cannon
Director of Health
Rhode Island Dept. of Health
335 State Office Building
Providence, Rhode Island 02903
Attn: Carleton A. Maine, Chief
Water Pollution Control Div.

SOUTH CAROLINA 803, 758-5631
W. T. Linton, Executive Director
S. C. Water Pollution Control Authority
J. Marion Simms Building
Columbia, South Carolina 29201

SOUTH DAKOTA 605, 224-5911
Dr. G. J. Van Heuvelen
State Health Officer
State Department of Health
Pierre, South Dakota 57501
Attn: Charles E. Carl, Director
Sanitary Engineering Div.

TENNESSEE 615, 741-2275
S. Leary Jones, Executive Sec.
Tenn. Stream Pollution Control Board
Cordell Hull Building, Room 621
Sixth Avenue, North
Nashville, Tennessee 37219

TEXAS 512, GR5-2651
Hugh C. Yantis, Executive Director
Texas Water Quality Board
1108 Lavaca Street
Austin, Texas 78701

UTAH 801, 328-6121
Lynn M. Thatcher, Director of
Environmental Health and Exec.
Secretary of Utah Water Pollution
Committee
Utah State Division of Health
44 Medical Drive
Salt Lake City, Utah 84113

VERMONT 802, 223-2311
Reinhold W. Thieme, Commissioner
Department of Water Resources
State Office Building
Montpelier, Vermont 05602

VIRGINIA 703, 770-2241
A. H. Paessler, Executive Sec.
State Water Control Board
P. O. Box 1143
Richmond, Virginia 23230

WASHINGTON 206, 753-6877
James P. Behlke, Acting Director
Washington Water Pollution Control
Commission
P. O. Box 829
Olympia, Washington 98501

WEST VIRGINIA 304, 345-2167
Edgar Henry, Chief
Division of Water Resources
Department of Natural Resources
1201 Greenbrier Street, East
Charleston, West Virginia 25311

WISCONSIN 608, 266-3221
Thomas Frangos, Administrator
Division of Resource Development
Department of Natural Resources
1 West Wilson Street
Madison, Wisconsin 53702

WYOMING 307, 777-7513
Lawrence J. Cohen, M.A.
Director of Public Health
State Office Building
Cheyenne, Wyoming 82001
Attn: Arthur E. Williamson, Director
Sanitary Engineering Div.

APPENDIX E

HEW ESTABLISHED PROCEDURES FOR IMPLEMENTATION OF THE AIR QUALITY ACT OF 1967*

STEPS TO BE TAKEN	AUTHORITY
1. Federal Air Quality Control Regions Selected	Department of Health, Education and Welfare National Air Pollution Control Administration
2. Air Quality Control Regions Designated	Department of Health, Education and Welfare National Air Pollution Control Administration
3. Air Quality Criteria Issued	Department of Health, Education and Welfare National Air Pollution Control Administration
4. Intent to Set Air Quality Standards	States
5. Public Hearings	States
6. Adopt Standards	States
7. Plans (Schedules of Implementation and Enforcement	States
8. Approval of Standards and Plans	Department of Health, Education and Welfare National Air Pollution Control Administration
9. Enforcement and Implementation	States

* An outline of the process by which the Federal Government plans to implement the provisions of the Clean Air Act of 1967. The outline shows the areas of responsibility, and steps to be taken by Federal and state agencies.

By Summer of 1970, all 50 states will be involved in the Federal air pollution control program. A check with your state air pollution control agency (See Appendix C) will provide you with information as to your area's involvement.

APPENDIX F

BIBLIOGRAPHY

AIR

Community Action Program for Air Pollution Control, National Association of Counties Research Foundation, Washington, D.C. 20036

The Adequacy of Technology for Pollution Abatement, Report of the Research Management Advisory Panel through the Subcommittee on Science, Research, and Development to the Committee on Science and Astronautics, United States House of Representatives, 2319 Rayburn Building, Independence and South Capitol, Washington, D.C., 1966.

Air Pollution Control Program Support Under the Clean Air Act, Division of Air Pollution, Public Health Service, United States Department of Health, Education and Welfare, Revised April, 1965.

A Compilation of Selected Air Pollution Emission Control Regulations and Ordinances, Technical Assistant Branch, Robert A. Taft Sanitary Engineering Center, Division Air Pollution, Public Health Service, United States Department of Health, Education and Welfare, Cincinnati, Ohio, May, 1965.

Edelman, Sidney, *Legal Problems of Interjurisdictional Air Pollution Control*, abstract, Environmental Health Branch, Public Health Service, United States Department of Health, Education and Welfare.

Forecasting Air Pollution Potential, Public Health Service, United States Department of Health, Education and Welfare, 1964.

Forward Thrust, A Process for Mobilizing Total Community Resources, Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006.

Forward Thrust, Guidelines for Mobilizing Total Community Resources, Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006.

Governmental Air Pollution Agencies, Air Pollution Control Association, 4400 Fifth Avenue, Pittsburgh, Pennsylvania, 1966.

Community Approach to Air Pollution Control – Role of the Control Officials, Public Health Service, United States Department of Health, Education and Welfare, 1962.

Legality and Legislation Regarding Control of Pollutants from Motor Vehicles, Division of Air Pollution, Public Health Service, United States Department of Health, Education and Welfare, 1960.

Community Action for Clean Air, Division of Air Pollution, Public Health Service, United States Department of Health, Education, and Welfare, June, 1964.

Measuring Air Quality, Robert A. Taft Sanitary Engineering Center, Division of Air Pollution, Public Health Service, United States Department of Health, Education and Welfare.

Ten Steps for the Use of Existing Community Resources for Air Pollution Control, New York State Action for Clean Air Committee, 105 East 22nd Street, New York, New York.

WATER

A.B.C.'s of Community Planning, Sears, Roebuck and Co., 1962, Dept. 703, 925 S. Homan Avenue, Chicago, Illinois 60607. (Basis document. Well illustrated. Can serve as guide for community effort in graphically explaining planning.)

Alternative Approaches to Government Reorganization in Metropolitan Areas, Advisory Commission on Intergovernmental Relations, 1800 G Street, N.W., Washington, D.C. 20575, June 1962. (Discusses reorganization of government structures and effects on citizen services – including sewage disposal and collection.)

Building for Clean Water, 1966, Department of the Interior, Federal Water Pollution Control Administration, from the U.S. Government Printing Office, Washington, D.C. 20402, \$.10, 14pp. (A report on federal incentive grants for municipal waste treatment and future construction needs.)

Catalogue of Federal Aids to State and Local Governments, and supplements, Senate Subcommittee on Intergovernmental Relations, Government Printing Office, Washington, D.C. 20402.

Catalogue of Federal Assistance Programs, Office of Economic Opportunity, Information Center, Washington, D.C., June 1, 1967, 701 pp.

Environmental Health Planning Guide, Public Health Service, U.S. Department of Health, Education and Welfare, Washington, D.C. 20201, 1962. (Discusses sewage services as well as air pollution, housing and water supply. Includes checklist for evaluating current programs.)

Financing Sewage Facilities by Duncan Gray, Journal Water Pollution Control Federation, 3900 Wisconsin Avenue, N.W., Washington, D.C., January, 1963, pp. 69-74.

Financing Water and Sewage Works, Portland Cement Association, 33 W. Grand Avenue, Chicago, Illinois. (A general summary.)

Focus on Clean Water, 1966, Federal Water Pollution Control Administration, Government Printing Office, Washington, D.C. 20402, \$.15, 31 pp. (A guide on how to organize effective local action program. Includes summary of how private, state, and federal agencies can assist local officials; a listing of state, interstate and federal agencies.)

Forward Thrust, A Process for Mobilizing Total Community Resources, Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006.

Forward Thrust, Guidelines for Mobilizing Total Community Resources, Chamber of Commerce of the United States, 1615 H Street, N.W., Washington, D.C. 20006.

Idea Packet to help you plan, promote, finance and build your community's new sewers. Clay Products Association, P. O. Box 172, Barrington, Illinois. (A survey of the factors that make up a good over-all program.)

Intergovernmental Responsibilities for Water Supply and Sewage Disposal in Metropolitan Areas, Advisory Commission on Intergovernmental Relations, 1800 G Street, N.W., Washington, D.C. 20575, October, 1962. (Contains information on forms and experiences of local government in pollution control.)

Suggested State Water Pollution Control Act, Revised and Suggested Urban Water Supply and Sewerage Systems Act, Federal Water Pollution Control Administration, 633 Indiana Avenue, N.W., Washington, D.C. 20242. (Models provide a basic framework for both state and local water pollution control programs.)

APPENDIX G

ENVIRONMENTAL POLLUTION ADVISORY PANEL

John L. Gillis, *Chairman*
Monsanto Company
St. Louis, Missouri

William B. Becker
Air Transport Association of America
Washington, D.C.

Thomas B. Becnel
The Dow Chemical Company
Midland, Michigan

L. W. Bremser
Black & Veatch
Kansas City, Missouri

Kenneth M. Burch
Greater Cincinnati Chamber of Commerce
Cincinnati, Ohio

Frank A. Butrico
Battelle Memorial Institute
Washington, D.C.

Robert A. Canham
Water Pollution Control Federation
Washington, D.C.

D. H. Doane
Cockle Ventilator Company, Inc.
Wheeling, Illinois

George J. Eicher
Portland General Electric Company
Portland, Oregon

John M. Fasoli
American Cyanamid Company
Wayne, New Jersey

Loren V. Forman
Scott Paper Company
Philadelphia, Pennsylvania

Burt Gamble
Continental Can Company
Chicago, Illinois

P. N. Gammelgard
American Petroleum Institute
Washington, D.C.

James R. Garvey
Bituminous Coal Research, Inc.
Monroeville, Pennsylvania

C. Howard Hardesty, Jr.
Continental Oil Company
New York, New York

Robert A. Kehoe
University of Cincinnati
Cincinnati, Ohio

John E. Kinney
Sanitary Engineering Consultant
Ann Arbor, Michigan

Joseph T. Ling
Minnesota Mining & Manufacturing Co.
St. Paul, Minnesota

Herbert S. Richey
The Valley Camp Coal Company
Cleveland, Ohio

John J. Roberts
Empire State Chamber of Commerce
Albany, New York

George E. Smith
University of Missouri
Columbia, Missouri

Carl Thompson
Hill & Knowlton, Inc.
New York, New York

H. Neal Troy
Owens-Illinois, Inc.
Toledo, Ohio

Charles E. Welch
E. I. du Pont de Nemours & Company
Wilmington, Delaware

John D. Wright
Watkins & Associates, Inc.
Lexington, Kentucky

Mr. ROGERS. Thank you very much, Mr. Richey. I think it is a very comprehensive statement that will be helpful to the committee.

Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman. I have just a couple of questions. On page seven, when you address yourself to standards pertaining to composition of fuel and additives, I notice you say that all alternatives, or alternative solutions should be explored. Who do you feel should do that exploration?

Mr. RICHEY. Well, I would like to see industry do it. I think, perhaps, Government research on this would certainly be well worthwhile. I think we tend to feel that this should be made as a systems approach. I am not expert on automobiles, I am a coal miner, but fuel is only one thing and, together with the design of the engine and exhaust system, they must all be considered as a whole rather than a series of parts.

Mr. SATTERFIELD. Don't you agree that if we were to adopt the bill as proposed, that it would enable the Government to establish standards that would dictate the composition of fuels, and we would in essence impede any possibility that the explorations you feel are necessary, would take place.

Mr. RICHEY. I would be afraid to have a law that stated what could be put in an engine or what could be put in a boiler plant or what could be put in anything.

It sets up a rigidity that I think very decidely discourages industrial research into finding a better way of doing it. I am more concerned with what comes out of the exhaust pipe.

Mr. SATTERFIELD. It was suggested a reason for extending the right to set standards was that something else is needed to produce results, the implication being that private industry wouldn't move unless the Federal Government got authority to control the content of fuels.

I take it, you don't agree with that approach?

Mr. RICHEY. No, I agree with deciding what comes out, the final product.

Mr. SATTERFIELD. If the purpose of extending these standards is as stated to make industry do more than it is doing today, your conclusion, I take it, would be that this would be the wrong way to go about it.

Mr. RICHEY. That would be the effect it would have on me as a businessman.

Mr. SATTERFIELD. I have no other questions.

Mr. HASTINGS. If I understand it correctly, the Chamber's basic approach is one of the Act itself, and wanting to do its part in treating this most serious problem.

Mr. RICHEY. I think our recommendations are based on the fact that we have this problem and we want to see it cured and we are trying to suggest ways that we think we can move it along.

Mr. HASTINGS. If I can reduce it down, you think the state and locals should be more involved than they are today, and there should be less of the Federal control that we are suggesting in some segments of this Act, and a lot of the authority would be stressed in the state and local governments; is that correct?

Mr. RICHEY. Yes. We feel there should be some national standards, but specific standards should be set locally. From my own practical experience, I can say with our mines in West Virginia, who have come out with their own air pollution regulations, they have been brought out and brought out intelligently and being enforced and there are timetables and deadlines to accomplish the result.

From my own company's standpoint, I think this is the only way you can do it.

Mr. HASTINGS. I think our only difference may be a difference in the approach. I would like, myself, to see state and local governments involve themselves to a much greater degree than they have. I am a little concerned, however, that some of them have been extremely slow in acting. I know that state and local governments don't like to press on an industry that is a pollutant, for the obvious reason that sometimes they tend to lose that industry.

Mr. RICHEY. This is correct, and this is one reason that we are suggesting that air quality regions be established to cover all of the states, and that national standards for each of those regions be set. This would have the effect of acting as a guideline. If the states don't comply with their own standards, at least as stringent as the national standards, then the Secretary of HEW will have to move in and do it for them.

I would also hope that there could almost be on an international basis because of our long border with Canada.

Mr. HASTINGS. I support this concept if we could make it work. I might say, however, that if we find out it doesn't work, that problems, in my judgment, is serious enough where the Federal Government is going to have to move a lot stronger than we would like to see. I value very much that relationship of local, state and Federal Government, and if we could treat it in that manner, I am for it.

I do find in several instances, private industry has to be included here. They don't act as quickly or decisively on their own until they have something hanging over their head. That is a human thing and I understand it. But industry's place in trying to solve the environmental problem is of absolute necessity.

I don't think the Federal Government can do it on its own. I very much welcome the help of private industry.

Along that line, do you think there should be additional incentives in the tax law, above those now in existence?

Mr. RICHEY. I don't feel that tax incentives have provided the incentive to do it. We all like to have our taxes lowered but as a businessman, if I can save tax money if I do this, that still shouldn't be the reason for doing it.

Mr. HASTINGS. I know the reason is well established, and we know why we must do it. My interest in that topic is only to see whether we can get the job done quicker than we have been able to up to this point.

Mr. RICHEY. It may provide an incentive, but the position we have taken here is that if we can establish these national air standards on a regional basis and give the states more or less a timetable, it would work.

Mr. COFFEY. If I may add something, the consideration of tax incentives is a misnomer. These tax advantages are not incentives.

The incentive is the law, and the social responsibility of industry to act. We are talking about cost-sharing, and I think any proposal for cost-sharing would certainly be beneficial, particularly on those industries which will be hard-pressed financially.

Mr. HASTINGS. There will be some.

Mr. RICHEY. There are marginal companies who will be hard-pressed to finance the equipment. I think we even have communities that operate their own local power plants. I just don't think that they can perhaps finance it.

Mr. HASTINGS. How do we treat that problem of marginal industry? If we impose standards, they can't do it.

Mr. RICHEY. They will be out of business. This is going to happen in the coal mining business. With the Coal Mine Safety Bill, a lot of them are going to go out of business. They don't want to put their private capital into the type of thing that is needed. I think this is going to tend to make some companies buy out little companies and take over their business. This will keep the Justice Department busy.

Mr. HASTINGS. You don't feel there is anything that we can do that would help encourage those people to stay in business?

Mr. RICHEY. Well, perhaps low interest loans. For example, the Small Business Administration is going to make small business loans to small companies to help them buy equipment to comply with the Coal Safety Mine Act.

Mr. COFFEY. I think the present conditions in the Tax Reform Act, which call for a five-year amortization, have not proven to be any kind of cost-sharing proposal to industries in this area. For a lot of industries, this doesn't even meet the accounting expenses in trying to write this equipment off.

Mr. HASTINGS. You would take a better look at a true cost-sharing proposal, and show more enthusiasm on that.

Mr. RICHEY. In the early part of the statement, you will recall we felt that the NAPCA staff is tremendously overloaded, and we would feel that by getting this out to the states and the local communities, you can distribute the workload to some extent. The problem is so big, and you are going to have air, and water, and solid wastes and noise, and how many Federal people can you have around the country?

Mr. HASTINGS. Thank you, Mr. Richey. I have no more questions.

Mr. ROGERS. I think some of your suggestions are very well taken, Mr. Richey. In designating air quality control regions, you say the primary responsibility for designation of intrastate, would rest with state authorities, but if there is no state action, the Secretary of HEW could do that. What is the time element that you would allow here? Should it be done in 90 days? We have had this bill for some time, as you know. I am as concerned as the Chamber and as you on the fact that we have had very little implementation, of the Clean Air Act, shockingly so.

Mr. RICHEY. That is one that I don't feel qualified to answer. I would think your best information on that might come from the state authorities who have to actually do this.

Mr. ROGERS. I wondered if you had any thinking, or if you might want to submit it for the record later on.

Mr. RICHEY. That would be fine. We would like to do some thinking on that.

Mr. ROGERS. I am concerned, when we passed the first Clean Air Act, or the one in 1967, it appears that we have made the procedure so ponderous that you are not getting any results. I hope that this committee is going to streamline the procedure, and tighten it up, and bring a time element much shorter than it is now. So, any thinking you have on time elements as to when conferences must be held, and when state decisions must be taken and when the HEW can come in if nothing is done.

Mr. COFFEY. We would be glad to check that with our state Chambers and we will try to supply that information.

(The following information was received for the record:)

The National Chamber feels that 90 days would give most States ample time to designate regions. Under extenuating circumstances, extensions should be granted—on an individual State basis.

Mr. RICHEY. As a personal example in this new Mine Safety Bill, certain time limits were put on dust, and I believe we have to sample the dust that every coal miner breathes, and it has to be done by sometime in April or May, and the Bureau of Mines has yet to approve the device we use to sample it. So, setting an early time element can bring some drawbacks.

Mr. ROGERS. I wasn't thinking so much of just one deadline, but time when you trigger something, and so much time to allow them once you are in a position to do it.

Mr. RICHEY. First thing that will have to be done is set up the regional authorities. That will determine which states have to make an intrastate compact.

Mr. ROGERS. In your regional setup, are you thinking of intrastate regions within a state or what is your opinion?

Mr. COFFEY. Both of them.

Mr. ROGERS. You think we have to set up regions first and this is to be done by whom?

Mr. COFFEY. HEW for the interstate areas, which they have the authority to do now but they haven't fully implemented the 1967 Act and it has been 2½ years.

Mr. RICHEY. I think the general feeling is that they haven't moved as quickly as they should have.

Mr. ROGERS. Without question, that is true. They have been very slow in moving.

Mr. RICHEY. That is a matter of people.

Mr. ROGERS. Well, I am not so sure that it is all that tied in with people. I think that they could have done much more. It just hasn't been done, and there has been no emphasis on it. They are beginning to move but it is very slow.

Now, you recommend a minimum national ambient air quality standard to be set by the Federal Government. This covers the whole United States?

Mr. RICHEY. By regions.

Mr. ROGERS. By each region, you mean?

Mr. RICHEY. Yes.

Mr. COFFEY. Each region would have to adopt at least that standard

Mr. ROGERS. Now you envision it being set by the Federal Government for each region or for the Nation?

Mr. COFFEY. It would be initially like a guideline for the states and regions to adopt and protect the public health, and the states would consider the adoption of more stringent air quality standards if they so desired.

Mr. ROGERS. So, it is a blanket thing.

Mr. RICHEY. To keep people from jumping from one place to another.

Mr. ROGERS. Now, if it varies in areas, then your thinki ng is that the state or region would respond and put more rigid controls in, if necessary.

Mr. RICHEY. It would have to vary because of geographical and meteorological conditions.

Mr. ROGERS. Now, then, I perceive that you are against, though, the Federal Government setting emission standards which would bring about the air quality standards set.

Mr. RICHEY. That is correct.

Mr. COFFEY. It would mean the Federal Government would have to set emission standards for each site, for each emission site in the country.

Mr. ROGERS. It could be done by industries, could it not?

Mr. COFFEY. No, where the plants are located would have an important bearing on the effect of their emission upon air quality.

Mr. ROGERS. I believe you would approve non-stationary emission sources with Federal emission standards.

Mr. RICHEY. Aircraft going from one state to another couldn't change their engines and their fuel or whatever had to be done every time they land and take off.

Mr. ROGERS. You would have it for automobiles, for anything that moved, but not for stationary things.

Mr. COFFEY. That is correct.

Mr. ROGERS. Well now, if you have a stationary source in a community, isn't that just as much a contributor as 100,000 automobiles, say. We know there are going to be 100,000 automobiles in a community. Now, we set standards for those and I understand there is some movement naturally. But basically, we could tell about what the automobile population is for your major cities. Now you want to set standards there but you don't want to set standards for stationary ones.

Mr. COFFEY. We want the regional authorities to consider that they have 100,000 automobiles in their area.

Mr. ROGERS. Why shouldn't the regional authorities set the moving standards as well?

Mr. COFFEY. You may have a pretty good handle on the fact you would have 100,000 cars in the area, but you wouldn't be sure it is the same 100,000 cars all of the time.

Mr. ROGERS. As long as they meet the standard you wouldn't care.

Mr. COFFEY. If you are going to let the regions set the standard, some region may not adopt as stringent a standard for mobile source as another region would, and you may have to stop at the state line and put a new device on your car.

Mr. ROGERS. I am not sure that I can reconcile the logic here, because suppose you have the automobile who has a standard set when it leaves Detroit on emissions. Then it goes to a little town in Arizona, they don't have any real significant air pollution, and the region might say, "Well, automobiles are not very significant here." How do you rationalize the setting of a national standard when you are not going to set it when they may have a plant there that is really polluting that community and also that is going over across the state, and I understand California is now polluted. I am glad we are not closer to California right now.

Mr. RICHEY. In taking the concept of a regional air standard with a national standard set, then both the stationary and non-stationary total emissions have to comply with the overall. I think this is the important thing.

Mr. ROGERS. Wouldn't it be easy for them to set a national standard on sulphur-oxide?

Mr. RICHEY. Yes, it is very easy to set it, but is it practical? For example, if there is a power plant out in "No Man's Land", with no one living around it, is it to be as restricted as one in downtown New York?

Mr. ROGERS. Does that contribute to the overall pollution of air in the Nation?

Mr. RICHEY. Every emission contributes, if you want to be broad, but the ambient quality of air around the isolated plant might absorb it, and it may fall within the Federal standards, whereas, in a city with 1 million automobiles and power plants there, it will have to have different standards.

Mr. ROGERS. I understand that. Now we have heard from Dr. Berry Commoner, who is quite an ecologist, and he says everything affects everything else.

Mr. RICHEY. That is a broad statement.

Mr. ROGERS. And you just don't get rid of something, it goes in some other form.

Now, if your stationary emission, sulphur from coal or oil, is polluting and it makes up the overall air quality, how can the Federal Government not take some cognizance of that?

In other words, it is saying we will do it if it is moving, but we are not going to do it if it is stationary. The people who produce all of the moving polluters say, "Well, you ought to include the stationary, they are doing that". In New York City, they would say it is even more.

Mr. RICHEY. The stationary plants will be controlled by local authority and by state authority. This is what we are going to do in West Virginia now.

Mr. ROGERS. But shouldn't the Federal Government have the right to come in, and shouldn't there be a minimum standard or a maximum standard of emissions set?

Mr. RICHEY. We think the Federal Government will set the minimum standard for the region.

Mr. ROGERS. I know they set the quality, but now we get down to what must be done. I think you only give it to them on a health basis there, imminent danger to health, isn't that your position?

Mr. COFFEY. That is the current language in the Act. We approve that, but we are not saying that there has to be an imminent danger to health for the Federal Government to set air quality.

Mr. ROGERS. I am talking about controls, to do something to stop it. This is what we want to get at. How are we going to stop it? I think everybody agrees, where we can do a State and local area, it is better. But it has been so ponderous. There may need to be some underlying enforcement authority if the States and local areas don't act on emission standards.

Suppose the Federal Government sets a maximum emission standard, that would affect the air quality of the Nation. Would you have any objection to that?

Mr. COFFEY. I think so, Congressman, because the basic question is the air you breathe or the air you utilize. That is ambient air. One doesn't breathe emissions from the smokestack unless one lives at the top of the stack. In setting an ambient air quality, should that be violated, the Secretary could move in if the State fails to act and set such controls as he felt were necessary to meet that standard.

Mr. ROGERS. If it is imminent danger.

Mr. COFFEY. No, if the state does not act to meet the national air quality standards, the Secretary can move in.

Mr. ROGERS. But that is air quality standard, but if it is higher in a certain area, or lower, but affects people right around, in the overall problem, shouldn't there be some way for the Secretary to get to this problem?

Mr. COFFEY. The question is: Is it concern over the ambient air that should be the primary concern.

Mr. ROGERS. Now, should the Secretary have the right where this air quality, the ambient quality, shouldn't there be some way for him to have some enforcement of that?

Mr. COFFEY. We are recommending that he does.

Mr. ROGERS. But not by doing it within any enforcement from the Federal Government.

Mr. COFFEY. Only in the absence of state action, to insure the health of their citizens, and the air quality of the region.

Mr. RICHEY. We say on page six, "In case these are violated, the regional authorities could check each emission site to determine non-compliance with the emission limitations and proceed with remedial action—judicial action, if necessary."

Mr. ROGERS. But he can come in and have a lawsuit, but he can't actually come in and set a standard. You don't allow him to set a standard, an emission standard?

Mr COFFEY. Not as long as the air quality of the region is being protected.

Mr. ROGERS. If is not, why shouldn't he set a standard to make sure it is being protected?

Mr. COFFEY. I think he would have that authority, such as he has now in interstate cases, where intrastate regions do not meet the air quality standards.

Mr. ROGERS. What I am getting at is this: You recommend national emission standards set by the Federal Government for moving but not for stationary.

Mr. COFFEY. Because the ability of the mobile sources to move between regions presents a problem that cannot be handled by state and regional authorities.

Mr. ROGERS. What about the moving of the pollution in the air? That doesn't stay steady.

Mr. COFFEY. If the air quality regions are designated properly.

Mr. RICHEY. This is where our interstate pacts come together. This is where we have the interstate compacts.

Mr. ROGERS. Do you know how many interstate compacts we have?

Mr. RICHEY. I don't know.

Mr. ROGERS. I think that there are two in the making.

Mr. COFFEY. We suggested if it were necessary, but there is no reason why the States couldn't cooperate together without the formalizing of an interstate compact. Cooperation between State authorities is not unknown.

Mr. ROGERS. It is not unknown, but I am not sure it is the quickest way to get at the problem.

Let me ask you this: Does the Chamber have any position on solid waste disposal legislation before the committee? I would like to know how you feel in respect to solid waste disposal. Are we going to look to industry more and more to begin to develop the techniques for disposing of it, and particularly those who contribute to it. Should they have this obligation to see that something is done?

Mr. COFFEY. This is still under consideration, Mr. Rogers.

Mr. ROGERS. You do not believe in the regulation of fuel composition but simply by setting a national emission standard. I assume a national emission standard would get at whatever control you need. What about registering fuels. This is in the present law. I presume you have no objection to that.

Mr. COFFEY. No, that is to handle new substances.

Mr. ROGERS. Are there any other questions?

Mr. SATTERFIELD. You mentioned something a moment ago which seems to me to go to the heart of things. You were talking about measuring dust in various mines and that your holdup had been that a measuring device hadn't yet been approved. This brings to mind something which seems germane to everything we are talking about. It doesn't really make much difference whether we are talking about setting up regional and local standards or whether we do it nationally, in so far as the need to set emission standards on stationary devices, which includes all furnaces in this country such as those in office buildings, homes and elsewhere.

To your knowledge, do we have the technological know-how today to actually meet such a standard if it is set.

Mr. RICHEY. Well, I couldn't answer that specifically. I wouldn't be qualified to, but I just think, sitting here, I don't know how many millions of stacks there are in this country, and if we had a device on every one, how many of those devices could be operated and maintained and this is really a police state.

Mr. ROGERS. You would allow the state and local people to do it, wouldn't you?

Mr. RICHEY. Yes, you would have to.

Mr. ROGERS. So, you are going to have some regulation one way or the other.

Mr. SATTERFIELD. It seems to me we must have a logical progression. First you establish a standard and then you have to set about learning how to meet that standard. I think this is the one thing that we seem to be overlooking.

Mr. RICHEY. We will be so busy doing this that we won't have a chance to go to work anymore.

Mr. ROGERS. Thank you very much, Mr. Richey. Your testimony is really helpful to the committee and I commend the Chamber for taking a very forward look in this area, and I think that your thinking is certainly in line with a solution that is needed.

Mr. RICHEY. It is a pleasure to hear you say that. Thank you.

Mr. ROGERS. Our next witness is Mr. Lawrence E. Blanchard, Jr., Executive Vice President of the Ethyl Corporation, accompanied by Mr. Howard E. Hesselberg, Coordinator of Air Conservation, and Mr. Daniel A. Hirschler.

We are delighted to have you here, Mr. Blanchard, with your associates and the committee will be pleased to receive your testimony.

We do have a call to the Floor. We are trying to get permission to sit, so that we can accommodate you in letting your testimony be received today so you won't have to come back again. We have a request in to allow the committee to sit.

STATEMENT OF LAWRENCE E. BLANCHARD, JR., EXECUTIVE VICE PRESIDENT, ETHYL CORPORATION; ACCOMPANIED BY HOWARD E. HESSELBERG, COORDINATOR OF AIR CONSERVATION; AND DANIEL A. HIRSCHLER, DIRECTOR OF AUTOMOTIVE RESEARCH

Mr. BLANCHARD. My name is Lawrence E. Blanchard, Jr., and I am a resident of Richmond, Virginia. I think that I should pause to say that I am not an expert witness in more ways than one, and that I have not previously appeared before a Congressional committee. I am impressed with the difficulty of trying to get any statement prepared which hundreds of experts will agree on, every word in it, as to its accuracy.

About all I can say is that those are the only two sentences in the speech that I wrote that there hasn't been anybody able to change so far.

Mr. ROGERS. We are finding that there is some difference of opinion in this subject matter, Mr. Blanchard. I might say that I read where a state utility commissioner who had been elected was testifying before a Senate Committee, fortunately not the House, and the Senate asked him, "What are your qualifications?" And he said, "Well, Senator, the same as yours. I got more votes than the other fellow."

So, I guess we are all pretty qualified.

Mr. BLANCHARD. I am Executive Vice President of Ethyl Corporation which 47 years ago introduced into commercial use the gasoline additive known as lead antiknock compound or sometimes with the fancy, technical term of tetraethyllead, which is now an essential component of 98 percent of all motor gasoline made in the United States. With me today are two gentlemen who, despite my protest as an expert, are experts, with many years experience in this field. They are Howard Hesselberg, on my right, who is our Coordinator of Air Conservation; and Dan Hirschler, who is our Director of Automotive Research.

We are not here with any apologies. We are pleased to be here before you gentlemen today because Ethyl is literally proud of the contributions which it has made to the automotive industry through the development of that magic ingredient that has made "100 octane" synonomous with efficiency and economy throughout the world. I think the point was best put by Mr. Cole, President of General Motors, in a speech on just this January 14th, when he said, "In short, tetraethyllead permitted the petroleum industry to increase the octane rating of its gasolines and improve their antiknock characteristics. This allowed the auto companies to boost compression ratios which resulted in improved engine efficiency and benefits—either in terms of economy or performance."

We don't think that contributions of this magnitude should be lightly regarded or precipitiously abandoned.

Today, all Americans are crusading against pollution. We are too, but we want the right solution, not temporary expedients that adversely affect the total ecology in the years ahead.

Since all of us want pure air, it is easy to stir up the public by emotional appeals and impatient demands for shortcuts and easy answers. Many of us also like to find a scapegoat for unwelcome problems. It is far easier to shift the blame for problems than to solve them.

Today, we are in the middle of a great furor over lead antiknocks in gasoline. After living through the last six weeks—if you can call it living and my wife has quite a different view of whether we have been living or not—there is no doubt in my mind that lead has been picked by some as the scapegoat for a host of serious problems of the automotive industry.

Therefore, the first part of my statement will be addressed to this recent furor that has created real chaos in the automotive oil and related industries. This has taken on so many emotional and political overtones, we think that the time has come to stop and take a long, hard look at just what is going on.

The second part of my statement will be addressed to the far-reaching provisions of Section 5 of H.R. 15848 which we believe should be amended and revised to prevent an abandonment of the "systems approach" to automotive emission control adopted in 1967, that we feel represents the only real hope for a long-range solution to air pollution problems.

THE CURRENT FUROR OVER LEAD ANTIKNOCKS IN GASOLINE

The present furor was started early in January by Mr. Cole of General Motors, who announce in his speech on January 14, 1970, that General Motors could not meet the 1975 emissions standards unless lead was removed from gasoline by that time. A couple of weeks later, Mr. Cole announced that lead-free gasoline would be needed this year because General Motors had determined to go back to the engines of some 15 or 20 years ago and in our opinion, to start to shift to the oil industry the burden of meeting many of the tough pollution-control problems that have been imposed by law on the automotive industry.

The stated purpose of this change is that some members of the automotive industry claim they don't know how to handle some of the engine effects created by lead antiknocks, invented by General Motors, and which have been used in virtually all the millions of automobiles that have been produced over the last 40 years.

We think one of the real purposes of this change in position was, as the New York Times last week quoted an unnamed General Motors official, "to put the monkey on somebody else's back."

We think the much publicized proposal to make cars with lower compression engines available in August and September of 1970, starting with the announcement in February, is essentially a publicity stunt, and I certainly have to admit that they are a lot better at publicity than we are. Indeed, their own publicity makes it clear that these cars can operate equally well on leaded or unleaded gasoline. So what is the purpose of all the publicity about needing a lead-free gasoline for the entire country within the next few months? We understand there will be no catalyst, no recycling device nor any other new emission control equipment added to these low compression cars. This is a cure that cures nothing.

I am also bound to say that we think, and anyone else in industry, is entitled to somewhat longer-range planning out of Detroit. Again, my wife doesn't agree with me, but I honestly think that I do longer-range planning than this for my summer vacation.

But above all, we think that you must take into account, with all of this talk about a low compression car in August or September of this year, that the total amount of exhaust emissions will not, in our opinion, be reduced—rather, we think they will be increased. The carburetor of the low compression ratio cars will have to be set for richer mixtures for the same degree of driveability. Fuel consumption and exhaust flow will be greater because of the lowered engine efficiency. The combination of these two effects will increase mass carbon monoxide emissions substantially. We believe, and I emphasize, we believe that nitrogen oxides will be reduced somewhat, although there is some technical debate about even that, but in any event, the carbon monoxide formation will overshadow any slight decrease in hydrocarbons and nitrogen oxide emissions due to the low compression ratio. I am sure you will remember from Dr. Middleton's testimony, that at least at this time carbon monoxide is still the toughest problem we have got at the moment, to cut it down.

Let me make it clear at this point, however, that we at Ethyl are not here today, and don't expect ever to be here, to argue for either a low compression engine or a high compression engine. We, obvioulsy have little or no voice in this decision and I don't suggest that we should have any voice in that decision. Either type, low compression or high compression, can operate well on leaded gasoline and meet emission standards. Forty years ago, they were all low compression, but we do think that you should recognize that the low compression engine is not likely to be here for any extended period of years. Spokesmen for the automotive industry have already indicated that they recognize that the public will not accept these inefficient cars and as soon as they get over the present furor they hope in the near future to increase compression ratios requiring even higher octane ratings with unleaded gasoline. On January 27, 1970, Henry Ford II said in a letter to a number of major oil companies:

I would also appreciate knowing how soon you think lead might be removed from premium grade fuel so we might again build new cars with more efficient engines requiring higher octane fuel.

In view of statements like these, the decisions you make in the next few months must take into account the fact that any restriction on lead antiknocks will eventually require a major reformulation of gasoline to meet, not only the proposed 1971 octane ratings, but also increased octane ratings in the years to come, when you and I and the rest of the public will want to drive again an efficient engine with all the present-day power attachments—from air conditioning to automatic transmissions.

Ethyl Corporation, through its Detroit Research Laboratories, and we have a huge research staff there—basically as a finance-man I have been known in the past to squawk with how much money it costs to run the Detroit Research Laboratory—has been doing research on the internal combustion engine and its emissions since the early 1950's

Even Ethyl has been able to modify existing cars to stay below prescribed emission standards. It never dawned on us until January that automobile producers couldn't do at least as well. We have such a modified car, a 1967 Pontiac, incidentally, that already meets all U.S. and California standards through 1974 and partially meets the 1975 standards using present-day leaded gasoline.

I have recently made this statement in California, and I have to admit I got called on it. The Board said, "You talk so big, why don't you take it down and get it tested on the California procedures."

No sooner did I walk out of the hearing than our man from Detroit who had the car was already cranking it up to head for Los Angeles, and I said, "Wait a minute, let us not be too hasty about this thing. I made all of these big statements, but confound it, I don't want you to go down there and find it won't meet them."

He said, "Larry, don't give it a thought, it will make it, despite Mr. Cole having called it an experimental car." Fred Marsie got in the car in my presence last week, drove it 450 miles from Sacramento all of the way down the coast to Los Angeles straight into the California laboratories and put it on a dynamometer. I am pleased to say within the last two days, we have gotten the results, the official results, which I am also pleased to say are better than the ones I had claimed, and it has now been certified as meeting the 1974 California standards.

We brought this modified car with us today. When you see it, it looks like a Pontiac and just remember it is really an "Ethyl". It is located out in front of the building. I sincerely invite—I know you gentlemen have an awful lot of spare time—I invite you to get in and drive it, because I sincerely believe it is as driveable as any car on the road today.

Mr. ROGERS. I think the committee would be interested in seeing it, and as soon as our questioning is over, maybe we could recess the committee and go down and take a look at the car.

Mr. BLANCHARD. That would be grand.

This Ethyl car and its predecessors have been made available to all the automotive companies for testing and study, and we have received many favorable comments on them.

It is my understanding that du Pont has developed mechanical emission control devices for cars that may do even better than our own. I don't want you to think that we are claiming that we are some geniuses. We think some other people who are willing to attack the problem can do just as well. In short, how many years can anyone expect scientists to stay ahead of the emission standards that have been set for the future? Even we are now 4 or 5 years ahead of schedule, and I am confident that a well-planned and concerted effort can meet the ultimate goal of an emission free car without imposing unreasonable burdens on any particular industry or on the general public.

POSITION OF AUTO INDUSTRY

Now let's look for a moment at the position of the automobile industry today.

First, the mass of refining, distribution and marketing problems for the oil industry which they have created stems from their saying they need lead-free gasoline by September, 1970, for their new low compression cars. Yet, as I have said, all of their publicity makes it clear that these cars can operate equally well on either leaded or unleaded gasoline.

If they intend to put some devices on this car—which I personally think that they will do, to continue to put improved emission controls on theirs, just as the kind we keep putting them on ours— whatever they are putting on theirs, they can't claim that they don't operate with lead because they have already made it clear that all of these cars will operate equally well on leaded or unleaded gas.

Next, they claim that some day off in the future they may be able to develop a practical catalyst to run only on unleaded gasoline. It is bound to be obvious that there is no need for you and me to drive inefficient cars at increased costs, and for the oil industry to rebuild facilities, during the years that they are experimenting in their laboratories on possible catalysts. Certainly we have never made that claim while we have been experimenting in Detroit.

Ethyl and du Pont have independently done as much work on catalysts for automobile exhaust as anybody. We and other manufacturers carried out, and met, qualification testing of a catalytic device in California in 1963–64 when that State's law required that such a device be developed for installation on automobiles operated on leaded gas. The problems encountered at that time were enough to make the catalyst appoach appear imparctical for long mileages, regardless of the type of gasoline used. This still appears to be the case.

The automobile industry concluded in 1964 that mechanical approaches to emission reduction were far more practical than catalysts. We still believe that this conclusion is sound and publications in 1969 of SAE papers, by both General Motors and Ford, give little basis for the belief that catalysts will be feasible even with unleaded fuels.

Admittedly today, because of all of the publicity that has come out, everyone is scouring the country today to try to find a practical catalyst. That is not only us but the automobile companies. New potential catalysts are claimed almost everyday, with many claims that they work with either leaded or unleaded gasolines. While we do not believe that the catalyst approach is the best way to proceed, we are naturally re-exploring its possibilities, and we have recently received several exciting submissions in this field, which fortunately or unfortunately are still covered by the typical inventors secrecy agreements at this stage. But several of them are very exciting. Also, we are impressed by the recent announcement by Mobil Oil Company of a new low emission car with a catalyst that works on both leaded and unleaded gasolines.

In our view the catalyst approach is not the only answer to controlling emissions. Even Detroit says that they don't know exactly what year they may be able to come up with one. As I have said, Ethyl has developed a car without a catalyst that now meets the 1974 California standards on leaded gasoline. It is my understanding that duPont has developed emission control devices for cars that may do even better.

In addition to emphasizing their catalyst problems, the Detroit people also say they will be unable to recycle exhaust gases to reduce the emission of oxides of nitrogen so long as leaded gasoline is used. Even Ethyl thinks it can effectively recycle exhausts right now on leaded gasoline and meet the 1974 California standards and come close to the 1975 Federal standards.

Recycling devices sound awfully complicated and sophisticated to a non-mechanical man like me, but in short, it isn't anything but a hole about as big as a pencil stuck in a wall of metal. While it may be a pretty difficult problem for Detroit to figure out how to keep that hole from getting plugged up, we certainly don't believe it is in the category of a national crisis. We certainly think there are numerous relatively simple devices to achieve effective recycling that present no more difficult problems with leaded gasoline than the many other parts of the automobile engine that have been operated on leaded gasoline for so many years.

HEALTH ASPECTS

We think there is no proof that lead in the atmosphere creates any health hazard to the public. This has been the subject of responsible, detailed investigation for many years. Ethyl and duPont, as well as various Federal agencies, the Surgeon General and the oil and lead industries, have probably spent more millions of dollars studying the health aspects of lead in air continuously over 40 years than has been spent by anyone studying any other substance in the entire atmosphere.

We intend to continue our part of this research program as a normal precautionary matter since our first concern has been, and will continue to be, to safeguard the public health. We welcome such medical and health research by responsible parties since it is our conviction that the public interest can be served only by reliance upon scientifically proved facts rather than upon speculation and unproved "concerns" and theories. I have filed with the subcommittee a paper summarizing the current scientific data on the health effects of lead in the atmosphere, and I hope you will have the opportunity to review it. (See "Public Health Effects of Lead Antiknock Compounds", p. 561, this hearing.)

I don't want to sound like I am glossing over this subject. But it is perfectly obvious from the three, four, and 10-day symposiums that have been held by the doctors, once every two or three years for the past 20 years, that it is obvious that you are not going to let me hold that kind of a symposium here before you.

In any event, even if someone concludes that at some stage lead in the atmosphere can get to be a problem, when you set particulate standards, which HEW has the right to do and is now proposing, the most obvious solution in our opinion is to simply place a lead trap and muffler on the exhaust system and retain the lead at the pipe.

Ethyl and duPont have done a great deal of research and development work in preparation for meeting the 1975 particulate standards. Ethyl's data show that lead constitutes less than one-third of the total particulates in automobile exhausts.

We have now working prototypes of particulate traps that have run for 24,000 miles, and will remove up to 65 percent of exhausted lead compounds. We also are testing more advanced trapping devices that can remove up to approximately 90 percent of all lead in the exhaust. I understand duPont is doing as well or better. Admittedly, this involves one piece of hardware, but in lieu of billions of dollars, you can afford a little hardware. I am absolutely confident that we are at least as advanced in developing lead traps as Detroit is in developing an effective catalyst.

All the public is ever told about are the alleged health questions related to lead in gasoline. Let's look for a moment at the side of the health story that gets little publicity.

It is clear that something has to take the place of the power that antiknock compounds have long provided and this involves reformulations of gasoline. We all know that taking lead out of gasoline normally increases its aromatic content. They simply haven't been able to find any other route to take the place of lead to get the required octane. We know that everyone is concerned about this feature of the total problem, and in our opinion, while again you can't wait for all of the detailed results and studies to be completely certain we think the unknown health hazards of this problem—the problem of carcinogens—outweigh the long studied question of lead.

Certainly, it is clear—and there is no speculation on this raising something that needs to be studied—it is clear, and even General Motors emphasizes this point in their testimony on the basis of their smog chamber research, that any increase in aromatics will increase the eye irritation of smog. That is what the eye irritation in smog is. When certain aromatics pass through the photochemical smog reactions they form a potent eye irritant which is probably responsible for half the eye irritation in Los Angeles smog.

SMOG EFFECTS

Let's look further at photochemical smog itself, which in the last analysis is what all of us are most concerned and rightly so. The U.S. Bureau of Mines—no Ethyl Corporation mind you—has recently reported that "Leaded and comparable quality prototype unleaded fuels yielded about equal amounts of emissions.

"This was true for both evaporative and exhaust losses." Now I continue to quote and italicize, "If the photochemical effect is considered—this is the smog—the fuel factor is shown to exert significant influence. The fuel alterations from leaded to unleaded (gasoline) changed emission characteristics so that the pollution effect was increased by as much as 25 percent." Dr. Earl T. Hayes, Acting Director, Bureau of Mines, testified to this effect before your subcommittee on March 5, 1970.

We think it would be a most serious mistake to risk any increase in smog in our country today. I understand it has been referred to many times. We don't want to act like we are just batting the old shoe on the table, but we feel obliged to point this out because we think that you gentlemen deserve to know what this Bureau says in their opinion is going to be the effect of going from leaded to unleaded gasoline on smog.

Therefore, we think it would be a most serious mistake to risk any increase in smog in our country today. You gentlemen and Congress have labored long and hard to make today's progress on reducing smog. I don't think we ought to overlook that the automobile industry has reduced the emissions almost 80 percent from when you started imposing standards. When you started setting hydrocarbon standards, just for example, we all remember some 5 years ago Detroit said there was no way we could reduce the hydrocarbons without a catalyst. That is why they did the catalyst work in California. Yet, there has never been a catalyst put on a car, and today, the hydrocarbon standards are down, or will be shortly, and our cars emit less than 50 parts per million after you started with over 900 parts per million in a typical car.

So, I don't want to say that we have not made progress. I think the automobile industry has made terrific progress, and I don't think we ought to risk throwing away any of that progress to increase the smog.

Independent investigations have clearly demonstarted that the presence of lead in gasoline does not increase the amount of photochemical smog produced by exhaust emissions and eye irritation has not increased. No one knows why this is so, but the investigations make it clear, that the presence of lead actually decreases the amount of eye-irritating aldehydes in engine exhaust.

This is the side of the story we believe the public has not been told, as against the emotional atmosphere of simply "getting the lead out" and it is doing something terrible.

ECONOMIC COSTS

Finally let's turn for a moment to the economic costs of the auto industry approach. First of all, assume that the proposed 91-octane unleaded gasoline is made available on a limited basis, and that the only other available fuel is a 97-octane leaded gasoline. This is the so-called "two-pump system" that has been the subject of so much discussion and controversy in the oil industry during the past month. Even if this system were ever put into effect, it is abundantly clear that the costs of manufacture and distribution of the unleaded 91-octane fuel are significantly higher than for the presently available leaded regular fuels and that the new product must carry a higher price and result in more fuel consumption.

Next, if (as seems likely) there should occur after 1971 a substantial demand for higher octane gasolines, then a crash program to restructure all of our oil refinery facilities will be required at a cost in excess of $6 billion. This would create a tremendous inflationary demand for skilled labor and equipment at a time when there is barely enough of either to satisfy the normal growth of the oil industry. In addition to this unprecedented capital expenditure (probably more than the oil industry has spent on refinery improvements in the last ten years), there would be an increase in manufacturing and distribution costs requiring increases in gasoline prices of at least 2¢ to 4¢ per gallon. Even if these heavy financial demands can be met by the major oil companies, many (we think more than 100) small, independent refiners will be forced out of the gasoline making business if lead is eliminated. Removal of lead from gasoline would reduce sales of the lead industry by about 25% and would have a tremendous impact on the price and availability of chemical feed stocks, particularly olefins and aromatics.

In summary, we think that you gentlemen and the public should be clearly advised that a premature decision to remove lead from gasoline will be likely to increase—not decrease—photochemical smog and exhaust emissions, and further will impose a tremendous and unnecessary inflationary cost on the entire economy.

OUR PROPOSED ALTERNATIVE TO SECTION 5 OF H.R. 15848

The proposed amendments contained in Section 5 are, in our opinion, a complete reversal of your carefully worked out regulatory scheme embodied in the Air Quality Act of 1967. That legislation empowered the Secretary to set standards for emissions from the exhaust pipe of the automobile and left it entirely up to private industry as to how to meet such standards. The legislative history makes it clear that the intent was to promote technical innovation and competition and thus to leave "all the options open" for the automotive and oil industries.

Now, whatever agreement or disagreement we might have on precisely what should or should not have been done by HEW, the fact remains that by setting these standards under the Air Quality Act of 1967, I think we ought to recognize that generally speaking, it has worked. It is making and it is continuing to make spectacular progress on what is happening to the automobile and its emissions.

Furthermore, if you say you have to speed them up, and if unleaded gas will enable us to get there sooner, I am not certain you can't get there sooner anyway. We have a car that already meets the 1974 standards and I am not sure that you can't get there sooner. I am not saying that you should get there sooner. I think HEW has set and consistently sets pretty tough standards, witness the howling that comes out of Detroit every time they have kept their feet to the fire. They have done a magnificent job of meeting every one of those standards and they have achieved a great deal of progress.

Now you have before you a proposal for the Secretary to regulate in minute detail the composition and chemical properties of fuels and additives used in automobiles. This is a drastic and unprecedented approach. I don't believe even the FDA is empowered to tell drug manufacturers what they can and cannot put in drugs and medicines, as distinguished from the ultimate effect of them. At the same time, there is nothing in H.R. 15848 that imposes any additional requirements whatever upon the automobile manufacturers—either as to engine design, exhaust system design or anything else. There is no way for the Government to require them to continue with any low compression car or to require them to place any particular control devices on any car, whether it be a catalyst, a particulate trap or anything else, regardless of whether that may be the best and cheapest systems approach from the standpoint of the total public to meet our total exhaust emission problem.

Thus, we at Ethyl can only conclude that the approach of H.R.15848 is essentially the same as the automobile industry approach—to shift the major burden of meeting existing and proposed emissions standards to the oil industry and its suppliers.

It seems clear to us that to meet emissions standards at the tailpipe requires a "systems approach" and not a piecemeal regulation of the various elements of the problem. H.R. 15848 is making a giant step backward by seeking to isolate and regulate only one of these elements—fuel composition—while leaving such other elements as the auto engine free of any regulation, supervision or disclosure requirements.

It is our strong view that the bill should be amended to provide the Secretary of HEW with reasonable licensing and information gathering powers that will apply to automobile engines, exhausts and fuel systems, as well as to fuel and fuel additives, which he has had the power to do all along. All I know these days is what I read in the paper and I apologize for not having any copy of Dr. Du Bridge's recent release. Therefore, I am reading from the Oil Daily on Monday, of his release over the weekend, where I am pleased to see that he says that he expects the Commerce Department Technical Advisory Board to be ready with recommendations in 90 days, on the type of "system" that would be less costly for Detroit, oil refiners and motorists.

Furthermore, again I am quoting from the Oil Daily, "Du Bridge was asked why the Government is now seeking a new law to control fuel composition, if 'performance' standards', that is, the systems approach, dealing with emissions are the best way to attact pollution from the automobile."

> He said that the Government wants the authority, because there may be other things, other additives than lead in motor fuel that need attention, but he said the Government might never need to use the authority.

I might observe in this connection that the Secretary has not yet utilized the power to gather information about fuel additives that Congress gave him in 1967. So, frankly, we don't understand what all of the hullabaloo is about, needing new information when they haven't bothered to get the information that you gave them the right to get in 1967. Their answer is, in all fairness, that they think they can set emission standards, and they have set emission standards and Detroit is staying ahead of them today.

Also, and this is most important in my opinion, the Secretary of HEW should be empowered—I might go so far as to say that I think he ought to be directed, and I don't think he needs to be empowered—to call for conferences and promote joint research and development work by the automobile and oil industries to meet emission standards under general Government supervision and guidance so that the present widespread fears of antitrust violations will be eliminated. These amendments would give the necessary impetus to a concerted attack on the problem of automotive emissions that is almost certain to succeed in reaching the goal of a virtually emission-free car by 1980. After all, that is not just around the corner.

In conclusion, gentlemen, I would first urge that you await action on H.R. 15848 until you have the benefit of the authoritative report that is to be made by the new Panel On Automotive Fuels and Air Pollution of the Commerce Technical Advisory Board that was described to you by Dr. Myron Tribus. (The only thing I know wrong with that panel is they do have a hard to pronounce set of initials, CTAB.) This panel was described to you in detail by Dr. Myron Tribus, Assistant Secretary of Commerce, on March 5.

What Dr. Du Bridge made clear this weekend was this need to look at the total effect of this thing in the context of economics, alternate approaches and so forth. The technical and economic alternatives to the automotive industry approach must be analysed and compared, and any major changes in automobiles or fuels demand intelligent planning and careful timing. You should not rush into a course of action that involves a substantial risk of setting back the battle against automotive air pollution.

With the panel's report in and, we believe you will be in a better position to amend H.R. 15848 so as to be certain that HEW has the the authority to obtain authoritative data as to all aspects of the automotive emissions problem and then promote concerted action to find the right solutions, bearing in mind the billions of dollars that may be required. All of us in industry have a man-sized job to raise all the money necessary to solve the great variety of pollution problems. No industry can afford to waste billions of dollars on red herrings in the decade that lies ahead.

We thank you for the privilege of appearing here today, and will be pleased to answer any questions you may have. More specifically, I have some experts here who I hope can answer questions or can discuss, to whatever extent you would like us to, any details of our low emission car approach or anything else.

(The supplemental statement attached to Mr. Blanchard's prepared statement follows:)

PUBLIC HEALTH EFFECTS OF LEAD ANTIKNOCK COMPOUNDS—A STATEMENT BY ETHYL CORPORATION

There has been a vast amount of research carried out as to the public health effects related to the discharge of lead compounds from motor vehicles as a result of the use of lead antiknock compounds. Research conducted by government, universities and industry investigators has been under way since the commercial introduction of lead antiknocks in 1923 and is continuing. This research has been referred to as one of the most extensive investigations of this nature on any single class of generally used chemical compounds. Understandably, there have always existed two schools of thought on the subject and this will probably always be the case. As a result, there have been numerous reviews of the situation and many investigations and conferences.

In the mid-1920's, after considerable scare propaganda relating to the possible effects of widespread dissemination of lead in vehicle exhaust, the entire situation was investigated with the best available technology. At that time, the Public Health Service concluded that there was no reason to prohibit the use of lead antiknocks. Government and industry studies since that time have repeatedly substantiated these initial medical findings.

In 1959, an ad hoc expert medical advisory committee of the Surgeon General of the U.S. Public Health Service again reviewed all available information pertaining to all aspects of the use of lead antiknocks. This committee concurred in raising the maximum allowable concentrations of lead antiknocks in motor gasolines from 3 to 4 milliliters per gallon (Reference 1). The average usage of lead in motor gasoline in the United States has always been substantially under the agreed upon maximum values and at the present time the usage is on the average about 2.5 milliliters per gallon.

The Surgeon General's committee did feel there was a need for additional information relating to the contribution of lead antiknocks to the atmosphere and the body burden of the population. As a result, an extensive industry-government investigation was initiated in 1961. This one-year study assessed the concentration of lead-in-air of three major cities—Philadelphia, Cincinnati and Los Angeles; and also lead body burden as indicated by the lead content of the blood and urine of some 2400 men and women residing in these areas. These studies showed that atmospheric lead levels were on the average generally low and that lead body burden of the population—including traffic policemen, downtown postmen, taxicab drivers, etc.—was within the levels generally considered normal. These findings, as published by the U.S. Public Health Service, are summarized in Reference 2.

To assess possible changes which may have occurred over the intervening period, an extended survey of similar nature is now under way, again supported jointly by the U.S. Public Health Service and industry. The original three cities are being reassayed, both aerometrically and biologically, and in addition, four major cities—Washington, D.C., New York, Chicago and Houston—have been added to the study. The results of this comprehensive program are anticipated upon completion of the sampling and analytical work in mid-1971.

The World Health Organization has reviewed the general lead situation as indicated by blood and urine analyses of individuals in some 16 different nations. A report of their studies is covered by Reference 3. Two statements from this document are felt to be significant:

"There has been no increase in lead contamination in the last two decades. If there has been any change it would appear that at present man is exposed on the whole to less lead in his environment than he was twenty years ago."

"The lead levels reported in the blood of New Guinea aborigines are of particular interest in that they demonstrate that these natives living in the hills of New Guinea away from industrialization and motorization showed blood lead levels higher in range than urban and rural Californians."

The report did caution against complacency and indicated the situation should continue to be evaluated and this is being done.

In response to the allegations of Professor Clair C. Patterson, a geochemist from California Institute of Technology, relating to the hazards of the continued usage of lead antiknocks, the American Medical Association commented in the February 1966 issue of Archives of Environmental Health as follows:

"The Committee on Occupational Toxicology of the Council on Occupational Health of the American Medical Association has reviewed with interest the article by Clair C. Patterson, PhD, in the September 1965 issue of the Archives. Whereas it feels it has no basis on which to judge Dr. Patterson's ability as a geochemist, it does at the same time feel obligated to point out that some of Dr. Patterson's conclusions in the biological field are open to serious question as to their validity. The Committee feels obliged to point out that as a result of years careful clinical study in workers in the lead industry significant, subtle, and unrecognized or 'unrecognizable' changes are not occurring in the general population as a result of its exposure to environmental lead. In fact, this vast clinical evidence, evaluated by a great number of clinically trained scientists, suggests that the general public is not now, nor in the immediate future, facing a lead hazard."

Further commenting on the Patterson allegation, Professor Thomas J. Haley of the University of California, School of Medicine, Los Angeles, made the following comment, "The supposed chronic lead intoxication from environmental contamination is a myth not a fact." See Reference 4.

Largely as the result of the Patterson allegations, the Public Health Service held a "Symposium on Environmental Lead Contamination" in December of 1965. A successful effort was made to bring together persons representing the widest possible range of informed scientific opinion on the subject of lead. The proceedings are reported in Public Health Service Publication No. 1440, March 1966. The major conclusion reached was that there was need for additional research as a precautionary matter.

The petroleum and lead-producing industries have sponsored a number of reviews of the available information relating to the possible health effects relating to lead antiknocks. These are contained in References 5, 6, 7 and 8.

To summarize our position, we do not believe that there is at present or in the foreseeable future a public health problem related to the use of lead antiknock compounds. Our position has been and remains that there should be firm evidence indicating that such a problem exists before production of lead antiknocks is curtailed.

REFERENCES

1. Committee's Letter of Recommendation, March 30, 1959, from "Public Health Aspects of Increasing Tetraethyl Lead Content in Motor Fuel," a report by Advisory Committee on Tetraethyl Lead to Surgeon General of Public Health Service, U.S. Department of Health, Education, and Welfare.

2. "Survey of Lead in the Atmosphere of Three Urban Communities: A Summary," J. H. Ludwig, D. R. Diggs, H. E. Hesselberg and J. A. Maga. American Industrial Hygiene Association Journal, Vol. 26, May-June 1965.

3. "An International Study of 'Normal' Levels of Lead in Blood and Urine," by Leonard J. Goldwater, MD, and A. Walter Hoover, MD, Arch Environ Health, Vol. 15, July 1967.

4. "Chronic Lead Intoxication from Environmental Contamination: Myth or Fact?", by Thomas J. Haley, PhD, Arch Environ Health, Vol. 12, p. 781, June 1966.

5. "Air Quality Standards for Lead," Air Quality Monograms, Monograph No. 69–11, American Petroleum Institute.

6. "A Review of the Toxicology of Lead," Air Quality Monograms, Monograph No. 69-7, American Petroleum Institute.

7. "Lead in the Environment—A Background Paper," Committee on Public Affairs, American Petroleum Institute.

8. "Facts About Lead and the Atmosphere," Lead Industries Association, Inc.

Mr. ROGERS. Thank you, Mr. Blanchard, for your statement. It is an excellent statement.

Mr. Satterfield?

Mr. SATTERFIELD. I would like to welcome Mr. Blanchard, he is from my city where he was a fellow practitioner of law. I have known him through the years both professionally and personally.

Mr. BLANCHARD. Thank you. I am not sure either of us have improved ourselves by giving up the practice of law.

Mr. SATTERFIELD. I don't think that I can argue with you on that point. Mr. Chairman, I am going to ask just a few questions at this point, because time is running short. I know we may have to go to the Floor so I would like to reserve the right to ask more questions later.

One question occurred to me while listening to your statement and I would like to ask this question: General Motors does not own a substantial interest in Ethyl. If they still did, do you think their attitude toward lead in gas might be different today?

Mr. BLANCHARD. I am not the smartest lawyer in the world, but I am not going to answer that question, Mr. Congressman.

Mr. SATTERFIELD. I think the question may answer itself. If I understood your statement, I think that you said that even if we did what has been suggested, take lead out of gasoline, this is not going to result in the addition of devices on automobiles to reduce pollution emissions in automobile exhausts next year, but that the only change that we can expect in automobiles is, perhaps, a reduction in the compression ratio. Is this correct?

Mr. BLANCHARD. I would like to answer that this way: I think that is correct. If on the other hand, that is incorrect, and there are going to be some new control emission devices put on the car, then for the life of me, I don't see how the Detroit people can say that lead in gasoline is interfering with them because they have made it clear that whatever devices they are going to have on this 1971 car will operate equally as well with leaded or unleaded gasoline.

Mr. SATTERFIELD. I think that you proved that in the automobile which you have outside for us to see. Is it your opinion and the opinion of the people in your company that that automobile and the devices it has on it can be produced today in Detroit?

Mr. BLANCHARD. Let me make this point clear, because I don't want to overstate our case. I don't want to look like we are coming here and saying, "We know more about making engines than the automobile manufacturers do."

We obviously don't. I wang to make clear that as General Motors says, and will say repeatedly, this is a so-called prototype, and this is an experimental car. On the other hand, my point is that this is where all new cars have to start from, is an experimental ptototype. We certainly don't suggest that the approaches that our people have worked out to go on this car are the only answers. Indeed, I pray that Detroit with all the money and talent the have got, should be able to do a whole lot better than we have been able to do.

Therefore, all I am saying is that we have been able to develop what we sincerely believe, these general principles, can be embodied in a simple, feasible approach to building an engine, and we certainly don't want to suggest that we know all of the answers or that they can't do a great deal better than we can.

Mr. SATTERFIELD. Let me ask one other question for the moment. Government witnesses have indicated in their testimony before this committee that they feel it is necessary to establish standards for the composition of fuels and additives in order to make industry do something which apparently it hasn't been doing. I ask Mr. Johnson when he was here, whether he was suggesting that we needed these additional standards to act as a catalyst to make the industry react, and he said, "Yes."

I would like to ask you, considering the amount of money which your corporation obviously has invested in research already, would you be more stimulated by standards of emission at the exhaust which you had to meet, or would you be more stimulated if the Federal Government was to establish standards for the composition of the fuel.

Mr. BLANCHARD. I think about all I can do is repeat what I have already said, and that is that I think the concept that was embodied in the 1967 Act, of controlling what came out of the rear-end of a car is working. I think that with a flat, known target as to what you have to meet, there is simply no doubt in my mind that you can meet them. The only danger we have is as soon as the biting starts to get a little bit tight, 5 years ahead of time, to let people come in and start saying, "Well, we are beginning to run into problems, let us see if we can't take some other approach." I think you set standards, and HEW has done a good job of setting reasonable, far-in-advance standards—not ones set in February for the next August—far enough down the road to allow intelligent planning and bringing to bear on the problem the total resources of the total research effort in this country.

In short, the best example I know of this approach is that they have met all of the standards set to date.

Mr. SATTERFIELD. Isn't it a fact that by setting these emission standards they have really stimulated more research in this area than existed before they were set?

Mr. BLANCHARD. There isn't the slightest doubt about that. It has stimulated a great deal of research.

Mr. SATTERFIELD. Who do you feel that the Government should hold responsible for the emissions of automobile exhausts, and in connection with that, what do you feel the Government ought to do in terms of enforcing the meeting of those emission standards?

Mr. BLANCHARD. I don't see anything wrong with just what you are doing now. If you want to word it, that puts the responsibility on the automobile companies, I suppose that is what it does. But by the same token, they are the ones who make automobiles and they are the ones who have the most of the total complex system within their control and within their power to shift on timing, tuning, compression ratios and anything else they may need to do to meet the standards.

Therefore, I don't look at it that you are overburdening them. I think the approach you have taken is sound. It is just to say that this is what we expect to see come out of a car and we think these are realistic standards. Now let us get on with the show and meet them.

Mr. SATTERFIELD. I notice in your statement you suggested that maybe we ought to require the Secretary of HEW to call meetings of all of the people involved to go over this entire problem. Am I correct in concluding from this that what you are really saying is that if we are going to go to a systems approach and set standards at the exhaust, then perhaps this ought to be a joint venture of all of the people involved, and that the Government should look to all of them to solve the problem in determining and enforcing what might be needed.

Mr. BLANCHARD. Well, I certainly think that if anyone has the idea that you can solve the problem by simply tinkering with one of the features of the system, then before you tinker with one part of the system, composition and additives or a part on behalf of the automobile companies, it is imperative that you get everyone together and find out how this complex inter-related problem goes on down the line. This is one of those things where you can turn one dial over here and it has the exact opposite effect of twisting the dial on the other end of the line the other way.

Therefore, if you are not going to simply say, "Stick to your standards," and you are going to determine that we want to start looking back up into the total system, then to me it is imperative that you get the people together and find out how the problems are inter-related.

Mr. SATTERFIELD. But to meet the performance end of the standards rather than the content?

Mr. BLANCHARD. Yes.

Mr. SATTERFIELD. I would like to reserve the rest of my questions, Mr. Chairman.

Mr. ROGERS. Mr. Carter?

Mr. CARTER. Thank you, Mr. Chairman. I think the witness has done an excellent job. Do you think the automobile industry in asking that lead be removed from gasoline is passing the buck to you, to your company?

Mr. BLANCHARD. No, sir. I think that they are passing it to the petroleum industry. I don't think that they are passing the buck to us. They are passing the buck to them by having to say, and needless to say they know this well, at least one of the companies used to own us, that if you take lead out of gasoline, and it has been known ever since it has been started, then something has to take its place to get the octane up. They try to overcome that by saying that we will have lower octane requirement for some of the cars, but even that requires you to get the total level of octane in the country up, and that means if you take lead out, then the oil industry has got to put in these billions of dollars of refining capability to increase the octane without lead.

So, it isn't a matter of passing it to us. Let me make it clear that I have often said that in the next life I want to be born a customer. We are in the process of living with customers. We don't sell lead to anybody except to customers who want to buy lead. Any time you don't have any octane requirement or they can spend the billions of dollars to get the octane up, you don't need any legislation. They are not going to buy lead. That is why I say they are not passing the buck to us in any sense of the word. We simply are in the business of selling what an oil industry needs to meet given octane requirements.

Mr. CARTER. Of course, one could make an unleaded gasoline. Is it much more expensive?

Mr. BLANCHARD. I would much prefer—not only prefer but I don't think it is appropriate for me to comment on what Amoco does. I have read the statement that their President made before your committee and I must say that I think it is one of the most candid, lucid and frank explanations of what their problem would be if they had to make non-leaded gas country-wide, as distinguished from their present premium on one selected marketing area where they are able to take the goodies out of the pool, their best grade and their best type of fuel, an stick it in one relatively limited tank, and then figure out what to do with the rest of the pool that has been somewhat reduced.

All of this he went into with a degree of candor that I think is very refreshing. I think it is inappropriate for me to attempt to paraphrase what he said in his very carefully worded statement on what he believes the problems are of attempting to do that nationwide.

Mr. CARTER. What effect would it have on your company if we went to unleaded gasoline, if that was required?

Mr. BLANCHARD. It would be a somewhat adverse development, let us say. I don't know why I am being hesitant about it from the standpoint of stockholders, because between the time of Mr. Cole's first speech and today, our stock has dropped 50 percent, from $30 to $15. It seems to me we have gone as far as we can go, there is nowhere left.

The publicity of this type of thing is bad. I don't want to be flip about it Mr. Congressman. I would be less than honest if I said it would not have an adverse effect on us, of course, and I am, needless to say, and I am sure you have to recognize as I am sure you do, that I am interested in the subject from a self-interest standpoint.

At the same time, I don't want you to think I am in a position that I think a great many independent refiners are in—the taking lead out of gasoline is simply going to put them out of business. Ethyl Corporation is in a great many other businesses. We certainly don't admit we are a so-called conglomerate, but we are in fact in aluminum, paper, plastics, and industrial chemicals and so forth, including, I hasten to add, in the State of Maine, with the Oxford Paper Company. I don't want to leave it, in any sense, that we are making some plea that if you do this, it bankrupts Ethyl. I can assure you that is not the case.

Mr. CARTER. It would not bankrupt Ethyl?

Mr. BLANCHARD. No, indeed, but we are talking about a lot of millions of dollars.

Mr. CARTER. I believe you stated that lead constitutes about a third of the substances that come from the exhaust of automobiles, is that true?

Mr. BLANCHARD. Yes, sir.

Mr. CARTER. Are you aware of any casualties which have occurred as a result of these emissions of lead?

Mr. BLANCHARD. I hesitate to make this kind of flat statement, but maybe since you know I am not a doctor, maybe I can state it: It is perfectly clear that there have been many examples down through the years, or some examples, of the case of an employee or a man who is handling tetraethyllead in the plant where it is made, or where he gets down in a tank where it is being confined, and it gets into him directly. We know this is an extremely serious problem and it has been since the 1920's. We, and Du Pont, we think, have worked out the most carefully elaborate system for handling and transporting this extremely toxic material all around the world.

In terms of any lead in the atmosphere, I know of no case of any kind where any casualty has ever been attributed to that cause. I know this is like arguing the same old thing, well, who knows, maybe your father died because he breathed something in the air sooner than he would have died otherwise. But in short, this is an over simplification, and subject to such criticism—we think lead is, in a sense, a lot like gasoline, itself.

We can talk about unleaded gasoline. Unleaded gasoline by itself is extremely toxic and a poison. If you take a glass of gasoline and drink it, it is going to kill you. By the same token, if you breathe enough gasoline fumes, it is going to kill you. Both of those are true of lead in a concentrated form.

Yet, the fact is, we have the fumes of all of the billions of barrels of gasoline that have been put out in our atmosphere and stratosphere for 40 years, and it is perfectly obvious that that type of total emissions of gasoline has not created any health problem. The amount of liquid tetraethyllead that is put in gasoline is less than a teaspoon in each gallon, and therefore, you obviously have the same type of problem. They are both poisons. But what we are talking about is a minute concentration in the world.

Now, like any minute concentration, you can find someone, I am sure, who says that the concentrations in the air of vapors from gasoline may some day swallow us all up and kill us.

Mr. CARTER. You wouldn't say that you have never known of a proven case of lead poisoning?

Mr. BLANCHARD. That is clearly my understanding, but I have to say that in the whole annals of medical history, I am not sure someone can't find one somewhere.

Mr. CARTER. What is really the other objection to the use of lead in gasoline, other than health?

Mr. BLANCHARD. That is the only one we have ever heard basically until this January, when, as I say, the automobile industry took the approach that it would interfere with the effective working of some catalyst that they might be able to develop in the future, and have also said that it interferes with their mechanical recycling devices. Again, we contend that it hasn't interfered with all of the complex mechanical devices that have been on cars for 40 years.

But let me answer it this way. In our opinion what caused the present furor just recently was, aside from this vague accusation that has been made for 40 years, was suddenly that the presence of lead had an effect on air because it in some way might impede the development of sophisticated devices to go on a car.

Mr. CARTER. The car you have out here, I believe you called it an "Ethyl" and not an Edsel?

Mr. BLANCHARD. I wish you had not brought that up. Someone said, "Don't call that an Ethyl. It sounds too much like the Edsel."

Mr. CARTER. What was the cost of building the additional equipment on this car?

Mr. BLANCHARD. I would hate to admit that to you, Congressman—probably $2 million to $3 million. I mean that this is our third or fourth generation and what we have been doing for the past 4 years is constantly putting on devices that meet one set of standards. As soon as we meet that, we keep building and building on to this base of total miscellaneous adjustments in carburetors or devise a new way to distribute the fuel a little better so it burns properly.

The millions of dollars that we spend in our Detroit laboratory on research is not minuscule even by the auto makers standards. By the same token, I know that they, of course, spend more in total research on their prototypes than we are spending on ours.

On the other hand, if you are talking about what the changes that we have made to this car would involve in terms of what it would add to the cost of a production car——

Mr. CARTER. That is it, that is the question?

Mr. BLANCHARD. For obvious reasons, I am extremely reluctant to be specific because I am subject to being called a complete liar by the automotive industry and a man who doesn't make cars and doesn't know what he is talking about. But in general terms, we don't think that anything we have put on our car, in our systems approach to the car, is exotic or any unusual cost.

It involves the same kind of things that each auto manufacturer puts on each year. He has a little different carburetor, a carburetor that has two or three more pieces in it, a different configuration on its exhaust pipe, a little smaller one, or one is insulated and one is not. It is this type of change in a car that we don't feel should add any more to the price of a new model car than any other given little refinement that is made on each model car that Detroit brags about each year. Therefore, we don't think that there is any significant additional cost by taking this route.

I should have bucked this one to Dan Hirschler in the first place and I apologize.

Mr. HIRSCHLER. You have handled it very well on the basis that it is totally integrated in the engine itself and the changes have been primarily different carburetion and differences in the exhaust system.

Certainly they are not greatly out of line with commercial practice, although there probably would be some minor cost.

Mr. CARTER. There would be some additional cost but not too much. It wouldn't be prohibitive?

Mr. HIRSCHLER. No, we look upon this as being a totally practical thing both from the performance point of view and from the cost point of view. When you put it in the context of better emission control systems, certainly everybody realizes that as these things are developed it will cost a little more.

Mr. CARTER. Does it cut down on the emission of lead?

Mr. BLANCHARD. This particular one does not because when this was developed there were no standards for emissions until 1975. This particular car doesn't have a lead trap on it, but, again, Dan can speak to the point of our work on this particuair trap.

Mr. HIRSCHLER. We simply haven't gotten around to putting everything on this one car. We do have other cars that do have these particular trapping devices. I think in Mr. Blanchard's statement he mentioned one that we have worked on that is very simple muffler type of replacement device, of about the same degree of complexity and cost, that we have run road tests on and picked up reductions of about 65 percent in exhausted lead.

We have other systems that you might call the concept type of system that aren't developed to the compact, practical state that this one device I mentioned is which is going up into higher levels of effectiveness in the 70 and 90 percent region.

Mr. CARTER. In the installation of your lead removal device, does it come after the other mechanisms or in front of them?

Mr. HIRSCHLER. That would be another part in the exhaust system that would be downstream from the modifications that we have made in the car.

Mr. CARTER. It would be downstream?

Mr. HIRSCHLER. It would be a more powerful muffler.

Mr. CARTER. That seems to be one of the big objections, the fact that lead is not just a health hazard but that it gums up the other systems and adversely effects the other catalysts.

Mr. BLANCHARD. Could I speak to that?

Your question is an obvious one—why not put the lead trap ahead of the muffler and be done with it. This gets back to the kind of problem that we are fighting. It is that General Motors says that they cannot develop a catalyst with a little lead—they say we don't know of any way to develop a catalyst with any lead and, therefore, if you put your trap up here unless you can get precisely 100 percent or every speck of it out, they say that fouls up a catalyst.

Now, I must say this whole problem is sort of like my problem of trying to shoot ducks. The trouble is that they keep moving, as my boy says, therefore, I can't ever hit them. Because in California on the second day at this recent conference, General Motors came in—and you probaly read all of this in the press—and said after all they had heard the day before, and because of the problems when you don't have lead, they concluded they could live another three or four years with a half a gram of lead in gasoline.

This is the type of problem that I have difficulty reconciling with their contention before that you had to have lead-free gasoline because of these catalysts. So, I can't completely answer your question on this.

Mr. CARTER. They said they could live with a half a gram per gallon?

Mr. BLANCHARD. Yes, and the present general average in the United States is in the neighborhood of 2½ grams per gallon.

Mr. CARTER. Thank you.

Mr. KYROS. If I understand your testimony this morning, it is directed to the changes that are proposed to be made to what used to be Section 210 of the Act, and this is now a new Section 5 of the Act. So, why don't you turn to that for a moment and let us see what the problem is.

I understand Section 210, as presently existing under the Clean Air Act, the Secretary now has certain powers about designating fuel or fuels and asking what the composition is, is that right?

Mr. BLANCHARD. He has that power, although I think it is clear he has testified that for various reasons he has not proceeded under that authority.

Mr. KYROS. With no company has he yet used any of these powers, is that right?

Mr. BLANCHARD. That is my understanding.

Mr. KYROS. Now, under H.R. 15848, the proposed Section 5 would make certain changes to 210, is that right?

Mr. BLANCHARD. Yes.

Mr. KYROS. The first thing it would do, again, it would give the Secretary the power to designate certain fuels or additives. Now, I don't see fuel additives in Section 210.

Mr. BLANCHARD. It is in there.

Mr. KYROS. On which we may get information, is that right? But then under Section (b) of the proposed new section, the Secretary may establish standards respecting the composition of the chemical or physical properties of any of the fuel or fuel additives?

Mr. BLANCHARD. That is correct. That is the new concept that I keep referring to, that instead of looking merely at the exhaust pipe you go back up and get into the complete control of what goes in the fuel. But it says nothing about going back up to get into what goes on in a car.

Mr. KYROS. Under Section (c) of the proposed new Section 5, they have expanded what was in the old Section 210 by giving the Secretary the right to require manufacturers to obtain additional information and he may require submission of scientific data if the information he receives establishes the toxic emissions or emissions of unknown or uncertain toxicity resulting from the fuel or fuel additives.

Mr. BLANCHARD. Yes, with oue more thing, for example, that he also in effect has the right to ban any fuel or fuel additives, the effect of the use of which might affect the performance of any emission control device or system in general use or likely to be in general use.

Now, you start with the assumption that certain people say that some catalyst may be a practical approach in the future, and it is clear that the main catalysts that have been tried have been the so-called noble metal catalysts.

You can make a platinum catalyst if you can find enough wives to throw all of their diamond rings in them in the whole country. You can make a platinum catalyst that is pretty effective, but it it is also ineffective with lead. By the same token, there may be other catalysts that are compatible with lead or not compatible with lead. That is the big search that is going on now.

This Bill says that you can prevent any additive that may interfere with any device that might be put on a car in the future. By definition, that automatically says you can do away with lead without ever looking back to the automobile people and saying, "How much would it cost to put a particulate trap on instead of putting a platinum catalyst on."

Mr. KYROS. Looking at the Bill, to what particular section do you refer?

Mr. BLANCHARD. That is in (c).

Mr. KYROS. In what line in the Bill?

Mr. BLANCHARD. It is two or three lines down, down to line 16 which says, "or fuel additives," and so on. I think it is line 18, "or impair the performance of any emission control device or system which is in general use or likely to be in general use on any motor vehicle."

Mr. KYROS. Are you reading from H.R. 15848?

Mr. BLANCHARD. I am reading from page 6, line 16.

Mr. KYROS. Then you are in Section "(b)" and not "(c)".

Mr. BLANCHARD. I am sorry. I think it is the same thing in "(c)" but let me look at it. It is about line 15 in Section "(c)."

Mr. KYROS. What is the section?

Mr. BLANCHARD. It is Section "(c)", page 7, line 15.

Mr. KYROS. That says for the purpose of establishing standards, the Secretary may require the manufacturer to furnish sufficient information as is reasonable and necessary to get the emissions resulting from the use of fuel or fuel additives or the effect of such use on the performance of any emission control device.

Now, where does it say that he can prohibit the use of such additives?

Mr. BLANCHARD. The same language I was reading you first is in Section (b). It is the identical language on page 6, line 18.

Mr. KYROS. He says that based on that information he can establish standards. That is the language to which you object?

Mr. BLANCHARD. That is the language that I am pointing to at the monent to indicate the far-reaching impact of this on the particular problem that we are talking about now.

I am not confining my objection to those particular words because, again, to restate, we think the system you have presently is correct, which says let him set emission standards from the rear end of the car, as opposed to giving him power to go all of the way up the engine and regulate every phase of compression ratio and everything else including fuel composition. But if you are going to go back up the line and not stick to the tail pipe, we think HEW ought to have the power to require the identical type of information from Detroit and the right to require a device by Detroit or prohibit a device by Detroit, because it is all part of one total system.

Mr. KYROS. So you feel that the Act as it was originally written without these changes is sufficient for him to do the job, is that right?

Mr. BLANCHARD. That is correct, not only sufficient but I think he is doing a grand job under it.

Mr. KYROS. But you say so far yet he has not required any information from the manufacturers.

Mr. BLANCHARD. Of fuel additive manufacturers because he has been able to set his standards without that information. That is what he said.

I don't have any reason to disagree with him, if he doesn't want to know any more than he knows, and he sets the standards which have reduced the pollution this far.

Mr. KYROS. One of the problems would be this: If he studies emissions and sets standards, and then if he works backwards from those standards, wouldn't he have to say, "I find these several ingredients are causing toxicity or problems in certain degrees and, therefore, I want to look to you, A, B, C on these particular items."

I want to get clear in my mind what you think is so harmful in this because I am sure no one wants to harm the industry, and I know you want to make the air just as clean as anybody else.

What is it that is so harmful in the approach that he wants to work toward, isolating the ingredients that go into the additives and being able to talk to the people that are responsible for those additives, whether they are aromatics, or whether oil, or lead, or whatever they are? What is so harmful about it?

Mr. BLANCHARD. Could I answer at the risk of repetition?

To lead into it, we still think the best approach is not to have Government attempting to regulate each of the things that causes the emissions from the rear end but to set standards at the rear end and let industry work it out.

But secondly, coming to your point, if HEW or you conclude that that is not the best approach or that you do need to go upstream and have the right to say, "No, you shouldn't have this many aromatics because they create a problem," you ought to have identical power to get from the automobile manufacturers all the data and knowledge that they have, furnish all of the information they have on devices that will take the aromatics out right now, just to use an example.

I don't know whether this is practicable but you ought to be able to say, "Give us all of the information on what alternatives there are within the engine, because all of this takes place within the engine, so that we can make an intelligent decision as to whether we should limit aromatics or whether we should require you to put an aromatics trap on," to use again what may be a silly example.

Mr. KYROS. Going back to the words of the statute that are before us, becuase that is what we are going to have to deal with, I remember my Harvard law professor, no matter what discussion we used to have, he would say, "Read the bloody statute."

This statute says that the Secretary may require the manufacturer to furnish the information about fuel and fuel additives and also the affect of the use on the performance of any emission control devices under Section (c).

So, I don't quite grasp what you told me. The Secretary under this section would have the power to ask the manufacturer, "Tell us your options and tell us the alternatives you have in regard to the use of fuel or fuel additives to the car as it is, or with emission control devices." Isn't this just what you said?

Mr. BLANCHARD. Except there is no way you can get from an oil company or from me anything except my side of the story, as to whether, let us say, I think I can make a lead trap. There is no way that you can get the other side of it—to get from the automotive manufacturer the information as to whether he has a lead trap right now and how much it costs to put it on. HEW can get from me all of the details about my additive and he can hear what I say Detroit ought to be able to do, but he has no authority to get the other side of the story to find out whether what I am telling him makes any sense, is practical, or otherwise.

Mr. KYROS. That goes to how he treats the information that is provided, but let me point this out to you: I don't know if what you are contesting is with Section (c). I think it is with Section "B" of this new proposed Section 5.

Mr. BLANCHARD. Well, the information requirement is in "(c)."

Mr. KYROS. He can make his own gasoline and he can say this is the gasoline for the United States of America, and that is what you are going to have to use, isn't that true?

Mr. BLANCHARD. Yes.

Mr. KYROS. Isn't that what you are concerned about?

Mr. BLANCHARD. Yes, sir.

Mr. KYROS. And you don't want him to decide finally?

Mr. BLANCHARD. That is correct.

Now, the reason that I talk about (c) is merely that (b) gears into (c). It is exactly correct that (b) is the approach that we think departs so materially from what both you and the Senate did in 1967 in saying specifically, "We are going to regulate the tail end of the car."

Mr. KYROS. Suppose Section 5 was changed to give the Secretary authority to require elimination or limitation of any gasoline ingredients, including aromatics and additives to determine the presence of which quantities are in excess of those prescribed would achieve certain emission standards, he would then not be able to mix the gasoline himself and say, "Here you are going to put items A through C in the gasoline." But he would be able to deal with specific ingredients in relation to standards.

Mr. BLANCHARD. I am sorry, Mr. Congressman, I am not trying to duck your question at all, I am just not sure that I fully understand it.

Mr. KYROS. Let me ask it again, and I will go slowly.

Suppose we change Section 5 so that it would provide that the Secretary had the authority to require elimination or limitation of any gasoline ingredient, if he decided that the presence of such ingredient in excess of prescribed limits would preclude achievement of a fixed emission standard?

Mr. BLANCHARD. Again, at the risk of paraphrasing the statute, I frankly think that is essentially what it says now. And, again, my only point on that is that it only gives him the right to take aromatics out without getting the identical information to decide whether that is the best overall from the standpoint of the American public, the economic route to get to that tail end problem.

Let us assume you can go either way. You can either take this ingredient out and abolish it or you can put one piece of hardware on a car. Let us assume that it costs the American public $6 billion to go one route and $1 billion the other.

Then I certainly think he ought to have the power to look at that. I am bound to say even further when you get down to that type of decision, I frankly think he ought to have the power to come in and make appropriate recommendations to Congress before he makes that type of drastic affect on the economy of America.

That is why I say this Stans Committee is going to bring in that type of data, I hope, and on the basis of——

Mr. KYROS. That is Dr. Tribus' report.

Mr. BLANCHARD That is where you are going to be looking at the economics involved in these approaches and, depending on what he says, I think that you gentlemen will be in a better position to decide whether what I am saying makes any sense or doesn't make any sense.

Mr. KYROS. Let me suggest this to you: You are in a position in your dealings with the Secretary of HEW to make a judgment. The way this Bill is currently set up before us, as proposed, H.R. 15848, this section would permit the Secretary of Health, Education and Welfare to make these determinations, I assume working with the industry. You have already told us this morning under the old Bill, Section 210, he has not yet asked for anything on fuel additives, and he just worked on emission standards?

Mr. BLANCHARD. That is correct.

Mr. KYROS. Now, if you don't take the route of working with the Secretary of Health, Education, and Welfare, kind of a reasonable, rational man, I think——

Mr. BLANCHARD. By all means, he is.

Mr. KYROS (continuing). And you take the route of working with the whole Congress where already bills have been filed to get the lead out—I am not afraid of the Congress and I have the highest respect for all of my colleagues, but we work on an incredibly complicated area where not only the technology but also the ramifications of any decision are of great impact throughout the country—and so that means that every Congressman is doing the best by his own district is going to try to make some kind of a decision.

Do you know how hard that really is? You can see the peril that is involved. We had the same problem when dealing with the tobacco industry, and everybody tries to deal with it honestly, but the views expressed by all kinds of Congressmen are different.

I am worried that, if you feel that you are not going to get the fairest shake from the Secretary of Health, Education, and Welfare, you may well be remitted to individual action by Congress where the rhetoric is swift, calculated and the dangers of lead are expressed across the Nation. What do you think of that?

Mr. BLANCHARD. If I may think one second, I am not the least bit unmindful of the dangers of rhetoric on an emotional subject like lead, but as sincerely as I know how, I would like to say that we are not here just to defend lead.

When we talk about the economic side of this thing, I sincerely believe that the kind of money we are talking about in an approach that is being adopted which involves at least $6 billion. Fortunately or unfortunately you gentlemen are about the only people in the world that even know what $1 billion is.

The rest of us don't even understand terminology of that type. You know, you built the atomic bomb for one third of that amount and that is a lot of dollars.

I agree with you on the horrible complexities of weighing the economic interest of the public, when you involve billions of dollars. I recognize that we have to live with what you gentlemen decide in a horribly complex subject of what my taxes are going to be, but never, no matter how the rhetoric comes out, would I be in favor of giving to any committee in this country the subject of telling me how many dollars I pay on my tax return, even though you may say that is a political issue. I want it that way.

And secondly when we are talking about billions of dollars in these alternatives, it is not just how you do something but the alternate costs of one versus another. We are talking about the kind of billions of dollars that I think you gentlemen ought not let anybody decide money matters of that size because they are experts in the scientific side of it.

Mr. KYROS. Mr. Blanchard, I want you to retain what I just tried to say or suggest to you—assuming really that the decisions upon lead or other additives are going to have to be made by someone because of public awareness, rightly or wrongly, would it not perhaps be better to be in the hands of the Secretary of Health, Education and Welfare and his experts than to try to come back to the Congress which I say, although well equipped as it is, and the Congressmen I have seen here will always try through their district and their view toward this Nation to do the right thing—still I don't think that they are as well equipped as perhaps the Secretary of Health, Education and Welfare. I wanted your judgment on that.

Mr. BLANCHARD. I am not unmindful of what you are saying and I certainly don't want you to think, and I hope I am not conveying any idea, that I am being flip when I say what I am saying.

Secondly, I want to make it clear that in our relationships with

HEW—we have worked on countless research projects with them, in our laboratories, and all sorts of programs—we have had the finest reputation with them, I think.

Therefore, I don't want to leave any impression that I don't think we have gotten a fair shake—we have had a fine working rapport with them. My only point is that if it is concluded that HEW ought to regulate this technical subject, then I think you ought to give them the power to throw the whole subject into the same hopper so that they can make these billion dollar decisions, not looking at just one piece of it, fuel composition, as distinguished from the automobile, but get all of the data and put it all in the pot and make a decision. Don't just look at one piece of it and make a scientific decision.

Mr. KYROS. I have just one more question, Mr. Chairman, and that is we saw an automobile out here a short time ago, I think, of the Ford Motor Company. They had two catalytic devices inserted on it, and we saw the effects.

I was surprised at how clean the air was that came out. That was unleaded gasoline they used that day, but they showed us another engine that they had. They had it mounted on the car which showed the recycling of the exhaust.

So, my question, your car that you have, is that a recycling?

Mr. BLANCHARD. It does have a recycling. Today's technology generally is that the catalyst will be helpful in meeting the hydrocarbon standards. We get below 50 parts per million without any catalyst.

There is much talk about the possibility of a catalyst for nitrogen oxides, but at this stage I think it is fair to say that even Detroit isn't claiming that that is a practical approach.

They have a recycling system and our car has a recycling system which gets the nitrogen oxides down below 300 parts per million which is standard for 1974.

We do have a re-cycle and we think it works fine on leaded gasoline.

Mr. KYROS. We were told at the time that you would have—I think this is correct—we had a 30 percent increase in fuel consumption, however, in using the recycling device on the engine. Is that a factor?

Mr. HESSELBERG. That was December 9, and I believe it was Mr. Misch of Ford who described it and they had a vehicle and also the engine that you are describing. That system involved what is generally called the high temperature reactor and the "fuel penalty" came from the fact that in the high temperature reactor system that Ford and the IIEC, I might add, were exhibiting at that time, involved a rich carburetion, and that is where they got a fuel penalty which they referred to.

In the approach that we have on our car, we do not operate rich. We operate lean, and therefore we do not have the fuel penalty that the Ford-IIEC thermal reactor has. But also in addition to the high temperature thermal reactor, it was equipped with a recycle device, as Mr. Blanchard pointed out, to control oxides of nitrogen.

Mr. HASTINGS. In the interest of time, I will reserve my questions and defer to you.

Mr. ROGERS. In this whole problem of air pollution, I think it has been recognized that we must do something about the emissions from automobiles. It constitutes 60 percent of the problem pretty much, of the air pollution problem of this Nation. What this committee is concerned with is making some progress. We want to be reasonable, but we want progress made.

Now, so far the law as it has been administered has called for emissions standards. Those emissions standards, the burden for meeting those, have gone to automobile manufacturers. Nothing has been done on standards as far as the oil industry is concerned.

Now, it is true that the automobile people now have said this is a partner, and the oil industry must also have some contribution and some responsibility to meet this because the automobiles burn the gasoline.

Now, the automobile companies tell us, "We can fix the devices to meet all of the standards, but we can't do it with leaded gasoline."

Now, should we give the Secretary the authority to come in and set some standards for the oil industry which I understand you would not want? You still want to keep an emission standard, but what device does the Secretary use then to get to the oil industry, to have them help in solving the problem, when the automobile industry says, "Well, the only way we can make our car work and meet your standards is to take the lead out."

Mr. BLANCHARD. May I comment on that at the risk of sounding like repeating something? And I am serious when I say in the next life I want to be born a customer.

In this competitive climate we have, I think that is important, it is perfectly clear from the publicity that has come out in the last few months that if in fact the automobile industry says, and means what they say, "We are going to build a car that requires non-lead gasoline of 90 octane," if you please—the rash of publicity in the last few weeks has made it clear that the oil industry is going to produce whatever it is the customer wants to run the car that Detroit produces.

If, in fact, Detroit builds a car that truly has to have lead-free gas, they are going to get lead-free gas. We are not complaining about that. Obviously, there is no point in that.

Mr. ROGERS. How are we going to bring this about? Is it just left to hope, or should we have some device in the law? This is what I want to know.

Mr. BLANCHARD. They have already said, "We are going to come out with a car in 1970 that needs lead-free gas." We don't understand it, because they also said it works just as well on lead or nonlead, but they said it needs nonleaded gas. The oil industry has said, "We will produce a lead-free gas for those cars."

All I am saying is don't close your options if, in fact, they later say, "Well, we said we wanted a lead-free gas because of this catalyst problem, but we have now discovered a catalyst that works just as well on lead as it does on unleaded gasoline." And let me hasten to add that I am not prepared today to make that flat statement, but I sincerely believe that is a distinct possibility.

Then someone in Detroit would presumably want to say, "Well, if your catalyst works as well on leaded gasoline, then my colleague is wrong when he says that low compression engines have resulted in improved benefits and so on." They would then want to stay at a high compression engine with one hundred octane gas which we all know is efficient, and he would want to get there with lead.

So, in other words, they can call the tune.

May I make one more point on how they call the tune, and I don't mean that in any critical way. Again in his same speech, Mr. Cole made it clear that the only reason that the automobile industry was able to achieve the efficiencies of the 1960's in going to a high compression car was that Detroit said, "We have concluded to go to high pression cars." And immediately the oil industry said, "We will give you the octanes you need to run your high compression car." And they gave him a fuel that would run his high compression car.

Now he says, or rather the automobile industry says, they want a low compression car and they want it with unleaded fuel, and the oil industry has responded, "If you want a low octane fuel, unleaded, it will be available the day you produce the car."

Mr. ROGERS. Then you are telling me that it should be if the automobile industry wants it.

Mr. BLANCHARD. If they have to have it—but in fact it will operate fine on leaded gas—and the public doesn't mind that kind of car, and you can run it on a low octane gas. We aren't here today, though I may be back to you some day when this horrible pollution comes, on that bill to require leaded gasoline——

Mr. ROGERS. Right now, the burden is placed on the automobile industry because we have set it and the devices are set and this is what we have looked at. Now we are looking at what goes in, and because the automobile company has said we need to remove lead. Right now even if they wanted to go up to high octane, it can be run on non-leaded gas.

Mr. BLANCHARD. That is right.

Mr. ROGERS. And regular can be non-leaded.

Mr. BLANCHARD. That is correct.

Mr. ROGERS. So the technology is here.

Mr. BLANCHARD. That is correct.

Mr. ROGERS. And I understand your position, being the Ethyl Corporation, which you should defend.

Mr. BLANCHARD. That is right.

Mr. ROGERS. And it is helpful in our deliberations.

Mr. BLANCHARD. We are not defending any requirement of anything. If Detroit is able to build a 70-octane car, a little mini-car that doesn't need any octane, and you can fuel it with kerosene, we are going to be very sorry it doesn't need tetraethyl gasoline. We used to sell a lot to the aviation industry. When all of the airplane engines switched to jets, you didn't need to regulate anything. The oil companies said thank you very much, we don't need anymore leaded gasoline because they all run on jet fuel and we said, "We are sorry; we will see you around."

Mr. ROGERS. What you are telling me is that we don't need any legislation; when the automobile companies convert, this will happen.

Mr. BLANCHARD. That is correct, and it will automatically happen and it is happening right now.

Mr. ROGERS. Then why are you arguing for lead and no regulations at all if this is going to be inevitable?

Mr. BLANCHARD. Only because of this present furor that says, "Legislate some way to take the lead out of gasoline."

What we are trying to get over is that the presence of lead in and of itself does not increase emissions, and indeed we think taking it out, if you go to the same octane, will cause considerable more pollution.

But we are not making that argument if, in fact, it comes on down and they only need a 90 octane. Then we don't understand what is the purpose of coming in now and having a bill in this present posture to say, "let us get the lead out."

Mr. ROGERS. It is already an accomplished fact?

Mr. BLANCHARD. If that is the kind of car that the future will hold, yes.

Mr. ROGERS. But here is what you are saying to us, you are saying, yes, the company is going to say this, but you really don't need lead out, so don't legislate to accomplish that end.

Mr. BLANCHARD. That is correct. All we want to be sure is that somebody isn't considering legislating to that end because that closes your options.

Let us assume, for example, that in fact you and I are not satisfied with the particular car that runs on 90 octane gas. I will take them at their word that the car is going to be just fine, but if in the future because of various power attachments people say, "I would like a better car for all of these interstate highways we have now. The lower compression engine was fine in 1950's, but I can't get out in traffic any more," so the public says, "We want a better car, we want a higher compression engine."

At that stage we want the oil companies to have the flexibility as to how you do get back up to that octane without putting out increased aromatics. They can do that if you just leave it alone, and they will be able to do it.

Mr. ROGERS. We have nonleaded gasoline now, that runs on high octane gasoline.

Mr. BLANCHARD. That is correct.

Mr. ROGERS. It is already produced. And so, if they want to go back up to whatever octane they want, as you know, they only produce 16 to 20 percent of their cars that require high octane gas.

Mr. BLANCHARD. High octane, but not regular 94 to 96 octane.

Mr. ROGERS. The regular gasoline is about 91 or 92, isn't it?

Mr. BLANCHARD. It is 94 to 95. The premium is 98 to 100.

Mr. ROGERS. These companies yesterday said they are refining gasoline up to 96.

Mr. BLANCHARD. They are producing with lead up to 96.

Mr. ROGERS. I beg your pardon; it was without lead.

Mr. BLANCHARD. Mr. Congressman——

Mr. ROGERS. We can have the transcript for you. These were the independents yesterday.

Mr. BLANCHARD. Their figure is 86 octane.

Mr. ROGERS. Their pool gasoline is 86, but one company said 25 percent of their production they get 96 percent.

Mr. BLANCHARD. But that is "why" the pool, which is nothing but a composite of it all put together—if you get an average you are going to have some at 80 and some 100.

Mr. ROGERS. But the technology to produce 96 octane is with us, and right now they are doing it, this is not something in the future. So we have to do something about air pollution.

Mr. SATTERFIELD. Will the gentleman yield at that point?

Maybe the answer to this question will help clear this up: Can you produce nonleaded gasoline at 96 octane from 100 percent of your pool? To raise the octane to 96 don't you reduce the octane of the rest? Don't you waste a lot to achieve this?

Mr. BLANCHARD. You clearly would waste, and you use considerable more of the crude oil—in the neighborhood of 8 percent more crude oil—to get to this level. But, in theory, you can still use 8 percent more crude to get to a given level.

Now, the point that I am not still sure I am able to get people to realize is that that is why we keep emphasizing this Bureau of Mines report. If you get up to any level above whatever you assume the pool is, 88 or 90, if you try to get above 90 without lead, the way you have to do it is increasing the aeromatics.

If you increase the aeromatics so that you have the same fuel, whatever you consider the pool after you had put lead in, you increase the smog 25 percent, because aeromatics are more reactive.

Mr. SATTERFIELD. Except for the catalyst which they say they can put on the car to take out the pollution from aeromatics, but they say they can't do it if there is lead in the gas.

Mr. BLANCHARD. My point is, when and if they have got a catalyst, then say, "We have a catalyst and we want nonleaded gas," and the oil companies will say, "You have it."

Mr. SATTERFIELD. They tell me it is going to take a little time to convert so as to provide nonleaded gasoline.

Mr. BLANCHARD. At 90, all I can do is take the oil companies at their word, that they can produce 90 octane this fall.

Mr. SATTERFIELD. This isn't the high octane, though.

Mr. BLANCHARD. No, that is correct.

Mr. ROGERS. Everybody is producing that.

Mr. HESSELBERG. On this availability and requirement for the fuel, what Detroit is saying they need for their 1971 model cars which will come out this fall, they are talking about wanting or producing to operate on a 90 or 91 fuel of that level. They are—I think Mr. Blanchard indicated they have said that we desire something in the neighborhood of half a gram, which is currently being supplied.

However, I think one of the points we are speaking to is that when the cars start coming on the road this fall, they will need only the low octane fuel, but you still have 90 percent plus vehicles that are designed to operate on the fuels that are currently available. These fuels are the 100 octane premium fuels, and the 94 to 95 octane regular fuels. They do contain lead.

Mr. ROGERS. Amoco doesn't.

Mr. HESSELBERG. It amounts to less than 2 percent of the total fuel in the United States, the non-leaded Amoco, and it is limited to the East Coast and the Southwest.

The question as far as industry is concerned is that they must still make available the fuels to operate all of the cars that are on the road today. These cars have a finite life. I think the conclusion is about 90 percent of the cars on the road will be up to 12 years old. For vehicles on the road currently, industry is producing a little bit over 40 percent of the fuel as a premium grade, about 100 octane fuel.

These cars are going to be on the road for an extended period of time.

The small refineries, in particular, do not, and they have so testified, have the capability of producing the high octane fuels without the availability of lead. Any restriction on the availability of lead to produce fuels of current type are going to put a lot of the small independents out.

Mr. ROGERS. The small ones may produce the regular and the large companies produce your high octane, I think that is quite feasible.

Mr. HESSELBERG. I think they are even in the position in the case of some of them, and they so testified yesterday in Sacramento, Calif., on this lead hearing out there—that if lead restrictions were enacted as have been proposed—this is not a legal proposal, it is just a discussion by the California Air Resources Board, the representatives, presidents and executives of these California independents testified that this would bankrupt them.

They are not in a position, they said, where they can supply at the proposed California restrictions on lead, a 90 octane with no lead and even make what is currently a regular at 94 or 95 octane number. They have no chance of getting to the 100 octane without investments and equipment that are beyond their capability to raise.

Mr. BLANCHARD. One thing I want to make clear—I never appeared before the Congress—that we are attempting to be argumentative.

Mr. ROGERS. No. This is what we need, an exchange of ideas.

Mr. HESSELBERG. The problem is both the existing cars on the road, and if they can come out with their 1975 models, which in their estimation now might have a catalyst, and I say might.

Mr. ROGERS. This committee is very interested in that, and I think that is a very good point that we intend to take up with the automobile companies. I think this is a vital point, as to the time element when this should be done.

I do think the Secretary has to have some authority to move in this field against air pollution. I think the oil industry shares a burden with the automobile companies in trying to reach a solution. Right now they say that these automobiles that have come out, they are testing them, and up to 80 percent on the road are not meeting the standards. This means that something is not working and they need to do more. Now, whether it is just the devices or whether it is gasoline presently being used with the inefficiency of the devices, this is what needs to be looked into.

Mr. BLANCHARD. You are testing a few prototypes, and when they put them in production they are not that good. What you ought to be testing is the ones that are on the road.

Mr. ROGERS. Of course, and when they have done that——

Mr. BLANCHARD. And I am bound to say I resent any accusations by them that when these cars, as soon as they put them on the road, don't meet those emission standards, that it is due to lead. Whatever you say about lead, it doesn't cause those cars not to meet those standards. They had to be tested on the prototype on leaded gasoline.

Mr. ROGERS. I presume it was, and I don't know that, but I would think so.

Mr. HESSELBERG. The present requirements are that the testing be done on leaded fuels.

Mr. ROGERS. I think there is great concern about the amount of lead in the air, and the amount contributed by the auto industry and the oil industry. It is quite significant. I know you have seen those figures, and I have them here.

We also have testimony that is going to be presented, I understand, tomorrow about the device, but it is a nonleaded device. We invited Du Pont to come in and tell us about this device that works on leaded gasoline; they claim. But they don't want to come in, and I can't understand why Du Pont is hesitant to come in and have an exchange of viewpoints and questions on a device that they have put out a publicity release on.

Yet, when we invite them, they said, "We can't come on that early."

We have been going on a week, and we had the last year, and I am at a loss to explain Du Pont's reluctance to testify on the record in public about a device they claim.

Maybe you could have some influence with them to get them to come and tell us tomorrow about this.

Mr. BLANCHARD. You understand we are violent competitors in most areas.

Mr. ROGERS. This would be a good place to combine, I would think.

Mr. BLANCHARD. Let me make it clear, as DuPont said one time, that some DuPont married "Ethyl somebody" back in 1870, and this is the first time since then that they have gotten in bed with ethyl. Let me make it clear that there is no divergence of views between us and DuPont. I just don't happen to know about their particular schedule, and therefore I have no reason to think that they are not willing to testify. I know nothing about their scheduling.

Mr. ROGERS. This is my reaction, when we have invited them to testify and they say, "We can't quite work it out."

Mr. BLANCHARD. I know of no reason why they will not be happy to testify here.

Mr. ROGERS. Now, suppose this commerce group comes out and says lead is to be put out of gasoline. Would you abide by that?

Mr. BLANCHARD. That is sort of like asking have you stopped beating your wife." I would rather not be committed because I want to hear what their basis are.

Obviously, let me make it perfectly clear, what you and I know, everyone knows, that if we ever had the slightest doubt in our minds that there was a health hazard, we are going to cut it out. You can be rest assured of that.

Mr. ROGERS. Have you seen the study on lead published in the British magazine, a late study?

Mr. BLANCHARD. Mr. Chairman, I have seen so many things in the last month, that I am not certain on that.

Mr. ROGERS. It talks about lead accumulating and being absorbed in the human organism by respiratory and digestive routes, and the distribution of it to the organs. Of course everyone knows lead is a poison.

Now, the extent of it being in the air and being consumed——

Mr. BLANCHARD. That was discussed and raised in the 1920's when tetraethyl lead was first introduced. At one stage it was illegal to sell "goofy" gas in New York because someone raised this.

Mr. ROGERS. What have you spent in the last 5 years in research on this air pollution problem?

Do you have any idea?

Mr. BLANCHARD. As the financial vice president, I certainly ought to know.

Mr. ROGERS. I wondered in round terms.

Mr. BLANCHARD. The only reason I am hesitating—I don't mind giving you this figure—you get into some nebulous regions as to which part is which, but I would say generally we have had a budget in the range of certainly $4 to $5 million a year. It has been somewhere in this order of magnitude and has been going on for years and years. This is strictly our research and development. It is not our medical research. We have a large new laboratory in New Orleans in connection with Tulane University.

Mr. ROGERS. What findings have you made?

Mr. BLANCHARD. We have run, and all of it is published in these medical symposiums that go on all of the time, countless studies on rats, mice, and the whole gamut of the types of careful research that has to be done under joint programs with the Government and on our own.

I start out by saying I am not even a technical expert on automobiles, but I am certainly not a doctor. We have attached to this, and we have given to the members of the committee, a short rundown simply because we did not assume that this whole subject—of the medical aspects, which gets into the type of thing that you need 25 doctors to give papers and have symposiums—lends itself to this type of presentation. But we did present as a supplement a summary of the findings for the last twenty years with references which have been given to the staff. (See "Public Health Effects of Lead Antiknock Compounds," p. 561, this hearing.)

Mr. ROGERS. That will be helpful.

Now, did not the Secretary of HEW request some time ago Ethyl to give information on health hazards involved in the lead additive? Do you recall that?

Mr. BLANCHARD. I know of nothing specific in that regard. We from time to time talk to him about all sorts of things and make them available to him. I know of no specific request that has been honored or refused.

Mr. HESSELBERG. Our representative is on an advisory committee with HEW, and we serve on that committee and regularly report to the Secretary through his appropriate staff people on all areas pertaining to that subject.

Mr. BLANCHARD. Not only report, but let me make it clear we don't simply report to HEW in that sense. We think that we have an extremely good day-to-day rapport with them on the total aspects of the problem.

Mr. ROGERS. Let me ask you this: You indicated that your device or system would not be very costly. What would it run, what range would it be? Would it be $30 to $50, or $100 to $150.

Mr. HIRSCHLER. For the same reason Mr. Blanchard mentioned, we are reluctant to give a close estimate, but something in the order of

$100 or $150 would probably be our best guess on this sort of thing. But it is not a device to put on a car, it is an integrated system.

Mr. BLANCHARD. That doesn't necessarily include what it replaces. For example, that may be our carburetor versus their carburetor, this type of thing.

Mr. HESSELBERG. Let me put it in perspective. You have seen the catalytic approach demonstrated that some people are looking at. I would say that there is no question about the fact that the systems approach which we are following, and which we will demonstrate, is certainly more compatible pricewise, and in our estimate it will be less costly, than the complicated catalytic approach

Mr. ROGERS. Let me ask you this: How long have you had this system?

Mr. HIRSCHLER. We have been in the development of this thing for many years and we have built many cars, each a little bit better than the other one. So the whole general concept is something that we have been working on for a number of years.

Mr. ROGERS. What do you do? Do you advise automobile companies of this, or——

Mr. HIRSCHLER. We have had informal contact with them and formal contacts where we have given technical papers.

Mr. ROGERS. What has been their reaction, if you have this system that will handle the problem now, why haven't they adopted it, would you say?

Mr. HIRSCHLER. I think that they have been interested in it. I think they are interested in all approaches, including the one that we are working with.

Mr. ROGERS. Is there an antitrust problem or something?

Mr. BLANCHARD. There is no antitrust problem.

Mr. ROGERS. You can have discussions, I understand.

Mr. HIRSCHLER. For a number of years, the type of thing we were working on was really in advance of the regulations. You could say there wasn't a need existing yet, but now as the regulations tighten up, it becomes a different matter. Certainly it becomes more pertinent to the current problems.

Mr. ROGERS. You feel there is a proper exchange of information, then?

Mr. BLANCHARD. I would like to answer that, because Mr. Hirschler lives in Detroit. I am not satisfied there is a proper exchange. I don't say this only about Detroit, I say it about any business, I am sure it is true in our business, as well as anybody's. Sometimes we feel that our devices have stamped on them what is called "NIH" in Detroit, which stands for "not invented here."

I think this is a very natural reaction of anyone to feel that you don't understand all of the problems, and there are a whole lot of other problems. As a result, I must confess that we have become a little discouraged. We are very proud of the automotive engineering knowhow we have embodied in these million of dollars we have put in these cars to show that emission standards can be met. We are not claiming that we are as smart as the automobile companies in any way, shape, or form, but we do think that some of our concepts lend themselves to greater attention than have been given them in lieu of saying that there are other approaches that could accomplish the same thing.

We have in the past had a flat company policy that everything we do has been announced to the automobile companies. Everything we do is public information and available, license and royalty free, and use any of it you please, because we are attempting to contribute to the solution of entire problem.

I have to confess to you, however, that we have within the last few weeks written them and said, "We are rescinding that policy and are going to take it up on a case by case basis from here on and decide whether, if you are interested in our approach, we will talk to you. We are not going to say that every single thing we do for all of these millions belongs to you, and you can reject it, as we think has been done in this recent publicity."

Mr. ROGERS. Let me ask you this: What reduction is brought about by your system in the emissions?

Mr. HIRSCHLER. About the hydrocarbons?

Mr. BLANCHARD. The current car we have out in front has a level of about 40 parts per million, which corresponds to .55 grams per mile.

Mr. ROGERS. Before the emission standards were put on, what reduction would that amount to?

Mr. HIRSCHLER. I am sorry, I think in terms of parts per million rather than the newer grams per mile terminology, but the standard cars before emission controls became needed were said to run somewhere 900 to 1,000 parts per million, and this car is down to 40, which represents a substantial reduction. On carbon monoxide the emissions are .4 percent, which is 10.4 grams per mile, which would correspond pre-emission values of the order of 3 percent. In terms of nitrogen oxides, it is at 300 parts per million, which is 1.3 grams per mile, which would relate to uncontrolled cars, cover quite a broad range, maybe from 1,000 to 2,000.

Mr. ROGERS. When did you make this system available to the automobile companies?

Mr. HIRSCHLER. It has been really continuously over many years, pretty much on an informal basis, largly by just talking to their engineers talking to us. As we would make new developments, we would let them know about them.

Mr. BLANCHARD. And primarily report them in the SAE papers, the Society of Automotive Engineers, and we make available our car, or any part of it, and go around and demonstrate it at any meeting that we have anybody to look at it.

Mr. ROGERS. Did you have a device to trap the lead particles?

Mr. HIRSCHLER. We have on other cars, not on this car. We have a sort of cutaway version here of the type of thing that we are talking about. We have a version that will show you the general design of it.

Mr. ROGERS. What reduction in emissions are there?

Mr. HIRSCHLER. In terms of exhausted lead for a simple type device, about 65 per cent. And by simple I mean something that looks the same size, shape, and general cost level of the muffler. In terms of a more exotic type that would be a little bigger and a little more complicated, we are getting reductions up to the neighborhood of 90 per cent.

Mr. BLANCHARD. Let me hasten to add that that is not where we expect to be by 1975. We have a fairly massive program that goes on constantly with new ideas, sticking in one little more piece of thing and running that for thousands of miles. This is a constantly improving process. With this decade now being only two months old and certainly by the years that they are talking about meeting standards, we have confidence in the ingenuity of the people working on this type of problem that this is not in any way an insuperable problem of any kind.

You have to keep using your brains and keep using ingenuity to work with little devices, new configurations of the air flow and this sort of thing. But it is the type of thing that goes on in American industry, every phase of it and not just automobiles.

Mr. SATTERFIELD. I have one more question.

I want to go back to something that Mr. Kyros was talking about, and I am sorry he has been momentarily called out of the room. If I understand what you said, it is that you would prefer that there be emission standards and we leave it up to industry to resolve how they are to meet those emission standards.

This seems to me to get to the question of how we work out an effective enforcement system which will guarantee adherence to those emission standards. I take it you don't have any basic objection to that.

Mr. BLANCHARD. No, we do not.

Mr. SATTERFIELD. In answer to Mr. Kyros, it seemed to me, if I understand correctly—when you were talking about establishing standards for the content of fuels, you were addressing yourself to the fact that when we talk about emissions we are talking about the interaction between fuel, its evaporation in the automobile, combustion in the engine, carburetion and what else happens in the exhaust system of an automobile, and that we can't differentiate between these points one from another. We are talking about an entire system.

As I understand it, you were raising the question that if we are going to give HEW the right to regulate one part of the system we ought not to give it that right, to deal with one specific part of this system, without giving it the right to deal equally with all parts of the system.

Is that basically what you were suggesting?

Mr. BLANCHARD. That not only is basically what I was contending, but you obviously have put it in words much better than I could.

Mr. SATTERFIELD. The next question that follows is this: If this be true, and if we should decide that this step should be taken, then we ought to empower whoever sets these standards with the right to tell the automobile industry what devices they shall put on their automobiles and how they shall design and construct their engines, to the same degree they can tell the fuel industry what it can put in its fuels.

Mr. BLANCHARD. I think that is exactly right. I recognize, however, that that is a very ambitious and complicated undertaking. Therefore, I still say the most practical way is not to get into that, but to regulate what comes out of the tail pipe.

Mr. SATTERFIELD. I have great reservations whether Congress should ever get into the position that we turn over to appointed officials the power to tell people in industry how they must manufacture their product. This certainly is something that we are going to have to consider. But it would seem to me that this kind of power should be something that we would do only as a last resort. I would hope that we can effect suitable legislation which would provide for proper enforcement so that industry itself can work out these problems.

Mr. ROGERS. Thank you very much. We appreciate this testimony, and it will be helpful to the committee. We would like to see the car, but we want to try to take two other witnesses before we see it, if that is not inconvenient.

Mr. BLANCHARD. That is fine.

All we can do is leave two experts here, and finally, if I am permitted, I cannot thank you enough for, most sincerely, for the amount of time you have granted us, and we are most appreciative.

Mr. ROGERS. The committee will stand in recess while Mr. Kyros and Mr. Satterfield look at the car.

(A brief recess was taken.)

Mr. ROGERS. Our next witness will be Dr. John S. Chapman.

STATEMENT OF DR. JOHN S. CHAPMAN, CHAIRMAN, COUNCIL ON ENVIRONMENTAL AND PUBLIC HEALTH, AMERICAN MEDICAL ASSOCIATION; ACCOMPANIED BY FRANK W. BARTON, DIRECTOR, DEPARTMENT OF ENVIRONMENTAL HEALTH; AND HARRY N. PETERSON, ATTORNEY, DEPARTMENT OF LEGISLATION

Dr. CHAPMAN. Mr. Chairman and members of the subcommittee I am Dr. John S. Chapman, assistant dean for postgraduate education, Southwestern Medical School of the University of Texas at Dallas, and chairman of the American Medical Association's Council on Environmental and Public Health. I am pleased to be here today to present the association's views on the legislation before you concerning control of air pollution. With me is Mr. Frank W. Barton, director of the AMA Department of Environmental Health, and Mr. Harry N. Peterson, an attorney in the Department of Legislation. Mr. Chairman, air pollution is increasingly becoming one of our most serious environmental health problems. For too long we have taken for granted the atmosphere, one of our natural resources; it is time now to look upon this resource as one on which the survival of man depends.

In recent years, the country has awakened to the need to control air pollution. Yet, more and more, our air becomes polluted and hazards to health increase. We must take stronger action to reverse this direction—stronger action than we have taken in the past.

The legislation before you, in extending the Clean Air Act, provides for intensified efforts in research, setting stricter emission standards and broadening their application, as well as strengthening enforcement procedures. We support these objectives.

Since 1955, the American Medical Association has supported Federal research and development programs in which State and local governments could assume the basic responsibility for preventing and controlling air pollution. The Association has continually stressed the need for maximum feasible reduction of all forms of air pollution, including particulates, gases, toxicants, irritants, smog formers, and other biologically and chemically active pollutants.

In view of the expanded seriousness of the problem of automotive emissions, the AMA has favored national standards for their control which were adopted and made into law in 1965. This policy has been followed in recognition of the fact that automobiles are designed, manufactured, and distributed on a national basis, and move continually across State lines. Requirements which might vary among the States and jurisdictions would only add to the cost and confusion of control procedures.

In 1967, the association gave its support to the Air Quality Act of 1967, which substantially expanded and strengthened the Nation's program against air pollution. That act authorized the Department of Health, Education, and Welfare to conduct research and other programs toward the development of improved low-cost techniques for the control of combustion by-products of fuels and for the removal of potential pollutants from fuels, and contained other provisions which would assure the adequacy of systems or devices in motor vehicles for the control of emissions. The Association also supported the provisions creating regional air quality commissions in those instances where air pollution would endanger the public health and where existing control mechanisms were shown to be inadequate. We stated that the designation of regions, as provided in the act, should bring about more effective measures for controlling pollution, especially since HEW would establish criteria for ambient air quality and would recommend control techniques.

Last December, the AMA House of Delegates directed the Association to intensify its efforts in promoting environmental health. Medical societies were requested to assist and advise private and governmental agencies; to encourage physicians to serve on appropriate advisory and policy boards; and in concert with others, to develop adequate criteria for the solution and prevention of environmental problems.

Mr. Chairman, it is imperative that all elements of our society join to overcome the increasing pollution of our atmosphere. Measures which a few years ago were deemed adequate to meet the needs simply have not achieved the desired goals. New steps must be taken if we are to make any substantial headway in alleviating the problem. Accordingly, we believe that it is now necessary to provide for additional pollution controls and to make the essential financial commitment. We are aware that the public similarly recognizes the seriousness of the problem and expects remedial action.

As we have indicated, we support the provisions of the bills before you extending the Clean Air Act and continuing the various research programs. In addition, we also believe that the provisions of H.R. 15848, authorizing the Secretary to set standards, both as to ambient air quality and as to emissions from stationary sources, should be supported. The authorization to the Secretary to set air quality standards for the Nation would simplify the current standard-setting procedures, expedite the development and implementation of standards and provide uniformity. By this impetus, states could move rapidly in their plans for implementation and enforcement. Since the cooperation of industry and the public is essential to any effective program, we suggest that the standard-setting procedures include opportunity for the participation by these groups in their development.

H.R. 15848 also provides that the Secretary would, by regulation, giving appropriate consideration to technical feasibility, establish standards with respect to emissions from classes or types of stationary sources which (1) contribute substantially to endangerment of the public health or welfare and (2) can be prevented or substantially reduced. These standards would be established only after reasonable notice and opportunity for interested parties to present their views at a public hearing. Authorizing the Secretary to set emission standards for stationary sources, under these requirements, appears warranted and has our support.

Mr. Chairman, before closing, I would assure this committee and the Congress of our wholehearted support for such action which would reduce, or even hopefully eliminate, the problem of air pollution. In our own organization, the mission of the AMA Council on Environmental and Public Health is to identify, develop, and promote medicine's role in environmental and public health affairs. Attention is focused on human health hazards and the medical implications resulting from environmental pollution. Preventive and corrective measures are stressed. In a variety of ways, continuing programs are conducted to educate and motivate physicians, to support medical societies in their efforts, and to inform the public.

The American Medical Association has sponsored annual AMA Congresses which call together all persons in the Nation who work or have a special interest in environmental health. At the first Congress, attention was focused on air and water pollution, pesticides and radiological health. The 1969 AMA Congress featured a subject gaining new recognition as a health hazard—noise pollution—with discussions centering on the impact of noise on emotional and physical health. The forthcoming 1970 Congress on May 4–5 in Washington, D.C., will feature the population growth problem and its relationship to health. Many informed sources, incidentally, believe that the expanding population is at the center of our pollution problems.

The American Medical Association also sponsors biennial Air Pollution Medical Research Conferences—this year's is scheduled for October in New Orleans. The purpose of these Conferences is (a) to encourage scientific investigation of the effects of air pollution on health; (b) to critically examine the present status, needs and goals in air pollution measurements to achieve better correlation of physical, chemical, and biomedical data; and (c) to present original research findings and to explore application of these findings to medical care and control efforts.

Mr. Chairman, let me again express our pleasure for the opportunity of presenting the American Medical Association's views on this important legislative issue. We will now be pleased to attempt to answer any questions the committee may have.

Mr. ROGERS. Mr. Satterfield.

Mr. SATTERFIELD. Your present position seems to be basically against emission standards.

Is that your position?

Dr. CHAPMAN. We are against everything that pollutes the air.

Mr. SATTERFIELD. You don't take a specific position with respect to the possibility of the Secretary of HEW having the right to control the contents of fuels which may be burned in automobiles or in stationary furnaces?

Dr. CHAPMAN. Not in a specific sense. It seems reasonable to me to think that if he has knowledge of what is going into fuels, he will be in a far better position to determine whether or not they are safe for use or not safe for use.

Mr. SATTERFIELD. Don't you think he should have equal knowledge about the effect of these things which the fuel is going into, on the other hand, at the same time?

Dr. CHAPMAN. Certainly.

Mr. SATTERFIELD. This bill doesn't provide that.

Dr. CHAPMAN. As has been pointed out on a number of occasions, all things that are done or not done have certain costs and certain benefits, so that the Secretary, obviously, is going to have to weigh, in our judgment, potential ill effects against potential good effects.

We are concerned, however, primarily, with ill effects, because we are concerned with people. We are not concerned with carburetors, nor fuels, nor exhaust pipes.

Mr. SATTERFIELD. But you are concerned with what goes into the air?

Dr. CHAPMAN. We are concerned with what goes into the air.

Mr. SATTERFIELD. Do you feel that the Secretary of HEW, then, should have maximum information and control of all of the devices, including the content of fuel, that would affect what goes into the air?

Dr. CHAPMAN. To any extent that it is dangerous or potentially dangerous to human life.

Mr. SATTERFIELD. Or to meet the standards he sets.

Dr. CHAPMAN. Or to meet the standards.

Mr. SATTERFIELD. I have no other questions.

Mr. ROGERS. I have just one question.

Mr. PETERSON. If I may interrupt for a moment, the two elements that Mr. Satterfield referred to are the major changes as we see them in the bill, so we have directed our comments to those.

I wanted to mention that the statement does have our recommendations for a continuation of the Clean Air Act in its various aspects of research and so forth.

I want to mention that the association has supported in the past the provision for the registration of the fuels.

Mr. ROGERS. Thank you.

I see here you also say that by regualtion to establish standards with respect to emission from classes or types of stationary sources, you would give this authority to the Secretary.

Dr. CHAPMAN. Yes, along with all moving things. Obviously, depending on the types of fuels used in furnaces, in apartment houses, and the types of incinerators, and in all such things as these the Secretary must have a control.

Otherwise, the pollution that we are tying to get rid of simply continues.

Mr. ROGERS. I wonder if you have any authoritative sources on the effect of lead on health.

If so, would you provide them for the record.

Dr. CHAPMAN. I haven't them with me. I will be glad to send them along.

Mr. ROGERS. That would be fine, if you could supply them for the record.

Dr. CHAPMAN. Sure.

(The information requested was not available to the committee at the time of printing.)

Mr. ROGERS. Thank you very much. I commend the AMA for its very strong stand in this position.

Our next witness will be Mr. Peter N. Gammelgard, senior vice president of the American Petroleum Institute.

Mr. Gammelgard, we appreciate your being with us and your willingness to shift around so many times for us.

You have been most helpful and we are grateful to you.

STATEMENT OF PETER N. GAMMELGARD, SENIOR VICE PRESIDENT FOR PUBLIC AND ENVIRONMENTAL AFFAIRS, AMERICAN PETROLEUM INSTITUTE

Mr. GAMMELGARD. Thank you. Before addressing myself to the provisions of the legislation, I would like to take a few moments to review, with the assistance of some charts, some of the progress that has been made in reducing automotive emissions.

I will offer smaller copies of these charts for the record if you wish.

This first chart (fig. 1) shows the upward trend in octane numbers from around 91 in 1950 to 100 currently for premium, and for regular from about 84 up to 94. The compression ratios have, of course, also increased to a present weighted average on new cars of about 9.5 to 1. Some cars at 8¾ to 1 compression ratio would get by on regular and some around 10 to 1 would need the 100 octane premium grade gasoline.

AVERAGE RESEARCH OCTANE NUMBER TRENDS AND COMPRESSION RATIO TREND

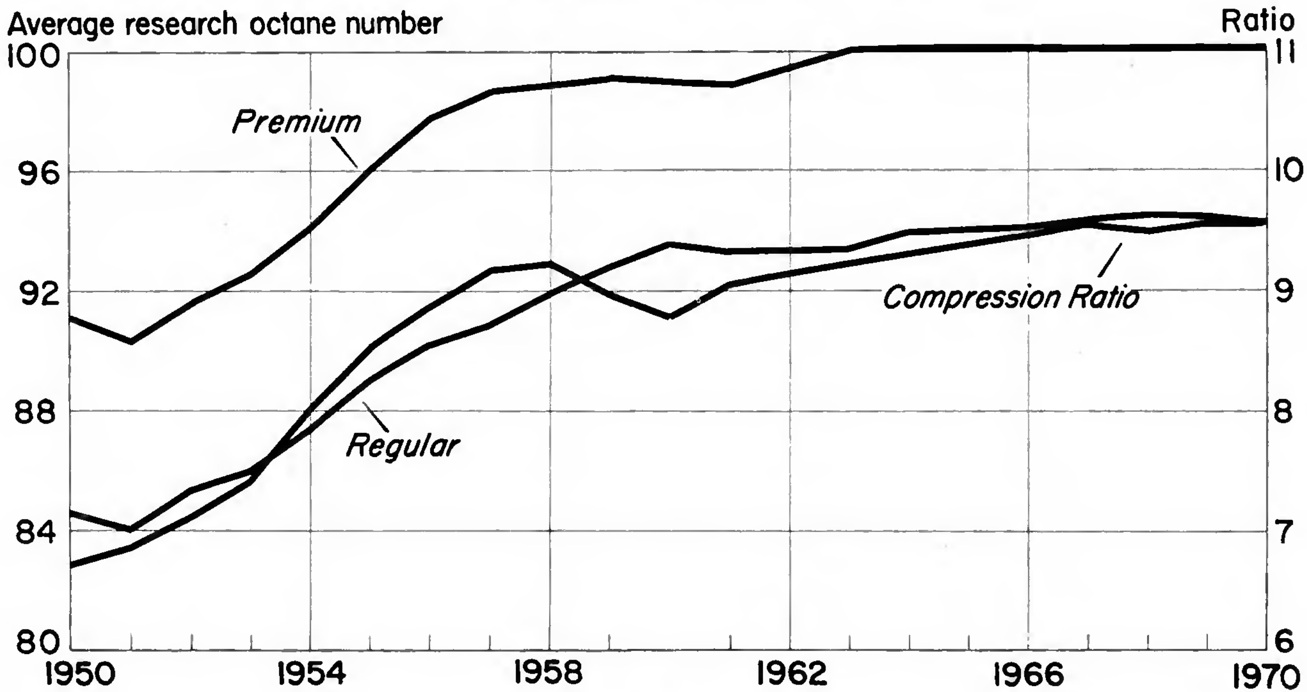


FIGURE 1.

Mr. GAMMELGARD. This next chart (fig. 2) shows exhaust emission standards in California for carbon monoxide. The dotted line is prior to any controls in which case the typical emission was about 80 grams of carbon monoxide per vehicle-mile traveled.

In 1966—these are the model years on the bottom—California came in with a requirement that dropped it from this high level down to approximately 33 or 34 grams per mile.

Starting with the 1968 model year, this little black triangle shows where the Federal nationwide requirements came in, copying, one might say, the California rule.

Starting with the 1970 model year, it dropped down as shown.

On the far right-hand side I have shown the 1975 proposed California and proposed Federal standards. They are so close together they are practically identical.

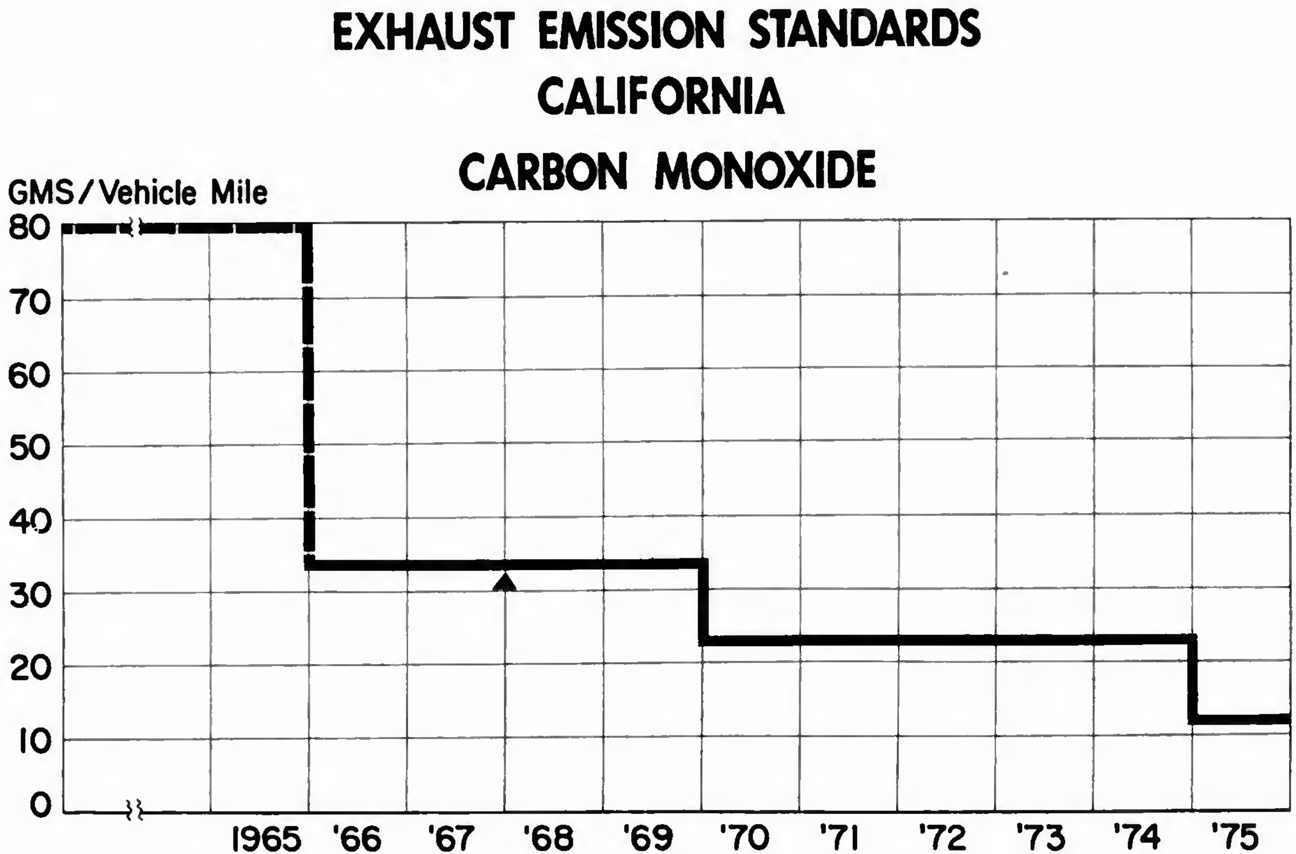

EXHAUST EMISSION STANDARDS
CALIFORNIA
CARBON MONOXIDE
GMS/Vehicle Mile
80
70
60
50
40
30
20
10
0
1965
'66
'67
'68
'69
'70
'71
'72
'73
'74
'75

FIGURE 2.

Mr. GAMMELGARD. The third chart (fig. 3) will be on the other two major pollutants which are hydrocarbons and nitrogen oxides. The blue line being hydrocarbons. which, prior to control, ran about 11 grams per vehicle-mile, dropping substantially with the 1966 model year in Califronia to their standard. In 1968, Federal standards became nationwide. In 1970, the standards were tightened to the levels shown. Also shown are the 1975 proposed standards.

When you look at the uncontrolled emission levels and then look at the 1975 levels, it is apparent that substantial reductions have been made. I don't have the 1980 levels which have been proposed but not not yet published in the Federal Register, but are being considered by the Environmental Quality Council, and are approximately half of the 1975 levels. It is evident that they would result in an essentially pollutant-free car.

Oxides of nitrogen (NO_x) have been reduced from about six grams per mile down to four in 1970, and then down to one gram per mile in 1975.

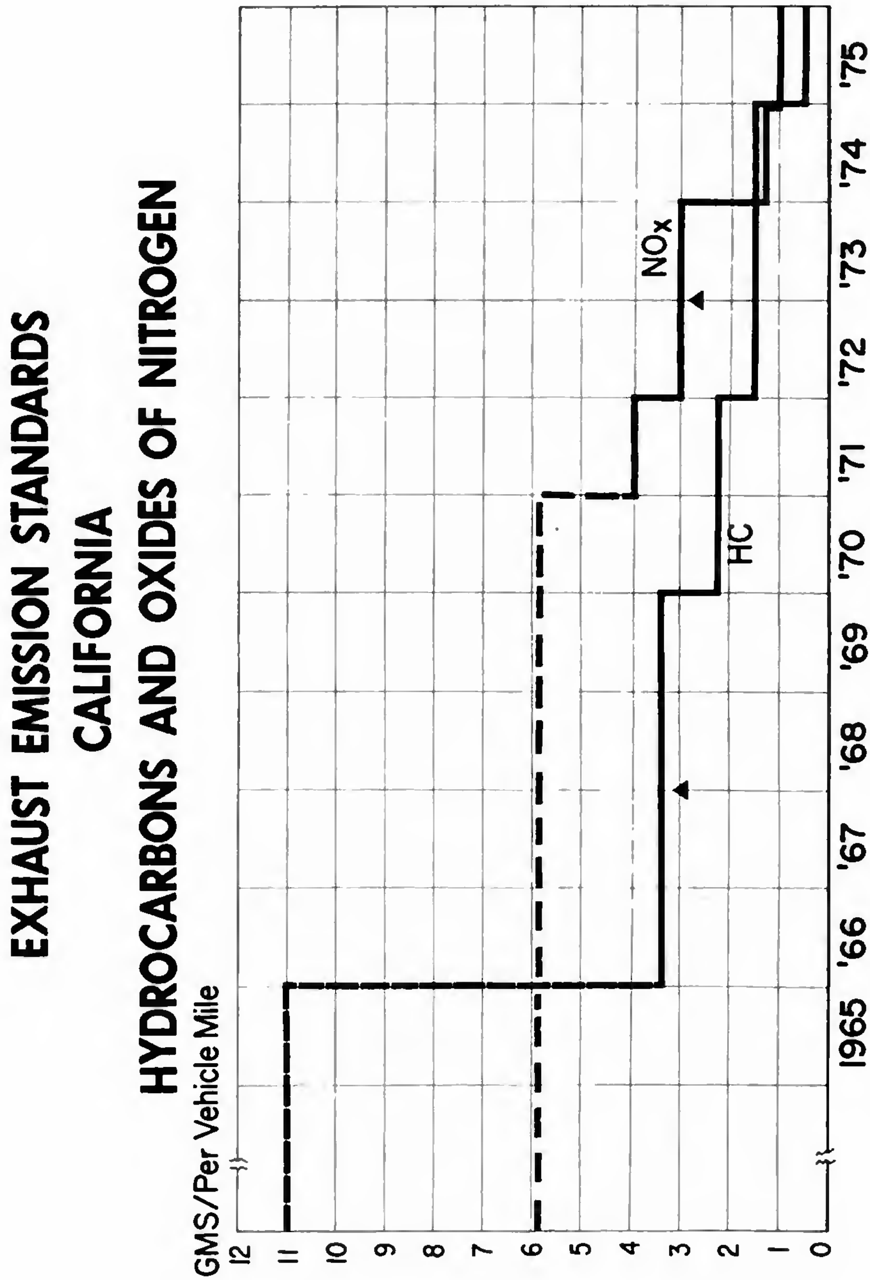

EXHAUST EMISSION STANDARDS
CALIFORNIA
HYDROCARBONS AND OXIDES OF NITROGEN
GMS/Per Vehicle Mile
12
11
10
9
8
7
6
5
4
3
2
1
0
1965
'66
'67
'68
'69
'70
'71
'72
'73
'74
'75
NOx
HC

FIGURE [illegible]

Mr. GAMMELGARD. These are tremendous reductions. I think that is pretty obvious from the graph. I think real progress has been made.

I sometimes think if other industries are making the same progress as is being made here, the pollution problem of the Nation would be well on its way to solution.

Now I would like to turn to the sections of H.R. 15848 that are of principal concern to the petroleum industry, sections 5 through 8.

Section 5 would authorize direct Federal regulation of fuel composition and additive use.

The effect of gasoline composition on air pollution cannot be discussed apart from the system in which the fuel is burned. The complex interrelationships among variables in vehicle design and gasoline composition must be viewed as a total system.

That has been adequately dealt with here, I think, this morning.

Over the past several years, API has actively cooperated with the Department of Health, Education, and Welfare, the U.S. Bureau of Mines, and the Automobile Manufacturers Association in extensive studies of how gasoline composition affects automotive emissions.

At the Bureau of Mines laboratories in Bartlesville, Okla., tests have been performed on a variety of specially formulated prototype fuels, both with and without lead additives. One finding that has emerged from this work is that gasoline composition has no significant effect on total hydrocarbon emissions.

All gasolines consist of relatively heterogeneous mixtures of hydrocarbons. When burned completely, hydrocarbons produce just two byproducts, water vapor and carbon dioxide—neither of which has any significance from an air quality standpoint.

Of course, combustion is not perfect in a gasoline engine. This is what gives us our problem. But the proportions of various unburned hydrocarbons in automotive exhaust are not the same as those found in the fuel. The composition of automobile exhaust is dependent on a number of engine operating variables and bears little relationship to gasoline composition.

Fuel composition has very little effect on carbon monoxide or nitrogen oxide emission. Carbon monoxide is a result of incomplete oxidation of carbon. Nitrogen oxides are a result of high combustion temperatures, which cause atmospheric nitrogen and oxygen to combine, chemically.

Federal standards for 1971 motor vehicles limit emissions of hydrocarbons to less than 15 percent of what they were in the early 1960's. And further reductions are being scheduled in 1973 and 1975. Thus, it would appear that hydrocarbon emissions are being adequately regulated without direct regulation of fuel composition.

I would now like to turn to the question of fuel additives—which do have some effect on emissions. The Secretary of Health, Education, and Welfare has had the authority, since 1967, to require manufacturers of fuel additives and fuel blenders to provide information on the nature, purpose in use, and extent of use of all additives in any fuel before that fuel or additive can be sold in interstate commerce. I refer specifically to gasoline. The purpose of this program, which has not been implemented to date, was to give HEW the information it needs to determine the possible air pollution significance of additive use.

I would certainly agree with the preceding witness, Dr. Chapman, that we need to know what comes out the tailpipe after these additives have been combusted.

Congress, in 1967, denied HEW the blanket authority to certify either fuels or additives, because the need for such authority had not been established. We see no reason why such authority should be be granted at this time.

At the time the fuel additive registration program was first proposed, I testified before committees of both Houses, including the full House Committee on Interstate and Foreign Commerce, to the effect that HEW should be given access to the information it needs to evaluate the possible air pollution significance of additives. That is still the industry's position.

To assist the National Air Pollution Control Administration in determining the scope and extent of additive use, API surveyed the industry in 1969 and provided gross figures on total additive use, types of additives, and their basic chemical components.

We provided that data in quite a lengthy report to NAPCA.

We stand ready to cooperate fully in the implementation of the registration program authorized by Congress in the 1967 amendments to the Clean Air Act. But we do not believe there is any justification for an extension of HEW authority to include approval of fuels or fuel additives or establishment of specifications for them.

The problem of matching fuel composition to the needs of motor vehicles should continue to be a matter of free, innovative competition and could be handled through such voluntary organizations as the American Society for Testing and Materials, which for years has helped to bridge the gap between producers, consumers, and general interests by broadly defining grades of gasoline and desirable seasonal and geographic variations in volatility.

In general, we believe that direct government regulation of gasoline quality is not in the public interest, because it tends to stifle competition. Government should limit its role to setting performance standards for motor vehicle emissions deemed necessary for protection of public health and welfare.

I would like to stress the words "deemed necessary." So many times we find that some proposed standards are looked at just as proposals initially. Then after they have been out for a couple of months, they suddenly become cast in concrete, as it were, and they become "this is it" without too much thought as to how much thought was behind the initial setting of these levels.

I might just point to that as a possibility in the 1975 goals, that there should be some good substantiation for them.

I think the fact that they have now been put in the Federal Register as goals for 1975 is a good example of giving adequate lead time for the affected industries to take suitable measures to be certain that they can meet them, and not, as some people seem today to be looking at them, as, "Well, they are 1975—why can't we achieve them in 1973?"

I think the reason they were set for 1975 is that knowing Detroit's problem in designing engines and our problem in making fuels, and possible processing changes, we need that type of lead time in this instance to meet those very, very tight, restrictive goals.

Methods of meeting those standards should be left to the ingenuity of industry. This will tend to encourage innovation and minimize costs.

I should now like to turn to Sections 6 and 7 of the bill, which permit the Secretary of HEW to set minimum national standards for ambient air quality. This would authorize a major change in the traditional Federal-State relationship in air pollution control.

It is impossible to take issue with the doctrine that our air must be made safe to breathe everywhere. Under the 1967 amendments to the Clean Air Act, the Federal Government already does, in effect, have the power to establish "minimum national standards," since all State standards must be consistent with Federal criteria and must meet with Federal approval.

I don't think the Federal Government would approve any locally set standards under the present Act that did not measure up to what the Federal Government thought was sort of a minimum national standard for that particular pollutant for which the standard was being set.

I think really, in effect, we have a minimum national air quality now, admittedly only for a few of the pollutants, but currently there are about five more criteria documents in the immediate offing which will trigger five more sets of standards to cover those pollutants. There will be more next year.

We fail to see what real purpose would be served by a change in this procedure at this time. Indeed, it might well lead to further delays in implementation of the basic Act, and States would still be permitted to set stricter standards than those promulgated by HEW.

Section 8 of H.R. 15848 would provide for direct Federal establishment of minimum national emission standards for stationary sources. This would be completely contrary to the theory of air quality management on which the Air Quality Act of 1967 was partially based. That theory, simply stated, is that control of pollution at its source should be based on what is needed, in a particular locality, to achieve legally established ambient air quality standards. In other words, the greater the volume of emissions in a given area, the stricter emission standards must be.

Direct Federal establishment of emission standards is contrary to the declaration of policy of the Clean Air Act—that "control of air pollution at its source is the primary responsibility of States and local governments."

We believe the Congress acted wisely in not authorizing the establishment of nationwide emission standards when it was last proposed.

I again refer to stationary sources.

Instead, in the 1967 amendments to the Clean Air Act, Congress called for a study of the feasibility and desirability of such standards and instructed the Secretary of HEW to report back within two years.

We assume that such a report will be forthcoming in the relatively near future, and we would suggest that action on this matter be postponed until the report is received and studied.

There appears to be some suggestion in Section 8 that Federal emission standards would be issued only in the case of emissions that substantially endanger public health or welfare. However, the Federal Government already has the power, under the present language of the

Clean Air Act, to secure an injunction against installations that pose an imminent and substantial threat to the health or welfare of persons. Thus, it does not appear to us that any additional authority is needed.

In closing, I would like to make one general comment on this bill. Taken as a whole, this measure does not appear to be an improvement over the present law, which adequately implemented and enforced, can and will get the job done.

We strongly urge that the Air Quality Act of 1967 be given a chance to prove its effectiveness before any action is taken on the sweeping changes contained in this bill.

Thank you for your attention.

Mr. ROGERS. Thank you, and we appreciate the very fine statement.

Mr. Satterfield.

Mr. SATTERFIELD. I have only one question.

Is there any question in your mind that by setting emission standards which everyone has to meet by a certain time and by incorporating some kind of enforcement procedure to guarantee that they will be met, we will be providing the greatest incentive to private industry to solve the problem?

Mr. GAMMELGARD. I think that is correct. There is no question in my mind that that prodedure will work.

Mr. SATTERFIELD. Do you feel, based on the experience that you have had in this area in the past, that they will be able to do this?

Mr. GAMMELGARD. Yes, sir. Take the sulfur dioxide problem in New York City and up and down the east coast. That is a good example.

We asked for leadtime to desulfurize the residual fuels. It took about 2 years to construct these facilities in the refineries.

Given that leadtime, they are now getting that type of fuel, low sulfur fuel.

Mr. SATTERFIELD. Thank you very much.

Mr. ROGERS. Dr. Carter.

Mr. CARTER. I have one question and then I will reserve the balance of my time.

I noticed on page 3 you state that gasoline has no effect on total hydrocarbon emissions, the composition of gasoline has no effect on total hydrocarbon emissions.

It does, however, have an effect on lead emissions, does it not?

Mr. GAMMELGARD. The effect on lead emissions?

Mr. CARTER. Yes, sir.

Mr. GAMMELGARD. How do you mean?

Mr. CARTER. Well, gasoline composition would have a significant effect on lead emissions if it had tetraethyl-lead.

Mr. GAMMELGARD. I am sorry. I didn't make this clear. What I am talking about here are the four classes of constituents of gasoline, parafins, olefins, napthenes, and aromatics.

I wasn't thinking of the additives. Certainly, that does have an effect.

Mr. CARTER. Thank you.

Mr. ROGERS. As I understand it, then, the position of the Petroleum Association is basically that the present law is sufficient to handle the problem?

Mr. GAMMELGARD. We believe so.

Mr. ROGERS. You don't see any need for amendment to the law?

Mr. GAMMELGARD. No. And further, I think to the extent that the law is considered workable, to change it after just a few years confuses the situation for people who are subject to control by the law.

They just get going and understand one set of rules, with standards based on various criteria documents—but then to come around and change the ballgame rules, I think would have a delaying tendency, really, on achieving cleaner air.

Mr. ROGERS. Is there any basis at all, do you feel, for the Secretary to issue national emission standards for movable pollutants?

Mr. GAMMELGARD. Yes. It may seem inconsistent, when we say yes, we are for national emission standards for mobile sources of pollutants but not for them on stationary sources.

Over 50 percent of the miles driven by cars are driven in urban areas, and we certainly have a great number of urban areas.

To say that different cities could have different standards of emissions for the cars would create a pretty chaotic situation for Detroit.

It would also create, I think, a pretty bad marketing situation if a car sold in the city cost $200 more than a car with emission controls sold in the country. People, I think, would find a way to buy their cars in the country, that is, the city people would. The administration problems would be chaotic.

Then if you drive from one area to another, if you drive to California and they say at the State line, "You have to meet California standards or you don't come in," I think this would be an unviable situation.

However, if a farmer buys a car in central Nebraska, he is paying more for the emission controls than is needed for that particular area.

But for the total society and the good of the entire Nation, with more than 50 percent of all mileage being driven in urban areas, I think uniform standards for vehicles are a must.

Mr. ROGERS. Do you feel there is any movement of the pollutants in the air across States or across regions?

Mr. GAMMELGARD. Yes, there is. There is, of course, a disappearance of them, too.

We don't, fortunately, build up or accumulate all the pollutants that go in the atmosphere from the year 1. If we did, we wouldn't be here today.

Mr. ROGERS. The rain and snow help to clear it.

Mr. GAMMELGARD. Yes, along with changes in chemical form oxidation, and the oceans act as sinks, and so forth.

Yes, there is an interstate problem. But I think the air quality control regions cross State lines and deal with a region having a common air pollution problem.

Mr. ROGERS. This is one of the questions we have to decide, of course, and whether to set standards for stationary or not, whether that would be warranted.

Your testimony has been most helpful. We also appreciate your cooperation with the committee on the time element.

Mr. GAMMELGARD. Thank you, Mr. Chairman.

Mr. ROGERS. Are there any other questions?

If not, thank you so much.

The committee will stand adjourned until 10 o'clock tomorrow morning.

(Whereupon, at 1:50 p.m. the subcommittee adjourned, to recon vene at 10 a.m., Friday, March 20, 1970.)

AIR POLLUTION CONTROL AND SOLID WASTES RECYCLING

FRIDAY, MARCH 20, 1970

House of Representatives,
Subcommittee on Public Health and Welfare,
Committee on Interstate and Foreign Commerce,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2322, Rayburn House Office Building, Hon. Paul G. Rogers presiding (Hon. John Jarman, chairman).

Mr. Rogers. The subcommittee will come to order, please.

We are continuing hearings on air pollution and solid waste disposal.

We have one of our colleagues here who would like to make a statement. So, we will ask Mr. Mayne to take the witness stand. We welcome you to the committee and are delighted to have your testimony.

STATEMENT OF HON. WILEY MAYNE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA

Mr. Mayne. Thank you.

Mr. Chairman and distinguished members of the subcommittee, I am pleased to testify in support of the bills under consideration this morning and take pride in being a cosponsor of the seven bills which constitute the President's environmental program. Realizing that the hearing today will be limited to discussion of just two of the seven proposals, I shall confine my brief remarks to the clean air and waste reclamation bills.

The President's determination to guarantee every American the right to breathe clean air and reside in unpolluted surroundings was clearly stated in his State of the Union address. On that occasion he first presented his environmental program to the American people. It is now up to the members of Congress to carry on the campaign to clean up the environment.

The legislation before you has the advantage of using both the "carrot and the stick" approach. A combination of penalties, standards and incentives are offered to persuade violators to adopt more socially acceptable practices.

For example, the automobile industry would be given a "reasonable length of time" and research incentives to provide a car that doesn't trail noxious fumes. At the same time, the bill provides for fines up to $10,000 per day in certain cases, which is certainly the "stick."

The President has also emphasized a relatively new technique known as recycling. The problem stated simply is one of finding economically efficient ways to convert the billions of tons of trash which litter the American land scape into reuseable products.

I have before me a letter from Mr. Edward P. Cliff, Chief of the Forest Service of the U.S. Department of Agriculture, which I will, with the permission of the Chairman, make a part of my testimony.

(The document referred to follows:)

U.S. DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, D.C., March 9, 1970.

Hon. WILEY MAYNE,
House of Representatives,
Washington, D.C.

DEAR MR. MAYNE: This sheet of paper is a matter of particular pride to me and to the research staff of the Forest Service. Thirty percent of the fiber in this sheet came from the city dump in Madison, Wisconsin. We have reclaimed refuse that is an eyesore and pollution problem in most American communities.

The red-dyed wood fibers that give this sheet its pink color came from that dump; the remaining 70 percent from a kraft pulp commonly used in papermaking. The transformation from rubbish to paper was made at our Forest Products Laboratory in Madison. This seeming alchemy is part of our research on reclamation and recycling of urban solid wastes.

The supply of fiber in rubbish is enormous. About half of the rubbish collected by cities is wood fiber, none of which is being reclaimed. Successful recycling of the wood fibers in waste could mean more paper like this, as well as newsprint, building materials, coarser papers, and even new products. It would also mean reduced pulpwood demand, more raw material for industry, less air pollution from burning rubbish, and less cost for waste disposal.

To get the knowledge we need to utilize fiber in solid wastes, we are cooperating with others. The City of Madison, Bureau of Mines, and Bureau of Solid Wastes Management are all concerned and participating in the exploratory research.

President Nixon in his message on the environment ordered "greater emphasis on techniques for recycling materials." We proudly present this sheet of paper as an example of what the Forest Service is doing. The President's budget of 1971 provides for an acceleration of this effort. We believe this is a significant step in learning to reuse resources and to enhance the quality of the Nation's environment.

Sincerely,

EDWARD P. CLIFF, *Chief.*

Mr. MAYNE. Thirty percent of the fiber in this sheet came from the city dump of Madison, Wis. The pink color of the paper is from red-dyed fibers from the same dump. Mr. Cliff states in this letter—

> About half of the rubbish collected by cities is wood fiber, none of which is being reclaimed. Successful recycling of the wood fibers of waste could mean more paper like this, as well as newsprint, building materials, coarser papers and even new products.
>
> It would also mean reduced pulpwood demand, more raw material for industry, less air pollution from burning rubbish and less cost for waste disposal.

Another area which merits consideration but has not been fully explored is the whole field of "biodegradables." These materials will decompose naturally when exposed to the environment and could replace such indestructables as aluminum beer cans and plastic packaging materials.

Antipollution efforts to date have been spotty and confused. President Nixon has sounded his administration's battle cry against pollution by placing the issue on a "now or never" basis.

Above all, a direction and a national purpose are desperately needed to support President Nixon's pledge to make the 1970's "the years when America pays its debt to the past by reclaiming the purity of its air, its waters and our living environment."

Man has proven from the dawn of civilization that he can conquer nature; the time has come to learn if he can live with it in harmony.

I respectfully urge the committee to give prompt and favorable consideration to H.R. 16032, 16033 and the other bills which embody the administration's environmental program.

Thank you, Mr. Chairman.

Mr. ROGERS. Thank you very much.

Do you feel that the funding that is recommended is sufficient for the program?

Mr. MAYNE. I believe for the beginning of the program, it is. It seems to me that we should see how effectively it operates, what we receive back in terms of cost and also what the public acceptance is before going on with more ambitious funding.

Mr. ROGERS. Actually, of course, this is somewhat of an ongoing program, as you know. We already have these programs. This is somewhat of an expansion on present law. Are there any questions, Mr. Preyer?

Mr. PREYER. I have just one question, Mr. Mayne. Thank you for your interesting statement.

Your demonstration was a dramatic one of recycling. Did Mr. Cliff indicate that that was an economically feasible and viable operation at the present time or was that a one-shot demonstration carried out at prohibitively high cost?

Mr. MAYNE. This sheet of pink paper on which Mr. Cliff's letter is written was made at the Forest Products Laboratory of the Forest Service, that is the U.S. Department of Agriculture Forest Service in Madison. It is a continuing research project which he recommends as justifying further exploratory research and a significant forward step in reusing these resources. I believe it is a fair interpretation of his letter which I will, with the Chairman's permission, place in the record, that he recommends this as an economically feasible way of implementing this effort.

Mr. PREYER. Thank you, Mr. Mayne.

Mr. ROGERS. I think it is very fine that you have brought to the committee's attention this Madison, Wisconsin, pilot operation. I hope that the paper industry would support another pilot operation to achieve recycling of one of the most important waste products, paper. I think this is a good example of it.

We appreciate your bringing it to the attention of the committee.

Mr. MAYNE. Thank you, Mr. Chairman.

Mr. ROGERS. Our next witness is the Honorable Hollis M. Dole, Assistant Secretary for Mineral Resources, Department of the Interior. He will be accompanied, I understand, by Mr. Carl Rampacek, Acting Assistant Director for Mineral Research, Bureau of Mines.

Mr. Secretary, we are delighted to have you with us this morning and Mr. Rampacek. We will be pleased to receive your testimony.

STATEMENT OF HON. HOLLIS M. DOLE, ASSISTANT SECRETARY, DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY CARL RAMPACEK, ACTING ASSISTANT DIRECTOR FOR MINERALS RESEARCH, BUREAU OF MINES

Mr. DOLE. Mr. Chairman and members of the committee, my statement today will summarize some of the research that the Department of the Interior, in the mineral resources area, has been doing for many years on the particular matters covered by the bills before you.

I have also passed out to you a booklet that describes what the Bureau of Mines has been doing in solid watse. Also I have provided you with a press release on a very interesting experiment that we carried out on converting refuse and garbage to a useable petroleum product.

This work is in a very formative stage but it has excited the imagination of researchers world-wide. I am not passing this out to be incorporated in the record, but merely to show to the committee that we have been active in this field.

Mr. Chairman and members of the committee, I am pleased to be here today to present this statement concerning H.R. 15847, the proposed "Waste Reclamation and Recycling Act of 1970," H.R. 15848, the proposed "Clean Air Act Amendments of 1970," and the other identical bills which have been introduced. We strongly support the provisions of these bills, which were proposed by the Administration to carry out recommendations contained in the President's message on the environment, February 10, 1970.

First, I should like to describe for you briefly the ongoing research programs within the Department of the Interior that are related to the disposal of solid wastes and the abatement of air pollution caused by emissions from vehicles and stationary power plants. Then, I shall present our views and recommendations concerning these bills.

The Bureau of Mines research program on solid waste disposal comprises the extraction of mineral and energy values from urban refuse, the recovery of minerals and metals from industrial wastes, and the disposal of and recovery of metals from automotive scrap. The budget for fiscal year 1970 is $430,000, plus $600,000 carried over from 1969, already obligated but not expended. I should point out this fund is only for urban refuse research. In addition, research related to other solid waste problems total 3.8 million dollars.

The research on methods for recovering metal and mineral values from municipal incinerator residues and raw refuse includes: Producing a clean, high-grade ferrous scrap from massive iron pieces and tin cans; devising techniques for separating the conglomeration of nonferrous metals contained in refuse and incinerator residues; and reclaiming glass fractions.

A continuous processing plant with a capacity of 1,000 pounds per hour was completed and placed in operation during fiscal year 1970 for separating the major metal and mineral values contained in incinerator residues.

Under a grant program, research is being initiated in fiscal year 1970 at a number of universities on the following urban refuse studies:

Utilizing waste glass; utilizing ash; evaluating present municipal incinerators and associated equipment such as air pollution and control apparatus; utilizing ferrous materials; extracting mineral and metal values; and producing synthetic gas by subsurface disposal of urban refuse.

A novel process for converting the combustible material contained in urban refuse, including garbage and cellulose, into crude petroleum is also being investigated. This, sir, is the press release that we have brought before you. The Bureau's program on the recovery of minerals and metals from industrial wastes includes: Stabilizing waste tailing piles that have no mineral or utilization value; determining the causes of spontaneous combustion in coal refuse banks; identifying the nature, magnitude, and significance of flue dusts from steel furnaces; determining the feasibility of utilizing abandoned surface-mined areas as municipal land fills; reclaiming high-value metals such as cobalt, nickel, and chromium from high-temperature or superalloy scrap; developing rapid and simple methods of identifying scrap metals not otherwise included in the automotive scrap program; recovering chromium, copper, nickel, zinc, and cadmium metals from waste electroplating solutions; recovering and recycling precious metals now lost in electronic equipment from commercial and defense applications; reclaiming and reusing various types of aluminum scrap; and developing new uses for mineral wastes generated in the mining and metallurgical industries.

Current research efforts on disposal of automotive scrap include studies of methods of producing clean ferrous scrap from junk cars by removing nonferrous components; upgrading nonmetallic and nonferrous rejects from junk car shredding operations; improving the recovery of copper by chemical means from electrical components of junked automobiles; oxidizing ferrous scrap at high temperatures to produce iron oxide and clean scrap products; producing clean cast iron from scrap automobile engines; producing secondary pig iron from mixed off-grade ferrous scrap, including junk cars; dismantling scrap cars; recovering values from discarded automobile tires by treating them in a heated reactor; and utilizing automobile scrap as a reductant for nonmagnetic taconite ore.

Because of recognized expertise in fuels combustion as related to the abatement of air pollution, the Bureau of Mines is engaged in a comprehensive research program on vehicular air pollution at its Bartlesville Petroleum Research Center and sulfur oxides pollution at its Pittsburgh Coal Research Center and Morgantown Coal Research Center. In addition, the Bureau of Mines is conducting in-house research and the Office of Coal Research is sponsoring industrial research on the conversion of coal to liquid and gaseous fuels, which is related to the abatement of air pollution by providing fuels that will produce lower contents of sulfur oxides when burned.

The Bureau of Mines research program on vehicular pollution is funded in fiscal year 1970 at a total of $824,000. This research is part of a united industry-Government effort and is partly supported by the National Air Pollution Control Administration of the Department of Health, Education, and Welfare and industry groups such as the American Petroleum Institute and the Coordinating Research Council.

The types and amounts of pollutants that escape from the automobile are controlled by the interaction between the fuel, engine, and exhaust. This total system is being studied using current production vehicles. Previous work had demonstrated that technology already exists for control of exhaust pollutants, but sufficient lead time is necessary to engineer and install these systems. More rapid progress for smog-affected areas may be possible by altering the properties of marketed gasoline. Bureau research recently demonstrated that the air-pollution potential from automobiles can be significantly reduced by suitable changes in gasoline composition.

Fundamental studies of the extremely complex smog-formation process are being made toward understanding this phenomenon. This work is of long-range significance and will provide a base upon which to develop future emission standards.

A limited solution to vehicular-caused air pollution may be to replace current engines with engines that operate on other fuels. The Bureau recently has initiated research on the nature of emissions, effect on engine performance and required maintenance, and economics of vehicles fueled with compressed natural gas and liquefied petroleum gases. This research later will be extended to engines fueled with liquefied natural gas and high Btu synthetic gases made from coal.

The Bureau's research program on sulfur oxides pollution is funded for fiscal year 1970 at $1,600,000 by Bureau of Mines appropriated funds and funds from the National Air Pollution Control Administration.

Air pollution research investigations are attacking the problem from two directions. In the case of coal, we are investigating removal of pyrite (iron sulfide) from coal prior to combustion and removal of the oxides of sulfur (SO_2 and SO_3) from the stack gases.

An effective reduction in the sulfur content by mechanical cleaning will require fine crushing and our current research is heavily oriented toward treatment of fine coal particles. We are developing optimum conditions of operation for the conventional coal washing table, and studies are being made of the Humphrey spiral and other coal cleaning units using centrifugation.

Operation of a froth flotation unit has been computerized to study the interrelationship of operation variables. The use of a column that will separate pyrite from coal particles in water in an electrical field, is being explored. Also, included are dry separation methods based on electrostatic means, air classification, and enhancement of the magnetic susceptibility of the pyrite. Plans are under way to scale-up the wet separation process in a 75–100 ton per day plant.

The other research approach to reduction of SO_2 is treatment of the stack gas. We have investigated a number of potential sorbents for removing SO_2, including limestone, red mud, metallic oxides, shales, phosphate rock, and pyrite, itself. We have developed a stack gas treatment system using pellets of alkalized alumina. This sorbent has excellent sorptive and regeneration properties but our failure, to date, to prepare a material having sufficient physical strength has been disappointing.

Both the Bureau of Mines and the Office of Coal Research are engaged in research and development that, while not specifically aimed at pollution abatement, will, as an added benefit, reduce the quantity of over-all pollutants. The conversion of coal to liquid and gaseous fuels yields products that lend themselves more readily to stripping out the sulfur and would eliminate much of the particulate emission. Also, under investigation are lower pollution potential systems such as magnetohydrodynamics (MHD) and fluid-bed combustion. Although these utilize coal as a solid fuel, they are recognized as potential methods to generate future electrical energy with less generation of pollutants.

The Office of Coal Research has sponsored development of the fluidized bed boiler combustion system. This system has a considerable potential for reducing the emission of both sulfur and nitrogen oxides. Because of this, the National Air Pollution Control Administration has contributed funds to the project.

The Office of Coal Research is sponsoring the construction and operation of a number of coal conversion process pilot plants, each representing an investment of $6 to $10 million. One is operating in Cresap, W. Va., and others are under construction at Chicago, Ill.; Princeton, N.J.; and Rapid City, S. Dak.

The Bureau's program on coal conversion for fiscal year 1970 is funded at $2,900,000; the Office of Coal Research budget for fiscal year 1970 is $15,300,000, plus $20,500 from National Air Pollution Control Administration.

We strongly favor the provisions of both H.R. 15847 and H.R. 15848. In fact, we regard both pieces of legislation as significant steps forward in our continuing struggle to utilize wastes, to combat air pollution, and enhance our environment. We pledge the continued efforts of the Department of the Interior, through its Bureau of Mines and Office of Coal Research, within the limits of our resources in continuing to promote the utilization of solid waste and the fight against environmental pollution.

Mr. Chairman, this concludes my prepared statement.

You will note it is a recitation of the research work that is being done within the mineral resources side of the Department of the Interior. We would be pleased to respond to any questions you might have.

Mr. ROGERS. Thank you very much for your statement telling us what you are doing.

Mr. Preyer?

Mr. PREYER. I have just one general question at this time: Thank you, Mr. Secretary. You certainly have a lot of balls in the air. It makes one wonder if you can carry out all these projects on your budget but I think that is a matter Mr. Rogers will go into.

From other witnesses we have heard repeatedly how short the time is in this battle to save our environment. I wonder if you can give us some general idea of how close to reaching results some of these studies are.

For example, on page 3 you talk about "fundamental studies of extremely complex smog formation process." You mention several areas where results have been disappointing. Do you feel we are going to beat some of these time deadlines that witnesses have been telling us we have to meet in order to solve our problems?

Mr. DOLE. Mr. Preyer, our problem here is that in solving some of these problems we find that we are creating other problems. For instance, if after-burners are placed on cars we find that we are increasing various nitrogen oxides in the exhaust of the cars. But, we do feel that we are making some significant progress.

Now, as to the question regarding the short time available to get results—the answer, of course, is to speed up our research. This is why I feel that these particular bills we have before us today are important. They do add a significant amount of money to that which is now available.

It is a matter of training people, studying and testing various systems, and gaining a through understanding of what is going on to make certain that we are not creating a bigger problem than we are trying to solve. So, even though we are engaged in fundamental studies, we have not made as much progress as I think the future holds for us.

Mr. PREYER. To take one specific example, your study of smog formation which you say is underway, can you see any light at the end of the tunnel on that one from the point of view of time as to when you might come out with an answer on it?

Mr. DOLE. Mr. Preyer, I would like to ask Mr. Rampacek if he would address himself to this. He has followed this research over a long period of time. I think he could give you a better idea of the success of some of these problems better than I.

With your permission, I would like Mr. Rampacek to address himself to this.

Mr. RAMPACEK. The smog forming constituents in the emissions from automobiles are quite complicated. There are unburned hydrocarbons, carbon monoxide, nitrogen oxides of various types and unburned hydrocarbons such as olefins and other compounds.

In the presence of sunlight, these materials react with each other. Depending on the composition of the emissions we find that the amount of smog which is formed will vary. Our research at Bartlesville, Okla., has been to identify the emission constituents that react to form smog, and to identify what kind of emissions would favor a minimum formation of smog.

The nitrogen oxides, we know, are reactive. The hydrocarbons react with the nitrogen oxides and also the olefins. We have made progress down this line. We are now identifying the types of fuels that will produce the least amount of hydrocarbons, more carbon dioxide, less carbon monoxide and less nitrogen oxides.

Mr. PREYER. At this time, you cannot give any specific date as to when you may have some answers on that?

Mr. RAMPACEK. No, sir, we cannot. We can identify the conditions that will lead to the smog formation and also how engine operations affect emissions. The carburetor setting on an automobile in combination with the type of fuel used) the timing of the automobile, the compression ratio, all have a definite effect on the ratio and types of emissions that come from the automobile. It is a very, very complex problem.

Mr. PREYER. Thank you. I think our hearings have indicated how complex developing new knowledge is and how it cannot be pushed but so fast. You can't go beyond what you can learn. The hearings have also indicated that there is a real sense of urgency to get some answers on these things.

Thank you, Mr. Chairman.

Mr. ROGERS. Would you let me know what your budget has been, say, beginning in 1967, if you recall, or if you can submit those figures for the record, 1967, 1968, 1969, 1970 and your 1971 budget and what you plan for 1972, any of those figures that you can recall for us now we might like to have on your research budget for coal, for fuel, for solid waste disposal, your recovery of metals.

Mr. RAMPACEK. I can recall the figure on the urban solid waste. In the 1970 fiscal year, about $430,000. This is the work that is being done at College Park.

Mr. ROGERS. What is the budget for 1971?

Mr. RAMPACEK. In that area, the same amount of money.

Mr. ROGERS. No increase?

Mr. RAMPACEK. No increase. We are funding all of our solid waste work out of our regular conservation and development appropriation.

Mr. ROGERS. That is the $430,000?

Mr. RAMPACEK. That is $430,000 out of conservation. We have no solid waste money, as such.

Mr. ROGERS. Should you have?

Mr. DOLE. Mr. Chairman, this is a matter of internal bookkeeping. We have, in the past, set this up under a series of program titles, and within these program titles there is money allocated for these various programs. We have found this to be a better way to budget. We can extract the amount and we will furnish these figures. We do not have them at our fingertips. We will furnish the amounts we have spent from 1967 to the committee.

(The following information was received for the record:)

TOTAL APPROPRIATION, FISCAL YEAR

[In thousands]

	1967	1968	1969	1970	1971
Coal research	$6,640	$6,893	$6,963	$6,968	$8,468
Petroleum research	3,582	3,846	4,761	5,108	4,708
Mining research	5,961	6,557	6,820	[1] 7,979	[1] 9,279
Metallurgy research	14,392	11,452	10,566	12,147	12,235
Minerals research	30,575	28,748	29,110	32,202	34,690
Resource evaluation	7,542	8,516	8,886	10,282	10,282
Total Bureau of Mines	38,117	37,264	37,996	42,484	44,971

[1] Does not include funds expressly for health and safety research to implement Public Law 91-173.

Note: Estimates for fiscal year 1972 have not been included, inasmuch as the Department of the Interior has not yet developed plans for 1972.

SOLID WASTE EXPENDITURES, FISCAL YEAR

[In thousands]

	1967	1968	1969	1970	1971
Coal research	$130	$145	$201	$311	$321
Petroleum research				137	137
Mining research					
Metallurgy research	4,290	2,481	2,578	[1] 2,814	2,530
Minerals research	4,420	2,626	2,779	3,262	2,988
Resource evaluation	500	650	1,450	935	865
Total Bureau of Mines	4,920	3,276	4,229	4,197	3,853

[1] Includes $430,000 for urban waste disposal (in-house research); $397,000 for urban waste utilization (contract and grant); $1,465,000 for developing new methods for treatment of industrial, mining, and processing. Includes $165,000 contract research, $522,000 for research directed to utilization of junk automobiles.

Note: Estimates for fiscal year 1972 have not been included inasmuch as the Department of the Interior has not developed plans for 1972.

SOLID WASTE DISPOSAL

	1966	1967	1968	1969	1970	1971	Total
Authorization	3,000,000	6,000,000	10,800,000	12,500,000			32,300,000
Budget request	2,100,000	4,335,000	3,232,000	2,167,000			11,834,000
Appropriation	1,400,000	4,300,000	3,367,000	[1] 1,067,000			10,134,000
Obligations	819,000	3,639,000	2,165,000	2,742,000	769,000		10,134,000
Expenditures	374,000	1,819,000	3,427,000	2,210,000	1,500,000	804,000	10,134,000

[1] Excludes $850,000 transferred to other appropriations to meet pay costs.

Mr. ROGERS. Compare the budget figures for all of your operations in these subject matters that we are discussing with your 1970 budget for next year, what you are asking for 1971 in comparison to your 1970 budget.

Mr. DOLE. Our funding level for our 1971 budget is essentially the same as it is in 1970.

Mr. ROGERS. What about the 1972?

Mr. RAMPACEK. I would like to increase our budget by about $4 million.

Mr. ROGERS. Out of a total of how much?

Mr. RAMPACEK. In research area, a total of about $32 million.

Mr. ROGERS. It was $32 million in 1970, $32 million in 1971?

Mr. RAMPACEK. Yes.

Mr. DOLE. On that order; yes, sir.

Mr. ROGERS. You would increase it how much, your own request?

Mr. RAMPACEK. About $4 million.

Mr. ROGERS. That is the internal request? Has that gotten Departmental approval yet?

Mr. DOLE. This is the internal request. It does not have Departmental approval.

Mr. ROGERS. So, you do not know whether that will really be the request or not?

Mr. DOLE. That is correct, sir.

Mr. ROGERS. How do you break down that $32 million? How is that spent?

Mr. RAMPACEK. About $7 million for coal research, but this is not all money for solid waste.

Mr. ROGERS. Well, that is what I want to know?

Mr. RAMPACEK. Out of the $7 million, about 2——

Mr. ROGERS. No; out of the $32 million? I want a breakdown of the $32 million; how that is spent?

Mr. RAMPACEK. About $7 million for coal, about $12 million for metallurgy research. We have about $9 million for mining research and about $5 million for petroleum and oil shale research. There is about $2 million in the mining research, health and safety research, actually.

Mr. ROGERS. That is out of the $9 million for mining you are devoting about $2 million?

Mr. RAMPACEK. Two and a half million dollars of that is for health and safety research.

Mr. ROGERS. Health and safety?

Mr. RAMPACEK. Yes, sir.

Mr. ROGERS. How much goes to the actual research for solid waste disposal or air pollution problems of the two and a half million dollars?

Mr. RAMPACEK. None of that is related to solid waste.

Mr. ROGERS. Now, out of the $32 million, what are you actually spending for solid waste disposal research?

Mr. RAMPACEK. The Bureau is spending a total of $4.2 million.

Mr. ROGERS. Where does that come from out of the $32 million? Is it from coal, from metallurgy, from mining, or oil research?

Mr. RAMPACEK. About two-tenths of a million dollars of that is in petroleum.

Mr. ROGERS. In petroleum?

Mr. RAMPACEK. Yes.

Mr. ROGERS. How much?

Mr. RAMPACEK. $200,000. About $1 million is from coal research for reducing air pollution caused by coal burning power plants. Then there is about $900,000 which is related to mineral resources studies which are not in research. The remainder of it is from metallurgy research.

Mr. ROGERS. Which is how much?

Mr. RAMPACEK. It would be about two and a half million dollars, sir.

Mr. DOLE. Mr. Chairman, I am not sure of the preciseness of these figures. I will furnish the committee with a breakdown of our various research activities for the 5-year period that you requested.

Mr. ROGERS. Yes. I realize you may not have all these figures, but I want to try to get a picture here of what we are doing.

Now, you have a million dollars from coal, $900,000 from mining, $200,000 from research. Now, where does the rest of the money come from?

Mr. RAMPACEK. It is coming from metallurgy research.

Mr. ROGERS. Metallurgy?

Mr. RAMPACEK. Yes, sir.

Mr. ROGERS. That would be how much?

Mr. RAMPACEK. $2.5 million.

Mr. ROGERS. That is involved with what type of research?

Mr. RAMPACEK. It is involved with the development of new and improved technology for recovering and recycling metals and minerals. Also, the stabilization and utilization of mineral wastes, utilization of scrap automobiles, work on low grade steel scrap, and the utilization of other types of wastes that occur in the mineral industry.

Mr. ROGERS. I think it would be helpful to the committee if you would let us have a breakdown on how you are spending these funds and on what projects.

Mr. DOLE. We will not only break it down into categories but we will put it in projects for you.

Mr. ROGERS. I think this would be helpful.

(The following information was received for the record:)

BUREAU OF MINES ENVIRONMENTAL INVESTIGATIONS

The following tables summarize funding by activity and area of investigation in the fields of Solid Waste and Pollution Abatement for fiscal years 1967 to 1971. Most of the work directly attackes some phase of the environmental pollution problem. Some of the items listed, have primary objectives of assuring continued supply of mineral and fuel materials to meet the needs of the economy. Development of alternative copper ore processing methods and gasification of coal are examples. Successful completion of these investigations, however, would have major impact on pollution control activities.

SUMMARY

[In thousands of dollars]

	1967	1968	1969	1970	1971
SOLID WASTE					
Activity:					
Metallurgy research	4,290	2,481	2,578	2,814	2,520
Coal research	130	145	201	311	321
Oil shale research				137	137
Mineral resource evaluation	500	650	1,450	935	865
Total (all appropriated funds)	4,920	3,276	4,229	4,197	3,843
AIR POLLUTION ABATEMENT					
Activity:					
Mineral resource evaluation	175	382	490	555	555
Coal research	3,020	4,346	4,677	5,695	7,065
Metallurgy research	490	590	750	610	600
Petroleum research	619	854	883	911	943
Total	4,304	6,712	6,800	7,771	9,163
Source of funds:					
Appropriated	3,330	4,703	5,012	5,858	7,348
Working	784	1,264	1,580	1,740	1,660
Contributed	190	205	208	173	155
Total	4,304	6,172	6,800	7,771	9,163

SOLID WASTE

METALLURGY RESEARCH

Junk Car Utilization.—Research is concentrated on developing new or improved technology of upgrading automotive scrap so that traditional markets may be maintained and new markets be developed.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Smelting of scrap	345	406	182	368	290
Purification of scrap by leaching	200	50	30	30	30
Recovery of accessory metals		67	70	70	130
Incineration of autos			72	54	80
Auto scrap as an iron ore reductant	2,200	200	161		
Contract and grant research	180	81	18		
Total	2,925	804	533	522	590

Industrial, Mining and Processing Wastes.—This phase of the Bureau's research is aimed at developing efficient methods for treatment of industrial wastes and scrap for recovery of secondary materials; development of processes to recover residual minerals from mine and mill wastes; perfection of technology for stabilization of fine mineral materials; creation of techniques for ultimate disposal of mineral wastes with minimal environmental degradation.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Recovery of secondary materials	400	600	680	800	900
Treatment ot processing wates:					
In-house	90	170	160	200	200
Contract and grant	30	68	30		
Stabilization of fine wastes:					
In-house	150	80	200	200	300
Contract and grant	40	40	40	14	
Utilization of mineral wastes:					
In-house	80	60	90	100	100
Contract and grant	365	389	370	151	
Total	1,155	1,407	1,570	1,465	1,500

Treatment of Urban Refuse.—Major effort is devoted to recovery of metals and mineral materials from municipal incinerator residues and raw refuse. Attention is also directed to refining and utilization of the recovered materials.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Separation of minerals and metals	210	270	250	250	200
Refining of recovered materials			100	100	200
Utilization (in-house)			83	80	30
Utilization (contract and grant)			42	397	
Total	210	270	475	827	430

COAL RESEARCH

Utilization of Solid Wastes.—Primary past effort has been devoted to developing uses for coal mine waste and fly ash from coal burning power plants. More recently attention has been directed to methods for conversion to useful form such wastes as automobile tires, battery cases and high cellulose garbage, and to recovery of the energy value of urban refuse.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Utilization of waste	130	145	201	201	221
Energy from refuse				110	100

AIR POLLUTION ABATEMENT—MINERAL RESOURCE EVALUATION

Resource studies on availability of fuels which will meet air pollution requirements.—The availability of fuels meeting the requirements of many municipalities for electric power generation with a minimum of air pollution is one of the major unmeasured factors in the Nation's energy resources. This study is intended to correct that deficiency as rapidly as possible and provide the information needed to guide the utility companies in meeting the more and more rigid specifications being established.

Studies have been completed on the availability of coal that can be recovered through strip mining and these are being followed by studies of coal-producing areas requiring the use of underground mining methods.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Appropriated	175	175	150	155	155
Working funds		207	340	400	400
Total	175	382	490	555	555

COAL RESEARCH

Air Pollution Research.—Three methods of reducing air pollution are being investigated under this program: (1) Removal of sulfur from coal before burning, (2) removal of sulfur oxides, nitrogen oxides and particulate matter from stacks of coal-burning powerplants, (3) conversion of coal to a clean burning synthetic fuel. Although the primary objective of the latter approach is to assure an adequate supply of fuel in the future, success of the R&D effort would enable significant reductions in air pollution.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Sulfur removal from coal:					
Appropriated	415	832	679	668	668
Working funds	75	125	221	505	400
Removal of SO_2 and other contaminants from stacks:					
Appropriated	515	1,269	1,307	1,285	1,285
Working funds	320	487	555	325	300
Coal conversion processes: appropriated	1,695	1,633	1,915	2,912	4,412
Total	3,020	4,346	4,677	5,695	7,065
Appropriated	2,625	3,734	3,901	4,865	6,365
Working funds	395	612	776	830	700

MINERALS RESOURCE EVALUATION

Solid Waste Problem Appraisal.—This activity consists of determining the magnitude and nature of mineral wastes accumulated to date, with emphasis on delineating waste piles which pose the greatest threat to the environment and the development of urban areas. The program includes identification of waste disposal problems, development of guidelines for proper disposal of wastes, identification of mineral resources available from present and future accumulations of solid wastes determining the potential for utilization of mined areas for disposal of wastes, and evaluation of methods for surveillance of solid wastes on an annual basis.

Funds

1967	$200,000	1970	$635,000
1968	350,000	1971	565,000
1969	400,000		

Culm Banks.—The Bureau is cooperating with the State of Pennsylvania in attacking burning coal mine culm banks so as to demonstrate techniques for extinguishing culm-bank fires. The operations provide the data needed to understand these fires and how to extinguish them. The reports resulting from these projects will be published and will provide guidance in eliminating these and preventing future fires.

Funds

1967	$300,000	1970	$300,000
1968	300,000	1971	300,000
1969	1,050,000		

OIL SHALE RESEARCH

Waste Disposal Problems.—The problems associated with disposal of spent shale are evaluated, and means of preventing wind and water erosion of spent shale dumps and possible contamination of water sources by rainfall leaching of the dumps are developed. Methods for treating above ground retorting process waters to remove contaminants or reduce them to harmless levels are studied.

Funds

1967	
1968	
1969	
1970	$137,000
1971	137,000

METALLURGY RESEARCH

Reduction of Sulfur Emissions.—Two approaches are being undertaken to reduce the amount of sulfur discharged to the air as the result of sulfide ore treatment: (1) removal of sulfur from smelter gases, (2) development of recovery processes that do not produce sulfur-containing gases. The second series of investigations are part of an intensive research effort to promote technological advance in the minerals industry.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Sulfur removal	307	385	623	481	450
Alternative processes	183	205	127	129	150
Total	490	590	750	610	600

Note: All appropriated funds.

PETROLEUM RESEARCH

Fuels Combustion Research.—This program is aimed at developing information to show the least expensive and most effective method to alter engine and fuel systems for greatest overall reduction of vehicular pollution.

[In thousands of dollars]

	1967	1968	1969	1970	1971
Photochemical reactivity	134	145	165	180	200
Fuel volatility	240	265	188	103	115
Fuel combustion technology	120	294	370	368	348
Natural gas-powered vehicles				75	75
Diesel-powered vehicles	125	150	160	185	205
Total	619	854	833	911	943
Appropriated funds	40	204	211	228	228
Working funds	389	445	464	510	560
Contributed funds	190	205	208	173	155
Total	619	854	883	911	943

Mr. ROGERS. It would appear to me that this is not a very significant amount to meet one of the nation's main problems, solid waste disposal, to be spending $4 million out of $32 million on solid waste disposal and not all of it is on that.

Mr. DOLE. I would agree with you, Mr. Chairman, that the amount of money that we are presently spending on solid waste is not large in view of what needs to be done. However, one of the purposes of my testimony before you today is to show that we have been concerned about this matter and we have been doing work in these fields for a long period of time. We have made some good progress.

Mr. ROGERS. We would like to have you set forth what positive results we have. I do not see too much being brought into action in getting rid of solid waste. For instance, they tell me if you could convince the automobile companies to take copper out of the cars this would help your disposal problem with automobiles, because if they would put aluminum in some of these spots that they put copper, that I understood could be done, then this would allow you to perhaps more easily dispose of the automobiles, so that the steel companies would be willing to buy them back.

Is any progress being made on this?

Mr. DOLE. Yes, Mr. Chairman. I think it is interesting to note that when we finally did break down cars into their various component parts, the automobile industry was very much interested in the reports of our work because the companies themselves did not know how much of each kind of metal was going into their autos. Through proper dismantling procedures we have been able to improve the quality of the scrap recovered from junk cars which would reduce the amount of copper. Copper, of course, is deleterious in the steel-making procedure.

Mr. ROGERS. Have you had any conferences with the automobile companies to see if they could make this shift?

Mr. DOLE. We have not had conferences with them to see if they can make this shift, but we have had conferences with them on the makeup of automobiles.

Mr. ROGERS. What success are you having with the auto companies?

Mr. DOLE. We have had no response from the companies, but I would like to refer to the statement on page 2 of my prepared testimony where we mention recovering values from discarded automobile tires by treating them in a heated reactor. I understand that the Firestone Tire & Rubber Company now is looking into the utilization of this process which would convert old tires and other rubber articles into an organic material and oil-like substance that could be utilized.

Mr. ROGERS. Have they actually done it yet or are they just looking into it?

Mr. RAMPACEK. I understand they are building a plant.

Mr. ROGERS. Will you let us know if that is so?

Mr. RAMPACEK. I will.

(The following information was received for the record:)

The plant is not being built. We have, however, been informed that the company now has under consideration approval of a small continuous pilot plant to demonstrate feasibility of the process for carbonizing tires. This unit will supply the design data needed for ultimate scaleup to a commercial size unit.

Mr. ROGERS. What about the automobile companies? Is there any progress there? Any commitments? Any encouragement?

Mr. DOLE. To the best of my knowledge, there are no commitments. I think the work that we do is being followed very closely by the automobile companies and hopefully they will make changes in the construction of the automobiles that would make junk automobile dismantling easier and permit recovery of higher grade ferrous scrap.

Mr. ROGERS. Are you that optimistic?

Mr. DOLE. Yes, sir, I am.

Mr. ROGERS. What is the time element?

Mr. DOLE. Of course, now we are getting into something that is beyond prediction. If automobiles are replaced too rapidly a lot of the second-hand cars will fall to people who are unable to buy a new car every year. I think we have to be careful that we do not impose an economic hardship on a large segment of the people.

Mr. ROGERS. What do you mean, have to buy a car every year. I thought the idea was to try to have them build the car so that they would last longer so that you would not have to scrap so many?

Mr. DOLE. I would hope that would be the idea, Mr. Chairman.

Mr. ROGERS. I do not know that I follow that. I would hope that you could give us something that you are doing with them and some positive results. Would you let us know what contacts, along what lines and what reaction for the record?

Mr. DOLE. Yes, sir, I certainly will.

Mr. ROGERS. Because I don't see much progress in this area either.

(The following information was received for the record:)

ACCEPTANCE OF BUREAU OF MINES RESEARCH ON SOLID WASTE AND AIR POLLUTION BY INDUSTRIAL FIRMS AND OTHER ORGANIZATIONS

1. Public demonstrations of the Bureau's minicipal incinerator residue processing plant at College Park, Maryland, were attended by 64 representatives of the aluminum, steel, glass, and secondary scrap metals industries and by city, state, and government officials from across the Nation. The plant treats ½ ton per hour of residue continuously to recover the iron, nonferrous metals such as aluminum, lead, zinc, and copper, and colorless and colored glass components. Representatives attending the demonstrations were from all of the major primary aluminum producers, the National and Bethlehem steel companies, the Glass Container Manufacturers Institute, Owens-Illinois glass company, the National Association of Secondary Metals Industries and a number of independent scrap metal processors. Reaction of the industry representatives to the Bureau's work was that the research had great promise inasmuch as markets already exist for the clear glass and nonferrous metal.

2. A smokeless junk auto incinerator developed by the Bureau of Mines, in cooperation with the Wasatch Metal and Salvage Co., in Salt Lake City, Utah, was demonstrated to the industry recently. The new incinerator constructed at a cost of $22,000, which is roughly one-tenth the cost of smokeless incinerators now commercially available, burns out about 50 cars per day at a cost of approximately $2.75 per car without the atmospheric pollution always attendant with open burning. In the short time since the demonstration the Bureau has received more than 200 inquiries from municipalities, junk auto processors, and manufacturers interested in design and construction details of the incinerator. Inquiries from cities in virtually every State in the Union and some foreign countries continue to be received. There is little doubt that a number of the incinerators will be constructed by scrap auto dealers.

3. One phase of the Bureau's program on junk auto utilization has involved extensive studies of various procedures for dismantling scrap cars. To date, 17 junk cars of various models and age have been weighed, dismantled, and segregated into their ferrous and nonferrous components in a series of time and motion studies using various dismantling methods. The Bureau's report, now available, has received a favorable appraisal by the Industry Advisory Committee, which includes Luria Bros., The Ford Motor Co., U.S. Steel, and the Foundrymen's Association. The Advisory Committee, on iron and steel scrap problems has commended the Bureau of Mines on the junk car research which is expected to suggest to the smaller, independent scrap dealers more effective ways of dismantling junk autos.

4. A new method was developed at the Rolla Missouri Metallurgy Research Center for reclaiming valuable cobalt and sintered tungsten carbide from metal cutting and grinding tool scrap. Molten zinc is used in the process to recover

over 99 percent of the tungsten carbide and 98 percent of the cobalt from the scrap. The carbide and cobalt are reusable without further treatment. The process has been dopted and is now being used commercially by the Wendt-Sonis, United Greenfield Division of TRW, Inc., Rogers, Ark.

5. Under a Bureau of Mines grant, studies by Stanford University demonstrated the technical and economic feasibility of producing bricks from California gold mine wastes. A report of the work showed that high strength and quality bricks can be produced from the tailings and delivered to market areas in the rapidly developing urban areas of San Francisco, Sacramento, and Los Angeles at costs ranging from $8 to $21 per 1,000, a price below the existing lowest quoted selling price of standard clay bricks. According to Stanford University personnel involved in the research, one company in the area intends to undertake commercial production of the bricks.

6. Bureau researchers, under the Solid Waste Program successfully stabilized two troublesome uranium mill waste tailing piles which have been a source of wind blown dust for many years. One 35-acre plot of tailing at Tuba City, Arizona, on the Navajo Indian Reservation, was stabilized by chemical means by the owner, the El Paso Natural Gas Company, under Bureau supervision, and another 13-acre uranium mill waste pile of the Foote Mineral Company, at Durango, Colorado, was stabilized by vegetative methods.

The Bureau also advised and assisted the Kennecott Copper Company in efforts to stabilize a 10-acre plot of copper mill tailings at McGill, Nevada, by vegetative cover. As a direct result of this work, the company is preparing to stabilize a 300-acre site in the same area.

Bureau also instructed and assisted plant personnel in planting seeds and chemically stabilizing 1- to 2-acre test plots of mill wastes of the White Pine Copper Company, White Pine, Mich., the St. Joseph Lead Company, Flat River, Mo., and the American Smelting and Refining Company, Page, Idaho. A 19-acre tailing pond belonging to the Vitro Chemical Company, Salt Lake City, Utah, also was treated chemcially under Bureau assistance and supervision. The vegetative or chemical stabilization in all cases have effectively prevented wind erosion and air pollution.

7. Efficient and economic removal of copper from millions of scrap automobile generators and motors salvaged each year has posed a continuing metallurgical problem to industry. The Bureau's answer, which has been seized upon by industry, has been to develop a superior method for sweating copper from the iron component using a molten salt, followed by recovery of the copper as a high-grade product. The process was developed in the Bureau's Twin Cities Metallurgy Research Center, Minneapolis, Minn. and affords industry significant advantages over current practices of reclaiming copper from scrap materials. Companies that have shown interest in the process are the Chemical Construction Corp., General Electric Co., Clevite Co., and the Carrier Air Conditioning Co.

8. A patented process was developed by the Bureau of Mines for converting nonmagnetic taconite ores (a presently unused waste material resulting from mining of magnetic taconite ores) to the magnetic form by reduction-roasting with low-grade ferrous scrap. Both the iron in the ore and in the scrap are converted into high-grade magnetic iron oxide which can be recovered and smelted. Construction of a demonstration plant was undertaken in 1967 by the Bureau at Hibbing, Minnesota, to obtain operating and cost data but the plant was not completed because of a lack of funds in fiscal year 1968. Despite curtailment of the project, however, the research completed to date was encouraging enough to stimulate wide spread interest by Harold LeVander, Governor of the State of Minnesota, the Upper Great Lakes Regional Commission, Washington, D.C., and the Iron Range Resource and Rehabilitation Commission, at St. Paul, Minn. This interest has generated action leading to the possibility of using the demonstration plant to follow up on certain phases of work proposed by the Bureau. Currently, the W. S. Moore Company of Duluth, Minn. is negotiating with the Bureau to complete the plant and operate it for the purpose of verifying the economics of producing reduced, heat-hardened pellets of the type that would have been produced by the Bureau in the plant.

9. The proper sorting and identification of scrap is a vital step in the secondary aluminum industry. Bureau research has developed a simple electrochemical identification kit for industry scrap metal processors that is capable of sorting through more than 100 aluminum alloys that end up as scrap metal, and in a few seconds identifying the alloy. The entire kit, contained in a 4 by 6 inch card file

box identifies magnesium which is a large tonnage alloying constituent of aluminum. Since the report of the work was presented, a number of inquiries have been made of the Bureau regarding the manufacturer and availability of the kit.

10. A symposium jointly sponsored by the Bureau and the Illinois Institute of Technology Research Institute was held in Chicago in March 1970. The purpose of this second Symposium was to emphasize the techno-economic aspects of mineral waste utilization, and to disseminate to industry groups of the progress being made by the Bureau of Mines and other organizations in solving problems in solid waste management through research. The symposium attracted over 300 participants. Several hundred were representatives of industry and the remainder were from the university sector, nonprofit research organizations, from city, state and federal agencies. Audience response was highly favorable to the broad range of Bureau research projects presented at the symposium.

11. One phase of the Bureau's work on air pollution abatement is aimed at developing effective and economical methods for recovering the 1.7 million long tons of sulfur vented to the atmosphere as sulfur dioxide each year by nonferrous metal smelters. In one method being developed, the sulfur dioxide is absorbed from gas streams in a special liquid and then by a simple reaction with hydrogen sulfide is converted to sulfur. Feasibility of the new method has been demonstrated in the laboratory. Nine copper firms, including the Anaconda, Inspiration, San Manuel, and Morenci copper companies have offered to cooperate with the Bureau in testing the process on a larger scale to determine the technical and economic feasibility of the method.

12. A recently published report entitled Bureau of Mines Research and Accomplishments in Utilization of Solid Wastes, has received wide circulation and acclaim in a few short weeks. Because of an unprecendented demand, the original printing of 1200 copies of the report was depleted within three weeks. A new printing has been ordered.

13. The Bureau's work on pyrolysis (destructive distillation) of worn out automobile tires has demonstrated that the process is effective for obtaining useful products from a solid waste material without polluting the atmosphere. The Firestone Tire and Rubber Company has made cost comparison between pyrolysis (Bureau work) and incineration as methods for hadnling scrap rubber, generated in company operations at the rate of 325,000 tons per year. The study has shown that pyrolysis is less expensive when value of products is taken into account. Firestone personnel recently advised that the company is set to approve a small continuous pilot plant to carbonize tires. This unit will supply the design data needed for scaleup to a commercial unit.

Based on the work done with rubber tires, the Bureau has been asked to study the feasibility of the pyrolysis technique for disposing of waste rubber soles by Wolverine Worldwide, Inc., Rockford, Michigan (manufacturer of Hush Puppies); wood wastes and spent liquor from paper manufacture, by Continental Can, Atlanta, Georgia; and scrap battery cases by Southern Lead Company, Dallas, Texas.

Work on converting cellulosic wastes to oil has aroused considerable interest from the paper and wood processing industries as a method for disposing of bark, saw dust, etc. It is yet too early to know whether the industry will accept this as a method for waste disposal.

14. A Bureau-developed froth flotation technique for reducing the sulfur content of fine coal is rapidly being accepted by all commercial coal preparation plants that use flotation equipment.

15. Research by the Bureau of Mines led to development of a method of drying coal under vacuum using steam as a drying medium. This method, now used in commercial practice, eliminates the need for thermal drying which is a major source of air pollution in coal producing areas.

16. Methods for measuring automotive emissions are an integral part of the Bureau research. Analytical procedures were developed and have been widely accepted for use in air pollution research. For example, a Bureau-developed method of separating and analyzing individual components of exhaust gases have been recommended by the Coordinating Research Council as the standard method to be used for this work.

17. Bureau of Mines fuel combustion studies have shown that fuel volatility and composition can be modified to effect significant reductions in pollutants from automotive exhausts. This information served as the basis for regulation standards now being considered by the California Legislature.

Mr. ROGERS. Now, you mention on page 3 "more rapid progress for smog-affected areas may be possible by altering the properties of marketed gasoline. Bureau research recently demonstrated that the air-pollution potential from automobiles can be significantly reduced by suitable changes in gasoline composition."

What are you referring to there?

Mr. DOLE. Mr. Rampacek.

Mr. RAMPACEK. Gasoline is a complex mixture of hydrocarbons. What light fractions are in what we call the front end of the gasoline and the heavy fractions are in the tail ends of the gasoline. Some of the light fractions are very volatile materials that actually evaporate from the gasoline tank. They evaporate from the carburetor. They are a cause of the considerable amount of our hydrocarbon pollution.

Our tests and research have shown that gasoline can be reconstituted to eliminate or reduce these volatile constituents thereby producing fewer emissions. The tests that we have run have indicated that the actual amount of emissions from the automobile can be reduced by 60 to 80 percent.

Mr. ROGERS. Sixty to 80 by simply remaking the fuel?

Mr. RAMPACEK. Remaking the fuel and the composition.

Mr. ROGERS. The composition of the fuel?

Mr. RAMPACEK. The constituent parts and combinations of hydrocarbons. That is right.

Mr. ROGERS. Would that increase the price of gas, do you estimate?

Mr. RAMPACEK. Yes, it would.

Mr. ROGERS. How much? Do you have any estimate?

Mr. RAMPACEK. I could estimate it. Not more than two cents a gallon.

Mr. ROGERS. Does this include lead or is lead taken out or what?

Mr. RAMPACEK. This would be with the lead in it?

Mr. ROGERS. Would it require more crude oil?

Mr. RAMPACEK. Not necessarily, no.

Mr. ROGERS. So, you would not have to have a larger stock?

Mr. RAMPACEK. It would require some changes in the refining process.

Mr. ROGERS. How much would that cost to convert to that?

Mr. DOLE. Probably not very much, Mr. Chairman. It is a matter of the utilization of the refinery process.

Mr. ROGERS. You would reduce 60 to 80 percent. Is that all of the emission?

Mr. RAMPACEK. It would be the emission that relates to the hydrocarbons and to carbon monoxide.

Mr. ROGERS. What about nitrogen oxides?

Mr. RAMPACEK. They would probably stay the same.

Mr. ROGERS. Stay the same? What about lead? Would it affect the emissions of lead in the air?

Mr. RAMPACEK. No.

Mr. ROGERS. Let us have details on that if you could, please, for the record?

Mr. RAMPACEK. All right.

(The following information was received for the record:)

Components of Automobile Exhaust Emissions

The principal emissions of automobile exhaust that react with sunlight to form smog are unburned hydrocarbons and oxides of nitrogen. Carbon monoxide is of concern as an emission because it is toxic and lead particles are a problem because there is concern about levels of lead in the atmosphere and because lead deposits may rapidly inactivate catalysts used in the exhaust system to reduce the reactive emissions. Bureau of Mines research has demonstrated that changes in the composition of fuels by reducing the percentage of light (volatile) hydrocarbons can decrease evaporative losses about 50 to 65 percent. However, the net effect of volatility reduction was to reduce the combined evaporative and exhaust emissions and their reactivity (smog forming) equivalent 25 to 30 percent. Volatility reductions had no discernible effect on oxides of nitrogen and lead in exhaust emissions.

Some small changes in refining processes might be required to achieve the desired volatility reduction. However, these changes would not require costly modifications to refinery equipment and the resultant cost to the consumer would be small.

Mr. Rogers. Is there any other research that looks like a breakthrough in any of this field?

Mr. Dole. In the petroleum field you mean?

Mr. Rogers. Petroleum or solid waste?

Mr. Dole. I think that the gasification of coal is one of the most interesting and promising things that is going on. Pollution problems exist wherever coal is burned, both from dust in handling it and from the combustion gases.

Centralized coal gasification plants would help solve the problems. The conversion of coal to gas creates no pollution and the gas can be moved through a pipeline. Also gasification would allow wider use of some of the western coals which are of low sulfur content and the lignites of the North Central States., I think we could make some real significant progress as far as pollution is concerned, both air and land.

Mr. Rogers. What is the present status of the coal situation as far as electrical power plants are now concerned? I read where they did only a very small amount. Are you aware of it?

Mr. Dole. Yes, sir. Coal certainly is our largest energy resource. The problem here arises as one of supply because the electrical industry, depending on nuclear plants coming on stream, caused a cutback in the opening of mines. We do not have the capability of furnishing the quantity of steam coal that is required for the foreseeable future.

So, it is not a matter of reserves of coal. It is a matter of opening up coal mines and getting the coal to the plants. This has to do with several causes, one of which is the lack of manpower.

Mr. Rogers. Now, as a matter of future on solid waste, aren't we going to have to increasingly look to the industry to come up with some technology and particularly those industries which are making the product which is then discarded. For instance, the paper industry?

Mr. Dole. Not only will the industry have to look to the recycling of waste and discarded materials, from the standpoint of the environment, but it will have to look also at wastes as a source of raw materials. Demands for raw materials in the future will be so huge that scrap pile will furnish a significant amount of needed metals and basic materials.

Mr. ROGERS. What coordination is there between you and the Department of Health, Education, and Welfare on your research? Do you keep close liaison?

Mr. DOLE. The liaison is very good.

Mr. ROGERS. Is there any problem that you see there?

Mr. DOLE. I know of none. Do you?

Mr. RAMPACEK. We have no problem whatsoever.

Mr. DOLE. We have nothing but fine relationships with them.

Mr. RAMPACEK. May I add something, Mr. Chairman?

Mr. ROGERS. Yes.

Mr. RAMPACEK. We do have a cooperative agreement now. It is a formal agreement with HEW and the Department of Agriculture. Agriculture is looking at recovery of the paper fraction from urban refuse, we in the Bureau are looking at the mineral fraction, and HEW is supplying us with materials from their contract operations.

Mr. ROGERS. Thank you. Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I am sorry I was not here when you gentlemen started. The gentleman on your left, sir, I did not get your name and your position.

Mr. DOLE. His name is Mr. Carl Rampacek. He is the Acting Assistant Director for Minerals Research.

Mr. SATTERFIELD. Thank you very much. I wanted to know that before I ask the questions I wish to ask.

I would like to direct your attention, sir, to the statement you made on page 3 pertaining to research which has been conducted with regard to vehicular pollution. Are there any reports available as to the findings of this research yet?

Mr. RAMPACEK. Yes, there are.

Mr. SATTERFIELD. Are they available to this committee?

Mr. RAMPACEK. Yes.

Mr. SATTERFIELD. Have they been made available to us?

Mr. DOLE. If they have not, they certainly will be.

Mr. SATTERFIELD. I would suggest that. While I am speaking of that, can you tell me who Mr. R. W. Hurn is?

Mr. DOLE. Mr. Hurn is a research chemist with the Bureau of Mines. He falls under Mr. Rampacek's direction.

Mr. SATTERFIELD. Has he been conducting research in the area of vehicular emissions?

Mr. RAMPACEK. He is our project coordinator in charge of that work at Bartlesville, Okla.

Mr. SATTERFIELD. I have a copy here of an article he wrote entitled "Fuel a Factor in Internal Combustion Engine Emissions." I wondered whether or not the information you are going to supply would include the contents of this article. If it is not, I would like to offer it at this time as evidence in these hearings.

Mr. ROGERS. Without objection.

(The following bibliography was received for the record:)

Bureau of Mines Publications and Presentations on Fuels Combustion as Related to Air Pollution Abatement, Fiscal Year 1967 to Fiscal Year 1970 [1]

PUBLICATIONS

Eccleston, B. H., B. F. Noble, and R. W. Hurn. Influence of Volatile Fuel Components on Vehicle Emissions. Bureau of Mines Report of Investigations 7291' February 1970, 80 pp.

Hurn, R. W. Fuel: A Factor in Internal Combustion Engine Emissions. American Society of Mechanical Engineers No. 69-WA/APC-8, November 1969, 5 pp.

Hurn, R. W. Air Pollution and the Compression-Ignition Engine. Reprinted from Twelfth Symposium (International) on Combustion by The Combustion Institute, 1969, pp. 677-687.

Vogh, J. W. Nature of Odor Components in Diesel Exhaust. J. of the Air Pollution Control Association, v. 19, No. 10, October 1969, pp. 773-777.

Whisman, M. L., and Basil Dimitriades. Radiotracer Procedures for Machanistic Studies in Air Pollution Research. Bureau of Mines Report of Investigations 7304, October 1969, 36 pp.

Stone, R. K., and B. H. Eccleston. Vehicle Emissions vs. Fuel Composition—API-Bureau of Mines—Part II. API Preprint No. 41-69, May 1969, 40 pp.

Hurn, R. W. Mobile Combustion Sources. Reprinted from Air Pollution, v. III, by Academic Press, Inc., 1968, pp. 55-95.

Marshall, W. F., and R. W. Hurn. Factors Influencing Diesel Emissions. Society of Automotive Engineers, Inc., No. 680528, August 1968, 9 pp.

Dimitriades, Basil. Methods for Determining Nitrogen Oxides in Automotive Exhausts. Bureau of Mines Report of Investigations 7133, May 1968, 29 pp.

Stone, R. K., and B. H. Eccleston. Vehicles Emissions vs. Fuel Composition. API Preprint No. 43-68, May 1968, 49 pp.

Dimitriades, Basil, C. F. Ellis, and D. E. Seizinger. Gas Chromatographic Analysis of Vehicular Exhaust Emissions. Reprinted from Advances in Chromatography, v. 5, 1968, pp. 327-362.

Hurn, R. W., and W. F. Marshall. Techniques for Diesel Emissions Measurement. Society of Automotive Engineers, Inc., No. 680418, May 1968, pp. 1492-1501.

Seizinger, Donald E. High Resolution Gas Chromatographic Analysis of Auto Exhaust Gas. Perkin-Elmer Instrument News, v. 18, No. 1, October 1967, pp. 11-12.

Dimitriades, Basil. Methodology in Air Pollution Studies Using Irradiation Chambers. Reprinted from J. of the Air Pollution Control Association, v. 17, No. 7, July 1967, pp. 460-466.

Dimitriades, Basil. Determination of Nitrogen Oxides in Auto Exhaust. Reprinted from J. of the Air Pollution Control Association, v. 17, No. 4, April 1967, pp. 238-243.

Hurn, R. W., Basil Dimitriades, and R. D. Fleming. Effect of Hydrocarbon Type on Reactivity of Exhaust Gases. Society of Automotive Engineers, Inc., No. 650524, May 1965, 5 pp.

PRESENTATIONS

Hurn, R. W. The Diesel Fuel Involvement in Air Pollution. Presented at the National Fuels and Lubricants Meeting, New York, New York, September 1969.

Dimitriades, Basil, B. H. Eccleston, and R. W. Hurn. An Evaluation of the Fuel Factor Through Measurement of Photochemical Reactivity of Emissions. Presented at the 62nd Annual Meeting of the Air Pollution Control Association, New York, New York, June 1969.

Marshall, W. F., and R. W. Hurn. Analytical Requirements for Realistic Evaluation of Diesel Emissions. Presented at the 9th Conference on Methods in Air Pollution and Industrial Hygiene Studies, Pasadena, California, February 1968.

Dimitriades, Basil. Recent Findings Concerning Effects of Extraneous Factors on Hydrocarbon Reactivity Measurement Using Irradiation Chambers. Presented at the 8th Conference on Methods in Air Pollution and Industrial Studies, Oakland, California, February 1967.

[1] Copies of these publications may be found in the committee's files.

(The following article, "Fuel: A Factor in Internal Combustion Engine Emissions," by R. W. Hurn, along with an excerpt from the official certified transcript of hearings of California Air Resources Board—March 5, 1970, were submitted for the record by Congressman David E. Satterfield:)

[an ASME publication]

FUEL: A FACTOR IN INTERNAL COMBUSTION ENGINE EMISSIONS

(by R. W. Hurn, Project Coordinator, U.S. Department of the Interior, Bureau of Mines, Petroleum Research Center, Bartlesville, Okla.)

Characteristics of fuel used in an internal combustion engine influence both the amount and the nature of air pollutants associated with engine use. Fuel composition directly governs the amount and character of pollutants from the fuel system and exerts varying influence upon the products of combustion. Fuels could be changed (from typical current practice) to reduce the pollution that results from their use; however, comparable or greater reduction could also be realized through mechanical or engine design changes. The fuel factor is, therefor. only one of several factors that should be considered. But it is important that fuel characteristics *be* considered in any concept of emission control.

Note: Contributed by the Air Pollution Control Division of The American Society of Mechanical Engineers for presentation at the ASME Winter Annual Meeting, November 16-20, 1969, Los Angeles, Calif. Manuscript received at ASME Headquarters July 30, 1969.

INTRODUCTION

Fuels for internal combustion engines vary widely—both in chemical composition and in physical properties. This is evident in considering such obviously different materials as propano and kerosene or natural gas and diesel fuel. Differences among motor fuels may not be so obvious; nonetholess, they may be highly significant.

Numerous physical and chemical properties affect fuel behavior; of these, fuel volatility (physical) and hydrocarbon composition (chemical) [1] are most important within tho context of this Bureau of Mines study. Volatility characteristics influence primarily fuel carburation phenomena while hydrocarbon-type composition affects primarily combustion behavior and combustion products.

Proposals for air pollution abatement have—almost from inception of the problem—included proposals for antismog fuels. Many of the suggestions (some seriously advanced from technical sources) havo been made on the assumption that all or most fuel-related smog precursors are to bo found in the fuel. Some of tho earliest work on the smog problem showed that this assumption is grossly misleading in that 1) many of the objectionable pollutants originate in the combustion process and 2) tho relationship between the composition of the fuel and that of the exhaust is highly dependent upon two engine parameters, speed and load. The technical question, therefore, is to determine how fuels influence engine and vehicle emissions under conditions that represent average-driver practice.

Another question that must be answered concerns not only the amount and nature of material discharged into the atmosphere, but also its probable effect insofar as pollution is concerned. This probable effect upon pollution is, in this paper, referred to as smog potential. The tendency of a unit quantity of emission to enter into smog-forming reactions is referred to as specific photochemical reactivity or, simply, reactivity. Note that reactivity involves only the chemical characteristic of the material, but that smog potential involves the activity characteristic, i.e., reactivity, combined with quantity. Although the reactivity of emissions may be of technical interest, it is only the end effect or the smog potential, as previously defined, that is the object of corrective action.

AUTOMOTIVE EMISSIONS AND THEIR SOURCES

In order systematically to discuss the relationship of fuel characteristics to automotive emissions, it is necessary to define clearly the sources of the emissions: tho fuel system and the exhaust system.

[1] For brevity, fuel characteristics that are defined in terms of hydrocarbon type and in terms of hydro carbon-type distribution are referred to simply as fuel composition or composition. In this sense, volatility and composition are considered and treated as independent variables.

Exhaust emissions include unburned fuel (hydrocarbon), partly burned fuel (oxygenates), carbon monoxide, and oxides of nitrogen. All of these may be affected to some degree by fuel characteristics, but only the unburned hydrocarbon and possibly the oxygenates are affected in significant degree by the fuel factor, per se. The oxygenates in exhausts have not been studied in detail adequate to associate their occurrence with fuel composition and, therefore, for this paper, discussion of the fuel-emissions relationship relates specifically to the hydrocarbon component of the emissions.

Hydrocarbon emissions in the exhaust are a mixture of original fuel components plus some lower molecular weight hydrocarbons that appear as fuel fragments. The origin and nature of unburned hydrocarbon in automotive emissions were explored in detail by Daniel and Wentworth (1).[2] Their experimental work showed that much of the unburned fuel is attributed to flame quenching at the walls of the combustion chamber, with the unburned material subsequently exhausted. However, it is pointed out that some oxidation occurs in the exhaust system in a postcombustion reaction, and therefore it is erroneous to assume that the fuel components survive exposure in the engine and are discharged wholly in their original form.

While the flame-quenching phenomenon described by Daniel and Wentworth accounts for a portion of the unburned hydrocarbons, other hydrocarbons appear in the exhaust as products of combustion. These are the light C_1, C_2, and C_3 hydrocarbon fuel fragments and C_4-and-heavier hydrocarbons that have been chemically restructured under the thermal stress of combustion. The emissions are, therefore, a mixture of original fuel components and other hydrocarbons,

[2] Numbers in parentheses designate References at end of paper.

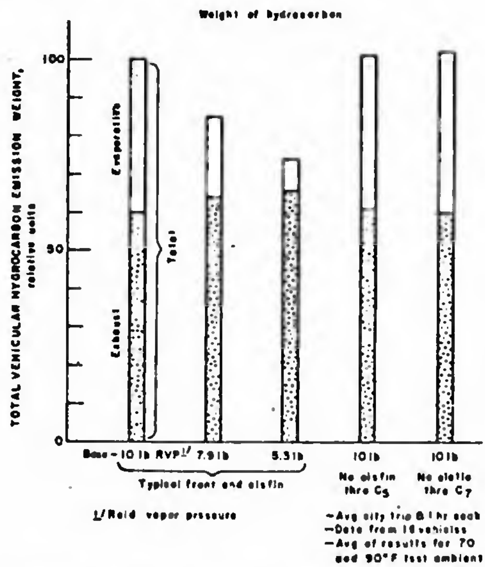


Fig.1 Dependence of hydrocarbon emissions on fuel characteristics, Dimitriades, et al. (5)

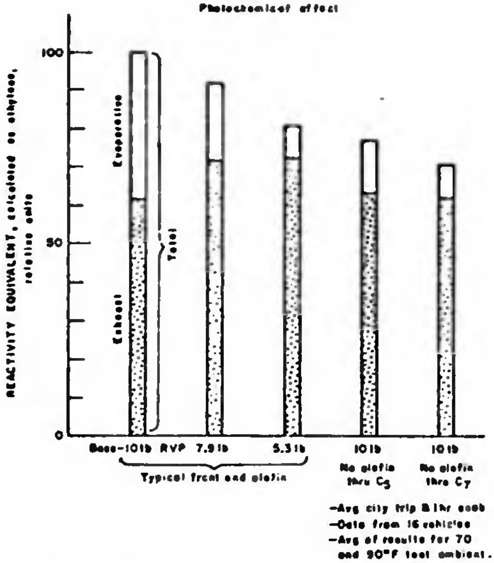


Fig.2 Dependence of hydrocarbon emission reactivity on fuel characteristics, Dimitriades, et al. (5)

with the composition of the mix dependent both upon fuel characteristics and upon engine-operating parameters.

Hydrocarbon is also lost directly from fuel systems, and this loss occurs primarily from two locations: the fuel tank and the carburetor.

The fuel-tank losses occur both (a) as a result of fuel vaporization that provides a driving force to displace vapors from the tank and (b) as a result of temperature cycles that induce the tank to breathe alternately inward and outward. While breathing inward obviously involves only the atmospheric air, the outward breathing involves both previously ingested air and fuel vapors that have mixed in the vapor space over the fuel. Fuel-tank losses involve the very light components of the fuel and, therefore, reflect the composition of the most volatile part of the fuel.

Carburetor losses are a result of fuel boiling from the carburetor in much the same fashion as water that is boiled from an open pan. During engine operation and during shutdown periods, when the engine and engine compartment are hot, temperatures of the carburetor and fuel in the carburetor may approach 200 deg F. Under these conditions, a sizable portion of the fuel may be evaporated; under extreme conditions, the fuel in the carburetor may be evaporated completely. It follows, therefore, that the composition of material lost from the carburetor follows the composition of, first, the light ends of the fuel, and, under more severe conditions, the progressively heavier fuel components.

While the composition of evaporative losses is governed by the volatility and compositional characteristics of the fuel, note that simple deductions concerning the relationship may be misleading. The time-temperature history of fuel in the fuel tank and in the carburetor must be known, and key parameters of the vehicles involved must have been experimentally investigated if the fuel-emissions composition relationship is to be correctly deduced.

EXPERIMENTAL WORK TO RELATE FUEL VARIABLES AND EMISSION CHARACTERISTICS

Experimental work to relate gasoline hydrocarbon composition to automotive exhaust emissions has been done in several studies—the most recent of which are reported by Dishart and Harris (2) who worked with a relatively large fleet

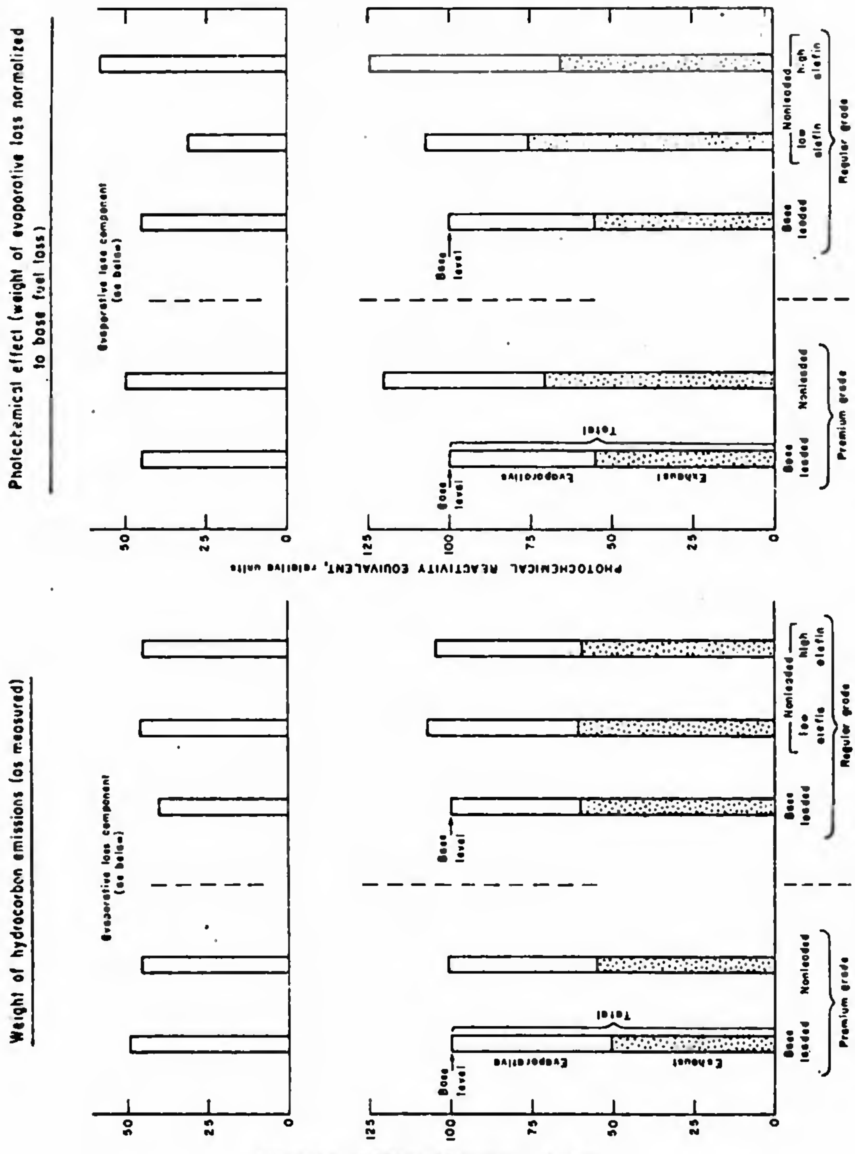


Fig.3 Comparative emissions - leaded and nonleaded fuels, Dimitriades, et al. (5)

of automobiles operated on the road and by Stone and Eccleston (3) who reported on work at the Bureau of Mines with a fleet of vehicles tested on a chassis dynamometer. Dishart and Harris concluded "that no significant changes in photochemical reactivity, total hydrocarbons, carbon monoxide, or nitrogen oxides in the exhaust would result from changes in gasoline hydrocarbon composition." These results were applicable only to exhaust emissions, and in the study there was no attempt to correlate the overall effect of hydrocarbon composition on the mix of the exhaust and evaporative losses.

In the studies conducted at the Bureau of Mines (4, 5), both evaporative and exhaust emissions were involved. The results of these studies showed that the total vehicular emissions (evaporative and exhaust) were affected significantly by changing either fuel volatility or fuel composition. Whereas volatility changes affected the quantity of both exhaust and evaporative emissions, fuel composition was found to have little influence upon the quantity, but did affect the photochemical reactivity characteristics of the emissions. These findings are illustrated in Figs. 1 and 2 taken from a report by Dimitriades, et al. (5). Fig. 1 shows that reduction of fuel volatility from 10 to about 5 lb RVP significantly reduced the evaporative components of the vehicular emissions; this reduction in evaporative loss was accompanied by a small, although significant, *increase* in exhaust emissions. The overall result from reducing fuel volatility, nonetheless, was a reduction in total amount of vehicular emissions. The same figure also shows that the total amount of either exhaust or evaporative loss was essentially unchanged when fuel was altered by substituting saturated material for olefin within the C_4 to C_7 molecular weight range.

As previously discussed in the paper, the amount of hydrocarbon discharged into the atmosphere is not a satisfactory criterion of its contribution to pollution; the appropriate criterion would relate to its objectionability, i.e., to toxicity or health effects, to measurable damage to plants or materials, or to deterioration of esthetic quality of the atmosphere. While there is as yet no satisfactory single measure of the potential that emissions hold for becoming objectionable in these aspects, observation of artificially induced photochemical reactions provides one useful approach. In such artificially induced reactions, rate of NO_2 formation was measured as the criterion of reactivity of emissions generated at the Bureau of Mines. Results of these tests (to indicate smog potential of the emissions) were expressed as an equivalent amount of a moderately photochemical reactive material ethylene. For the purposes of this paper, it is adequate to explain that the quantity, grams ethylene equivalent, is indicative of the smog po ential of the emissions. Results of the photochemical experimental work are shown in Fig. 2.

By applying this criterion of the effect of fuel composition, it was found that reducing fuel volatility did affect emissions and that lower overall emissions were associated with the lower volatility fuels. The primary effect was upon the evaporative-loss component, and this was due to the fact that lowering the volatility reduced the amount of the evaporative losses. Some of the favorable effect of volatility reduction upon evaporative losses is canceled by an accompanying increase in smog potential of the exhaust. If evaporative losses were prevented entirely, e.g., by mechanical means, exhaust would comprise the total of emissions and the effect of fuel changes would be as shown by the exhaust data of Fig. 2 (lower portion of bars). These exhaust emissions were found to increase with decreased fuel volatility. It follows, therefore, that if mechanical means were used to reduce evaporative emissions, then with vehicles so equipped, lowering fuel volatility should incur a net penalty by way of increased smog potential from the exhaust. Experience in these tests to relate the fuel factor to vehicle emissions clearly demonstrates that total vehicular emissions rather than any one source must be considered.

In Fig. 2 the relationship of fuel composition to emission photochemical effect is also demonstrated for olefin reduction (right-hand bars). Fuel compositions altered to substitute paraffinic material for olefin through the C_5 and C_7 fractions, respectively, altered emissions so that the smog potential was reduced as much as 30 percent. In the case of this fuel modification by olefin replacement, the fuel factor acts only upon the evaporative losses with no significant effect upon the exhaust emissions.

The fuel factor becomes highly important in any consideration of reducing the amount of lead that is used in motor fuel for octane quality control. Lead-free, as compared with leaded, fuels necessarily contain high percentages of aromatic, alkylate, or some combination of naturally high-octane components. These high-octane components might be expected to influence emissions. Representative leaded and unleaded fuels were studied, and the results (Fig. 3) illustrate the interaction of fuel and emissions.

Leaded and comparable-quality prototype unleaded fuels yielded about equal amounts (left side of Fig. 3) of emissions. This was true for both evaporative and exhaust losses. If the photochemical effect is considered, the fuel factor is shown to exert significant influence. The fuel alterations from leaded to unleaded changed emission characteristics so that the pollution effect was increased by as much as 25 percent. The data for low and high-olefin unleaded fuels further illustrate the fuel-emission interaction. Olefin, occurring in the light-fuel components, influences primarily evaporative losses (top right, Fig. 3); while the aromatic content of the fuel, highest in the low-olefin nonleaded fuel, has the dominant influence on exhaust smog potential.

CONCLUSION

Fuel design influences significantly the amount and quality of automotive emissions. The emissions originate from two sources: the fuel system and the exhaust system. The volatility of the fuel affects the amount of emissions evaporating from the fuel system, while the hydrocarbon composition and distribution of the fuel govern the reactivity of these emissions. Exhaust emissions are affected only indirectly by fuel composition; engine parameters greatly influence the extent to which fuel influences the exhaust emissions. Overall, the relationships between fuel and emissions are complex and interact with vehicle parameters. Any one system must be evaluated in its entirety for the overall influence of fuel on emissions from all sources.

REFERENCES

1 Daniel, W. A., and Wentworth, J. T., "Exhaust Gas Hydrocarbons—Genesis and Exodus," Vehicle Emissions, SAE Technical Progress Series, Vol. 6, 1964, p. 203.

2 Dishart, K. T., and Harris, W. C., "The Effect of Gasoline Hydrocarbon Composition on Automotive Exhaust Emissions," presented at a Session on Air and Water Conservation, 33rd Midyear Meeting of the Division of Refining, American Petroleum Institute, Philadelphia, Pa., May 16, 1968, Du Pont Petroleum Chemicals publication.

3 Stone, R. K., and Eccleston, B. H., "Vehicle Emissions vs. Fuel Composition API-Bureau of Mines—Part II," presented at a Session on Air and Water Conservation, 34th Midyear Meeting of the Division of Refining, American Petroleum Institute, Chicago, Ill., May 13, 1969, API Preprint No. 41-69.

4 Eccleston, B. H., Noble, B. F., and Hurn, R. W., "Influence of Volatile Fuel Components on Vehicle Emissions," Bureau of Mines Rept. of Inv. No. 7291, 1969, (in press).

5 Dimitriades, Basil, Eccleston, B. H., and Hurn, R. W., "An Evaluation of the Fuel Factor Through Direct Measurement of Photochemical Reactivity of Emissions," presented at the 62nd Annual Meeting of Air Pollution Control Association, New York, N.Y., June 22-26, 1969, APCA Preprint No. 69-153.

Excerpt From Official Certified Transcript of Hearings of California Air Resources Board—March 5, 1970

Dr. Starkman. I think we should proceed.

I would like to welcome Mr. Livermore back to this group. I must say he has missed, shall we say, some rounds for the last few hours. They have been most enlightening and interesting. We haven't laid anybody out in the aisles yet. Hopefully we won't before the session is over.

The next person whom we have called up to say something, Mr. Richard Hurn, didn't volunteer. We thought perhaps we should ask him to come forth. If you will recall during the proceedings here there were some remarks that were made that alluded to increase in emissions accompanying the removal of lead from gasoline, and there was also an indication that it was Mr. Hurn's information that was being quoted. Mr. Hurn is from the United States Bureau of Mines, Bartleville, Oklahoma.

Mr. RICHARD HURN: Thank you, Mr. Chairman. I am Richard Hurn, U.S. Bureau of Mines, Petroleum Research, Bartlesville, Oklahoma.

I have been asked to clarify information from the Bureau of Mines' tests to determine comparative emissions from leaded and unleaded fuel.

Let me first emphasize that what I will say should not be construed as pro-lead or otherwise. I do suggest very careful consideration of the consequence of any fuel composition change that would accompany lead removal. And briefly, I would like to speak on three points.

First, I would like to clarify the concept of and the results of the Bureau of Mines' comparative tests of leaded and non-leaded fuel.

Secondly, I would like to present a qualitative review of some findings in our laboratory concerning the effect of lead, per se, not the deposits from lead, but the effect of lead, per se, on emissions.

And third, I would like to briefly comment on the possible consequences of altering fuel composition, not necessarily considering the lead issue, considering emissions in the auto population through the 1970 or 1971 model year.

It does appear to me there has been some confusion here, or at least a lack of clear distinction, in what is being considered. It appears to me there are two issues to consider: The effect of fuel changes upon the existing population of vehicles and the effect upon vehicles that will count.

Out on the plains of Oklahoma I hear a very dramatic plea and I think that certainly is justified for action to improve the situation now, and it would occur to me that there is action to improve the situation now, this action must be made upon the existing vehicles and although it is well to plan ahead aad certainly we should, then what is to be dono should be considered in the context of the effect that it has on the automobiles that are in the population now and will remain in the population for a number of years to come.

Let mo speak now to the Board's request for clarification of our findings comparing leaded and unleaded fuel.

First, I think the Board should know that these findings were not from work done by the Bureau of Mines alono. These findings were from work that was done cooperatively with the American Petroleum Institute in the general program of investigation that Mr. Hartley described just a few minutes earlier, so we were cooperating with A.P.I. We had guidance, excellent technical guidance, from the A.P.I. and this entire program.

The concept of the program was to determine the consequences upon the total vehicular emission including the exhaust gas as well as evaporative losses in changing from a leaded to non-leaded fuel of comparable octane quality in both the regular and premium grades. And let me again emphasize that the concept was to determine the effect in the present vehicle population. The leaded fuels were to be typical 1968 U.S. fuels. The non-leaded fuels were to be those that the industry would produce to meet the demand for a non-leaded fuel of octane quality comparable to that of present day fuels.

And so far as I have been able to determine, looking back on the experiment, the fuel design objectives we met as successfully as might be expected.

Very briefly, the experimental program was run using eight late model vehicles. The experiments were conducted monitoring emissions over a typical driving cycle and monitoring emissions during hot soak periods that followed the driving cycle.

The results that I will review and those that have been cited were results that were applicable to tests at 95 and 70 degrees Fahrenheit, the average of those tests.

Now, the result that was obtained in those tests is, I think, best summarized in a paper that was presented here on the West Coast to the American Society of Mechanical Engineers in the fall of this year. And I concluded as follows: Leaded and comparable quality, comparable quality prototype unleaded fuels yield about equal amounts of emissions. This was true for both evaporative and exhaust losses. If the photochemical effect is considered, the fuel factor is shown exerting influence. The fuel alterations from leaded to unleaded changed emission characteristics so that the pollution effect was increased by as much as 25 per cent, and that is the end of the quote from the published paper.

Let me call to your attention that the figure 25 percent depends upon the fuel composition changes that were made. In the regular grade category of fuels that were tested, there were three cases; the basic case, the typical leaded fuel; another case in which olefins were somewhat reduced and a third case in which olefins were somewhat higher than typical.

The photochemical effects from the exhaust gases of the low olefin unleaded fuel were increased by 38 percent over the photochemical effect from the regular leaded fuel. Now again, that is not to say, gentlemen, that if one changes, if one removes lead from fuel that this will happen. It is to say that it can happen if the fuel composition is as was used in this test.

Let me make it quite clear that from our viewpoint, from our analysis of these data, the application of these findings to today's question requires information on the fuels that will be involved, and let me repeat because I think it is very important, we have here recommendations for a fuel program, I submit that we cannot possible assess the desirability of these proposals unless and until there is information on the composition of fuels to meet the proposal.

We have heard from Mr. Hartley that he does not expect his company to change on balance on the net inventory the molecular structure of the fuel he will supply, so that one voice is heard, and I think we must hear others.

Let me speak now very briefly to typical points that may or may not carry so much weight and that is whether or not lead is good or bad or a technical point that will be useful in evaluating price that must be paid or the benefit that could be had by altering lead content, and I speak first to the question of deposits of emissions increase with accumulation of mileage on leaded and non-leaded fuels. It is an important point.

In working with several engines in the laboratory operated on a chassis dynamometer, on an engine dynamometer, but using cycles that we think are realistic and using cool down periods, we think this is a reasonably good test of the fuels under conditions that might be met in service.

We found that there was a definite increase of emissions from leaded gasoline over those emissions to be had with unleaded gasolines, in one engine. Results were quite inconclusive with two other engines. To be more specific, because I think it might be important, that engine which showed the highest sensitivity to lead deposits was a Chevrolet 327 engine. Now, this again is not to indite any one engine. I think it is to call to your attention what I believe is to be taken away from these experiments, not the suggestion that there is necessarily or that there is not an effect from lead deposits. I suggest that it depends upon the engine and I think there is evidence to suggest that the effect of lead deposits depend upon the service in which that engine is employed.

I would ask of those gentlemen who have produced very good experimental data comparing leaded and non-leaded fuels whether the base fuel was truly typical of today's gasolines. The fuels that we used in our experiment we think are typical. I know the Ford experiments were done in a very excellent manner and with very clear results were done with Indolene 30, I believe that is correct, and clear Indolene and I would submit that these fuels are not at all typical of present U.S. fuels and it would be quite interesting to see results of comparable tests if typical U.S. fuels were used.

I would like to speak very briefly to give you qualitative results from the work with fuels in one case clear and in the other case leaded in which there was a quick switch from one to the other and therefore the effect of the deposits was not involved. The only difference was the lead content of the fuels.

In a series of experiments using in effect four engines with specific tests in each case repeated eight times and using two base fuels, each of these base fuels, leaded and clear, we found no discernible effect of lead, per se, upon combustion. Again, I submit that this may be a system effect and I think it would be inadvisable to make decisions concerning this vast fuel investment and inventory without clearly checking out the possible inferences of differences in fuels and differences in fuel system whereas the lead, per se, effect is concerned.

Finally, gentlemen, I would like to make a point about the consequence of changing from fuels that have today's typical characteristics to some fuels of unknown characteristics, and I do not have any information to submit on the consequences of changing. I can tell you that the data from a very large number of experiments to be obtained over the last two years with some 20 or 30 very carefully selected fuels used in tests that we think are representative tell us that both hydrocarbons and CO emissions are penalized when fuel specific gravity is reduced from that that is typical of toay's fuels to values that we associate with fuels of lower volatility and fuels that have some other characteristics.

Now, I am not submitting that specific gravity of fuels, per se, have any fundamental significance whatsoever. I think it is an indicator of a characteristic of today's fuels, and the only thing this tells us is that when we depart from that characteristic which has been built into today's fuel and for which today's engines have been designed, we see a rather significant penalty in exhaust emissions, and again I would submit that considering the effects upon today's present population, it would be well to co sid r very carefully the consequence of going to fuels of different formulatic n, and I think we do need to get the answers in on what fuels will be supplied in answer to the proposal that has been made. Thank you.

Dr. STARKMAN. Thank you very much, Mr. Hurn. I think this gets the question right out in the open and helps in interpreting the statements that have been attributed to you. Questions then from the members of the Board or the Committee. Dr. Cattaneo.

Dr. CATTANEO. I take it you did not use the 7 mode cycle to determine the emission level?

Mr. HURN. Yes, sir. In which, Dr. Cattaneo?

Dr. CATTANEO. Well, the ones where you specifically measured emissions.

Mr. HURN. Those tests that were made determining the effect of fuel composition, those tests to which I referred as having been made in cooperation with A.P.I. were made using the 7 mode cycle. Those tests to which I referred investigating the effect of emissions on build up or increase with mileage accumulation were made using a different cycle that included some heavy acceleration on high speed driving.

Dr. STARKMAN. I think Dr. Haagen-Smit has a question.

Dr. HAAGEN-SMIT. You were talking about 100 per cent increase. Are you going to reduce the emission to, let us say, 10 per cent of what it was? Then that 25 per cent doesn't mean much, does it?

Mr. HURN. That is correct, Dr. Haagen-Smit. This is why I think it is important to consider the problem in the context of an existing population and population that will come, but I think we must be careful that we again or continue to assess the effect of fuel composition on that population that will come, because although it may be a small amount, it still could be 35 per cent of whatever level is to be achieved and the ratio of loss to achievement remains the same.

Dr. HAAGEN-SMIT. That is just my point. I think we are bombarded in L.A. Now, we made a lot of statements over there. We are bombarded all the time with this percentage business and we are not after the percentages. Now, when it is 25 per cent increased from 10 per cent that was left, that is a very small quantity it seems to me.

Mr. HURN. This is true, Dr. Haagen-Smit. There is no question. This is a question of appraisal of benefits. We have long supported a change to mass or absolute quantities for describing emissions. However, I think the fact remains and I think it remains inescapable whenever we are 50 parts per million control level, if it is important that we get to 50, it is then important whether it is 50 or 75.

Dr. HAAGEN-SMIT. Well, I still don't agree with you. I want to point out the closer we come to zero, it doesn't matter at all. As a matter of fact, it doesn't make any difference what kind of cycle you have. It doesn't matter if you increase your aromatic content.

Mr. HURN. I couldn't agree with you more. When we are at the delightful point in time, then it doesn't matter, and if the control devices act equally upon the fuel and exhaust constituents, then the point becomes irrelevant.

Dr. HAAGEN-SMIT. We are coming pretty close to it. We already came from about 900 parts per million hydrocarbons. We will pretty soon be at 50, so those differences don't sound very large anymore.

Dr. STARKMAN. Mr. Chass.

Mr. CHASS. Mr. Hurn, see if I can perhaps put this whole problem in a smaller block here. If L.A. County requires the 1974 standard to be met on parts of all automobiles and until 1980 before a substantial number of those vehicles meet those '74 standards, then are you saying that between 1970 and 1980 we really should watch very carefully the fuel composition in existing vehicles?

Mr. HURN. I think we should watch carefully the consequence of fuel changes wherein that consequence reflects a change in emissions from the current population of vehicles because the numbers tell me that from 1972 or '74 on the greatest contribution to and the greatest source of problems in Los Angeles will be the narrow existing vehicle population.

Mr. CHASS. Might I ask you the same question I asked a speaker yesterday. Then would you support legislation placing a maximum on the aromatic content?

Mr. HURN. Mr. Chass, I would like to supply you with technical data, but I cannot answer that question.

Dr. STARKMAN. Dr. Cattaneo.

Dr. CATTANEO. I would like to add that this discussion I think to me, this is just an additional reason not to change the composition of the pool gasoline anymore than we have to and I think the refining industry has given us ample reason to try and avoid any such major change because of the expense and everything else associated with it. But limiting the content of a particluar gasoline, now you do something else if you split the pool one way or another way, your total aromatic you put into cars would remain the same regardless of how you split it, but if you set a maximum, then you now prescribe how the pool has to be spread, so I don't really see the way it looks to me now that this is going to be a major problem.

Dr. STARKMAN. Do you have an answer to that, Mr. Hurn?

Mr. HURN. No, I have no answer. I can't fault the reasoning at all. Again, the extrapolation of information that I have is only to say that we must look at fuel composition and assess the effect of any lead change. We must know what corresponding changes there will be in fuel composition.

Dr. PITTS. Just to follow that one more step, a specific example, are you suggesting, or is it implicit in the proposal of Mr. Hartly, since the total pool would be unchanged, the proposal then, some of the problems you outlined that might come by modifying fuel composition are not a problem?

Mr. HURN. I think that is an intriguing question and I already have a note in my notebook to go back and look into that. I can't give you an off-the-cuff answer. Whether or not keeping the total the same will come out with the same effect is not self-obvious.

Dr. PITTS. Just give me an acknowledgment then.

Mr. HURN. I would not expect it.

Dr. STARKMAN. The answer then at the moment is you don't expect there to be any change in the effect in the atmosphere?

Dr. PITTS. But he reserves the right.

Dr. STARKMAN. Thank you very much, Dick.

Mr. SATTERFIELD. Let me ask you one further question. I gather from your statement and from what I have read that there has been established a feeling that you can't really consider the fuel in an internal combustion engine, in and of itself, in terms of emissions but you have to consider the entire system in the automobile. It has been suggested here that we give to HEW the right to establish standards for the content of the fuel that is to go into motor vehicles.

If they have this right, would it not follow, based on the fact we are talking about the whole system, that they should have the same right with respect to the component parts of an automobile engine and its exhaust system?

Mr. DOLE. This would be a difficult subject to disagree with you on. There should be a systems approach to the emissions problem. As a matter of fact, one of the problems with emissions research is that it has not been systems oriented. We have been looking at bits and pieces instead of the whole thing. I find it very difficult to argue with your conclusion, sir.

Mr. SATTERFIELD. It would seem to me and I don't know whether you can comment on this or not, that this would go so far as to vest in whatever authority we vest the power to set such standards the right to tell the automobile manufacturers how to build their engines and what to put in them.

Mr. DOLE. I hope it would not go that far.

Mr. SATTERFIELD. Do you think it should?

Mr. DOLE. I think we are entering into a field, Mr. Satterfield, that would be pretty sensitive, that is to tell industry how to conduct its private business.

Mr. SATTERFIELD. Well, if you are going to do this for the fuel industry, if someone is going to say it can't use lead or if they are going to say, as was suggested here, that maybe they should restructure their fuel, it would seem to me that this would be to do precisely to the petroleum industry what I suggest maybe should be done to the automobile industry, if a unified system approach is what we are talking about.

Mr. DOLE. You put up some very persuasive arguments.

Mr. SATTERFIELD. Thank you, sir.

Mr. ROGERS. Dr. Carter.

Mr. CARTER. Thank you, Mr. Chairman.

I notice that you are studying or evidently doing some research work on the manufacture of synthetic gas from garbage. Is that right?

Mr. RAMPACEK. Yes, sir.

Mr. CARTER. What is the process?

Mr. DOLE. Dr. Carter, we passed out a press release just a little bit earlier which tells of the work that was done. It has not been in depth. It was a matter of taking regular municipal garbage, putting it in an autoclave and hydrogenating it. The residue came out as a crude synthetic fuel.

Mr. CARTER. Yes. This was in the manufacture of crude oil, a type of petroleum, was it not?

Mr. DOLE. Yes.

Mr. CARTER. You spoke of synthetic gas, too. Would that be a distillate?

Mr. DOLE. No, the synthetic gas would be derived from the gasification of coal or of lignite.

Mr. CARTER. What do you mean by gasification of coal?

Mr. DOLE. Converting the coal into a gas and a char.

Mr. CARTER. That would be by heating, of course, would it not?

Mr. DOLE. By heating and by distillation.

Mr. CARTER. That is my point. That is what I wanted to know.

Mr. DOLE. Mr. Carter, I think Mr. Rampacek would like to add something to this if you please.

Mr. CARTER. Surely.

Mr. RAMPACEK. With respect to the production of distillate and synthetic gas from refuse, we have actually been using the pyrolysis method. At Pittsburgh, we have been working on the coking of coal for a long time. We have used the same equipment there to coke the refuse and we have produced a high quality synthetic gas, and also a distillate which consists of a variety of hydrocarbon materials. We are now characterizing the liquid fractions of the distillate.

Mr. CARTER. I notice, also, that you state that air pollution potential can be reduced by suitable changes in gasoline. What are these changes you refer to?

Mr. RAMPACEK. I stated earlier that by reducing the amount of volatiles at the head end of the gasoline,——

Mr. CARTER. The ones that come off first when they are heated, in other words?

Mr. RAMPACEK. Yes, sir, they are the ones that evaporate from the gas tank and also from the carburetor.

Mr. DOLE. Actually, these are put into the air prior to combustion.

Mr. CARTER. Yes. You lose a good portion of your gasoline that way.

Mr. DOLE. That is right.

Mr. CARTER. What are you going to do? Are you going to evaporate that before you use it as a fuel?

Mr. DOLE. In the blending of gasoline, various fractions are blended into it and, of course, you would blend in heavier fractions rather than the extremely light fractions.

Mr. CARTER. You think, then, that the end products of combustion would not be as poisonous, there would not be as much nitrogen oxide?

Mr. DOLE. The nitrogen oxide content would be about the same, the carbon monoxide and the unburned hydrocarbons and some of the olefins that are emitted in the exhaust would be somewhat lower.

Mr. CARTER. The more nearly perfect fuel, the nearer complete combustion, the less residue you have, is that not true?

Mr. DOLE. That is right.

Mr. CARTER. What is the sulfur content of lignite?

Mr. DOLE. Of course, that depends on where you get it. A lot of the lignites have fairly low sulfur content. Sulfur content is down around two or three percent or less.

Mr. CARTER. Do you have any bituminous coal with a lower sulfur content than that?

Mr. DOLE. I beg your pardon?

Mr. CARTER. Do you have any bituminous coal with a lower sulfur content than two percent?

Mr. DOLE. From the eastern United States, from the Appalachian region, I think you are referring to?

Mr. CARTER. Yes.

Mr. DOLE. Yes, there are some Kentucky coals, I believe, that have a sulfur content less than half of a percent.

Mr. CARTER. Less than one percent at least?

Mr. DOLE. Yes.

Mr. CARTER. That is Harlan County, particularly, and Lester County. You were speaking of your coal conversion plants in West Virginia and Chicago. How are they progressing?

Mr. DOLE. The plant at Cresap has had its problems We now are making a review of the operation. We have just authorized a review of this plant to see if we can overcome problems they have encountered. The plant at Chicago on the gasification of coal has been so successful that we are now talking with our contractor about going directly into a pilot study. This is based upon the bench scale studies that have been made.

We are going to move into our gasification program faster than we had anticipated because of this success.

Mr. CARTER. What are the products you get from heating coal?

Mr. DOLE. You get pipeline gas and a char.

Mr. CARTER. Pipeline gas?

Mr. DOLE. Yes, pipeline gas and a char that can be used in furnaces.

Mr. CARTER. That is a sort of coke?

Mr. DOLE. A good deal like coke, yes, sir.

Mr. CARTER. This gas, of course, if it were distilled would be a volatile liquid sort of like gasoline, would it not?

Mr. DOLE. I imagine there could be a way to go about this but I am not enough of a chemist to tell. Our studies have followed two lines. One has been in the direction of liquifying coal to produce a gasoline. This is the type of project we have down at Cresap, West Virginia.

The other approach is to make a pipeline gas and a char from the coal directly. It is not pointed toward further work on the gas, itself.

Mr. CARTER. Is this gas to be used as a fuel in thermal electric plants, particularly?

Mr. DOLE. Thermal electric plants and other purposes for which natural gas is used, such as cooking, heating and so on.

Mr. CARTER. Have you any information on the composition of this gas?

Mr. DOLE. Yes, I am sure we do have.

Mr. RAMPACEK. It has a composition very similar to natural gas. It would contain about 93 percent methane.

Mr. CARTER. 93 percent methane?

Mr. RAMPACEK. Which is about the composition, of natural gas.

Mr. CARTER. Carbon and hydrogen?

Mr. RAMPACEK. CH_4.

Mr. CARTER. Methane?

Mr. RAMPACEK. Yes. The relative Btu value of the synthetic gas will be about 950 Btu's per cubic foot as compared to natural gas which varies between 950 and a thousand.

Mr. CARTER. How expensive is this as compared to the production and the use of natural gas?

Mr. DOLE. Correct me if I am wrong, Mr. Rampacek, but we estimate that the production cost will be somewhere around 40 to 45 cents a thousand Btu as compared with natural gas which is around 28 to 30 cents a thousand Btu. Am I within the ball park?

Mr. RAMPACEK. Right.

Mr. CARTER. Synthetic is about 55?

Mr. RAMPACEK. It is a little less than that, around 40 to 45 cents to manufacture. I would call to your attention, Dr. Carter, that there are many who feel that the price of natural gas is underpriced and it could very well be that we will go into a gas shortage in the 1973–1980 period. The price of natural gas may rise.

Mr. CARTER. Of course, if you use natural gas in these automobiles, you don't have these bad fumes.

Mr. RAMPACEK. No, you don't. It has a high octane rating, also.

Mr. CARTER. Thank you, Mr. Chairman.

Mr. ROGERS. Thank you very much, Mr. Secretary. If you will furnish the information that has been requested for the committee, it will be helpful.

Mr. DOLE. Thank you.

Mr. ROGERS. Our next witness is Denis Allen Hayes, Coordinator of Environmental Action. Mr. Hayes, the committee will be pleased to receive your testimony.

The committee invited Mr. Hayes to appear this morning and give us some of his thinking in this area of pollution, and particularly how young people in the country are responding, and how they feel, and whether they think the present efforts are sufficient or not.

We will be pleased to receive your thinking at this time. We are delighted to have with us, Mr. Hayes. You might tell us just a little bit about your group and what is being planned. I think the committee might be interested in this—to public opinion in doing something in this area.

STATEMENT OF DENIS ALLEN HAYES, COORDINATOR OF ENVIRONMENTAL ACTION

Mr. HAYES. Certainly, Mr. Chairman.

Perhaps that would fit in most appropriately toward the end because of the way I thought I would present this material.

Mr. ROGERS. Any way you want.

Mr. HAYES. First, I would like to thank you very much for this invitation to comment on the ways the Reclamation and Recycling Act and the amendment to the Clean Air Act.

When I accepted your invitation my immediate expectation was that I would be commenting in some depth on the substance of the proposed legislation. I am bothered by the emphasis on new plants in the legislation and the slight attention which is being paid to the existing villains.

I am bothered by the many areas in which the Secretary of HEW could make exceptions such as research, investigations, studies, demonstrations, training or natural security.

I am bothered by the thought of establishing standards with insufficient provision for regular review and revision to upgrade those standards over time.

I am very disturbed at the weakness of the enforcement provisions, giving no courtroom priority, no provisions for citizen or class suits, the discretion allowed with regard to fines and the grossly inadequate funding of the enforcement sections.

At a time when the most frequently heard phrases in Washington, D.C., seem to be "law and order," industrial criminals seem to be treated with kid gloves. This is disturbing to me. I think it is disturbing to much of youth.

On reflection, however, I consider my contribution would be more worthwhile if I left the technical details of the specific processes of legislation to other witnesses and directed my remarks to the broader matters of the conceptual setting of these bills.

Polluted air can probably be held accountable for ten to twenty deaths every day in New York City. Emphysema death rates have increased twenty deaths a year in each of the last 20 years in California. And people, I think, are getting angry. A good deal of this air pollution is a result of the by-products of the internal combustion engine and lead-free gasoline which I understand the committee has been devoting a good deal of its time to.

Modifications in I–C engines and in fuels, are really no answer. We will still be plagued by carbon monoxide, nitrogen oxides and various hydrocarbons. The time has come to realize that in order to deal effectively with this whole matter of automobile pollution, we must look seriously to man's subordination to the car culture.

Americans are not looking now for new mufflers. Americans are looking for a way to clean up their air. That is something that will result in some very significant shifts in the whole transportation matrix which pervades the country.

Americans eat in cars, sleep in cars, watch movies in cars and make love in cars. We bank in cars, buy groceries in cars and 80 percent of our long-distance travel is in cars.

General Motors continues to exploit us with what they term the "latest necessary accessories" and the neighborhood dealers then cash our paychecks for the next three years. We are dealing here with an industry guilty, I believe, of an inexcusable assault on the nation's ecological system, an industry whose three major producers have amassed more wealth than the overwhelming bulk of the nations of the world. We cannot pretend to be concerned with the environment and allow our society to continue to be enslaved by metal captains.

There seems to be no way that the automobile can be challenged in the context of the existing order. It can be modified—most of the modifications proposed to date have been slight—perhaps contents of automobile bodies can be changed for easier recycling but by and large the automobile has not been challenged.

One need only look at the vested interests at play; the billions of dollars that are invested in Detroit in perpetuation of the auto industry; billions of dollars invested by the petroleum companies; accelerated now with the development of the North Slope, the three million six hundred thousand miles of roads and streets—one mile of road for every square mile of land in the country.

There are probably a series of legislative bills that could be designed that would be dealing effectively with the automobile and perhaps even create a new kind of system in the country, a system much more geared to public transport. But the kinds of legislation which would be required would demand acts of courage which I simply have not seen emerging from Congress.

Unfortunately, as had been suggested several times, we are in a pretty bad situation, and it's getting worse. I think the young people of America are coming to recognize that we don't have much time and therefore we can't afford to give you much time.

President Nixon has boasted that for the first time in two decades, the Federal Government will spend more money on human resources programs than on national defense. That statement resulted from some new pie charts and some new approaches to the way of conceiving of the budget, bringing in funds that had never been considered in the general budget before, like Social Security. It also meant that such things as veterans payments, previously considered as "defense," were now "human resources."

However, in the budget where fifteen cents of every general revenue dollar goes for past, present or future wars, only four-tenths of one cent will go to improve the air we breathe or the water we drink.

The President has suggested in another context that, "small decisions today often lead to large cash outlays in the future." For example, the $1.5 billion expected for ABM today is going to be escalated into a cost of $10 to $50 billion.

Today we are trying to go spend $87 million for AWCS, a new airborne radar system, that is ultimately going to be costing $15 billion. Today we are spending $370 million for a start on the F–15 fighter plane that is expected to mushroom to beyond $25 billion.

We are beginning to recognize the interrelationship of all of this. We have a finite number of resources available, and the distribution of resources in one area has an impact on how many resources are available to be distributed in other areas.

If we spend our money in one area, we can't spend it in the other. Many of us are beginning to think we are spending our money in wrong areas. Within that context the wastes reclamation and recycling act budget receives less than one dime per citizen per year. That seems a rather insignificant approach, a token gesture—laughable in light of the fact that each of those citizens is producing five pounds of personal solid waste every day.

The "city" is burying itself in its own solid wastes. At the same time our air is being poisoned at a scandulous rate and nothing of significance is being done at the Federal level to combat this.

I think nothing of real significance is being proposed in bills.

Now, to address the question that you were asking at the beginning, Mr. Chairman, about what is happening today.

There is a new kind of concern that seems to be building in this country. It is a concern, not with a series of small, little problems. It is a concern with what I think is The Problem. It is a difficult thing to try to speak of it in a very few sentences. It is the problem of perpetuating the delicate balance of life on this planet. In a great many ways that balance is in an uncertain state right now.

We have been organizing across the country for a series of educational activities that will be taking place on April 22. We presently have ongoing organizing groups on 950 college campuses, over 4,000 high schools, and several hundred community groups and organizations.

At this point it is a little bit silly to talk about the magnitude of the number of people who will be participating on that day. It will be a function of a great many things that will be evolving in the course of the next month, not the least of which will probably be climatic factors.

But it is safe to say it will be a gigantic operation and it will have a fantastic educational impact on the country. A lot of people will be looking at the kind of things that are coming out of Congress much more closely this year.

In the past, a Congressman only had to go home and read off a couple of names of bills that had "environment" in the title and the people were satisfied. This year will be different. Our groups are analyzing every one of your votes. The questions that are going to be addressed to you and your colleagues as you campaign for election this year will be informed questions.

People will be seriously concerned with your answers. There is a story that is of some sort of significance as a possible closing anecdote. When miners went into the mines before they had sophisticated meters, and apparently in many countries it is still the practice, they would take down some birds with them. The birds would be singing during the course of the day. If the birds ever stopped singing, the miners knew they were in trouble and they scrambled out of that mine as rapidly as they could, because that meant that the birds were being poisoned by something in the air.

In a great many areas in this country right now our bird population is being devastated. People who used to have birds in their back yards don't have them any more. We have extinguished several species in the course of the last five years because of chlorinated hydrocarbons having an effect on egg shells and otherwise. The birds are stopping their singing.

There is no place we can scramble to. We are stuck right here. We have to start cleaning up this planet. We have to start today.

Mr. ROGERS. Thank you, Mr. Hayes. That statement, I think, is helpful to the committee to let us know the feeling of so many young people, not only young people. This committee, too, is concerned. That is why we are having these hearings to see what can be done. I think your approach of a teach-in is an excellent approach so that people can be informed because if we know what needs to be done and what can be done, then I think we can make real progress.

I think this type of activity in a positive way is so much more effective than a negative approach. So, I commend you for a positive approach of teaching and getting knowledge out. I think this is one way we can help solve our pollution problems which are tremendous.

I agree that the current programs do not anywhere meet the need of our nation. We have tried to point this out in some of our hearings. For instance, today, where we have four and a half billion dollars spent on handling solid waste, four and a half billion dollars, we have a research budget here in the Interior Department of $4 million.

This is true in air pollution. I think they estimate up into the $11 to $20 billion from air pollution damages. We are spending a hundred million dollars. That is what the present effort is supposed to be. So, I would agree with you. This must be accelerated. I am hopeful this committee can begin to do something about it.

Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I would like to say this, I welcome the comment you have made that people are going to be looking at us this year and wanting to know what we believe and why we believe it. I welcome this always. I might say at this point, since you brought that question up, that it is my hope that the people you speak for will afford us the same kind of objectivity that we have the responsibility to exercise in the position we occupy.

I was interested to note when you started off that you mentioned something about this being a time we hear about law and order and then referring to "industrial criminals."

I am interested in the use of this word. We hear more and more about "industrial criminals." Actually, you don't have any criminals in this country unless there is a law which is violated. Isn't that right?

Mr. HAYES. Well, if you want to carry on a sort of semantic struggle, we are breaking a whole series of nature's laws.

Mr. SATTERFIELD. Don't you think you ought to state this is the type of criminality you are talking about rather than making a blanket statement that we have a lot of industrial criminals in this country?

Mr. HAYES. Mr. Congressman, there are a whole series of things that are being done in industries that are fairly well documented right now which are contributing enormously to the degradation of the world, and probably in an irreversible manner. That kind of action, whether or not this body or a state legislature has seen fit to pass a law, is criminal. As I was using the term, a criminal is a person or institution who robs others of their right to an ecologically-balanced world.

Mr. SATTERFIELD. Based on your own opinion, is that right?

Mr. HAYES. Right.

Mr. SATTERFIELD. I have no other questions, Mr. Chairman.

Mr. ROGERS. Dr. Carter.

Mr. CARTER. Thank you, Mr. Chairman.

Are you a native-born American?

Mr. HAYES. Yes.

Mr. CARTER. For what reason have you selected April the 22nd as the time for these teach-ins?

Mr. HAYES. I actually became involved in the environmental action program only at the beginning of January. Prior to that time there had been two things established by a group that had constituted itself as a steering committee. They would incorporate us as a tax exempt organization and they would have some activity on April 22. The decision about April 22 was, to the best of my knowledge, made by Senator Gaylord Nelson.

Mr. CARTER. Why April 22?

Mr. HAYES. I presume there were a whole series of reasons.

Mr. CARTER. Is it because it is Lenin's birthday?

Mr. HAYES. You might very well ask Senator Nelson if that is the reason.

Mr. CARTER. I am asking you.

Mr. HAYES. I did not make the choice. By the way, it is also Queen Elizabeth's birthday, William Shakespeare's birthday, Marianna Kaufman's birthday, and her Aunt Linda's birthday.

Mr. CARTER. You have quite a list. You were ready for the question.

Do you agree with the late Mr. Joe Kennedy that all industrialists are sons of bad people. From what you have said, you have indicated that?

Mr. HAYES. No, they are not necessarily the sons of bad people.

Mr. CARTER. But they are?

Mr. HAYES. They are what?

Mr. CARTER. I certainly agree with you that we need to clean up our air and our water. I too have noticed there are not as many birds as there were at one time. I think that we can accomplish our purpose more by working with people rather than against them. I don't think that all of the people in this country are rascals or rogues. The majority of the people are good.

I can understand some anger, some frustration of the youth. I can understand some disgust with the idea that we are not spending more on this because we are spending more in other fields. I regret that that is done. Very fortunately, I had no part in that.

I must say that you are quite erudite and articulate in what you said.

Thank you, Mr. Chairman.

Mr. ROGERS. Mr. Preyer.

Mr. PREYER. Thank you, Mr. Chairman.

Mr. Hayes, I agree with the comments of the Chairman that the teach-in can certainly be a positive and effective event.

I am sure you will direct that at people generally as well as to your Congressmen because I think it is very clear that Congress is a pretty accurate reflection of the people of this country and in the nature of things is going to remain that way.

For example, you suggest more emphasis on public transport as a solution to the car problem. I think the reason public transport is having such a hard time vis-a-vis the car is because people like to drive to work in their car. The attitude of people is going to have to change on this.

I personally think it has to change. We have to have better public transportation but it is difficult to do something about it when people feel emotionally and personally attached to their automobiles until we get a changed climate of opinion.

As to industry, you mention General Motors. I think you used the word "enslaving." General Motors is providing what people want. I don't think they are trying to enslave people. So, rather than attack just General Motors, it is a question of getting people to agree with some of your ideas. I assume that that is one of the purposes of your teach-in, to persuade rather than just to castigate.

Mr. HAYES. That certainly is one of the purposes.

We are certainly trying to go to conduct an educational activity on the 22nd. Involved in that educational activity there will be some finger-pointing. There are some people who are doing some things that are vast abuses of what decision making authority they have received through one mechanism or another.

Some of that is Governmental, some of that is industrial. Some of that is personal. There will be a lot of introspection on the part of people, and a lot of people will have to be questioning their inherent personal values.

Within the context of people making decisions about things like the automobile, it is absolutely critical that we remember that people are going to be making decisions on the basis of what information is available to them. The function of decisions concerning transportation are going to be functions of the way the things are covered in the media, a function of advertising, a function of a whole variety of things that simply have to do with availability of transportation.

If you never had an option, if everything was automobiles, it is pretty difficult to expand your horizons to a different set of considerations. In this area there should have been a far greater amount of Governmental leadership.

I think it is absolutely critical that money be spent on developing mass transportation systems. Very little money has been spent thus far, and an insignificant amount is being spent this year.

If we are going to get rid of the automobile, we might put a statement on front of each automobile saying "This killed 50,000 people in America last year, and it is polluting products which are dangerous to your health." After all an automobile is more dangerous than a package of cigarettes.

I don't see any bills that are arising in Congress that will crimp the purchase of automobiles. If we can do that to cigarettes, it might be desirable to do it to automobiles. We might also talk about a massive campaign which would be educating people to the desirability of mass transport systems.

The kind of legislation that will be necessary is a ban on automobiles with internal combustion engines.

All these kind of things are dramatic steps. We are going to have to be taking them very soon. I hope they won't require a series of suicidal tragedies. One of these days Los Angeles will have that atmospheric thermal inversion, and 20 to 30 thousand people will die. But I don't see anything done in Los Angeles, California, or in the U.S. which will avert that.

Mr. PREYER. Thank you, Mr. Hayes. You have some mindblowing ideas there. We will follow their development with interest.

Mr. ROGERS. We appreciate your being here, Mr. Hayes. I think it is true that if we can approach this from an educational basis, the problem and possible solutions, that is what we are going to have to do. As you say, the American people are going to demand some individual transportation, even though we have mass transportation, I expect for some time to come.

So this is going to be an evolution of education and research and what possible soultions can come. I do think that your effort to begin this educational process with young people can be a very positive thing for good.

Thank you for being here. We appreciate your attendance.

Our next witness is Mr. Joseph M. Mullan, Director of Air Pollution Control for the National Coal Association, Washington, D.C. He is accompanied by Mr. Robert Stauffer, Assistant General Counsel.

STATEMENT OF JOSEPH W. MULLAN, DIRECTOR, AIR POLLUTION CONTROL, NATIONAL COAL ASSOCIATION

Mr. MULLAN. Unfortunately, I am not accompanied by Mr. Stauffer today. Mr. Stauffer. had to catch a plane to Denver this morning.

Mr. ROGERS. We are sorry that we had to hold you up. We appreciate your patience.

Mr. MULLAN. I am Joseph W. Mullan, Director of Air Pollution Control for the National Coal Association. National Coal Association is the principal spokesman for the coal industry and represents the major coal producing and sales companies of the Nation. We appreciate this opportunity to appear here and express our views on the proposed clean air legislation.

Air pollution is not a new problem. It has been with us, I suppose since the first campfire. However, it wasn't until 1963 that the Federal Government took an active interest in its control, with the enactment of the Clean Air Act of 1963, which was a product of this committee.

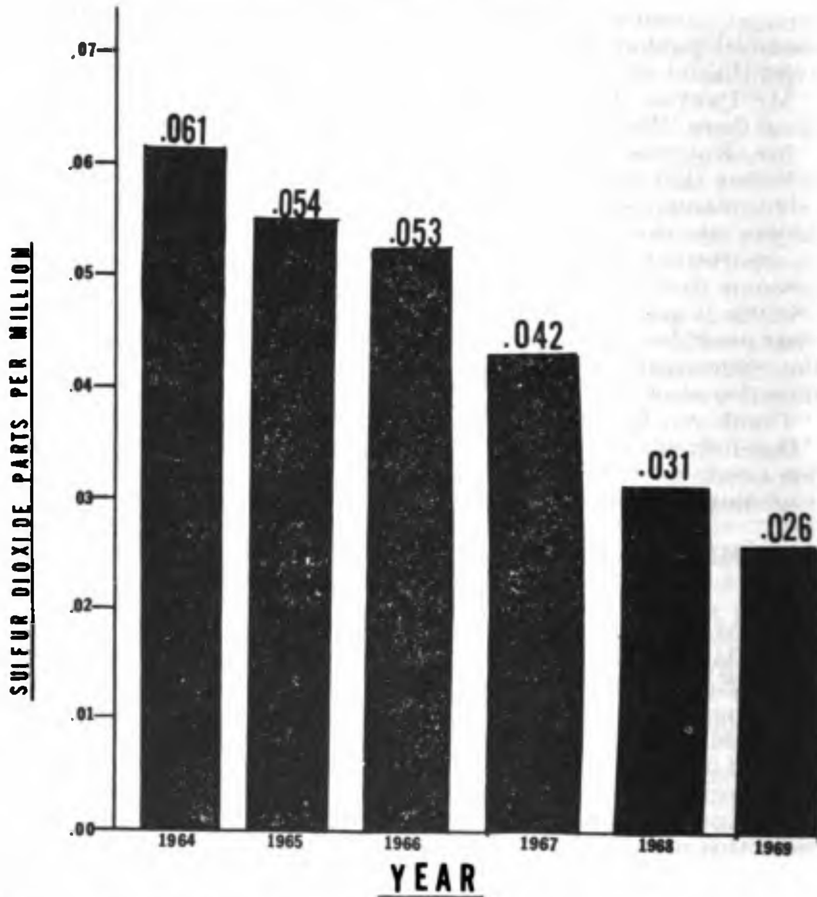
Much was accomplished in the succeeding six years. In that respect, I have attached an exhibit to my statement, graphic evidence that the air is getting cleaner—not dirtier—in some of our major cities. This is not to say it is clean enough, but it's a start.

Mr. Chairman, I request this be made a matter of evidence in this hearing.

Mr. ROGERS. Without objection it is so ordered.

(The chart follows:)

CHICAGO AIR YEARLY AVERAGE SULFUR DIOXIDE



Source: Chicago Department of Environmental Control Statistics; Figures shown are the arithmetic average of the 24-hour averages for the 20 station network in the Chicago area.

Prepared By: Mid-West Coal Producers Institute, Inc. February, 1970

Mr. MULLAN. The sulfur dioxide level in the Chicago area has declined steadily over the last six years. The attached chart illustrates this improvement. In 1968 and 1969 the level was well below the suggested goal of less than .04 parts per million as published in the U.S. Department of Health, Education, and Welfare criteria on sulfur oxide.

This improvement in the ambient air is due entirely to the voluntary efforts made by Chicago citizens, since the sulfur restrictions of the Chicago Air Quality ordinance do not become effective until July 5, 1970.

The 1969 average sulfur dioxide level of .026 parts per million was reached five years ahead of the schedule projected by the coal industry when the ordinance was being considered. Philadelphia, New York, and Washington have made similar progress.

Federal leadership, beginning in 1963, and expanded by the 1967 Act is, I believe, principally responsible for the improvements that have been made. But none of it would have been accomplished without cooperation by the government of lesser jurisdictions, and the active efforts of the industrial community.

We have had the opportunity to view the process as it now exists on a first hand basis. Either Mr. Stauffer or myself have testified at practically every air pollution hearing—State or Federal—held under the existing law. Certainly, based on experience under the law, improvements can be made, but, basically it is a "good law."

Section 104 would be amended to provide for a new expiration date, and, I quote, "such sums as may be necessary" . . . In this respect, I can only say that like any major national problem, it will take time and money to clean our air. But it must be done. It must be accomplished without sacrificing our industrial base and our power generation facilities. When it comes time to talk specific dollars and cents we would hope you will give serious consideration to expanding the funds to assist utility companies in the construction of full-scale size, sulfur removal facilities. These devices require huge capital expenditures, almost as much as a power plant itself, and therefore every electric utility is reluctant to take the first step alone, and justifiably so. But, a cooperative effort by the Federal Government, the manufacturer of the abatement device and an electric utility could result in a proven full-scale facility. This would not be a novel undertaking, for it would be no more, in fact many times less, than what the government has done with respect to nuclear power.

Inasmuch as Mr. James R. Garvey, our Vice President of Research and Engineering, testified at your hearings in 1967 on the state of the art of sulfur dioxide abatement devices, we feel it necessary to bring you up to date. In the interest of conserving the committee's time, we are including as an exhibit his February 25, 1970, statement to the Joint Committee on Atomic Energy.

Mr. Rogers. Without objection it is so ordered. The statement will appear immediately following your oral statement.

Mr. Mullan. His testimony at that time is exactly on point. It was accompanied by a number of exhibits, which we have not included, but if the committee wishes, we can furnish them for the record.

Simply stated, Mr. Garvey said, three years ago, that the sulfur abatement devices were near reality. On February 25, 1970, he described several systems that have been developed by industry without financial support from the government and guaranteed by the manufacturer to effectively remove the sulfur dioxide from the stack gases at efficiencies at or near 90 percent.

I might inject one small paragraph from that testimony.

> Still to be accomplished is the application of such process to existing and new power plants. When one considers the tremendous capital investment required for sulfur control processes, the reluctance of the utility companies to apply them is understandable. We believe the Federal Government could stimulate more interest by applying the available systems to Government-owned power plants and by participating in the financing of installations in privately owned plants for demonstration purposes.

Section 107 would be amended to provide for National Air Quality Standards and the repeal of the criteria procedure. We strongly support the continuance of the criteria procedure. We believe that the National Air Pollution Control Administration best explained the value of the criteria in its introduction in the criteria documents. I quote:

> Air quality criteria are an expression of the scientific knowledge of the relationship between various concentrations of pollutants in the air and their adverse effects on man and his environment. They are issued to assist the States in developing air quality standards. Air quality criteria are descriptive; that is, they describe the effects that have been observed to occur when the ambient air level of a pollutant has reached or exceeded specific figures for a specific time period. In developing criteria, many factors have to be considered. The chemical and physical characteristics of the pollutants and the techniques available for measuring these characteristics must be considered, along with exposure time, relative humidity, and other conditions of the environment. The criteria must consider the contribution of all such variables to the effects of air pollution on human health, agriculture, materials, visibility, and climate. Further, the individual characteristics of the receptor must be taken into account.
>
> Air quality standards are prescriptive. They prescribe pollutant exposures which a political jurisdiction determines should not be exceeded in a specified geographic area, and are used as one of several factors in designing legally enforceable pollutant emission standards.

It is vital that appropriate criteria be issued on each contaminant prior to hearings on air quality standards. Only in this manner can anyone even begin to appreciate the problem accompanying the particular pollutant. This procedure should be maintained.

We have strong reservations with respect to National Air Quality Standards. We say this even with the knowledge that some jurisdictions have adopted air quality standards which will never be realized.

The establishment of National Air Quality Standards would only serve to confuse and forestall action that has already been taken by many States. While it is known that the standards for only one air quality region have been accepted, some sixteen have been submitted, and are awaiting action by NAPCA. Many also have completed the public hearing stage, and standards are now being finalized. The States are obviously fulfilling their obligations under the Clean Air Act.

Should the Congress adopt the concept of a National Air Quality Standard, it is imperative that such a standard be evaluated in a manner similar to the procedures used in developing criteria. None of the current air pollution bills before this Committee would require public hearings prior to adoption of national standards. Certainly, hearings are cumbersome and time consuming. This is particularly true with regard to a subject as politically attractive as air pollution control. However, scientific evidence, as well as public opinion is accumulated in such a process and it would be unwise to sacrifice intelligence and prudence for speed in an area as vital to the Nation as air pollution control.

Section 108, of the existing law, deals with Air Quality Standards and Abatement of Air Pollution. Inasmuch as the proposed amendment of this section relates directly to proposed Section 107, much that we have previously stated would apply here. However, we are pleased to note that public hearings are called for with respect to implementation.

There are, however, two minor points upon which we would like to comment. The word "area" or "areas" appears in numerous places in the proposed section. Presumably, it refers to an air quality region. If so, we believe it should be so defined.

The second problem has to do with the word "Standards". In the area of air pollution control, it is probably the most misunderstood word that exists. We believe the word should be "Goals", and as this has also been recognized by NAPCA, we believe it should be made clear in any new legislation. Paragraph 2.20 of HEW's Guidelines for the Development of Air Quality Standards and Implementation Plans, states:

> 2.20 Air Quality Standards:
>
> Air Quality standards represent air quality goals established for the purpose of protecting public health and welfare. They provide a basis for State, local, and regional planning for the abatement and control of pollutant emissions from existing sources and for preventive measures to insure that urban and economic growth trends do not add to community air pollution problems.

In this manner, all concerned will know that it is a "Goal" to be achieved, not a "Standard" to be met today.

Our final comments refer to the proposed changes of Section 112, "Stationary Source Emission Standards." While this seemingly duplicates the authority of Section 108(k) of the existing law in some respects, it represents a completely new approach to Federal clean air legislation. The Federal Government has never been involved in this problem, so we must presume it is the result of the study called for under Section 211 of the Clean Air Act of 1967. The Act required that the report be made to Congress but we understand that it is being made public this week. Since we have not seen it, we cannot comment on its findings.

Subsection (a) of this section does not specifically refer to electric powerplants or any other industrial complex. However, for purposes of discussion we shall assume that the authors are referring to such installations, and this was apparently the conclusion drawn by HEW's witness last Monday.

If this interpretation is correct, we believe that in addition to a public hearing prior to setting the emission standards a procedure similar to the present criteria setting procedure should be followed.

We would, of course, support subsection (b) which provides for limitations on the emission of pollutants that are "extremely hazardous to health." So defined, there are probably few who could oppose it.

Finally, if it is determined that stationary sources should be federally regulated, we request that any stationary source emission standards apply to new installations only. This is specifically stated with respect to emissions that are extremely hazardous to health, subsection (b), but not with resepct to subsection (a). It is true that the Secretary could probably exempt any existing installation under the broad powers proposed for Section 112(a). However, we believe existing sources should be specifically exempt since, in the case of electric powerplants, the life is limited, and old plants are constantly being phased out and new ones are brought on line. It would be anything but prudent to try to up-date some of these old plants.

And, the Secretary is given discretion with respect to "technological feasibility." This, of course, is a phrase subject to wide interpretation. If liberally interpreted, the impact could be minimal. But if conservatively viewed, the Secretary could shut down practically every fossil-fueled powerplant in the country. We feel this should be expanded on.

In closing, we would like to paraphrase a question that we had directed to us at perhaps a dozen State and local air pollution hearings: "If we can put a man on the moon, why can't we have clean air?" Gentlemen, if we had the NASA budget we could! I mean we, everybody connected with solving the air pollution problem. "We" includes those government agencies involved, the industries involved, and yes, sir, the public also is involved.

We wish to thank you for the opportunity to present these facts to you.

(The statement of James R. Garvey, referred to, follows:)

STATEMENT OF JAMES R. GARVEY BEFORE THE JOINT COMMITTEE ON ATOMIC ENERGY, FEBRUARY 25, 1970

Mr. Chairman, my name is James R. Garvey. I am President of Bituminous Coal Research, Inc., Monroeville, Pa. BCR is an affiliate of National Coal Association, Washington, D.C. A biographical summary of my qualifications is attached to my written statement.

In the almost twenty-five years I have been with the national research agency of the coal industry, I have been engaged in or directed research on coal combustion including control of pollution resulting from coal combustion. During the past ten years I have on numerous occasions appeared before Committees of Congress and other governmental agencies to testify on the "state of the art" of control of sulfur oxides.

At one such appearance, before the New Jersey State Department of Health on October 6, 1967, I said:

"With all the activity by various research organizations, we are confident that an economically attractive approach for the recovery of sulfur oxides from flue gases will be available in the next three years, give or take a year."

The purpose of my testimony here today is to bring to your attention the fact that this prediction of about two and one-half years ago was correct. We now have commercial processes available for use although their economic attractiveness may not be all we desire; the added cost for sulfur oxide control may increase the cost of electricity to residential consumers by at least three and perhaps eight percent.

There are four companies offering for sale sulfur oxide recovery systems for existing and new electric power generating plants which when applied will enable the use of high sulfur fuels with stack emissions equivalent to the burning of fuels with 0.5 percent of less sulfur. We had hoped to have the four companies offering these systems appear here individually to describe their processes, and their confidence therein, but in the interest of conserving the Committee's time, three companies have agreed for me to present a brief summary of their development and to submit their written statements on the processes for the record. These statements are attached to my statement, together with a copy of a published review of the fourth. I hope the Committee will approve the inclusion of them in the printed record of these hearings.

All four processes have some similarities and some basic differences. Because of these, one or the other may have certain advantages in application to a given power plant depending upon size, location, age and available space. But all have in common the desirable advantage of upwards of ninety percent elimination of sulfur oxide emissions. For your information I will briefly describe the processes without any attempt to favor one over the others, although the coal research agency which I represent carried out work in our laboratories on one of the approaches and contributed financially to one other.

To fully understand the technical problems involved, and to better appreciate the cost, we must keep in mind that even with a very high sulfur fuel the gases emitted from a power plant stack contain very little sulfur oxides per cubic foot—of the order of a couple of thousand parts per million. To remove the dilute quantities of sulfur oxides we must first convert them chemically to another material so a separation can be made. All four systems available do this, but in a somewhat different manner.

One system is offered by Monsanto Chemical Company, a large and well-known chemical company, located in St. Louis, Missouri. Their process converts the sulfuric oxides into saleable sulfuric acid. The principal advantage of the Monsanto process is that the chemical recovery of the sulfur values is self-sufficient; that is, no chemical reagents must be brought into the power plant. By use of a catalyst and changes in the heat exchange cycle, a disposable liquid, sulfuric acid, instead of an untouchable gas, sulfur dioxide, is produced. To reduce the idea to commercial practice has required millions of dollars and the operation of a 15,000 KW pilot plant in Eastern Pennsylvania for two and one-half years. But the necessary development work has been done and Monsanto is prepared to sell this process and guarantee performance.

The second process has been developed by Combustion Engineering, Inc., whose main offices are in Windsor, Conn. Combustion Engineering is one of the leading suppliers of power boilers to the electric power industry—for both fossil and atomic fuel firing.

The Combustion Engineering approach to sulfur oxide control differs considerably from the Monsanto approach. First of all, no saleable product results. In addition, a chemical reagent must be brought in to react with the sulfur oxides—to change them into removable solids. But the end result is the same, removal of both particulates and sulfur oxides from the exit gas stream. The process has been proven feasible at a pilot installation in St. Louis and another at Lawrence, Kansas. As Combustion Engineering has pointed out in public statements, they are confident they can design and erect a recovery plant with a guaranteed sulfur removal equivalent to that of burning 0.5 percent sulfur coal and a guaranteed particulate removal of ninety-nine percent. Further, they have stated that while they will guarantee this high level of recovery, they expect to do even better.

One mid-west utility, Kansas Power and Light Company, has sufficient faith in the process that they are incorporating it into the design of a new 430 MW plant planned for operation in 1971. The decision of that Company is best expressed by an official thereof who, in discussing their pilot test of the Combustion Engineering process and their future plans, said:

"As you can appreciate, I am sure, this has not been an easy road, and there have been numerous detours, but it does look like we are going to be able to accomplish what we set out to do. Retain the clean air in Kansas, and burn coal at the same time."

The remaining two systems which are described in statements attached to my written test have not quite reached the advanced state of commercial development as that of Monsanto and Combustion Engineering. However, they are nearly there and as the statements of the companies indicate, they are confident of success in the near future.

Wellman-Lord Company, a prominent consulting firm in the phosphate fertilizer plant field, has pilot tested a sulfur oxide recovery plant at a large Maryland power station, and will start up another in New Jersey this year. Like Monsanto, this process produces a saleable product—but concentrated sulfur dioxide instead of sulfuric acid. This product can be used directly or shipped for ultimate conversion into sulfuric acid or fertilizer depending on markets in the power plant vicinity. Unlike the Monsanto process, an alkalai reagent must be introduced.

The final sulfur oxide recovery system described in the statements submitted is under development by Chemical Construction Corporation, commonly referred to in the trade as Chemico. This company is one of the oldest and largest chemical engineering firms in the world. For more than 50 years Chemico has been designing and erecting major process plant installations for the chemical, petrochemical and mineral process industries.

The Chemico sulfur oxide recovery process also produces a saleable product, elemental sulfur. But the approach is unique in that the final product is not evolved at the power plant. Recognizing that (1) electric power generating plants are not in the chemical business nor interested in getting into it, and (2) the economics of any sulfur recovery process will be primarily a function of the size of the plant which produces a final chemical product, Chemico conceives the total system as being in two parts. First, the power plant would be supplied with a chemical reagent for use in scrubbing sulfur oxides from the flue gases and, second, the used reagent would be shipped to a central processing plant for recovery of sulfur values and regeneration of the reagent for return to the power plant. Under this system, one large reagent processing plant could serve many small utilities—and even some industrial plants—in the most economic manner. As with the other three processes described, Chemico is ready to move into full scale application and eliminate sulfur oxide pollution.

The four processes which I have briefly described have been developed by industry without financial support from government. It is estimated that fifteen to twenty million dollars have been spent on them to date. A number of other companies have processes in various stages of development. In addition the

National Air Pollution Control Administration of the Department of Health, Education and Welfare is researching with public funds other feasible approaches to sulfur oxide control. One of these, the use of dry alkali additives, is currently undergoing large scale pilot test at a TVA power plant.

Gentlemen, that concludes my description of what we believe are currently available commercial processes and which, in at least two cases, the manufacturer is prepared to guarantee will eliminate the so-called "SO_2 pollution problem." I have made only passing reference to cost. As the President in a recent message to Congress stated, the cost of pollution control will be high. But the processes for sulfur oxide recovery which we are calling to your attention today are less costly than other solutions which have been suggested. These include the use of natural gas and imported foreign fuels. As this Committee has acknowledged, fossil fuels must be the source of energy for our power plants for many years to come despite the expected growth in atomic power. We feel the means are available to supply the needs without sulfur pollution by use of our vast reserves of coal, most of which is high in sulfur, through the application of the processes I have described and others now under development by the National Air Pollution Control Administration of HEW.

Still to be accomplished is the application of such processes to existing and new power plants. When one considers the tremendous capital investment required for sulfur oxide control processes, the reluctance of the utility companies to apply them is understandable. We believe the Federal government could stimulate more interest by applying the available systems to government-owned power plants and by participating in the financing of installations at privately-owned plants for demonstration purposes.

JAMES R. GARVEY, PRESIDENT AND DIRECTOR OF RESEARCH, BITUMINOUS COAL RESEARCH, INC., MONROEVILLE, PA.

James R. Garvey, president and director of research of Bituminous Coal Research, Inc., and vice president, research and engineering, National Coal Association, received a Bachelor of Engineering degree in Mining from the Ohio State University in 1941. Since then, with the exception of four years during World War II when he served in the Air Force, he has been associated with the coal industry in mining and in research.

He joined Bituminous Coal Research, Inc., in 1946, as a development engineer, rising to supervising engineer, assistant director of research, director of research in 1958, and president in 1963. As president of BCR, he has the primary responsibility for the development and execution of the cooperative research program of the coal and related industries. Early in 1966, the Board of Directors of National Coal Association, of which BCR is an affiliate, elected him vice president, research and engineering. In that capacity, he assumed the management of the industry's cooperative engineering service program as well as its research.

Mr. Garvey is a member of the New York and American Academies of Science; the American Institute of Mining, Metallurgical, and Petroleum Engineers, and the American Society of Mechanical Engineers. He is also a member of the American Gas Association, International Briquetting Association, American Association for the Advancement of Science, and American Coke and Coal Chemicals Institute. He has been an active member of committees of these societies, serving as chairman of several of them.

Mr. Garvey's service to the state and federal governments has been extensive. On appointment by Governor Scranton and reappointment by Governor Shafer, he has served on a Pennsylvania Advisory Committee on Pneumoconiosis. At the federal level, he serves on the General Technical Advisory Committee to the Office of Coal Research, U.S. Department of Interior; is a member of the Environmental Pollution Panel of the U.S. Chamber of Commerce, and is a member of the National Air Quality Advisory Committee of the U.S. Department of Health, Education, and Welfare.

In addition to mining engineering, his experience includes design and development of coal-handling and coal-burning equipment for residential, commercial, and industrial markets and technical supervision of coal utilization research covering a wide scope. He holds several patents on coal-combustion equipment and is the author of many professional papers covering research and engineering application in these fields.

In 1963, Mr. Garvey received the Percy Nicholls Award. This award is presented annually by the Fuels Division, ASME, and Coal Division, AIME, for notable scientific and industrial achievement in the field of solid fuels research.

Mr. Rogers. Thank you very much for a very fine statement. We appreciate your giving your ideas to the committee.

Mr. Satterfield.

Mr Satterfield. No questions, Mr. Chairman.

Mr. Rogers. Dr. Carter.

Mr. Carter. Thank you, Mr. Chairman.

If I might at this time refer to the previous witness, evidently he had really prepared himself as to the birthdays of people on the 22d of April. However, William Shakespeare was not born on that day. Neither was Queen Elizabeth. But very close to that day, one before and one after.

Thank you, Mr. Chairman.

Mr. Rogers. Mr. Preyer.

Mr. Preyer. No questions, thank you, Mr. Chairman. I think it is a very clear presentation.

Mr. Rogers. What would the cost be of getting rid of the sulfur dioxide from the stack gases? I understood you to say it can be done. Several systems have been developed. What will it range?

Mr. Mullan. Can I take the low and the high and we can work something in between?

Mr. Rogers. Yes.

Mr. Mullan. Proposals made by the Combustion Engineering Corp. have ranged between five and seven dollars per kilowatt installed capacity. This would be on a new installation of course, it would be higher on existing installations because of duct work changes, and sometimes the stack is in the way, things of that nature. That would be the low. The high would be, say probably the proposals of the Monsanto Co., which are more in the range of $27 to $35 per kilowatt installed. The range there being between new and retrofit on an older plant.

I have to add to this, though, that the Monsanto proposal ends up with a salable byproduct, it ends with sulfuric acid, which is a salable product. So its operating process would be lower. The Combustion Engineering process today has no salable product. That is two of several, I might add.

Mr. Rogers. If you could have any specifics for the record we would appreciate it.

Mr. Mullan. We will. This was included in our exhibits to the Joint Committee, the one I referred to. We will supply you with all of those exhibits.

Mr. Rogers. Thank you very much.

(The following statements were received for the record:)

Statement of Joseph G. Stites, Jr., Manager, Air Pollution Control Department, Monsanto Enviro-Chem Systems, Inc., St. Louis, Mo., Prepared for Presentation to the Joint Committee on Atomic Energy, February 25, 1970

Mr. Chairman, members of the Committee, I am Dr. Joseph G. Stites, Jr., and am manager of the air pollution control department of Monsanto Enviro-Chem Systems, Inc. This company has heavy orientation towards pollution control and is a subsidiary of Monsanto Company. My office is in St. Louis, Missouri.

I am involved in the development and marketing of a specific air pollution control process, called the Cat-Ox system. Cat-Ox effectively removes sulfur oxides and fly-ash from flue gas.

The process is the result of over nine years of research and development. Since 1967, we have operated a prototype plant at Metropolitan Edision Company's Portland, Pennsylvania generating station. The operation of the prototype plant has been technically successful. The prototype has been operated by power plant personnel. To date, more than 9,000 hours of operating time have been accumulated and more than 1,100 tons of sulfuric acid have been recovered and sold.

The prototype plant has demonstrated its ability to remove 100% of the fly-ash and 90% of the sulfur dioxide from flue gas. We are confident of the operability of the system and our ability to scale up to full size stations.

Fly-ash is removed from flue gas with a highly efficient electrostatic precipitator, sulfur dioxide is then catalytically oxidized to sulfur trioxide which is then removed from the system as a marketable quality sulfuric acid.

The sale of the recovered sulfuric acid can offset a part of the cost of installing and operating the equipment necessary to cleanse flue gases. Based on our experience, we consider the Cat-Ox system to be especially appropriate to large-capacity power stations which burn sizable tonnages of high-sulfur bituminous coal. We believe it would apply equally well to similar power stations that burn high-sulfur fuel oil. By "large" power stations, I refer to generating capacities of 100 megawatts or more. The system is applicable to both new and existing stations.

Conversely, we recognize that a Cat-Ox installation would not be suitable to all plants that burn fossil fuels, for reasons of their small size, age, space limitations and other factors.

Even when there is a recovered by-product, we believe that air pollution control will not be self-supporting cost-wise for utilities. With a process such as Cat-Ox on large plants, however, some of the cost can be offset. Furthermore, we believe the Cat-Ox system would be less expensive to the consumer of electric service than if utilities tried to solve their problems by purchase of low-sulfur coal or alternate fuels, assuming that it would be available.

Basically, those are the two alternatives to sulfur pollution by industry—either to burn a fuel that is low in sulfur, or to remove the sulfur from flue gas before it is released into the atmosphere.

Either way, the ultimate consumer will have to pay the cost. We estimate that a sulfur removal system, such as Cat-Ox would increase the cost of electric service from large plants by approximately 6–8 per cent to the resideutial user. This would vary depending upon the value of the recovered by-product. On the other hand, in some areas projected low-sulfur coal costs would increase the cost of electricity by 10 per cent or more. There is not an adequate supply of low-sulfur coal for the nation.

However, we know there *is* an adequate supply of high-sulfur coal. I believe Cat-Ox offers a definite advantage. It enables the utility to recover an economically useful by-product, sulfuric acid. Thus it conserves a natural resource that might otherwise be wasted. At the same time, with Cat-Ox, the utilities could help assure the future of the coal industry, which is important to the national economy.

In October of 1968, following a year of operation of the Portland unit, we publicized the commercial availability of the Cat-Ox system. Since then, a great deal of effort has been made to contact electric utilities, to interest them in the system. The utilities have shown great interest in our accomplishments and what we can do toward controlling emissions.

But there has been a marked reticence on their part to make the investment required for air pollution control. Admittedly, the necessary abatement equipment—ours or anyone else's—requires an investment that would add considerably to the total capital costs for a new power station. Installation of a Cat-Ox unit might add as much as 25 percent to the capital cost of a large power station.

However, as a result of the development of the Cat-Ox system, we are convinced that technology does exist today which will substantially reduce the emission of fly-ash and sulfur oxides from large stationary sources without creating attendant pollution problems.

Monsanto Enviro-Chem is prepared to offer a guarantee of performance for their Cat-Ox system.

We have confidence in our system for sulfur removal, and we are able to estimate quite closely the costs of installation and operation. The following figures are, we believe, very realistic:

	Addition of Cat-Ox to 500 megawatt existing powerplant	Installation of Cat-Ox with new 1,000 megawatt powerplant
Capital cost	$18,000,000	$32,300,000
Dollars per kilowatt	36.00	32.30
Added operating cost, in cents per million B.t.u. (gross)	6.5	3.3
Acid credit	2.3	2.4
Net	4.2	.9
Fixed costs (at 16 percent), in cents per million B.t.u	8.7	8.2
Total costs, in cents per million B.t.u	12.9	9.1
Total costs, in mills per kilowatt-hour	1.23	.82

In making the foregoing estimates, we have assumed an 80 percent plant factor for both plants. With respect to the installation on a new plant, we have taken credit for overlapping equipment (such as precipitators). In converting the costs per million Btu to mills per kilowatt hour, we have assumed a heat rate of 9,500 for the existing power plant and 9,000 for the new plant. We have assumed a price of $7.50 per ton (100% basis) for the sulfuric acid by-product. In both cases, the Cat-Ox system will result in 100% particulate removal and we are willing to guarantee that the emissions of sulfur dioxide to the atmosphere will not exceed a range of 10 to 15% of the sulfur contained in the coal.

In summary, air pollution by utilities can be significantly controlled—but it will cost the residential consumer a premium of 6–8% on his electric bill.

Statement of Robert H. Quig, P.E., Engineer-Utility Operations, Chemical Construction Corp., Prepared for Presentation to the Joint Committee on Atomic Energy February 25, 1970

CHEMICO AND ITS AFFILIATES

Mr. Chairman: Chemical Construction Corporation, or as it is better known—Chemico—is an architect, engineers and construction firm of large chemical complexes designed plants account for:

- 30% of world sulfuric acid production through 237 plants
- 20% of world ammonia production through 106 installations
- 25% of world urea production

Chemico's Pollution Control Division has in operation or under construction over 1,000 systems in the chemical, oil refining, pulp and paper, smelting, steel and most recently utility industries. Chemico is affiliated as a sister organization with Ebasco Services, Inc., who are architect-engineers of utility power plants.

Chemico has associated itself with Basic Chemicals of Cleveland, Ohio, to form a joint venture company for the removal and recovery of SO_2 from stack gas as a salable product. Basic has developed numerous applications for the use of magnesium oxide in agriculture, paper processing and pollution control. The joint venture company is called Chemico-Basic and its main purpose is to promote the use of magnesium based scrubbing for SO_2 recovery in the electric utility and other pertinent industries. Since the removal and recovery of SO_2 is more than a sole desired function of the power plant operator, this joint venture company will coordinate and make arrangements for the necessary integration of the utility and chemical industries.

While Chemico is prepared to offer SO_2 recovery programs to the utility industry, it is also prepared and is now offering SO_2 control programs for the disposal of waste materials. We recognize that the decision of a utility to enter into recovery or disposal of SO_2 must be made within the framework of economical marketing of the recovered SO_2 in certain geographical areas. Scrubbing of the SO_2 from stacks utilizing lowcost calcium additives for disposal may very well be the cheapest solution in many instances.

I would like to dedicate the remainder of this statement to the recovery of SO_2 utilizing the concept of centralized recovery operations.

FACTORS FOR AND AGAINST SO_2 RECOVERY

The decision to recover SO_2 from stack gas will be made as an economical alternative to the potential land waste problems associated with disposal of calcium sulfite/sulfate and fly-ash materials obtained from dry and wet collection systems. This is especially true in the densely populated and heavily industrialized sections of the country where disposal areas are limited.

SO_2 recovery while being an improvement over a disposal condition in most cases, still needs refinements itself. To date, the basic problem involved with SO_2 recovery from stack gas is that while the SO_2 is present in sufficient quantities to be considered an air pollution problem, it is not great enough from any single stack to be an efficient and economical source of sulfur.

Figure 1 illustrates this problem. The concentrations of SO_2 emitting from a stack are very small, but the gas cleaning systems required to absorb or adsorb the gas must, of necessity, be constructed to handle the total gas volume of 100% boiler output. If the SO_2 recovery section of the total control system is also located between the boiler and the stack, it too must be designed for 100% output conditions. This creates an undesirable situation of sulfur recovery economics at each individual SO_2 emission source not only being a function of unit load factor, but also power plant size and sulfur content of fuels burned.

Based on past, present and estimated future performance, it is generally accepted that the average annual load factor of a fossil burning unit will assume a pattern as described in Figure 1. Thus, it is noticeable that even in the early life of the generating unit, the best annual load factor will hardly ever exceed 80%. After the seventh or eighth year of operation, the load factor will then begin to decline with an increasing rate. Assuming that the average sulfur content of the fuel remains relatively fixed and sulfur product marketing conditions do not change, the declining load factor curve will represent the diminishing product recovery revenue curve. This same problem exists in the very early life of the unit when start-up problems keep the unit off the line or forced to operate at reduced loads.

It is clear then that the impact of declining load factor plus the added complexities of a utility being in the chemical business require further though as to the best SO_2 modus operandi for the utility. Chemico feels that, while the SO_2 removal system being designed for the gas volume associated with full load conditions cannot be avoided, the SO_2 recovery operation can be restructured so that it is a meaningful and economical source of sulfur products. The concept which we refer to is that of centralized recovery.

PROCESSES FOR THE CONCEPT CENTRALIZED SO_2 RECOVERY

Chemico envisions that sulfur dioxide, efficiently removed from boiler flue gas by the application of proven scrubbing techniques, may be effectively and economically recovered at one centralized process plant. This central concept of recovery then allows many SO_2 emitters in a given geographical region to consolidate their pollution control efforts into one effective recovery operation. This is in lieu of constructing many small inefficient chemical plants at each power plant site; whose economics are, of necessity, directly related to the size and load factor of the power plant as well as the sulfur content of fuels burned. The SO_2 scrubbing system at the power plant is utilized simultaneously for over 99% removal of fly-ash.

Fig. II illustrates the concept of consolidating "captured" SO_2 emissions from many sources in a region at one centralized recovery complex. These "captured" emissions are in the form of magnesium sulfite crystals obtained from the aqueous scrubbing of flue gases using solutions of SO_2 absorbing materials such as magnesium oxide. The crystals of magnesium sulfite are then removed from the scrubbing system in an anhydrous form and forwarded to the central recovery plant. At the recovery plant, these crystals may be processed to elemental sulfur or sulfuric acid. Ultimate business and marketing evaluations will determine the best products to recover. The conversion of magnesium sulfite for recovery is accomplished by utilizing calcining or fluid bed techniques. Figure III further describes this. A concentrated but manageable SO_2 gas stream is generated for introduction into a conventional sulfuric acid plant. Essentially this is no different than the conventional processes for the recovery of sulfuric acid from metallurgical roasting plants such as copper converters or smelters. A secondary process reaction is the regeneration of the magnesium oxide for recycle back to the utility scrubbing systems at the various power plants. The SO_2 gas may also be reduced directly to elemental sulfur.

ADVANTAGES OF THE CENTRAL RECOVERY PLANT

The major advantages of a centralized sulfur recovery operation are believed to be:

1. With the exception of producing magnesium sulfite in a dried transportable condition, the capitalization and operation of chemical recovery processing is divorced from power plant activity.
2. One central process plant strategically located could provide recovery for 5000–7000 MW or more of power plant capacity. At the same time it could also provide recovery activity for smaller industrial customers who would have no hope of achieving economical sulfur recovery as an alternate to solid waste disposal. The small industrial plants would enjoy the results from economies of scale created by the large central stations.
3. Economies of scale and good process efficiency may be obtained by one large chemical complex which is sized for the SO_2 emitting from the average load factor of the system it services.
4. One large recovery plant, owned and managed by companies knowledgeable in chemical industry operations and marketing would be a formidable and competitive source of sulfur. The central plant would be able to sustain sulfur market fluctuations with greater capability than many small recovery plants could do individually.
5. Fuel suppliers as a joint venture effort with chemical producers and marketers could establish the recovery plant in return for long term fuel contracts with utility and industrial fuel consumers.
6. Central process in concept is not foreign to utilities since they already have inter-relationships with power pooling over their transmission grid networks. Many utilities today are sharing the investment burden for new generating facilities.
7. The participating utilities as "sulfur donors" may elect, if desired, to have an equity position in the recovery plant.
8. Most important, the historical lines of conventional and economical fuel supply would not be interrupted by the pressure of SO_2 laws. Low sulfur fuels could then be diverted to very small consumers such as high-rise apartments or shopping centers.

COSTS FOR CENTRALIZED SO_2 RECOVERY

The utilities and other industrial organizations who must control SO_2 are expected to assume the capitalization and operation of the total scrubbing system for SO_2 and fly-ash removal which includes all process steps at the power plant site necessary to get the magnesium sulfite into a transportable condition. Capitalization estimates for this indicate that a range of \$5–7/kw may be expected for a new power plant and \$6–9/kw should be expected for a retrofit operation (1969 pricing basis). Operating costs including capitalization for these scrubbing systems are expected not to exceed \$1/T of coal or 25¢/bbl of oil burned. No credits are included for avoiding the use of electrostatic precipitators or the utilization of short stacks. See Figure IV for comparable figures escalated to 1975.

In return, the central recovery plant, if made large enough, say, 1000 T/day of sulfuric acid will be completely self-sustaining operation sufficient for a third party to realize a rate of return consistent with chemical industry practices. *This third party could very well be the fuel supplier.* Magnesium sulfite from the power plant scrubbing systems will be "donated" to the recovery plant in direct exchange for regenerated alkali with makeup supplied on a "free" basis.

A 1000 T/day acid plant can be "supported" by approximately 3000 MW of power plants which burn approximately 2.5% S fuel and have a system load factor of 65%. This large acid plant including off-sites would require approximately an \$8,000,000 investment and can produce sulfuric acid in a cost range of \$10–12/ton.

PRIOR TESTING—WORK IN PROGRESS—FUTURE

Chemico has conducted pilot plants for fly-ash and SO_2 testing at seven different power plants and a sulfuric acid plant. The reduction of SO_2 can be guaranteed at 90% or better. Fly-ash removal can be guaranteed in excess of 99%. SO_2 recovery as a guaranteed process for yield and operating economics must still be considered elusive until prototype plants are operated—we are presently planning to build such a prototype system sized for a 150 MW generating unit. Chemico is working with a consortium of four private utilities, an international oil supplier, the National Coal Association, a leading chemical company and the National Air Pollution Control Administration to complete final plans and financing for this prototype project.

Under construction by Chemico is a large 150 MW equivalent venturi scrubbing system on an eastern utility boiler designed for fly-ash removal initially with provision for future SO_2 control, if desired.

Recently announced by the Arizona Public Service Company is APS plans for Chemico to design, engineer and construct a fly-ash now—future SO_2 scrubbing system for 575 MW.

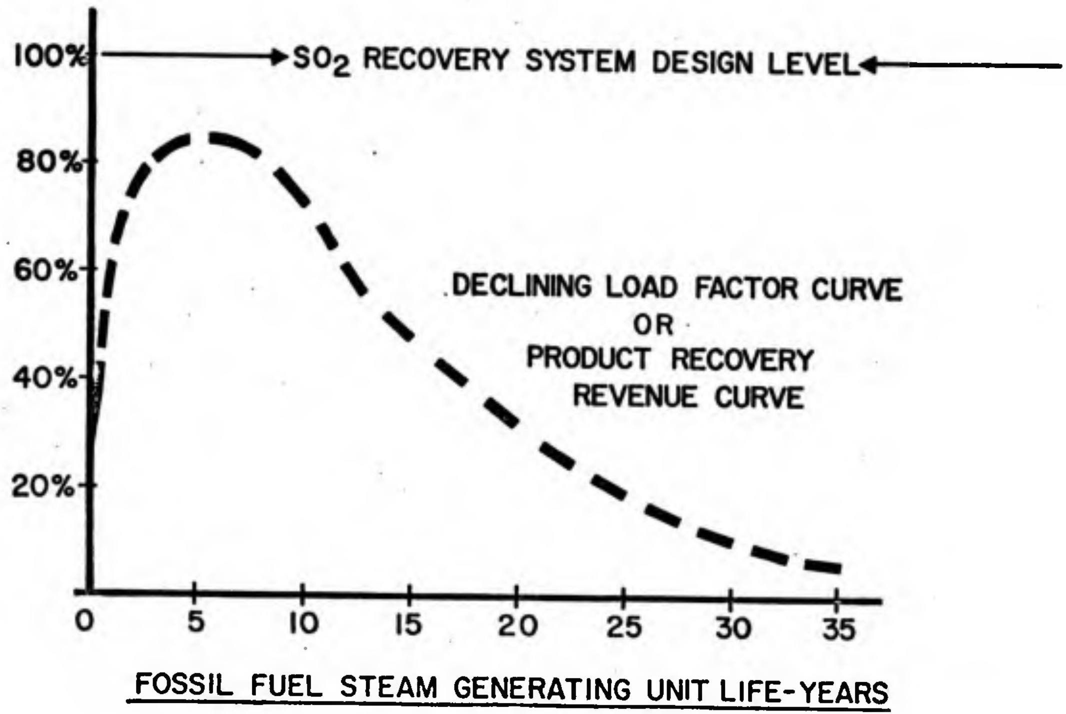
CONCLUSION

We at Chemico conclude that work by us and the other fine organizations, Monsanto, Combustion Engineering and Wellman-Lord will enable SO_2 control to be achieved in a manner which will not upset the historic fuel consumption patterns in this country.

Much still needs to be done. A major problem is the financing of these large demonstration projects to convince and give confidence to industry that SO_2 control is economically attainable. This may and should require a reassessment of R&D priorities in federal grants, etc. SO_2 control to date has been at the bottom of the list.

For the purpose of record, we at Chemico believe that SO_2 control is available now.

FIG. I - THE EFFECT OF LOAD FACTOR UPON SO_2 RECOVERY REVENUE



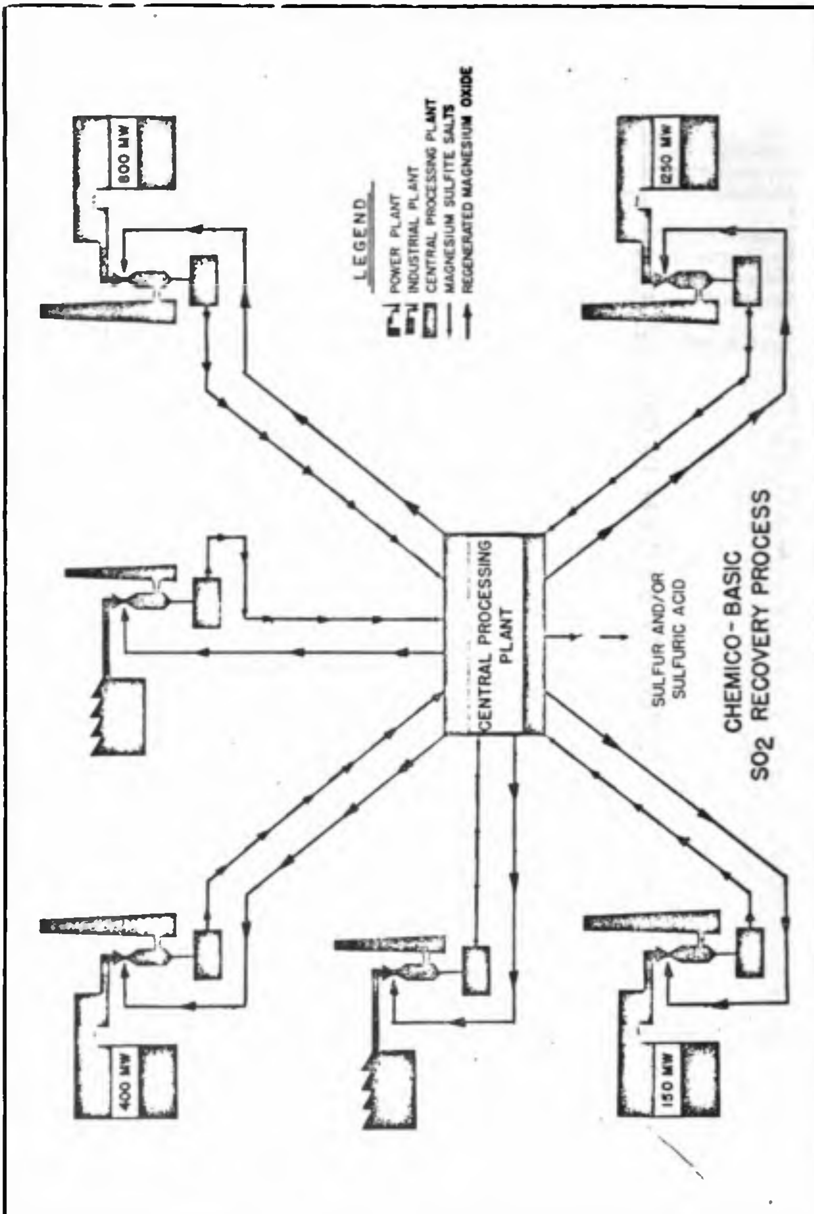
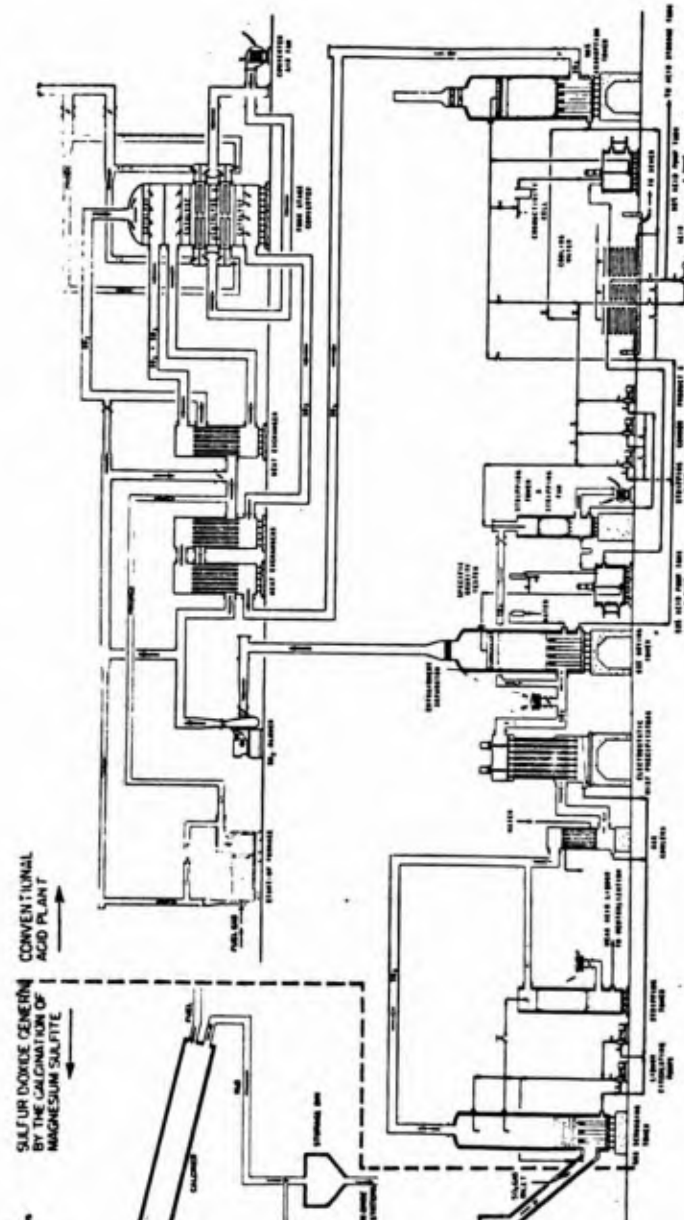

600 MW
1250 MW
400 MW
150 MW
LEGEND
POWER PLANT
INDUSTRIAL PLANT
CENTRAL PROCESSING PLANT
MAGNESIUM SULFITE SALTS
REGENERATED MAGNESIUM OXIDE
CENTRAL PROCESSING PLANT
SULFUR AND/OR SULFURIC ACID
CHEMICO-BASIC
SO_2 RECOVERY PROCESS

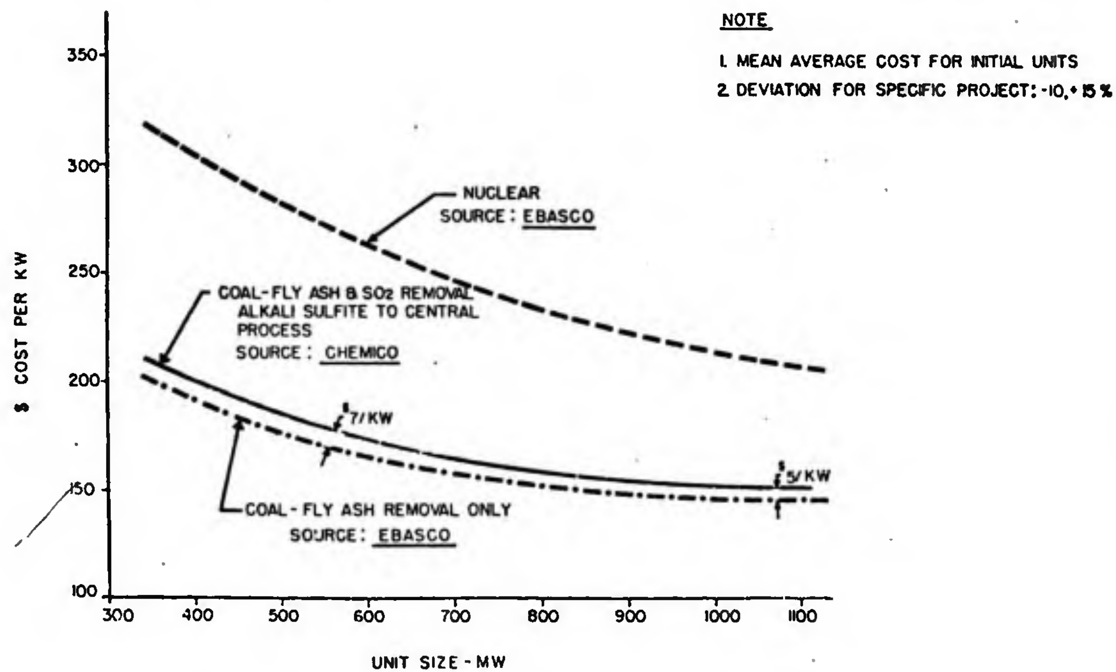
FIG. II



CHEMICO CENTRAL SO_2 RECOVERY PLANT FOR SULFURIC ACID (98%)

FIG. III

FIG. IV CAPITAL INVESTMENT
ESCALATED TO 1975
COAL VS. NUCLEAR UNITS



STATEMENT OF STUART WATTS, WELLMAN-LORD, INC. PREPARED FOR PRESENTATION TO THE JOINT COMMITTEE ON ATOMIC ENERGY, FEBRUARY 25, 1970

Mr. Chairman, in June, 1969, Wellman-Lord presented a paper at the National Air Pollution Control Association meeting in New York City. This paper covered the economic reasons for and technical development of our potassium sulphite based SO_2 recovery system, and reported on initial results of the commercial demonstration plant for the process which is the Maryland Clean Air Project. In preparing this second report, we have for clarity recapped the June report and added the following information to bring you up to date on the status of our work.

1. A summary of results and experience on the Maryland Clean Air Plant regarding pollution control with the potassium system.
2. New information on our first full commercial plant which removes SO_2 from the sulfuric acid plant tail gas. This plant is based on our sodium sulphite absorption system.
3. A comparison of the potassium and sodium systems and which look most promising.
4. Plans for commercialization in Japan.

SUMMARY

In cooperation with the utility industry and certain chemical companies, Wellman-Lord has worked on the development and commercialization of SO_2 pollution control systems for over three years. The basic technique used is absorption of the SO_2 present in stack gases in an alkali salt solution, followed by recovery of the absorbed SO_2 and continuous recycle of the solution. Development emphasis was placed on producing a salable form of sulfur as liquid SO_2, strong sulfuric acid, or elemental sulfur. Two technically similar absorption processes have been studied—one uses a potassium salt solution, and the other a sodium salt. Both produce liquid SO_2 as an end product. The SO_2 can be converted to strong H_2SO_4 by standard technology, and additional investigations are underway to reduce the SO_2 to elemental sulfur or alternately produce elemental sulfur directly from the absorption process instead of SO_2. Progress to date can be summarized as follows:

1. In a joint venture with the Tampa Electric Company a one megawatt pilot plant was operated on the potassium system in April through September 1967 at their Gannon Station. Results proved the process to be chemically feasible and indicated good process economics.
2. The Maryland Clean Air Project was developed as a 25 megawatt demonstration plant for the potassium system and the plant started up in January 1969 at Baltimore's Gas and Electric's Crane Station. Operating results proved decisively that this approach can remove over 90% of the SO_2, SO_3 and particulate in the flue gas and is therefore effective from a pollution control standpoint. Certain mechanical problems were encountered, particularly in the final SO_2 compression section, which limited the operating factor of the test program, but these problems were either corrected or solutions have been identified which can be employed at a future date. Based on the Baltimore operating experience an improved design for the particulate pre-scrubber is being evaluated, with the objective of removing more of the fly-ash in the pre-scrubber and less in the in-line centrifuge. The biggest disappointment was in steam economy. Low pressure steam requirements for SO_2 stripping appeared to be over twice as high as we had hoped for. Therefore, unless a solution to this problem can be developed, investment and operating costs for the potassium system will be higher than our projections from the TECO tests.
3. Early in 1968 we began preliminary studies on a sodium based absorption system. Certain advantages over potassium became apparent, particularly for smaller plants, and where SO_2 concentrations in the gas to be treated exceeded about 0.3 per cent. In early 1969 we evaluated both the potassium and sodium systems for reducing SO_2 emission from Olin Chemical's 700 TPD H_2SO_4 plant in Paulsboro, New Jersey. The sodium system showed significant advantages and in July 1969 we were awarded a firm price contract to install this system. Recovered SO_2 is reused in the H_2SO_4 plant and SO_2 concentration in the clean gas is guaranteed to be less than 500 ppm. Engineering design is complete and has been based on unit operation pilot tests in suppliers' laboratories . . . plant start-up is scheduled before June 1, 1970.

In summary, we can compare the design basis and operating experience of the Maryland Clean Air Plant (potassium) with the Olin Chemicals plant (sodium) and believe that the sodium design is the most economical. The experience gained at MCADP was of direct use in the Olin design and is the basis for our confidence in the sodium system. Advantages of sodium are elimination of a separate steam stripping section (reduces capital investment), lower steam usage, and a simplefied over-all operation. The MCA plant has been temporarily shut down pending the results on the Olin plant. If projected performance is obtained, the sodium system will be recommended for utility application.

In addition to these projects, Wellman-Lord is evaluating two approaches for production of elemental sulfur, using the absorption process as a first step. One involves direct reduction of $K_2S_2O_5$ crystals where we have a pilot plant installed in Lakeland, and the second relates to application of proven technology for reducing SO_2 gas to sulfur. Also, negoations are underway by our Japanese licensees (Mitsubishi and Sumitomo) to install the Wellman-Lord system which has been selected as one of three government-sponsored 150 MW demonstration units in Japan.

* * * * *

Abstract of Paper Presented Before National Air Pollution Control Association in New York City, June 1969

(by Stuart G. Watt, Executive Engineer, Wellman-Lord, Inc., Lakeland, Fla.)

The Wellman-Lord SO_2 recovery process is based on absorption of SO_2 in potassium sulfite solution, crystallization of $K_2S_2O_5$ from this solution, and conversion of $K_2S_2O_5$ to $KHSO_3$ by dissolving the crystals in water. SO_2 is stripped from the $KHSO_3$ solution and can be used as a gas or compressed for shipment. The 3-year development program included a 1 megawatt pilot plant at Tampa Electric's Gannon Station and a 25 Megawatt demonstration plant in operation at Baltimore Gas and Electric's Crane Station. Technical and economic performance have been promising. Tests have been conducted at a metallurgical smelter and this process concept has wide application. An alternate sodium sulfite system is available. Pilot plant tests to produce elemental sulfur are in progress.

A. GENERAL BACKGROUND

Wellman-Lord's basic business has been design, engineering, and construction of agricultural mining and chemical complexes and related facilities. In 1965 and 1966 we were involved in the planning stages of agricultural projects which were limited by a sulfur shortage. Although current supply/demand on sulfur shows increasing availability, we had seen price escalations of nearly 80% during the past few years. Government sources give the following quantities of sulfur potentially available from stack emissions:

Source	Tons of sulfur per year	Percent
Coal combustion	7,014,000	61.0
Petroleum combustion	2,408,000	20.7
Other industrial (including smelting)	2,257,000	18.3
Total	11,680,000	100.0

The total sulfur consumed in sulfuric acid is about 9,000,000 tons per year, so it is apparent that an economical SO_2 recovery process could provide an effective alternate sulfur source, providing logistics are reasonable. We have mapped sulfur emission versus the H_2SO_4 use, by state, and there are many areas where emission and use are in close proximity.

Following a state of the art review of existing recovery processes, we began research in June 1966 to develop a process which would both control SO_2 pollution and recover valuable sulfur. Design objectives (and how they were achieved) were as follows:

1. *End Product.*—Should be either pure SO_2 or sulfur which have wide market acceptance, can be economically transferred over long distances, and are not tied to a single market. The Wellman-Lord process makes pure SO_2 and we have two methods in the pilot plant stages to produce elemental sulfur.

2. *Efficient Pollution Control.*—Tests to date indicate removal of over 90% of SO_2, SO_3, and fly ash leaving electrostatic precipitators (utilities).

3. *Liquid System.*—Our experience with liquid versus fluosolid systems indicates liquid is much easier to control, operate, and maintain. We, therefore, based our development on liquid scrubbing systems, which are the basis for our process.

4. *Common Chemical—Regenerative.*—Our processes are based on either KOH or NaOH as starting materials for the sulfite, which are widely available from competitive sources, and of uniform, well established quality. System regeneration is positive, in solution form, and chemical makeup is a minimum.

5. *Secondary Pollution/Disposal.*—There are no solid or large liquid streams to dispose of in our process.

6. *Proven Process Equipment.*—Equipment is well proven for use in the chemical industries. The basic unit operations of absorption, crystallization, filtration, and steam stripping are involved.

7. *Variable Stack Conditions.*—The absorption process can handle varying SO_2 concentrations and gas flows because of its relatively high inherent turndown ratio.

8. *Fuel Benefits.*—Because of an economic base which favors high SO_2 production, in fuel burning units, high sulfur fuel improves economics. Similarly, when the process is used to remove SO_2 from industrial units (such as H_2SO_4 plant) where the capacity of industrial plant can be increased by permitting higher SO_2 in gas, the Wellman-Lord process can be designed to recover this higher gas strength.

B. PROCESS DESCRIPTION—POTASSIUM SYSTEM

The chemistry of SO_2 absorption in potassium salt systems has been studied for nearly 40 years with one of the basic problems being the high steam requirement to strip and recover the SO_2 from the resulting solution of potassium sulfite (K_2SO_3) and potassium bisulfite ($KHSO_3$). However, if a nearly pure solution of $KHSO_3$ could be obtained (without K_2SO_3 present), the partial pressure of SO_2 above this solution is very high and consequently the SO_2 could be stripped out with very low steam requirements. This is illustrated by the partial pressure diagram in Figure 1. Developments of a simple method to obtain a pure $KHSO_3$ solution, then became one of the key points of our process. This was accomplished by developing a method to crystallize potassium pyrosulfite crystals ($K_2S_2O_5$) out of a complex potassium salt solution. The crystals are filtered and when redissolved in water give the high purity $KHSO_3$ solution required for low cost steam stripping. Our process has three basic unit operations—absorption crystallization, and steam stripping.

Absorption Section

The absorber section is comprised of a specially designed prescrubber to remove particles of fly ash, and an absorption column where the SO^2 is absorbed in the sulfite solution. Principal reactions are:

$$1.\quad 2KOH + SO_2 \longrightarrow K_2SO_3 + H_2O$$

$$2.\quad K_2SO_3 + SO_2 + H_2O \longrightarrow 2KHSO_3$$

The prescrubber operates at low pressure drop and a water rate of less than 0.2 gpm per 1,000 cubic feet of gas treated. In utility operations, a high percentage of the SO_2 present in the gas is adsorbed on the fly ash surface and leaves with the small fly ash slurry to waste disposal. The sulfite solution adsorbs over 90% of the SO_2 in the original flue gas and the gas leaves the stack at 140° F. unsaturated. The overall pressure drop across the adsorber circuit is less than 8 inches of water.

Crystallization Section

The sulfite solution is cooled in a vacuum crystallizer and $K_2S_2O_5$ crystallizes out as follows:

$$2KHSO_3 \xrightarrow{\text{cool}} K_3S_2O_5 + H_2O$$

The crystals are filtered and the mother liquor is recycled to the process. The pure pyrosulfite is dissolved in H_2O to form the $KHSO_3$ for stripping.

Stripping Section

The $KHSO_3$ solution is pumped counter-currently through steam stripping columns where SO_2 vapor comes off the top of the column and the stripped solution is recycled to the adsorber.

$$2KHSO_3 \xrightarrow[\Delta]{\text{steam}} K_2SO_3 + H_2O + SO_2$$

As the bisulfite is converted to sulfite, the partial pressure of SO_2 in the solution decreases very rapidly The steam consumption for stripping is dependent on the number of stages used, but we are projecting consumption as 4 to 8 pounds per pound of SO_2. The SO_2 and steam vapor, discharged overhead from the column, are fed to a heat exchanger to condense most of the steam. Depending upon the end use for the product, the SO_2 can either be used as a gas or compressed for shipment.

C. COMMERCIAL DEVELOPMENT

The chemistry of the process described was confirmed in our laboratories in late 1966 and a program was outlined for pilot plant testing. In a joint venture with Tampa Electric Company, approximately $300,000 was allocated for construction and operation of a 1 megawatt pilot plant at their Gannon Station in Tampa, Florida. Operation began in April 1967 and was successfully concluded in September 1967. Problems with fly ash removal were recognized early in the program and a special pre-scrubber was designed to clean the gas before it contacts the solution. Basic process chemistry was demonstrated on a continuous basis and results on $K_2S_2O_5$ crystal growth were encouraging.

Successful operation at a larger scale, and on a continuous basis were necessary before any firm design could be made for a full scale utility. It was decided that a 25 megawatt unit would provide design information which could be scaled up reliably for larger power plants. The Maryland Clean Air Project was developed as a 25 megawatt demonstration plant for this process with the following participants:

The W. R. Grace Company (operates demonstration plant)
Baltimore Gas & Electric Company
Potomac Electric Power Company
Delmarva Power & Light Company
Potomac Edison Company
The Bechtel Corporation
Wellman-Lord, Inc.

The project is installed at Baltimore Gas and Electric's Crane Station in Baltimore. This $2,000,000 demonstration unit started up on schedule January 1969 and the operating and test programs conducted to date have been encouraging. Results on basic process chemistry continue to be very satisfactory and a number od design modifications have been made to improve operating factors. All unit operations have been tested through production of liquid SO_2 and optimization of the total circuit is in progress. An extensive test program in the prescrubber section has minimized problems encountered with fly ash during the start up phase, and identified methods of removing various types of fine solids depending upon their chemical composition and size distribution. Over 90% of the SO_2 has been consistently removed from the flue gas with fly ash removal as high as 98%. There have been extended test runs through production of gaseous SO_2. We are currently modifying the compression step and studying overall steam balance.

In addition to the projects at Tampa Electric's Gannon Station and Baltimore Gas and Electric's Crane Station, test work has been conducted at two other utility stations covering both fuel oil and coal fired units. These latter tests used a portable test unit of the prescrubber and absorber only. This portable unit is available for testing with other clients.

In the metallurgical area, the portable unit was tested on smelter off gases in the western United States. During a three-week test, the following results were obtained:

(a) From a 2.2% SO_2 gas stream, SO_2 recovery averaged 96%.
(b) Particulate rejection averaged 90%.

D. DEVELOPMENT STATUS

We expect to complete testing of the potassium sulfite process at the Maryland Clean Air Project within the next few months. At that time we plan to convert the demonstration unit to a sodium based circuit and continue the test program. Patents have been filed for on both processes. We are currently prepared to offer either the sodium or potassium based circuits for immediate application to small power stations, and certain industrial plants such as sulfuric acid, in those cases where SO_2 is to be used as a final product. Pending the results of continuous demonstration tests, we will be able to begin firm designs for large units by the end of 1969. We are studying two processes for production of sulfur instead of SO_2 from these systems. A pilot unit is in operation at our Lakeland office and in the first stages of testing. Feed materials for the Lakeland unit are shipped from the Maryland Clean Air Plant which permits the results to be directly related.

Summary and acknowledgements

Following nearly 3 years of development work, the technical and economic feasibility of this approach to SO_2 recovery is being successfully demonstrated. Although there have been mechanical improvements as the program developed, basic process chemistry has been unchanged since inception. There appears to be a wide range of possible applications in the utility, industrial, and metallurgical fields as an effective pollution control system. Economics are dependent on the size of installation, the amount of SO_2 or sulfur produced, and product marketing. For medium utility stations using high sulfur fuel (or the equivalent industrial plant) we are projecting at least a breakeven cost for the operation.

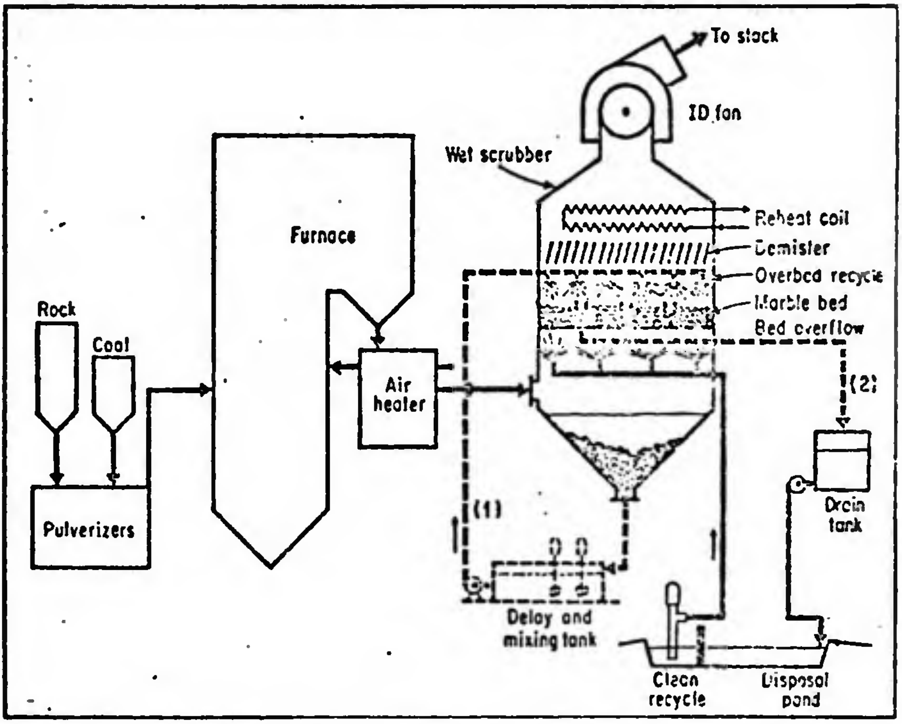
Wellman-Lord is totally indebted to the utility companies who gave their full support and guidance throughout this program. Without this support and cooperation, none of the development work would have been possible. We would also like to acknowledge the financial, operating, and marketing assistance W.R. Grace and Company is providing for the Maryland Clean Air Project.

MODIFIED SO_2 SYSTEM FACES NEW TESTS

SUSTAINED OPERATION UNDER THREE TYPES OF LIMESTONE INJECTION IS GOAL FOR COMBUSTION ENGINEERING WET SCRUBBER SYSTEM AT KANSAS POWER & LIGHT'S 125-MW LAWRENCE 4

Operation of an air pollution control system (sulfur and particulate removal) under three types of limestone injection, and sustained operation at or exceeding guarantees are objectives this fall and winter at the Lawrence Power Station of Kansas Power & Light Co. These plans were revealed recently by D. M. Miller, KPL's manager of electric production, in a status report on the wet scrubber system installed on the 125-Mw No. 4 unit at Lawrence (EW, March 4, 1968, p. 35). Modifications in the system since operation began late last year will be incorporated into a similar sulfur-removal system for the station's 430-Mw No. 5 unit now under construction.

Miller first told of these minor problems encountered on initial operation with the limestone-injection wet-scrubber system: Severe vibration of the ID fan duct at reduced load levels, corrected by changing the operating mechanisms on inlet dampers originally installed "in reverse"; high pressure differential across the scrubber's marble bed and excessive ash carryover, eliminated by removing "construction dirt" from water spray nozzles immediately below affected areas; and buildup of flyash cement by eddying of moisture into the scrubber inlet duct. Ladder baffles under the marble bed in the inlet plenum and baffles and flow guides above the reheaters were installed to improve gas flow distribution. This last modification also allowed the unit to carry up to 90% of load without excessive ash carryover to the reheat coils in the scrubber. Also, temporary air soot-blowing lances below the reheat coils are used to maintain clean coils without water washing as previously planned.



Modifications to increase sulfur removal include (1) recycling and retention of spray reject water and (2) direct discharge of bed overthrow to disposal pond. These changes will promote reactivity between sulfur oxides and calcined limestone

A low level of effluent pH in the marble bed overflow caused advanced corrosion in the bed overflow pots, unpainted piping and scrubber tank bottom. Overflow pots and drains were replaced using PVC components, while the scrubber bottom was given a 2-in. gunite lining over a heavy bitumastic coating. Analysis of pH values throughout the scrubber clearly indicated that reactive (limestone) materials were not getting into the bed area. This was due to drop-out of heavier particles of ash and lime dust in the inlet plenum below the marble bed.

The air pollution control system on the No. 4 unit is designed to remove 99% of particulates and 83% of sulfur oxides (under conditions in accompanying table). But during initial operation the pulverizer did not reject a 1% sulfur-equivalent of pyrites from the coal-limestone mixture. Coal as fired averaged over 3% sulfur. However, concentrations of SO_2 at the scrubber inlet were equivalent to 2% sulfur coal, supporting the expected 30% reduction by furnace reaction. Conditions at the scrubber outlet averaged the equivalent of 1% sulfur coal.

Although guarantee and acceptance tests are incomplete, preliminary readings on stack discharge indicate a particulate removal exceeding 99%.

For greater removal of SO_2, a test was made of recycling the solution in the effluent tank back to the marble bed; results proved affirmative. Subsequent tests pumping and recycling modes led to further improvement in SO_2 removal. Additionally, powdered limestone was injected at the furnace arch level (gas temperatures of 2,000 to 2,200F) for less over-burning and a more readily reactive material at the scrubber. The combination of recycling and direct injection allowed the holding of SO_2 concentration at the stack to a mean of 250 ppm during a test run of almost two days.

Based on these and other tests, it was decided by KPL in conjunction with Combustion Engineering, designer of the system, to make these changes in the handling of effluent and reactive materials:

1. Bed (or pot) overflow is piped separately from inside the scrubber to the effluent (drain) tank and then directly into the settling pond. This water has a pH of 5.8 to 6.4.
2. Spray-nozzle-reject water that falls through the plenum under the marble bed is collected in a separate delay and mixing tank, sized for about a 1-hr holding time. This water then recycles to above the marble bed where it becomes a part of the violent action of the fluidized bed.

The recycle solution consists of bed plate reject water and the reactive limestone and ash materials which drop directly from the flue gas stream in the inlet plenum. This recycle-detention system is expected to yield a 250-ppm further reduction in SO_2 at the stack.

Though the flue gas handling system is unchanged, KPL is installing permanent air soot blowers in the scrubber inlet to help move solid materials into the unit and to further minimize the wet-dry interface problem. Additionally, permanent air soot blowers will be installed at the reheater to keep it clean. And, unrelated to the scrubber modifications, two more air soot blowers (for a total of 9) will be installed in the furnace superheat-reheat pass to keep injected material and ash moving through the furnace. It is planned to leave 50% of the scrubber reheat surface out of service, as its effect on plume rise is not great. Remaining surface will still give a 25F reheat to keep the ID fan dry and clean.

The limestone injection system has been modified to make three methods of injection available on the 125-Mw unit:

1. Limestone and coal mixed on the belt to the bunker are pulverized and injected at all burners. This mode, planned initially, allows full-load operation of the unit, but its associated extreme calcining temperature yields the least reactive material at the wet scrubber. Also, the 1-hr detention time for the reject spray water will not result in the reactivity of all available material. Nevertheless, this mode is expected to approximate SO_2 removal guarantees.

2. Inject pulverized limestone *only* through the top burners at each corner of the boiler and coal *only* in the other burners. This method permits operation only up to 90% of full load because a pulverizer is used to grind the limestone. However, it separates the limestone feed from the main flame and thus provides more reactive material at the scrubber. It is expected that this method will meet SO_2 removal guarantees.

3. Inject limestone (pulverized independently of the unit) through separate injection nozzles at the top gas burner locations in each corner of the boiler. Nozzles will be angled to inject the limestone high into the furnace for calcining, thus minimizing overburning and providing a maximum of reactive material at the scrubber. Based on test performance, this method offers not only full-load operation but also SO_2 removal in excess of guarantee (350 ppm SO_2 in effluent gas).

For the air pollution control system being installed on the 430-Mw No. 5 unit, limestone will be pulverized in an adjacent unit. Limestone will be injected into the coolest location in the furnace as is practical to reach. Flue gas and material will follow a normal path through the furnace, i.e., from the air heater into a plenum and through six wet scrubber marble beds, the demister and reheater, and then to the ID fan and out the stack. A 25F pickup in the scrubber reheater is planned.

The bed overflow water will be separated and flow by gravity to the settling pond. Plate reject water and material collected under the marble bed will flow to detention tanks for recycling above the activated bed. It is fully expected that the system on the larger unit will be reliable, available for continuous operation, and capable of meeting SO_2 and particulate removal guarantees.

DESIGN CONDITIONS FOR SULFUR REMOVAL SYSTEM

Coal Supply:
- 12,300 Btu/lb
- 3.4% Sulfur
- 12.5% Ash

Limestone injection:
- 13% by weight (of coal fired)

Pyrite rejection by pulverizer:
- Equivalent to 1% sulfur

Furnace reaction:
- 20 to 30% of sulfur oxides to combine in dry furnace reaction, remainder in wet scrubber

Guarantees:
Removal of 83% of sulfur oxides and 99% of particulates

Mr. ROGERS. Now you say that 16 sets of standards have been submitted and are awaiting action by NAPCA on air quality regions, only one approved. Would this indicate that the areas are moving ahead of the Federal Government?

Mr. MULLAN. I think Mr. Satterfield could probably better answer that than I. Mr. Satterfield's own State agency submitted theirs on October 13, 1969, it was not due until November 10, 1969. There has been no action by the Federal Government since then. HEW has not approved it.

Mr. ROGERS. I cannot understand that. This committee is going to try to see what we can do about it, particularly where we have 16 areas ready to go and they are taking the formal course of bureaucratic review rather than getting to the job and approving them. I don't think it is a difficult job to approve them. The States have already submitted them, have they not?

Mr. MULLAN. It is more complicated than that when you see the State is obligated by law to come up with an implementation plan in 180 days. The State of Virginia has to come up with a plan on May 7 on standards that they have not approved yet.

I have to compliment Virginia. They were the leading one.

Mr. ROGERS. You can't point a finger at me to explain why something has not been done.

Mr. MULLAN. No, I said I complimented Virginia.

Mr. ROGERS. We are going to check into that. Any suggestions you have we will be glad to have. You want "goal" stressed rather than the "standards." You do not want the Federal Government to set emission standards for stationary polluters. Is that right?

Mr. MULLAN. That is right. I have no expertise in the automobile and I don't intend to talk about the automobile.

Mr. ROGERS. You are not objecting to national standards for movable—

Mr. MULLAN. I will say that is their decision, it is not mine.

Mr. ROGERS. That is in the law.

Mr. MULLAN. As far as power plants are concerned, the emission from power plants, do go across State lines but air quality regions normally are designated to cover the area to which emissions from power plants go. I have been involved in several of the circumstances where they develop the region. They don't go in and pinpoint where the power plant is. They look downstream. The SO_2 effect is within a limited area from the power plant. Usually SO_2 levels from power plants are quite low when you get five to seven miles away from the power plants.

Mr. ROGERS. And particulate matter?

Mr. MULLAN. I must admit we are pretty proud the way we have gone to that. We are up to 99 percent plus! 99.5 percent with electrostatic precipitors in operation now.

Mr. ROGERS. Have these been installed in all plants?

Mr. MULLAN. They are being installed in all new plants and installed in older plants. As you realize this is something the coal industry does not do. This is something that the utility industry does.

Mr. ROGERS. Thank you very much. Your testimony has been most helpful. We appreciate your being here.

Mr. CARTER. I just want to say, Mr. Chairman, I suggest that they use more Appalachian coal.

Mr. MULLAN. I can understand Dr. Carter's interest. In fact, this is our proposal to several agencies, that you use low sulfur coal and sulfur removal devices. We are going to have to use all of these things in order to achieve a lower level of sulfur.

Mr. ROGERS. Thank you.

The committee will stand adjourned until 1:30 this afternoon when we will take up our additional witnesses. I think we will have interesting testimony this afternoon, some new techniques, and we are looking forward to this testimony.

The committee will stand adjourned until 1:30.

(Whereupon, at 12 o'clock noon the committee was recessed, to reconvene at 1:30 p.m. the same day.)

AFTER RECESS

(The committee reconvened at 1:30 p.m., Hon. Paul G. Rogers presiding.)

Mr. ROGERS. The subcommittee will come to order, please.

We will continue with our hearings on air pollution and solid waste. The next witness is John O. Logan, President of the Universal Oil Products Company, Des Plaines, Illinois.

We are delighted to have you, Mr. Logan. We appreciate your patience in dealing with the committee.

STATEMENT OF JOHN O. LOGAN, PRESIDENT, UNIVERSAL OIL PRODUCTS CO.; ACCOMPANIED BY C. G. GERHOLD, ASSISTANT TO THE PRESIDENT; AND W. H. THOMAS, WASHINGTON REPRESENTATIVE

Mr. LOGAN. Thank you, Mr. Chairman.

We are indeed happy to be before you and your distinguished committee.

I am John O. Logan, President of Universal Oil Products Company with headquarters in Des Plaines, Illinois. I have with me Mr. C. G. Gerhold, on my right, and Mr. W. H. Thomas of our Washington office. For the benefit of those who may not be closely familiar with our company, I would like to mention that it is not an oil company. We have no oil properties, either above or below ground. Our company is a 57-year-old organization founded to research, develop, and license processes for use by the petroleum refining industry. It has more recently grown into a diversified international organization, operating in a number of fields, with approximately 12,000 employees and annual revenue of approximately $450 million. However, the original research and development activity continues to be an important part of our business. Testimony to our achievements in petroleum refining technology are the almost 1,800 licensed units operating in 75 countries around the world, and the pool of 6,000 active patents, mostly in the petroleum and petrochemical fields.

UOP has devoted a considerable amount of its activities and research and development facilities to the problems of reducing the air pollution resulting from the internal combustion engine. Over the past ten years our investment in this type of research has amounted to approximately

$10 million of our own money. At the current rate we are operating in excess of $2 million a year. These activities have resulted in development of a catalytic exhaust converter device which is effective in the removal of contaminants from automotive exhaust.

In connection with these activities, we have become convinced that the internal combustion engine in the general form presently used in passenger vehicles is capable of being converted from its current role as the principal air polluter to a position in which its contribution to environmental pollution will be extremely minor. We have also become convinced that this can only be accomplished by a systems approach to the whole problem. The piecemeal approaches which have been taken up to now will continue to prove inadequate for the total job.

Specifically, we believe that the elimination of pollutants emitted from the vehicle exhaust will require the combination of suitable vehicle and engine designs, the tailoring and accurate control of the fuel, and use of a properly designed catalytic converter system employing catalyst with optimum properties. All of these must be done jointly to obtain the best overall results.

In this connection I would like to now present several charts showing some recent results obtained in our laboratory which indicate the kind of emissions control obtainable through a systems approach to the problem.

These data resulted from the installation of one of our catalytic converters on a standard vehicle with modified carburetion using one of our experimental catalysts and employing lead-free gasoline. A single catalyst was used in this installation and no secondary air injection or exhaust gas recycle were used to obtain these results.

The first chart shows the substantial conversion and effective control of nitrogen oxide which was obtained under these conditions.

The figures on the left refer to nitrogen oxide content in parts per million. The lower curve refers to the nitrogen oxide in the exhaust, coming out of the car, whereas the upper red curve shows the nitrogen oxide from the engine going into the converter device. Therefore, the difference between the two red areas really is the amount of oxide nitrogen removal.

These tests follow the California standard test cycle which calls for operation over various conditions. I might say based upon these figures the nitrogen oxide conversion was essentially 90 percent.

Now the second and third charts: the second chart shows the low levels of hydrocarbon under the same conditions. These measurements have been made simultaneously so these represent simultaneous tests results.

Again the bottom curve shows hydrocarbon out of the converter device, the upper curve shows hydrocarbons into the converter device out of the engine. This conversion was 73 percent.

The third chart shows the same data simultaneously collected on carbon monoxide. You will observe with practically no carbon monoxide coming out of the exhaust following the converter and rather substantial in-put of carbon monoxide to the converter from the engine. This conversion was approximately 94 percent.

In considering these data, we would like to point out that they are not believed to be in any sense optimum, but do indicate the direction in which we think effort should be concentrated if vehicles are to be produced which will minimize emission levels of all the objectionable pollutants. It should also be borne in mind that these results were obtained without the changes which are being seriously considered currently for commercial adoption and which will sacrifice performance or fuel economy for moderately reduced nitrogen oxide emission levels; namely, the simultaneous reduction of all three pollutants is obtainable only when the engine is controlled to around the stoichiometric air-to-fuel ratio; that is, operated without either excess air or fuel. Across the bottom is a set of figures called "% CO", which in effect reflects the ratio of air to fuel going into the engine and the three lines on the chart relate to the percent conversion of carbon monoxide, hydrocarbons and nitrogen oxide.

You will see that in a very narrow range there of roughly .95 to .115 you are obtaining maximum conversion of all three pollutants simultaneously. Under these conditions the emissions of nitrogen oxides directly from the engine are nearly maximum, but because of the substantially better operation of the catalyst system with such an exhaust gas, overall results involve a minimum of nitrogen oxide as well as other pollutant emission levels from the vehicle. These low levels would not have been obtainable if the nitrogen oxide from the engine had been minimized.

In other words, going back to what I said up above, some of the currently considered modifications are aimed at reducing the nitrogen oxide coming from the engine and that does not necessarily give you the minimum nitrogen oxide coming out of the tailpipe when you employ a single catalyst converter system.

As we pointed out above, the results shown were obtained using a nonleaded gasoline. We have not been able to obtain similar results when lead is a part of the fuel. We therefore believe that the elimination of lead from the gasoline is a highly desirable part of a total systems approach to the solving of the problem. In connection with the practicability of elimination of lead from gasoline, we would like to review briefly some additional charts which we have prepared in this connection and which have been used in earlier testimony before a committee of the California Legislature. The first chart shows the historical record of octane quality of both premium and regular grades of gasoline.

These are national average figures running from 1930 up through 1969. They point out the relatively minor role which lead plays in producing octane quality at the present time compared, for example, to the octane added by lead in premium gasoline during the period 1930 to 1940 as shown in the upper chart. The upper curves are premium gasolines and the lower curves are regular grades. The blue area as labeled represents the octane of the base stock and has gone up from about 58 to 92 in the case of premium grades and from about 62 to 86 in the regular grades. The red of course is the octane added by lead.

The next chart compares the performance of exhaust converters on leaded gasoline.

The next chart compares the performance of exhaust converters on leaded and unleaded gasoline and demonstrates the much superior performance and stability obtained when using a lead-free fuel.

Here you see in the upper chart emissions of hydrocarbon. The figures represent parts per million starting at zero mileage and extending over on this chart 50,000 test miles of vehicle operation. The red line indicates the performance that you get in terms of hydrocarbon emission when leaded gasoline has been used and the lower blue line represents the hydrocarbon emissions from the converter when unleaded gasoline is used.

Incidentally, this particular vehicle had an untreated emission of slightly over 300 parts per million, just about at that point on the chart.

The lower curve is the same kind of data for carbon monoxide, showing again the leaded gasoline condition and the clear gasoline. Carbon monoxide emission from this vehicle with no device or really going into the device was slightly over one percent.

We might say there further that you will see the lines in both cases where leaded gasoline has been employed represent a degeneration of the conversion efficiency over mileage operation. So that by the time you have of the order of 20,000 to 25,000 miles you have in essence significantly reduced the effectiveness of your system.

Our next chart indicates our best estimates of the costs which would be involved in the substitution of octane numbers obtained by additional refining as a substitute for the addition of lead. These costs are for a 90,000 barrels per day California refinery and also indicate the capital requirements which would be invovled in making such a change. These figures represent the costs which would be involved if gasolines of present top octane quality were produced. Current proposals for producing nonleaded gasolines at somewhat lower octane numbers would, of course, entail correspondingly lower costs.

Our figures, when put on a national basis, would represent a total investment of between two and two and one-half billion dollars for the refining industries. The per gallon cost figures would be similar to those which we have shown. All of these figures are based on the production of gasoline of the same octane quality as is now being produced with the addition of lead.

Let us look at that chart. Along the bottom ordinate is the amounts of lead added and in this particular case it was two and a half grams or cc's per gallon. Up the side we have cents per gallon. The red area represents the investment required to replace certain portions of the lead addition. In other words, if all of the lead were removed, that particular refinery would have to invest $13.5 million of capital and the cost per gallon of gasoline at the refinery would be slightly under one cent per gallon including a five-year amortization after taxes of the capital investment.

That is amortization of the additional cost.

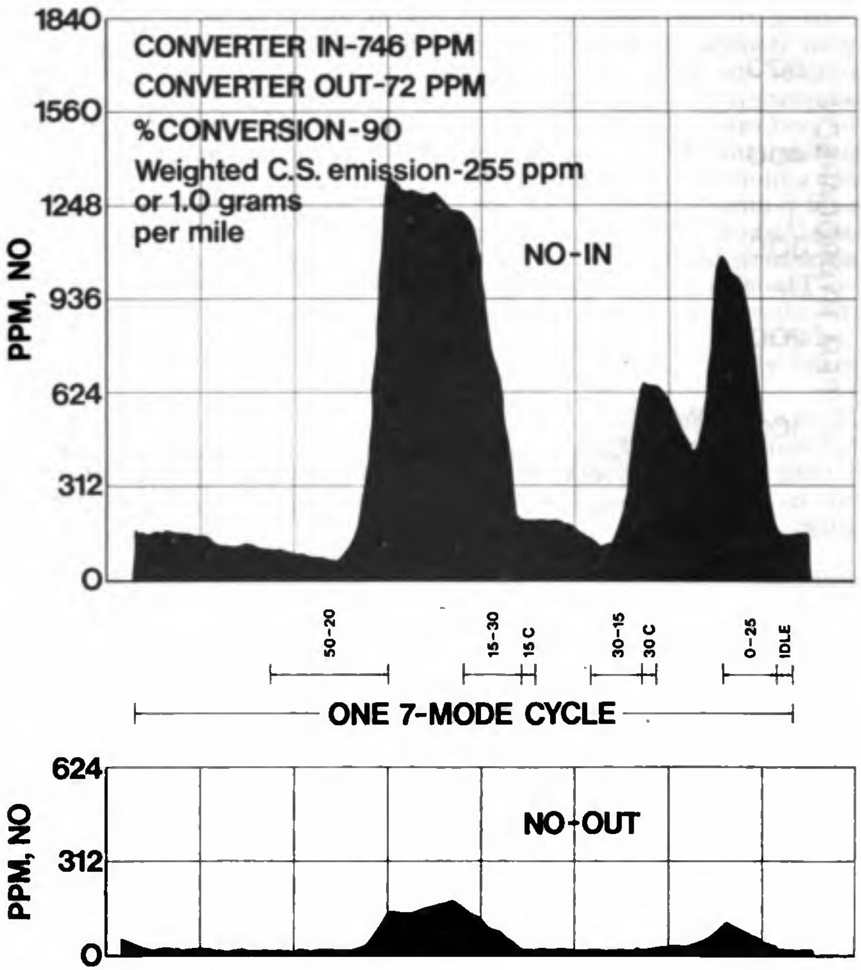
We are quite aware that these figures are considerably lower than those which have been widely publicized by others; however, we have carefully reviewed our figures and compared them in detail with other studies. We are convinced that if full advantage is taken of available modern technology, our numbers are sound. It is an essential part of UOP's licensing business to provide refiners with accurate processing costs involved in the use of our licensed processes, and our success in the petroleum field testifies to the quality of our estimates.

In summary, we feel it is perfectly possible to reduce emissions of hydrocarbons, carbon monoxide, and nitrogen oxides simultaneously to extremely low levels. These results are attainable without seriously sacrificing either engine performance or gasoline mileage. We are, however, somewhat skeptical that this will be attained unless a more unified approach to this whole problem is undertaken using, cooperatively, all of the available technology and skills in the fields of automotive design, catalyst container design, catalyst formulation and fuel production. One of the worst barriers to this kind of progress is the so-called NIH, not invented here, factor in which organizations and individuals tend to depreciate or ignore the contributions previously made by others. And I might add that we have this within our own company, too.

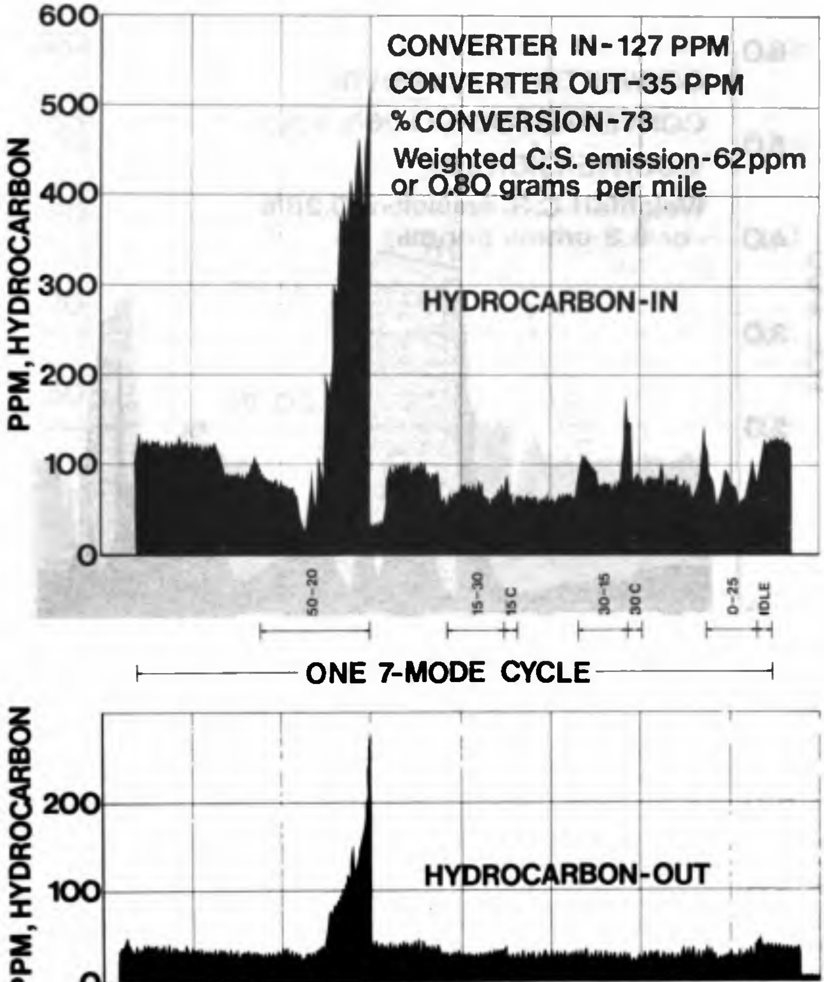
Our company feels strongly about another point. It is urgent that steps be taken promptly to modernize and set up definite discriminating testing procedures and performance standards. This step is vital if organizations working in this area are to know what their targets are. It should also do much to minimize the possibility of adopting systems of actual mediocre effectiveness, but which appear to perform well because of unrealistic weighting factors or because performance during the measured modes was better than that throughout a more complete range of driving modes. Our company has repeatedly pointed out to various government bodies our objections to the established performance standards, but progress in recognizing these objections has been painfully slow.

(The charts accompanying Mr. Logan's statement follow:)

NO_X EMISSION
HOT CYCLES

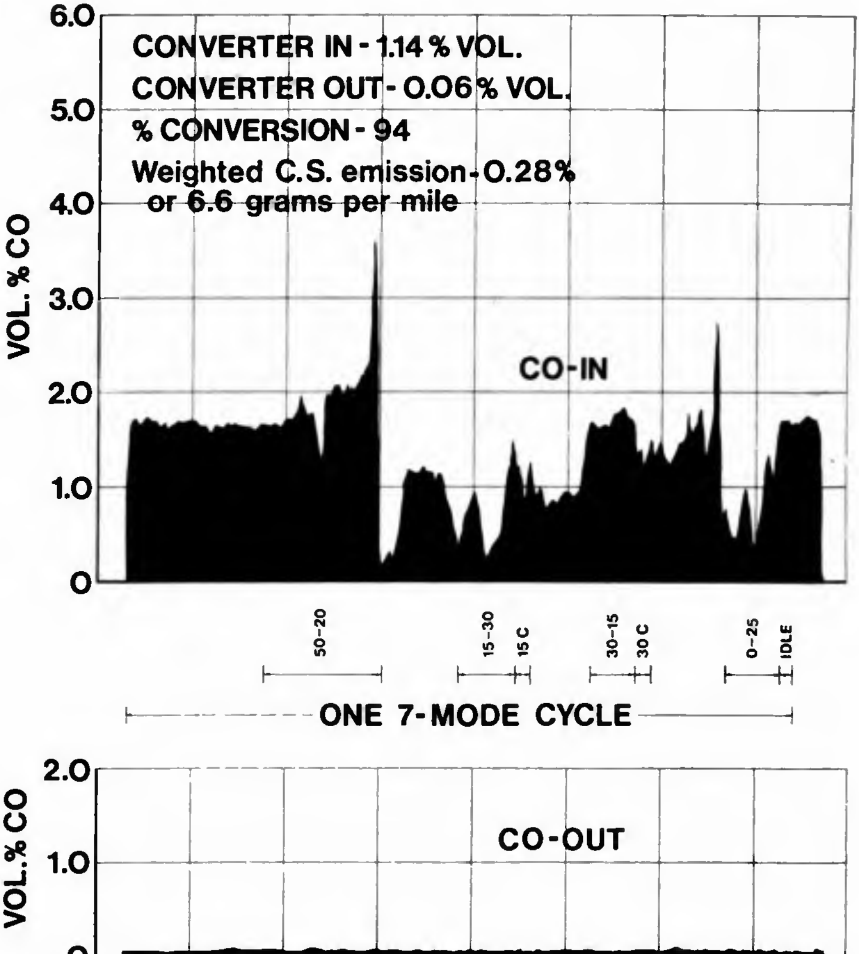


HYDROCARBON EMISSION
HOT CYCLES

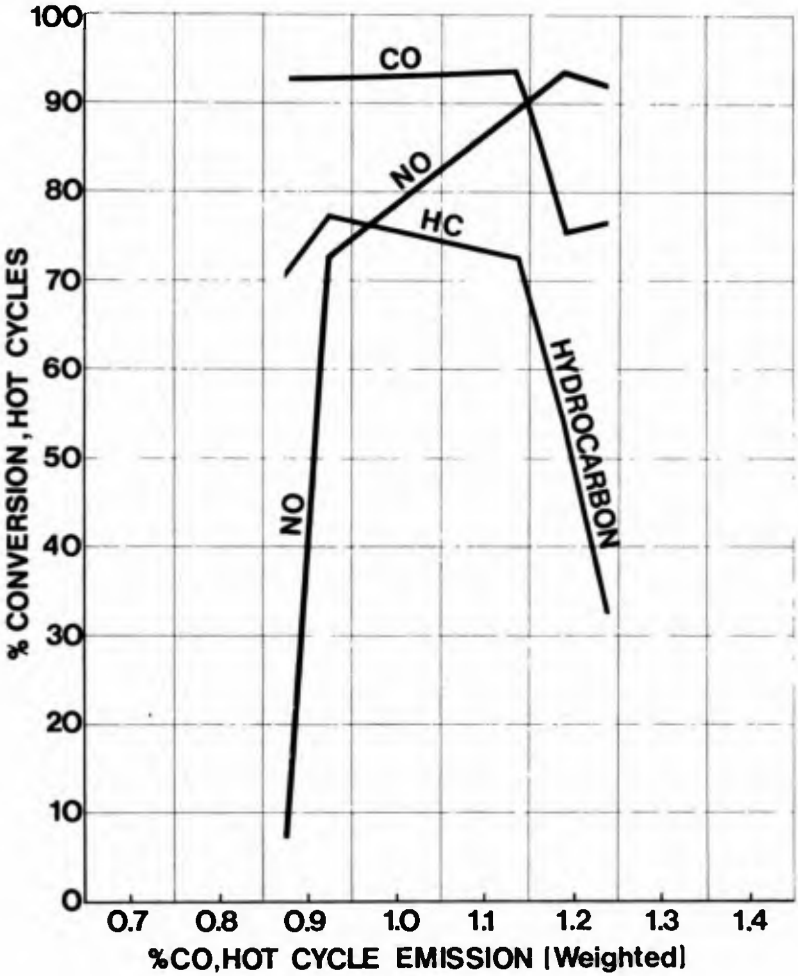


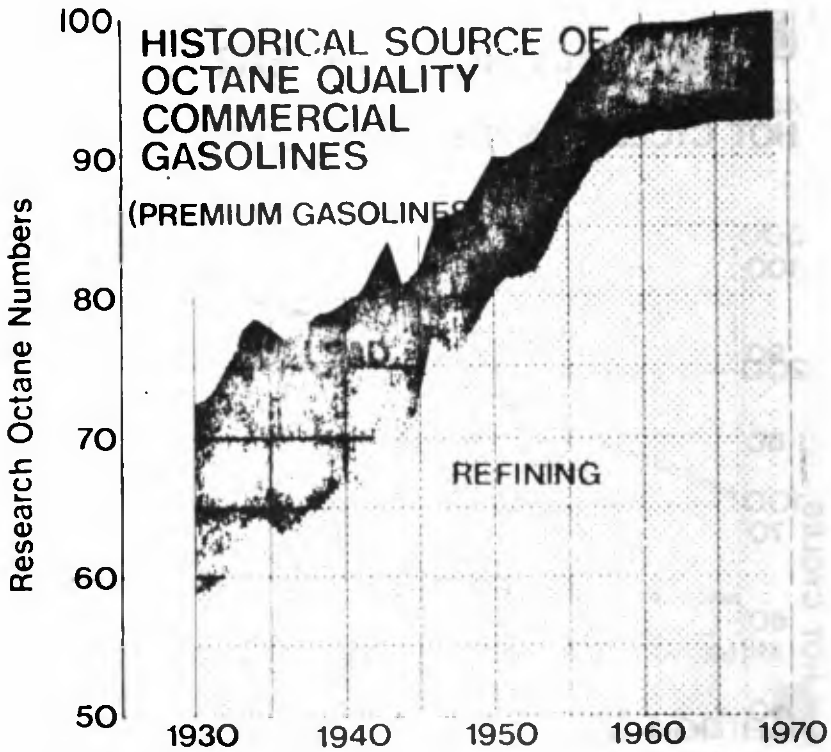
43-933 O—70—pt. 2——14

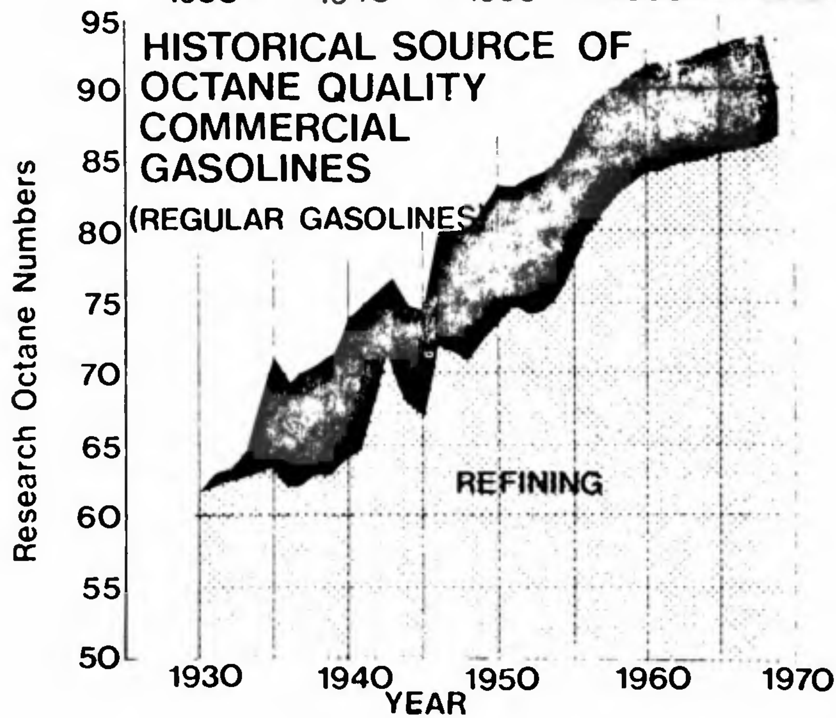
CO EMISSION
HOT CYCLES



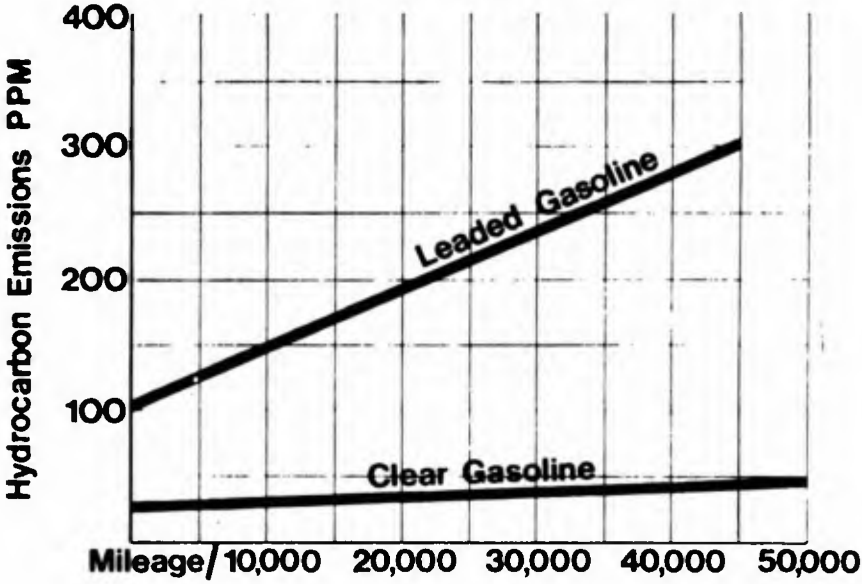
HOT CYCLE CONVERSION VS CARBURETION



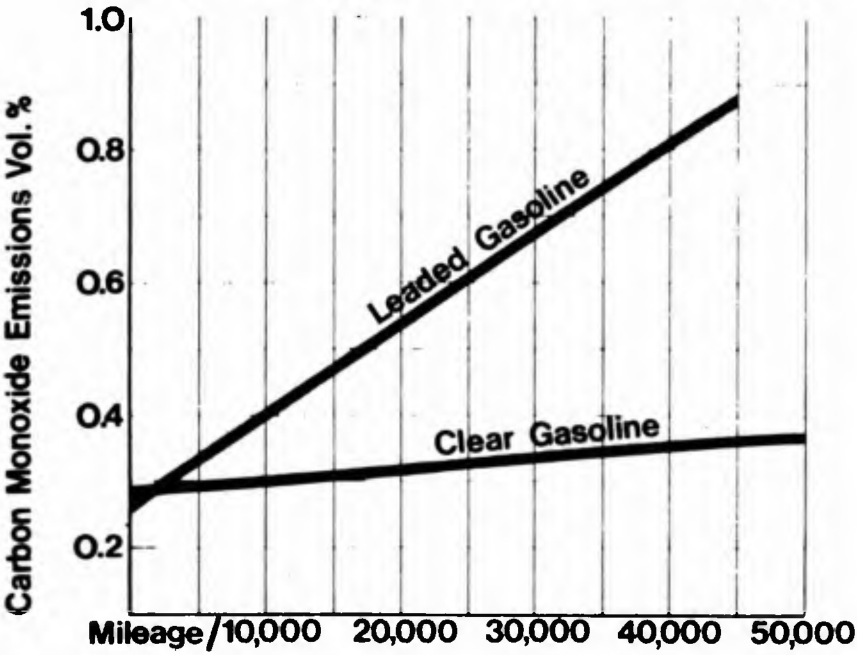

HISTORICAL SOURCE OF
OCTANE QUALITY
COMMERCIAL
GASOLINES
(PREMIUM GASOLINES)
REFINING
Research Octane Numbers
100
90
80
70
60
50
1930
1940
1950
1960
1970


HISTORICAL SOURCE OF
OCTANE QUALITY
COMMERCIAL
GASOLINES
(REGULAR GASOLINES)
REFINING
Research Octane Numbers
95
90
85
80
75
70
65
60
55
50
1930
1940
1950
1960
1970
YEAR

TYPICAL VEHICLE EMISSIONS WITH A CATALYTIC CONVERTER

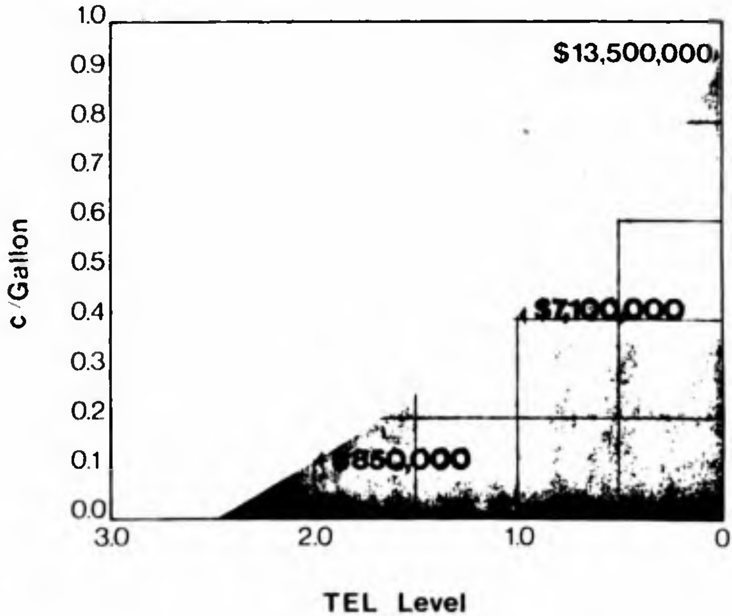


Carbon Monoxide Emissions, Volume%



COST OF LEAD REMOVAL FROM GASOLINE

¢/Gallon vs Lead Level



Mr. LOGAN. I might say that what we are referring to is the so-called California cycle which was perfectly appropriate when it was initiated approximately 10 years ago and was supposed to reflect driving conditions prevalent in California at that time. It does not necessarily reflect driving conditions in other localities nor is it necessarily reflecting current driving conditions in California. So, you have a series of prescribed tests based upon driving procedures which may not be realistic.

I might add, Mr. Chairman, that we have here in front of us a small exhaust converter device. This happens to be one that has been operated on a test run on a small foreign car. It is easier to carry that and therefore that is what we have with us. This particular one can be taken apart. There is inside a metallic type basket in which a catalyst looking somewhat like this is simply inserted to fill the metal basket.

The gases from the engine go in through the top of this system, go through the catalyst basket and come out the bottom. Obviously, due to the range of automobile design and size this would serve only certain types of cars and we have other designs for other types of vehicles.

Mr. ROGERS. Thank you very much, Mr. Logan and Mr. Gerhold.

Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

Have you made any estimates with respect to this catalytic converter as to what it might cost to put into production?

Mr. LOGAN. Yes, we have made estimates in terms of a variety of production rates. Obviously, this is something that lends itself to lowest cost if you are making sizable volumes. We use the general range of costs of $40 to $100 for small to large units. That would cover, we think, the range of automobile engines in operation.

Mr. SATTERFIELD. I take it that the material you use or the little pellets you add would have to be replaced periodically?

Mr. LOGAN. If you will refer to the next to the last chart you will see that if these pellets in a proper device were put on a car using clear gasoline you would expect that to be effective for well over 50,000 miles. In fact, the tests on this particular data now are up over 70,000 miles. So, you might say there would be no replacement. If you put it on a car using leaded fuel, you would get a degree of effectiveness for a period of time and then you could change it if you so desired if you wished to retain that effectiveness.

Mr. SATTERFIELD. Can you state what those pellets are?

Mr. LOGAN. These are an inorganic chemical base very similar to the catalyst that is widely used in refining practice to which has been added certain activators in relatively small quantity. These are very porous pellets, there is a great deal of surface. The active ingredient is put on there in a very, very minor percentage scattered across that surface.

Mr. SATTERFIELD. I notice in connection with this on page 3 of your report you say that you believe that the elimination of lead from gasoline is a highly desirable part of the total systems approach.

I assume from this, from what you have said, that you are talking about a total systems approach that includes a catalyst converter.

Mr. LOGAN. That is correct; yes, sir. We think that is the optimum way to obtain the maximum results.

Mr. SATTERFIELD. I notice on page 5 you mention the fact that an essential part of your licensing business is to provide refiners with accurate processing costs. I perhaps don't completely understand. What licensing are we talking about?

Mr. LOGAN. That is with reference to the difference in the cost estimates that have been made as to what it would cost the refining industry to convert from present practice to the production of equivalent octane gasoline without lead.

Mr. SATTERFIELD. You are referring here though to UOP's licensing business?

Mr. LOGAN. That is right.

Mr. SATTERFIELD. What business is that?

Mr. LOGAN. This is the licensing of processes to the refining industry. For example, the platforming process that is widely publicized, very widely used today, is an UOP process, It is licensed all over the world.

Mr. SATTERFIELD. Is that a catalytic process?

Mr. LOGAN. That is a catalytic process.

Mr. SATTERFIELD. Your company is in the business, then, of catalytic processing?

Mr. LOGAN. Therefore I am saying because of the experience we have had with the oil industry where they have licensed from us based on our cost estimates, we believe the same degree of reliability is in our present cost estimate.

Mr. SATTERFIELD. You believe that if the conversion is to be made, it would run somewhere between two to three billion dollars?

Mr. LOGAN. That is correct.

Mr. SATTERFIELD. Is this predicated over a given period of time?

Mr. LOGAN. This is predicated on knowing what the ultimate objective is and proceeding either completely at one stage or in stages aimed at the ultimate objective.

Mr. SATTERFIELD. If we were to impose this requirement, say right now, and you got into a crash program, would it still be two or three billion dollars in cost?

Mr. LOGAN. It would probably be a little more expensive. We think this is the cost if it were done in a reasonably orderly fashion.

Mr. SATTERFIELD. When you say reasonably orderly fashion, what are you talking about in terms of time?

Mr. LOGAN. Well, we are on record in our California testimony as saying that it would take probably no less than five years to do this if everybody worked diligently starting fairly quickly.

Mr. GERHOLD. If I may add a point there, the petroleum construction industry is about a billion dollar a year industry. If you add to that basically a $2.5 billion load this has to take place over a period of years simply in order for this industry to absorb that kind of additional burden.

Now one other thing that comes in is that this kind of equipment in general takes about two years from the date of a decision for installation until it is in and operating. You get into the double-edge business, simply the lack of skilled people and equipment and so forth, to build these units and the natural time delay. So that in any figure I think less than five years is rather an impractical kind of thing.

Mr. SATTERFIELD. Now the figure that you give us here, I take it, is predicated upon the cost of refinery procedures that would be necessary to accomplish the objective.

Mr. GERHOLD. Yes.

Mr. LOGAN. The capital figures that we used on the chart reflect our experience with a specific California refinery that we are familiar with and we simply took that and said we will make the same gallonage each of the same octane by upgrading the refining process.

Mr. SATTERFIELD. In arriving at your overall figure for the cost to the industry did you take into consideration and reflect possible additional costs in terms of trying to operate a dual fuel system, or do you feel that would be necessary?

Mr. LOGAN. I am not sure I understand what you mean by dual system.

Mr. SATTERFIELD. There has been some talk here that if action was taken to require non-leaded gasoline, that the present population of automobiles would not be able to operate with such fuel. Thus we would need one fuel for new cars and another for existing automobiles and that this would impose additional costs in terms of storage, separation, hauling to locations, using separate pumps and so on.

Mr. LOGAN. We are referring to the refinery cost. We don't think we are equipped to deal with the distribution aspects of this problem.

Mr. SATTERFIELD. I would like to ask you this question: since you are familiar with the problems that would be entailed if we took lead out of gasoline, who do you feel should set the time limit if a time limit is going to be set? Should it be set by industry or government, or perhaps by joint cooperation of the two?

Mr. LOGAN. My reaction is that, and I dislike the matter of pressure but I think that a degree of pressure on encouragement is probably going to be required to put some reasonable time limit on some of these matters.

Mr. SATTERFIELD. You do not think that the pressure which is in the offing right now in terms of meeting exhaust standards would be sufficient?

Mr. LOGAN. That will certainly be helpful. I think in order to meet the ultimate of the things we have shown here involving nitrogen oxides it is going to require considerably more effort all around than has been evidenced to date.

Mr. SATTERFIELD. It would seem to me that if HEW were to establish the maximum amount of nitrogen oxide and the other things that come out of an exhaust and possessed sufficient strength by law to enforce its established standards, that this would create the type of pressure you are talking about and would leave it to industry to try to resolve.

Mr. LOGAN. I think that is so.

Mr. GERHOLD. To some extent that has already happened to the pressure from the automobile companies on the oil companies to provide them with this lead-free gasoline. I think the automobile companies were responding to the more rigid specifications.

Mr. SATTERFIELD. Well, they were responding, I agree—You have used an expression that we have heard a couple of times before, "NIH". Have you had problems—maybe this is not a fair question and you can answer it or not. Have you had problems gaining acceptance of things you have developed simply because it wasn't invented in Detroit?

Mr. LOGAN. I will answer yes or no. Our company had an acceptable device, certified by the California authorities in the early 1960's. This was never put on a car because other mechanisms were used to accomplish some reductions. I might bring it up to date by saying that we are having excellent cooperation currently and have had for the last two years, from the automobile companies. They are fully aware of our data. They are working diligently themselves along these lines. We have made test devices for their cars. We have provided them with material. I think we are all working pretty diligently at the moment.

We feel here too, particularly with respect to the nitrogen oxide situation, and this is relatively recent data, and to the best of our knowledge there is no similar information available elsewhere, that this involves problems that haven't been faced before and that therefore it is necessary that the utmost in cooperation be involved if we are going to solve the nitrogen oxide problem which is a key item to the pollutant and a key part to the smog problem.

Mr. SATTERFIELD. If you are going to have cooperation involving the whole system, as I visualize it, we are talking about fuel as well as the engine, and if we are going to give an agency the power to control the content of the fuel, for example, don't you believe it would be only proper in this context to also give it the power to determine what is going to be in the engines and what accessories there are to be to an engine since one vitally affects the other?

Mr. LOGAN. We have not said that we think there ought to be regulations controlling the content of the fuel or additives to fuel. We have simply said that if you want to achieve this kind of result we believe that you will have to have fuel of a certain type.

Mr. SATTERFIELD. Let me ask you this, then: If we get to the question of evaluating alternative devices who do you believe ought to make that determination?

Mr. LOGAN. I think the statement of standards, standards being what comes out of the exhaust pipe is of critical importance. What is done prior to the end of the exhaust to accomplish this result is a combination of a number of things and I think it can be successfully achieved probably letting the automobile industry, the oil industry, and people like ourselves work together to maximum advantage. There may be alternate procedures here, alternate combinations.

Mr. SATTERFIELD. Thank you, sir.

I have no further questions.

Mr. ROGERS. Dr. Carter.

Mr. CARTER. Thank you, Mr. Chairman.

Your real business is in doing research and development, is that right?

Mr. LOGAN. That has been the major historical part of our business. Until 1960 it was almost the entire business. We have diversified since then, sir.

Mr. GERHOLD. We are not a research institute.

Mr. CARTER. I understand.

Mr. GERHOLD. We do not do research and development for hire. We do it on our own initiative and then sell the product.

Mr. CARTER. You develop mechanisms for sale to the oil industry, in other words.

Mr. GERHOLD. That is right.

Mr. CARTER. You have developed a catalytic converter which you think is quite effective, is that right?

Mr. LOGAN. That is correct.

Mr. CARTER. Do you think the automotive industry should use your converter?

Mr. LOGAN. I think the automotive industry should use a converter and I would hope that they would use some of ours.

Mr. CARTER. Do you think yours is the best there is on the market at the present time?

Mr. LOGAN. We think ours is as effective as anything we have seen and we believe that with respect to the removal of nitrogen oxide our particular catalyst is better than anything we have seen to date.

Mr. CARTER. What about the removal of carbon monoxide and hydrocarbons?

Mr. LOGAN. The removal of carbon monoxide and hydrocarbons we think we effectively solved months ago.

Mr. CARTER. Yes, sir, but with this you would want an unleaded gasoline, is that true?

Mr. LOGAN. This chart shows the comparison between leaded gasoline and clear gasoline. If you take the hydrocarbons at the stop starting with an engine emitting three hundred parts per million, on leaded gasoline in the first mile you have a hundred parts left, you have accomplished two-thirds of the reduction of hydrocarbons. But as you proceed out on the mileage that conversion drops significantly. Now if you want to get a higher percentage conversion initially and continue this high conversion, you have to feed that engine with clear gasoline. So there are benefits to the use of these devices with leaded gasoline. The performance is less significant than it is with clear gasoline.

On the leaded gasoline catalytic devices are poisoned so that the duration of the conversion——

Mr. CARTER. Would you repeat that, sir? I did not understand. Just the last part.

Mr. LOGAN. The problem with the use of the leaded gasoline is that the lead in the gasoline does what is called poison the catalyst and renders it incapable of consummating the conversion to the same degree of effectiveness. Therefore, the conversion from an engine using leaded gasoline deterrents rather rapidly as shown by the top curve in comparison with the bottom line.

Mr. CARTER. There are those who say though that they overcome this problem with leaded gasoline.

Mr. LOGAN. Not on a catalytic system.

Mr. CARTER. Sir?

Mr. LOGAN. I would say I don't think so on a catalytic system.

Mr. CARTER. We just rode over to the Capitol in a car.

Mr. SATTERFIELD. If the gentleman will yield, that was not a catalytic system.

Mr. CARTER. Possibly you are right on that.

Mr. LOGAN. I might further add at that point, because there are some systems, I referred to them briefly in my notes here, there are some suggestions, for example, a clean air package that has been put on cars to date involves pushing more air through the exhaust system. That system uses power from the engine. We have been told, based on fleet tests in New York City, that the clean air package on taxicabs to date results in ten percent more fuel consumption. It does not do you much good to have a lower content of material in the exhaust if you are putting ten percent more fuel through the total system.

Also, any system that injects air, additional air into the system, increases the nitrogen and the oxygen going out tailpipe because the only source of nitrogen and oxygen is the air that goes into the engine or into the exhaust system.

Mr. CARTER. Just right there. You say that is the only source of the nitrogen and oxygen.

Mr. LOGAN. Essentially.

Mr. CARTER. I agree as far as nitrogen is concerned, but gasoline itself is a hydrocarbon and does not contain oxygen within itself.

Mr. LOGAN. Not appreciably. It is carbon and——

Mr. CARTER. What is the formula for gasoline?

Mr. LOGAN. CH, carbon and hydrogen.

Mr. CARTER. It has no oxygen within it.

Mr. LOGAN. Not significantly in gasoline.

Mr. GERHOLD. I think you are thinking perhaps of carbohydrates.

Mr. CARTER. Yes.

Thank you, Mr. Chairman.

Mr. ROGERS. Mr. Preyer.

Mr. PREYER. I just wanted to ask you, a figure you mentioned when you were discussing the cost of lead removal and you gave the total cost for new refining facilities would be some two to two and a half billion dollars. Then you used the figure of one cent per gallon. I understood that that was the cost in the example of a refinery that you used.

Mr. LOGAN. Yes.

Mr. PREYER. This worked out to one cent a gallon.

Mr. LOGAN. To one cent per gallon of gasoline produced, including a charge to amortize the new investment of capital in that particular refinery.

Mr. PREYER. Can you extrapolate that to the entire oil refining industry?

Mr. LOGAN. Pretty well. We can extrapolate that. We have, let me say, made numerous studies since that time of different situations and it confirms to us that we are well within a reasonable range in our estimates of two to two and a half billion dollars for the industry. That is not to say that individual cases will not cost more per gallon and others less, but we believe that we are in a reasonable range at roughly one cent and two to two and a half billion dollars per gallon.

Mr. PREYER. Thank you very much.

Mr. ROGERS. Have you developed a platinum catalytic device? I had understood that perhaps you had developed this.

Yesterday we heard that if this were developed every woman in the country would have to turn in their rings. What is the story on that?

Mr. LOGAN. Mr. Chairman, the petroleum industry for all of its platforming process and for other processes uses a catalyst in which platinum is incorporated, and there is a tremendous amount of platinum circulating today throughout the petroleum refining industry. We have a wide range of catalysts, I think 30 in number, that we have used in some of this test work. Some of those have platinum and some do not. We get variable results from both types.

With respect to the problem of platinum, because we make millions of pounds a year of catalysts for the refining industry we are one of the largest users of platinum in this country and we are constantly reprocessing the catalysts from the refineries, removing platinum, putting it on new material, new base, and making up the difference. We buy sizable quantities of platinum each year.

I have investigated this with two platinum sources and am told that there are adequate reserves of platinum. There would be problems in terms of opening up new reserves, depending on the magnitude of demand.

I might further add that from the standpoint of the refining industry, we are successfully developing new catalysts which use less platinum per unit of refining performance and therefore some of the developments here in improving the octane from refinery operations need not necessarily significantly add to the amount of platinum required.

If you used a platinum catalyst in the converters that is another problem. You can multiply the number of platinum catalyst converters by the number of cars that are used and I have been told that all new cars coming out of Detroit could be equipped with platinum catalyst converters if the platinum industry were given just a reasonable period of time to get ready for that demand.

Mr. ROGERS. Your testimony has been that if lead is taken out of gas, aromatics have to be added to bring up octane. Is that true?

Mr. LOGAN. That is essentially correct.

Mr. ROGERS. How many different aromatics have to be added?

Mr. LOGAN. Basically present-day gasolines run I would guess around 30 percent aromatics and perhaps that level would have to be raised to 40. That depends to some extent on the exact mechanism used to carry it out. The simplest version is simply to do more reforming, make more aromatic blending stock and use more of this.

Mr. ROGERS. Would the emission from aromatics be caught in your device?

Mr. LOGAN. An aromatic is simply another form of hydrocarbon. To the extent that hydrocarbons are burned out in the device it would be burned, the aromatics would be burned out also.

Mr. ROGERS. So there would be no problem with adding aromatics if you had the device that catches them in nonleaded gasoline.

Mr. LOGAN. That is correct.

Mr. ROGERS. Let me ask you this: On your chart that is on the floor there I notice that the industry since 1930 has been able to increase the octane of its basic gasoline product without adding lead, rather considerable progress. I believe you stated they are up now to around 94 or so.

Mr. LOGAN. 92 or 94.

Mr. ROGERS. We had some independents telling us that they were up to 96.

What is the likelihood that that can be carried up? Are we making any progress here in continuing that?

Mr. LOGAN. Mr. Chairman, this I think is a good point because actually the results shown on this chart do not necessarily indicate the maximum octane being made in the refining industry today. They simply indicate the average octane going up from the refinery and put into premium gasoline.

Mr. ROGERS. This is pooled gasoline?

Mr. LOGAN. That is right. If you take the refining octane improvement over the period 1930 to 1960 you will note an almost constant improvement in octane. If that line is simply projected it would be over a hundred octane today.

Now we know there are processes in use today that can make one hundred octane gasoline as base stock without the addition of lead.

Mr. GERHOLD. If I can add a point. The top of this chart basically represents the requirements of the engine that Detroit has provided, so that this curve basically has leveled off because the compression ratios have more or less been held constant over the last ten years. There has not been this large increase in compression ratios that took place before this.

The margin here really represents an area in which it is economically cheaper to get octane numbers by adding lead than by refining. So when the upper line stopped the lower one did too simply on the basis of economic laws taking place. But there is no technical reason why that could not have gone up. If the upper curve had gone up, the lower one would have.

Mr. ROGERS. What would be the difference in cost?

Mr. LOGAN. If you wanted to take, in the example cited, if you wanted to take the octane on the blue part of the curve right up to the 100 level, then that is what we did in the example we cited which brought the cost up approximately one cent a gallon and the investment shown on the other chart.

This results from processes that are in operation today. This is not new technology that has to come off the shelf. We are fully confident that the years ahead this may even be improved further.

Mr. ROGERS. Now will your converter fit all models or can it be adjusted to fit all models?

Mr. LOGAN. We have a number of different designs and we have made a number of different ones for Detroit's various cars ranging from small ones to large ones. This happens to be off a small foreign car. It was operated in a vertical position simply because there was space near the engine for its operation in that position. The ones that we have on some of the Detroit cars are an elongated version because they have been made to fit under the car. The preferential place from the standpoint of conversion efficiency is near the engine because the maximum temperature condition prevails at that point and that is helpful to efficiency.

Mr. ROGERS. How long would it take to produce this if Detroit decided to use this?

Mr. LOGAN. Detroit could probably answer that better but I am sure it would take less time to do this than it would take to gear up for a new model. We are in the process of designing a pilot run that will make several thousand of these. We have commitments to make several hundred of them right now. We will start making them. To make them in the millions would take the time necessary to put in equipment and build a line and it might be 12 months or longer.

Incidentally, we had one chart that we did not show you that shows you the variety of designs depending on the nature of the dimensional space available at the location in which it is installed.

Mr. ROGERS. Are there any other questions?

Thank you so much, Mr. Logan and Mr. Gerhold. We appreciate your being here and giving the committee a very interesting display. This testimony I think is encouraging.

Mr. LOGAN. Thank you, sir.

Mr. ROGERS. Our next witness is Mr. M. J. Mighdoll, accompanied by Edward L. Merrigan. Mr. Mighdoll is Executive Vice President of the National Association of Secondary Material Industries. We welcome both of you gentlemen to the committee and we will be pleased to receive your testimony.

STATEMENT OF M. J. MIGHDOLL, EXECUTIVE VICE PRESIDENT, NATIONAL ASSOCIATION OF SECONDARY MATERIAL INDUSTRIES, INC.; ACCOMPANIED BY EDWARD L. MERRIGAN, ATTORNEY

Mr. MIGHDOLL. Thank you, Mr. Chairman.

My name is M. J. Mighdoll. I am Executive Vice President of the National Association of Secondary Material Industries, Inc., with headquarters at 330 Madison Avenue in New York City.

The National Association of Secondary Material Iudustries, Inc. represents approximately 700 of the leading firms in the nation concerned with the reclainimg and recycling of secondary raw materials. These firms collect, process, and prepare the overwhelming proportion of such economically vital secondary materials as aluminum, copper, lead, zinc, nickel alloys, precious metals, paper stock, and textiles.

Our association vigorously supports the objectives of H.R. 15847. For reasons we will detail further in this statement, it is essential that there be—as this legislation proposes—"maximum Federal effort in, and attention to, programs for encouraging greater use of reclamation and recycling of materials from solid wastes through incentive and regulatory measures". Restraints impeding the industry must be removed and economic and technological incentives established. The provisions of this legislation represent a major step in that direction.

The industry we represent has, for more than half a century, devoted its efforts to recovering and recycling secondary materials in such commodity fields as nonferrous scrap metals, paper stock, and secondary textiles. It annually reclaims millions of tons of such raw materials, much of which might have represented nothing more than waste if it had not been for the initiative and resourcefulness of scrap processors and scrap consumers who established a major industry in this country. We are the "umbrella" trade organization—representing the total industry, those companies which are in any way concerned with secondary materials.

President Johnson's Science and Advisory Committee estimated that the collection and processing of secondary materials was a $7 billion per year business. It reflects the scope and importance of the many firms in the United States whose reclamation efforts have a tremendous impact on our economy.

Here are some key factors to point up this economic importance:

Over 3,000,000 tons of nonferrous metal scrap are annually processed by dealers and consumed by smelters and refiners in the United States.

About 10,000,000 tons of paper stock are recovered and processed our industry for the Nation's paper, paperboard, and building material mills. That constitutes 20 to 30 percent of the raw material makeup of the paper and paperboard manufacturers.

Approximately 40 percent of the supply of copper is recovered from scrap. As a matter of fact, more copper comes from scrap sources than is mined from domestic mines.

The quantity of lead recovered from scrap has risen from insignificance in 1900 to over one million tons in recent years, surpassing by a wide margin the lead supplied from domestic ores.

The value of sales by textile waste dealers and processors has recently been estimated at approximately $300 million.

There are many more statistical facts that could be cited to dramatize the resourcefulness of our industry. We append our statement. "Perspectives of the Secondary Materials Industry", which contains useful data in this field. Also, we submit for the record, a statistical sheet showing the significant proportion of secondary metals to available mine production and to the total raw materials supply.

The secondary materials industry has developed a vast collection system, through which it reaches out over the industrial, community, and Government generators of waste material and brings into the marketplace every pound of scrap material that has an economic value. At the local community level there are small "retail" scrap collectors whose function it is to buy secondary materials from small business establishments, farms, and the general public. This scrap is segregated in a very basic manner and then sold to "wholesale" dealers, whose technical knowledge and more sophisticated equipment permits them to process it into the kind of product which can be consumed by mills. In this processing operation, the wholesale dealers remove contaminants which might otherwise make this material unsalable, and often change the form and size of the scrap to fit consumer requirements. Wholesale dealers also purchase larger quantities of secondary materials from industrial plants, Government installations, manufacturing operations, printing firms—in short, all sources of waste become generators of a new resource—secondary materials.

Our industry also includes a wide range of firms which consume secondary materials in its processed scrap form, and through smelting, refining, and related processes transform this recycled material into a raw material suitable for its ultimate consumption by the nation's manufacturers, mills, fabricators, foundries, et cetera. Here we see the end of the cycle: from manufactured waste to processed secondary materials to specification raw material to new end product. We call it recycling resources—and without it, our economy could not long survive.

It becomes obvious that an industry which has developed such a widespread collection system, which has the technological know-how to process this material, and which has the ability to meet critical specification demands and is able to market it economically—already is recycling a very large percentage of solid wastes. It is, in our opinion, the only industry which is economically oriented and technologically prepared to cope with the vast accumulations of solid waste that will arise in the future and to transform this into recoverable and utilizable material.

The job our industry has done and is doing in this reclamation and recycling process of secondary materials has been attested to by Government and business leaders over the years.

In its "Defense Scrap Yard Handbook", the Department of Defense states:

Conservation and reclamation of scrap are of the utmost importance in order to provide the necessary raw materials for the manufacture of essential military and civilian items. Secondary raw materials recovered from scrap provide a vast reservoir of hard-to-obtain materials.

The historic Paley Report stated:

Recovery of scrap in the secondary metal market is essential for the operation of the metal industry.

The late President John F. Kennedy, in a message to our Association's 50th Anniversary, declared:

In your inventory there is nothing that is useless. Scrap metal, textiles, rubber, waste paper—these are your raw materials for new useful production. In wartime you taught us how to make do. In peacetime, you give the lie to those who say we are wasteful. If any word were to describe your industry, that word might well be resourcefulness.

The recognition that the secondary material industry is the logical place to promote expanded solid waste reclamation is, we are glad to note, beginning to be felt in Government circles now.

In a recent article, Richard D. Vaughan, Director of the Bureau of Solid Waste Management, Department of HEW, stated:

Private scrap dealers and processors now play a very significant role in helping to cope with the nation's solid waste problem. The importance of their service to society, as well as the business opportunities for the scrap industry, may be expected to grow even larger in the future.

The shift in Government thinking from the "disposal" of solid waste to its "recovery and recycling" has at last focused on the established operations of the secondary material industry which, both in times of war and peace, has been the principal source of raw material reclamation in this country.

Our industry several years ago saw the direct and pragmatic relationship between the recovery of secondary materials and the challenging problem of solid waste accumulation. As a result, we have engaged in our own studies in solid waste utilization; we have established a National Solid Waste Utilization Committee to spearhead activities in this field; we have conducted meetings and conferences on this subject.

Of most recent significance is the proposal we have advanced to HEW for an intensive economic and technological study designed to provide opportunities for greater solid waste utilization. We eagerly await HEW acceptance of this plan, which we believe will be the first coordinated Government-industry program to knock on the door of new opportunities for solid waste recycling. This proposed study would appropriately put our industry in the forefront of the problem and develop the type of interrelationship with H.E.W.'s Solid Waste Bureau that will be essential to the ultimate solution of the question of greater solid waste utilization.

The change in emphasis by the Government from "disposal" to "recovery" of solid waste has been a swift and dramatic one. At last the Government became concerned with how to reuse secondary materials instead of how to get rid of "junk". It is obvious that recycling procedures are useful not only in eliminating the need to find dwindling dump areas, minimizing air pollution and alleviating the rising cost of disposal for municipalities and States—but in recovering material of an economic value and thus adding to the gross product of the United States.

In its thoughtful "Policies for Solid Waste Management", the Ad Hoc Committee on Solid Waste Management points out that: "The 200 million tons of solid waste material per year represent a national resource and will in time be a major one. Return of fractions of solid waste to economical reuse must in the long run become common practice and must be a national objective. Some mineral fractions of the total solid waste stream are recycled today—notably steel and copper. But lesser fractions in the aggregated waste streams must eventually be recycled."

The Ad Hoc Committee then went on to state as one of the objectives of solid waste management: "To economically recover and adequately process for recycle increasing portions of the solid waste streams."

Mr. Chairman, our testimony is designed to emphasize the fact that the secondary raw material industry has for more than 50 years "economically recovered" material which otherwise would have been lost to the economy and magnified the solid waste problem. It has converted waste into useful raw material and has each year put into the mainstream of U.S. production channels millions of tons of material with an economic value running into the billions of dollars.

Obviously, not all solid waste material is economically recoverable. The term "fractional reclamation" used by the Ad Hoc Committee on Solid Waste Management refers to the percentages of material that can be recovered economically. The secondary material industry has, over the past few decades, actually been expanding that "fractional reclamation" to the point where it is successfully recovering and reclaiming ever larger tonnages of material which were once thought to be unreclaimable. This work has been accomplished as a result of the industry's own developmental efforts, its own ingenuity, its own dollars.

For instance, through intensive research in the field of de-inking processes, our paper stock industry has been able to reclaim and reuse huge tonnages of paper which otherwise would have been burned or buried. In order to comprehend the importance of this particular successful process, it is only necessary to look at a recent study by the Glass Container Manufacturers Institute (in the report "Controlling Wastes for A Quality Environment" by John H. Abrahams, Jr.). This report shows that paper accounted for 50 to 60 percent of the total litter.

I was particularly interested in the previous witness this morning who held aloft a piece of paper and commented this was made from secondary fiber. There is no end to the number of other examples that could be used to demonstrate this. Just in this last year our industry sponsored a research project which enabled us successfully to find a means of removing tar and other types of contaminants from container type waste paper.

This has opened up another whole avenue of further use of waste paper. What would seem to be necessary in this regard is some encouragement to the paper manufacturers to utilize increasing amounts of secondary raw material in their product as well as virgin fibre. You might be interested in one additional comment I can make on this. That is that the annual recovery of waste paper constitutes the equivalent of 200 million trees.

There is no statistical study available to indicate the substantial tonnages of paper stock that have been taken out of that 60 percent because our industry developed a de-inking process which permits the economic recovery of waste paper. But this is one example of the resourcefulness and ability of the secondary material industry to reduce the staggering size of the solid waste challenge—and at the same time to help conserve the nation's forests.

Here is another: When the problem of air pollution became evident to Government and industry and open burning of insulated wire was abolished by most of the municipalities, cities, and States in the United States, our industry through its own initiative and through private research, developed a process for the removal of the insulated wire from copper and aluminum by means of new chopping and mechanical separating operations. These avoid pollution of the air and at the same time economically recover the metals.

In that respect, firms in our industry have spent substantial funds to develop special air pollution control equipment in order to be able to continue to process increasing quantities of secondary materials without polluting the air. By doing this, it has been able to speed the flow of scrap for recycling. And this type of research on air pollution control equipment is continuing.

The expansion of "fractional reclamation" can be seen in every area of the secondary materials industry. Twenty-five years ago, much of the nickel alloy and exotic metal scrap (molybdenum, titanium, tantalum, et cetera) was simply bypassed because the industry did not have the technological ability to handle such metals. Vast economic "mines above ground" were being lost because the knowledge, equipment, and industry resources had not reached the point whereby this material could be recovered economically. Today, this material not only represents an economic gain, but also represents strategic metals and expresses a vital conservation factor. But it needed research and equipment on the part of private industry to do the job.

In the past ten years a similar situation existed in precious metal scrap. Little attention had been paid to the recovery and reuse of silver scrap, for example. Here again, private initiative within our industry has made precious metal scrap an important economic factor today.

One of the vast problems facing America today is the staggering production of metal cans which are being thrown out each day. A recent study states that these metal cans represent 16 percent of total litter.

What can be done with the millions of cans that are being discarded daily and whose bulk will grow and multiply in the next decade? This is the kind of challenging problem which our industry is already studying with a view toward expanding the potential of "fractional reclamation".

Yet the economics of the problem cannot be ignored. The collection of individual cans is extremely uneconomical. The feeling exists within our industry that somehow these cans will have to be collected, reprocessed and recycled. Our Association has been in contact with Reynolds Metals Company which recently began a pilot project in this field, and we are how searching for possible reclamation techniques by means of which these aluminum cans can be put back into the recycling process.

Our industry is constantly on the alert for new economic methods by which to expand the use of recoverable solid wastes. By developing foreign markets for surplus metals, for paper stock and textile wastes, for example, we have been able successfully to reduce the aggregate size of the solid waste accumulation in this country. Millions of pounds of potential solid waste have been shipped abroad to foreign consumers. This type of international trade can be expanded to reduce our total solid waste accumulation even further if we can make U.S. surplus scrap competitive in the world marketplace and reduce current restrictions on its overseas flow.

Unfortunately, our industry has had to face numerous restrictions on its operations which have hampered the expansion of the potential recycling of raw materials. When such restrictions occur, the result has been an accumulation of solid waste for disposal, rather than for reuse. One such instance is the secondary textile industry which has suffered from restrictive legislation to a point of economic deterioration. As a consequence, three to four hundred million pounds of contaminated cotton-synthetic blends alone are now accumulating as solid waste.

Legislative restrictions are also evident in the nonferrous scrap metal industry, as evidenced in our study, "The Secondary Material Industries and Environmental Problems", which we would like to append to the record. Zoning clauses which force scrap firms to move; municipal ordinances which require scrap businesses to meet inordinately expensive requirements in order to be permitted to operate; special administrative requirements for scrap companies; discriminatory Government quotas for export shipment—these are some of the difficulties that have resulted in a contraction of the collection process and a dislocation of the channels for reprocessing of secondary raw materials. This has been a major cause for the disruption of the important collection system our industry has built up over the years.

There are also economic restraints to be considered and corrected. Such subjects as transportation costs, adequate and trained manpower, consumer discrimination and prejudices, technological assistance, inequitable export quota restrictions, are but some of the areas deserving of constructive attention. It is only by strengthening—not weakening the reclamation system developed by our industry—that the Government can help in reducing the accumulated 200 million tons of solid waste per annum. We must remove the restraints, including the psychological ones, which inhibit the recycling of recoverable solid waste.

That is why H.R. 15847 is so important. There most certainly must be studies of these restraints and attention given to possible incentives and regulatory assistance which can enable the industry to recycle, reclaim and utilize the maximum amount of recoverable solid waste. This industry and its commodities have often been the victim of Government regulations and restrictions; it is now vital that it become the beneficiary of Government efforts.

The Department of the Interior has submitted a report—"Summary of Investigations and Research on the Extraction of Mineral and Energy Values from Solid Wastes". In this report, it was pointed out that "the total scrap and energy value that could be derived annually from these wastes (household and commercial refuse collected annually) approaches $1 billion." The report went on to say that the Bureau of Mines is studying techniques "to separate the conglomeration of nonferrous metals contained in the refuse and incinerator residues. Research on methods to separate and recover the aluminum, copper, zinc, lead, and tin values from the nonferrous fractions are continuing. Refinement of the separate nonferrous values to marketable products is the ultimate objective."

This, of course, is also the aim of our industry. As I noted previously, we have devoted the research and operational efforts of our industry to widen the recovery of all economically reclaimable secondary materials. One of the significant aspects of this program has been the development of new types of materials handling and production equipment to speed the recycling of scrap.

Our Association has continually spotlighted the role that new technology can play in recovery and recycling through an intensive program which features the exhibits of a number of equipment firms in many fields, including air pollution control and solid waste utilization.

With the aid of the Government—through grants for studies and research and through economic incentives—our industry can move effectively to expand the recovery of those solid wastes which today seem economically or technologically unrecoverable. We can uncover new markets and broaden existing ones through physical research and through realistic analysis of the restrictive elements and prejudices which adversely affect the recycling of these secondary raw material resources.

Our industry has already embarked on research into broadening the reclamation of certain of our secondary commodities. With the aid of the Government, through economic and technological encouragement and assistance, we can move into untapped areas of reclamation and begin to utilize millions of additional pounds of raw material with an economic potential which today are only adding to the solid waste burden.

Scrap is an American product. It is generated and produced in the United States. It does not require special transportation facilities to bring it into this country's economic supply lines. It can be reused over and over again. No foreign country can suddenly cut off this vital, and sometimes strategic, raw material. It is here in our own backyard and it remains for us to utilize it without self-imposed restrictions.

During World War II and during the Korean war, when the need for secondary materials was critical, and when the Government called upon the citizens of this country to save its waste paper and its scrap metals, our industry accomplished a gigantic task. Now we are ready to declare war on solid waste. We are prepared to use all our energies and efforts to reduce the magnitude of the problem of solid waste facing every city, every municipality, every section of our country. We believe that our industry is the only logical instrument for accomplishing the conversion of the additional quantities of solid waste into an economically useful product. We have the experience, the facilities, and the know-how. We ask that Congress appropriate the necessary funds for research and development so that they are directed productively for expanding solid waste utilization in harmony with our industry and not competitively with it.

Our industry—the nation's solid waste utilizers—with all its resources, stands ready to make a maximum contribution to the nation's solid waste program. We offer the experience and competence of this industry and this Association specifically by making available our leaders to serve as members of the Advisory Committee that are proposed by this legislation.

ADDITIONAL STATEMENT—RE H.R. 15848

Our Association also favors the general aims and purposes of H.R. 15848, the Clean Air Act Amendment. However, as we advised this committee in 1967, when the Air Quality Act was before the Congress:

1. We continue to believe that if the desired air pollution controls are to be accomplished effectively and quickly, Congress should simultaneously provide adequate financial assistance or tax relief, or a combination of both, to businessmen required by law suddenly to comply with rigid new air pollution controls and to install costly air pollution control equipment at their plants.

2. We also feel very strongly that, in connection with this pending legislation, this committee should again make it clear to the Federal agencies charged with the administration of the Clean Air Act that all Federal policies, air quality standards and air pollution control procedures should be carefully coordinated and administered through close cooperation and collaboration between the Secretary of Health, Education, and Welfare, representing the health and welfare interest of the public at large, and the Secretary of Commerce, representing the practical ability of the business and industrial communities of the United States to meet the public health requirements in each particular region of the country. In other words, we are convinced that effective, practical, necessary air pollution controls will be achieved sooner through control policies, criteria and standards which take into account from the very outset, not only the scientific goals involved, but also questions of economic feasibility and the various industrial methods which already exist or which might have to be devised ultimately to control and eliminate toxic air pollutants in specific sections of the United States.

3. We also continue to oppose the adoption of uniform, nationwide standards of air pollution control for entire industries, or even for certain segments of entire industries. In this regard, H.R. 15848 authorizes the establishment of ambient air quality standards for the entire nation with respect to any pollutant or combination of pollutants which the Secretary of Health, Education and Welfare determines may endanger the public health or welfare. A similar proposal, of course, was made in 1967, and we think it was very wisely rejected by the Congress.

In the secondary materials industry, in metals alone, our plants differ radically from those engaged in the primary metal industry. Within the secondary industry itself, several different types of metals are processed in several dissimilar plants and plant operations, some large, some medium sized, some small. These plants are located throughout the United States and in most cases the physical surroundings of one plant differ substantially from those of most others. The same type of picture is found in the secondary paper industry, the secondary textile industry, and the secondary rubber industry.

Thus, the problems of air pollution control in the secondary materials industries themselves vary substantially from plant to plant and from locale to locale. A secondary copper plant in a large congested city like New York, Chicago, Baltimore or Los Angeles would, from its location alone, have a far different air pollution problem to contend with than that which might confront the secondary copper plant located out in the open areas of the Midwest or in the deep South. By and large, therefore, each plant differs from the other in quantity and quality of industrial emission; in the character of its surrounding area; in the character of the surrounding atmosphere; in the nature of the physical land or water surrounding it; and in the prevailing weather characteristics—that is, dry, windy weather not susceptible to stagnating air pollution to wet, heavy air conditions where industrial emissions are trapped near the ground and thus constitute a hazard to the public health and welfare.

Accordingly, our Association opposes the establishment of national standards because we think they are impractical; that they will be unnecessarily burdensome in many cases where some of the type of local or regional standard would be just as effective; and in many cases they might require small plants, possibly at the expense of going out of business, to meet standards which in fairness and reality, have no application whatsoever by dint of the plants' locations, physical surroundings, surrounding atmospheric conditions, et cetera.

For the same reasons, however, our Association continues strongly to support the overall approach to the problem already taken and underway under the existing Clean Air Act. Under that law, air quality control regions are required in lieu of national standards. The emphasis is very properly on regional and local air pollution problems and controls, that is, the present statute seeks to control air pollution where it is found and not needlessly elsewhere.

In essence, insofar as air pollution controls are concerned, our Association feels strong, effective controls are needed, but we urge the Congress not to divide or impair the secondary materials industry's ability to meet the nation's requirements in the field of solid waste reclamation and utilization by seeking to drive some of our small business concerns out of the industry because of their complete inability to cope with national air pollution standards which, in many cases, are totally unnecessary and irrelevant.

The importance of this inter-relationship between an unrestricted and uninhibited secondary materials industry and an expanded solid waste utilization program have already been emphasized by us. We ask the Congress not to impair, but rather to provide air pollution control research and development and air pollution control assistance in incentive form to enable both effective air pollution control and the maximum possible solid waste utilization.

(The attachments to Mr. Mighdoll's statement follow:)

SECONDARY METAL'S SIGNIFICANT STATISTICAL POSITION

[In 1968—in short tons—in the United States]

	Domestic production	Secondary recovery	Total supply	Percentage of secondary recovery to total
Copper	1,204,600	1,218,000	2,655,000	45
Aluminum	3,255,000	1,070,000	4,983,000	20
Lead	477,000	550,000	1,366,000	40
Zinc	526,000	254,000	1,384,000	18
Nickel	16,700	[1] 22,000	[2] 160,000	15–20

[1] Estimated.
[2] Consumption.

Source: Figures based on statistics in Bureau of Mines reports, American Bureau of Metal Statistics, Metal Statistics 1969, Aluminum Statistical Review, BDSA Copper Quarterly Report, Study of Secondary Lead in the United States.

PERSPECTIVE OF THE SECONDARY MATERIALS INDUSTRY

Until recently—with the exception of wartime periods—the secondary materials industry has enjoyed scant public attention. An understanding of the scope and functions of the industry has been limited to industry members, scientific researchers, and a few economists.

Those who have studied the industry immediately recognized that secondary materials are not only an important economic factor in national and international economics but, surprisingly enough, also function to conserve vital and strategic raw materials.

Recently, however, with a greater public awareness of the problems of ecology, environmental pollution, and conservation, the secondary materials industry has come increasingly into the limelight. There is now a far more realistic appreciation of this industry and its impact. Public officials, conservationists and community groups, in searching for solutions to these problems, have become increasingly aware fo the concept of *Recycling Resources* through the secondary materials industry.

In his recent message to Congress (February 10, 1970), proposing action against Pollution, *President Nixon* said:

"As we look toward the long-range future—to 1980, 2000 and beyond—recycling of materials will become increasingly necessary not only for waste disposal but also to conserve resources . . . A great deal of our space research has been directed toward creating self-sustaining environments, in which people can live for long periods of time by reprocessing, recycling and re-using the same materials. We need to apply this kind of thinking more consciously and more broadly to our patterns of use and disposal of materials here on earth."

The secondary materials industry represents this kind of thinking *in action.* Functioning in its normal pattern—collecting, identifying, processing, packing, and distributing secondary raw materials—the industry acts as an important conservation and economic factor. It has been often referred to as a "time above ground." *The Department of Defense's "Defense Scrap Yard Handbook"* states:

"Conservation and reclamation of scrap are of the utmost importance in order to provide the necessary raw materials for the manufacture of essential military and civilian items. Secondary raw materials recovered from scrap provide a vast reservoir of hard-to-obtain materials."

The historic Paley Report stated:

"The recovery of scrap in the secondary metal market is essential for the operation of the metal industry." This statement, which could equally apply to the paper stock and textile segments of the industry, illustrates that secondary materials are in integral and vital part of the *entire* raw materials supply.

ECONOMIC IMPORTANCE

Statistics for the year 1968 (the last complete year available) give a cursory view of this nation's deepening dependence upon secondary materials and imports:

In the United States, secondary recovery of Nickel represents 31.7% *more than* the total domestic mine production for that metal; for Lead and Copper it is 15.3% and 1.1% more than domestic mine production, respectively. Secondary recovery of Zinc and Aluminum represent almost ½ and ⅓ the total domestic mine production, respectively.

Secondary paper stock annually provides 25% of the total raw material supplied to producing mills. The reclamation and use of each ton of paper stock spares 17 full grown trees. Every ton of paper stock frees 3⅓ acres of forest land for some other productive use for one year. As one top industry official put it, "Any material that has gone through a portion of the normal life cycle from its source, refining, fabricating, has consumed a constantly increasing amount of labor, processing and transportation expense. The scrap industry is based upon the conservation of this value."

SOLID WASTE UTILIZATION

Correlative with the conservation aspect of the secondary materials industry is the effect of industry operations upon the crucial environmental problem of solid waste accumulation. For without the continuous and healthy operation of this industry, tens of millions of tons of textile, paper and metallic materials now being recycled and reused would accumulate as waste. This waste problem would be of such magnitude as to stagger the imagination. It would effectively suffocate our nation's streets and streams, making our everyday business and pleasure activities impossible.

To understand the true importance of solid waste utilization, all one need do is realize that of this nation's gross national product—now approaching the trillion dollar mark—8.4% is concerned with the production of itsms to *replace* industrial machinery, equipment, and consumer goods now in use. Much of this obsolete equipment becomes scrap. And this does not include the enormous quantities of material that become available in the manufacturing process itself.

However, the secondary materials industry is constantly on the job of *recycling resources*—secondary materials. In fact, it is at both doors of the manufacturing cycle—providing increasing quantities of raw materials to be used in the growing manufacture of consumer products, and by purchasing the by-products of industry for processing and eventual reuse.

INDUSTRY PROFILE

With the growth of the industry and the increased demand for secondary raw materials, extensive expansion is taking place in the plant, equipment and laboratory facilities of industry firms. To keep pace with the handling of larger volumes of materials, to be able to properly process and package, to cope with the increased complexities of industrial by-products, and to guard against the contamination of these valuable materials—the industry has turned to the introduction of new and modernized equipment and technical systems.

Approximately 41% of Association firms have multi-plant operations. (The average is over 2.5.)

The "average" Association member employs—13.4 executive and supervisory employees and 77.5 plant workers. The "average" firm payroll is over $500,000.

More than half of the Association's firms have an annual gross sales in excess of $3,000,000 and the membership average approximates $10,000.000.

More than half of the Association's members value their capital investment in plant and equipment in excess of $500,000 and the average is $1,300,000. The total valuation placed on plant and equipment of just the Association's member firms is over $700,000,000.

Secondary materials move in international business. The flow of scrap metals, paper stock, textiles, rubber, plastics and other commodities plays a vital role in the economic growth and stability of underdeveloped countries. Without these raw materials, many of these underdeveloped countries—lacking primary materials of the ability to pay for them—would suffer serious industrial handicaps. The larger nations of Europe and the Far East also are buyers of U.S.-generated scrap. As a result of this international trade, the U.S. also gains in balance of payments.

As the industry has grown and matured, so has its Association—NASMI. Now in its 58th consecutive year, NASMI not only continues with its many basic trade association activities, but also is concerned with such modern problems as solid waste utilization, air pollution contol, and technological research.

Perhaps the late President John F. Kennedy said it best:

". . . . If any one word describes your industry it is 'resourcefulness' . . . ." (Message to NASMI on its 50th Anniversary in 1963.)

The secondary materials industry is more than a collection of companies with an annual gross volume in excess of $7 billion. It is a vital, well-organized economic force which provides an essential source of raw materials feeding practically all key industries comprising the nation's economy. It figures economically in the operations of practically all industrial concerns—both large and small. Here are just a few statistical highlights which dramatize the story:

Over 3,000,000 tons of nonferrous scrap metals are annually processed by dealers and consumed by smelters, refiners, and ingot makers in the U.S. This includes copper and brass scrap (1,500,000 tons); lead scrap (700,000 tons); aluminum scrap (700,000 tons); zinc scrap (225,000 tons); nickel base scrap (25,000 tons). In addition, scrap dealers and brokers handle substantial scrap metal which enters international trade; in 1964 about 225,000 tons, valued at over $100,000,000, were exported.

Scrap is a substantial percentage of the total raw material supply. Approximately 45% of the total available copper is recovered from scrap by the secondary material industry, as is 20% of all aluminum and 18% of all zinc. More than 50% of the total domestic lead supply is recovered from scrap.

About 10,000,000 tons of paper stock is recovered and processed by the industry for the nation's paper, paperboard and building material mills. Paper stock represents almost one-fourth of the raw material supply of the paperboard industry.

Textile secondary materials are an equally important factor to both domestic and international consumers. Annual sales of these commodities approximate $400,000,000.

NASMI's own business survey puts the plant and equipment investment by the Association's members at $675,575,000. The average investment is in excess of $1,000,000.

NATIONAL ASSOCIATION OF SECONDARY MATERIAL INDUSTRIES, INC. PUBLICATIONS

For additional information about the publications listed below, please contact:
NASMI PUBLICATIONS
330 MADISON AVENUE
NEW YORK, N.Y. 10017

CURRENTLY AVAILABLE

"The Nonferrous Scrap Metal Industry," a comprehensive study of nonferrous operations, procedures and techniques. The only book of its kind. (A few copies still available.)

"NASMI Metal Seminar Digest—Management and Ownership Trends in the Secondary Materials Industry," factors in mergers and acquisitions as they relate to the privately-owned company, the public corporation and the conglomerate.

"Industrial Profile and Cost Factors in Nonferrous Scrap Processing," the latest publication dealing with important industry cost elements.

"Proper Materials Handling Techniques for Nonferrous Scrap," a concise summary of various materials handling techniques for the nonferrous scrap industry.

"The Secondary Materials Industry and Environmental Problems," a detailed look into the environmental problems affecting the industry as well as the impact of zoning, licensing, urban renewal, etc. Contains an economic evaluation of the secondary materials industry.

"NASMI Specifications—NF-66, PS-70, WS-63, CS-65," the internationally accepted standards and practices for trading in secondary metals, textiles and paper stock.

"NASMI . . . Ahead in the Seventies," a look into NASMI—the Association's makeup, its regional and commodity divisions, its membership services, programs and activities.

"Serving A Vital Industry—The Paper Stock Institute of America," a pamphlet describing the paper stock industry and its importance to the economy of the nation.

NASMI PERIODICAL PUBLICATIONS

"NASMI Metals Report," a weekly market report on all phases of metals. This authoritative and often quoted newsletter is available only to members of NASMI.

"NASMI Technical Service Bulletin," a new concept giving the latest technological information in such areas as solid waste recycling, air pollution control and materials handling.

"NASMI Tax Advisor," a monthly publication analyzing the latest developments in the tax field of interest to businessmen. Available to NASMI members only.

"NASMI Commodity Outlook—1970," NASMI commodity and division heads look at the industry for 1970.

"Letter from Headquarters," a periodic publication giving information on current developments and association activities in all spheres of industry interest. Available to NASMI members only.

"NASMI Bulletins and Special Commodity Reports," issued on tho instant, these publications keep members up-to-date on the latest industry news, techniques and studies.

OUT OF PRINT

Available for reference at the NASMI headquarters library.

"A Study of the Secondary Lead Industry in the United States"

"Nonferrous Scrap Metal Guidebook"

"The Secondary Materials Industry in a Changing Society"

"Air Pollution Control in the Secretary Metal Industry"

"Cost Studies in the Nonferrous Scrap Metal Industry"

BACKGROUND INFORMATION ABOUT NASMI

NASMI stands for the National Association of Secondary Material Industries, Inc. Its headquarters are at 330 Madison Avenue, New York, N.Y. (Telephone: 212—867-7330).

NASMI was founded in 1913 and is now in its 58th year as a trade association.

NASMI represents leading firms in the secondary material industries in such fields as nonferrous metals, paper stock, textiles, rubber and plastics, and foreign trade. A recent survey indicated that the Association's membership had an estimated gross sales of $7.0 billion and an annual payroll approximating $375,000,000.

NASMI's membership is national in scope and consists of small, medium-size and large firms in nearly every state of the Union. NASMI members may also be found in countries throughout the world; as far away as Japan and Australia. As a result, the Association has an unusually complete industrial framework. Not only are there the diverse commodity interests, but NASMI also has extensive membership representation on the various levels of industrial operations: scrap generator, dealer/broker/exporter, scrap consumer and manufacturer.

NASMI has five commodity divisions: Metal Dealers Division, Secondary Metal Institute, Paper Stock Institute of America, Textile Division and Foreign Trade Division. Each division has its own officers and develops its own program of activity.

NASMI has four regional divisions: Eastern, Midwestern, Southern and Western. Each regional division has its own officers and executive members and plans and arranges regional meetings and conferences throughout the year.

NASMI specifications in the fields of nonferous scrap metals, paper stock and textiles are internationally accepted and business is done all over the world on the basis of these specifications.

NASMI runs extensive information and education programs for its members. It issues newsletters, bulletins, pamphlets, books, etc. It has—through its Metals Seminar Board of Regents—conducted seminars for junior and senior executives at Michigan State University, University of Wisconsin and the University of Chicago. Its Textile Division has conducted Fibre Identification Seminars at the Philadelphia College of Textiles and Science. The Metal Dealers Division has held a number of supervisory educational programs throughout the country. The Paper Stock Institute has supported research aimed at the increased usage of paper stock by the paper and board mills and has also sponsored educational courses.

NASMI's Educational and Research Foundation recently published an in-depth transportation study of great importance to the entire secondary material industry. The goal of the Foundation is to support and further research relevant to the secondary material industry.

NASMI has its own Arbitration Service available for members. It also maintains credit files, providing a confidential business service for Association members.

NASMI sponsors far-flung insurance programs for its members in the fields of life insurance, major-medical plans, accidental death/dismemberment, a unique national workmen's compensation program and umbrella-liability coverage.

NASMI has concentrated many of its committee activities in areas of industry concern such as: air pollution control, solid waste utilization, urban renewal and related problems, transportation, costs, plant management, labor, Government sales, etc.

NASMI through its Washington representatives, maintains a continuing liaison with Government officials, legislators, and important agencies in the nation's capital.

NASMI holds an Annual Convention and conducts regional meetings, conferences, workshops and seminars throughout the country. It sponsors trade shows in conjunction with its Convention.

STUDIES OF DISLOCATION FACTORS: No. II

The Secondary Material Industries and Environmental Problems

A SPECIAL STUDY BY

NATIONAL ASSOCIATION OF SECONDARY MATERIAL INDUSTRIES, INC.

PREPARED AS A PROJECT OF NASMI's

URBAN RENEWAL AND RELATED PROBLEMS COMMITTEE

EDITED BY: SI WAKESBERG, *Commodities Vice President*

PUBLISHED BY: NASMI, 330 MADISON AVENUE, NEW YORK, N.Y. 10017

National Urban Renewal and Related Problems Committee

Chairman....................................DANIEL SCHAPIRO
Schapiro & Whitehouse, Inc., Baltimore, Md.

Vice-Chairman....................................MARVIN FOX
Markovits & Fox, San Jose, Calif.

Vice-Chairman........................ARNOLD S. POWELL
Joseph Behr & Sons, Inc., Rockford, Ill.

HARRY B. ARONOW
Arco Die Cast & Metals, Inc., Detroit, Mich.

SAM A. BARNETT
Sam A. Barnett Metal Co., Inc., Akron, Ohio

BEN E. BERLIN
Somberg-Berlin Metals Co., Detroit, Mich.

RICHARD BRASINGTON
Consolidated Metal Company, Asheville, N. C.

ANDREW T. COSTARINO
Hicks-Costarino Co., Inc., Maspeth, N. Y.

ARTHUR S. DRAPKIN
Pioneer Paper Stock Division, Gardena, Calif.

EARLE GLANT
Pacific Iron & Metal Co., Seattle, Wash.

HERBERT GOLD
North Shore Waste Paper Co., Inc., Salem, Mass.

LEONARD GREENFIELD
Samuel Greenfield Division of GCF, Inc., Buffalo, N.Y.

MORRIS GROSS
Wimco Metals, Inc., Pittsburgh, Pa.

J. WAYNE HARRIS
Benjamin Harris & Co., Chicago Heights, Ill.

JOHN J. KEEFE
Commercial-London, Inc., Atlanta, Ga.

JOSEPH S. KIMERLING
M. Kimerling & Sons, Inc., Birmingham, Ala.

BERYL KOPLIN
Georgia Paper Stock Co., Inc., Atlanta, Ga.

BEN I. KRAFT
Consumers Waste Paper Co., Milwaukee, Wisc.

WILLIAM LEDBETTER, JR.
The I. V. Sutphin Co., Nashville, Tenn.

SOL LEDERMAN
Airways Metals & Refining Co., Wilmington, Calif.

HAL LENNON
R. Lavin & Sons, Inc., Chicago, Ill.

HOWARD G. MARTIN, JR.
Martin Metals, Inc., Los Angeles, Calif.

DAVID A. NEBERGALL
Aluminum & Magnesium, Inc., Sandusky, Ohio

HOWARD W. RASHER
McMahon Iron & Metal Co., Inc., Bronx, N. Y.

HENRY M. RUBIN
Rubin Brothers Waste Co., Harrisburg, Pa.

AARON SCHLESINGER
Joseph Rosenthal's Sons, Inc., Swedeland, Pa.

BEN SCHWARTZ
Schwartz, Marshalltown, Iowa

JULIAN I. SCHWARTZ
Pacific Smelting Co., Torrance, Calif.

WALTER E. SIMON
Delaware Valley Smelting Corp., Tullytown, Pa.

WILLIAM WARSHAUER
Wabash Smelting, Inc., Wabash, Ind.

DANIEL WEINSTEIN
Vac Air Alloys Corporation, Frewsburg, N. Y.

ROBERT R. WOOLFSON
Pacific Trading Corporation, Lynwood, Calif.

CONTENTS

FOREWORD

• All America desires clean air to breathe and the vision of a beautiful countryside. But unreasonable and unrealistic regulations and controls can only result in severe economic restrictions on the very industry that is the instrument for reclaiming the by-products of our land.

Where would the factories of the cities or the citizens of the residential communities market their industrial and household by-products were there no scrap collector and processor of secondary raw materials in their areas? What would happen to the waste paper, the old refrigerator, the discarded automobile, the worn out tires generated by the private citizenry? What would the industrial plant do with the cuttings, clippings, turnings, and numerous other forms of factory by-products generated by the tens of thousands of pounds?

Far from thinking in terms of eliminating, relocating, or hiding the secondary materials firm, the nation and the local community should promote its existence as a progressive step toward the maximum utilization of the ever-growing recoverable solid waste of the country. There also are the important considerations of assuring an adequate raw material supply for our expanding national economy and helping to provide lower cost end-products for the American consumer.

Perhaps the legislator and the city planner would do well to review the late President Kennedy's comments to the secondary materials industry:

> *"The fifty years of achievement by the members of the National Association of Secondary Material Industries are a bright chapter in our country's economy. In your inventory, there is nothing that is useless. Scrap metal, textiles, rubber, waste paper — these are your raw materials for new useful production. In wartime, you taught us how to make do. In peacetime, you give the lie to those who say we are wasteful. If any one word were to describe your industry, that word might well be 'resourcefulness'."*

The secondary materials industry has the continuing challenge of expanding its reclamation system, improving its processing facilities, and conquering the technological problems of the times. The nation—and that means private citizens and governmental bodies alike, on a local, state and federal level—have the obligation to provide a community and industrial atmosphere conducive to the growth of this vital industry. With this as our goal, the Association has undertaken the study that follows.

M. J. MIGHDOLL
Executive Vice President, NASMI

I

Emergence of New Major Factors of Dislocation

The walls around scrap yards are gatting thicker, the fances ere growing higher, municipal laws ara toughar, end the costs of maintaining a secondary material business as a result of naw restrictiva zoning, licensing, beautification, end air pollution regulations are becoming impossibly high—this is the conclusion of a datailed study made by NASMI's Urben Ranewal and Ralated Problems Committee.

From Rochester, N.Y. in the East to Portland, Oregon in the West, local edministrations ere cracking down on scrap plents, paper stock companies, secondary taxtila firms with stricter regulations, higher licensing fees, speciel texes, and onarous ordinances that are buffeting end bludgeoning tha industry. Companies ere being zoned out of central business districts in urban ereas and pushed further end further away from their normal sources of supply end from thair consuming outlets. This type of dislocation is making it more difficult for some of the smaller firms to survive.

Severel years ago, urban renewal loomed as the No. 1 chellange facing the industry. Dislocations of secondary materiel firms were common due to the vast urban ranewal projects scattared across the country. Possibly, the brunt of displacemant in tha industry as a result of urban renewal has elready been falt, although some industry officiels believe that this problam will haunt us for many yesrs to come. But it has been supplanted by zoning, licensing, beautification and eir pollution which have become the principal factors in the dislocation procass. Evan whare the end-result is not ectual dislocation, it is e major factor in posing difficulties for companias in the secondery material fiald.

FENCING IN AN INDUSTRY

A study of the complax eree of zoning end licansing indicatas that this particular problem is "local" rather than national. By that we mean that citias and ragions throughout the United States have established thair own municipal codes which pertain specifically to their own prescribed ereas in which business firms can operete. It is therefore no accident that these regulations end ordinances have to be challenged on local grounds.

NASMI, as e nationel trade associetion, has sought to gather information which it could then dispense to local member groups who are directing the fight against injurious laws and regulatory controls. The ordinances are differant in different parts of the country; they epply differant measuring standards; they establish different zoning rules and different licensing fees. In other words, while thera ere certain similaritias in a general and fundamantal sense of the zoning and licensing codas—the specifics are different and must be met locally in differant ways.

It is for this reeson that e certain part of the chellenge has been mat either by local groups who have banded togather for the axpress purpose of securing more intelligent and reasonable zoning and licensing laws, or by existing local essociations more conversant with the immediata local situation. NASMI has been able to give direction through its Urben Ranewal end Speciel Problems Committee, publish studies such as its widely-disseminated "The Secondary Matariel Industries in e Changing Urban Society" which has been hailed by urben planners, city administrators, univarsitias, etc., end gather general information about the industry which would be of value to eny local group working in this field of andeavor.

In making its study, NASMI hes come across the following trends which are apparent in the industry ecross the country:

1. The tandency among municipal administrations is to davelop stricter ragulations regarding the zoning of scrap yards, paper stock plants, and other industry firms.

2. Licensing of new firms in the secondary meterial industry is eccompanied by closer survaillance, higher fees, insistence on conditions that make for hardship within the industry.

3. Beautification in some ereas hes become the means of harassing smaller scrap firms.

4. Urban renewal continues to displaca firms, although it is not as vital e factor today es are other dislocation forcas.

5. Highway construction still remeins a displacement factor. Widening of highways, ax-

43-933 O—70—pt. 2——16

tansion of turnpikas, creetion of new roads have caused the closing down of e number of scrap yards.

6. Air pollution controls are becoming more and more the chief problem of many firms in the industry. While statistically, only ebout 40% of the secondary firms hava bean somawhat affected, interviews with member firms indicate that they enticipata a much largar parcentage figure by 1970.

7. The entire problam seems to be inextricably tied in with the "image" of the industry and the ineffective public relations ganerated by the industry in the past decades. There is a ganeral agreement that e bettar public reletions program is needed.

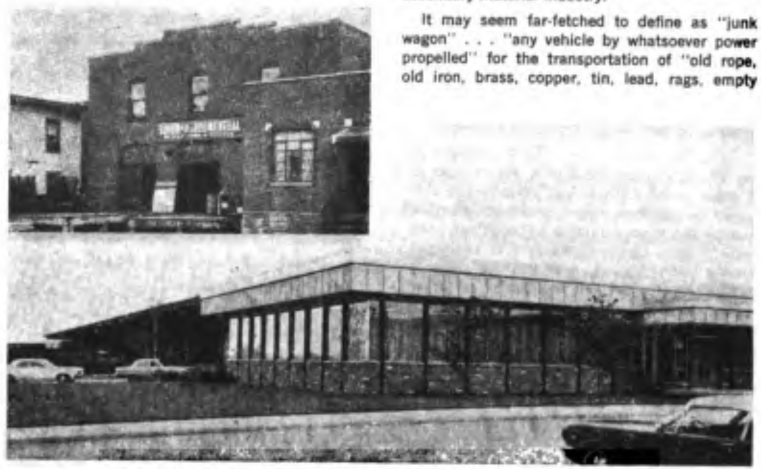
8. It is believed, on the basis of investigation, that some city planning commissions and municipal administrators are becoming more aware of the existance of the secondary material industry es en industry of economic importance. In some areas of the country, attampts ara being mada by local edministrations to blunt the impact of ordinances on the scrap industry. However, these instances are still few and far between.

It is apparent that tha problem for the secondary matarial industries—as they entar the decada of tha 1970's—wiil be to find an economic and industrial environment which will not restrict their oparations. The purposa of this study is to highlight some of the factors that currently maka such an environment untanabla. By analyzing the material, it will be possible to chart the direction in which tha industry can move to attain tha kind of environment which will make possibla tha eecondery material industry's role as an economic esset to the community.

II

Antiquated and Outmoded Definitions

A study of municipal codes dealing with the establishment of scrap yards and plants reveals one common denominator: the use of the word "junk" to refer to operations within the industry.



The metal plant as it looked yesterday (top) and as it appears today (bottom) with modern design and layout, characterizing the dramatic evolution of the development of the scrap industry.

The phraseology that constantly recurs in these codes may be summed up as follows:

"JUNK, PAPER AND RAGS"

"JUNK SHOPS"

"JUNK WAGONS"

"JUNK LICENSES"

"JUNK YARDS"

With rare exceptions, this terminology is used as it was fifty years ago. City administrators who pride themselves on the fact that their cities have made remarkable advances into the 20th century, are still using the outworn vocabulary of the 19th century when it pertains to the secondary material industry.

It may seem far-fetched to define as "junk wagon" . . . "any vehicle by whatsoever power propelled" for the transportation of "old rope, old iron, brass, copper, tin, lead, rags, empty bottles, paper, bagging, scrap metals of all kinds, and other worn out or discarded material." But this antiquated definition is written into the codes of a number of cities.

Sociologists would perhaps explain this as a matter of psychological pressure. The retention of phrases such as "junk wagons"—once applied actually to horse and wagon vehicles, serves to paint a picture of second-class citizenship and to place the secondary material industry outside the pale of normal industrial activity.

It might be pointed out that modern technology and scientific materials handling techniques have transformed the secondary materials industry from the category these administrators classify as "junk" into an industrial complex that is highly sophisticated and that operates on the same level as other large industries such as petroleum, chemical, iron and steel, etc. The utilization of equipment costing hundreds of thousands of dollars in some instances, the installation of cost-saving machines—all this tends to be negated by the "junk" label.

Even smaller and medium-sized yards and plants are using the more sophisticated techniques for segregating, testing, and processing secondary material. The old, outmoded methods of hand operation long ago gave way to machines. But the old, antiquated phraseology in city codes regulating the scrap industry remains unchanged.

WHAT IS "JUNK"?

In the nomenclature of the secondary materials industry, the word "junk" has long gone by the board. It is not merely a matter of semantics, or of trying to cover certain industrial operations under a new sweet-smelling description. But from "junk" to "secondary materials" represents an industrial development as different in its concept as from the "silent screen" to "talkies" to the present wide-screen Cinerama. The industry has changed so materially and so substantially that the appellation "junk" today simply seems to be used to satirize or denigrate the industry and it is therefore objected to and rejected.

A few years ago, "Industrial & Engineering Chemistry," writing about the recovery of rare metals from scrap by reprocessors, declared: "The reprocessor is assuming an ever increasingly important part in the economics of metal processing. The modern day scrap dealer is highly insulted when aligned with the classic concept of the 'junk' dealer."

The financial magazine, Barron's, in an article entitled "Sophisticated Scrap," indicated by its subtitle "The Metal Reclaiming Business Has Come a Long Way from the Junkyard" the thesis of an advancing and progressive industry. Said Barron's:

"While the industry performs a wide variety of functions in collecting, processing and marketing ferrous and nonferrous metal scrap and boasts of a yearly volume of $4.4 billion, it is one of the least known businesses in the United States. With its extensive network of yards, plants, and warehouses, the scrap industry gobbles up annually not only millions of junked cars and trucks, but also dismantled refineries, oil tanks, railroads, copper wire communication lines and storage batteries and converts them into raw materials for making shiny new cars, refrigerators and other metal products."

In the publicity attending the recent beautification program, the word "junkyard" seemed originally applied to what we call automobile graveyards—collection points for wrecked and abandoned vehicles—and then by extension to auto wrecking yards. Finally, because of the looseness of the terminology, the legislation introduced in Congress designated "junkyards" to cover ". . . any place which is used, maintained or operated for the purpose of storing, keeping, buying, selling, or disposing of garbage, trash, scrap metal, rope, rags, batteries, paper, rubber, or junked, dismantled, or wrecked automobiles or parts thereof."

During Congressional debate, the question was asked: "Scrap metal processors by definition here are different from junkyards and auto graveyards?" In answer, one Congressman stated: "The junkyard includes the junk processor. Your metal processor is included. They would be restricted as junkyards that accumulate the junk. They would be equally covered."

This was predicted by M. J. Mighdoll, NASMI executive vice president earlier when he noted in a letter to all NASMI members: "Such an all-inclusive definition of 'junkyards' would bring the operations of our industry fully within the scope of this legislative proposal, in spite of the contentions voiced in some quarters that "they don't really mean us!"

DEALERS AS "PROCESSORS"

From a strict legislative point of view there have been a number of Court decisions which have defined the scrap dealer as a "processor" or "manufacturer," thus differentiating him from the accumulator of scrap (such as the auto graveyard, for example). It would seem obvious, from the report in this study, that the scrap dealer or processor, handles an economically valuable raw material in the very same manner that a metalman, for example, handles primary raw material. The objection to "junk" as a title to a bill, or as a catchword to denote a $5 billion industry is therefore understandable. The secondary material industry operates at a high level of technical efficiency, abides by standards and specifications, conducts vast educational programs, including Seminars for its younger members at leading universities, has ties with producers and consumers, and moves its products across a wide national and international boundary. It asks for the same status and position as any other self-respecting industry group in the United States. Its opposition to the "junk" tag therefore is deeprooted and uncompromising.

There are indications that some municipalities are beginning to take a more enlightened approach to this subject. Not too many, it must be admitted; but even these few help set a pattern for the future. Thus a recent revision of the Atlanta Code of Ordinance, reads as follows:

> *"An ordinance to amend Chapter 17 of the Code of Ordinances City of Atlanta, Georgia, relating to licensing and business regulations by deleting Article XI relating to junk and junk dealers in its entirety and inserting in lieu thereof a new Article XI relating to scrap, scrap processors, scrap yard operations and scrap dealers."*

The old Article XI, with its reference to the shopworn "junk" terminology was deleted by the Board of Aldermen in September 1966 which approved the new wording.

It is certainly an improvement in raising the image of the industry to meet the following definition in the Atlanta code:

> *"The words 'scrap processor' shall mean any person who buys, sells, or in any ways deals in scrap and who owns, leases, operates or otherwise maintains a scrap processing facility within the city of Atlanta."*

It is not a matter of semantics to distinguish so specifically between the definition of a "junk" dealer and those of a "scrap processing facility" —it is an acknowledgment of an advance in industry technology and it sets the industry into a different frame of reference.

We are using the Atlanta ordinance as a sample of the kind of change in vocabulary that is needed to eliminate the prejudices of the old "junk" classification with its horse and buggy connotations. The industry long ago left the world of the 1900's and is firmly entrenched in the technical civilization of the upcoming 1970's.

III

Restrictive Covenants in Zoning and Licensing

There is every indication that special restrictions are being established for scrap yards in many parts of the country. Many of these restrictive ordinances are based on the "beautification" concept which requires walls, fences, enclosures to surround the raw material and keep it out of sight. Others are based on tighter zoning measures emanating from political pressures in various localities. Some restrictions lap over into the area of closer inspection through keeping of special records. Whatever the case, it all falls under the general heading of discrimination against one particular sector of the business and industrial community.

We append here some news items which illustrate this trend toward restrictive covenants effecting the scrap metal industry:

"TOWN CONSIDERS STRICT YARD CONTROL"

"ROCHESTER, N.Y. — An ordinance calling for stricter controls over junk yards, plus a licensing measure, will be introduced before the City Council meeting . . . The proposed measure would give the city the authority to inspect existing junk yards, a right not granted by the present ordinance. Corporation Counsel Robert A. Feldman said: 'The annual licensing provision would give the city a measure of control'."

These new ordinances were later adopted, although several community leaders felt that "they were not strict enough." Scrap yard dealers are expected to take the new city ordinance to the courts.

"CITY GOVERNMENTS STUDYING WAYS TO TIGHTEN SCRAP YARD CONTROL"

"Los Angeles — Strict controls which would beautify automobile wrecking yards, junk yards and other eyesores in industrial areas have been recommended by the City Planning Commission . . . they would require wrecking and junk yards and secondhand box or barrel yards to be completely enclosed or surrounded by high masonry walls . . ."

Local dealer groups in the Los Angeles area have been opposing some of the restrictive measures intended to control the operations of scrap processors in that area of the country.

"TOWN BOARD QUESTIONS YARD OPERATORS"

"Syracuse, N.Y. — Five Cicero scrap yard operators were quizzed by the town board on their progress toward beautifying their property and were given until November 6 to comply with the village junk ordinance or pay $50 a day fine."

It was pointed out in the article that one scrap yard operator, whose yard is on Route 11 reported that the state and federal governments are building a $30,000 redwood fence around his scrap yard. He added: "That's where the taxpayer's money is going." Another scrap yard operator who did not fall within the assistance act of the federal government, will have to pay the total cost of erecting an eight foot fence or shrubbery screen.

A study of some of the regulations in different parts of the country indicates that space for new scrap yards or plants is becoming more unavailable in central business districts. New ordinances also place heavier burdens on newcomers in the industry.

Here are some illustrations of regulations in several areas of the country:

In New Orleans, scrap dealers who were operating prior to the effect of the new zoning ordinance may continue to operate in a **fenced area.** However, new scrap establishments must be within **enclosed buildings.** Scrap plants in New Orleans are confined to areas prescribed as "light industrial" or "heavy industrial."

In Chicago, scrap yards are classed as "special uses" under the Chicago Zoning Ordinance and are permitted in M2 and M3 Heavy Manufacturing Districts and only after a public hearing before the Board of Appeal. Smelting plants are permitted use in M3 Heavy Manufacturing District. No license is required for the operation of smelting plants. (It is reported that a special committee in Chicago is currently reviewing the present zoning ordinance.)

In Nashville, Tenn., all scrap yards and plants are classified as Industrial B. Dealers in Nashville contend that there is very little Industrial B Property near the business district of Nashville. It is intimated that for scrap yards and plants to relocate would present a problem in securing Industrial B property.

The Cleveland ordinance lumps together the storage of "secondhand lumber, or other used building material, junk, paper, rags, unrepaired or uncleaned containers, or other salvaged articles . . ." and goes on to say: ". . . less than 125 feet from any public thoroughfare, public land, or Residence District, are enclosed within a ten-foot high, solid masonry wall, not closer to the street line than the set-back building line and not closer than 50 feet to any Residence District. Such wall may have one opening, not more than 20 feet in width for street access and may have two such openings if the wall along the street is more than 200 feet in length."

The city of Newark, N.J. ordinance states: ". . . any junk yard must be within a solid enclosure not less than 6 feet high."

The Los Angeles ordinance declares that: ". . . automobile wrecking yards, junk yards and the secondhand uses enumerated in (1) be permitted in the future in M3 Zone only if conducted within enclosed buildings or in an area completely enclosed with a solid masonry wall not less than eight feet in height, and provided that no material or equipment be stored to a height greater than that of the wall. . . ."

THE SCRAP PLANT BELONGS HERE . . . AND THEY PUT IT THERE!

It is obvious that (1) Restrictive covenants aimed at the scrap industry exist; (2) That established firms are finding it more difficult to operate within the restrictive ordinances; (3) That if such firms for reasons of urban renewal or highway construction have to relocate, it is most difficult to secure new locations within the industrial district; (4) That newcomers in the industry are being discouraged because of the excessively tightened regulations.

Local dealer groups have been waging their own campaign for more reasonable ordinances. Such local campaigns have been waged in New York and Los Angeles for definitions to permit scrap yards to operate under a code that would distinguish between "scrap processing facilities" and auto wrecking yards or salvage plants, for example. That is not to say that all such campaigns have proved fruitless. Los Angeles dealers have been successful in staving off added tax burdens and New York dealers have made some inroads in impressing on the local administration the importance of the scrap industry. In Atlanta, as has been mentioned earlier, a new ordinance uses language much more acceptable to the scrap industry.

The conclusion to be reached on zoning and licensing is this: Our study shows that most city governments are reacting to public pressure for more restrictive ordinances. It is to be anticipated that for practical purposes the attampt wiii be mada to crack down more stringantly on existing scrap astablishments end to discourage the setting up of new plants in business areas. Tightar regulations through licensing wili also harass the industry in yaars to coma.

The procedure to counteract this may be listed as follows:

1. Since these are local probiams, they must be met on the local leval. Cooperation of eil scrap dealer groups in e given area must be secured and effective action waged both through political and legal channels.

2. One of the principal staps to be takan must be to secure a revision of definitions, so that a "scrap processing facility" can be distinguished from a "junk yard," "euto wrecking plant," or "salvaga plant."

3. Material should ba accumuleted (such as the Atlanta Ordinance, for axemple) as an illustration of the kind of ordinance which would be fair and reasonebie.

4. A iocal pubiic reiations campaign must be mounted to maka both the city administration and the public aware of the economic importance of tha scrap industry. In this connection, local groups can secure the cooperation of NASMI's National Public Raiations Committee which has established e Speakers' Bureau for just such purposes.

5. Heip can be secured from NASMI on a broad and ganeral basis. The Association has affective material—such as this pamphlat for axample, or other publications which show the vital importance of the secondary materiel industry.

IV
Experiences of the Industry

A survey undertaken by NASMI indicates that many of its members have had frustrating experiences in zoning, licensing, urban renewal, highway construction, air pollution, etc. However, in any number of instances, when the case was pressed or when groups of dealers banded together locally to fight what they considered restrictive ordinances or unjust taxation (as in Los Angeles) a fairly successful conclusion was reached.

Here are some typical cases in which NASMI member concerns listed their experiences:

Missouri: "When we applied for our license, the local newspaper ran a front page article that a junk yard was to be opened in that area which resulted in a mass meeting of 100 people at City Hall protesting it. The City Fathers turned down our request for a license."

Connecticut: "We met antiquated thinking on the part of the members of the Zoning Committee. Their ideas of the type of business we do dates back about fifty years."

Ohio: "The city is going to take over one of our warehouses. . . . We understand they will pay a certain amount for the moving cost but are not yet sure how much. We need this space very badly, especially now since many items are not salable and have to be held for better times."

Wisconsin: "We met prejudice and discrimination in trying to move from downtown to an industrial zone; finally the move was allowed but with Junk Dealers restrictions such as concrete block buildings, etc."

Virginia: "The property in which we had been located for over 30 years was claimed by our local redevelopment authority. We received about 90-100% of its fair market value—this was equal to about 1/3 of its replacement cost and we were fairly well satisfied with this. However, we are farther away from good labor supply, being in the country, and are exposed to inferior fire and police protection. After three years, our figures show a loss of as high as 25% of volume in the same prime grades with no increases that can be attributed to the new location."

Maryland: "We experienced some pilferage through our six foot chain fence and complaints of trash thrown over the fence into our field. In order to beautify the area and discourage pilferage, we decided to replace the six foot fence with a twelve foot fence and then grade and seed and plant shrubs along the fence on our side. We unexpectedly ran into difficulties from our neighbors who claimed we were putting up a "Berlin Wall" and retained an attorney to discourage us. However, we completed the job and installed a mercury vapor area lighting along the new fencing. Subsequently, we have received a number of compliments from the residents in the neighborhood. . . ."

Connecticut: "About four years ago we were told that we would be included in redevelopment. We contacted local officials in an effort to remain in the city. Zoning was a problem because during this period Redevelopment and Zoning worked hand in hand. In order to keep the acquisition costs low, Redevelopment would tell the Zoning Board not to approve our plans for installing a new machine or process, the reason being that we were not zoned for that particular process. The upshot was that we finally approached another town where we bought a large parcel of land and we were welcomed with open arms."

Tennessee: "Our experience with urban renewal was in conjunction with the taking of some of our property and also their cutting through our property with storm sewers and gas lines which affected our use of those areas. Despite our efforts, the rulings were adverse to us and Urban Renewal was able to proceed with the project. They compensated us for the actual work we did to clear the area but we lost the future use of the property for its originally intended purpose."

Ohio: "Our approach has been that the city in designing any ordinance should direct its legislation towards the condition they want to correct and not any particular industry. We have not been too successful with this approach although the zoning commission has asked our advice on new legislation."

Pennsylvania: "Zoning was the problem. The local dealers met with local authorities and everyone was satisfied at conclusion. The main hitch was classification, i.e., light or medium or heavy industry. But it was all worked out."

California: "Problem was initiated by voluntary need to develop property for future expansion. Encountered resistance to development by county planners and Board of Supervisors. The property, in the county, was eventually annexed to the city. We approached the city authorities with well developed plans prepared by civil engineer showing fences, landscaping, and well designed buildings. City gave us appropriate zoning, requiring that all future construction plans be submitted for their planning department approval."

It is obvious from the comments noted in these responses to our survey—and they represent a typical segment—that the restrictive measures mentioned in our previous chapter are all too real for the average secondary material concern. However, it is apparent, too, that many of the firms took action to fight the unfair restrictions either through legal means or by banding together locally, and that these efforts in some cases bore fruit. But obviously, there's still a long road ahead.

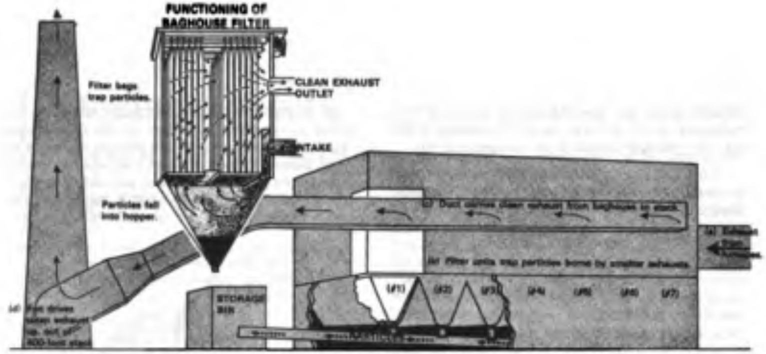
V

The Challenge of Air Pollution

Air pollution looms today as a major problem, not only in the secondary material industry but in industry everywhere. However, because of the specific nature of metal plants and because of their vulnerability in the community, this problem has assumed critical proportions, particularly for some of the smaller and medium-sized firms in the industry. Larger companies have the financial resources to cope with the outlays required both for research in this field and for the actual manufacture of devices to control air pollution. But the smaller and medium-sized firms, faced with heavy monetary requirements for equipment still of an experimental nature, are finding it increasingly difficult to satisfy local and State air pollution officials.

One of the hard core factors is the fact that the entire air pollution problem is still in a state of flux so that there are no pat answers to the questions that arise. Bethlehem Steel Corporation's president recently noted that pollution control must be approached with "knowledge and reason and in proper balance with society's other problems." He pointed out that "agencies involved in the problem have multiplied like rabbits . . . many of their approaches and activities tend to be unrealistic and impractical."

A survey among NASMI members has indicated quite clearly that two of the major problems facing the metals industry revolve around



New Air Pollution Control System at a copper refining plant. To meet stringent air pollution regulations involves large financial outlay on the part of the industry.

the areas of zinc chloride emissions and the incineration of insulated copper wire scrap. Firms in the secondary metal industry have been doing their own work in these fields; sizable sums have already been committed, for example, in an attempt to control emission of zinc chlorides in secondary zinc operations but with little visible success. A number of concerns have indicated to NASMI that despite the recruitment of engineering and technical consultants and the purchase of equipment which ran into thousands of dollars, they have been denied approval by local and State air pollution officials.

Experimentation in the field of recovery of insulated copper wire scrap is also going on. Some companies have completely abandoned the incineration technique and have been using other methods and devices to recover copper wire. A number of firms have installed specially constructed incineration equipment to burn insulated wire and have succeeded to securing approval from local air pollution officials. It is evident, however, that this problem is still one that has to be licked on an industry-wide basis.

Most companies admit that a good deal more research will have to be done in these areas before "solutions" are found that will satisfy the stringent air pollution regulations. NASMI, through its Air Pollution Committee, has been engaged in conferences with the Cincinnati technical center of the Department of Health, Education and Welfare in an effort to initiate a joint research project in the secondary zinc field, particularly looking toward the control of zinc chloride emission. It is hoped that such a pilot plant study can be begun soon.

Other NASMI efforts have included a workshop on air pollution control in Pittsburgh in 1967 at which three leading engineering authorities in the metal field discussed such factors as: the use of scrubbers and precipitators; the design and operation of baghouses; and the handling of insulated copper wire scrap. The Air Pollution Committee has also developed a bibliography of air pollution material available at the NASMI office in New York. Association representatives have held conferences with top officials of HEW in Washington and the NASMI executive vice president has testified at hearings on the Clean Air Act before Congressional subcommittees.

The economics of air pollution represents a major porblem. Until such time as equipment can be manufactured at a reasonable cost, the financial burden on the industrial community will be a heavy one. This is another factor that results in secondary material industry dislocation. While industry members believe that it is vital to achieve pollution-less air—they do not want all smaller firms forced out of business. The goal is to develop proper machinery and equipment at moderate cost so that effective air pollution control can be achieved without placing an onerous financial burden on the industry. In order to do this, of course, Government may have to implement its program with tax credits, research funds, and incentives of various kinds.

Overcoming air pollution may take time, and local and regional officials should be cautioned that when industry gives clear evidence that it is seriously attempting to meet and solve this problem—consideration should be given to that fact. Patience, research, education, cooperation—all these are necessary to make air pollution control a reality without imposing hardship and burdens that will lead to greater industry dislocations.

VI
The Disposal of Solid Wastes

A recent study by President Johnson's Science Advisory Committee, entitled "Restoring the Quality of the Environment," notes that a large fraction of consumer goods ends up as urban solid waste, though significant amounts are recycled back into industry. The report declares that industries engaged in the reprocessing of secondary materials operate at the level of $5 to $7 billion annually.

Without An Effective Scrap Industry, The American Citizen Will Be Swamped In Solid Waste

Some sociologists and students of the urban society foresee a growing trend to accumulate annually larger and larger amounts of solid waste without the means of removing or disposing of it. We know the critical problem of abandoned automobiles and the burden this imposes on cities and counties. In recent years, many municipalities have been faced with landfill space problems and vanishing areas for dumps. With air pollution controls restricting the incineration of some types of solid wastes, the challenge is growing even more acute.

It is therefore vitally important to assess the role that the secondary material industry plays in recovering and reprocessing huge tonnages of material which normally might end up as solid urban waste. Testimony by NASMI executive vice president M. J. Mighdoll before a Subcommittee on Public Health and Welfare disclosed that the secondary material industry enables many thousands of by-products of factory, farm and home to retain an economic value and replenish the country's raw material supply. He added: "Just as industry is dependent upon our members for much of its raw material supply, so is the general public from the standpoint that this recovery of secondary materials minimizes the waste left unusable throughout the country." The question might be asked what our cities and countryside would be like had not the secondary material industry pioneered and developed means of collecting, processing and utilizing secondary materials. Because the consumption of secondary materials is expanding with the growth of the economy itself, the techniques used in recovery make the industry more important than ever as an industrial reclaimer, a direct adversary of "waste."

A study recently prepared by the New York Regional Plan Association, entitled "Waste Management," warned that the amount of waste was growing in the metropolitan area and that within the next 25 to 30 years, the amount of waste generated per person would rise from 5 to 10 pounds a day. The report stated that more emphasis should be put on recycling into productive use the waste that is now dumped. It added, however, that "society has few incentives at present to recycle its wastes."

The problem of solid waste disposal will become more acute in the years to come, according to authorities on this subject. The chief counteraction lies in the expanding utilization of secondary materials, for in this operation by the industry, uneconomical material can be transformed into a potentially valuable raw material. It is for this reason that the industry must be strengthened and that some of the dislocations that are engendered by onerous regulations be eliminated.

One might also consider the economic aspect of the problem of solid waste recovery. A recent report by Penn State University, as reported in the American Metal Market, declared: "Ashes in this city's (University Park, Pa.) municipal incinerators have been found to contain metals worth as much as $12 per ton of ashes thus making the ashes richer than many of the metal ores. In spite of this, such ash is still being buried as land fill with total losses of the metal. . . . It is apparent, the Penn State scientists note, that many new metals recovery projects will be directly related to various industrial and liquid waste disposal problems. A major goal, therefore, is to devise new methods for recovering as many industrial wastes as possible, in useful, valuable forms."

The displacement of the secondary industry because of urban renewal and highway construction, for example, means that small dealers have been put out of business. Collection of so-called solid wastes rests at this industry level; when small collectors are out of business, potentially utilizable raw material lies abandoned and uncollected. A continuation of this kind of dislocation will only lead to a growing accumulation of solid wastes within large urban areas posing huge problems for municipal planners.

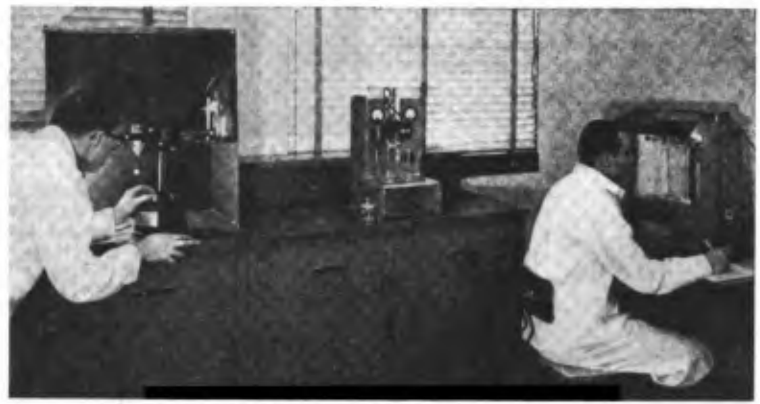
The secondary material industry is the most effective agent for the disposal of certain types of solid wastes—and this disposal is of an economically constructive kind, through reutilization and recycling back into industry channels. It is part of the overall "conservation" process which the secondary industry has been practicing for more than half a century.

VII

Changing Aspects in Technology and Industry Structure

Secondary materials today is a multi-billion dollar industry. It encompasses the areas of nonferrous scrap metals, scrap iron, paper stock, secondary textiles, scrap rubber and plastics. The growth of the industry has been paralleled by the vast changes in its technology, structure, and economics. The industry today has changed radically since World War II—to such an extent that it has been characterized by competent analysts as "sophisticated." What this definition means is that the industry has achieved stability and maturity.

Technologically, the industry today bears only superficial resemblance to the 19th century industry local legislators are talking about. The high-powered equipment in use today in yards and plants is the latest in a series of scientific developments that have revolutionized the processing of secondary materials and have turned it from a hand-operated business into a modern, automatically-operated industry. It is now well on the road toward computerization in many areas. Exactness of specification determined in com-



Research laboratory at modern metal plant — today research is an integral part of the scrap industry's operations.

pany laboratories, efficiency achieved by yard and plant layouts, use of labor-saving devices—all these have provided the industry with a "new look."

The machinery and equipment being used costs millions of dollars annually. Companies seeking to keep up with new and advanced methods have to invest large financial outlays in equipment. There is constant study going on of machinery used for processing, baling, packaging.

A study by NASMI indicated that its members' capital investment in terms of plant and equipment valuation in a recent year was estimated at over $675,000,000. An American Metal Market report had anticipated a spending program by NASMI members for equipment during a five-year period "as high as $20 to $40 million."

One must take into account the fact that new types of equipment, such as air pollution control equipment or incinerators for the burning of insulated copper wire scrap are now part of the plant operational scene and that these add to the vast financial outlay. One must also consider the additional burden of "beautification" investment for fencing and screening by many dealers who do not fall into the classification in which they receive compensation by the Government.

Because of the sharp change in technology and the mounting cost of operating secondary material plants, there have been obvious changes in industry structure. Smaller and medium-sized firms are having a more difficult job to subsist and compete; as a result, it has become evident in the past decade that mergers are increasing. There have been many articles written about the disappearance of the wholesale metal dealer, for example, whose activities were a major part of the scrap scene in the 1930's and 1940's. Many of these companies have been swallowed up by larger concerns, others have become victims of the trend toward specialization in the scrap industry since 1945.

There are signs that this trend toward merger is not over. The family-dominated business—once considered the pride of the industry and which, to some extent still survives in greater numbers than in many other American businesses—is slowly giving way to the corporate entity. As has been pointed out in a number of reports, more and more secondary material firms are now on the various stock exchanges and others are expected to join this growing list. There is no doubt that this change in industry structure is having wide repercussions within the industry.

Spectroscope tests metals for identification—one of the new tools of the modern scrap industry.

Growth of alloys and hi-temperature metals indicates the ever-expanding markets of the secondary material industry.

Concomitant with the changes in technology and industry structure is a growing need to reassess the economics of the industry. The problem of costs has become of major importance. Cost analysis is today a constant company activity. It is realized that haphazard operations are intolerable; that there must be a distinct awareness of costs in every company department. Recent Association activity has directed these efforts into channels of Cost Study Committees and Plant Management and Operational analyses.

VIII

Conclusion: The Road Ahead

No industry can grow and develop to its maximum potential if the environment in which it operates is hostile to its efforts. Attempts by local and State governments to restrict and limit secondary material industry operations through zoning and licensing regulations, air pollution ordinances, urban renewal limitations, highway construction blocks, beautification requirements, etc., tend to frustrate and constrict the natural growth of the industry.

One of the basic requirements in the effort to bridge the gap between the secondary material industry and the local community in which it operates is communication. If the community understands and realizes the nature of the industry, its importance to the economy, its conservation value, its vital activity in helping to recover valuable raw material, its efforts to dispose of solid wastes—if the community understands this, it will move toward constructive rapprochment with the yards and plants within its boundaries.

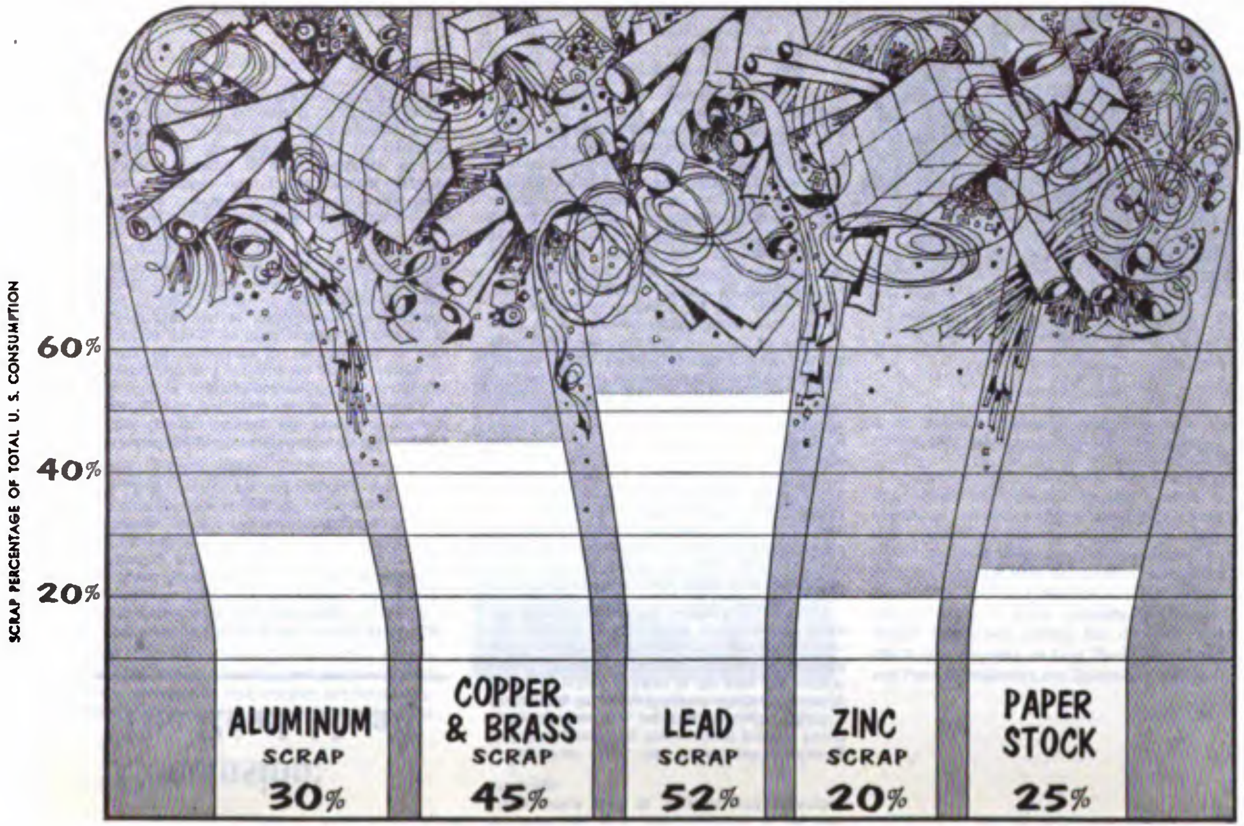
NASMI's Community Guidance Program—under the direction of its National Public Relations Committee—has taken concrete steps to achieve this kind of communication. It has established a Speakers' Bureau, with available speakers in many small and large communities in the United States. It hopes to bring the message of the industry's role in the economic life of the nation into these communities. By doing so, it may avert difficulties arising out of the very problems that have been discussed in this brochure which lead to frictions and misunderstandings.

Individual firms, too, have been developing their own community improvement projects based upon information supplied through NASMI's Community Guidance Program. Visits to company plants by school children in the area, the supplying of literature about the secondary material industry to local libraries, participation of industry members in community activities—all these efforts will help cement relations.

The secondary material industry is an integral part of the American business community. It must be treated as such and not discriminated against because its raw materials are materials that have already been "used." The existing restrictions in zoning, licensing, urban renewal, beautification, air pollution must be evaluated in terms of both the needs of the community and the needs of the industry to exist and do a worthwhile and vitally important job. Reasonable attitudes must supplant suspicion and distrust.

The future of the secondary material industry in the United States is an expanding one. As more goods are produced, there will be a greater need to recover and recycle them back into industry channels. Without this vast effort on the part of the secondary industry, the urban centers and even the countryside will be choked with accumulating material. Only the secondary industry can help in the reutilization of these mounting tonnages and in converting them into valuable raw materials for the future growth of the nation's economy. The victor will be the American public—whose consumer needs depend on the secondary raw materials that industry produces and whose environment depends on the ability and ingenuity of industry to collect and utilize such secondary raw materials.

Secondary Production Accounts for a Major Portion of Raw Material Supply



APPENDIX I

The Economic Importance of the Secondary Material Industries

A hendbook of the Department of Defense defines the reclamation of scrap and secondary materials as "of the utmost Importance in order to provide the necessery raw materials for the manufacture of essentiel military and civilian itams. Secondary materials recovered from scrap provide e vast reservoir of hard-to-get materials."

This succinct statamant graphically describes the multi-billion dollar secondary matarials industry which hes been recycling and reclaiming rew materials for more then half a century with growing efficiency end greater technological know-how. President Johnson's Sciance Advisory Committee has noted that Industries engaged in the raprocessing of secondary materials operated at a level of $5 to $7 billion ennually.

The industry consists of firms in the fields of scrap iron, scrap metals, peper stock, secondary textiles, rubber and plastic scrap. NASMI concerns itself with all these raw materials except scrap iron. A survey among our member firms taken a few years ago indicated that gross sales for this group alone totaled over $4 billion. Valuation of plant end equipment amounted to over $675,000,000 and total membership payroll exceeded $240,000,000. These figures, of course, are for NASMI members only—the figures for the entire Industry would be much larger.

We are dealing then with the economics of an industry which can be classified on the same level as such industries as chemicals, petroleum, steel, and textiles. Like these, the secondary material industry employs thousands of workers, has developed highly technical skills, has expanding markets in this country and abroad, has built harmonious relations with its suppliers and consumers—but, in addition, the secondary material industry engages in conservation policies.

By reclaiming material already in use and sending it back into the industrial mainstream, the secondary industry "saves" the use of millions of tons of natural resources and lessens our nation's dependence on foreign countries.

For example: During the copper strike of 1967-68, when all the domestic mines in the United States were shut down, a preponderance of the supplies utilized by domestic consumers consisted of scrap. The rest came from imported material which had to be brought into the U. S. and thus distorted our balance of payments. If there had been no scrap available—the United States would have had to import all of its metal and the balance of payments deficit would have been staggering.

It is for that reason that secondary materials are called "a mine above ground." Every pound of scrap used saves a pound of ore from domestic mines which face depletion. For every ton of waste paper used, trees are saved which would have to be used in the production of wood pulp. The tremendous savings in natural resources as a result of the efficiency of the secondary material industry, is what makes our country a "have" nation as against other "have not" nations.

The vital link of the secondary material industry in the economic complex can be seen in the fact that it has direct relationship both with producers of manufactured goods and consumers of raw materials. From the back door of the manufacturer flows a vast accumulation of byproducts to the secondary industry which is accumulated, sorted, segregated, and processed. The material then is shipped to consuming outlets via the front door where it is again transformed into a usable product. This is a never-ending cycle and it is upon this cycle that a large part of the U. S. economy depends.

Here are some highlights of the economic importance of the various segments of the secondary materials industry:

The nonferrous screp metal industry processes ebout 2,000,000 tons of scrap annually, valued at close to $2 billion. In a typical year, based on U. S. Bureau of Mines figures, the scrap metal industry processed: 850,000 tons of copper and copper-base screp; 350,000 tons of aluminum scrap; 450,000 tons of lead scrap; and 210,000 tons of zinc scrap.

In 1966, e more normal year than 1967, U. S. mine production of copper was 1,415,000 tons and U. S. copper recovered from scrap was 1,300,000 tons—nearly a 50-50 retio. That same year, Free World Supply of copper was about 60% mined and 40% recovered from screp. It is statistics of this kind that led one of the leading world authorities on copper, Jean Vuillequez, of Roan Selection Trust, to write in en article: "The magnitude of scrap is seldom appreciated even by experts in the industry."

That same year, some 850,000 tons of aluminum were recovered from scrap. This represented approximately 25% of the total supply. The volume of recovered scrap in tha aluminum industry is rising year by year and its value to the supply total growing progressively. Kaiser Aluminum vice president Fred Drewes has remarked that: "Any material that has gone through a portion of the normal life cycle from its source, refining and fabricating, has consumed a constantly increasing amount in labor, processing and transportation expense. The scrap industry is based upon the conservation of this value."

Lead recovered from scrap totaled about 512,000 tons—and this compares with 448,000 tons produced at primary plants. It baars out the analysis made by H. H. Callaway, of the Bureau of Mines, who declered that: "Lead recovered from scrap of over 500,000 tons annually, surpasses by a wide margin lead supplied from domestic ores." About 165,000 tons of zinc were recovered from scrap, representing about 20% of the total supply.

In addition, it should be noted that in the two decades since World War II, the rise of nickel alloy and stainless steel scrap use has been phenomenal and has added large tonnages to the available scrap supply. Today, the field is expanding in exotic and rare metals such as molybdenum, titanium, tantalum, columbium, etc. A recent study indicates that the technology of secondary production in these fields is changing to permit much cleaner and quicker recovery of the individual metals from scrap. Precious metals, too, are now being recovered in much larger quantities. Some of these metals—such as silver—formerly used mainly in coinage, have now become vitally needed by the industry.

In the field of paper stock, some 10,000,000 tons of waste paper are used annually. Use of this tonnage is responsible for a vast conservation of America's timber resources and has prompted a Commerce Department official at a recent Paper Stock Institute of America meeting to say that: "One recent study showed that 46% of the municipal waste in an Eastern city consisted of paper and paperboard. Studies under way may show the need for the greater emphasis on the salvaging of paper stock." In one given year, some 40,000,000 tons of fibrous material were used to produce 39.2 million tons of paper and paper board.

As far as secondary textiles are concerned, these consist of cotton, woolen and synthetics and come from fabric mills, dye houses, finishing plants, apparel manufacturers and independent dealers who collect textile by-products. These materials are channeled back into hundreds of industries here and abroad, to emerge as new and useful products which play an important part in the world's economy. Textile wastes find their way into fine writing paper, paper mills, flooring plants, fibre mills, shoe manufacturers, laundries, and wiping cloth industries and woolen mills.

The dollar volume of sales of secondary textiles runs over $377,000,000 and exports approximate 5,000,000 lbs., valued at $54,000,000.

It is obvious that this is a complex and modern industry, technologically alert, equipment-conscious, totally sophisticated and in some cases even computerized. It is an industry composed of a vast network of companies with the latest in materials handling machinery, with highly technical analytical laboratories, and with skilled and college-trained personnel to run large plant operations.

Secondary material firms also employ a large force of non-skilled labor. Their ability to employ and train this type of labor has effectively helped absorb into the employment stream many of the so-called "unemployables" and has proven that these workers, once given the opportunity, can rise to positions where certain specialized skills are required. The industry thus does a service to the country as a whole by offering opportunities to the unskilled workers. Through such educational devices as NASMI's "Blue Collar Workshops," many workers in the industry are given special training.

A recent NASMI questionnaire indicated that Association members have a labor force of over 41,000 plant workers and over 7,000 supervisory employes in the scrap phase of their operations and that the total membership annual payroll exceeds $236,000,000. And behind these firms are hundreds of smaller companies comprising the industry's vast collection and reclamation system.

It is unfortunate that the public is not more aware of the giant strides that have been made by the secondary material industry. It still thinks of it too often in terms of "horse and buggy" even though companies in these fields are using computers in their offices, spectrographs for modern and up-to-date materials handling techniques.

NASMI through its seminars, workshops, and metal identification, the most complex and sensitive devices in their laboratories, and the most meetings constantly offers programs of education to the industry. Few are the industries and trade organizations in the United States that enable so many of their junior executives to go to week-long seminars at universities; their technical men to workshops; their foremen and superintendents to special training sessions—as this industry has in the past two decades. The percentage of college-trained executives in the industry is clearly on a par with other large industries in the United States.

The secondary material industry does the unique job of transforming what would otherwise be "waste" into valuable raw materials worth billions of dollars to our economy. Through its vast conservation effort it saves this nation's domestic natural resources. It is an international industry, exporting thousands of tons of all types of materials annually. The industry's growth in the next few decades is assured, according to studies of leading economists and with this expansion will come greater capabilities of serving the American economy and the community.

PHOTO CREDITS

METAL PLANT YESTERDAY AND TODAY (page 2),
Courtesy, Sulsman & Blumenthal, Inc.

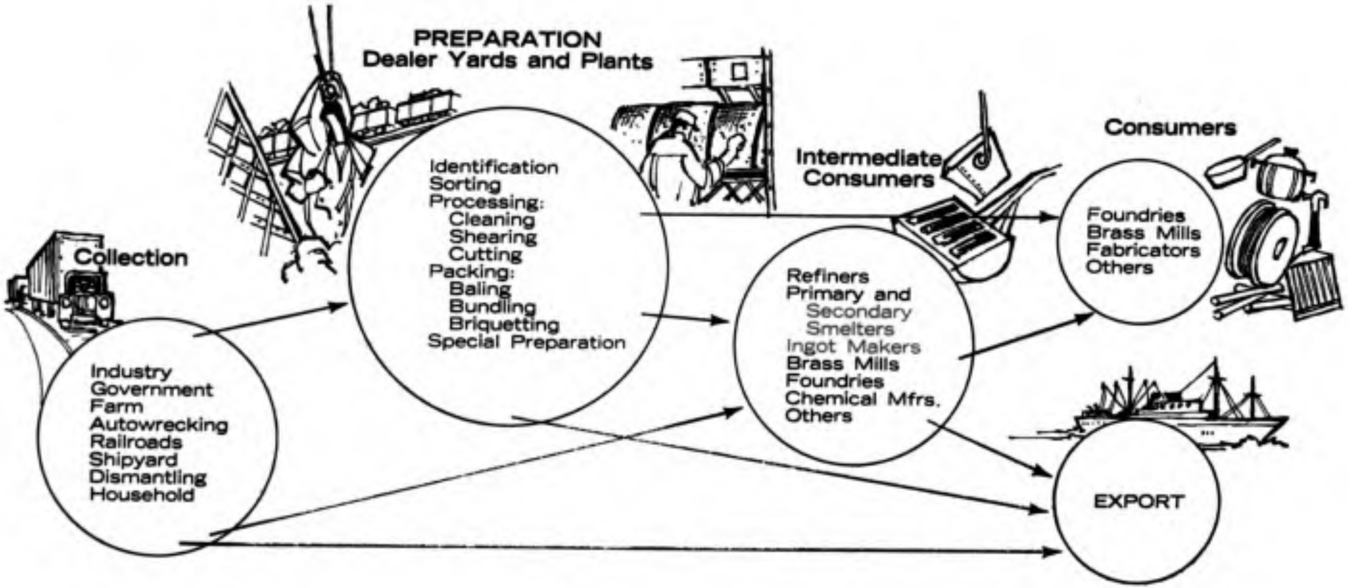
AIR POLLUTION CONTROL SYSTEM (page 7),
Courtesy, U.S. Metals Refining Co.,
American Metal Climax, Inc.

RESEARCH LABORATORY (page 9),
Courtesy, Frankel Co., Inc.

SPECTROSCOPE TESTS METALS (page 10),
Courtesy, H. Kleff & Co., Inc.

Appendix 2

FLOW CHART OF NONFERROUS SCRAP METALS



BIBLIOGRAPHY

Chicago Zoning Ordinance (Chapter 194A) Municipal Code of Chicago.

City Plan Case No. 17262, City of Los Angeles, Department of City Planning.

Third Supplement to Codified Ordinances of the City of Cleveland.

Zoning Title 27, Revised Ordinances of the City of Newark, N. J.

An Ordinance to Amend Chapter 17 of the Code of Ordinances, City of Atlanta, Ga.

Zoning Ordinances, City of Seattle, Wash. (pages 2136 and 2077).

Zoning Ordinances, City of St. Louis, Mo.

Zoning Ordinance and Charter Provisions on Planning and Zoning, City of Hartford, Conn.

House Bill 1236 (Recordkeeping for metal dealers), Oregon Legislative Assembly.

Zoning Regulations Applying to Scrap Firms, City of New Orleans, La.

Communications by City of Chicago Department of Buildings and City of Chicago Department of Urban Renewal.

Minnesota Statutes (Sections 322 to 335, recordkeeping by dealers).

Testimony of M. J. Mighdoll, NASMI Executive Vice President, before Subcommittee on Public Health and Welfare, Interstate & Foreign Commerce Committee on S. 306.

Ordinances Amending Chapters 115 and 68 of the Code of the City of Rochester, N. Y.

U. S. Bureau of Mines: Copper, Aluminum, Lead and Zinc monthly reports.

1963 Census of Business (Wholesale Trade), U. S. Department of Commerce.

1963 Census of Manufacturers (Major Group 33) Smelting & Refining of Nonferrous Metals and Alloys, U. S. Department of Commerce—3341—Secondary Nonferrous Metals.

"The Secondary Material Industries in A Changing Urban Society." Published by NASMI.

"Air Pollution Control in the Secondary Metal Industry". Published by NASMI.

"The Changing Role of the Paper Stock Industry" by Lloyd Williams, Container Corp. of America. Secondary Raw Materials, November 1967, page 48.

"Scrap Processor: A Manufacturer" by David Reichert. Scrap Age, Feb. 1967, page 33.

"Sophisticated Scrap", by Joseph V. Sherman. Barron's, December 4, 1967, page 3.

"Urban Renewal Program of NASMI". Association Management, Dec. 1967, page 13.

"Challenge in Changing Urban Society". Report by Si Wakesberg, NASMI Commodities Vice President. Mill Trade Journal, February 14, 1967, page 1.

"Automobile Disposal: A National Problem". U.S. Bureau of Mines.

"Air Pollution Future Threat to Secondary Metals Industry", by Arnold Gates. American Metal Market, April 17, 1967, page 24.

"Study of Secondary Recovery of Metals Programmed at Penn State University", in American Metal Market, March 28, 1968.

"Report Urges Wastes Be Put to Productive Uses". N.Y. Times, April 1, 1968.

"City of Rochester Reported Determined to Recommend Its Junkyard Ordinance", American Metal Market, October 27, page 27; and Oct. 16 and 17, page 27.

"The Nonferrous Scrap Metal Industry". Published by NASMI.

"Defense Scrap Yard Handbook", published by the Department of Defense, Washington, D. C.

"Restoring the Quality of Our Environment". Report of the Environmental Pollution Panel, President's Science Advisory Committee; Washington, D. C.

"Lead—A Material Survey", by H. M. Callaway, U. S. Bureau of Mines.

"How Metal Goes to Market", by Jean Vuillequez. E & MJ Market Guide on Copper, October 25, 1965.

Mr. ROGERS. Thank you very much, Mr. Mighdoll. We appreciate that. That will be most helpful.

Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman. I feel your statement will be most helpful too. Particularly I am interested in the observations you made on page 7, statement No. 2, in which it appears you seem to feel that we ought to give the widest possible latitude to industry to solve all these problems and at the same time we ought not to close our eyes to the economic impact and economic feasibility of whatever approach is ultimately arrived at.

I think this applies pretty well across the board, myself.

I would like to ask you this question. There have been some arguments raised that simply because certain products such as aluminum cans don't rust and don't ultimately disappear through the process of nature they ought to be outlawed. It would seem to me that your statement urging the reconsideration of the recycling process would indicate that precisely the opposite approach should be the one we ought to take. Am I correct?

Mr. MIGHDOLL. Absolutely, Mr. Satterfield. I don't believe we are going to prevent progress and I believe the aluminum can and other developments of this modern age are here to stay and probably will grow in intensity. I believe the challenge is on us as industry and on Government—in every economic and technological way possible—to solve the riddle of how to utilize the aluminum can. It can be utilized. The aluminum can can be used by the scrap industry just as quickly as other more convenient aluminum scrap products. The problem is merely—I do not emphasize merely—how do we collect the aluminum can, how do we bring it to the point of processing where it can be easily consumed?

Mr. SATTERFIELD. You think it is possible that the recycling process with respect to aluminum cans and similar products is economically feasible?

Mr. MIGHDOLL. Yes. I see it as indigenous to the waste paper product we produce in our home. When the economics of the market are such, the American consumer saves his waste paper and bundles it. It is kept separate from the garbage and returns to the recycling line as raw material.

I think the same could be true for the aluminum can and similar household products if the economics will permit it and if some education is done on it.

Mr. SATTERFIELD. You referred to paper. I presume this applies to aluminum foil and those metal foils that may be more difficult to burn, for example. Do you feel there is any difficulty in handling them as opposed to handling any other paper or solid waste?

Mr. MIGHDOLL. No. Once we can retrieve them and recycle them. The word is recycle. As soon as we can get it back in that channel, the industry can go forward.

Mr. SATTERFIELD. Thank you very much. I have no further questions.

Mr. ROGERS. Mr. Preyer?

Mr. PREYER. Thank you, Mr. Chairman. I was very much interested in learning something that I knew very little about. The tone throughout your testimony is that you have been regarded somewhat as a second class citizen. You talk about the "psychological restraints" on your industry but I think if you can continue to put out facts such as that the annual paper you reclaim is equivalent of 200 million trees, that you can become heroes rather than being psychologically restrained.

I did want to ask you one question on page 5. You mentioned the secondary textile industry as one which has suffered from restrictive legislation which has reduced the amount of cotton synthetic blends apparently which are able to be sold. What is the nature of the restrictions there?

Mr. MIGHDOLL. Very simply, the original cotton byproduct or cotton waste was readily marketable, it was pure cotton and had a ready market. When synthetics came along and blends became a common occurrence, there is no technological way as yet to economically remove tho synthetics from the cotton or vice versa. They are blended together and in that form have very limited markets in this country. Therefore, this product became principally an export commodity and principally to countries which at one point did not have blossoming economies and could utilize that material.

Now as economies in Europe and elsewhere in the world have themselves prospered we find countries shutting out imports of this material from the United States. We have taken this matter up with both the State Department and the Commerce Department to point out that unless these international points of consumption are again opened up, this material is just going to accumulate. In fact it is doing it right now, there are practically no markets for blendod, or what we call in the industry, contaminated materials.

Mr. PREYER. So that they pile up in the warehouse or you have to dispose of them as solid waste?

Mr. MIGHDOLL. Yes. We had a similar situation, and this is what I referred to as self-imposed, with the Wool Labeling Act, some years ago which psychologically tuned the American consumer out of reused and reprocessed wool, as those products had to be so labeled, and this again depended on the international market and again as the countries in Europe prospered and developed their own secondary industries, there was an economic, in this case, shut out of the American waste.

Again, this is a dwindling industry. As a matter of fact, once it was the largest segment of our Association; it is now by far the smallest.

Mr. PREYER. Thank you very much.

Mr. ROGERS. What about plastics? Are they subject to much reuse?

Mr. MIGHDOLL. No, sir. In fact, I think this probably has been the most disappointing segment of the raw material industry. The plastics industry at this point has only found limited ways of reusing certain of the plastic items.

Mr. ROGERS. In fact, it is not even easy to get rid of them, is it?

Mr. MIGHDOLL. No, it is not. This is a real challenging situation. In fact there are only a few companies making any worthwhile contribution to the recycling of plastics.

Mr. ROGERS. We would like to know any that are, if you happen to know them, for the record.

Mr. MIGHDOLL. Fine.

(The information requested was not available to the committee at the time of printing.)

Mr. ROGERS. You said that some of your research depended on HEW's acceptance of a study for a plan for recycling?

Mr. MIGHDOLL. We have submitted to HEW—as a matter of fact, we are anticipating early advice, hopefully in the next few weeks—a very broad study of all secondary materials from point of generation of the scrap to the ultimate point of consumption, in all the commodity lines, with the emphasis on achieving greater utilization through economic and technological recommendations.

Mr. ROGERS. How much would this cost?

Mr. MIGHDOLL. This has been budgeted slightly under $400,000, $366,000.

Mr. ROGERS. What response have you received?

Mr. MIGHDOLL. The HEW staff members have been inclined favorably to this. I understand from Mr. Vaughan it is going to his review committee this week or next week in Cincinnati. We are hopeful for favorable advice.

Mr. ROGERS. How long will this take?

Mr. MIGHDOLL. One year.

Mr. ROGERS. You can do it in one year?

Mr. MIGHDOLL. Yes. We feel if we don't get to it that quickly it will be too late.

Mr. ROGERS. Are there any other major breakthroughs you see in this whole program that the committee ought to be advised of?

Mr. MIGHDOLL I see a breakthrough, I am happy to report, in psychological attitudes toward secondary materials. I see major corporations in this country which frankly not too many years ago turned up their noses at the secondary market, are now suddenly realizing they cannot survive without it. Our Association, as a matter of fact, during the last five years, has been happy to greet many of the larger American corporations who have suddenly discovered the importance of secondary materials.

Mr. ROGERS. Thank you very much, Mr. Mighdoll, and you, Mr. Merrigan, for being here.

Mr. MIGHDOLL. Thank you.

Mr. ROGERS. Our next witness is Dr. Richard Smith, President of Combustion Power Company, Inc., of Palo Alto, California.

Dr. Smith, thank you for your patience. You are very kind. You have a story we want to hear. I am somewhat familiar with it.

STATEMENT OF DR. RICHARD C. SMITH, PRESIDENT, COMBUSTION POWER CO., INC.; ACCOMPANIED BY WILLLIAM C. DELL, VICE PRESIDENT

Dr. SMITH. I have with me Mr. William Dell, Vice President and Director of Combustion Power Company, Inc., Palo Alto, Calif.

Mr. ROGERS. Welcome to the committee

Dr. SMITH. Before we start I would like to submit, if you will, the testimony for the record and briefly summarize it here.

Mr. ROGERS. Yes, without objection this will be received as part of the record following your oral statement.

Dr. SMITH. Thank you very much. The work that we are going to talk about a little bit today is the research and development we are doing to generate electric power from solid waste. This is a program which has been supported by the Department of Health, Education, and Welfare, Bureau of Solid Waste since June 1967.

It is advanced research and development. We of the Combustion Power Company are ex-space engineers and scientists. We all worked in rocket programs in our earlier days and about three years ago changed and are now applying the technology and systems experience that we learned to this new field.

I might add one item. In working in research and development in cooperation with the Government, it is very important to have close personal relationships and good contact with the staffs and to that extent Mr. Richard Vaughan, who is head of the Bureau of Solid Waste Management, has been very helpful in his guidance and direction and a pleasure to work with.

With that, I have a few charts and pictures.

I will go through these very rapidly. The name of the project is the CPU–400, Combustion Power Unit, and it consumes 400 tons of solid waste a day. It is a package plant.

We look at a city as a system. The food and hard goods come in. Water flows in at 150 gallons per person per day. Eleeric power is consumed at the rate of 22 kilowatts per person. Out goes the waste water, essentially flushing a lot of the things out of the city, and solid waste at the rate of five pounds per day per person.

The best recycle is the direct recycle, we feel. What the CPU–400 does is recycle the energy in solid waste into electric power. We take all the solid waste of the city and convert it to power. We get about 10 percent of the power requirement of the city. Out of this system come metals and minerals for recycle in accordance with many of the discussions we have heard today.

Solid waste is largely paper and paper products, plastic and paper, what we consume as fuel. It is not a bad fuel. This is a plot of heating value of solid waste as compared with coal. The best coal gives 15,000 BTU. Solid waste gives about 6000. A lot of the coal used in Europe is down to about 6000. It is a much better fuel than recognized. It also happens to be available right in the city in which it is used.

This is a schematic of how the CPU–400 works. Basically, it is an adaption of a jet engine or gas turbine to burn refuse. The refuse comes in and everything is shredded. It is dried and goes through what is called an air classifier, where metals and glass may be removed and introduced into a special combustion chamber. This is a gas turbine or jet engine which supplies high pressure air.

The material is burned in a bed of sand which has limestone in it. The particles are taken out of the hot gas and it goes through the turbine to create electric power and the hot gas goes up the stack.

Most of our research and development is in this area. It is almost all oriented toward burning solid waste without polluting the air.

The program has been in work now for over two years and every element of the system is either available through another manufacturer or we have demonstrated it in tests.

This is a picture of a device similar to the one we use for a carousel. This is storing and feeding wood chips in upper Maine.

This is a shredder developed by the EIDAL Corporation of New Mexico to shred cars first and now solid waste. It is operating.

These are pictures of Combustion Power Company's equipment for doing research and development on the fluid bed. The bed of sand is contained in here. Here it is shown flying up. The specks are refuse.

We have operated a 12-inch diameter fluid bed at elevated pressures with real refuse.

This is a picture of one of three types of particle cleanup devices that we have tested. These must operate at high temperatures and new state of the art is required.

This one happens to be a mat filter. We have made an electrostatic precipitator to operate at 1700 degrees. We have also made inertial separators operating at these temperatures.

The gas turbine is a key part of the plant; we use the standard design gas turbine. These are being made in this country now by three manufacturers. It is the gas turbine type of device which the utilities are literally diving for in order to help them get over their problems with peak power generation.

Why bother with the program? Well, the answer is here. This is a plot of disposal costs for the two existing methods of solid waste disposal. Landfill at $2 a ton, incineration eventually at perhaps $7. The CPU–400, by generating electric power, provides a product, the income from which largely offsets the cost of disposal. Our estimates are approximately $1 a ton.

Mr. Rogers. One dollar a ton?

Dr. Smith. Yes, net.

In Europe, which is generally conceded as having more advanced methods of solid waste disposal than this country does today, they use steam boilers, the kind we used to burn coal with in this country way back at the turn of the century.

This is the picture of the CPU in red against a large steam boiler of the type used in Dusseldorf. You get a comparison of the relative size.

The plant is designed to be a package to be dispersed throughout a city. 160,000 people will be served by one plant.

This is San Francisco. Thus the small plant can be dispersed about the city so that the collection costs are less. That is, the route to the plant is shorter. Large incinerators, larger and larger types which one must build to be efficient with the steam type of incinerator, result in fairly efficient plants but they place increased cost burden on collection and transportation to a single location.

Stepping beyond with the CPU, looking into the future a bit, we see the possibility of using vacuum collection in pipes underneath streets; shown here is a CPU with pipes leading into the carousel or the waste storage area which eliminates the very high and often bothersome collection aspects of solid waste in the cities.

Mr. Rogers. Isn't that system actually being used in Sweden?

Dr. Smith. Yes, it is.

Mr. Rogers. So it is a proven system?

Dr. Smith. It is proven. It has been in use approximately four years now. Surprisingly enough, heavy things can be transported thru the pipe. It works.

Because the CPU–400 uses a gas turbine there are some special things that we can do to further help the city in its system. We mentioned the vacuum collection. We can produce steam for heating or for air conditioning which would be useful, for example, in downtown New York or Detroit where they have steam systems.

Attached to the CPU one can put some of the equipment being developed by the Office of Saline Water for salt water conversion and get 2,500,000 gallons of water a day. That is about 10 percent of the water that this population segment of 160,000 needs. If you decide you really want water, you can delete the electric power and just make water alone which would give you 11 million gallons a day or about half of the requirement for the people.

Now this may be attractive in New Mexico or areas that are water short.

The CPU–400 also provides an option to get rid of sewage sludge from conventional plants, which is often a problem in terms of sanitary disposal of this output of the plant.

A little different way of making a CPU and one that we hope to get into very shortly is that we have found a way to take refuse and to make char of it (pyrolysis), and to activate the char so that it becomes an active carbon. Now active carbon treatment of sewage is one of the most modern and desired ways of really cleaning it up. It gets out the phosphates, the nitrates, in addition to dissolved organics. It is used, for example, at Lake Tahoe in a pilot plant.

This is a photo showing the char from refuse. This is one series of experiments we have made to look into this process compared to the use of commercial brands of active carbon such as Darco. This is bone char. The char from solid waste is comparable. It is very encouraging because we are now using the garbage to clean up the sewage.

Mr. ROGERS. Will this affect the tertiary treatment?

Dr. SMITH. Well, it could be tertiary treatment, but the latest research and development result of the FWPCA indicates that the new process, using this technique, is better than the old biological process. Just start out with an active char treatment and you will be better off. There are some experiments going on, I believe, in Michigan in accordance with this. We are borrowing from research and development conducted by the Federal Water Pollution people and saying we can provide these resources (active char) from solid waste.

This is an artist's sketch of a CPU–400 plant. It fits on an acre. This shows the trucks coming in and dumping. Because of the gas turbine we are able to make it so compact.

The final chart, briefly we are over two years into the program. We have conducted studies. We have conducted subscale experiments on the key components, and approximately a million dollars has been spent on the program by the Department of Health, Education, and Welfare. We have now started on the pilot plant, also under their support, which is a one-tenth scale model of the large one. We anticipate this will take a year and a half. At this point one year from now we feel we can start the development of a full scale CPU–400 to be operational four years from now.

Lest one get discouraged about the four year time in concert with the urgency of the problem as expressed by the gentleman earlier today, with this approach, when one has passed the four years of development, then you can build the package plants with a lead time of maybe a year. Currently it takes five years or four years to build each incinerator because each starts out from scratch as a new engineering project.

So, we would try to apply the lessons learned in the space business and military rocket business of getting a sophisticated device, producing it on a production line, and fitting a few final parts together at the site where we would intend to operate.

Very briefly, our estimates for the funding of this program, which includes one full-scale operating device, is a little over $19 million.

That ends our summary.

(Dr. Smith's prepared statement, charts, and photos follow:)

STATEMENT OF RICHARD SMITH, PRESIDENT, COMBUSTION POWER COMPANY, INC.

CPU-400 RESEARCH AND DEVELOPMENT PROGRAM

Mr. Chairman, Members of the Subcommittee, it is a pleasure to appear before you today to discuss the CPU-400 research and development program. The objective of the program is to develop a new process that generates electric power from solid wastes.

This program, wholly supported by the Bureau of Solid Waste Management, Department of Health, Education and Welfare, was initiated in June 1967 under the Solid Waste Disposal Act. We believe it is a good example of the research and development which has been funded to date by the Solid Waste Disposal Act. The CPU-400 is an ongoing program and will require continued support for several years before it is completed. Consequently, funding requirements for the CPU-400, as well as other research and development in this important area, should be considered in any legislation to extend the Solid Waste Disposal Act.

Chart—Title Sheet

CPU-400 stands for Combustion Power Unit-400; 400 is the plant capacity in tons/day of solid waste, the output of 160,000 people. Following the selection of electric power as the product to be derived from solid wastes, studies were undertaken to define the best system to accept the cities refuse and generate electric power. These studies showed that a package plant of 400 tons/day capacity would fit well with our towns and cities; that package plant is the objective of the research and development program in which we are engaged.

Chart—Flow Diagram—Typical City

To better appreciate the manner in which the CPU-400 would be integrated with a city, it would perhaps be instructive to examine the flow diagram of materials and energy for a typical city. Flowing into a city are food and hard goods, water, and electric power or fuel. The majority of materials entering a city also must exit from it. Waste water, in an amount almost equal to the water supply, is a dilute solution containing organic wastes, chemicals, and bacteria. Solid waste is comprised largely of the used (but not consumed) hard goods which flowed into the city.

Chart—Modified Flow Diagram—Recycle

The most efficient recycle mode is the direct conversion of solid wastes to a product used by the same city.

As shown in the chart, the CPU-400 accepts the solid waste of the city and produces electric power, which is consumed directly in the city. The amoun of power generated from solid wastes will be approximately 5–10% of the total power consumed by the city. Solid waste used as a fuel to generate power conserves natural resources of fossil fuel or nuclear fuel that would normally be consumed for that purpose.

Sterile ash will be produced by the CPU-400 in addition to electric power. This ash will contain virtually all valuable metals and minerals contained in the solid waste.

Chart—Solid Waste

Solid waste is an excellent fuel. As shown on the photo on the left of the chart it is comprised largely of paper and paper products. Solid waste, assuming a 20% moisture content, has a heating value of 5000 Btu/lb; 6300 Btu/lb when dry. As shown on the right side of the chart, this compares favorably with coal. The heating value of the highest grade coal is 14,000 Btu/lb but many coals have a heating value of 6000 Btu/lb and below.

A portion of the cost of any fuel is its transportation cost. Solid waste, as a fuel, is not burdened with this added cost as it is generated in the city in which it is used. A disadvantage of solid waste as a fuel is that it contains polyvinylchloride plastic which produces hydrochloric acid vapor when it burns.

Chart—CPU-400

This chart shows a schematic of the CPU-400. Solid waste is received from municipal trucks and stored temporarily in a rotary storage area. All of the solid waste is shredded in a high capacity shredder; no separation or sorting is accomplished prior to shredding. After shredding, the solid waste is dried in a rotary dryer using waste heat from the exhaust of the gas turbine. The purpose of drying is to assure that the refuse entering the combustion chamber has a predictable and uniform burning rate.

After drying, the shredded solid waste is passed through an air classifier to separate out pieces of netal, glass, and rocks. The iron and steel is easily separated from the glass by a magnet. The remaining material, largely combustible, passes through a rotary air-lock feeder into the high pressure fluid bed combustor.

Air is compressed by the gas turbine compressor to a pressure of 100 pounds per square inch and supplied to the fluid bed combustor. The fluid bed combustor is composed of a container of sand which is being kept in a fluid-like state by the passage of air up through it. Literally, it appears to be boiling as water would boil in a heated pot. The sand is at a temperature of 1650°F (glowing red) and as the shredded solid waste is injected into it, rapid and thorough combustion takes place. The compressor supplies about four times the amount of air needed for complete combustion of the solid waste.

Fluid bed reactors are well known in the chemical processing industry; they are now being considered by the Air Pollution Control Administration for large coal fired boilers because they can capture the majority of pollutants from burning fuel before those pollutants are released to the air. It is for this reason that the fluid bed reactor was selected for the CPU–400. In the CPU–400 application, the capability of the fluid bed to remove pollutants will be used to remove the majority of the hydrochloric acid vapor from the combustion of polyvinylchloride plastic. The fluid bed will also be effective in removing sulfur dioxide and as well as other pollutants that may be present in solid waste in the future.

Ash from the solid waste will either remain in the bed or be elutriated with the hot gas leaving the bed. Ash remaining in the bed will be removed periodically through an opening in the bottom of the bed and sorted from bed material. Ash elutriated from the bed will be separated from the hot gas in highly efficient particle separators. The separators serve a dual purpose; they protect the turbine from erosion and they prevent air pollution by preventing discharge of particulate matter.

The hot gas leaving the particle separators passes through a turbine in which it is expanded to nearly atmospheric pressure; after expansion its temperature is still fairly high, 930°F. The turbine drives the compressor and the electric generator that produces the power output of the plant. The hot gas, at 930°F passes through a heat exchanger to supply heat to the dryer and through an optional waste heat boiler before being exhausted to the atmosphere.

The CPU–400 plant will produce 15,000 kilowatts of electric power as a base load plant. Because of the simplicity of the gas turbine however, it is possible to make this small 400 ton/day plant comparable in overall efficiency with a larger plant of conventional construction.

Chart—Shredder

Several components of the CPU–400 are already well into the development stage. Shown here is the shredder, an Eidal International Company SW–750, which was originally developed by that company to shred auto bodies. Several installations are in daily operation. It has been adapted for shredding municipal solid waste, a less arduous job, but its inherent ruggedness will allow it to cope with the occasional car axle that finds its way into the garbage can.

Chart—Fluid Bed Combustor

One of the key components of the CPU–400 is the low pollution fluid bed combustor; shown on the left side of the chart is a photo of our subscale fluid bed combustor. This fluid bed combustor was successfully operated at 1650°F and 100 psia with actual refuse, gathered in Albuquerque, New Mexico as a matter of fact.

The photo on the right side of the chart is a close-up of a fluid bed in operation. For ease of observation, the bed is contained in a plastic tube and operated at ambient conditions. Note the highly turbulent nature of the bed with bursting bubbles of air and sand on the upper surface. The dark specks are pieces of solid waste.

Chart—Particle Separator—Mat Filter

Removal of the particulate matter from the hot gas leaving the fluid bed is one of the most technically challenging areas of the CPU–400 development. Particle removal is routinely accomplished today at temperatures up to 700°F; the CPU–400 requires that particulate removal be accomplished at 1650°F.

Subscale tests of three types of particle separators have been conducted at 1650°F and 100 psia; inertial separators, electrostatic precipitators, and mat filters were all tested. This chart is a photo looking at the downstream side of the mat filter. The results of the tests showed that particulate could be efficiently separated from gas at these elevated temperatures and pressures.

Combustion Power Company was joined by a strong team of subcontractors, each an expert in his field, in advancing the technology of high temperature particle separation. Major contributors were the Donaldson Company who supplied the inertial separator, and Research-Cottrell Inc. who supplied the electrostatic precipitator, and the Marquardt Corporation who conducted the testing.

Chart—15,000 KW Gas Turbine

The most expensive single component of the CPU–400 is also, fortunately, the best developed one. Shown on the chart are a number of 15,000 KW gas turbines in regular service; hundreds of such units have been produced and are generating electric power all over the world.

Chart—Low Cost Operation

Shown here is a comparison between the cost of conventional sanitary land-fill, incineration, and the projected operating costs for the CPU-400. The dramatic reduction in operating cost of the CPU-400 compared to the conventional approaches is made possible by the efficient generation of a product and its sale. In these calculations, no credit was assumed for sale of metals or minerals in the sterile ash.

The potential payoff from research and development in the field of solid waste is significant. Savings in only 5 years' operation in a city the size of San Francisco would repay the development costs.

Chart—Comparison: CPU vs European Practice

Compared to the solid waste disposal technology used in the United States today, European practices are quite advanced. Some people in the field are of the opinion that we should copy the Europeans. Rather than copy them, we should leap-frog their technology and use the vast storehouse of knowledge from our space and defense work to put us squarely in the lead. This chart compares the size of a modern European incinerator with an equivalent CPU-400. The heat release rate in the combustors of the CPU-400 will be over 30 times that in the European incinerator.

Chart—Plant Dispersion

The cost of solid waste disposal is actually comprised of two parts, collection and the actual disposal itself. Collection costs are often 3 times higher than disposal costs; for example in Washington, D.C. collection costs averaged approximately $20 a ton a few years ago. Collection costs can be decreased by decreasing the distance from the pickup points to the disposal site.

On the left side of the chart is an outline of the San Francisco peninsula showing a potential location of a large European type incinerator, say 1500 tons per day. These types of incinerators become efficient only as the size increases, consequently larger central plant design is favored. On the right side of the chart potential locations for four CPU-400 plants are shown. Because it will be highly compact, the CPU-400 will fit on approximately one acre.

Comparing the left and right side of the chart, the dispersed plant siting will reduce the haul distances significantly and consequently reduce collection costs.

Chart—VaCol Automated Collection

One of the most promising advanced developments in the field of solid waste collection is pneumatic transport. Pneumatic transport of materials has been practiced in industrial plants for many years and the technology is now being applied to the collection of solid waste. As shown in the chart, pipes 18 to 24 inches in diameter are laid in the streets and connected to each apartment, office building, or dwelling. During the day solid waste is accumulated in each building but at night, when the demand for power is lowest, the compressor of the CPU–400 draws a vacuum on the lines and the valves in each building are sequentially opened along each trunk line to make the collection.

The compressor of the CPU–400 is powerful enough to collect 400 tons of solid waste from the surrounding urban environment in approximately 2 hours. The dispersion of small package plants throughout the city makes this possible by limiting the maximum line length.

The VaCol or vacuum collection system, when mated with the CPU–400 eliminates the need to provide for the going and coming of refuse trucks and consequently greatly reduces the area required for the plant. The plant can now be placed in the subbasement of a large downtown office building.

Chart—Add-on Capability

In addition to the VaCol system, there are several other attractive add-on features which could benefit cities. These add-ons are uniquely available because of the use of the gas turbine in the CPU–400.

Waste heat can be used to generate steam for heating, or air conditioning. This is attractive when the plant can be located near a downtown area of a large city or in an industrial area.

Desalting systems, developed by the Office of Saline Water, require heat to distill salt water into fresh water. When that heat is supplied by the waste heat from a CPU–400, the production of 2,500,000 gallons of fresh water is possible, about 10% of the consumption of those residents supplying solid waste to the CPU–400. The cost of water is estimated to be 28¢/1000 gallon.

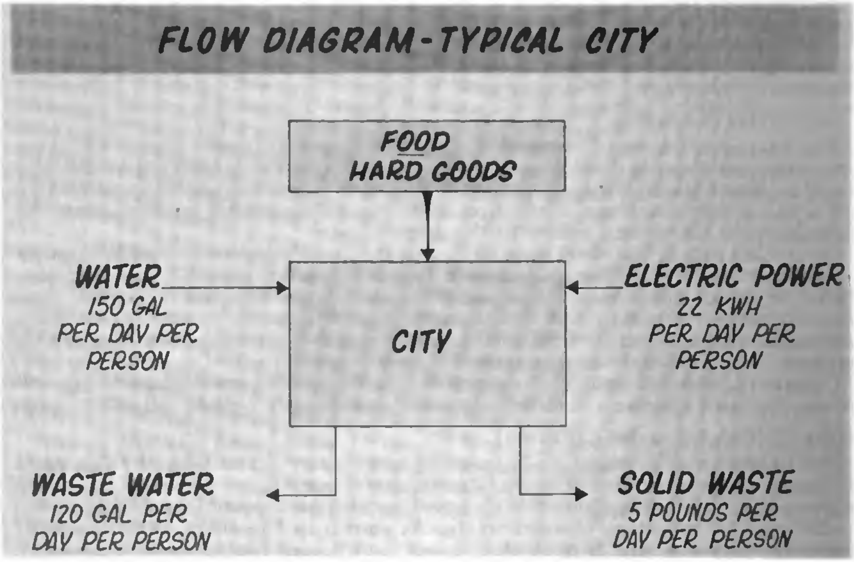
Finally, the waste heat can be used to dry and incinerate sewage sludge from conventional sewage processing plants. The pollution free disposal of sewage sludge is a problem in many communities.

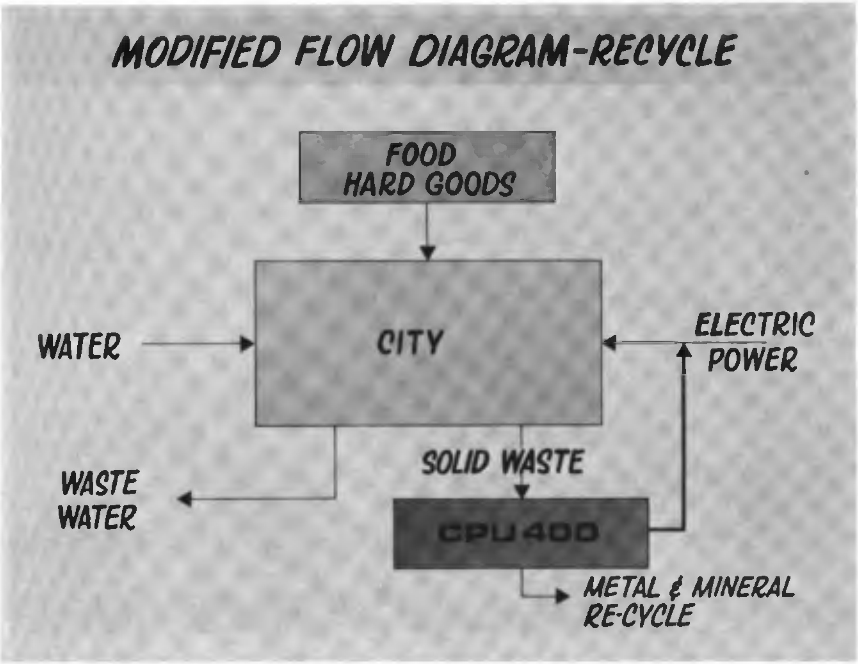
Chart—CPU–400 Plant

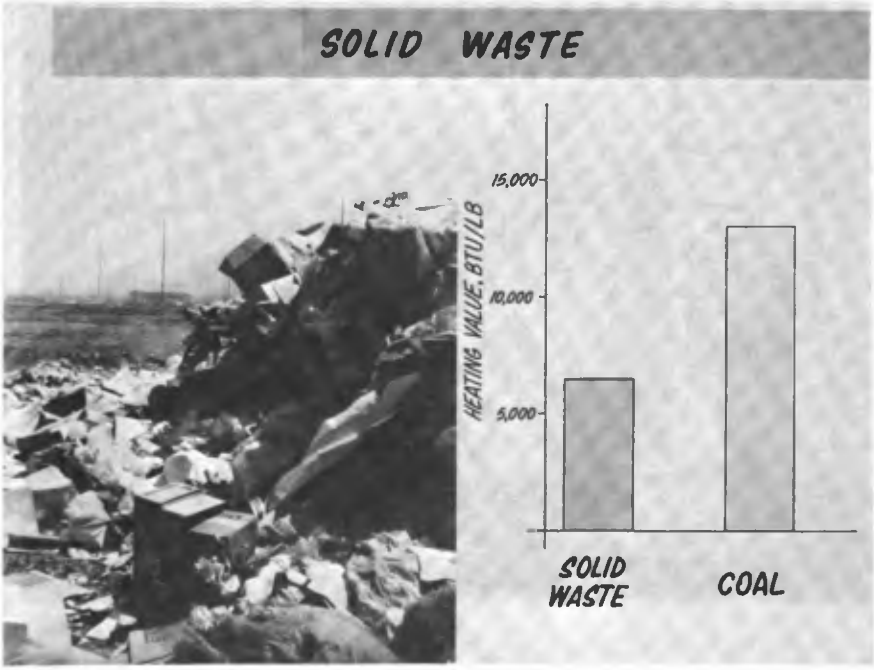
Shown here is an artist's rendering of the CPU–400. Attractive, and because of its small size, it should fit in many urban locations.

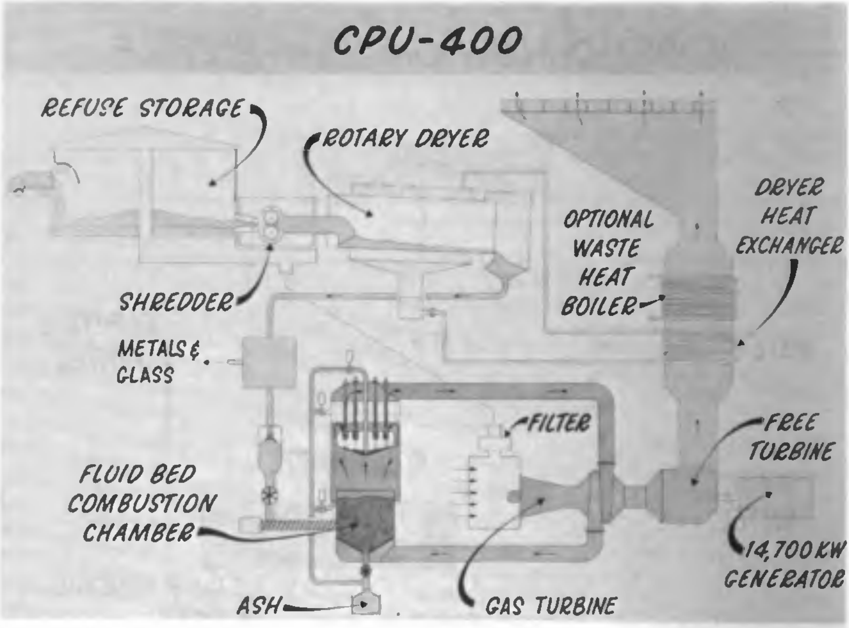
Chart—Basic CPU–400 Development

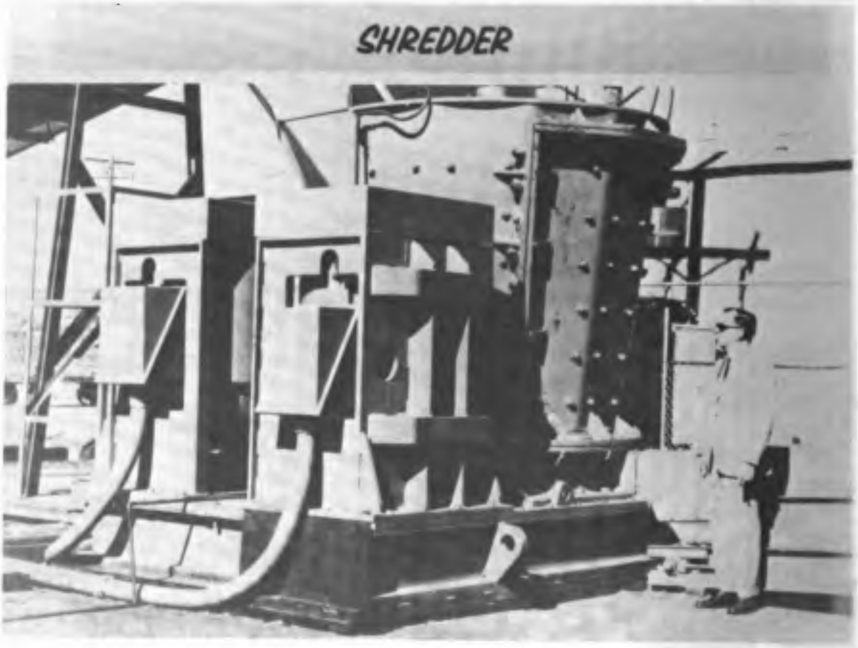
The status of the program is reported on this chart. Over two years of studies and subscale testing have been conducted, and approximately one million dollars of Federal funding has been expended to date. The next phase of the program, the pilot plant, is now underway. Over 19 million dollars of additional funding will be required to complete the development and build the first full scale prototype. As shown on the chart, the prototype is scheduled to be operating in 1974.



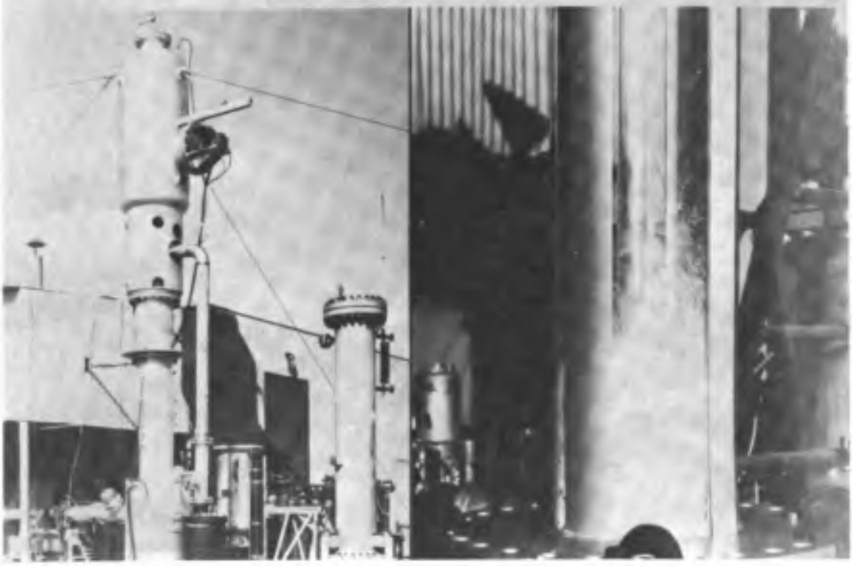

MODIFIED FLOW DIAGRAM-RECYCLE
FOOD
HARD GOODS
WATER
CITY
ELECTRIC
POWER
WASTE
WATER
SOLID WASTE
CPU 400
METAL & MINERAL
RE-CYCLE


SOLID WASTE
HEATING VALUE, BTU/LB
15,000
10,000
5,000
SOLID
WASTE
COAL

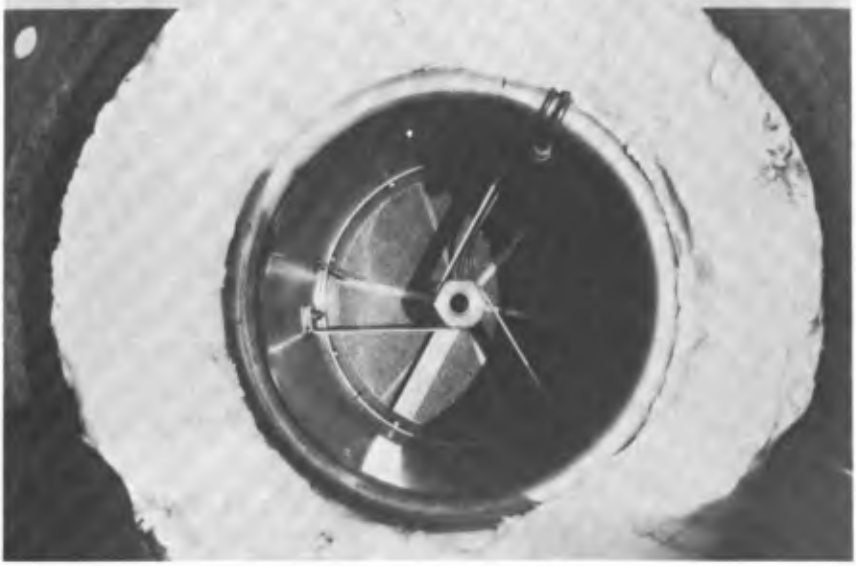

CPU-400
REFUSE STORAGE
ROTARY DRYER
DRYER HEAT EXCHANGER
OPTIONAL WASTE HEAT BOILER
SHREDDER
METALS & GLASS
FILTER
FREE TURBINE
FLUID BED COMBUSTION CHAMBER
14,700 KW GENERATOR
ASH
GAS TURBINE

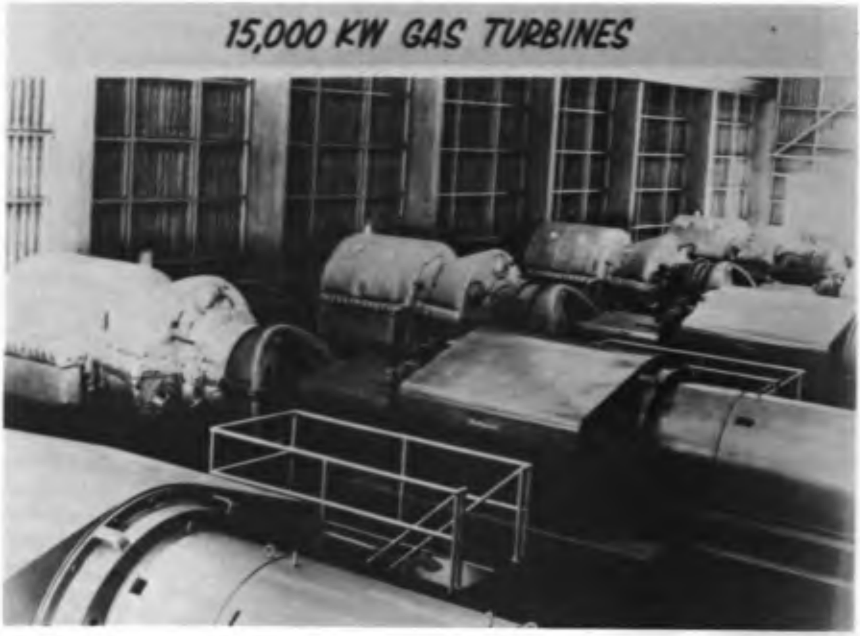

SHREDDER

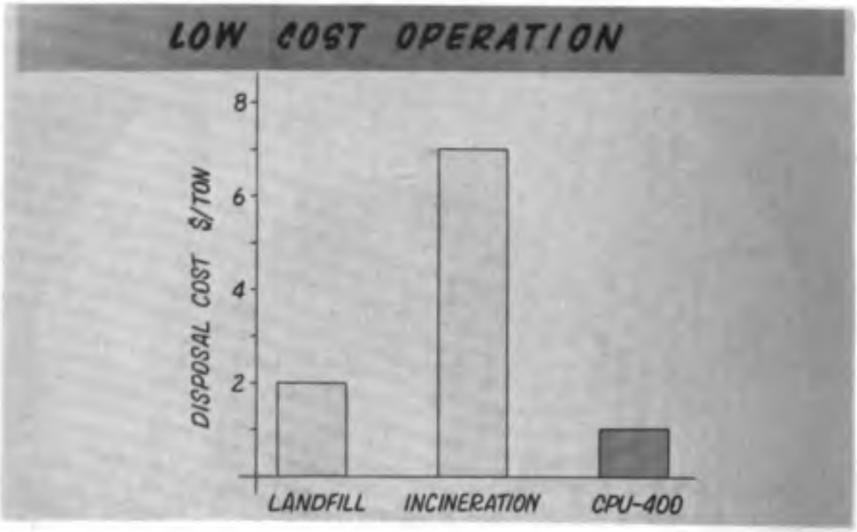
FLUID BED COMBUSTION

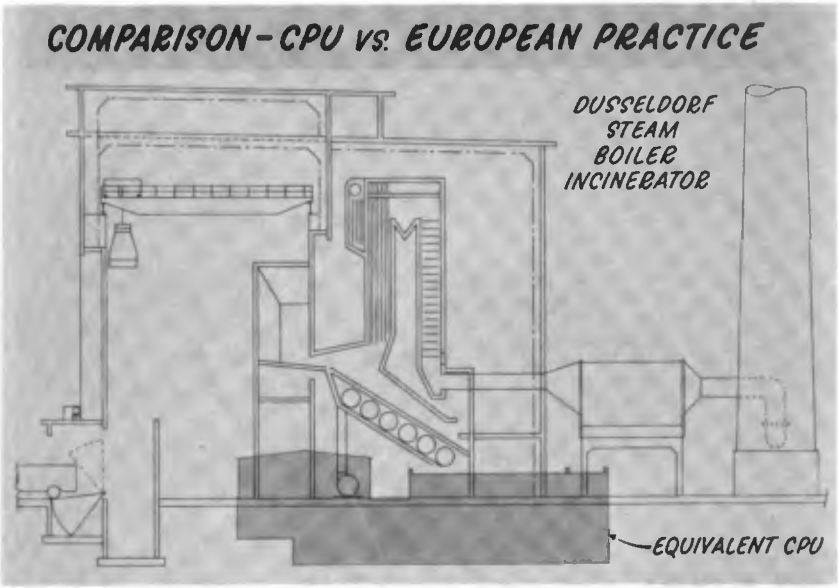


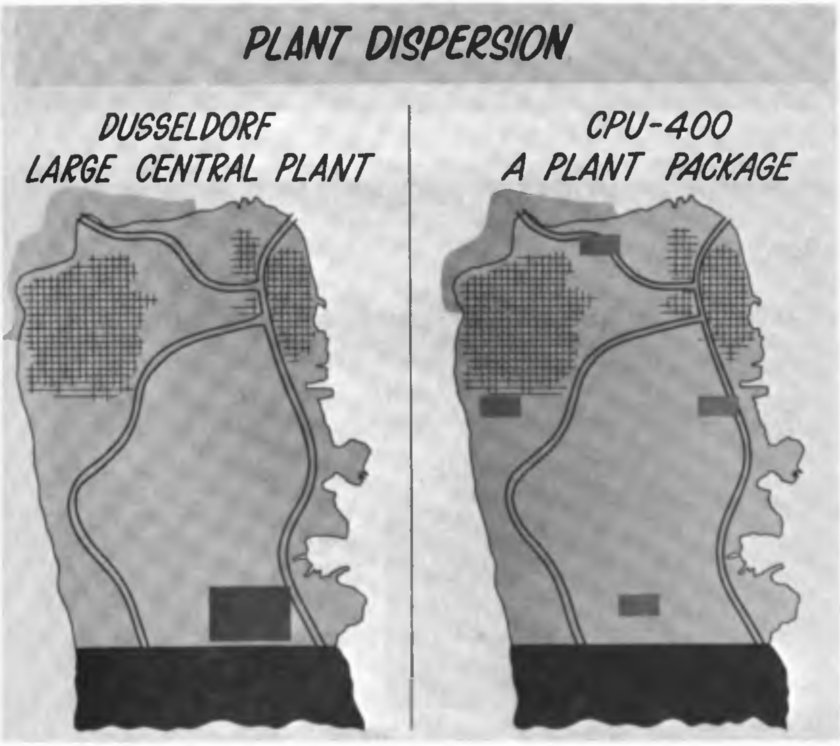
PARTICLE SEPARATOR-MAT FILTER

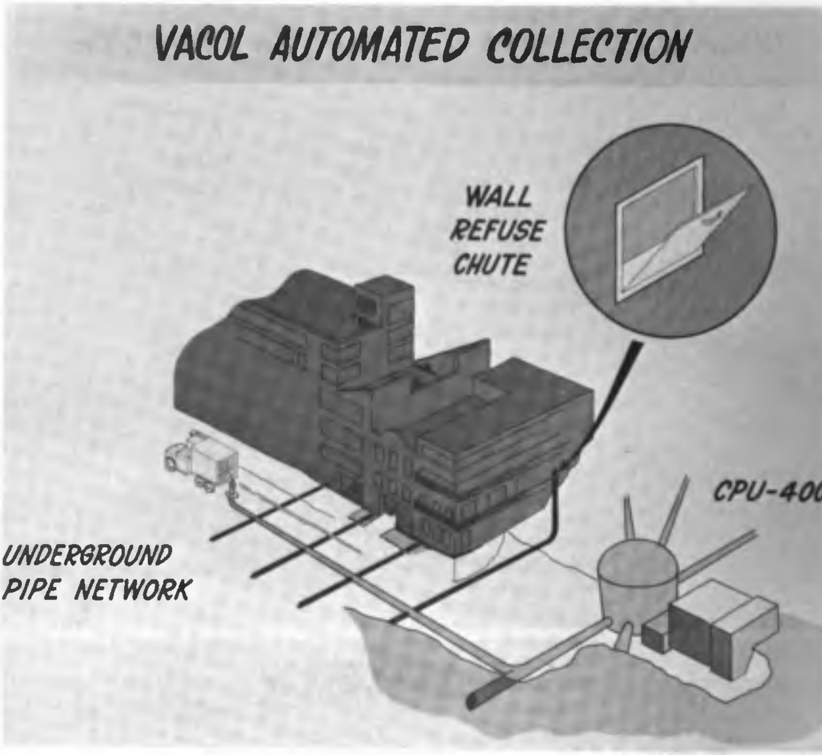


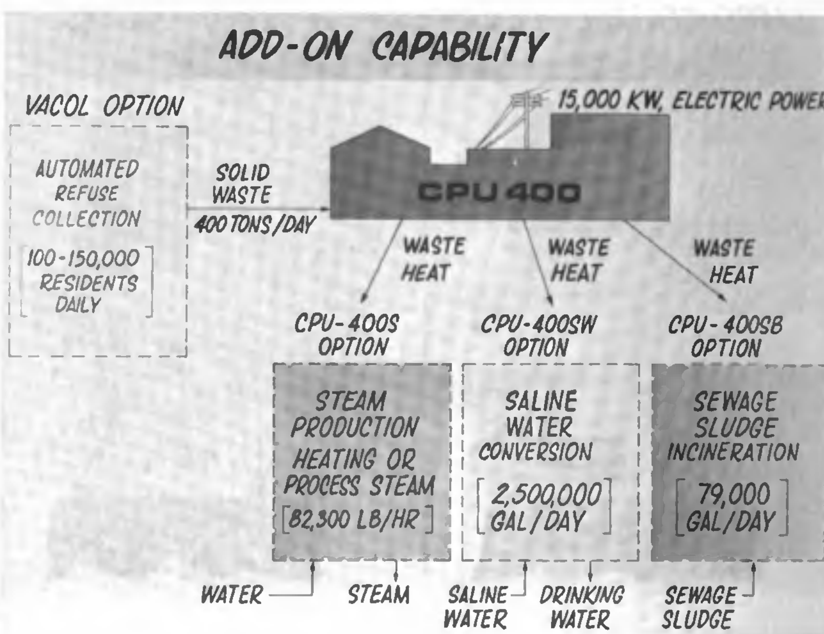

15,000 KW GAS TURBINES


LOW COST OPERATION
DISPOSAL COST $/TON
8
6
4
2
LANDFILL
INCINERATION
CPU-400

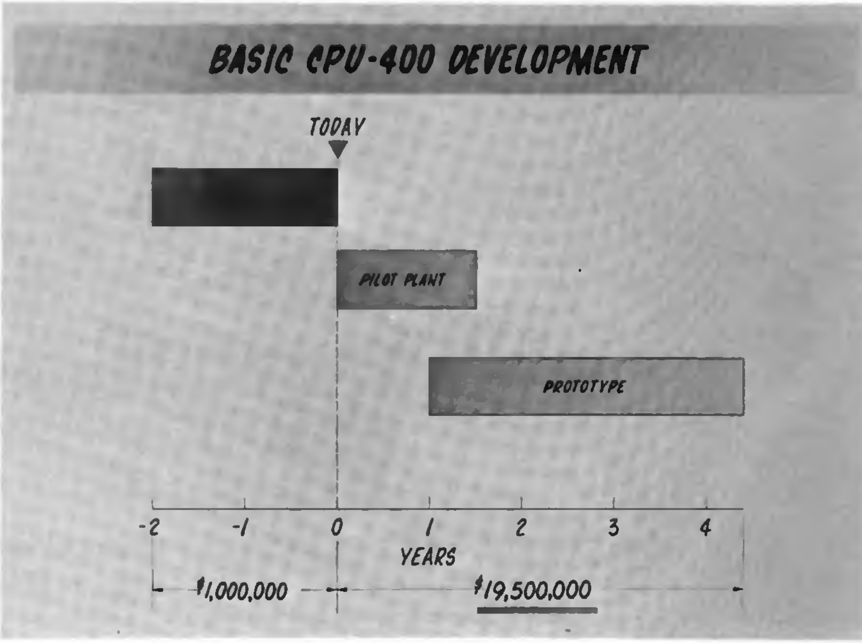

COMPARISON - CPU VS. EUROPEAN PRACTICE
DUSSELDORF
STEAM
BOILER
INCINERATOR
EQUIVALENT CPU


PLANT DISPERSION
DUSSELDORF
LARGE CENTRAL PLANT
CPU-400
A PLANT PACKAGE


VACOL AUTOMATED COLLECTION
WALL
REFUSE
CHUTE
CPU-400
UNDERGROUND
PIPE NETWORK


ADD-ON CAPABILITY
VACOL OPTION
AUTOMATED
REFUSE
COLLECTION
100-150,000
RESIDENTS
DAILY
SOLID
WASTE
400 TONS/DAY
15,000 KW ELECTRIC POWER
CPU 400
WASTE
HEAT
WASTE
HEAT
WASTE
HEAT
CPU-400S
OPTION
CPU-400SW
OPTION
CPU-400SB
OPTION
STEAM
PRODUCTION
HEATING OR
PROCESS STEAM
82,300 LB/HR
SALINE
WATER
CONVERSION
2,500,000
GAL/DAY
SEWAGE
SLUDGE
INCINERATION
79,000
GAL/DAY
WATER
STEAM
SALINE
WATER
DRINKING
WATER
SEWAGE
SLUDGE


CPU-400 PLANT



Mr. ROGERS. Thank you. That is excellent.

Mr. Satterfield?

Mr. SATTERFIELD. I am very impressed with this. I think you may show the way that when people put their minds to it, with the right application and know-how, and by utilizing their scientific knowledge and experience, we can solve all the problems of pollution from the automobile, stationary furnaces, and everything else.

Dr. SMITH. I think, Mr. Satterfield, that there is a lot that new technology can do that we have in this country as a resource. I think that the frustrations expressed by the earlier witness in banning all cars, he said people needed knowledge, because they can't extrapolate against what they don't know. I think there is not a good understanding of what technology can do when applied to these fields of pollution.

Mr. SATTERFIELD. We had a gentleman hese earlier who was most depressing in terms of what he saw. He said we had to roll back to someplace in the past in order to survive. I feel that maybe you have shown a way that indicates we won't have to do that.

Dr. SMITH. I think we feel that there is a lot that can be done about it.

Mr. SATTERFIELD. Thank you, sir.

Mr. ROGERS. Mr. Preyer?

Mr. PREYER. I agree with Mr. Satterfield that this is the most encouraging note we have run into. Dr. Commoner's testimony seemed to envision having to slow down the economy or go into a different type of economy. But he said he was an optimist at the conclusion of his story because of the possibility that developing technology and breakthroughs would solve it. What you are doing certainly seems to do that. I think this is very interesting.

Dr. Smith. Thank you.

Mr. Preyer. You went a little too fast for me to have detailed questions.

Mr. Rogers. I will ask a few and then if you have any you may ask them later,

I am very impressed. I think this could offer really the answer to each community's problem. We are going to have to move into something like this where we have a recycling.

What about air pollution that might result from your burning?

Dr. Smith. Well, air pollution from incineration comes from, let us say, two kinds of sources. One is particulate and the other is fumes from, let us say, burning of plastics of which polyvinyl chloride is the most common and one of the worst offenders.

In the particulate area we are going to have particulate collection devices, probably two stages of extreme sophistication, well over 99 percent. Our earlier tests confirm the ability of these to operate under CPU conditions.

In the area of fumes which is very important in incineration, not now recognized, or are just becoming recognized, we are borrowing heavily on some of the earlier research and development done by the National Air Pollution Control Administration in fluid bed technology. They are operating on coal with 3 percent sulphur, refuse has about half of one percent. They are working with limestone and other additives to the fluid bed which they have found are successful in absorbing suphur dioxide and have done other tests that were successful in absorbing the hydrochloric acid that comes off the burning plastics.

We have deliberately chosen this new kind of combustion, the fluid bed, for its pollution suppression capabilities and these have been demonstrated in the tests that we have conducted to date.

Mr. Rogers. What would be the percentage of air pollution do you think, with this treatment?

Dr. Smith. We talked earlier about nitrogen oxides. Our tests now are showing 50 parts per million or less which is a very low figure. We hope to get down to equivalent figures, I guess, in terms of hydrochloric acid and sulphur dioxide. We will know a lot more probably in about eight months, when we have our eight foot combuster operating with real refuse; we are going to seed it with all these bad things.

Mr. Rogers. We would like to be kept advised of this whole operation, because I think it is important to develop it as quickly as possible. Now is there any way that it can be speeded up? Supposing you had additional funds?

Dr. Smith. Yes, sir, there is a way that it can be speeded up but even the funds that we are looking at to keep the schedule that we have shown are, as you are aware, beyond the budget.

I would like Mr. Dell to comment on that.

Mr. Dell. To keep our schedule for this program, Mr. Chairman, for the next five fiscal years, this program would need, $1.5 million in fiscal year 1970 and in 1971 it would need $3.1 million.

Mr. Rogers. What have you received?

Mr. Dell. In 1970 we still have an opportunity to negotiate some more money into the program, but I would predict that we will probably get about $1.3 million in fiscal year 1970.

In fiscal year 1971 we need \$3.1 million. In fiscal year 1972 we need \$8.9.

Mr. Rogers. \$3.1, \$8.9?

Mr. Dell. Yes, sir. In fiscal year 1973 we need \$4.4. In fiscal year 1974 we need \$1.6. That should total up to roughly the \$19.5 million that Dr. Smith shows on this schedule.

Mr. Rogers. What is scheduled in the budget for you in 1971?

Mr. Dell. The budget request for fiscal year 1971, as you know, for the Bureau of Solid Waste Management is \$15.3 million. This program has not been line itemed in their budget. It is presently funded in their direct operations money and in that category they usually have around \$2½ million. That money has to be used to support their own in-house research and pay their salaries. What in the past has been left over to spend on R and D of this type is about a million a year.

So, in fiscal year 1971 I would predict we are \$2 million short of keeping the program on schedule as it is. To think in terms of accelerating it requires even further funding.

Mr. Rogers. What slippage will this bring about?

Dr. Smith. Well, the prototype bar that is down below starts sliding off to the right a year. Approximately \$1.4 million of our fiscal 1971 request is to complete the pilot plant. The remaining is to get started on the design of long lead items.

Mr. Rogers. So if you could get \$3.1, this is what you would program for and could handle, could you speed it up even more if you were given additional funds?

Dr. Smith. Yes, sir, I believe we could. I believe we could get that prototype bar started probably six to eight months earlier than would be possible, than we are planning at the moment.

Mr. Rogers. If you had sufficient funds?

Dr. Smith. Yes.

Mr. Rogers. So, you could develop it in less than four years?

Dr. Smith. Yes, sir.

Mr. Rogers. About three?

Dr. Smith. We had not done a study of how fast it could really go because it seemed a little academic in view of the budget situation.

Mr. Rogers. Can you shorten the prototype bar there?

Dr. Smith. I suspect that we could, yes. This is a one-shift operation, normal sort of technical program proceeding along. It is not the same character of program that we engaged in the rocket and space business.

Mr. Rogers. If you really wanted to go at it what is the most development, would you estimate?

Dr. Smith. I am guessing we could probably chop a year from it if we really had to,

Mr. Rogers. Suppose you went on more than one shift?

Dr. Smith. That is how you do it. You go on three shifts, you would order materials ahead of time.

Mr. Rogers. You would shorten it about a year?

Dr. Smith. Yes.

Mr. Rogers. What total cost do you estimate for this unit?

Dr. Smith. The production price that we estimate for the unit is in the order of \$5 million.

Mr. Rogers. To handle a city——

Dr. SMITH. A population segment of 160,000. It could be a single city or it could be——

Mr. ROGERS. A number of elements in a city?

Dr. SMITH. Right.

Mr. ROGERS. Can you build smaller segments? Suppose you have a city of 50,000?

Dr. SMITH. Indeed we can. The pilot plant is a one-tenth scale. We would intend to have that as a product for industrial applications, for industrial solid waste and for smaller communities. It can be used in two, three or four units so that we can essentially pretty well cover the waterfront there for smaller communities.

Mr. ROGERS. You could tie in the city with apartment houses, high rise, and use your tubes to bring it in and then use that element to produce electricity or water?

Dr. SMITH. Yes, sir. I might add one thing. In terms of a product we looked very early and we said we wanted to make a major research and development program nationally. It has to be a product that can be used nationally. You have to be careful. You can't make 190 million tons of wall board a year. Electricity is used universally and has a stable price. At the time we started this program we did not know it was going to be in quite short supply, but it is turning to be serendipitous for us at this point in time.

Mr. ROGERS. I think this is one of the most hopeful research projects we have seen. I think this committee will be interested in trying to see if we cannot push it along a little more rapidly. Maybe we can line item it.

Dr. SMITH. Thank you very much.

Mr. ROGERS. I don't know but we will see.

Dr. SMITH. Thank you. We appreciate the opportunity to come here and speak to you.

Mr. ROGERS. Thank you for being here and thank you for waiting such a long time to testify.

The committee will stand adjourned until April 7 at which time we hope to have automobile companies back to testify on their proposition and also the Dupont Company. I made some remarks about the Dupont Company yesterday. They advised me by telegram that they had misunderstood and there was a misunderstanding. They did not realize that we had invited them to testify. But they are willing to and we are delighted and will receive their testimony.

(Whereupon, at 3:20 p.m. the subcommittee adjourned to reconvene on April 7, 1970.)

AIR POLLUTION CONTROL AND SOLID WASTES RECYCLING

TUESDAY, APRIL 14, 1970

House of Representatives,
Subcommittee on Public Health and Welfare,
Committee on Interstate and Foreign Commerce,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2123, Rayburn House Office Building, Hon. John Jarman (chairman) presiding.

Mr. Jarman. The subcommittee will please be in order.

We continue the hearings on H.R. 15848, H.R. 12934, and similar bills dealing with Clean Air Act amendments.

Our first witness this morning is Dr. Paul F. Chenea, Vice President, Research Laboratories of General Motors Corporation, accompanied by Dr. Fred W. Bowditch, Director, Emission Control, and Dr. Charles S. Tuesday, head of the Fuels and Lubricants Department of the General Motors Research Laboratories.

Gentlemen, you may proceed in any manner that you have in mind

STATEMENT OF DR. PAUL F. CHENEA, VICE PRESIDENT, IN CHARGE OF RESEARCH LABORATORIES, GENERAL MOTORS CORP.; ACCOMPANIED BY DR. FRED W. BOWDITCH, DIRECTOR, EMISSION CONTROL; AND DR. CHARLES S. TUESDAY, HEAD OF FUELS AND LUBRICANTS DEPARTMENT, RESEARCH LABORATORIES

Dr. Chenea. Thank you, sir.

Mr. Chairman and Members of the Public Health and Welfare Subcommittee:

We welcome this opportunity to address ouselves to the various technological aspects of power plant developments in relation to auto emissions, in which we understand you are particularly interested.

H.R. 15848, CLEAN AIR ACT AMENDMENTS OF 1970

As to legislation before the subcommittee, it appears consistent with the need for cooperative industry-government progress with respect to:

(*a*) Vehicle emissions.
(*b*) Stationary source emissions.
(*c*) Ambient air standards.

We have endorsed and continue to endorse the extension of the Clean Air Act. We offer the following observations concerning the provisions for testing of motor vehicles and engines:

There is a need for further refinement of test procedures to ascertain if production vehicles meet emission control levels.

Discussions currently are underway with California authorities to implement test procedures for that State. Extension to a national basis logically would be expected.

We suggest that the Department of Health, Education and Welfare be authorized to establish appropriate standards and test procedures for the testing of production vehicle emission control systems or components. Further, we suggest that if these standards are not met, the deficiencies must be remedied.

Improvements in measurement techniques now permit us to achieve reasonable correlation between assembly line tests and the HEW hot cycle test.

We have been operating an audit testing program at our California assembly plants. The program has been conducted on an audit basis to develop experience with it and the instrumentation required. Presently, there are problems associated with use of the instruments in this type of facility. Further, stabilizing of test procedures would assist in the problem of designing required test equipment. Finally, expenditures for installations of this type of instrumentation on a nationwide basis would be very substantial, and if only one manufacturer were to undertake such a program nationally, it would be subject to a severe competitive disadvantage.

We have reviewed the bill's provision relating to the type of production tests the Secretary may perform and the consequences of his finding that some vehicles or engines do not conform. We believe there are some technical problems related to new test procedures, and we will be discussing these with your staff. For example, if new test procedures are established, there should be adequate lead time for manfacturers to get ready. Also, specifications for any new tests should give recognition to the need for recommended maintenance to retain low field emission levels.

All of us, government, industry and the public, are interested in nonpolluting vehicles. General Motors is endeavoring to ensure that vehicles it produces will be virtually pollution-free.

USED CAR MODIFICATIONS

Since our appearance before this Subcommittee last December, we have announced developments that we feel will lead to further reductions in automotive pollution.

On March 9, we announced a used car modification package that will reduce emissions of older cars. Subsequently, on March 18 we reviewed this package with the California Air Resources Board pointing out that it would be used, not only on GM cars, but also for most other cars in California of 1955 to 1965 model years. This encompasses a vehicle population of approximately 2.3 million in the Los Angeles Basin alone. Marketing the package would be contingent on Board certification and perhaps regulation.

Dr. Bowditch gave the Board a detailed engineering report on the parts and installation requirements, adjustments and test results with GM and other used cars.

On April 8, we announced that the suggested retail price for the modification package would be $9.95, plus installation. It is estimated that installation will involve about an hour's time, including the engine tuning and carburetor adjustments to manufacturer's specifications.

Tests conducted by us indicate that this used car exhaust control package provides a potential for an average 52 per cent reduction in hydrocarbons and 37 per cent reduction in carbon monoxide from existing operating levels. In more practical terms—in the Los Angeles Basin, for example—applying this modification to all 1955–65 cars would mean that hydrocarbons emitted to the atmosphere would be reduced 358 tons per day, or 24.4 per cent, while carbon monoxide levels in the atmosphere would be reduced 1,860 tons per day, or 23 per cent.

ENGINE DESIGN; FUEL COMPOSITION

The benefits in reducing auto emissions that could be achieved by removing lead from gasoline were described by Mr. E. N. Cole, president of General Motors, in a speech on January 14 to the Society of Automotive Engineers. A copy of Mr. Cole's remarks is attached and submitted for the record.

Shortly after Mr. Cole's SAE speech, General Motors held a series of separate meetings with representatives of 13 petroleum companies, Ethyl Corporation and E. I. duPont, as well as federal government officials from the President's Environmental Quality Council, the President's Office of Science and Technology, the National Air Pollution Control Administration, Consumer Protection and Environmental Health Service, U.S. Public Health Service, and the Department of Health, Education, and Welfare.

We summarized in our presentations to them the results of GM research and development work in this area. We invited their comments on the technical accuracy of our data. Thus far, they have not conveyed any information to us which would lead us to any different conclusion.

On February 15, we announced that all 1971 model General Motors passenger cars will be designed to operate on either unleaded or leaded fuel of at least 91 Research Octane Number (RON).

Mr. Cole further amplified our reasoning on the importance of removing lead in presentations on March 4 and 5 before the California Air Resources Board.

At these meetings, other automobile manufacturers also stated that they believed that it would be necessary to remove lead from gasoline. Subsequently, the California Air Resources Board recommended to the Governor of California that they be given authority to provide for the removal of lead from gasoline.

Since then, we have appeared before a Department of Commerce automotive fuels panel and both the California and Pennsylvania Legislatures to report on our research findings on unleaded fuel in connection with reducing auto emissions.

Mr. Cole has communicated our position on unleaded fuel to the Department of Health, Education and Welfare in response to Secretary Finch's request for such information. Mr. Cole's letter to Secretary Finch is attached and is submitted for the record.

We have become increasingly concerned about the degradation of emissions with our current control systems and the limitations on developing essentially pollution-free power systems imposed by the presence of lead in gasoline.

The need for fuels with reduced or no lead additives became more critical with the issuance of more stringent standards by the State of California for 1972 and 1974 model years and is imperative to meet the standards proposed by the Department of Health, Education, and Welfare for the 1975 models.

A most important consideration in making the removal of lead imperative is the proposed particulate emission standard for 1975. We know of no way to meet this standard with leaded gasoline.

Previous statements before this Subcommittee and at other hearings indicate a lack of understanding of the reasons why General Motors is designing its low compression 1971 engines to operate on either leaded or unleaded fuel and why we have urged early availability of unleaded fuel. For the following three reasons, General Motors is convinced that this is an essential course of action at this time:

(1) Unleaded fuel would reduce hydrocarbon and particulate emissions from the existing car population and reduce the potential depreciation of emission control systems of 1971 models.

(2) The above benefits carry over to models beyond 1971. More importantly, to meet the more stringent emission standards beginning with 1972, many of our car models may require advanced control devices even more sensitive to depreciation caused by leaded fuel.

(3) General Motors action to reduce octane requirement levels of our power plants starting with 1971 models means that approximately half of the General Motors cars on the road in 1975 will be capable of running on 91 octane (RON) fuel. This should be very helpful to the petroleum industry in making a transition to unleaded gasoline.

SIGNIFICANCE OF UNLEADED FUEL ENGINE DESIGN

In our appearance last month at the Senate hearing on the Clean Air Act, I was asked the basis for engine design for 91 Research Octane Number (RON) for 1971 models.

The purpose of this design is, simply to minimize any need to compensate for the removal of lead from gasoline. While the new GM engines will operate on existing leaded fuels, they will be designed for the lower octane—91 RON unleaded fuel. When unleaded fuel is used, the emission control systems will operate more effectively.

THE TREND TOWARD UNLEADED GAS

I want to emphasize that our public statements on the subject. illustrated by Mr. Cole's SAE speech in January, have not represented a new approach by us.

Our research over the years has demonstrated the problems with lead in gasoline and its effect on emissions, and as a result, we have long been concerned about finding solutions to these problems. Recent developments with regard to future emission standards escalated our concern and caused us to conclude that there was need for prompt action.

In our appearance before this Subcommittee last December 9 we reported on our work with manifold reactors and converters. In connection with reactors, we said this device necessitates a heat-resistant material that is longer lasting than any material available today.

As to catalytic converters, our statement pointed out that we and others have found that the catalysts known to us are rendered inert by leaded gasoline, with relatively short mileage.

Despite the claims that have been made hare and elsewhere for reactors, it should be made clear that they do not control particulate emissions in any way. Thus, reactors would not make it possible for vehicles to meet the contemplated Federal standards with leaded gasoline.

As to catalytic converters, the problem is to find satisfactory catalysts to do the required job. At this point, we have found catalysts that work in experimental vehicles with unleaded fuels. We still have to solve the problem of making these catalysts work in 5 million new production cars each year on a reliable, long-life basis at a cost that the customer can afford. When we use leaded fuel, we have not been able to find any catalyst that will work satisfactorily even in the laboratory.

The effects of leaded gasoline on emissions have been well known to the research community for many years. For your information, we have submitted with our statement a chronology of publications and events dat.ng back to 1957 on this subject.

As the chronology demonstrates, many researchers from government and industry have found that leaded fuel presents certain barriers to catalyst use. Additionallly, there are a number of papers—dating back to a 1957 report by Hirschler, et al.—on lead particulates in relation to auto engine exhaust.

Until the present time, the automobile industry has succeeded in reducing auto emissions very substantially without the use of reactors or catalytic converters. However, the ground rules changed recently when both California and the federal government disclosed their goals for auto emission standards in the future.

We were advised of the federal objectives for the first time at a meeting on November 20, 1969, of the President's Environmental Quality Council. Secretary Finch then suggested much more stringent auto emission levels, including, for the first time, limitations on particulate emissions. The latter, in particular, represent very serious reductions.

Subsequent to that meeting, we reviewed our research and engineering data in terms of our projected capability to manfacture cars that would meet such emission goals. We concluded that achievement of some of the emission objectives would require both unleaded gasoline and engines designed to operate on such fuel.

Starting December 9 before this Subcommittee, we have reported our concern about the need to remove lead to allow use of advanced systems to achieve the more stringent and desirable emission control levels of the future.

We have not advocated in this period legislation or regulation limiting the use of lead. We have simply reported that our data and research create serious doubt, as far as we are concerned, that future standards—especially as to particulates—could be met with leaded fuel.

In order that there be no misunderstanding, we have also reported to the petroleum industry and various government agencies our data and research on other aspects of fuel composition and its relationship to vehicle emissions.

Unquestionably, the problems of fuel composition, availability of octane pools and distribution are complex. We believe that they require the full attention of the oil industry and presumably could be discussed more appropriately with them. However, we wish to make it clear that General Motors is not in any way advocating regulation of the oil industry.

In closing, we wish to reaffirm that General Motors is committed to making every effort necessary to solve the air pollution problem related to automobiles.

We thank you for this opportunity to discuss these important issues with you today.

(The attachments to Dr. Chenea's statement follow:)

ATTACHMENT A

FIELD PERFORMANCE OF EXHAUST EMISSION SYSTEMS

When we appeared at the December 1969, hearings of this Subcommittee, Representative Rogers raised a question concerning data supplied earlier to the Subcommittee by the Department of Health, Education, and Welfare on the field emission levels of a group of GM cars.

These data, we were told, showed that 73 percent of the vehicles in question failed to meet either the hydrocarbon or carbon monoxide certification emission standards. These cars were in the hands of a car rental firm. Subsequent to the December 9 hearing, we submitted written responses to Mr. Rogers' questions on this subject.

More recently, there have been statements that "around 80 percent of production line vehicles do not meet the emission control specifications that their prototypes did when tested by the National Air Pollution Control Administration," and questioning, therefore, whether there has actually been a reduction of 80 percent in the level of emissions to the atmosphere, as stated by the auto industry, by our 1970 California cars, as against our 1960 cars.

This is a complex matter and cannot be discussed adequately except at some length. However, I would like to do so. Let me state emphatically that we definitely believe that the stated reductions have occurred and this conclusion is concurred in by California authorities and by HEW.[1]

As a first step in discussing this matter, it is important to review the provisions of Title II of the Clean Air Act. Section 206 (a) permits a manufacturer to apply to the Secretary of HEW for a certificate of conformity applicable to vehicles and engines which have been tested and found to be in conformity with regulations prescribed by the Secretary.

If a manufacturer elects to be certified, the regulations promulgated by the Secretary require that each type of vehicle be tested before production and sale. Certification is obtained by testing four vehicles selected in accordance with provisions of the regulations as representative of each type of vehicle to be certified. Since these vehicles must be available for testing prior to general mass production, they are prototypes assembled well ahead of the general start of production.

In addition to these four vehicles of each type, a group of prototype vehicles are subjected to a 50,000 mile durability test with prescribed driving schedules to establish the lifetime durability of the emission control systems. These driving schedules approximate "average" usage, including prescribed driving speeds, accelerations, and decelerations in order to establish the lifetime durability of the emission control systems. Tests are made by GM and verfied by NAPCA during this durability mileage accumulation which determine the depreciation factor of the emission control system.

During these tests, the test procedures specifically permit maintenance to be performed in accordance with the manufacturer's specifications, including spark plug changes when required and a major tune-up at about 25,000 miles.

NAPCA measures the emissions of the four prototypes furnished to them, calculates the average emission level for each type of vehicle to be certified, and applies the depreciation factor to project the data to the equivalent of 50,000 miles of service for the average vehicle. This corrected figure is then compared to the certification standards to determine compliance for certification purposes.

[1] National Air Pollution Control Administration Publication No. AP-66, March 1970, p. 3-9.

Section 206(b) further states that any new motor vehicle which is in all material respects substantially the same construction as the certified test vehicles shall be deemed to be in conformity with the regulations.

It is important in this connection to note that the law and the standards are not applicable to cars in the hands of owners. Thus, field tests of such cars which purport to show whether such cars "meet the standards" have no bearing on compliance with the law.

This does not mean, of course, that we fail to recognize that the law has an inherent objective. This objective is that cars which have been properly maintained would, on the average, after 50,000 miles of use, have emissions no greater than those contemplated in the standards.

However, to reiterate, there is no legal requirement that this actually be achieved, either by individual cars, or on the average.

The HEW regulations from the outset looked to "average" vehicle emissions, not only in establishing standards to achieve the "average" need of the atmosphere, but also in determining compliance with standards. This is because it is the average level of emissions from all vehicles and not the individual vehicle values to which the atmosphere responds.

To put the two concepts of "average" and "failing to meet standards" into perspective, I will cite some hypothetical examples.

As we have noted, certification is accomplished by testing four vehicles that are representative of each production engine type to be certified. For 1969 models, federal regulations required that each set of four certification cars average at or below 275 parts per million hydrocarbons and 1.5 percent carbon monoxide. This meant that the certification cars which conformed with HEW standards would on the average emit pollutants to the atmosphere at or below those levels.

Looking now at a set of four comparable cars in the hands of owners, assume that when tested in the field the emissions from the four cars were as follows:

	Hydrocarbons (p.p.m.)	Carbon monoxide (percent)
No. 1	285	1.5
No. 2	285	1.5
No. 3	285	1.5
No. 4	245	1.5
Average	275	1.5

The first three cars in the hypothetical example performed at a level over the certification standard for hydrocarbons. Thus, it might be said that 75 percent of the four cars "failed to meet" the certification standard of 275 ppm.

However, the average emission from the four-car fleet was at the certification standard of 275 ppm, because the good performance of car No. 4 evened out the entire group's emissions to the atmosphere. This would be equivalent to 100 per cent of the sample achieving the certification level of 275 ppm.

Had car No. 4 been measured in this test at 185 ppm HC, which many do, the average of the four cars would have been 260 ppm—15 ppm under the certification level. This would have meant a 6 per cent improvement in emissions to the atmosphere by the four cars, compared to the standard. Despite the better "average" performance by this group of cars, again it might be said that 75 per cent of them "failed to meet" the certification level of 275 ppm.

This type of analysis can be applied to larger groups of vehicles and most certainly is in keeping with the letter and spirit of the certification regulation.

The discussion of the requirements of the law—and what tests of individual cars actually mean in the light of those requirements—is intended only to put the matter into perspective and contribute to a better understanding of the problem. It is not intended to imply that we are not concerned about the performance of individual cars in the field. We are making efforts to bring about improvements and we expect that our 1971 cars will have improved field performance.

Although we can and have undertaken steps in our manufacturing process to provide good vehicle emission performance, there are many factors that have an effect on emission levels. These include such variables in the total vehicle system as distributor variance, spark timing, shift point, head gasket fit, brake adjustment, engine friction, transmission oil level, tire pressure, choke or carburetor adjustment and piston ring fit. Performance variations involving any of these—or any combination of them—could affect emission levels.

Moreover, maintenance is a critical part of keeping the emission levels of cars below certification levels, and this is a factor beyond our control. As pointed out earlier, certification cars are maintained in accordance with manufacturer's instructions. However, maintenance of the vehicle is a matter within the discretion of the owner.

Also, as was discussed earlier in the statement, a large share of the depreciating deposits in emission control systems are lead and lead compounds. Thus, the removal of this ingredient from gasoline would be of assistance in keeping emission levels closer to their design and production values.

In our California assembly plants, we conduct an audit of our production off the end of the production line, which is sufficiently large to justify application of the data to the entire volume of production.

Auditing of our 1969 and 1970 California production has shown that at the time our cars leave the factory they have emissions on the average less than the levels contemplated by the standards.

This is illustrated by Figure 1, which shows the distribution of emission levels for hydrocarbons, based on the audit of our 1969 and 1970 California production.

The broken line shows the actual distribution curve of HC emissions at the end of the production line in 1969. Note that the curve peaks well before the certification standard of 275 ppm, and the sales-weighted average is 177 ppm. This peak shows that most of the cars tested were audited at this smaller emission level. The readings at each end of the curve show that very small numbers of production cars had either very high or very low emission levels.

The solid line shows that the distribution curve for HC emissions in 1970 averaged substantially below the 1969 performance. The 1970 exhaust emission standard, equivalent to 180 ppm, is the vertical dotted line to the left of the 1969 line. The entire performance curve shows the average HC emissions for 1970 improved over 1969 and total emissions were lower, as was the standard. The sales-weighted average for 1970 is 136 ppm.

Similarly, figure 2 shows the data for CO emissions for the GM car lines for 1969 and 1970. Here again it is apparent that we made real progress in reducing the average emissions from 1970 production below the 1969 level, and, below the standard.

The 1969 sales-weighted average for CO emissions is 1.08 percent, compared to the standard of 1.5 percent. For 1970 models, the sales-weighted average dropped to 0.76 percent, while the standard dropped to 1.0 percent.

FIGURE 1

SALES WEIGHTED FREQUENCY
DISTRIBUTION OF EMISSION LEVELS - HYDROCARBON
GM OVERALL - 1969 & 1970

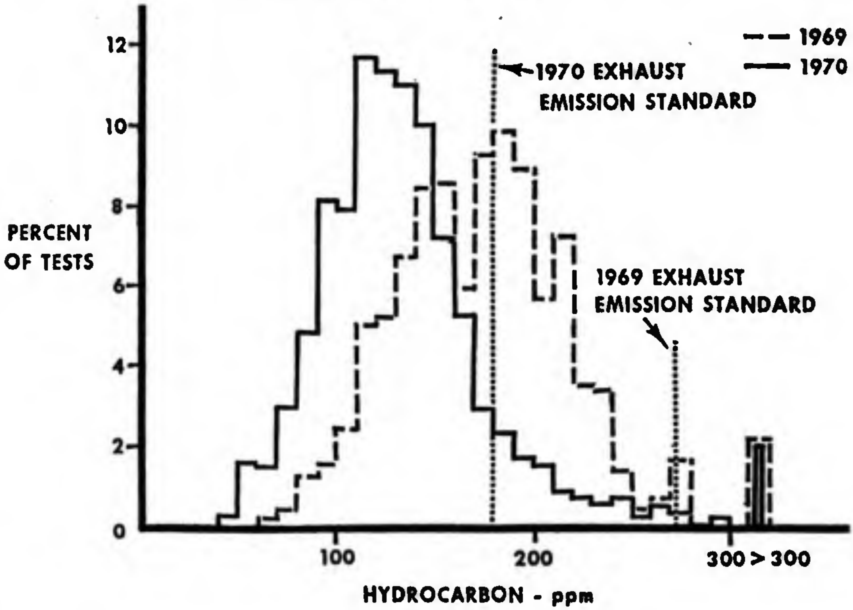
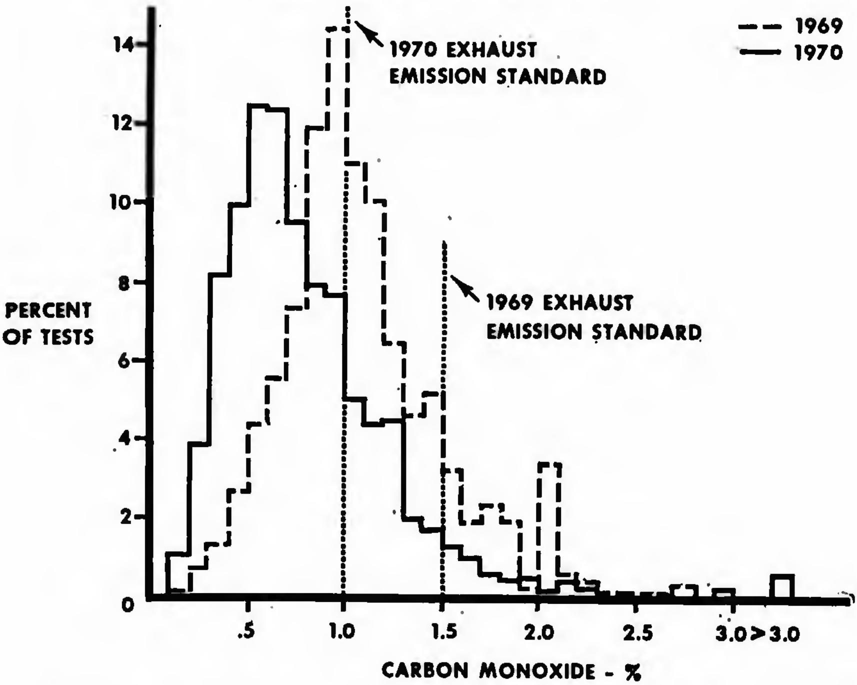


FIGURE 2

SALES WEIGHTED FREQUENCY DISTRIBUTION OF EMISSION LEVELS - CARBON MONOXIDE GM OVERALL 1969 & 1970



Thus, the total emissions from our 1969 and 1970 California cars added less pollutants to the atmosphere than if they had been exactly at the certification standards. The scattering of emission levels that were on the high end of the emission distribution curves was more than offset by the preponderance of units below the certification standards.

As demonstrated by this production audit data, major reductions have been and are continuing to be made in hydrocarbon and carbon monoxide emissions to the atmosphere. This has been accomplished in spite of the fact that the field performance of some vehicles results in emissions in excess of certification standards. We are trying to improve further on this performance.

In conclusion, let us now turn to the HEW data referred to at the beginning of this statement, said to show that 73 percent of a group of GM cars "failed" to meet the Federal standards. We have already pointed out that classifying percentages of "failures" is not meaningful, that the atmosphere responds to averages. Therefore, if we state the HEW data in terms of sales-weighted averages, the data then show that for all the General Motors cars in their sample the average emissions were as follows:

	Hydrocarbons (p.p.m.)	Carbon dioxide (percent)
1968 and 1969	243	1.68
Standard	275	1.5

The source of those figures is shown in figure 3. Thus, according to these data supplied by HEW, General Motors cars are meeting the objective of the Clean Air Act insofar as hydrocarbons are concerned, but do not quite do so with regard to carbon monoxide.

HEW COLO START HYDROCARBONS AND CARBON MONOXIOE DATA

Division	Engine	Year	Average Hydrocarbons (p.p.m.)	Average Carbon monoxide (percent)
Chevrolet	307	1968	383	1.60
		1969	268	1.30
	327	1968	284	1.73
		1969	230	1.52
	350	1969	207	1.82
Pontiac	350	1968	195	1.40
		1969	247	1.73
	400	1968	154	1.97
		1969	184	1.28
	428	1969	324	2.72
Oldsmobile	350	1969	187	2.35
	455	1968	135	2.05
Cadillac	472	1968	146	1.09
Sales weighted 1968–69 average			243	1.68

What does that mean as to the effect on the atmosphere? HEW, California and automobile manufacturers have been using the same series of calculations to determine reduction of pollutants in the atmosphere. This provides a comparison of typical emissions from uncontrolled 1960 models with the later year models which are equipped with control systems. Applying this method of computation to the HEW figures, the average 1968 and 1969 GM car emitted 65 per cent less hydrocarbons than the average 1960 model car. Similarly, for carbon monoxide, the average 1968 and 1969 GM car in use shows a reduction of 52 per cent.

More improvement is provided by 1970 model California cars and will be provided by 1971 model cars nationwide. Assuming the same field performance on those 1970 and 1971 cars as the HEW data show for 1968 and 1969 GM models, those later GM cars in use will have average emissions of 87 per cent less hydrocarbons and 68 per cent less carbon monoxide than did the average 1960 model car. These are greater than the reductions set forth in our Annual Report for 1969—namely 80 per cent and 65 per cent respectively.

In this connection, it is of interest that if every one of our 1970 cars were exactly at the standards the total reduction in hydrocarbons from the uncontrolled 1960 cars would be 85 per cent and 71 per cent for carbon monoxide.

When we look at the effect on the atmosphere, instead of "pass-fail" numbers for individual cars, we see that cars in use are limiting emissions very closely to the objectives and expectations which underlie the Clean Air Act and the HEW regulations.

ATTACHMENT B

Chronology of Publications and Events Concerning the Effects of Leaded Gasoline on Emissions

1957

Hirschler, D. A., Gilbert, L. F., Lamb, F. W., and Niebylski, L. M., "Particulate Lead Compounds in Automobile Exhaust Gas," *Ind. Eng. Chem. 49,* 1131–1142, 1957.

Ethyl publishes classic paper characterizing lead particulate in auto engine exhaust.

1958

U.S. Public Health Service *Air Pollution Measurements of the National Air Sampling Network* PHS No. 637, *24,* 164, 1958.

USPHS indicates 3.2% of particulate in Berkeley, California air is lead.

1959

Nebel, G. J., and Bishop, R. W., "Catalytic Oxidation of Automobile Exhaust Gases—an Evaluation of the Houdry Catalyst," presented at the SAE Annual Meeting, Detroit, Michigan, January, 1959.

GM researchers show short catalyst life with leaded fuel.

1962

Mueller, P. K., Helwig, H. L., Alcocer, A. E., Gong, W. K., and Jones, E. E., "Concentration of Fine Particles and Lead in Auto Exhaust," presented at Symp. on Advancements in Methods of Air Pollution Meas., Am. Soc. Testing Mat., Los Angeles, Oct. 1962.

California Department of Public Health characterizes lead particulate from auto exhaust.

1965

U.S. Department of Health, Education, and Welfare, Public Health Service, *Survey of Lead in the Atmosphere of Three Urban Communities*, publication No. 999 AP12, Jan. 1965.

Three-city study shows atmospheric lead is a measurable source of the body burden of lead.

Cordera, F. J., Foster, H. J., Henderson, B. M., and Woodruff, R. L., "TEL Scavengers in Fuel Affect Engine Performance and Durability," *SAE Trans., Vol. 73*, 576–608, 1965.

Shell researchers show lead scavengers reduce exhaust system durability, but small amounts of lead prevent valve seat wear.

Colucci, J. M., and Begeman, C. R., "The Automotive Contribution to Air-Borne Polynuclear Aromatic Hydrocarbons in Detroit," *Air Pollution Control Assoc. Journal, 15*, 113, 1965.

GM researchers show measurements of lead particulate in the atmosphere correlated with traffic density.

1967

Gagliardi, J. C., "The Effect of Fuel Anti-Knock Compounds and Deposits on Exhaust Emissions," preprint No. 670128, SAE Annual Meeting, January 1967.

Ford researchers show exhaust hydrocarbon emissions about 150 ppm higher with leaded fuel than with unleaded.

U.S. Department of Commerce, *The Automobile and Air Pollution*, report of the Panel on Electrically Powered Vehicles (The "Morse Report"), Oct 1967.

After reviewing entire situation, Morse Committee recommends Federal standards to prevent further increases in lead emitted to the atmosphere.

Lawson, S. D., Moore, J. F., and Rather, J. B. Jr., "A Look at Lead Economics in Motor Gasoline," reprint No. 36–67, API Division of Refining, May 1967.

Description of the Bonner and Moore study outlining the economics of lead removal from gasoline.

1968

Brodovicz, B. A., "Air Quality Criteria for Pennsylvania," *Air Pollution Control Assoc. Journal, 18*, 21–23, 1968.

The State of Pennsylvania establishes an ambient air quality standard of 5 $\mu g/m^3$ for lead.

CRC–APRAC organizes working committee to review all existing data on the effect of leaded combustion chamber deposits on exhaust emissions, Feb. 1968. (Committee report in third draft in April, 1970.)

Agnew, W. G., "Science and Technology in Automotive Air Pollution Research," presented to Royal Society of London, Feb. 29, 1968.

GM researcher reviews emission problems including effect of lead on catalyst life.

1969

Weaver, E. E., "Effects of Tetraethyl Lead on Catalyst Life and Efficiency in Customer Type Vehicle Operation," Paper No. 690016 presented at SAE International Auto. Engr. Congress, Detroit, Jan. 1969.

Ford researchers show lead shortens catalyst life.

Gagliardi, J. C., and Ghannam, F. E., "Effects of Tetraethyl Lead Concentration on Exhaust Emissions in Customer Type Vehicle Operation," Paper No. 690015, presented at SAE International Auto. Engr. Congress, Detroit, Jan. 1969.

Ford researchers show increased hydrocarbon emissions due to leaded combustion chamber deposits, and poorer lubricant performance with leaded gasoline.

Pahnke, A. J., and Conte, J. F., "Effect of Combustion Chamber Depostis and Driving Conditions on Vehicle Exhaust Emissions," Paper No. 690017, presented at SAE Interational Auto. Engr. Congress, Detroit, Jan. 1969.

Dupont researchers show a small reduction in exhaust hydrocarbon emissions by use of unleaded gasoline.

Hall, C. A., Felt, A. E., and Brown, W. J., "Evaluating Effects of Fuel Factors on Stabilized Exhaust Emission Levels," Paper No. 690014, presented at SAE International Auto. Engr. Congress, Detroit, Jan. 1969.

Ethyl researchers show no significant differences in hydrocarbon emissions from leaded and "unleaded prototype" fuels.

Mick, S. H., Discussion at SAE International Auto. Engr. Congress, Detroit, Jan. 1969.

GM researchers show direct effect of TEL in increasing hydrocarbon emissions by inhibiting oxidation in exhaust gas.

Schwockert, H. W., "Performance of a Catalytic Converter on Non-Leaded Fuel," preprint No. 690503, SAE Mid-Year Meeting, Chicago, May, 1969.

GM engineer describes good performance of catalyst on non-leaded gasoline.

Agnew, W. G., "Future Emission Controlled Spark Ignition Engines and Their Fuels," presented to API Division of Refining, Chicago, May 12, 1969, and also to SAE St. Louis Section, Oct. 14, 1969.

GM researcher reviews gasoline effects on emissions, including lead.

Dr. Lee DuBridge informs automotive company presidents of proposed exhaust particulate goals for 1975 and 1980, Nov. 1969.

1970

Agnew, W. G., "Gasoline Changes Affecting Emission Control," presentation to oil companies, Ethyl Corporation, Dupont, Office of Science and Technology, and HEW at GM Technical Center, January–March, 1970. Also presented to API Marketing Division, Detroit, Feb. 1970, pointing out emissions benefits from unleaded gasoline.

Cole, E. N., "New Engineering Priorities for the '70s," speech at SAE Annual Meeting indicating emissions benefits from unleaded gasoline, Jan. 14, 1970.

Cole, E. N., press release announcing GM 1971 model cars would operate on unleaded (or leaded) 91 octane fuel, Feb. 15, 1970.

Cole, E. N., statement to joint meeting of California Air Resources Board and its Technical Advisory Committee, suggesting 1971 marketing of an unleaded gasoline, March 4, 1970.

Cole, E. N., statement to joint meeting of California Air Resources Board and its Technical Advisory Committee suggesting two grades of gasoline, one with no more than 0.5 g/gal lead, March 5, 1970.

ATTACHMENT C

GENERAL MOTORS CORP.,
OFFICE OF THE PRESIDENT,
Detroit, April 6, 1970.

HON. ROBERT H. FINCH,
Secretary of Health, Education and Welfare,
Washington, D.C.,

MY DEAR MR. SECRETARY: I appreciate the opportunity of responding to your recent letter asking for General Motors comments on suggested changes in motor vehicle fuels as a means of achieving significant additional reductions in automotive pollutions.

We in General Motors have become increasingly concerned about the detrimental effects of lead on devices designed to develop essentially pollutant-free power systems in the near future. With the issuance of more stringent standards by the State of California for 1972 and 1974 model years and proposed goals by the U.S. Department of Health, Education and Welfare for 1975 and 1980 models calling for additional reductions in emissions, the need for fuels with reduced or no lead additives became more critical.

Our research indicated that unleaded fuels would reduce the inherent pollutant characteristics of our engine-fuel systems by eliminating the detrimental effects of lead in such areas as spark plug life and lead deposits in combustion chambers. Even more important, however, is the fact that more efficient, long-life emission control systems incorporating such features as manifold reactors, catalytic converters and exhaust gas recirculation systems appear to be technically feasible with unleaded fuel.

This position was expressed in a speech which I gave to the annual meeting of the Society of Automotive Engineers in Detroit January 14, 1970. Shortly thereafter, General Motors held a series of separate meetings with a number of petroleum companies, as well as representatives of the Ethyl Corporation, E. I. duPont, and the Department of Health, Education and Welfare. Our presentation summarized the results of GM research and development work in this area and invited their comments on the technical accuracy of our data. Thus far, no information has been produced which materially varies from the results of our research.

Our research indicated that substantial improvements in emission control could be made by modifications in the engine-fuel relationship. This would involve changes in the composition of fuel, including reduced volatility, removal of light olefins and the elimination of lead additives, as well as possible reductions in compression ratios and other engine modifications necessary to reduce octane requirements.

Earlier this year, on Feburary 15, we announced that all 1971 GM cars are being designed so that the engines will be able to operate satisfactorily on leaded or unleaded gasoline of 91 Research Octane Number (RON).

On March 4 and 5, at the request of Governor Reagan, General Motors testified before the California Air Resources Board and its Technical Advisory Board. My statement on March 4 indicated that GM might need unleaded fuels in California to meet that state's 1972 and 1974 emission standards, as well as new federal goals proposed for 1975 models (Attachment No. 1).

Following our testimony on March 4, comments were made by other automobile manufacturers as well as producers of petroleum and lead additives. Testimony by the petroleum companies indicated that some of these firms might have serious difficulties in marketing a completely unleaded 91 RON regular fuel and a leaded 97 RON premium fuel in the immediate future.

As a result of this testimony, General Motors modified its position on the following day, March 5. We indicated our belief that the best solution to the current problem could be accomplished on this basis:

1. Have two grades of fuel from 1972 through 1974 model years with a regular grade at 91 RON with one-half gram of lead per gallon, and a premium grade 97 RON with up to four grams of lead per gallon.
2. Have two grades of fuel for the 1975 model year and beyond. A regular grade of 91 RON with no lead and premium 97 RON with a maximum of four grams of lead per gallon—phasing out lead as improved refinery technology is developed, equipment is replaced, or as the capacity of the petroleum industry to produce unleaded gasoline is expanded.

(Highlights of the March 5 statement covering the most important aspects of our recommendations are enclosed as Attachment No. 2.)

Retaining a maximum of one-half gram of lead per gallon of gasoline until the fall of 1974 would reduce the requirements for molecular upgrading by the petroleum companies but would still allow us, in our opinion, to meet 1972 and 1974 California emission standards. Retention of this small amount of lead additives would eliminate concern by some automotive engineers about valve life deterioration in pre-1971 cars if unleaded fuel is used.

It is important that we have unleaded regular fuel by the fall of 1974 because it is anticipated that significant further reduction of auto pollution will require more advanced control systems expected to be ready for introduction by this date—and our research indicates that these systems have limited effective life if leaded gasoline is used. Such systems will be necessary, in our opinion, to meet 1975 federal emission goals. However, if a reduction in control system life would be acceptable to the regulatory agencies, a small amount of lead could remain in the fuel beyond 1975. Any position on this would seem to depend on a careful analysis of the trade-offs.

As a result of these considerations, General Motors would strongly support the three-point course of action expressed in your March 20 letter to petroleum company executives. The proposed schedule for suggested modifications, we believe, would allow time for the required changes on an orderly basis.

General Motors is committed to the introduction of a pollution-free vehicle at the earliest possible date. Toward this end, we would welcome the opportunity to discuss this general subject in more detail with you or members of your staff if you desire.

Sincerely,

E. N. Cole, *President.*

ATTACHMENT D

New Engineering Priorities for the 70's

[Remarks: Edward N. Cole, President, General Motors Corporation at the Annual Banquet, Society of Automotive Engineers, Cobo Hall, Detroit, Michigan, January 14, 1970]

Thank you, Phil. And good evening, members of the Society of Automotive Engineers, special guests, ladies and gentlemen.

It is a sincere pleasure to have the opportunity of participating in this important annual meeting and to visit with old friends—Many of whom I have known for more years than I like to admit.

I have attended many of the SAE's annual meetings during my 27 years as a member. My attendance tonight, however, is a special pleasure because of the fact that my long-time friend and associate—Harry Barr—has just been inaugurated as your new national president. I have worked closely with Harry for 40 years. He is one of the most able and dedicated automotive engineers in America today, and I know he will do an outstanding job as your new president.

In my comments tonight, I would like to discuss the expanded responsibilities of the engineer in our changing business, social and political environment.

The primary role of the automotive engineer continues to be that of an innovator. His responsibilities as a creator and stimulator of constructive change, in fact, have increased significantly.

The engineer plays a vital role in our efforts to provide the best possible value in automotive transportation; to insure that our products retain their competitive position against all other goods and services. In addition, he has a key responsibility in bringing a steady flow of technological improvements which will help compensate for rising costs and stimulate a high level of consumer interest in our products.

The importance of these fundamental engineering responsibilities to the success of our business and to the progress of the nation cannot be minimized. At the same time, the changing pressures of the nation's social, environmental and political life during the past few years have added an even more dramatic dimension to the assignment of the automotive engineer. More than ever before, the engineer must concern himself with the effects of his creations on society and its physical environment.

It is to this broader responsibility of the engineer that I wish to address my remarks tonight, with major emphasis on the problems of highway safety and vehicular air pollution.

First, let's look at highway safety, which involves the vehicle, the highway, and the driver.

The automobile industry has made significant progress in recent years in improving the inherent safety of its vehicles, both to provide the driver with increased capabilities for avoiding an accident and also to give occupants a higher level of protection in the event an accident does occur.

In recent years, the lion's share of attention has been directed to improvements in the automobile. We have no quarrel with the objective of maximizing the safety characteristics of the vehicle. But we also believe that equal attention must be given to improvements in the quality of highways and driver performance.

Any such efforts, of course, do not detract one iota from our responsibility to seek even further improvements in the safety of the vehicle. Top priority must be given to development of passive safety features—those which require little or no participation on the part of the driver or occupants.

The new bias-ply, glass fiber belted tire which is standard equipment on most current model U.S. cars, is an excellent example of a passive feature which improves controllability because of better traction, longer life and improved resistance to road damage. In addition, industry engineers and scientists are working on better handling, improved brakes, and other parts of the vehicle which contribute to controllability.

In the area of crashworthiness, a number of significant advances of the passive type have been introduced during the past few years. Examples include the energy-absorbing steering column, improved energy-absorption characteristics for interior structures and appointments, and steel guard rails in doors for increased protection in side impacts.

Occupants of current model American cars have the potential of surviving relatively severe automobile accidents without serious injuries. There's only one problem. Only about 30 percent of the people who have lap belts wear them and probably less than 5 percent wear shoulder belts.

As a result, all of the crushability—or energy-absorbing capabilities—we are attempting to design into our cars outside of the passenger compartment is of little value to the occupant. If he *is* wearing safety belts, he is attached to the vehicle and "rides down" the crash as a part of the vehicle, taking advantage of its crushability. If he is *not* restrained, the occupant continues to move forward at the same velocity until he hits some part of the car's interior. He is thus subjected to full impact much more abruptly—and injury potential is increased substantially.

As automotive engineers, we recognize the need to have good front-end crush characteristics. At the same time, we are very concerned about the rising cost of repairs aad its effect on insurance costs—a significant part of which occurs in relatively low-speed accidents.

Auto manufacturers have a responsibility—as well as competitive incentive—to provide the highest possible value in transportation service. And insurance rates account for a substantial portion of expense involved in owning and operating a car. This poses a serious dilemma for automobile engineers in seeking both maximum safety through added structural crush and reduced vulnerability to property damage.

At what impact level do we draw the line between concern for property damage and the desire to maximize occupant protection? Certainly I am not saying that we can't build in greater crash resistance than is presently available. Increased strength and resiliency of bumpers, as well as different designs and positionings, represent obvious areas of potential improvement. Other prime targets include the use of non-metallic materials and sectionalized components in critical areas.

But our primary attention must be directed toward designing cars for maximum safety—and to cover as many accident situations as possible. What type of collision do we design for? What is the speed? What type of object is being struck? What is the direction of the impact? Obviously, we must design our cars for the most common types of serious accidents, with many trade-offs being necessary to provide the most protection under the greatest number of accident situations.

Frankly, none of us should be satisfied with the performance of our total safety systems on today's cars—largely because of the small percentage of occupants who use lap and shoulder belts. One answer is to remove as much of the human element as possible.

This places an even more urgent priority on the need to develop new concepts of passive restraint systems. This involves two basic objectives. One is to develop and prove through exhaustive testing a system which—when deployed automatically at a certain level of impact severity—would provide the potential for reducing occupant injury. The level at which actuation might be established, for example, would be a 10 to 15 miles-per-hour car-to-car crash or about an 8 miles-per-hour barrier impact. The second objective would be to redesign the interior of our cars to provide increased protection in accidents at or below the level at which actuation occurs—and without use of safety belts.

In the past, our main objective has been to provide occupant impact protection against death or serious injury which might occur at higher speeds. But if we have an auxiliary system which automatically provides high-speed impact protection, we can concentrate on interior designs and materials which provide greater protection against less serious injuries such as lacerations.

Many proposals have been made for passive restraint systems to replace the lap and shoulder belts. At the present time, the inflatable air cushion restraint system offers the most promise, but there are still some difficult problems to be resolved.

One of the most serious is the possibility of inadvertent actuation—both in our plants and in the hands of our customers. The system must be designed so that inadvertent actuation will not seriously affect the driver's control of the vehicle. If car occupants are out of position when the system activates, serious injury might result. Or how do we provide protection in the event the car runs into more than one object?

General Motors is aggressively pursuing answers to these and other problems of air cushion restraints. We must have a workable, reliable system, but we cannot say at this time when it will be ready for volume production. We will do it as quickly as possible, consistent with time requirements for thorough testing and necessary tooling. At the same time, we will continue to encourage our engineers and scientists to explore other ideas which may have greater long-range potential for improving built-in safety of our vehicles.

The second major responsibility faced by the automotive engineer today relates to air pollution. While there are many sources of atmospheric pollution, I want to concentrate tonight on automotive emissions

Significant progress has been made by the automobile industry in reducing the level of pollutants from its vehicles. During the past 10 years, the level of hydrocarbon emissions has been reduced by about 70 percent and carbon monoxide by more than 65 percent when compared with cars that do not have emission control systems.

In California, where hydrocarbon emissions from many sources play a major role in the formation of photochemical smog, we also have installed in our 1970 model cars a system to control evaporative losses. This system, which brings the total hydrocarbon reduction to 80 percent, will be standard equipment on all U.S. cars beginning with the 1971 models.

The results of these advances will become increasingly evident as older non-equipped cars are phased out of the nation's car population. Nevertheless smog remains a critical problem, particularly in California, and air pollution is becoming a matter of serious concern in many metropolitan areas of the country.

We have said before, and I repeat it here tonight: We are committed to eliminating the automobile as a factor in the nation's air pollution problem at the earliest possible time. We will have no hesitation in using a power source other than the internal combustion engine if it will solve the automobile's part of the pollution problem and meet the needs of our customers at a price they can afford to pay for automotive transportation.

Our research into alternate power sources has been going on for many years and has included just about every possible competitor to the gasoline internal combustion engine. In the long run, we recognize that new power sources may be required. But in the desire for a quick solution, let us be careful not to give up the highly-developed, efficient internal combustion engine for a power plant of unknown and unproved qualities. We could be creating more problems than we cure.

Development of a new power source for automobiles is not a simple assignment. Considerable work must be done and technological breakthroughs must be achieved before an alternative power plant can be ready for passenger car use. Extensive research in this area is now going on in the automobile industry.

In the meantime, there are a number of avenues by which we can further reduce the amount of pollutants from the conventional gasoline engine. These include modifications in engine design, improved control systems and possibly fuel injection for more precise air-fuel ratios. The key questions are: How far can we go in cleaning up the gasoline engine, and what will be the national clean air requirements of the future?

Based on information from several sources, it appears that the U.S. Department of Health, Education and Welfare plans to issue shortly proposed new automotive emission goals for 1975 and 1980 model vehicles. If these proposed goals go into effect, here is how the 1975 model cars would compare emission-wise to the non-equipped cars of 1960.

During this period, emission of hydrocarbons would be reduced 95 percent, carbon monoxide 85 percent and oxides of nitrogen 75 percent. And while there is no accepted means at this time of measuring the emission of particulates (which are solid materials in the exhaust), it appears that the 1975 specification would require the elimination of about 50 percent of the present particulate matter from exhaust emissions.

The proposed HEW goals for 1980 would require that the allowable emissions in each of these categories be reduced by more than 50 percent compared to 1975.

Achievement of these proposed levels of auto emissions will be no easy assignment. But in my opinion, the quickest, most effective way of moving toward goals of this type is to seek every possible means of reducing the levels of pollutants from the gasoline internal combustion engine.

The automobile companies have spent many millions of dollars in attempting to control automotive pollutants—both through improved engine combustion efficiency and emission control systems. And this work will continue extensively. The petroleum companies, too, are concerned with this problem and have strong programs designed to seek contributions from the third major element in the emission triangle—automotive fuels. We must not neglect any area of potential improvement as we escalate the war on air pollution.

For example, reductions in gasoline volatility could have a major effect on the amount of hydrocarbon vapors emitted from carburetors and fuel tanks of cars which are not equipped with evaporative emission controls. The reduction of gasoline volatility levels would be particularly important because it would bring immediate reduction of emissions in *all* cars—new and used.

Adjustments in the molecular structure of gasoline could also prove highly beneficial. We know that smog is caused by a complicated interaction of sunlight, nitrogen oxides and certain *hydrocarbons*. Because olefinic hydrocarbons have a particularly high photochemical smog reactivity, a reduction of these substances could have marked benefits—particularly with respect to evaporative emissions.

The potential gains which might be realized through removal of tetraethyl lead from automobile gasoline should be evaluated. Our research indicates that after several thousand miles of driving a car using fuels without lead, there is a reduction in hydrocarbon emissions of about 40 to 100 parts per million compared to a car using leaded gasoline.

Even more important to long-term reduction of pollutants, however, is the fact that within the present state of the art, lead presents problems with respect to the life of possible advanced emission control concepts. Research indicates that without lead in gasoline, long-life exhaust catalytic converters would become technically feasible. Exhaust manifold reactors also would have increased life. The same is true of exhaust gas recirculation systems to control oxides of nitrogen. We need these advanced concepts to reach our 1975 and 1980 objectives.

There is another important factor to be considered. Proposed federal goals are expected to call for substantial reductions of auto exhaust particulates by 1975 and virtual elimination by 1980. Most of the particulates in automotive emissions are lead compounds derived from tetraethyl lead in the gasoline. It is important to emphasize that—if stringent control of particulates becomes a federal goal as we expect—we know of no way presently that such control can be accomplished with lead in gasoline.

The introduction of tetraethyl lead in gasolines in the early 1920's was considered a major advance in fuel technology. At that time, the use of additives was the only known way to increase the octane levels of gasoline. In later years, as fuel chemistry became more sophisticated, petroleum scientists developed new refining processes and learned how to alter the molecular structure of gasoline. This resulted not only in improving anti-knock characteristics, but also increasing overall fuel performance. In World War II, for example, leaded gasoline played a vital role in the production of high performance fuels for military vehicles and aircraft.

In the meantime, our society was developing at a rapid pace. The automobile industry was faced with increasing demands for better, higher performance vehicles with which people could travel expeditiously and safely—both in city traffic and also on the high-speed trunpikes which were spanning the nation. To meet these requirements, more efficient engines with higher compression ratios were needed and this meant development of even higher octane gasolines. Because it was still the least expensive means of boosting octane ratings, tetraethyl lead became a universal ingredient in virtually all automotive gasolines produced in this country.

In short, tetraethyl lead permitted the petroleum industry to increase the octane rating of its gasolines and improve their anti-knock characteristics. This allowed the auto companies to boost compression ratios which resulted in improved engine efficiency and customer benefits—either in terms of economy or performance.

The use of tetraethyl lead, therefore, has made a significant contribution over the years in increasing the efficiency of our modern internal combustion engines. Today, however, we are dealing with a new set of requirements.

The inter-relationships involving octane levels, compression ratios, use of lead and costs, must be re-evaluated in light of the increasingly serious air pollution problem. For example, use of unleaded fuels as a means of reducing pollutants from exhaust emissions would result in a loss in engine efficiency because of the lower compression ratios required. However, it is possible that this loss in efficiency could be recovered through improved fuels and fuel systems and engine modifications.

It is urgent that those most concerned with these problems—the government, the automobile manufacturers and the petroleum refiners—give top priority to the resolution of these issues. It is particularly vital that efforts be made as quickly as possible to establish specifications for fuels with reduced pollutant characteristics which would be available for automotive use at some future date—such as 1975. This is a critical requirement if the petroleum companies are to have adequate time to make necessary changes in the composition of motor fuels and the automobile companies have sufficient time for design, testing and tooling requirements of modified power systems which can operate satisfactorily on these new fuels.

The common goal is to find the best possible solution for maximum reduction of pollutants in the soonest partical time frame and at the lowest cost to the consumer. Achievement of this objective no doubt will require additional modifications in engine design, as well as improvements in control systems and fuels.

We have already demonstrated in our laboratories that these improvements are technically feasible. As a result, it is my opinion that the gasoline internal combustion engine can be made essentially pollution-free in the hands of the public. This is what must be done to meet suggested future federal emission goals. This is a goal to which General Motors is devoting extensive resources and we are confident it can be achieved.

Ten years from now, the choice of automotive power sources will not be predicated on small differences in the emission of pollutants, in my opinion, because the levels of emissions will be about the same for all power plants. Rather, the choice will be made on the basis of which engine—or engines—will provide the greatest overall benefits to the American car owner.

As engineers and managers, it is important to recognize the vital need for providing sound leadership for progress in these and similar areas. The automobile industry obviously is equipped with the technical resources and knowhow to provide such leadership.

But we must be highly aggressive in taking action and, equally important, in getting credit for our accomplishments. And getting public credit for what we do has been extremely difficult in recent years. But if we don't provide strong leadership and have this fact recognized, we must accept continuing public criticism and perhaps even government regulations which might be unsound. Most damaging of all, lack of leadership on our part could result in misguided national policies which would not advance the cause of safety or cleaner air but also could be extremely detrimental to our customers and the mobility of our economy, and thus seriously affect our businesses.

It is also important that the Federal Government and the automobile industry cooperate closely in developing more stable, long-range standards and test procedures for both safety and auto emission controls. Frequent changes in standards and test procedures—either in terms of specification requirements or general goals—and insufficient advance notice of changes, could impose severe burdens on the automobile companies and be a disservice to our customers and the public as well. We need sound, long-range planning of national goals in these and other critical areas—goals developed cooperatively by industry and government on realistic time schedules. This is necessary to minimize wasted effort and to maximize the combined resources of our nation which in the long run will provide the greatest gains in the shortest time and at the lowest cost.

In seeking maximum utilization of total resources toward the resolution of this problem, much work is to be done. The automobile industry, over the years, has done extensive research and development work in advance power sources and emission control systems. The results of this work have been made public through various presentations to technical societies and through publications.

If the Federal Government desires to finance research in the vehicular pollution field, we believe it could be most effectively utilized in areas where new data and technological breakthroughs are badly needed by the automobile industry—rather than duplicating work already accomplished or now being done by the automobile industry. Areas of greatest potential for new research activities which might be funded by the Federal Government, for example, would include studies designed to develop new and improved materials for components of advance power plants and for exhaust reactors, with particular emphasis on catalytic materials for exhaust control systems.

In focusing major attention on the problems of automotive safety and air pollution, it was not my intention to minimize the importance of other areas of challenge to the automobile engineer. To place these critical assignments into proper perspective, let me summarize my remarks tonight with what I consider to be eight of the most important challenges or areas of greatest potential for the automotive engineer in the next decade or two.

One is the need to develop a more effective systems approach to design which encompasses all of the essential requirements of the automobile during its lifetime of use. Obviously, attention must be given to such essentials as emission control, safety, performance, utility, economy, convenience, durability and sales appeal. However, equal consideration must be given to other factors involved with long-term transportation value of the vehicle. Of major importance are buildability, serviceability and repairability.

Challenge number two is to develop better concepts of space engineering. As the customer demands more and more of his automobile, we must seek new ways of maximizing the use of space available both in exterior dimensions and under the skin of the car. Important considerations are basic performance, safety, roominess, convenience, protection against property damage, but with definite limitations imposed by such vital factors as highway and parking space. We cannot expect any more space to work with; but we could have less.

Our third area of opportunity is increased use of electronics—and more specifically solid state devices. It is conceivable that the car of the 1980's will contain an efficient in-car computer which would serve as a processing center for information about various operational parameters. This would allow us to simplify many auxiliary functions and reduce space requirements for many separate electrical sensing and control systems. Other probable areas of application for electronics include fuel injection, ignition, breaking systems, driver communications, as well as devices to monitor or control other functions vital to safety. I also expect much more extensive use of electronics as aids to manufacturing quality and service diagnosis.

Our fourth major engineering challenge will be to develop new materials and fabricating processes. The next few decades will see the birth of new alloys and non-metallic materials with performance far surpassing that of traditional metals—and, hopefully, at lower costs. These advances should open broad new avenues for improving the automobile, encompassing both design and propulsion.

The fifth important challenge is to improve the maintainability of auto designs during their lifetime of use—particularly in the areas of safety and air pollution. This involves further improvements in basic quality by a closer correlation between design and manufacturing practicabilities. We should seek new design concepts and materials which provide extended durability and troublefree operation. In addition, we need to develop a truly effective systems approach to the diagnosis of mechanical problems—both as a part of basic design and as a foundation for improved field service.

The sixth challenge is to develop a system for disposing of junk motor vehicles—a system which would be economically feasible within our free enterprise system and without the need for government subsidy. New advances in processing methods would represent a substantial contribution toward this goal.

Our seventh major area of challenge relates to the continuing basic responsibility of the engineer as an innovator—as a prime creator of constructive change. This requires particular emphasis on development of new or improved designs, materials or concepts as a means of providing increasing value in our products which are so fundamental to our way of life.

Our eighth major challenge concerns the effects of the engineer's work both on society and the physical environment. This involves not only automotive safety and air pollution, but also such other major challenges as automobile thefts, industrial pollution and urban transportation, including parking requirements.

It is particularly vital that we—as engineers and managers—provide leadership in anticipating, directing and helping to create the forces of change for the greatest overall progress. We must learn how to manage change more effectively than we have in the past so that we are the beneficiaries rather than the victims of change. We must learn how to manage accelerated change so it can be more effectively assimilated into our businesses and into our society.

Never in the history of our nation has tho engineer been given such great responsibilities. Never has his role in the future been more vital. Society has great confidence in engineers to help solve the major problems of our times and create a fuller, more enjoyable life for all of us in the years ahead.

Let's roll up our sleeves and get on with the job!

Mr. JARMAN. Thank you, Dr. Chenea.

I know there will be a number of questions from the other members of the subcommittee. The Chair would like to ask just two or three preliminary questions before calling on other members.

Could you give us the percentage of new vehicles that General Motors has sold during each of the last five years. In other words what percentage of the market does GM have.

Dr. CHENEA. General Motors, sir, has about half the market, and the total number of vehicles each year in rough terms is 7 to 10 million, of which we produce about half. The variation depends upon how many trucks you count.

Mr. JARMAN. I understand. That is my understanding that it was about 50 per cent of the overall market.

Dr. CHENEA. Yes.

Mr. JARMAN. In view of that big percentage of the total new car market that GM supplies, doesn't it follow that the gasoline manufacturers have to fit their plans for their product to General Motors' plans and the cars that General Motors builds?

Dr. CHENEA. I think so, and vice versa. I think it would be very difficult for the oil industry to have to manufacture separate and distinct fuels for each auto manufacturer's vehicles. Likewise, it would be extremely difficult for us to manufacture vehicles for each of a variety of fuels in the marketplace.

Mr. JARMAN. Well, I can understand that it is a mutual responsibility, and that there is interdependence between the two sides. Therein lies a very basic aspect of the problem that we are discussing this morning.

On page 8 of your statement you say that you know of no way to meet the proposed 1975 emission standards with leaded gasoline. The one question that I would ask in that regard would be with reference to the position taken by duPont on this subject with which I am sure you are familiar.

Would you or your associates this morning care to make any comments regarding the duPont position that the objectives can be achieved with leaded gasoline?

Dr. CHENEA. Yes, we are well aware of duPont's position and their research. We have run similar reactors ourselves. We obtained emission levels which are not in disagreement with their emission levels. Some of the lowest emission levels that we have obtained we have obtained with reactors of this type, and this kind of a reactor is certainly a possible contender for 1975 and thereafter.

We do have a difficult time, however, coming into complete agreement with the duPont people with regard to the durability of these reactors. Unless these reactors can be made to function in the hands of the general public at the rate of 5 million new cars a year or more, and will function for 50,000 miles or more with the kind of maintenance that they get or lack of maintenance that they get, it is not a very viable solution to our problem.

We have tested some of their early reactors and found that they did not meet our requirements for durability. We understand that they have newer versions which they think are better and we have some on order and we will test these. Of course there is a particulate emission problem which is not spoken to by this particular solution to the automotive emissions problem.

Mr. JARMAN. One part of duPont's statement is to the effect that reactors have been shown to be capable of reducing hydrocarbons and carbon monoxide to very low levels and to do it over the lifetime of the car without attention or maintenance.

Dr. CHENEA. DuPont has made this statement. We have not been able to duplicate it to our satisfaction, sir.

Mr. JARMAN. Would you have any comments to make as to the adequacy of the tests which duPont has conducted of its equipment?

Dr. CHENEA. With regard to measuring the emission levels our tests give about the same numbers, and we presume that they are doing the same kind of tests we are. We are not in a position to compare our durability tests with theirs.

Mr. JARMAN. Thank you.

Mr. Rogers?

Mr. ROGERS. Thank you, Mr. Chairman.

Doctor, we appreciate your testimony in trying to give us your thinking now on some of the questions that have been raised since you last appeared before the committee.

For instance, the test proceedings. We are very much concerned that the present method of testing is not really effective to assure the public that the emission standards will be maintained. Would you agree that that is correct?

Dr. CHENEA. I would agree. Our tests of the durability of emission control devices are made according to HEW procedures and are checked by HEW. These show the depreciation when a vehicle receives the kind of maintenance that it is supposed to have . However, this does not correspond to what we find in the field.

Mr. ROGERS. Well, as I understand the present testing they will take four prototypes, is that correct, which are selected for certification purposes? And then, there are additional vehicles simultaneously put on durability runs.

Dr. CHENEA. Yes. We run the durability tests at the research laboratories for 50,000 miles on a prescribed driving course with the maintenance specified by the manufacturer.

On the basis of the degradation of the control devices during this 50,000-mile period and the measurements that we and HEW make, there is a depreciation factor obtained. It is actually the emissions at 50,000 miles divided by the emissions at 4,000. This factor is applied to the numbers that are obtained from the four prototype emission vehicles to determine whether we are eligible for certification.

Mr. ROGERS. Now, do they average the four vehicles?

Dr. CHENEA. They do average the four vehicles. I understand in California they do not.

Fred, would you like to speak to that?

Dr. BOWDITCH. That is correct. And it is four vehicles for each engine displacement.

Mr. ROGERS. In other words, three of your engines might not meet the standard where one would be below it and so HEW would take the average of that and say if the four vehicles, even though 75 per cent of the prototypes did not meet it in effect that they would give you a certification?

Dr. BOWDITCH. That is correct. California insists that each of the four cars pass.

Mr. ROGERS. Well, I would think that——

Dr. BOWDITCH. This is true, I understand.

Mr. ROGERS (continuing). Would at least be preferable, but surely that it is no test really to get only four automobiles, and what we need is probably an off-the-production line test, say, at the end of each day where a certain number of cars would be picked at random and a test made for that particular car. Would you agree some procedure like that should be instituted?

Dr. CHENEA. We would agree, sir, and we did suggest some kind of procedure like this to the Muskie Committee in the Senate. We think the procedure has reached the point where it is practical to develop a system of this kind and we cannot help but think it will be more reliable and give better results.

Mr. ROGERS. Also this 50,000-mile test, the way it is now required it really does not project the way a car is used by the average owner, does it?

Dr. CHENEA. I cannot help but agree. It certainly does not. When we measure vehicles in the field and compare them with our 50,000-mile durability test, there is a discrepancy that is unmistakable.

Mr. ROGERS. Yes. So it seems to me that the testing system that has been set up by HEW really is a sop to the public to make us think that everything is certified when it really is not, and I think your feeling that it does not properly set forth the procedures verifies that.

Now, let me ask you this. If we gave authority to HEW and tried to get them to go in for testing where they do an average daily test, or at least even if they would designate that the company would make these particular tests aud they could audit it and this may be a more practical means—I do not know.

I think HEW has suggested that—then they would have the right of audit to check it all, right of inspection and you would have no objection to that?

Dr. CHENEA. We would have no objection.

Mr. ROGERS. Should a daily run, for instance, show that the cars are not meeting the test, don't you agree that the certification should be withheld or lifted and none of those cars be put in interstate commerce until they are corrected and certification reestablished?

Dr. CHENEA. Should daily production or some other time period of vehicles indicate that they are not meeting the standards, I think there is no question but that those vehicles which do not meet the standards should not be sold until they are brought into compliance. And action taken to correct the problem.

Now, what the appropriate sequence of actions taken at this point should be I do not know, but certainly action should be taken to get the situation corrected.

Mr. ROGERS. For it to be corrected?

Dr. CHENEA. Yes, for it to be corrected.

Mr. ROGERS. Before those automobiles are sold to the country?

Dr. CHENEA. Certainly the ones that are not meeting the standards should not be sold until they are corrected.

Mr. ROGERS. Yes, that is what I understand. Well, I would agree with you there, and I think that it is the only way we can begin to move in to some area of credible testing.

Dr. CHENEA. I think it is important to realize that there has been great advancement in the technology of measurement and I think the time is right for us to give serious consideration to some sort of a system like that. As I pointed out, it has to be industry-wide. It is an expensive investment, and it would be unthinkable for one company to start this and then find out that what was finally adopted did not conform with all the instrumentation they had.

Mr. ROGERS. Yes. Well, I agree, and I do not see any point in us going through this charade that we are presently going through with

HEW claiming they are giving certification on four prototypes and then we get out and test, which in turn shows that the cars not used is the way the testing is done in effect and the certification really does not mean much.

Dr. CHENEA. I think, however, one needs to say a word in favor of HEW. The system has resulted in massive reductions in emissions.

Mr. ROGERS. Well, I think the law has resulted in massive reduction, and I think great progress has been made. I would agree with that.

Mr. CHENEA. The law and the way it has been implemented.

Mr. ROGERS. I think the automobile companies are responding now and are leading some of the thinking, for instance, in taking lead out of gasoline. I think that it has been very helpful.

Now, let me ask you this. Suppose we were to require a warranty on antipollution devices or systems. Do you think this would be an unreasonable approach?

Dr. CHENEA. The present devices and systems which we manufacture are warranted to the extent of material and quality of manufacture at the time that they are assembled just like all other components in the vehicle, in accordance with the manufacturer's warranty.

Mr. ROGERS. So you have no objection to our saying that these should be warranted for a certain period of time, if a owner of an car were to maintain it on the schedule as the automobile manufacturer set forth in the maintenance manual, then the automobile dealer would be responsible as long as the maintenance has been done on the car, if it does not meet the standards within that warranty period?

Dr. CHENEA. There is a very severe problem here in talking about individual vehicles in this context because often at the end of the production line some of the new vehicles do not meet the emission levels that we are talking about. Most of them do. So many of them do, that the average off the end of the production line is well below the emission level. But to select an individual vehicle later, one will find in all probability that it meets the standards but it may not.

Mr. ROGERS. Well, would you be willing to fix that car if it did not?

Dr. CHENEA. Readjust it to the manufacturer's specifications?

Mr. ROGERS. Yes.

Dr. CHENEA. Certainly. We do this now.

Mr. ROGERS. Yes. So there would be no objection?

Dr. CHENEA. We do this now. We provide a tune-up service in the dealers to do exactly this.

Mr. ROGERS. Yes. Now, I understand that you would support proper funding and the necessary personnel for HEW to do research on testing equipment and testing devices?

Dr. CHENEA. Testing equipment and procedures.

Mr. ROGERS. And procedures?

Dr. CHENEA. Absolutely.

Mr. ROGERS. And this could also be used throughout the States in connection perhaps with their safety program, and so forth?

Dr. CHENEA. We think this is a most important thing to get started.

Mr. ROGERS. Now, what is the difference in the California standard and in the HEW standard?

Dr. CHENEA. As far as the emission levels are concerned?

Mr. ROGERS. Yes.

Dr. CHENEA. Fred, would you answer this? You have them on your fingertips.

Mr. ROGERS. In other words, what I am trying to say, are they about 2 years ahead of the Federal standards in California?

Dr. BOWDITCH. This would depend on which of the particular requirements we are speaking about. Right now, for instance, California leads by 1 model year with regard to control of evaporative emissions.

Mr. ROGERS. Evaporation then, California is ahead of the national standard?

Dr. CHENEA. The Federal standard. As far as oxides of nitrogen are concerned California will begin requirements next model year. The Federal Government has announced the proposal and has said they will begin with 1973 model year.

Mr. ROGERS. 1973. But California begins in 1971.

Dr. BOWDITCH. 1971, and then proceeds model year by model year to lower numbers. The Federal Government would pick up the oxides of nitrogen as a 1972 calendar requirement and make that a Federal requirement in 1973. At the moment the 1975 requirements are almost identical between the proposed Federal ones and the ones that the State of California is proposing.

Mr. ROGERS. On nitrogen oxides?

Dr. BOWDITCH. On all pollutants, on nitrogen oxides, hydrocarbon and carbon monoxide.

Mr. ROGERS. What about hydrocarbons?

Dr. BOWDITCH. They would be the same requirements by 1975. There is a difference in California in that they would lower their hydrocarbon requirement in the 1972 model year.

Mr. ROGERS. 1972, and the Federal Government not until 1975?

Dr. BOWDITCH. That is correct. These are the proposed dates——

Mr. ROGERS. Does it require, to meet calendar standards do you have to put additional devices or more refined devices on the car?

Dr. BOWDITCH. On some occasions, yes. For instance, our evaporative controls, we have them now only on the California models. We will have them on nationwide in 1971.

Mr. ROGERS. And what about carbon monoxide?

Dr. BOWDITCH. The carbon monoxide standards are the same between the State of California and the Federal Government.

Mr. ROGERS. They do not differ?

Dr. BOWDITCH. They do not differ.

Mr. ROGERS. Now, what is the difference presently in your devices? Are the 1966 devices that I presume are on most of the cars, or 1968, how do they differ in California from the rest of the Nation?

Dr. BOWDITCH. You mean today's devices?

Mr. ROGERS. Yes.

Dr. BOWDITCH. Today the exhaust control systems are the same.

Mr. ROGERS. Exhaust control the same.

Dr. BOWDITCH. Between California and nationwide. We have begun oxides of nitrogen control on our cars this year both in California and across the country so it is the same.

Mr. ROGERS. Exactly the same?

Dr. BOWDITCH. It is the same equipment. Now, we do have the evaporative control systems on California-only cars for this year. The crank case control systems are the same nationwide as they are in in California.

Mr. ROGERS. And therefore for controlling the hydrocarbons, the carbon monoxide and the nitrogen oxides, they are the same?

Dr. BOWDITCH. As far as the exhaust components, yes.

Mr. ROGERS. Well, what about in the other devices?

Dr. BOWDITCH. Well, the evaporative control device goes on the fuel-tank and carburetor, and for that source of hydrocarbon the system is different.

Mr. ROGERS. Do you have any difference in your control of nitrogen oxides?

Dr. BOWDITCH. No.

Mr. ROGERS. Will you?

Dr. BOWDITCH. No.

Mr. ROGERS. What about 1971 and 1972?

Dr. BOWDITCH. We do not intend that there be any difference. Present plans call for the same equipment.

Mr. ROGERS. What difference of price is there in the car sold in California and the car sold nationwide?

Dr. BOWDITCH. It is either $30 or $35 sticker price difference. I would like to get you the exact figure.

Mr. ROGERS. Yes, I understand.

Dr. BOWDITCH. It is an item of record.

Mr. ROGERS. Do you attribute this to the control, air pollution control features?

Dr. BOWDITCH. Yes, this is——

Mr. ROGERS. Or is it transportation or some other reason?

Dr. BOWDITCH. This is the control system itself. It is the hardware associated with the evaporation—

Mr. ROGERS. Evaporation?

Dr. BOWDITCH. For the evaporation control system.

Mr. ROGERS. Mr. Chairman, I have other questions but I will reserve additional time, if I may.

Mr. JARMAN. Mr. Nelsen?

Mr. NELSEN. Thank you, Mr. Chairman.

I notice that you used the terms crank case control, emission control and then also reactor. Are they all one and the same thing?

Dr. CHENEA. No, sir. They differ quite a bit. In the crank case vapors are generated which contain hydrocarbons. Ten, fifteen years ago these were vented directly to the atmosphere. Starting in 1961–62 we installed a device which pipes these vapors back up to the carburetor where they go through the engine and are burned. So that is the nature of the crank case control.

The exhaust reactor is a device that replaces the exhaust manifold on the engine. This is outside of the cylinders themselves after the burning has taken place. The purpose of this device is to provide an additional place where additional oxidation can take place and thereby reduce the unburned hydrocarbons that enter into the exhaust system at the end of the engine. They are quite different devices for different purposes.

Mr. NELSEN. On the manifold that you mentioned, is that the device that burns the emissions from the motor, the exhaust? Is it fed with a richer mixture which then burns the emissions that come out of the motor?

Dr. CHENEA. This is the device you are talking about.

Mr. NELSEN. I see.

Dr. CHENEA. And it may be fed with a richer mixture. There are also lean reactors.

Mr. NELSEN. Now, in the lower compression engine, I am just curious, what did this require to manufacture, a different type of cylinder head or length of stroke or piston design?

Dr. CHENEA. This can be accomplished in many ways, that is the reduction of the compression ratio can be accomplished in many ways. One can either increase the volume contained in the head of the engine; one can go to pistons that have a recess in them. There are serveral parameters that one can use to vary a compression ratio.

Mr. NELSEN. Now, in the testimony before the committee, some of the smaller producers of fuel felt that the extensive cost involved in converting to lead-free gasoline would put them in such a position of disadvantage that only the major companies would be in business, and they would be out of business. Do you feel that this is going to be an expensive process beyond the reach of some of the manufacturers?

Dr. CHENEA. The statement that you refer to I think was made in California at the hearings out there. Undoubtedly, various oil companies are in different positions and always should be. We do not think it will be expensive if you do not by some other technique require that the octane rating be retained. And this is why we have reduced it to91. And this way we think that for most companies there will be little that needs to be done other than just leaving the lead out of gasoline.

Mr. NELSEN. I notice that you state we have not advocated in this period legislation or regulation limiting the use of lead.

In other words, you are not proposing a mandatory regulation. You are not going to be involved in such a recommendation, is that right?

Dr. CHENEA. We are not recommending this.

Mr. NELSEN. I see.

Dr. CHENEA. We do not think it is appropriate that we should.

Mr. NELSEN. I understand. I think you are right.

Now, the low-compression engine, will that accommodate leaded fuel, say, that is, fuels on the market that are leaded?

Dr. CHENEA. The 1971 compression engine will burn regular fuel, leaded, as we know it now. It will also burn premium fuel leaded as we know it now, in addition to 91 unleaded.

Mr. NELSEN. I see. Now, in the so-called emission control devices, that are attached to the manifold, it is my understanding that the metals required because of extreme heat results in its becoming an expensive device and it would need a good deal of servicing in the future. Is that true?

Dr. CHENEA. We have found this kind of difficulty with many manifolds. Durability is the problem. There is no question about this. Because the temperatures are very high and can become extremely high if a spark plug does not fire or something like that. We have also looked very extensively at the ceramics which have the property of sustaining much higher temperatures, but here again one has very severe durability problems.

Mr. NELSEN. And is it also not true that mileage would be reduced considerably?

Dr. CHENEA. With the lower compression ratio?

Mr. NELSEN. No, not with the lower compression ratio but with the manifold emission control device that would burn the excesses out of the exhaust?

Dr. CHENEA. I cannot see how it would be appreciably different. We are talking about a very, very small part of the fuel.

Mr. NELSEN. I see.

Dr. CHENEA. Whether it is burned in the exhaust reactor or is pushed out the end of the exhaust pipe unburned really would not make any difference.

Mr. NELSEN. I see.

Dr. CHENEA. It is an extremely small amount, but it does not take much. This is our problem. We are talking about parts per million on all of these things.

Mr. NELSEN. Getting back to the motor design, having operated engines all of my life, I remember when leaded gasoline first came on the market that on some of the farm tractors the stem on the valves would build up with lead and you would burn them out.

Now, has that been fully designed in your low compression engine so in the event that some driver happens to get a leaded gasoline which is not accommodated to this low compression engine, will he have the same experience as we did within our farm tractors?

Dr. CHENEA. Well, you have this problem, and you also have the problem of valve difficulties without lead, You need a certain amount of lubrication of the valves. There is no question about the fact that the design will have to take this into account. We have run a great many engines on unleaded fuel and have had no difficulty. And of course one petroleum company has been furnishing unleaded fuel for many, many years in New England.

Mr. NELSEN. I know that.

Dr. CHENEA. And to the best of my knowledge no serious problems have resulted.

Mr. NELSEN. Thank you very much.

Mr. JARMAN. Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I would like to try to put something in proper context which has been testified to before, I think. Is it not a fact that when we are talking about pollutants being expelled into the air from what occurs in an internal combustion engine that we are really talking about the interaction of an entire system including the content of the fuel and everything that occurs from the gasoline tank to exhaust from the automobile, isn't that correct?

Dr. CHENEA. That is right.

Mr. SATTERFIELD. I take it from what you have said that you have reached the conclusion that a catalyst device or a catalytic device is the only real solution that you see that will work?

Dr. CHENEA. No. No, we have not come to that conclusion. We think the manifold reactor may also be a solution to this problem. We just do not know at this stage of the game. What concerns us deeply is that neither of these devices operates more effectively with lead, and they do operate much more effectively without it. With lead in the gasoline the catalytic converter is completely out of the picture, no longer a candidate, and we do have problems with exhaust reactors.

Mr. SATTERFIELD. Well, isn't it a fact that the exhaust reactor—I think you mentioned something about this—if you attempt to depress all pollutants in an exhaust system, that the reactor would only be only one component of a system designed to remove all the pollutants?

Dr. CHENEA. The exhaust reactor will help you with some pollutants. It helps you with hydrocarbons and it helps you with CO.

Mr. SATTERFIELD. This does not preclude additional systems which would take care of the other pollutants that the reactor would not control?

Dr. CHENEA. Not at all. I could visualize using several systems if it becomes necessary.

Mr. SATTERFIELD. Well, if I understand correctly in answer to Mr. Jarman you made the statement that you had tried to duplicate the device that du Pont has and had not been as successful as they had apparently stated they had been. Have you used their precise device or one similar to it?

Dr. CHENEA. No, we purchased devices from them, and as I say have some of the new models on order to test. They are very good exhaust reactors from the standpoint of performance on low emission. The durability question is the only one that needs to be resolved.

Mr. SATTERFIELD. I think you stated in connection with durability that one thing you would require would be that they insure the durability of that device, good for 50,000 miles.

Dr. CHENEA. It should.

Mr. SATTERFIELD. Do you have a catalytic device today that is efficient, reliable and good for 50,000 miles?

Dr. CHENEA. We gave some catalysts that have functioned extremely well in the laboratory on experimental vehicles.

Mr. SATTERFIELD. I was interested in that connection with your statement on page 11 when you said, "We still have to solve the problem of making these catalysts work in 5 million new production cars each year on a reliable, long-life basis at a cost that the customer can afford." I assume from this statement and from what you just said that you do not have such a catalytic device now that will work effectively in the 1971 cars with unleaded gasoline, is that correct?

Dr. CHENEA. We do not have one that we think we could put into production. This is correct.

Mr. SATTERFIELD. I am interested very much then why you have made the suggestion that you can manufacture an automobile which would operate on unleaded gas in 1971, and I would ask you the question, since you do not have a device that would remove these pollutants, what benefit would we reap from this situation?

Dr. CHENEA. Oh, several very important ones. First of all, the unleaded gasoline would give us lower emissions on all the vehicles already manufactured. There are two effects here which almost everybody who has run tests in this area has found—as a matter of fact, I do not know anybody who has not—showing that taking the existing vehicles and running them on the unleaded gasoline would decrease the pollutants——

Mr. SATTERFIELD. Didn't you say in your statement that we could not convert all the existing automobiles because it would be too costly and that a lot of existing vehicles would not run on unleaded gasoline?

Dr. CHENEA. No, sir.

Mr. SATTERFIELD. Isn't that in your statement?

Dr. CHENEA. I do not think so, sir.

Mr. SATTERFIELD. I apologize.

Dr. CHENEA. If it is in there, I apologize. But it should not be in there.

Mr. SATTERFIELD. It must have been in something else I read. It is easy to get the content of one statement confused with another; we get confused.

Excuse me. Go ahead.

Dr. CHENEA. This is one important factor, if we go, as we think we must, to some additional devices to handle the other pollutants, such as the nitrogen oxides. These devices deteriorate more rapidly with lead in the gasoline. But the real reason why we are going to lower octane ratings in 1971 is to get a jump on the field population of vehicles.

By doing this, at some future date whenever unleaded gasoline becomes available, a bigger fraction of vehicles in the field will be able to use it. We think this is most important.

Mr. SATTERFIELD. Well, to go back to my misstatement just now, I would like to know what your view is with respect to automobiles in the existing automobile population and how well they might operate on non-leaded gasoline?

Dr. CHENEA. The 91 unleaded gasoline we are talking about?

Mr. SATTERFIELD. Yes, say 91.

Dr. CHENEA. We think that most of our regular car vehicles will operate without any difficulty. We think some of them will require some adjustment. Of course, our premium cars that are in the field will not be able to operate on it.

Mr. SATTERFIELD. So what we are really talking about so far as premium cars are concerned is that we would have to have a dual fuel system?

Dr. CHENEA. As we have now.

Mr. SATTERFIELD. And in making a decision with respect to this did you give any consideration as to what the cost to the public might be with a dual system such as this?

Dr. CHENEA. As far as the manufacture and distribution of gasoline is concerned?

Mr. SATTERFIELD. Yes.

Dr. CHENEA. We are not really in a position to do a thorough analysis of this. And what little analysis we can do would seem to us to indicate that by lowering the compression ratio so that the octane does not have to be restored when you take out the lead, it should help immensely in making this transition. I think you should speak to the oil companies in that regard.

Mr. SATTERFIELD. But don't you think an analysis such as this should play a very strong part in the making of the decision as to what route we follow today?

Dr. CHENEA. I think it is undoubtedly correct. Some of the oil companies apparently have already made their decision and have made public announcements.

Mr. SATTERFIELD. I was also interested in your statement on page 14, and I think you have already referred to this. You said that "The problem of fuel composition, availability of octane pools and distribution are complex. We believe that they require the full attention of the oil industry and presumably could be discussed more appropriately with them. However, we wish to make it clear that General Motors is not in any way advocating regulation of the oil industry."

Now, in view of the discussion we have had here about lead, I would be interested in knowing who you think should make the decision as to whether lead should be removed from fuels or not?

Dr. CHENEA. Who should make the decision?

Mr. SATTERFIELD. Yes, sir.

Dr. CHENEA. Individual oil companies have announced that they are going to provide some fuel without lead voluntarily. Sooner or later, however, there has to be found a mechanism to get some uniformity in this situation. What kind of mechanism I am not in a position to say but certainly it has got to be found.

Mr. SATTERFIELD. Well, are you aware of the fact that legislation before us right now would deliver to HEW the right to set standards which in essence would give it the right to control the content of fuel?

Dr. CHENEA. I am aware.

Mr. SATTERFIELD. And do you support that position?

Dr. CHENEA. We do not support it or oppose it. If this seems to be the best way to get the job done, why certainly that is what we ought to do.

Mr. SATTERFIELD. Well, are you aware of the fact that since we are talking about an entire system, that if HEW is given the right to control one part of that system that it ought to have the right to control all of it?

Dr. CHENEA. It now has the right to control the vehicle with regard to its emissions performance.

Mr. SATTERFIELD. If it can control the content of fuel, shouldn't it also have a right to tell you as a manufacturer what you can put in your engine, how to build your engine, how to build the entire system since that is part of the pollution problem?

Dr. CHENEA. I think it should and must have authority to set standards over all performance requirements of the engine consistent with the fuels.

Mr. SATTERFIELD. When we talk about content, we are not talking about performance. We are talking about design and content.

Dr. CHENEA. One does not need to specify the dimensions and the various components in detail to achieve the necessary matching of fuel and engine.

Mr. SATTERFIELD. And I take it then you would object to a provision or a bill which would permit HEW to set standards in terms of design of your fuel system, of your exhaust system and of your engines themselves?

Dr. CHENEA. Beyond those performance requirements necessary to get the proper emissions, I think it would be improper.

Mr. SATTERFIELD. Well, isn't what you are really saying, isn't it a fact that if you set standards as to what comes out of the tail pipe of an automobile, that this is the kind of performance that HEW ought to determine and that how you achieve that exhaust standards—meet those standards—really ought to be left up to the automobile industry and the fuel industry working together?

Dr. CHENEA. Yes.

Mr. SATTERFIELD. I do not see, in my own mind, how you could have both. You either have the emission standards and let the industry work out the problem to meet those standards or if you go beyond the exhaust further back in the system it seems to me you would have to give HEW the right to control the entire system and to dictate what goes in it.

Dr. CHENEA. And we would not oppose such a right, if implemented through performance standards.

Mr. SATTERFIELD. You would not.

Dr. CHENEA. We would not.

Mr. SATTERFIELD. I have no other questions at this time, Mr. Chairman.

Mr. JARMAN. Dr. Carter?

Mr. CARTER. No questions.

Mr. JARMAN. Mr. Kyros?

Mr. KYROS. I think what you just said is very important. Are you saying then that, as far as General Motors is concerned, once the Federal Government through the Secretary of Health, Education, and Welfare sets the standards for air pollution, then working from that point, if they demand a certain design of vehicle as well as certain performance, you have no objection?

Dr. CHENEA. I think that there must be performance standards set on the major components in any system if you are going to get the total system to conform. Consequently, HEW would have to set some sort of regulations with regard to the vehicle. I do not think this means that they have to specify every nut and bolt that goes into the vehicle. There are many ways in which this could be done. Vehicles could be required to, meet an emission performance standard with some standard fuel.

Likewise, one could say that the various producers of gasoline have to be able to meet some emission standard with some standard vehicle. This is one possibility. There are a lot of ways you can go about this.

But I certainly think it would be a mistake to make it so complicated and get it so complex that it could not be administered and would not achieve the end.

Mr. KYROS. But going back to what I asked you—and I think you have answered it really—in other words, first, you have no quarrel with the Secretary of Health, Education, and Welfare setting the kind of standards that are included in H.R. 15848?

Dr. CHENEA. We do not.

Mr. KYROS. And secondly, you just expressed that you want to cooperate whether in design or in performance of the vehicle with whatever standards that he sets?

Dr. CHENEA. Absolutely, we have and will cooperate with any law Congress passes.

Mr. KYROS. Now, in your statement——

Mr. SATTERFIELD. Would you yield at that point because this is the point I was discussing.

Mr. KYROS. I certainly will.

Mr. SATTERFIELD. As I read the act today, the standards that HEW must set do not really go to the question of how you are manufacturing your motor vehicle or your engine. Would you object then to expanding the powers of HEW so as to give them the same power that this would give them over the content of fuel, over the entire system, the same power?

Dr. CHENEA. I am not quite sure I understand what you mean. I think they should expand HEW's regulatory power if it needs expansion to accomplish lower emissions from vehicles through performance standards.

Mr. SATTERFIELD. I just wanted to clarify it. Thank you, sir.

Dr. CHENEA. In no way are we against making changes in the design and the operation, testing, certification, or what not of vehicles to achieve the end of lower emissions.

Mr. KYROS. Doctor, let me call your attention to the act, section 5 which appears on page 5 of H.R. 15848 which is entitled "Registration and Regulation of Fuels and Fuel Additives."

You are generally familiar with that, sir, is that correct?

Dr. CHENEA. Yes.

Mr. KYROS. Now, do you have any objection to any part of Section 5, which in effect—and you can correct me—provides among other things that the Secretary of Health, Education, and Welfare can stop the sale of or delivery of any fuel or fuel additive not registered, that he sets the standards of composition of any fuel to meet emission standards, that he can obtain information to determine whether there is any toxicity from emissions—in other words, gives him almost complete power over the composition and additives of fuel.

Now, do you have any objection to that section?

Dr. CHENEA. I have no objection. I assume it would be exercised with prudence and good judgment. Obviously, with a weapon like this in your hand you are in a very strong position.

Mr. KYROS. On February 15 you announced that all 1971 model General Motors passenger cars will be designed to operate on either leaded or unleaded fuel of at least 91 Research Octane Number?

Dr. CHENEA. Right.

Mr. KYROS. Now, does that mean as far as General Motors is concerned you have made a determination that as far as your judgment is concerned lead is a harmful additive in fuel?

Dr. CHENEA. In the health sense.

Mr. KYROS. In a health sense.

Dr. CHENEA. We are not in a position to speak about the health matter. We understand there is quite a controversy over this. Our concern about lead is strictly one of meeting the emission standards that are projected for the future.

Mr. KYROS. Well, now, just a moment. The emissions standards call for what emission of lead by 1971, do you know?

Dr. CHENEA. There are no standards on the emission of lead that I am aware of.

Do you know of any?

Dr. TUESDAY. No. There is a particulate standard but that is not until 1975.

Mr. KYROS. All right. So you are not concerned about providing for unleaded fuel because of the emission standard but simply because your catalytic devices will not work with lead?

Dr. CHENEA. We are concerned about all of the pollutants that are affected by lead. The hydrocarbons are affected by it, and the particulates are especially affected particularly by it. They are largely lead compounds.

Mr. KYROS. I understand that what comes out of the exhaust is nitrogen oxide, hydrocarbons, carbon monoxide, and what else?

Dr. CHENEA. Particulate matter.

Mr. KYROS. Solid pieces——

Dr. CHENEA. Not gaseous. They may be liquid drops.

Mr. KYROS. All right. And what is that made up of?

Dr. CHENEA. This is a very difficult question to answer. All of our research to date, and most people agree with us, indicates that a fraction of this is lead or lead salts, various lead compounds. There are some carbonaceous materials in here, too. And, of course, I suppose some water vapor and this sort of thing. Just exactly how much of the total and how it is distributed we do not know yet. The particulate standards were new to us less than 6 months ago. But we are very confident that there is considerable lead in them and this is where a big fraction of the lead goes.

Now, it is very difficult to reproduce tests in this, and let me tell you why. The particular test cycle that will be used in measuring against the particulate standards has not yet been determined. We find that the amount of particulates that come out of the exhaust pipe varies widely from cycle to cycle.

There is a tendency for it to hang up in the system and then when you accelerate you get a big blob of it out of the exhaust pipe. But as near as we can tell, running what we think are typical kinds of driving cycles, about half of it is lead related.

Mr. KYROS. I want to digress for a moment.

You know, I was over in Saigon, South Vietnam, recently. They have a huge number of Hondas over there. Everybody rides a Honda.

Do those motor vehicles emit a greater number of pollutants than normal? Do you know?

Dr. CHENEA. Charlie, do you ride a Honda?

Dr. TUESDAY. No, but I think they are carburetted rich to get power, and I would expect, although we have not made any specific measurements, that they would be higher in emitting carbon monoxide and hydrocarbons, at least, than motor vehicles.

Mr. KYROS. They sure kill all the trees in Saigon, all the leaves.

Anyway, let me ask you this, doctor. What led General Motors to make this decision? Can you tell us concretely and specifically that you will design motorcars in 1971 to operate on either leaded or unleaded fuel? What are the specific reasons for making that decision, if you can give them to us?

Dr. CHENEA. Yes. I think I can. It was kind of the case of the straw that broke the camel's back. We had been learning to live with lead in gasoline, for efficiency reasons, for many years and it has not always been easy. Lead has always had various problems associated with its use, but we have mastered these quite well. In recent years there has been a growing collection of evidence that lead made achievement of very low emission levels more difficult. Lead inhibits the complete combustion of hydrocarbons to some degree. It also gives rise to deposits which clog up the devices that you put on for emission control. However, the thing that really essentially broke the camel's back was the proposed new standards in the particulate field. When you look at these and back off and consider the many successful methods of control you have tried you ultimately conclude you do not see any remaining way of doing the job at all with lead in the gasoline. Hence we thought it was time that we quit trying that route and took a more promising way to go.

You see, up until that time we had not considered it necessary. But I think we have reached the point where we have done about all we can do with the vehicle with the present fuels and we see a lot more that can be done if we get a new fuel-engine relationship.

Mr. KYROS. Would unleaded fuel of at least 91 RON be generally available in the United States in 1971?

Dr. CHENEA. I do not know, honestly. Several oil companies have indicated that they will provide some of this. But I do not know whether you could say it would be generally available everywhere.

Mr. KYROS. It worries me about how you are going to take this risk because you will probably modify your car to get this kind of a car out and yet if gasoline is not readily available will not that possibly hinder your sales?

Dr. CHENEA. No, you misunderstand me, sir. The car that we are going to produce will run on 91 octane unleaded fuel. It will also run on all of the fuels in the marketplace today.

Mr. KYROS. Yes. I see that. I see leaded or unleaded fuel. But I say for it to be effective as an unleaded 91 RON car. I just wondered if fuel was generally available for it. That is all.

Dr. CHENEA. We hope it will become increasingly available. And as long as this car is in the population it is there to run on unleaded fuel when it does become available.

Mr. KYROS. We recently had testimony here by a gentleman from Universal Oil and they made claims regarding a catalytic device that they have before this committee that would be an adequate catalytic device I understood for all purposes.

Now, do you know anything about those statements that were made before this committee?

Dr. CHENEA. Let me ask Dr. Tuesday to speak to that.

Dr. TUESDAY. Yes, we are aware of that, and we have a catalytic program. We are testing a number of catalysts and we have tried to contact U.O.P.——

Mr. KYROS. Mr. Logan?

Dr. TUESDAY (continuing). To get some of this catalyst, to test ourselves, and as of this date they have been unwilling. For some reason we have not been able to get it. I do not know if it is legalistic or technical.

Mr. KYROS. What is going to happen, how could you convert all the higher compression engines which I understand will still require higher octanes numbers than 91, the cars that are out on the road, like my own car—what is going to happen to them by 1971. What are they going to run on?

Dr. CHENEA. If you have an engine that runs on 97 or 98 or a hundred octane premium fuel, it will have to continue to run on this fuel and we expect it to be available. However, by replacing the regular with 91 unleaded we would still only have two gasolines in the marketplace and all of the vehicles in the field could operate.

Mr. KYROS. You know, there have been statements that the California State Government has exercised leadership in regard to automotive emission standards. Would you agree with that, that they have gone ahead of most states?

Dr. CHENEA. I think in some regards they have, yes.

Mr. KYROS. Now, what about HEW? What comments do you have on the efforts they have made in terms of competency of personnel and leadership in seeking emission standards?

Dr. CHENEA. We have a great deal of respect for HEW and found them very cooperative in trying to solve this problem.

Mr. KYROS. I also notice that you were talking today about the durability of any anti-pollution equipment, and that this should be a criterion that should be stressed, is that right?

Dr. CHENEA. I think unless there is durable equipment in the hands of the customer we are not getting the problem solved.

Mr. KYROS. Sure. Well, what about fenders and bumpers; are you still working on durability for them?

Dr. CHENEA. We are worried about those, too.

Mr. KYROS. Doctor, I just want to say that I have been reading the full page ads of what you have been doing and frankly from your testimony this morning and your cooperative attitude I think General Motors should be highly commended for the leadership you are taking in anti-pollution devices.

Dr. CHENEA. Thank you. And I will carry that back to Mr. Roche. I am sure he will be delighted.

Mr. KYROS. Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Hastings?

Mr. HASTINGS. Thank you, Mr. Chairman. I just want to make sure I understand GM's position completely. By 1975 GM can meet the emission control standards as they have been promulgated by HEW if we have an unleaded gasoline. Is that correct?

Dr. CHENEA. We think the probability is good that we will meet them with unleaded gasoline.

Mr. HASTINGS. Your on going research would indicate that you could produce an engine that will be able to meet those standards but under no circumstances do you feel that you could meet them with leaded gasoline?

Dr. CHENEA. That is correct.

Mr. HASTINGS. Then it relates to the situation of determining that the gasoline companies are going to have to make a massive change in the product that they produce?

Dr. CHENEA. Some time in that period on some appropriate schedule.

Mr. HASTINGS. At the same time the automobile people will be in a position to have an engine that will meet the standards?

Dr. CHENEA. Right.

Mr. HASTINGS. Thank you, Mr. Chairman. I have no more questions.

Mr. JARMAN. Mr. Preyer?

Mr. PREYER. I have no questions, Mr. Chairman. Like Mr. Kyros, I find your testimony straightforward and interesting, and your attitude very commendable.

Thank you.

Mr. JARMAN. Mr. Rogers, do you have further questions?

Mr. ROGERS. Yes, Mr. Chairman. Thank you very much.

Now, when the oil people were here, they told us that they did not see much point in their going to nonleaded gasoline unless the automobile companies were ready to put on some devices that would stop the pollution emissions that might have to be, that would be brought about when they took lead out and added aromatics and so forth. Now, what is your time schedule on putting on devices that will handle the emissions problem on your cars if you get non-leaded gasoline?

Dr. CHENEA. As soon as we have either reactors or catalytic converters that we are confident will function in the hands of the public, we will want to get some experience with them actually in the hands of the public. We use California for this quite frequently to test out new devices ahead of time, and I am sure we are going to want to run a sizable sample of these in the hands of actual customers to see how they abuse them and use them.

I cannot tell you when this will be, sir, as much as I would like to. We are in the position of talking about either an exhaust reactor or a catalytic converter, whichever turns out to be most promising and offers the best bargain to the customer to get the job done. And we do not have a design at the moment that we think is final.

Mr. ROGERS. Do you have any idea when you think you will have your design final?

Dr. CHENEA. We better have them by 1975 or we are in deep trouble.

Mr. ROGERS. This is your thinking now, 1975?

Dr. CHENEA. This is correct.

Mr. ROGERS. It disturbs me that we are postponing that until 1975. In other words, here you are reducing the compression of your engines for the next year, which I commend you for. It is my understanding the oil companies are beginning to try to meet this by having a non-leaded fuel that those cars can run on which would help the problem some right there, I understand?

Dr. CHENEA. Right.

Mr. ROGERS. But to really do the most effective job in air pollution it will be necessary either to redesign your system to take out the rest of the emissions or to put on catalytic devices. I think you agree to that?

Dr. CHENEA. We do not see any other way of doing it by 1975 unless we have such devices.

Mr. ROGERS. Yes. Now, for instance, people like Logan—and I think we can see maybe through the auspices of this committee that Mr. Logan will get with you. He claims he has a device. It has been tested 50,000 miles and he says it does the work. DuPont claims they have one. Now, they are coming up to testify today. I have any number.

Now, are you actually interested in testing it or do you kind of put a stamp on it because it is not NIH, not invented here? Do you have an antipathy for using any other manufacturer as long as he would be willing to allow this on the market? What is the attitude of General Motors on this?

Dr. CHENEA. Well, I think General Motors is interested in a better idea wherever it comes from.

Mr. ROGERS. Well, that is good. I am encouraged.

Dr. CHENEA. As far as the NIH factor is concerned, I do not think we have this disease any more than anybody else. And I guess we all have a little of it.

Mr. ROGERS. Well, I can understand that, but I would hope in this instance that the NIH factor could be——

Dr. CHENEA. Minimized.

Mr. ROGERS (continuing). Modified to such a degree that any device—we are having any number of them coming forth now since this subject has been raised nationwide, and I would hope that you would be willing to test and to see what could be worked out.

Now, let me ask you this. Would you be willing to place devices on your automobiles if you can find a sufficient one, say, in 1972?

Dr. CHENEA. If we find a device that we are satisfied has the durability and will function, we are going to want to test it in the hands of the customer somewhere. I do not think we just go nationwide immediately.

Mr. ROGERS. But at least you would begin putting them on in 1972 if you could find them?

Dr. CHENEA. We certainly would be willing.

Mr. ROGERS. You would be willing to do that?

Dr. CHENEA. Absolutely.

Mr. ROGERS. Well, I commend you for that. And I hope we can start getting devices on before 1975. And where we have a technology that is capable of doing this, I think we are really going to get on top of this air pollution problem. And I commend you for your attitude today and for the testimony you have given. I think it will be most helpful.

Thank you, Mr. Chairman.

Mr. JARMAN. Are there further questions?

Well, gentlemen, we appreciate very much your being with us to testify at this important hearing.

Dr. CHENEA. Thank you, Mr. Chairman.

Mr. JARMAN. Our next witness this morning is Mr. Donald A. Jensen, Director of the Automotive Emissions Office of the Ford Motor Company.

Mr. Jensen, we welcome you before this committee.

STATEMENT OF DONALD A. JENSEN, DIRECTOR, AUTOMOTIVE EMISSIONS OFFICE, FORD MOTOR CO.

Mr. JENSEN. Mr. Chairman, members of the committee:

My name is Donald A. Jensen, and I am Director of the Automotive Emissions Office, Ford Motor Company.

I appreciate the opportunity accorded by this Committee to comment on legislation extending and amending the Clean Air Act of 1967. My statement will be directed entirely to the area of vehicle emission controls, and will focus on: H.R. 15848, introduced by Representative Harley O. Staggers and William L. Springer to carry out certain proposals contained in President Nixon's message on Environmental Quality; H.R. 12934 introduced by Representative Paul G. Rogers; and related bills.

Mr. Chairman, before commenting on the matter contained in these bills, I would like to reiterate that Ford Motor Company considers the reduction of vehicle emissions a matter of highest priority, and we are continuing our intensified efforts to accelerate the achievement of a virtually emission-free internal combustion engine.

RECORD OF PROGRESS

I would also like to stress that the story of emission reduction from our vehicles is a story of continual and accelerating progress. This is seen by the record of accomplishment which is reproduced in this statement in the form of a table.

Emission control device	(California) introduced	Percent reduction	Type reduced
Crankcase	[1] 1961	25	Hydrocarbons.
Exhaust	[2] 1966	40	Do.
		57	Carbon monoxide.
Exhaust (improvements)	1970	5	Hydrocarbons.
		14	Carbon monoxide.
Evaporation	[3] 1970	16	Hydrocarbons.

[1] Nationwide introduction in 1963. Same percentage reduction.
[2] Nationwide introduction in 1968. Same percentage reduction.
[3] Nationwide introduction in 1971. Same percentage reduction.

As you can see, starting back in 1961 there was a 25 per cent reduction in hydrocarbons from crank case controls; in 1966, an additional 40 per cent reduction in hydrocarbons; for the first time a 57 per cent reduction in carbon monoxide, and on down the line to the final increment of a 16 per cent additional reduction in hydrocarbons by evaporative emission controls in California, 1970 and 1971 nationally.

As we can see the devices already installed or about to be installed have produced a total reduction then of 86 per cent in hydrocarbon emissions and 71 per cent in carbon monoxide emissions. By 1973 there will be further reductions bringing the total for California to 90 per cent of hydrocarbons. Oxides of nitrogen, nationwide, will have been reduced by 47.5 per cent. This is a story of a step-by-step movement by the automotive industry to reduce emissions from motor vehicles.

DEVICES TO BE INSTALLED

To secure still further progress in emission reduction, including oxides of nitrogen, our research effort has developed three types of devices that show great promise. They were discussed earlier in general by General Motors. I will briefly summarize them.

EXHAUST GAS RECIRCULATION

This involves rerouting a small part of the burned exhaust gases back through the engine induction system into the cylinders. Being essentially inert, the exhaust gas can be mixed with the fuel-air intake charge in the cylinder to absorb some of the heat of combustion and produce a corresponding reduction in the formation of oxides of nitrogen.

THERMAL REACTORS

Still another way that appears to offer promise in achieving future exhaust emission standards is through use of thermal reactors. These are comparatively large tank-like devices which retain the exhaust at high temperature for a time sufficient to attain more complete combustion. An air pump is also required to provide supplemental air for the reaction process. This system requires special metals that can resist the high temperatures involved as well as devices, to guard against damage to the reactor should too much fuel be fed into it.

CATALYTIC MUFFLERS

Catalysts were first considered for vehicle emission control systems in the middle 1960s. Experiments were discouraging to a large degree due to the fact that we could not discover a catalyst with sufficient life operating on leaded fuel. We nonetheless continued our research because the catalyst offers great possibilities for emission control particularly since it could not only reduce hydrocarbon and carbon monoxide emissions but would also permit selective reductions concentrating on those compounds in the emissions which are high in reactivity. More recently, there have been encouraging results in controlling oxides of nitrogen through catalytic action.

I would anticipate that we will place the first of these new devices on our vehicles in the 1972 model year to meet the California requirement concerning oxides of nitrogen. This device will be exhaust gas recirculation, assuming we can solve various problems, one of which I will discuss shortly. This system may well be installed on our full vehicle line by the 1973 model year for nationwide distribution.

In order to meet proposed requirements for 1975, it will probably be necessary to use exhaust gas recirculation together with a thermal reactor or catalyst. We cannot, as the previous witness has indicated say with absolute certainty that such devices will meet all requirements though data gained from experiments provide some ground for encouragement. We can say that, given the present state of the art, such devices will not be able to meet the 1975 emission requirements and satisfy government specified durability requirements with fuel containing lead.

We also cannot say with any degree of precision what the cost of these devices may be when installed on a mass production basis. We are working in a whole new area of technology where there are still unsolved problems. Undoubtedly, there may be problems yet to be encountered, in research, in design, and in production. Therefore, we can only estimate within a range what the cost of meeting the proposed 1975 standards may be, and I would say, subject to later revision, that this range is roughly from $150 to $300 per vehicle.

At this point, Mr. Chairman, I would like to bring up an incidental matter not contained in the statement. It is not specifically related to legislation now under consideration but General Motors did mention their efforts to control used car emissions.

We of Ford Motor Company like to think we inspired activity in this field based on the announcement of the Chairman of our board on December 10, 1969 that we had a used car emission control system. To prove out its validity and applicability we entered into a cooperative program with the General Services Administration.

That program has now been underway for two months at Cape Kennedy on a six-day per week two-shift per day basis. It has been so successful that today we publicly announced our formal intention to obtain accreditation in California on the basis of substantial reduction of emissions, up to 50 per cent of hydrocarbons, carbon monoxide, and oxides of nitrogen and we also plan to market a kit nationally.

Our system has proven through the GSA-Ford cooperative effort to be installable in approximately one hour and our costs will be competitive at about ten dollars plus installation time.

Now back to the formal statement, Mr. Chairman, with your permission, I will talk about fuel composition.

FUEL COMPOSITION

The internal combustion engine is essentially a device in which a certain group of chemicals is introduced into the engine; the engine then transforms these chemicals into energy, heat, and by-products. The characteristics of the chemicals introduced (the gasoline) are obviously critical to the nature of the by-products produced. Modern internal combustion engines have reached their present high levels of efficiency due to the increasingly sophisticated fuels provided over the years by the petroleum industry, as well as to advances in engine design. When attention was being accorded primarily to increasing efficiency, fuels and engines were modified to gain this end. Now that attention is focused on minimizing emissions while maintaining the maximum amount of efficiency, attention must also be given to modifying both fuels and engines.

In the course of our research into methods of reducing vehicle emissions, Ford Motor Company has studied closely the effect of lead as a fuel additive. There is one primary purpose for this additive—to provide an economical basis for achieving a high octane level in gasoline. While this is a positive contribution to engine efficiency and fuel economy, our emission control research has shown that there are a number of negative effects of lead in fuel.

These negative effects involve:

(1) emission of lead itself into the atmosphere in the form of particulates;

(2) engine deposits which affect the overall level of exhaust emissions; and

(3) . . . barriers to the durability of the three separate future emission control systems I have already described.

I look at each of these negative effects in turn.

PARTICULATES

Lead in gasoline is emitted into the atmosphere as particulate matter. While we are not qualified to address ourselves to the health danger, if any, that may be posed by these particulates, we do know that these small particles in the atmosphere can serve as nucleation centers so that smog aerosols, which do hinder visibility and cause some eye irritation, can form and grow. Proposed government standards of levels of 0.1 grams per mile in 1975 and eventual control to 0.03 grams per mile for particulates have been suggested by the Department of Health, Education, and Welfare.

Although formal test procedures have not as yet been established for measuring particulates, the limited number of the tests we have conducted seems to indicate that the mass of particulates from a vehicle can be reduced substantially just by changing from leaded to nonleaded fuel.

ENGINE DEPOSITS

Studies have shown that for the engine itself, lead additives and their associated combustion chamber deposits have a significant effect on the deterioration of hydrocarbon emission control with mileage accumulation.

In a Ford research study reported to the Society of Automotive Engineers in January 1967, four vehicles were run for a distance of 24,000 miles. Two used normal leaded fuel containing approximately 3.0 milliliters of lead per gallon, and two ran on fuel containing only 0.05 milliliters of lead per gallon (considered essentially lead free).

The average difference in hydrocarbon emission levels between these two groups of cars is dramatic: 156 parts per million at the 24,000 mile point.

In 1969, at another SAE Engineering Congress, Ford again presented data on similar vehicles as used in the 1967 work. This time, however, the vehicles were operated under random, customer-type driving patterns and at a much slower rate of mileage accumulation. Again, the difference in exhaust hydrocarbon emissions between vehicles operated on leaded and unleaded fuels was significant—150 parts per million. The test results from both the 1967 and 1969 work can be submitted for the record if the Committee wishes.

(The Effect of Fuel Anti-knock Compounds and Deposits on Exhaust Emissions, Automotive Engineering Congress, Detroit, Mich., January 9–13, 1967 (J. C. Gagliardi, Ford Motor Co.), and Effects of Tetraethyl Lead Concentration on Exhaust Emissions in Customer Type Vehicle Operation, International Automotive Engineering Congress, Detroit, Mich., January 13–17, 1969 (J. C. Gagliardi, Car Systems Research, Ford Motor Co., and F. E. Ghannam, Applied Research, Ford Motor Co.), may be found in the committee files.)

Mr. Jensen. Finally, I would like to report that our research shows that lead additives have a highly deleterious effect upon the three separate control systems I described earlier.

DAMAGING EFFECTS ON NEW SYSTEMS

In Exhaust Gas Recirculation systems, lead compounds condense and lead deposits form. The build-up of such deposits quickly reduces the efficiency of the gas recirculation system. Tests with unleaded gasoline shows much slower deterioration of efficiency.

As for Thermal Reactors—these are attacked by lead compounds and by compounds of chlorine and bromine associated with lead as scavengers. The problem is particularly serious because thermal reactors require a thin alloy material to allow fast warm-up. Corrosion or building up of deposits on material of such small cross-section quickly defeats the purpose of the system. Our research shows that fuels containing lead cause far more rapid deterioration of thermal reactors than does fuel without lead.

Studies on catalysts also reveal that efficiency is adversely affected by the presence of lead in fuel. Our tests at Ford show that catalysts could be expected to deteriorate to one-half their original efficiency by 7,500 miles with leaded fuel compared to 33,000 miles for unleaded fuel. It is clear to us that catalysts cannot operate effectively over extended periods with an appreciable amount of lead in the gasoline.

I say "appreciable amounts" purposely, because we are also particularly interested in the effect of very low levels of lead—up to 0.5 grams of lead per gallon—on catalysts. This interest stems from the fact that our research shows that retaining a very small amount of lead in fuel will mitigate the potentially serious engine problems for older cars that would occur should they be required to run on totally unleaded fuels—specifically I am speaking of "valve seat pound-in." We are confident that we can design new engines to avoid this problem, but for the millions of existing engines, retention of a small amount of lead appears the best method of protecting the motorist during a transition period until other means are discovered to avoid or diminish this serious problem.

POSITION ON FUEL COMPOSITION SUMMARIZED

To summarize our position on the question of fuel composition, we believe the first step would be a move to gasoline containing no more than 0.5 grams of lead per gallon, and that it is vital to continued progress in emission control that eventually lead be removed from gasoline. As a reflection of our conviction, we have accelerated our engineering and research work to speed the day when all Ford Motor Company gasoline engines can accommodate such unleaded fuel. Furthermore, progress to date on this work has been sufficiently encouraging to enable us to announce that 90 per cent of our engines will be ready to operate effectively on nonleaded gasoline with a research octane of 90–91 at the start of the 1971 model season—or the fall of this year—with the remaining 10 per cent to be adapted to such fuel within the same model year.

To achieve this capability, there will be a reduction in compression ratios that will vary from engine to engine. I would like to stress again that retention of the 0.5 grams per gallon of lead in regular grade gasoline during the transition period is critical for the used car population.

Mr. Chairman, the Secretary of Health, Education, and Welfare recently asked for our comments on a proposal concerning lead in gasoline that he had sent to petroleum companies. In his letter, the Secretary suggested that these companies take certain steps in advance of any legislation. We agreed that the petroleum industry should move toward the production and distribution of essentially lead-free gasoline as rapidly as possible, and offered our own slightly modified version of his proposed three step formula to achieve this end.

As modified, the formula we endorsed was as follows:

1. After July 1, 1971, gasoline marketed in the United States would contain no more than 0.5 grams of lead per gallon unless its octane rating were at least 97;

2 After September 30, 1973, gasoline should be generally marketed in the United States that would contain no lead; and

3. Gasoline of 97 or greater octane levels would contain up to 4 grams per gallon of lead so long as the demand for such gasoline existed.

I would like permission to place a copy of Mr. Ford II's letter in the record in this respect.

Mr. Jarman. We will be glad to receive it.

(Mr. Ford's letter referred to follows:)

FORD MOTOR CO., *Dearborn, Mich., April 8, 1970.*

HON. ROBERT H. FINCH,
Secretary of Health, Education, and Welfare,
Washington, D.C.

DEAR MR. SECRETARY: I appreciate the opportunity to comment on the letter you have sent to petroleum companies concerning lead in gasoline.

On the basis of our research to date, we are convinced that it is vital to our ability to comply with proposed 1975 emission standards that essentially all lead be removed from gasoline prior to the start of the 1974 model year.

To emphasize our belief that prompt action must be taken, we have accelerated our engineering and research work designed to speed the day when all Ford Motor Company gasoline engines can accommodate unleaded fuel. We have been sufficiently encouraged by the progress of this engineering and research effort to announce that 90 percent of our engines will be ready to operate effectively on lead-free fuel with a research octane number range of 90–91 at the start of the 1971 model year. The remaining 10 percent of our engines will be adapted to use such fuel within the same model year. I should like to stress that retention of 0.5 grams per gallon of lead in regular grade gasoline during the transition period is critical for the used car population.

Therefore, we strongly endorse the three-step formula you propose as generally in accord with our own views on required progress toward essentially lead-free fuel.

We do, however, feel that there must continue to be "regular" grade fuel available (lower than 97 octane) with a minimum of lead such as 0.5 grams for approximately 60% of the existing car population. Therefore, some modification of your second point is required.

In addition, we have a suggestion in regard to timing. It would seem advisable that the general availability of lead-free gasoline should coincide with the introduction of 1974 model cars in the fall of 1973. The reasoning behind this view is based on the fact that California has been granted a waiver for its very stringent automobile emission requirements for the 1974 model year. Meeting the levels specified by California will certainly necessitate use of exhaust gas recirculation, and may well also involve catalysts or thermal reactors. All of these control systems are adversely affected by lead. Because of the mobility of our car population, we feel that it would be a mistake to provide for lead-free fuel in but one state in the fall of 1963. Instead, we believe it appropriate to establish *national* fuel composition standards so that California residents traveling in other states would find suitable fuel for their cars. Such an approach has additional benefits to recommend it, since it would also permit widespread use of fleet cars designed to meet proposed 1975 federal emission requirements. The type of field experience gained from fleets so equipped is essential to elimination of possible operating problems before controls are mass produced for the general population in the fall of 1974.

Your proposed third step we consider to be of particular significance, since it recognizes a major practical obstacle to removing all leaded gasoline from the market. This is related to the point we made earlier which asked for retention of a regular grade of gasoline with a minimum amount of lead.

There are now well over 80 million automobiles in the United States. Even with a scrappage rate exceeding 6 million annually, it will be some time before attrition absorbs these vehicles. In addition, to modify 80 million cars so that they would not be damaged by totally lead-free and/or lower octane gasoline would be a monumetal task, even if there was not already unprecedented pressure upon the capacity of the automotive service industry.

In view of these facts, and in light of the serious lead-time problem involved, we concur fully with your view that the petroleum industry should move toward the production and distribution of essentially lead-free gasoline as rapidly as possible.

If, in your judgment and the judgment of Congress, legislation is requlred, provision should be made to accommodate the rapidly developing nature of the emission control science. Perhaps this could be accomplished by delegating to your office the power to limit fuel ingredients harmful to health or pollution controls.

In summary, we support your hope that petroleum companies will undertake early and voluntary action to make unleaded fuel available. And we favor the formula you have suggested to gain that end, modified as follows:

1. After July 1, 1971, gasoline marketed in the United States would contain no more than 0.5 grams per gallon of lead unless its octane rating were at least 97;

2. After September 30, 1973, gasoline should be generally marketed in the United States which would contain no lead;

3. Gasoline of 97 or greater octane levels would contain up to 4 grams per gallon of lead so long as the demand for such gasoline existed.

Best Regards,

HENRY FORD II
Chairman of the Board.

Mr. JENSEN. I realize that achieving this timetable will place cost burdens upon the petroleum industry. I have seen a variety of estimates concerning the cost to the petroleum industry. Some are quite high. But many of these high estimates seem to be based on the premise that gasoline at present octane levels would be necessary without lead. However, some petroleum industry leaders have looked objectively and realistically at the problem and have said that there is a practical and comparatively inexpensive solution, if octane levels are reduced, as we suggest. I believe that others who take the same approach to the problem will arrive at the same conclusion.

COMMENT ON H.R. 15848

I would like to turn to specific provisions of H.R. 15848. While we agree in principle with both the purpose and proposed means for achieving the purposes contained in this bill, we do have several suggestions to make on some features of the measure which, as they now stand, could possibly cause problems of implementation.

One such suggestion relates to the provision of section 206 concerning the testing and certification of new vehicles in respect to emission control compliance. Certification through testing of prototype vehicles would become mandatory for automobile manufacturers. As far as we know, every automobile manufacturer has utilized this optional certification procedure since the advent of controls in 1968, so this in itself is not a major innovation. In addition, there is a proposed requirement that representative samples be tested as they come off the production line. We endorse this concept.

However, there is one point to which we do object, primarily because it would cause considerable hardship and disruption without any contervailing benefit. I refer to the provision that would call into effect the full range of "prohibited acts" should the Secretary of Health, Education, and Welfare revoke an automobile manufacturer's Certificate of Compliance if he finds that a representative sample does not meet the standards. One such prohibited act, as listed in Section 203 of the Clean Air Act, necessitates that "manufacture for sale" cease upon revocation of certification. If this means that release for sale should cease pending a remedy for whatever defects might be found, we certainly agree. However, the mechanism whereby release for sale is halted should be left to the discretion of the Secretary pending determination of the validity of the representative sample data used to establish noncompliance of the vehicle. But if this prohibited act is construed as meaning that production should cease, then we feel obligated to point out that halting production would not aid compliance. For production must continue in order to assure that corrective actions are made within a normal production environment. Therefore, I would urge there be a change in the language of H.R. 15848 to remove this ambiguity and give discretionary power to the Secretary, in order to assure uninterrupted manufacture after possible revocation of the certificate, but to prohibit sale or delivery to ultimate consumers of vehicles so manufactured until they meet the standards.

H.R. 15848 would also modify section 210 of the Clean Air Act to give to the Secretary of Health, Education, and Welfare the authority to establish regulations on fuel composition and to control fuel additives.

I believe I have already indicated how vital the removal of lead is to continued progress in emission reduction. Thus, we would favor a provision in H.R. 15848 which would authorize the Sectreary to limit fuel ingredients harmful to health or pollution controls.

Mr. Chairman, this concludes my prepared statement. I welcome whatever questions you may wish to ask.

Mr. JARMAN. Thank you very much, Mr. Jensen.

I know the committee has been interested in your comment about the used car technique and the kit to which you refer.

You mentioned test results from both the 1967 and 1969 work and your offering them for the record if the committee wishes. I am sure that it will be helpful for the committee to have this as a part of the record. (See note on p. 787.)

Mr. JENSEN. Thank you, Mr. Chairman.

Mr. JARMAN. The Chair has no questions at this time.

Mr. Rogers?

Mr. ROGERS. Thank you, Mr. Chairman.

Mr. Jensen, I think your statement is good. I hope that we can make a little more progress on the time element on the devices. Now, as I understand from your testimony, you anticipate that you can begin putting some new devices on your vehicles in the 1972 model year?

Mr. JENSEN. Yes, sir.

Mr. ROGERS. Now, that would be concerned with nitrogen oxides?

Mr. JENSEN. Yes, sir.

Mr. ROGERS. Now, is that the exhaust gas recirculation system?

Mr. JENSEN. Yes. It is the one that uses the inert gases to cool down the combustion process so you reduce oxides of nitrogen.

Mr. ROGERS. Now, is there any reason why you could not begin putting on catalytic mufflers by 1972 if we get nonleaded gasoline?

Mr. JENSEN. Our intent at Ford, Mr. Rogers, as announced by the Chairman of our Board in respect to availability of this kind of equipment is to work with the Government like we have on the GSA project with used cars. Or we would work with fleets of private owners to immediately get these into the marketplace, really for valuable field experience.

For example, we have been running exhaust gas recirculation systems for a year or two with taxicab fleets to determine what would be the most functional as far as the general public is concerned. Certainly we would move as fast as possible primarily working with Government to achieve what you have indicated.

Mr. ROGERS. Well, that is encouraging. Now, as I understand it, you have cars that presently have these devices on them, do you not?

Mr. JENSEN. Yes.

Mr. ROGERS. The catalytic muffler as well as the exhaust——

Mr. JENSEN. Yes. We have 24 what we call "concept cars" in three varying packages. On December 9 this committee, as you know, saw some of these—or at least two of the general packages. These are being run for the durability and gradually we are eliminating the problems so we come up with the solution that looks like the most pliable.

Mr. ROGERS. So it is possible then that you could begin even putting catalytic mufflers on in 1972?

Mr. JENSEN. With this fleet use that I have indicated, yes, sir.

Mr. ROGERS. Well, that is very encouraging because this is what we want to see done, and General Motors has indicated they are going to try to see what they can do by 1972, which will increase the whole approach on getting rid of air pollution. And if we are expecting oil companies to come in, and this has been one of their criticisms. I am sure you know, saying don't go forcing us to have nonleaded gasoline if the auto companies are not going to put on their devices that will handle the reduction of the emissions, and I think they had a legitimate point but now this is encouraging to me. If you say you are ready to put some devices on and certainly even the catalytic muffler possibly by 1972, this accelerates the time when we need the nonleaded gas on the market.

Mr. JENSEN. Yes, sir.

Mr. ROGERS. So I think that is very encouraging.

Now, let me ask you, you talked about leaded gasoline. What parts of the automobile does lead affect adversely? For instance, I understand on plugs, spark plugs?

Mr. JENSEN. Yes. There have been tests that indicate that spark plugs can have much longer durability without lead in the fuel. Today, we have not talked specifically about that because we are addressing ourselves primarily to emissions.

Mr. ROGERS. I understand.

Mr. JENSEN. If you are talking about engine deposits that caused increased hydrocarbons out the tailpipe and the durability of the component parts that I have mentioned such as the reactor, the exhaust gas recirculation. This then is what we have discussed as our primary concern.

Mr. ROGERS. Well, now, Amoco told us when they testified here that in their tests with their gasoline nonleaded the life of the spark plug was almost doubled which means a saving to the car owner. Now, I would like to find out if you know and have any knowledge, and you may not have it with you, but you could submit it for the record, of the various items of an automobile, various parts that are adversely affected by lead and whose life would be changed which would be a savings to the individual car owner if lead were not in the gasoline. See what I mean?

Mr. JENSEN. Yes, Mr. Rogers. We do have some studies on this, technical studies. I will be glad to submit those for the record.

Mr. ROGERS. And I would like to know what the cost is, what would be the average cost for having plugs installed, what would be the average labor cost, the average cost of the plug itself, the cost of the muffler, what it costs in labor, because this could be a savings in effect to the owner, individual owner.

(The following technical papers were submitted for the use of the committee and may be found in the committee's files: "Can All Engine Wear Be Trapped in a Can"? by Robert J. Pocock, Ford Motor Co., for presentation at the SAE National West Coast Meeting—August 11–13, 1952; "Aviation Spark Plug Fouling—Part I—

Its Control by Tricresyl Phosphate" excerpts from paper by V. E. Yust, Shell Oil Co., and E. A. Droegemueller, Pratt & Whitney Aircraft—January 17, 1952; and "Cylinder Bore and Piston Ring Wear" by J. C. Gagliardi—1969.)

Mr. ROGERS. Do you agree that the present tests the way they are done by HEW are in effect ineffective and really a fraud on the public on taking four prototypes?

Mr. JENSEN. I would not—I think they are much more valid than that. Now, the reason I say that is the original intent was to run 50,000 miles in accelerated fashion and try to duplicate what happened in the general populace. For that reason the 50,000 miles are not run in accordance with manufacturer's specifications. They are run with only one tune-up in that entire 50,000-mile period for the domestic car, so there was an attempt made to duplicate what happened in the real world.

The fact is that it did not develop appropriate results because of the accelerated nature of the running—you run 50,000 miles in 3 months. This is not the real world. But there was a——

Mr. ROGERS. No, but it makes a lot of difference when you start up a car from a cold start and it is continually running, doesn't it?

Mr. JENSEN. That is correct.

Mr. ROGERS. Great effect. So it is not a very realistic test, is it?

Mr. JENSEN. That is right, but I want to indicate that it was the most realistic testing procedure that was available when these control systems first went on cars because you did not have field experience and that was not brought out in the previous testimony.

Mr. ROGERS. Well, I understand this, but as far as the public is concerned three of your cars can be over the standard on the four prototypes, one can be under and they average it.

Mr. JENSEN. That is true theoretically. Actually, they all meet.

Mr. ROGERS. Sure. Well, now, that is not what I understand and certainly not in the hands of the owner.

Mr. JENSEN. No, not all of them meet in the hands of the owner.

Mr. ROGERS. Not by any means.

Mr. JENSEN. The average does meet, I think.

Mr. ROGERS. Well, I am not sure that the studies have shown that, not according to the facts we have.

Mr. JENSEN. The HEW studies show that the Ford vehicles that were tested in that rental fleet based on the information that was given to us do meet standards. I dropped out of calculations the 289 cubic inch displacement engine—there were 45 of these tested and we have not made that engine for two years. If you consider the engines which we are now making, the 302 C.I.D. and the 390 C.I.D.—then the average levels were 266 parts per million of hydrocarbon and 1.13 per cent carbon monoxide.

Mr. ROGERS. As an average?

Mr. JENSEN. Yes. sir.

Mr. ROGERS. This is what you are talking about?

Mr. JENSEN. Yes, sir.

Mr. ROGERS. Well, I am saying this is not much testing when you take four, three-quarters of the cars may be over and one may be under, but if you average it all together that is a very effective test.

Now, California does not do that, does it?

Mr. JENSEN. California requires——

Mr. ROGERS. Every car to meet the prototypes.

Mr. JENSEN. The prototypes for each displacement should meet——

Mr. ROGERS. Why, sure. So it is a fallacy to say that the certification by HEW is saying that every car in effect meets it. It does not even say the prototypes meet it. It simply says the average does. And I realize that is not your doing, but I am saying you would agree that this type of testing ought to be changed, would you not, and we ought to have a random sampling, say, of a daily run on the production line.

Mr. JENSEN. Yes. The statement indicated we would favor that.

Mr. ROGERS. Yes, I understood that and I just wanted to make that clear, and I certainly would agree with that.

Are you checking any other inventor's products? Do you suffer from the NIH—as we call it—syndrome, not: invented here?

Mr. JENSEN. I am prejudiced, obviously, but I think we do take in almost anything we can get our hands on that looks promising. DuPont was mentioned earlier. Yesterday I had our engineers review the contacts with duPont since February of 1967. There have been 30 contacts with duPont as we have attempted to resolve durability difficulty with their device. The reactors they gave us initially that we ordered back in 1968 failed at 1290 miles. We have worked with them—

Mr. ROGERS. Was this leaded or nonleaded gas?

Mr. JENSEN. Leaded gas.

Mr. ROGERS. With leaded?

Mr. JENSEN. Yes, sir.

Mr. ROGERS. Do they claim it works with leaded?

Mr. JENSEN. Pardon me?

Mr. ROGERS. They claim it works with leaded gas, is that correct?

Mr. JENSEN. Yes, sir. We have worked with them in redesigning one of our engines—this 302 C.I.D. engine. This is our "bread-and-butter" engine, and on April 2nd they announced after quite a bit of time that we could pick up the vehicle equipped with reactors.

So we have worked with them for three years with their reactors. We also have our own reactors running on test vehicles.

Mr. ROGERS. Yes.

Mr. JENSEN. But if they have got a better idea we want it. UOP was also mentioned.

Mr. ROGERS. That is Logan's company?

Mr. JENSEN. Yes, sir; Mr. Logan is president of Universal Oil Products. We have been running their catalyst for some time. We have not yet received this latest one they have announced. We are supposed to have it within the next week.

Mr. ROGERS. So you are going into the testing of it?

Mr. JENSEN. We are running it right along. One thing we found in the catalysts we have run is that we have to—this includes UOP or any other kind of catalyst because we have numerous companies supplying them, that we do have to have provision for a bypass system. When there are unusual operating conditions and tremendous heat or long speed high temperature during the test we bypass so we do not burn up the catalyst. And I think, Mr. Rogers, you saw this bypass system on one of the prototype cars, and other members of the committee did, when it was here on December the 9th.

Mr. ROGERS. Yes. Now, let me ask you this. What devices are placed on the California cars from your production that are not placed on the others?

Mr. JENSEN. These are exactly the same as indicated by the previous testimony. The only one that is different in this point in time is the evaporative emission control system.

Mr. ROGERS. What would be required next year? Is there any difference?

Mr. JENSEN. The evaporative control emission systems will of course go on nationally, so the only difference in 1971 will be additional spark retard for California vehicles as compared to the rest of the country.

Mr. ROGERS. And for 1972?

Mr. JENSEN. 1972, California will again go ahead with these exhaust gas recirculation systems I mentioned.

Mr. ROGERS. Yes.

Mr. JENSEN. Which then will go nationwide in 1973. There is about a year lag on these things.

Mr. ROGERS. Yes. Now, suppose HEW set the standards the same as California. What would happen?

Mr. JENSEN. We obviously would meet them. I think that there has been in the past some proven advantages to the consumer in permitting large scale types of field tests in California. They are in a situation where they have snow and mountains and deserts with Death Valley types of high temperatures. Thus, you get a variety that is typical of almost any place in the country.

So a year's field experience has proven beneficial to the people of the United States in this respect.

Mr. ROGERS. As I understand it, all of your automobiles will be able to take 91 octane gas by the end of 1971?

Mr. JENSEN. Yes, sir.

Mr. ROGERS. Well, I commend you, and I think we are making some progress, and I am particularly pleased that you are going to start putting some devices on in 1972, if possible, even the catalytic muffler.

Mr. JENSEN. Yes.

Mr. ROGERS. Thank you.

Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Nelsen?

Mr. NELSEN. Thank you, Mr. Chairman.

Quite frequently when a situation develops as is now true with environment, it is quite the thing to talk about so we go off on many tangents as to what to do about it. But getting back to the design of a motor, your statement indicates that the leaded fuel, if we get a motor designed to take and accommodate nonleaded gasoline, this would be the greatest contribution we could make. Isn't that about what it sums up to?

Mr. JENSEN. The contribution for 1971 up through 1973 reduces only hydrocarbons. The major contribution comes when you can put on these sophisticated systems we discussed for 1974 and 1975 models.

Mr. NELSEN. Yes. Now, the thing I was getting at, if you get a low compression engine and it is mechanically in good shape and you have a nonlead fuel, that combination is a major contribution to a better situation, is it not?

Mr. JENSEN. We think so, yes, sir.

Mr. NELSEN. Yes. Now, what about—I noticed in your statement that some of the older model cars if you moved to a nonleaded fuel, that there would be motor damage because the motor is designed for leaded fuel and vice versa for the motor that is designed for a nonleaded fuel, and a low compression engine, the leaded fuel might have some damaging effect on valves and what have you. Is that a fair statement?

Mr. JENSEN. No, sir. The 1971 models that Ford makes will be designed from a metallurgy point of view to operate on nonleaded fuel but they also can operate no leaded fuel with no damage and no problem.

Mr. NELSEN. I see.

Mr. JENSEN. The older cars particularly at sustained high speed operation—for example, if you are pulling a trailer up a mountain grade for six or seven miles—may be in trouble. If that car was designed for lead in the fuel, the metallurgy that went into the valve system was such that we think you will have problems. They are run on totally lead-free gasoline.

There have been claims you can make an adjustment. We feel that with the shortages in the present automotive service industry and the limited number of competent mechanics and service facilities that are available which have been the subject of discussion here in Washington D.C. on many occasions, that it is impractical to consider that you could re-do 80 million cars to adjust to this. That is why we recommended that, at least for the regular fuel cars, there be 0.5 gram of lead in the fuel for the foreseeable future to prevent this problem.

Mr. NELSEN. What I am most concerned about is the mechanical condition of an automobile. You see some of them on the street with the smoke coming out behind, the rings are worn out and they are pumping oil. This is perhaps one of the most damaging situations. A nice new automobile that is mechnically in shape does not have the emissions there are from an old jalopy that is not in good repair.

I want to be sure that we are not moving in the direction of forcing on the public a lot of gadgets when really the problem is motor design and fuel design. That is our major point. Sometimes we go off on a tangent moving in a direction where gadgetry becomes the thing to do rather than to get at some of the basic things.

I want to thank you for your statement. Having worked with motors on the farm, it is something that is quite familiar to me. I think you recall I mentioned how leaded gasoline would hang up the valves on a motor not designed for leaded gasoline, and of course this could happen in the transition of fuels where you would go in the reverse.

Mr. JARMAN. Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

Mr. Jensen, you have heard some of the testimony here and I would like to ask you this question. Do you agree that the content of an automobile exhaust is a product of an entire system starting with the fuel and running through all the component parts from the gas tank to the exhaust in the automobile?

Mr. JENSEN. Yes, sir.

Mr. SATTERFIELD. Now, as I read the last page of your report, page 11, you seem to be taking the position that you feel it is proper for the Secretary of HEW to limit the ingredients in fuel and thus I assume that you agree with that provision in the pending bill that would give HEW the right to include standards to control the content of fuel?

Mr. JENSEN. There is a great difference, I think, in what I am saying and I think what you have just said. We are not saying that the Dept. of HEW should have the responsibility for determining total fuel composition. We have said specifically the Secretary should limit fuel ingredients which are harmful to health or pollution controls.

This is the same authority he now has over the hardware that we put on our vehicles.

Mr. SATTERFIELD. Well, then, you do not agree with Section 210 of the Clean Air Act as it is contained in H.R. 15848, then?

Mr. JENSEN. Our statement is specifically what we are recommending because it does agree with the authority the Dept. of H.E.W. has in controlling our hardware. For example, if we put a catalyst on that would put out powder which was unhealthy or if our cars emitted some ingredient into the atmosphere that would be unhealthy, it is incumbent on the Secretary of H.E.W. to limit the kind of unit we put on the vehicle.

Mr. SATTERFIELD. In a purely dormant state and not as subjected to internal combustion in an engine, is there anything harmful to health about fuel? Doesn't it become harmful only after it passes through your engine?

Mr. JENSEN. As I have indicated in the statement, I am just not qualified at all to speak about the health effects of lead. And I have tried not to address myself to that particular situation because I do not know.

Mr. SATTERFIELD. I think when we are talking about this proposed section 210 this is precisely what we are talking about and maybe other additives to fuel.

Mr. JENSEN. And that is why I have indicated that our recommendation would be to authorize the Secretary to limit the fuel ingredients if he finds them to be harmful to health.

Mr. SATTERFIELD. In their natural state or connected with an automobile exhaust?

Mr. JENSEN. There are air quality standards and criteria now in various stages of development, which would indicate appropriate levels both in the natural state and how they come out of the exhaust. At least I have seen this in the press.

Mr. SATTERFIELD. Now, today HEW has the right to set the standards as to what comes out of the exhaust, is that correct?

Mr. JENSEN. Yes, sir.

Mr. SATTERFIELD. What they are asking for in the new bill is to move forward into the system and set standards about what fuel goes into that system. Do you disagree with this?

Mr. JENSEN. I have tried to differentiate—if you determine the total fuel composition, there are hundreds of things that could be legislated or regulated. If you talk about this kind of a limitation that speaks to fuel ingredients harmful to health or pollution controls, I think it ties down that broad authority to something that is specifically indicated for the public welfare.

Mr. SATTERFIELD. Well, don't they have that authority already under FDA and other provisions?

Mr. JENSEN. Well, if they do, I do not know about it.

Mr. SATTERFIELD. Well, regardless of how you interpret it, I still would like to get an answer from you as to whether or not you think HEW ought to set the standards of fuel in terms of the content of fuel that is going to go into an automobile engine.

Mr. JENSEN. I think they certainly should if it is harmful to health or if it is going to affect pollution controls.

Mr. SATTERFIELD. All right. If you are going to say that, isn't it proper then to contend that they ought to have the same power over the whole system and not just part of it?

Mr. JENSEN. I am saying, Mr. Satterfield, that they do. If we tried to put out catalyst that would be harmful to health or pollution, they would stop it immediately. They would have to. I think they now have that authority over our hardware.

Mr. SATTERFIELD. How would you differentiate?

Mr. JENSEN. I think—pardon me.

Mr. SATTERFIELD. Excuse me. Go ahead.

Mr. JENSEN. I was going to say these are all the things that we have talked about, the special emissions that come out of the exhaust. The Department of HEW have told us or will tell us what is permissible. There is a provision in the Federal Register that indicates we are limted in what we can put on in the way of hardware in this respect.

Mr. SATTERFIELD. And in terms of components of the automobile that you are talking about and your catalysts and so on, you have got to relate the emissions that come out of the exhaust in terms dealing with health, do you not?

Mr. JENSEN. Yes, sir.

Mr. SATTERFIELD. Then why shouldn't you give to HEW the same control over the components of the engine and the exhaust system and in the carburation that it is contended they should have over the fuel itself, if it is harmful to health?

Mr. JENSEN. And I am saying they have that now. My interpretation is that they do.

Mr. SATTERFIELD. I do not quite think so, sir. Since the testimony we heard earlier, at least in so far as the last gentleman is concerned who seemed to have established the fact that his company would not object to this kind of control by HEW. What I am trying to find out is whether Ford Motor Company would object to the kind of control under HEW that would give them the right to come in and set the standards as to what component parts you must have in your automotive engine as well as its design all the way from the gas tank through the exhaust?

Mr. JENSEN. I would object unless it was related to the same language I have used here. If it was related to a health effect I think they should have that authority.

Mr. SATTERFIELD. Isn't this what we are talking about?

Mr. JENSEN. Yes. That is what the provision has been. For example, when the catalyst was first considered—this goes back in history—in California the Public Health Department sat down with the manufacturers and talked about the hardware, the ingredients. Two doctors were called in, the company doctor and the Public Health Department doctor, to decide whether there was any kind of health affect in the hardware that was contemplated for installation on automobiles. And I think this was an appropriate function. I think it applies now to the hardware we as companies put on our automobiles.

Mr. SATTERFIELD. I frankly say I am not real clear on what you are trying to say and I realize I do not understand all the components that go into gasoline. But let us take lead as an example. This is what we have been talking about. Lead is not per se unhealthy. It depends on how it is used and what is done with it, isn't that correct?

Mr. JENSEN. I have heard testimony, public testimony on both points and I have sat and listened because I—

Mr. SATTERFIELD. Take a solid chunk of lead sitting in the room, there is nothing unhealthy about that, is there?

Mr. JENSEN. That is correct.

Mr. SATTERFIELD. So what we are really talking about if we are going to say that there are unhealthy things in fuel, is what is in the end product of that fuel after you burn it, isn't that correct?

Mr. JENSEN. Yes, sir.

Mr. SATTERFIELD. And yet you say that you do not object to control by HEW over the content of the fuel and its relation to what happens to that fuel when it is being burned?

Mr. JENSEN. That is correct.

Mr. SATTERFIELD. Then I come back to my original proposition. It would seem to me that if we are going to control one part of an entire system you have got to control all of it to the same degree. And I think this would include controlling the content of your engines and specifying how they are to be built.

Now, I'd like to know if you do or you do not agree that this would be proper?

Mr. JENSEN. I think it is proper, Mr. Satterfield, if it is related to engine components and operation that would be harmful, that would result in a harmful health situation.

Mr. SATTERFIELD. You do not feel that the standards which are set today in terms of what emissions are acceptable furnish us sufficient control and initiative to solve all of these problems?

Mr. JENSEN. I am sorry?

Mr. SATTERFIELD. Do you feel that the existing standards which establish the acceptable content of exhaust are sufficient today to the end that industry itself can determine how to meet those starndards, or do you think it is really necessary that they move forward in the system, forward of the exhaust to set standards?

Mr. JENSEN. I think it is essential to meet the standards that have been discussed for the future, that they have broader authority than they now have.

Mr. SATTERFIELD. Thank you, sir.

Mr. JARMAN. Mr. Kyros?

Mr. KYROS. Just one or two questions, Mr. Chairman, thank you.

Mr. Jensen, on page 10 of your testimony, sir, you point out this problem that would occur under the Clean Air Act of 1963, as amended in 1967, whereby if one car was tested and found not to meet the standard, the entire manufacturing process would have to stop; is that correct?

Mr. JENSEN. Yes, sir.

Mr. KYROS. Now, what language do you have to submit to the committee and where, in what section would it go that would correct what you see as—and I would readily agree with you—a very serious problem, and I do not think it was ever intended to be this way?

Mr. JENSEN. I just checked with my attorney who is from the Office of General Counsel of Ford and he indicates that they are working on some language and will submit it with the permission of the chairman.

(The proposed language referred to was not available to the committee at the time of printing.)

Mr. KYROS. Yes. Because I would agree if it indeed is as you explain it, and I do not see where it should not be so from a literal reading of the statute, it is a problem that should be cleaned up.

Now, let me call your attention to the bottom of page 10 and to page 11. You say that in Section 210 of the Clear Air Act it provides that the Secretary of HEW has indeed regulations on fuel composition to control fuel additives. But when you say:

> We favor a provision in the statute which would authorize the Secretary to limit fuel ingredients harmful to health and pollution controls.

What I do not understand is, I thought that that is already in there, that he has the power to establish standards respecting the composition of the chemical and physical properties of any fuel or fuel additives. Why should anything in addition be given to him?

Mr. JENSEN. Well, what we were trying to do is actually suggest a limitation on what the Secretary prescribed. And I admit you have to read the whole section and the key sentence appears as indicated in the previous question at the top of page 11.

This would limit the total authority to control fuel composition within the specified authority as indicated in the last sentence on the top of page 11.

Mr. KYROS. Well, on page 11, Mr. Jensen, you just say, "I believe I have already indicated how vital the removal of lead is to continued progress in emission reduction."

And this just merely conforms with the power that he is going to have anyway.

Mr. JENSEN. Yes.

Mr. KYROS. And then you say, "Thus, we would favor a provision which would authorize the Secretary to limit fuel ingredients harmful to health or pollution control."

That is exactly what he has got. So I do not understand what do you want when you bring this section up?

Mr. JENSEN. If you control fuel composition, you could be specifying octane number, you could be specifying all kinds of additives that now go into our competitive system.

Mr. KYROS. Yes, sir.

Mr. JENSEN. This is the kind of thing at least at Ford Motor Company we did not think was necessary for a government regulatory agency to control.

Mr. KYROS. You did not say that here, though.

Mr. JENSEN. But what we did think was that there should be authority to limit those ingredients and only those ingredients which are harmful to health or to pollution control, only those rather than the total spectrum. So we tried to limit what we said on the bottom of page 10. That is what we sought to suggest.

Mr. KYOS. Yes, but getting back to page 6 again, because I am interested in any language that you desire to submit which might amend this, on page 6 it says the harmful properties of any fuel or fuel additive are those which would endanger public health or welfare or impair the performance of any emission control device.

So it has that caveat there. It already has your qualification about health. Is there some specific language that you want to submit for section 210, subsection (b) on page 6 as it appears in the statute?

Mr. JENSEN. The representative from our office of general counsel has indicated we would submit some language to the committee with the chairman's permission.

Mr. JARMAN. We would be very happy to receive it, and place it in the record at this point.

Mr. JENSEN. Yes, sir.

(The proposed language referred to was not available to the committee at the time of printing.)

Mr. KYROS. Thank you, Mr. Jensen. And again I want to join the other gentlemen here in commending you on the progress that you have made because we have seen the escalation of the rehetoric on pollution. I think everybody is getting kind of queasy about breathing but I think that men like yourself and the people in General Motors, here this morning, are trying to do the job and I admire the cooperation and the things you have done here and I commend you for it.

Mr. JENSEN. Thank you.

Mr. JARMAN. Mr. Jensen, we appreciate your excellent testimony this morning. I join the members of our subcommittee in a tribute to you gentlemen in the automobile industry who are gearing quickly and effectively to try and meet this tremendous responsibility to the public.

We, on the committee, are very familiar with the recent statements of Henry Ford, speaking for your company, that the company considers the reduction of vehicle emissions a matter of the highest priority, and that the company is continuing its intensified efforts to accelerate the achievement of a virtually emission-free internal combustion engine. And I do not know of any contribution that is more needed in the overall health conditions of our Nation, and it is good to see in your listing on page 2 of changes that have been brought about in this field since 1961, in trying to meet this responsibility and cure this problem. We appreciate your testifying before this committee.

Mr. JENSEN. Thank you, Mr. Chairman.

Mr. JARMAN. Let the Chair announce that the House is now in session. We have asked permission to continue the hearings at 2 o'clock, at which time the subcommittee will hear witnesses from Chrysler, American Motors, the DuPont Co., and the Air Transport Association.

Thank you, gentlemen.

The committee will stand in recess until 2 p.m. this afternoon.

(Whereupon, at 12:30 p.m. the subcommittee recessed, to reconvene at 2 p.m. on the same day.)

AFTER RECESS

(The committee reconvened at 2 p.m., Hon. John Jarman, chairman, presiding.)

Mr. JARMAN. The subcommittee will please be in order.

As we continue the hearings this afternoon, our next witness is Mr. Sydney L. Terry, vice president of engineering of the Chrysler Corp. Mr. Terry, we are glad to have you with us and will you please introduce your associate?

STATEMENT OF SYDNEY L. TERRY, VICE PRESIDENT–ENGINEERING, CHRYSLER CORP.; ACCOMPANIED BY CHARLES HEINEN, CHIEF ENGINEER IN CHARGE OF EMISSION CONTROL AND CHEMICAL DEVELOPMENT

Mr. TERRY. Thank you very much, Mr. Chairman. My name is Sydney L. Terry, I am vice president of engineering for Chrysler Corp. My associate is Mr. Charles Heinen, who is chief engineer in charge of emission control and chemical development.

I appreciate this opportunity accorded by this committee to comment on legislation extending to and amending the Clean Air Act of 1967.

On March 4 and 5 the Air Resources Board of the State of California held a special meeting to discuss the question of future fuels. Mr. L. B. Bornhauser, our vice president—product planning and development staff, presented a statement which summarized the Chrysler Corp. position with regard to some of the subjects of interest to this Committee today.

It is brief; therefore with your permission, I would like to read his statement updated for today's meeting and then supplement it.

"Chrysler has a major effort directed toward the successful development of advanced emission control systems, including catalysts, to meet the 1975 California and Federal air quality standards.

"On the basis of current technical knowledge as well as our research to date, it appears that completely lead-free gasoline would be absolutely essential for approaches involving catalysts.

"I would like to point out, however, that we do not as yet have a satisfactory catalyst system. Neither have we determined finally what equipment will be used by Chrysler to meet the 1975 emission standards.

"If we find that catalysts are to be used, two needs become obvious:

"1. An assurance that clear gasoline"—that is, unleaded—"would be available in sufficient volume countrywide to handle the potential needs of the 1975 and later vehicles.

"2. A necessity that these catalytic-equipped vehicles could never be fueled with leaded gasoline. One way to prevent this would be to design a different gas station pump nozzle for lead-free fuel. It would only fit an appropriately designed automobile gas tank filler tube.

"Actually, irrespective of the lead-free fuel objective, we would favor the design of new equipment for the interface between the gas station pump and the vehicle. An important reason is the need to eliminate the hydrocarbon pollution problem that exists at gasoline stations today. Hydrocarbons are emitted into the atmosphere from fumes and spillage when gasoline is pumped into vehicle gas tanks.

"As the new cars produced by the industry become more emission-free of hydrocarbons, the quantities of hydrocarbons emitted at the filling stations have become increasingly more significant in the atmosphere. The volume of these emissions may be as high as the additional reductions obtainable by the 1975 standards."

That is as compared to the 1974 standards.

"At this meeting today and tomorrow, we hope to hear more about the availability of clear fuel—when, where, and how much.

We would like to know the characteristics of this fuel, particularly octane levels which will determine future engine standards and their fuel consumption and performance.

"We fully understand and appreciate the problems involved when proceeding toward making additional improvements in air quality. Governmental actions can be most helpful in the areas to be resolved that require joint planning between the petroleum and automotive industries.

"Governmental agencies such as the Air Resources Board can take the initiative to accelerate the process by which both industries can meet and arrive at solutions to the types of fuels and hardware to be used in the future.

"It is important that increased costs to the consumers be minimized in the decisions and changes to be made. In this respect, unnecessary hurry and major dislocations to either or both industries should be avoided because, whatever is done, the customer will ultimately pay the bill.

"During the period between now and 1975, we stress that there should be a considerable degree of flexibility in considering an orderly transition to the availability and use of unleaded gasoline.

"In the meantime, we understand that greater volumes of regular-grade lead-free fuel may become available next year.

"To position ourselves and our car owners for this possibility, Chrysler has already scheduled the engineering moves to make most of our 1971 engines capable of using these fuels.

"Starting with the 1971 models, we plan to have about 93 percent of Chrysler Corporation engines rated to run on regular-grade fuel—leaded or unleaded. Currently, about 70 percent of our engines already have this capability.

"We encourage the oil companies to maintain the present octane levels with the unleaded gasoline so that the customer can retain the benefits of fuel economy and good vehicle performance. Given a reasonable lead time, however, Chrysler can adapt its engines to use whatever fuels become available."

That is the end of Mr. Bornhauser's statement.

To continue: It is difficult to comment precisely on all of the implications of the notice of proposed rule making which incorporated the proposed 1975 standards because the method for testing particulates, the test cycle, the instrumentation for the other components and method for evaluating flow were not described.

On the reasonable assumption that when these are finally released they will not make our task any easier, it becomes evident to us that there are only a limited number of approaches that have any possibility for meeting the proposed standards by 1975.

Specifically for hydrocarbons and CO the exhaust reactor or an oxidation catalyst can be considered. For oxides of nitrogen a combination of exhaust recirculation and engine modifications or a catalyst may be used. Finally, it appears to us that a particulate trap of some as yet unspecified design will be required, since our preliminary investigations indicate that any combination of the above controls will tend to increase particulates from the present levels regardless of whether the operation involves leaded or unleaded fuels.

None of the devices described above are at a stage where they can be considered practical engineering solutions for sure by 1975, but it is very clear to us that any of the approaches that appear as possibilities will cost the customer about $200 per car over present controls, most of which will also have to be oontinued. In addition, all of the approaches will result in additional costs for fuel.

Our position on the lead content of fuels is based on two paramount considerations:

1. Since at present we do not know what approaches, if any, will prove to be practical by 1975 we want to keep all of our engineering options open.

2. In view of the major cost increases involved in meeting the proposed 1975 standards we would like to have the maximum flexibility in order to keep the total costs of vehicle purchase and operation to a minimum.

From the above, it becomes evident that our primary desire for a lead free fuel is that it be generally available by 1975. We would like to arrive at this point in an orderly, economic manner.

In the first flush of enthusiasm for the immediate, complete removal of lead from at least one grade, a number of benefits were cited, including cleaner engines. lower corrosion, and some unspecified health and weather gains. All of these have been known and studied extensively for many years, and the general conclusion has been that the economic advantages of lead in fuel outweighed other possible gains.

Further discussion has brought out the fact that such a move would result in severe economic hardship to certain producers, and that the cost of the unleaded grade would be substantially in excess of the present regular. In addition, the octane would be reduced, and there was no assurance that valve train lubricating function of lead would be provided by other fuel additives. While suitable engine adjustments can be made to compensate for the octane loss, and the use of premium fuel for sustained high speed or heavy duty operation would provide the necessary lubrication, the practical problem of modifying engines is a major one.

As a result of both economic and engineering considerations a more gradual approach to the removal of lead from at least one grade seems to be developing. As a first step it has been widely recommended that some value below 1 gram per gallon or 1.0 milliliter/gallon be used and that this be reduced in steps until a lead-free grade with suitable additives to provide necessary engine lubrication and adequate octane level is generally available in 1975. We wholeheartedly endorse this approach. We believe it will meet all of the real needs at a minimum cost to our customers. We believe we have taken the first step in cooperating with such a move by the changes which we are making in our 1971 engines and we will certainly do whatever is necessary to cooperate in the future.

Thank you for the opportunity of appearing before you.

Mr. JARMAN. Mr. Terry, we appreciate this concise, succinct contribution to our hearings.

Mr. Rogers?

Mr. ROGERS. Thank you. Mr. Terry, I join the Chairman. We certainly appreciate your being here and giving the statement. It impresses me, however, that you are not very much impressed with the problem at least not to the extent that the two other manufacturers who have testified today are. I would say that your testimony should be characterized as one of, well, if it is necessary we will do it but we really don't see much point or anything to it. Is this about correct?

Mr. TERRY. Mr. Congressman, I think we feel that putting lead in gasoline in order to get octane is the most efficient way to get higher octane, the least expensive, and higher octane engines give us better efficiency and economy, and therefore we feel that to the customer, lead in gasoline is a good buy.

Mr. ROGERS. What about air pollution for the customer and those who are not customers? Do you feel any responsibility there or do you think——

Mr. TERRY. We certainly——

Mr. ROGERS. Do you think this is a problem?

Mr. TERRY. We certainly do, Mr. Congressman, but up until this point we don't believe that anybody has said or maintained that lead as such in the atmosphere is a harmful pollutant. At any rate, this is not the basis that we understand that it is being proposed to remove the lead from gasoline. We do feel very strongly that lead should be removed from gasoline if and when we have to use catalysts in order to meet the air pollution requirements on automobiles.

Mr. ROGERS. In other words, you are not aware of any problem with lead particulates in the air?

Mr. TERRY. I am not aware that it is a health problem.

Mr. ROGERS. Not at all?

Mr. TERRY. No, sir. There have been——

Mr. ROGERS. Have you done any research on that?

Mr. TERRY. Well, there were some studies that were made back in the 30s when there was a scare on pollution in the air and it was very thoroughly investigated and at that time lead came off as being not a provable harmful-to-health pollutant.

Mr. ROGERS. You haven't read the testimony of the previous witnesses to this committee, I assume?

Mr. TERRY. I heard some of it but my feeling from what I did hear was that they were not claiming that lead was a harmful-to-health pollutant in the air, either. What I got out of their testimony was that they were not taking—not recommending that lead be removed for that reason.

Mr. ROGERS. You didn't read the testimony about if you breath in lead particulates, how it decreases the ability of the lung to throw off the pollutants that come in from the air?

Mr. TERRY. No, sir. I didn't read that.

Mr. ROGERS. Well, I would recommend that you might like to read this testimony and also the scientific group from New York which has also found lead to be a problem in the air and the scientific group that has also found it to be maintained and suspended in the air and it is coming down on Maine through the rain and polluting some of the lakes and also the fact that it is a deflecting screen from the sun.

Mr. TERRY. Could I let Mr. Heinen comment on that? He is——

Mr. ROGERS. Yes.

Mr. HEINEN. Can I comment on several of these points? Let me start in by commenting on the health effects. Last Thursday I believe it was, Mr. Middleton, who presumably is our top authority, appeared before the Society of Automotive Engineers and the question was asked, is there any effect on health of lead? And he said, after some circumlocution, the question of lead on health is moot. The World Health Organization has indicated that there is no particular effect. Any number of other technical people that I could cite you have come to that conclusion. We are just engineers. We are in the automotive business but all the expert testimony seems to say that. Now, if the prime experts in this business don't feel that way, we hardly feel that we can come forward and say to you get rid of it on a health effect. What we are saying is that if we have a catalyst there is no question. Our tests show that when we are saying get rid of it under those conditions.

Now, as to the weather thing you are presumably talking about Dr. Shaffer's——

Mr. ROGERS. Yes, Mr. Shaffer.

Mr. HEINEN (continued). Conclusions and that is kind of an interesting one, too. Presumably that is supposed to cut down on the rainfall in the cities and yet the average rainfall hasn't changed one darn bit over the cities.

So the point that we are driving at, and I am glad you brought along this line of questioning, the point that I am driving at here is that there is a great deal of doubt about side effects and we think that the main concentration should be on whether it will or will not help us reduce pollutants for 1975. And that is the point that we are trying to make here.

Mr. ROGERS. Yes, well——

Mr. HEINEN. And this is the evidence facing us.

Now, if there are other experts that disagree with Dr. Middleton and the World Health Organization and a bunch of others, I happened to chair a meeting at the APCA on this general subject and the conclusion of that meeting was that the—the Air Pollution Control Association—the conclusion was that there was no proved effect nor indicated effects and, as a matter of fact, listening to both sides of the argument it certainly looked to me like the ones who said there was no effect came out way ahead. Anyway, the conclusion is that. So if there is a health reason, we pass. We are not giving that as any reason for removing it. That is what we are trying to say.

Mr. ROGERS. Yes. Well, I am somewhat disturbed that you imply there is no health effect.

Mr. HEINEN. Of course——

Mr. ROGERS. You know that lead ingested is certainly a poison.

Mr. HEINEN. I know that pretty near anything ingested is a poison in the wrong quantities.

Mr. ROGERS. Well, in rather small quantities. From lead paint, I am sure you know of.

Mr. HEINEN. Sir, all we can do is to quote you that these various authorities say that in the air it is not present in quantities that cause any effect. If you wish——

Mr. ROGERS. In some areas this may be true, but now perhaps you didn't read Dr. Barry Commoner's testimony either.

Mr. HEINEN. I didn't read Dr. Barry Commoner's testimony.

Mr. ROGERS. I would commend that to your reading.

Mr. HEINEN. I have read a lot of Dr. Barry Commoner's.

Let me assure you all he is doing is quoting some of the same testimony that we——

Mr. ROGERS. I think that is a rather presumptuous statement for you to make when you haven't read any of them.

Mr. HEINEN. I say some of his other information, yes.

Mr. ROGERS. He is somewhat recognized as an authority on ecology and I thought you were an engineer.

Mr. HEINEN. Mr. Rogers, why do you insist that we use health for one of the reasons for removing lead? All we are saying is we have not seen that as a reason, we are not citing ourselves as authorities.

Mr. ROGERS. I am saying that you should use anything——

Mr. HEINEN. Okay.

Mr. ROGERS. (continuing). Because it appears to me that you don't want to use anything as a ground for making any change and this is what is disturbing to me in line with the testimony of the automobile producers.

Now, I notice another statement that concerns me saying that these devices, you don't know any devices that can be put on before 1975. You don't know whether you are going to be able to do anything. You talked about a gas recirculation, exhaust recirculation, when you have just heard Ford—maybe you were not here. Ford has just testified that they have such a device that will be placed on their automobiles for 1972. And you don't seem to know anything about any of these devices.

Mr. HEINEN. Oh, heavens.

Mr. TERRY. Mr. Rogers, we have in the statement that exhaust reactors and catalysts or some combination thereof will we think be required to meet the 1975 standards.

Mr. ROGERS. Now, let me read you your statement. "None of the devices described above," including exhaust recirculation "are at a stage where they can—where they are considered practical engineering solutions by 1975."

Mr. HEINEN. The combination——

Mr. ROGERS. Now, this seems to me to be a complete overlooking of the technical knowledge. How much of your budget is devoted——

Mr. HEINEN. Mr. Rogers, may we——

Mr. ROGERS. Let me ask this question.

Mr. HEINEN. It will save you the trouble.

Mr. ROGERS. Let me ask what I want. How much of your budget is devoted to research on air pollution devices?

Mr. TERRY. I believe we have sent the committee something on that. It is something in the neighborhood of $6 million as I recall which is——

Mr. ROGERS. What are your overall sales?

Mr. TERRY. Which is—our overall sales?

Mr. ROGERS. Yes.

Mr. TERRY. Our overall sales are something in the order of $6 billion.

Mr. ROGERS. Six what?

Mr. TERRY. $6 billion.

Mr. ROGERS. $6 billion and you are spending $6 million.

Mr. TERRY. You should have asked us what our overall profits were.

Mr. ROGERS. Well, I presume this wouldn't necessarily be a profit item. It would be an expense.

Mr. TERRY. Well, it is an expense.

Mr. ROGERS. So I would think you would take expense out of sales.

Mr. TERRY. Let's put it this way. It is a very substantial proportion of our total engineering and development effort and it is getting to be an increasingly large percentage.

Mr. ROGERS. Well, I am not very impressed with $6 million out of $6 billion for devices. I can understand it with the evident priority that you are placing on this from your testimony.

Now, I want to be fair and I think you wanted to say something.

Mr. HEINEN. Yes. I wish you would let me put this in. The recirculation device by itself is not what we were talking about. The recirculation device will be in our 1972 cars just like everybody else's. It is the combination of devices that make a total system that we are talking about. Talking about just having recirculation devices is no problem. The two things that are difficult are the catalysts and the exhaust reactors which are the only two approaches available and if anybody is ahead of that in this country, I would like to see them.

We were in the exhaust reactor business before anybody, along with Thompson-Ramo-Wooldridge. We know the problems. There are many and severe problems outstanding.

Now, we are just trying to get that engineering picture across to you. As for the catalysts, we have looked at hundreds of catalysts literally. We have seen hundreds of promises on the catalysts literally. These catalysts haven't made it.

Now, this is just—these are just engineering facts, Representative Rogers, and believe me, we are working just as hard as we know how on this problem and always have been.

Mr. ROGERS. Well, have you investigated the Logan catalyst?

Mr. HEINEN. We have been trying to obtain a catalyst for nearly a year. We have a car over there. We have investigated a number of their catalysts in the past and just for the record, they have not reached the performance that was claimed for them, and we have a car which as I say we are waiting for momentarily but we have been waiting momentarily for some time to get it to look at it.

Mr. ROGERS. Because the Logan people have claimed that they do have a catalyst that has been tested 50,000 miles that will accomplish this.

Mr. HEINEN. Just not to be unkind toward them, but just let me point out that this same claim has been made for previous catalysts and the claim has not stood up.

Mr. ROGERS. What about du Pont? Have you worked with du Pont at all?

Mr. HEINEN. The du Pont people when they started their reactor work called us because I had written a thermodynamic paper on the principle of reactors and because we and Thompson-Ramo-Wooldrige were the only ones in the country that had a major program going on this subject. We have worked constantly and consistently with them and I have stated publicly that they have an excellent reactor and we have, about 15 different versions, alterations of that particular reactor scheme working in our test laboratories.

Mr. ROGERS. Well, they claim it is all ready to go and they will give it to everybody that wants it. I just heard their ads last night.

Mr. HEINEN. They have given it. All right, now, fine. Now we get into the field and we still have some durability problems under some particular conditions. If you wish, we will enter into the record a picture of some of the failures.

(The information requested was not available to the committee at the time of printing.)

Mr. ROGERS. Well, I think too it would be good for the record to show. If the company is making claims that are not so, the public ought to know it.

Mr. HEINEN. No, it isn't quite that clear, Mr. Rogers. They have run 50,000 miles. It is just that there are a number of operating conditions, severe operating conditions, that have to be considered.

For example, back in the early days when I was running one of these reactors out in California, this must have been 1962, or something of that order. It was a ceramic catalyst. Our recorder ran up to 2600° F., and it stopped right there because this was the maximum recording temperature.

Now, 2600° closely approaches the melting point of many materials. To substantiate this, I have seen, under special operating conditions in the laboratory, metal run out on the floor. These are conditions that can be achieved under particular driving conditions.

The Du Pont reactor has not been tested under these conditions. Neither has anybody else's to the best of my knowledge. Now, the Du Pont people are here. They may wish to——

Mr. ROGERS. I am sure they are going to testify.

Mr. HEINEN (continuing). Supplement the information but I think you will find that they will agree that they have not tested them under all the conditions that a motorist is going to encounter in the field and we can't very well ask a motorist to acceptsomething that will not take care of all the contingencies.

Mr. ROGERS. Well, as a matter of fact, you are doing that all the time, are you not, when you get a certification from HEW on the emissions because you are not testing all of the conditions as a driver would have them in those tests.

Mr. HEINEN. We are testing——

Mr. ROGERS. Is that correct?

Mr. HEINEN. We are testing all of the conditions, sir, let me assure you. We are testing under the most difficult operating conditions you can find. They are not part of the official Federal test, this is true.

Mr. ROGERS. I am saying your certification does not cover all of the——

Mr. HEINEN. No. The certification doesn't cover all of these exceptional conditions, this is true, and it doesn't need to. What you want to know is the average conditons under field test.

Mr. ROGERS. California doesn't agree to that.

Mr. HEINEN. Yes, they do.

Mr. ROGERS. They make you test—each of your protypes in California must reach the standards.

Mr. HEINEN. Each prototype must reach the standard, that is correct.

Now not each——

Mr. ROGERS. That is not true in the federal testing, is it?

Mr. HEINEN. Well, that would be no great chore. They all meet anyway.

Mr. ROGERS. You know——

Mr. HEINEN. That is almost playing with words. The problem is what happens in the field later on. The numbers aren't all that different, let me assure you.

Mr. ROGERS. The numbers in the field show they are not even meeting the standards there.

Mr. HEINEN. On the average, at 12,000 miles, the Chrysler cars, that were presented to you, were running 240 and 1.03 and the other one was 203 and 1.4 something, out of a required value of 275 and 1.5. Mind you, that is above either one of them, and——

Mr. ROGERS. Above either one of what?

Mr. HEINEN. One point five.

Mr. ROGERS. It is above what?

Mr. HEINEN. The 275 and 1.5 required is above the numbers that were for the Chrysler cars and as far as the industry weighted average the numbers there, as I recall it, were 270 and 1.4 which is not a great margin but is within the requirement of 275 and 1.5.

Now, I am not saying that we aren't constantly trying to do bettei but this certainly—the numbers that were submitted, and we just saw a couple of days ago, I mean in detail certainly do not indicate a failure on either Chrysler's part or for that matter the industry's part to meet what was expected. Now I will freely admit to you if you extrapolate to 50,000 miles there is a good probability at least it might drop——

Mr. ROGERS. Sure. I think it is pretty obvious to come to all of us and say this is all meeting the standards and it simply is not so yet.

Now, I am also concerned with the fact that you don't indicate you will do much before 1975.

Mr. TERRY. No. That is not true. We can and do expect to do a great deal before 1975.

Mr. ROGERS. What specifically?

Mr. TERRY. Well, we have—we will put evaporative emission control in for all cars in the United States next year and then we will begin —we will control oxides of nitrogen also with exhaust gas recirculation, but first we will use a change in the timing set up for oxides of nitrogen, but we will be meeting standards increasingly more severe up to 1975.

But since you bring up 1975, I would like to make a point that I feel very strongly about myself and that is that the difference between the 1974 California standards and the 1975 California and federal standards is almost a factor of two. However, at that point in time, it is going from 90 percent elimination to 95 percent elimination which as you see is a factor of two as far as how much you are taking out.

Now, I feel very strongly and our engineers and technical people feel that this is—this may be considerably past the point of diminishing returns as far as what it actually is going to give to the country in reduced air pollution.

Just to illustrate the point of diminishing returns, the actual amount of pollutants, unburned hydrocarbons and carbon monoxide that we will be eliminating with this last step which we feel will cost $200 to the customer or in excess of that, is just about the same amount of pollution that was eliminated with the first step that we took with a little $3 or $4 crank case breather which vented the crank case.

In other words, that eliminated more pollution with that little inexpensive step. We did more with a $3 or $4 item than we are going to do with the $200 item when you go from 1974 to 1975.

Now, I just use this to say that with the kind of outlay it is going to cost when we start putting catalysts and exhaust reactors or some combination of them as added gadgets on the car, that we should be very sure that we are actually going to get our money's worth out of that in terms of cleaner air in the country.

Mr. ROGERS. Is this with leaded or non-leaded gasoline?

Mr. TERRY. If we go the step from 1974 to 1975 with the kind of hardware that we will need, it will have to be unleaded gasoline. If we go up to 1975, we can meet all requirements with leaded or unleaded gasoline. That is not a factor.

Mr. ROGERS. So any further cleaning up, then, would have to require the nonleaded gas.

Mr. TERRY. Yes, sir.

Mr. ROGERS. Now, let me ask you this. Suppose the federal standards were the same as the California standards coming up in 1972, 1973, 1974. Can you meet those?

Mr. TERRY. We could. We would prefer to try them out for a year in California because of a lesser—less of a load. In other words, when we go into one of these relatively big changes we would like to be able to run them on a smaller number of cars first and get the experience, find out what our problems are, and then be able to correct those problems before we go into production on a nation-wide basis the following year. But if it came to a question of whether we could or not, certainly if we can do it in California, and it becomes law that we have to do it in the rest of the country, we will do it for country-wide.

Mr. ROGERS. What about an average days random selection for testing? Do you think this should be done from your production line?

Mr. TERRY. We are doing that right now, Congressman.

Mr. ROGERS. I mean the government to do this testing.

Mr. TERRY. We don't feel that it is necessary or desirable to have government inspectors in the plant doing our inspecting for us. It is our job to see that we produce cars that meet the necessary——

Mr. ROGERS. Suppose——

Mr. TERRY (continuing). Requirements.

Mr. ROGERS. The auditors have the right of inspection.

Mr. TERRY. We are perfectly happy to have the government people come in and audit. As a matter of fact, we have invited HEW people into our plants. We are checking about 15,000 cars a year now just pulled off the line in three different plants and we have got an automatic set up for testing them on a representative cycle which is a ten minute cycle which we have done a lot of testing in order to correlate that cycle with the California cycle which is much more time consuming so that we are quite sure that we have got good correlation.

Mr. ROGERS. And what about the lifting of the certification if that daily test run doesn't meet the standards?

Mr. TERRY. Lifting of the certification?

Mr. ROGERS. Yes.

Mr. TERRY. Well, we——

Mr. ROGERS. Do you have any objection?

Mr. TERRY. Certainly we would.

Mr. ROGERS. Not put into interstate commerce those cars which did not meet——

Mr. TERRY. Certainly we would object to that. The whole principle, and here if I may, a little discussion about the way we read the standard and the intent and what we are actually doing and the averaging principle so-called might be in order.

What we are measuring, if you think about it, sir, is we are measuring a very small amount of so-called pollution out of a very large volume of gas and from a technical standpoint that is a difficult thing to do. And so not only are we measuring one part in ten thousand which is about what we are looking for for this unburned hydrocarbons and it is made up of 60 or 70 different kinds of unburned hydrocarbons, but also trying to measure that to a tolerance which is plus or minus 10 percent. Then we say don't be over any or if you are over, do you think we should withdraw your permission to manufacture cars.

No. This thing that we are doing, and the reason we are checking 10,000 or 15,000 and the reason we are sure we are within what we think the law requires is that we do take averages very carefully of all of the engines that are measured and we count them off and we average them up and they all average below the pollution standards.

Mr. ROGERS. Why shouldn't all of your cars meet this standard?

Mr. TERRY. We could do it in such a way that all the cars would meet the standards if the standards were set 30 or 40 percent higher. It is just a matter of how you want to do it and because of the measuring problems and the tolerances involved and the technical side of it as I have said, we have thought—and we helped the authorities write these regulations, we helped them by developing measuring equipment for them and by working with them and showing them all we knew about it—we felt that the best way to actually get control was to keep a running average over a big enough sample to make sure that what we were putting out was actually going to end up on the average with this kind of a pollution level and we are doing that and we are meeting that pollution level.

Mr. JARMAN. A rollcall is in progress in the House and the subcommittee will stand in recess until completion of the rollcall.

(Short recess.)

Mr. JARMAN. The subcommittee will please be in order as we continue the hearings with Mr. Terry and Mr. Heinen.

Mr. Rogers?

Mr. ROGERS. I just will conclude by saying, Mr. Chairman, that the impression I get is that Chrysler is really quite insensitive to the problem, certainly in comparison with the treatment of the matter by General Motors and Ford in their testimony today, and I would think that this is why we have to have legislation and I shall support legislation to do something about the air pollution problem.

Mr. TERRY. Well, I would certainly hate to leave the impression with you that Chrysler is insensitive to the problem of air pollution. We are very sensitive to the problem of air pollution and we are working on it very hard.

Perhaps it would be correct to say that Chrysler does not feel the immediate necessity for getting lead out of gasoline, nor does

Chrysler feel that it is necessarily the best thing to do from an economic or an air pollution point of view for 1971 or 1972. That is our opinion.

And it is our opinion after assessing the situation in total as accurately as we are able to do so.

Mr. ROGERS. I understand that, and I am just surprised as to your very different approach compared to the two largest producers in the field.

Mr. TERRY. That is what makes horse races.

Mr. ROGERS. I understand, and they are the largest.

Mr. TERRY. That is right.

Mr. ROGERS. Thank you.

Mr. JARMAN. Mr. Satterfield.

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I have listened to your testimony and one thing I think you were talking about, but it was interrupted, seemed to get to the problem that apparently confronts the automobile industry, and I would like to know whether or not my understanding is correct. That is one of the most serious problems that confront you is how to develop the means to meet the standards and keep pace with the standards as they are promulgated. Is that a correct statement?

Mr. TERRY. That is very true, yes.

Mr. SATTERFIELD. That is the overall tenor of your statement which I interpret to mean that until full development is achieved the proper course of action would be to keep all of your options open rather than to foreclose certain of them by determining to follow the catalytic device route.

Mr. TERRY. That is correct.

Mr. SATTERFIELD. I am a little concerned that a lot of these hearings have focused on the question of taking lead out of gasoline. I realize that there may be many additives in gasoline, and, of course, if we start down this road we don't really know where we may end up. What disturbs me more than anything else is that if we focus our attention on this one point, we would be saying that we are accepting the catalytic device as the means of cleaning up automobile exhaust pollution and no other. Is that correct?

Mr. TERRY. That I think is the only real compelling reason for wanting to take the lead out of gasoline in our opinion, yes, sir.

Mr. SATTERFIELD. Well, in that process wouldn't we run a very great risk of limiting the prospect of research and development in other devices which in the long run might be more economical and more efficient as new developments in connection with them come forward?

Mr. TERRY. Yes, sir. I believe that is so.

Mr. SATTERFIELD. Frankly I can't really understand why the objectives that you say we must seek can't be achieved by the employment of exhaust standards such as we have today.

Mr. TERRY. There is one suggestion I might make. It is true that if we don't have the proper ingredients in the fuel, or let's say if we have an improper ingredient in the fuel, it can make it impossible for us to develop hardware to digest exhaust gas the way we would like to do and we acknowledge that lead is making it practically impossible for us to digest the exhaust gas the way we would like to do using the catalysts. But it seems to me it would be possible to put a performance standard on fuels that wouldn't necessarily mention lead but would simply say that fuel must be of such a quality that it does not corrode or make useless certain catalysts which could be specified as a performance standard when and if it becomes necessary to use catalysts to meet pollution standards.

I would favor the minimum amount of regulation as to what specifically can go in fuel and what can't in order to encourage research and development in the fuel industry to do a better job of providing fuels that will do a better job for the automobiles.

Mr. SATTERFIELD. Well, if we were to place in the hands of HEW efficient enforcement provisions against the whole system, and I include fuels in this, why would it not be proper to establish, as you say, the performance standards but establish them at the pollutant point, the tail end of the exhaust, and then leave it to industry to solve its problems as to how they are to be met. It would seem to me the question of the economics of the solution as well as what devices will work and won't work and how long they will work and all these other things would more or less dictate the development of a whole system without the need for government to come in and do it for us.

Mr. TERRY. I think we would agree with that position.

Mr. SATTERFIELD. I have one other question. We were talking about lead-free gasoline and I think somewhere in your statement here you said that you thought it would be necessary at least for a period of time to provide high octane leaded gasoline even if we went to non-leaded gasolines of 91 octane. Is that what you meant?

Mr. TERRY. No, what we meant to say and the way we feel about that point is this. It is an advantage to the customer to have engines that run on as high an octane gasoline as possible. We can translate higher octane number directly into better performance and better fuel economy. The higher the octane the better the performance, the better the fuel economy. So what we are saying is that is is desirable with what ever kind of fuels we get in the future, whether they are leaded or unleaded, to have the octane number as high as possible in line with what it costs to make it that, and so the economics should determine how high the octane number should be, just as it has in the past.

Mr. SATTERFIELD. Well, don't we get into the situation that if you are going to raise the octane and not use lead, that we will have to employ aromatics might be more harmful from a pollutant standpoint than lead.

Mr. TERRY. That is possible but it is not necessarily true. You don't have to have more aromatics in from a scientific point of view although from an easy refining standpoint it is easier to get to the higher octane number with these higher aromatics. So really the economics should govern and there is plenty of competition in the petroleum industry to get economics to do the governing of whatever the situation turns out to be.

We know we are going to have regular gasoline so-called of about 94 octane for the cars already on the road and we know we are going to have octane gasoline of about 99 or a hundred for the premium fuel cars that are already on the road regardless of what happens as to leaded and unleaded.

Now, it seems to me arbitary to say we ought to pick 91 octane. That is not right either because it might very well—it could shake out at 94 octane which is what it is now for regular gasoline. That might be the better solution. So our position really is that it should not be regulated any more than absolutely necessary to get to the overall lower pollution levels that we are all looking for, not to regulate with specifics such as taking the lead out of gasoline. Rather, by performance.

Mr. SATTERFIELD. Actually that kind of regulation could come about through action in the industry. If you have got to meet the performance you are going to come up with the devices and the fuel that will do it, regardless.

Mr. TERRY. Yes, sir.

Mr. SATTERFIELD. Thank you.

Mr. JARMAN. Mr. Kyros.

Mr. KYROS. Thank you, Mr. Chairman. Mr. Terry, granting all you say, I don't see anything in your statement concerning the legislation before us, H.R. 15848. Am I to take it you are in complete approval with all portions of this bill as proposed?

Mr. TERRY. No. We are not taking a specific position on the bill as to whether we are for it or against it except that we feel that the specific regulation of specific additives in the fuel, if that is what is intended, and that is the way I read it, we would not be for. If we—we feel that there is already the power invested in HEW to limit the use of compounds that are found to be a health hazard. We think they already have that. When something is discovered to be a hazard to health that they already have the authority to limit usage of such materials. And so we would favor a much more general and performance oriented limitation as far as fuel is concerned.

Mr. KYROS. Well, let me suggest this to you. In an area where we have to be quite precise to write a new clean air bill, your statement right now is incredibly vague for a representative of so large a company. So let's go back over the bill in detail and see what you agree and disagree with.

Mr. TERRY. Could we submit to you a statement of language that we would recommend?

Mr. KYROS. You mean you are not prepared at this hearing today to tell us what you agree or disagree with in this bill?

Mr. TERRY. No, sir, I am not prepared.

Mr. KYROS. Well, if the Chairman wants it, you certainly can submit anything you want to.

Mr. JARMAN. Yes. The committee will be glad to receive any recommendations that Chrysler would make.

(The following letter and attachment were received for the record:)

CHRYSLER CORP.,
Detroit, Mich., April 15, 1970.

Hon. JOHN JARMAN,
House of Representatives,
Washington, D.C.

DEAR CONGRESSMAN JARMAN: During the course of yesterday's hearing before the Subcommittee on Public Health and Welfare on the subject of non-leaded gasoline, we were asked for our comments on other aspects of H.R. 15848, a bill to extend and amend the Clean Air Act of 1967. These comments are attached.

We appreciate the opportunity we had to appear before your subcommittee.

Very truly yours,

SIDNEY TERRY,
Vice President—Engineering.

CLEAN AIR ACT AS IT WOULD BE AMENDED BY
H. R. 15848 WITH OUR SUGGESTED CHANGES

Section 203

The Bill in Sections 3 (e) of the Clean Air Act by deleting the stricken material and adding the underlined material further revision of the Bill and Section 203 is suggested by deletions as indicated by //// and addition of "it" enclosed in [].

(a) The following acts and the causing thereof are prohibited:

(i) in the case of a manufacturer of new motor vehicles or new motor vehicle engines for distribution in commerce, ~~the manufacture for sale,~~ the sale,. or the offering for sale, or introduction or delivery for introduction into commerce, or (in the case of any person, except as provided by regulation of the Secretary), the importation into the ~~United States for sale or resale,~~ United States of any new motor vehicle or new motor vehicle engine, manufactured after the effective date of regulations under this title which are applicable to such vehicle or engine unless [it] ~~it is in conformity with~~ ~~such manufacture~~ is covered by a certificate of comformity issued (and in effect) under regulations prescribed under this title (except as provided in subsection (b) of this section).

It is suggested that the Bill be changed so as to add the following to subsection (b) of Section 203 of the Clean Air Act.

"(4) Any new motor vehicle or new motor vehicle engine manufactured after the effective date of regulations under this title which are applicable to such vehicle or engine shall not be subject to the provisions of subsection (a), if it is covered by a Certificate of Conformity issued (and in effect) under regulations prescribed under this title or is in conformity with applicable standards issued under Section 202 (a)."

Section 206

The Bill in Section 3 proposes addition of subsections (c) (1) and (c) (2) to Section 206 of the Clean Air Act. It is suggested that the Bill be changed by deleting the stricken material and adding the underlined material so as to add a new paragraph (c) to Section 206 of the Clean Air Act as follows: (c) (1) ~~In order to determine whether new motor vehicles or new motor vehicle engines being manufactured by a manufacturer are in fact constructed in all material respects substantially the same as the test vehicle or engine.~~ The Secretary is authorized to prescribe appropriate test procedures and to test a statistically representative sample of ~~such vehicles or engines~~ new motor vehicles or new motor vehicle engines being manufactured by a manufacturer on a non-discriminatory basis. Such tests may be conducted by the Secretary directly or, in accordance with conditions specified by the Secretary, by the manufacturer.

(c) (2) If, based on such tests ~~conducted on a representative sample of such vehicles or engines~~, the Secretary has reason to believe ~~determines~~ that ~~such~~ vehicles or engines covered by a certificate of conformity do not substantially conform with the regulations in effect on the date the Certificate of Conformity was issued, he shall immediately notify the manufacturer of such findings and shall include all information upon which the preliminary findings are based. If the Secretary determines on the record after opportunity has been afforded for a hearing at which sworn testimony is taken, the parties thereto are accorded opportunity for cross-examination, and a full and complete record of the evidence adduced is prepared and certified, that such substantial non-conformity exists and that it contributes to or is likely to cause or contribute to, air pollution which endangers the health and welfare of any persons he may revoke such certificate in whole or in part depending upon the extent of the nonconformity and so notify the manufacturer. Such revocation shall apply ~~in the case~~ to the sale, but not the manufacture of any new motor vehicles or new motor vehicle engines manufactured after the effective date of such notification. ~~and until such time as the Secretary finds that vehicles and engines being manufactured by the manufacturer do conform to such regulations.~~ The Secretary's order of revocation shall become effective ten days after receipt of such order by the manufacturer, unless the manufacturer requests court review under paragraph (c) (3) of this section. Upon request from a manufacturer for reinstatement of the Certificate of Conformity, the Secretary shall proceed promptly to rule upon such request

(c) (3) (a) In case of actual controversy as to the revocation of a Certificate of Conformity under Section 206 (c) (2) of this section, a manufacturer may at any time prior to ten days after service of such order file a petition with the United States Court of Appeals in a circuit wherein such manufacturer does business, for a judicial review of such order. A copy of the petition shall be forthwith transmitted by the clerk of the court to the Secretary of other officer designated by him for that purpose. The Secretary thereupon shall certify and file in the court the record of the proceedings on which the Secretary based his order, as provided in Section 2112 of Title 28, United States Code.

(c) (3) (b) If the manufacturer applies to the court for leave to adduce additional evidence, and shows to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for tbe failure to adduce such evidence in the proceeding before the Secretary, the court may order such additional evidence (and evidence in rebuttal thereof) to be taken before the Secretary, and to be adduced upon tbe bearing, in such manner and upon such terms and conditions as to the court may seem proper. The Secretary may modify his findings as to the facts, or make new findings, by reason of the additional evidence so taken, and he sball file such modified or new findings, and his recommendation, if any, for tbe modification or setting aside of his original order, with tbe return of such additional evidence.

(c) (3) (c) Upon the filing of the petition referred to in paragrapb (a) of this subsection, the court shall have jurisdiction to affirm the order, or to set it aside, temporarily or permanently. If tbe order of the Secretary refused to reinstate tbe Certificate of Conformity and such order is not in accordance with law, the court shall by its judgment order the Secretary to take action, with respect to such revocation, in accordance with law. The findings of the Secretary as to the facts, if supported by substantial evidence, shall be conclusive.

(c) (3) (d) The judgment of the court affirming or setting aside, in whole or in part, any such order of the Secretary sball be final, subject to review by the Supreme Court of the United States by certiorari or certification as provided in section 1254 of Title 28, United States Code.

(c) (3) (e) Any action instituted under this subsection shall survive notwithstanding any change in the person occupying the office of Secretary or any vacancy in such office.

(c) (3) (f) The remedies provided for in this subsection shall be in addition to and not in substitution for any other remedies provided by law.

(c) (4) In the case of new motor vehicles or engines manufactured outside the United States, provisions of paragraphs (c) (1), (2) and (3) of this section, applicable to a "manufacturer", sball apply to the importer of such vehicles or engines.

Comments Regarding Suggested Revisions

Section 203

H. R. 15848, Section 3 (e) would amend Section 203 (a) (1) of the Clean Air Act to prohibit the manufacture for sale, the sale, the offering for sale or the introduction into commerce of any new motor vehicle or engine which is not covered by a certificate of conformity issued by the Secretary and in effect at the time of manufacture.

This would give the Secretary the authority to revoke the certification previously granted, which would shut down assembly lines and halt manufacture of vehicles or engines covered by the certificate until it is reinstated. This would work intolerable hardships on the manufacturer. The objective of the bill is to prohibit the operation of new vehicles which fail to meet emission control levels required by regulation. This can be effectively accomplished by prohibiting the sale of vehicles. It is not necessary to prohibit the manufacture of new vehicles if their sale is prohibited. Accordingly we propose that H. R. 15848 apply only to "the sale" and not to "the manufacture" of new vehicles.

Our suggestion would add a new section, Section 203 (b) (4) to the Clean Air Act. This section would allow manufacturers to produce vehicles, after revocation of certification, but only to sell those vehicles which meet the required standards. The effect of this proposed subsection would not lessen the protection afforded the public against non-conforming vehicles. Thus, the objective of protecting the public would be satisfied without causing unnecessary hardship to the manufacturer or to the public.

Section 206

H. R. 15848, Section 3 (c) (2) authorizes the Secretary on the basis of tests conducted on a "representative sample"* to revoke a certificate of conformity. Presumably, failure of a "representative sample" taken from one plant would cause all plants manufacturing the model in question to shut down. However, the cause of the failure to conform may be isolated in a single plant. No useful purpose will be served by closing down plants which are producing identical vehicle models which comply.

We propose two substantial changes to Section 3 (c) (1) of H. R. 15848 that would become Section 206 (c) (1) of the Clean Air Act. First, under the existing language of the bill the Secretary could employ a test other than the certification test upon which to base his order to revoke the manufacturer's certificate of conformity. But, there is no provision for defining what this alternate test might be. Therefore, we suggest the addition of language authorizing the Secretary to "prescribe appropriate test procedures", in order that the manufacturer will not be faced with the possibility of shut-down on the basis of an undefined test of which the manufacturer had no prior knowledge.

In addition, we suggest that the term "a statistically representative

---

*We recommend the term "statistically representative sample".

sample" be substituted for the term "representative sample" and included in Section 206 (c) (1) instead of 206 (c) (2). With these new changes Section 2-6 (c) (1) prescribes the test to be conducted by the Secretary; and 206 (c) (2); with our suggested additions, prescribes the procedure the Secretary would take to revoke the certificate and the method for the manufacturer to obtain judicial review of such action.

We recommend that the word "substantially" be inserted before the phrase "conform with the regulations" in Section 3 (c) (2) of the bill (Section 206 (c) (2) of the Clean Air Act as it would be amended). This will afford vehicle manufacturers an opportunity to demonstrate that production vehicles do in fact "substantially" conform to certification vehicles. We believe the Secretary should not revoke a certificate of conformity, unless there is reason to believe that such vehicles substantially differ from the previously certified prototype vehicle.

Also enclosed is language changes for Section 210 of the Act regarding REGISTRATION AND REGULATION OF FUELS AND FUEL ADDITIVES.

Section 210, Page 6 (c) Line 14 after the word "establish" and before the word "standard" insert the word "performance"

Section 210, (c) Line 14 after the word "respecting" and before the word "the" on Line 15 strike the words "the composition or"

Section 210, (c) Page 6 Line 16 after the word "additive" and before the word "that" strike the words "to assure" Line 16 after the word "that" and before the word "cause" Line 17 strike the words "such fuel or fuel additives will not"

Section 210, Page 6 (c) Line 17 change the word "cause" to "causes" and the word "contribute" to "contributes"

Section 210, (B) Page 7 Line 3 after the word "the" and before the word "chemical" strike out the word "composition" Line 5 put a period after the word "additive" Strike out remainder of sentence in parentheses

Section 210, (B)(c) Page 7 Line 11 after the word "establishing" and before the word "standard" insert "performance"

Mr. KYROS. Thank you very much.

Mr. JARMAN. Are there other questions?

Mr. ROGERS. Just two.

Do you have any device for used cars?

Mr. TERRY. Yes, sir, we do.

Mr. ROGERS. What is its sales price?

Mr. TERRY. We announced a price of $12.50.

Mr. ROGERS. And this will be available when?

Mr. TERRY. It is available now in dealerships.

Mr. ROGERS. Let me ask you this, sir. If the government hadn't set standards or California, do you think you would have done anything about this problem at Chrysler?

Mr. TERRY. If the government——

Mr. ROGERS. Had not set emission standards or California had not set emission standards would there have been any incentive for Chrysler to have done anything on this problem?

Mr. TERRY. Oh, yes, sir. We were working on it long before standards were set with California people.

Mr. ROGERS. I say if California had not set any standards.

Mr. TERRY. Yes, sir. Yes, sir. Well, I must say it was not until 1953 that it was discovered, and we helped to discover it, our engineers working with people in California, what California photochemical smog was due to, what it came from and we weren't worried or concerned about air pollution from automobiles until we found that there was a problem.

As soon as we found there was a problem, actually we went to work to see what we could do to alleviate or cure it completely, hopefully.

Mr. HEINEN. Mr. Rogers, perhaps it will make you feel better about us at Chrysler to know that the first field survey was headed up by a Chrysler man, that the second field survey was started up by a Chrysler man. This was in 1954 and 1960. That the traffic survey was headed up by a Chrysler man. A non-dispersive infrared analytical device was first proposed by a Chrysler man, that we were the first ones to come out with a device in California and the first ones to get approved, that incidentally the system used for car devices that is currently being touted so highly by the various companies was first recommended by us in 1964 to California and was spoken about at the Air Resources Board in November prior to the somewhat more publicized announcement made later, and that we have been right in the battle all along.

I wish you would understand that the things we are trying to tell you are not trying to hold up the march of progress. We are trying to put out some caveats on questions of fact, not language.

I feel very strongly personally, that we are accepting an awful lot of things as if they were fact where indeed there is a great deal of wishful thinking existing in this whole area and I hope you understand this is all we are trying to do, all we are trying to point out.

Mr. ROGERS. Thank you.

Mr. HEINEN. Thank you, Mr. Chairman.

Mr. JARMAN. How long do you think it will be before you can submit to the Committee your recommendations for legislation?

Mr. TERRY. Language?

Mr. JARMAN. Yes.

Mr. TERRY. I think we can do that within—would a week be soon enough.

Mr. JARMAN. We are really in the process of concluding these hearings as of today, certainly by tomorrow, and the subcommittee will start immediately on executive sessions on this bill preparatory to working out a bill to report to the full committee. So it would be helpful if you could get any definite legislative recommendations to us at the earliest possible date.

Mr. TERRY. All right. Mr. Chairman, we will give you something in writing that will indicate the way we think it could be shaped within a matter of a few days. (See letter dated April 15, 1970, p. 815, this hearing.)

Mr. JARMAN. Fine. Thank you very much, gentlemen, for being with us.

Mr. TERRY. Yes, sir.

Mr. JARMAN. Our next witness is Mr. John F. Adamson, vice president, engineering and research, American Motors Corp.

STATEMENT OF JOHN F. ADAMSON, VICE PRESIDENT, ENGINEERING AND RESEARCH, AMERICAN MOTORS CORP.

Mr. ADAMSON. Thank you, Mr. Chairman, members of the subcommittee.

My name is John F. Adamson. I am vice president of engineering and research, American Motors Corp.

American Motors supports the elimination of lead from gasoline in an orderly manner. We feel that it will be a required step in continuing efforts to reduce automotive air polluting emissions. Lead-free fuel is necessary in our opinion for the successful development of advanced control systems including such components as catalystic converters, exhaust gas recirculation devices and exhaust reactors.

Now, in addition our engineering experience to date indicates that the elimination of lead from gasoline results in a slight lowering of the pollutant emissions in current vehicles at new or low mileage conditions. Further beneficial effects, in terms of lower HC emission of vehicles in the field after mileage accumulation, is expected. The exact degree of this improvement has not been determined by our engineers.

We do, however, wish to point out that based on the information we, American Motors, have to date, the use of a lead-free fuel presents certain basic problems both to vehicles now in use and in the design of engines for the future.

Early in the development of the internal combustion engine as a power source for automobiles and trucks, the need for the adaptation of engines to the available fuel, and the converse, was recognized. This led to many cooperative programs between the automobile and petroleum industries carried on through the Coordinating Research Council.

In my lifetime of automotive engineering, we have designed engines in a period of gradually increasing octane quality and have utilized fuels that contained reasonably constant lead content.

Speaking for American Motors, I wish to indicate that for very practical reasons, until now there has been very little incentive to develop any significant body of test and design experience with lead-free fuels. Further, we have never designed and produced engines in a situation of declining fuel octane. The latter can have a major impact on used vehicles currently in the field. Especially difficult is the situation in which we find ourselves today—the exact octane quality is not known and, in fact, several other critical fuel specifications are as yet undefined.

American Motors' 1971 engines are currently in the final tooling stages. However, most of them can be modified to operate on a low-lead fuel, assuming only a slight reduction of octane levels. We must, however, point out that such modifications present legal and technical problems relative to our currently operating 1971 Emission Certification Vehicle Fleet. Our future engines can be designed to operate on still lower octane levels if this is required for economic reasons. The degree of redesign is dependent upon the detailed characteristics of the nonleaded fuel to be made available for public use.

We are actively exploring in our laboratories at this time, the adaptation of our engines to nonleaded fuel of a lower octane. While we are optimistic as to our success, many important questions remain unanswered. Our limited experience indicates two possible known problems with the nonlead fuel. One is a mechanical problem having to do with lack of engine valve and valve seat durability in the absence of lead, and the second as I mentioned is the reduction in octane level brought about by the removal of lead. In recognition of these problems and the implications to our customers, it is important, we believe, that the transition to nonlead fuel be made with a reasonable degree of caution and in a stepped procedure.

In discussing the octane requirements of the engines now in use, it must be recognized that their design was an optimization of many components which define octane requirements of the engine, such as compression ratio, combustion chamber shape, valve timing, distributor advance characteristics and distributor initial setting. In new engine designs, changes in all these variables are possible and will be employed to meet the fuels to be available in the future. For cars now in use, however, it becomes practical to make changes only in a limited number of these variables, principally a change in the initial setting of the distributor and possibly a change in the advance characteristics of the distributor.

It is our estimate, at this time, that a reasonable percentage of our regular fuel engines in the field, designed for an average octane requirement of 94, could by minor modifications accept a slightly lower octane-rated fuel.

I might add it must be recognized, however, that the national man-hour requirements alone to modify the millions of current vehicles in use may well be staggering.

It is our understanding that, in your invitation to appear at this hearing, you submitted six questions pertaining to the automobile exhaust emission problem.

First, you asked, "What is the company's position with respect to production of automobiles using low compression engines?"

Our answer is since the start of the 1970 model year, a substantial percentage. And the figures I am going to give you are pretty consistetn back through the years, a substantial percentage, somewhere in the area of 85 or 90 percent of the engines produced by American Motors have been low-compression units. A portion of the high-compression engines that we do produce can be converted to a low-compression configuration early in the 1971 model year. We estimate that the revisions required to all of our engines will take us into the start of the

1972 model year. It should be noted that programs to convert some of our high compression engines prior to model introduction on a crash basis this fall could well result in severe driveability compromises.

Your second question was, "What fuels will be required for operation?"

We feel fuels of substantially the current octane level and with a low-lead content will be required for the operation of our current and 1971 engines.

Question three was, "What attachments will be added to vehicles to reduce air pollution?"

We cannot specifically answer this question without knowledge of the level of exhaust emission required. If this question is addressed to the proposed Federal 1975 standards, we are quite certain that manifold reactors or catalytic convertors must be added to our vehicles. In addition, more refined methods of carbruetion and the use of exhaust gas recirculation must also be considered.

The fourth question was, "What is the earliest model year for these attachments?"

We are unable to answer this question as to the hardware we believe will be required is only in the early laboratory stages. Obviously our target is as soon as practicable.

The fifth question was, "What is the estimated cost of such attachments?"

We hesitate to estimate the cost of these attachments at the present time, due to the previously mentioned status of possible hardware requirements. Obviously, cost estimates cannot be made until such time as designs and development programs are completed, and methods of production determined.

The final question was, "What is the economic effect of this action and what can be contributed by industry, State and Federal Government?"

As I have stated, I believe that it is too early to attempt to predict any of the eonomics involved. I am sure that our industry will contribute everything within its power to reduce air pollution. I also believe that one area of Government participation must deal with the motivation of drivers to service their vehicles and purchase the fuels that will be required to maintain the lower levels of pollution that we will be designing into our cars.

If I may, Mr. Chairman, before I conclude, I would like to digress from my prepared testimony to address myself to a number of the questions that came up this morning which I think are apropos to the American Motors position this afternoon.

There was some discussion of the validity of the durability fleet that we use for our certification and I would like to submit for your records, sir, that all of the 1970 American Motors vehicles—it was between 300,000 and 400,000 miles—were all driven on city streets. We did not run them off on a proving ground on some artificial type of test Procedures.

Mr. ROGERS. Are these the four prototypes you submitted?

Mr. ADAMSON. No. I think we had four or five 50,000-mile car and 18 4,000-mile cars. All of those were on city streets, sir.

Also there was some reference to data furnished by HEW indicating that surveillance in the field indicated a poor record of cars in meeting the then existing standards. I would like to submit that that record, sir, shows that American Motors, in the number of vehicles tested, had no failure in hydrocarbon emission and their 1969 cars were tested by HEW on the rental fleet, and 8 percent failure in the carbon monoxide emissions. We think that is an excellent record and one that obviously we would hope to even better.

You also brought up the question this morning of the Universal, UPI catalytic unit. We have been discussing this with them. We are furnishing some of our engine parameters to them and we expect to get samples from them shortly.

Now, gentlemen, in summary I want to thank you for the opportunity to present our views on this very important issue of the control of automotive air pollution. We are confident that the subject being discussed is a step forward. We will continue to make every effort to press for the resolution of the unanswered questions at the earliest possible date.

Thank you.

Mr. JARMAN. Mr. Adamson, will American Motors have any specific comments to make on the bills before the committee or any specific legislative recommendations aside from the bills themselves?

Mr. ADAMSON. Yes, sir, we will, and my apologies to the subcommittee for not having that data here today. We did not get any direct request from the subcommittee staff to appear to talk about any particular subjects. I was under the impression we were talking about leaded fuel and low compression engines only and that is all I am prepared to speak on, but American Motors per se is preparing a direct statement.

Mr. JARMAN. It would be helpful for the committee.

(The information requested was not available to the committee at the time of printing.)

Mr. JARMAN. Mr. Rogers?

Mr. ROGERS. Thank you for your statement. I think it is true American Motors probably has the best record of trying to meet the standards. The figures I had were six of your cars out of 56 or about 10 percent. Perhaps my figures given to me by HEW were in error.

Mr. ADAMSON. The ones I have, fleet of 36 cars, rental fleet.

Mr. ROGERS. I had six out of the 56. I will check that out, though. Now, what do you plan to do about the particulate emissions?

Mr. ADAMSON. At the moment, sir, I think we are hopeful of getting information of what the particulates are. There is a great deal of conversation. I have no in-house information myself relative to what the makeup is. As you know, I believe it was just last November that the first public statement of a particulate emission requirement was made. I don't believe—I know we at American Motors have no knowledge of what the particulates coming out of the tailpipe of a car are.

Mr. ROGERS. You don't know.

Mr. ADAMSON. We have every reason to believe from what we read, part of it is lead. I am sure part of it is carbon, part of it I am sure is rust off the tailpipe but I know of no actual trap or measuring method available to us or available to the industry that will actually measure what comes out of the tailpipe in a matter of particulates.

Mr. ROGERS. What has surprised me somewhat is that here an air-emission problem in this country which is contributed to by the automobile and oil industry combined, that makes up 50 to 60 percent of the problem, and we have been building for some time and no one knows anything, you know, and I realize the pressure has just come lately but it is amazing to me that here are two major industries who have contributed to the air pollution problem in this country, the major portion of it, and yet there has been, well, like the witness before, there don't seem to be any feeling of responsibility to know or to find out, see what is happening.

And now we find out no now knows that particulates, although they tell me lead and some of the others—even asbestos—may be from the linings coming from the cars, and I realize they are not easy problems to solve, but I just wonder if we would have gotten anywhere if we hadn't started passing some laws.

This is what concerns me and in fact that now it appears that with some of the companies, you know, we can't get them to do this voluntarily. Some will, I am sure, but some we can't get. And this almost ought to be something that would be voluntarily done where they are the contributing source to the pollution problem.

Mr. ADAMSON. Congressman Rogers, I think that if I could make a statement to that——

Mr. ROGERS. Sure.

Mr. ADAMSON. I think there is a tremendous amount of increased awareness——

Mr. ROGERS. I will agree to that.

Mr. ADAMSON (continuing). By us as engineers and the industry as a whole. I think what is happening, sir, correct or not, I think this is the way we have been playing the game, that in the past we have built cars and products to the dictates of the consumer. I think this is fast changing over to the dictates of society and we are realizing that and I think this is going to accelerate our work in these areas.

Mr. ROGERS. Thank you. Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Satterfield.

Mr. SATTERFIELD. Thank you, sir. I notice on page 4 you were talking about fuels and in answer to one of the questions you stated that fuels of substantially the current octane level with a low lead content will be required for operation of 1971 engines.

Mr. ADAMSON. Yes.

Mr. SATTERFIELD. This doesn't necessarily and automatically mean that there would be less pollution as a result of that, does it?

Mr. ADAMSON. Yes, sir. I think there will, for two reasons. One, as I mentioned earlier, we have test data that reducing the lead content of the fuel does, due to inner action within the combustion chamber and the exhaust manifold, reduce the emission of hydrocarbons.

Now, I have some data that says under a given condition it is 10 percent. I have other data that states 3 percent. So it is there somewhere.

Mr. SATTERFIELD. You are talking about hydrocarbons?

Mr. ADAMSON. Yes, sir.

Mr. SATTERFIELD. That is not all of the pollutants; all of the exhaust.

Mr. ADAMSON. No. The fact that we are going to lower compression ratios in itself is in the direction of reduction of oxides of nitrogen. If in the model year 1971, 1972 or very shortly we do get into some type of exhaust gas recirculation, we have data that shows that

that device is going to last longer without maintenance with the lower lead or nonlead fuels. I think this is an advantage.

Mr. SATTERFIELD. Won't something have to be added to this gasoline to bring octane count up to current levels?

Mr. ADAMSON. I don't understand the question, sir.

Mr. SATTERFIELD. If you take the lead out of gasoline this automatically drops the octane count, doesn't it?

Mr. ADAMSON. Depending on the refining methods but the general direction would be that.

Mr. SATTERFIELD. Then something must be added to bring it back up to present levels, would it not?

Mr. ADAMSON. That is a question the petroleum industry could answer far better than I can. Their testimony before the California Air Resources Board, and they may have repeated it before your group, they feel—or one or two companies do—that they can produce a 90 or 91 octane fuel with no lead.

Now, my thought of a half gram of lead which I think is necessary for current and older engines to keep valve life reasonable——

Mr. SATTERFIELD. Is it your interpretation, then, that the current level of octane is 91?

Mr. ADAMSON. No, sir; 94, and I say it cannot be reduced substantially. By that I mean it can't go down to 84 or 85 until we have time to adjust our engines to it if it becomes economically feasible some day to go that far.

Mr. SATTERFIELD. I notice in answer to the next question, about what attachments would be needed, you mention tow manifold reactors or catalytic converters. It would seem to me in this respect of following the line previous witnesses testimony that it would be wise to keep as many options open as you can until you arrive at a point where you have got to make a decision.

Mr. ADAMSON. Yes. I think options are very necessary to our work to get successful both from the working standpoint and economic piece of hardware. I think the greatest fear I have, sir, is that regulations will outrun technology and I just hope that doesn't happen.

Mr. SATTERFIELD. Don't you feel that the present situation of HEW setting emission standards at the exhaust pipe would be sufficient and would provide the greatest amount of latitude to pursue that option which you ultimately find to be best?

Mr. ADAMSON. Generally speaking, I am certainly in favor of performance demands rather than design demands because then we would have the alternatives of being competitive and going in various directions to find the best solution. If it is necessary to make a given component of the car work by providing a design standard for the others, I feel that might be necessary.

On the other hand, if we are speaking specifically to fuel— and I am not enough of a lube engineer to know all of the answers to the fuels—I am not sure that a performance standard point could not be put on fuel that would allow it to give us a lead-free content such as a given amount of fuel must be burned and the by products of that burn and the residue left shall contain no more than X amount of lead. That to me is a performance standard.

Mr. SATTERFIELD. You say if some design standards are in order. You wouldn't go so far as to say that if we had a design standard concerning compression ratio of an engine that this would be proper, are you?

Mr. ADAMSON. If the reasons were good enough, sir, it would be proper. At the moment I don't see those reasons.

Mr. SATTERFIELD. Couldn't you achieve the same goal with an emission standard and leave it to the industry to resolve the question of compression ratio and the type of fuel that will work with that ratio?

Mr. ADAMSON. Yes, sir. A standard of oxide of nitrogen, as an example. If for some reason we find our exhaust gas recirculation system, which is one of the direct paths we are going on falls apart or doesn't work, a solution could well be a drastic reduction in compression ratio.

Mr. SATTERFIELD. You don't have any doubt in your mind if the automobile industry decided to produce automobiles that ran on 91 octane gasoline, that the petroleum industry would follow suit and provide 91 octane gasoline, do you, sir?

Mr. ADAMSON. I don't believe I can answer that. I think more and more evidence of what is happening to the public motivation is going to be occurring. One of the fuel companies just recently offered 91 lead-free fuel on the west coast market at a price that was 2 cents over premium. We are all watching that with interest to see is there any public motivation to buy that type of fuel.

Mr. SATTERFIELD. Of course, if you build cars that will run on specific fuel, it would seem to me the supply would follow.

Mr. ADAMSON. I would be hopeful they would. On the other hand, I do not believe it is the job of the automotive industry to force the fuel industry into unnecessary economic penalties.

Mr. SATTERFIELD. Thank you, sir.

Mr. JARMAN. Mr. Kyros?

Mr. KYROS. Just a few questions, Mr. Chairman. Thank you.

Mr. Adamson, your company has just come out with a new car model, the Gremlin.

Mr. ADAMSON. Yes, sir.

Mr. KYROS. A good looking car, too.

Mr. ADAMSON. Thank you.

Mr. KYROS. We have heard testimony about some of the advances that have been made in the past several years in lowering pollutant emissions from vehicles. Could you just summarize what you have incorporated in that car, the Gremlin, to lower pollutant emissions?

Mr. ADAMSON. We don't—we are speaking now entirely of the engine. Because we use our engines across several lines, I don't want to leave the impression that only the Gremlin has the particular advantages cited.

Now, it uses engines that also go into most of our other lines. In our 1970 engines, we have revised cam shafts, which have an effect on the pollutant. Our timing has been changed. I think we have added some small pieces of hardware on some given engines. I can't state which ones exactly, with deceleration valves, that type of thing.

Mr. KYROS. Is there as far as you know any significant difference in the amount of hydrocarbons, nitrous oxides and other emissions from the car that have lowered the level of pollutants?

Mr. ADAMSON. There is not in parts per million, sir. That is, by the amount of the pollutant within a given amount of exhaust gas. But in grams per mile, the current Federal standard, because that vehicle is putting out fewer cubic feet of exhaust gas per mile, the grams per mile are in excellent shape.

Mr. KYROS. Thank you very much.

Mr. JARMAN. Mr. Rogers?

Mr. ROGERS. May I just ask some questions. What was that you said about 2 cents over the premium?

Mr. ADAMSON. Yes, sir. I believe one fuel company is currently marketing the 91 octane fuel in California, marketing at a price 2 cents over premium.

Mr. ROGERS. I understood there was one marketing at 4 cents over, 4 to 6 cents over their premium, too. Well, I don't think that is very much incentive for the consumer, do you?

Mr. ADAMSON. No, sir.

Mr. ROGERS. Now, let me ask, do you think the oil companies should be allowed to put anything in their gas and then put the responsibility on the automobile companies to clean it up?

Mr. ADAMSON. No, sir. It has to be a joint program and has been for the past 20 years.

Mr. ROGERS. Certainly. I think it has got to be joint and there has got to be some regulation of both I would think in order to get some cooperation.

Mr. ADAMSON. We talk a great deal, sir, about the octane rating. You see we say 91, 94, 97, 100, which is our end of the research octane number. Actually there is another octane number the so-called motor number, and the difference between the motor number and the research number is referred to as fuel sensitivity. This is almost as important a factor as the actual research octane number.

Mr. ROGERS. Yes. Thank you.

Thank you, Mr. Chairman.

Mr. JARMAN. Just one final question from the Chair for the record, Mr. Adamson.

If we should set performance standards only, the achievement of those standards would require joint responsibility of automobile and fuel manufacturers. To whom, then, should the Government look to assure that the standards will be achieved if the manufacturers should disagree with regard to the method to be employed in achieving those standards?

Mr. ADAMSON. I don't know that I can answer that, Mr. Chairman, other than I am sure if the Government has to be the referee, then you are talking regulations. I don't believe I am in any position to say you certainly have got to regulate them or you have certainly got to regulate us. It is a problem that may well come, although I hope it doesn't. I would not expect it to.

Mr. JARMAN. It is this type problem and others like this that, of course, we are trying to face up to. We must in terms of legislation that is in the best interests of every one concerned.

Are there further questions? If not, we appreciate your being with us and contributing to the record.

Mr. ADAMSON. Thank you.

Mr. JARMAN. Our next witness is Dr. Donald Diggs of the E. I. du Pont de Nemours and Co., Inc.

Dr. Diggs, would you identify your associate for the record?

STATEMENT OF DR. DONALD R. DIGGS, TECHNICAL DIRECTOR, PETROLEUM CHEMICALS DIVISION, E. I. DuPONT DE NEMOURS & CO.; ACCOMPANIED BY C. E. WELCH, ENVIRONMENTAL QUALITY COMMITTEE

Dr. DIGGS. Yes, Mr. Chairman.

Mr. Chairman, members of the subcommittee, my name is Donald R. Diggs. I am technical director of the Petroleum Chemicals Division of the DuPont Company. Here with me is Mr. C. E. Welch, a member of my company's Environmental Quality Committee.

I appreciate the opportunity your invitation to comment upon the bllis under consideration has given us. My statement is directed to those portions of this legislation which would deal with the problem of pollution from automotive exhaust and the use of lead antiknocks in gasoline. The DuPont Company is a major supplier of lead antiknock compounds to the petroleum industry and is thus vitally concerned with the bill in question. We have conducted extensive research in the area of fuels, engines, and exhaust emissions, and have learned a great deal about the relation of lead antiknocks to automobile emissions. This statement will summarize the pertinent findings from this work. We hope it will be helpful in your assessment of the need for the subject legislation.

All concerned agree that air pollution from automobiles must be reduced promptly, and in a manner consistent with the public interest. The automobile industry has done a good job to date, and 1970-model vehicles emit only a fraction of the pollutants that cars once exhausted. Despite this significant accomplishment, still greater reductions in exhaust emissions must be obtained to achieve the standards and goals proposed by the Secretary of Health, Education, and Welfare. DuPont has developed systems for exhaust emission control which can be applied to engines of today's design, operate on fuels of today's composition, and meet the 1975 standards. With continued development we expect to achieve even lower emission levels.

In considering the advisability of restricting the lead content of gasoline there are two separate problems. The first is the matter of producing new cars to meet the emission standards of the future. The second problem concerns the continued satisfactory operation of cars already on the road.

In considering restriction of the lead content of gasoline for future engines, we know it is possible to redesign the engine so that it will operate on lead-free gasoline of reduced octane number. But we also know that if such a course is chosen it will be more costly to the motorist. One question which you must answer is: Is it necessary to impose this cost penalty, together with dislocation in gasoline distribution, in order to achieve the necessary goal of a low-emission vehicle?

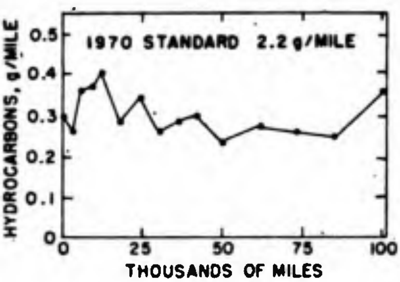
Removal of lead antiknocks from gasoline is not necessary to achieve low-emission levels with the emission control system which Du Pont has developed. The principal part of this system is called the exhaust manifold thermal reactor. Du Pont has been developing this device for the past 7 years. It has shown itself capable of rediucng hydrocarbons and carbon monoxide to very low levels, and to do this for the normal lifetime of the car without attention or maintenance.

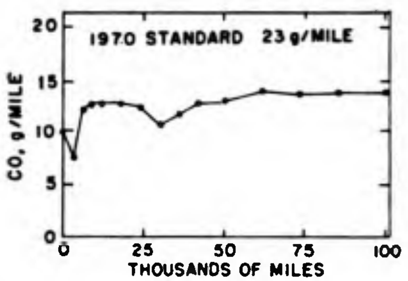
In combination with the exhaust gas recirculation system to control nitrogen oxide emissions, all gaseous exhaust emissions can be reduced to the 1975 level proposed by the Federal Government. The long-range goals discussed for 1980 also seem well within reach.

The reactor is mounted on the engine in place of the conventional exhaust manifold. It provides a high-temperature zone in which the hydrocarbons and carbon monoxide are oxidized thermally to carbon dioxide and water. The reactor consists of a shell in which is mounted a tubular core and a shield to insulate the hot core from the cooler outer shell. Exhaust gases, mixed with air supplied by a conventional air injection system, first enter the tubular core which is designed to promote mixing and initiate the oxidation. The reacting gases pass sequentially through the spaces between the core and the shield and then between the shield and the outer shell. Oxidation is completed during this passage before the gases exit into the exhaust system.

Extensive testing of exhaust manifold reactors has shown they are capable of reducing exhaust emissions to very low levels. Results of a test covering 100,000 miles of operation using a popular make of car equipped with reactors are shown in table I.

TABLE I





Mileage was accumulated on a programed chassis dynamometer following the driving schedule specified for the Federal certification of emission control devices. Emission levels averaged 0.33 gm/mile hydrocarbons and 14 gm/mile carbon monoxide for the 100,000 miles of operation. Only normal vehicle maintenance was performed; no maintenance of the exhaust reactor system was required.

Since the completion of the 100,000 mile test, reactor design and performance have been improved to a point where even lower emission levels can be obtained.

While manifold reactors provide excellent control of hydrocarbons and carbon monoxide, they do not by themselves have any effect on nitrogen oxide emissions. To control simultaneously hydrocarbons, carbon monoxide, and nitrogen oxides requires a combination of systems. Exhaust gas recirculation is presently our preferred method for nitrogen oxide control, and in combination with the exhaust manifold thermal reactor will control all the gaseous emissions.

Many systems to provide exhaust gas recirculation have been studied. The one being used currently by Du Pont was developed by Esso Research and Engineering Co. Exhaust gases are taken from the exhaust pipe just ahead of the muffler and are directed into the carburetor between the venturi section and the throttle plate. The amount of exhaust gas which enters the carburetor is metered by an orifice located in the recirculation line. A simple vacuum-operated on-off valve shuts off the recirculation at idle to give smooth engine operation and at wide-open throttle to prevent loss in vehicle performance. A small cyclone separator to remove particles which might plug the system can be incorporated in the recirculation line if desired. To date we have not found this necessary, and our system is now operating after more than 25,000 miles without decrease in the recirculation flow rate.

Systems combining exhaust manifold thermal reactors, exhaust gas recirculation and evaporative loss control have been installed on several 1970-model cars.

One of these cars is on display in the Rayburn Building garage, the location of which the chairman mentioned, and I hope all of you will take an opportunity to inspect this car, if possible. This car was tested at the California Air Resources Board Laboratory in Los Angeles on March 20, 1970. The official results of this test are given in the table below, and are compared to the 1975 Federal standards and the projected 1980 Federal goals.

	Emissions, gm/mile		
	HC	CO	NO_x
ARB test of Du Pont reactor plus E.G.R.	0.22	7.4	0.41
1975 Federal standards	.5	11.0	.9
1980 Federal goals	.25	4.7	.4

As you can see from the values in the table, the 1975 standards were achieved handily and in two out of three cases the 1980 goals were met.

Performance of the vehicle equipped with the combined emission control is not significantly different from the unequipped vehicle. Driveability remains excellent, while fuel economy on a city-suburban driving schedule is 14.5 mi/gal with the equipped car and 15.3 mi/gal with the unequipped car.

The cost to the motorist of any emission control system consists of the initial cost, the maintenance cost throughout the life of the car, and any increased fuel cost. The initial cost of other projected systems; maintenance cost will be lower since thermal reactors will not require servicing during the lifetime of the car.

An assessment of the ultimate potential of the exhaust reactor combined with exhaust gas recirculation is given in the document "Control Techniques for Carbon Monoxide, Nitrogen Oxide, and Hydrocarbon Emissions from Mobile Sources" just published by the National Air Pollution Control Administration. This document was issued pursuant to the provisions of the Air Quality Act of 1967. It considers 20 separate approaches for controlling vehicle emissions to three separate levels, the most stringent of which is identical with the proposed 1980 Federal goals. The exhaust manifold reactor with exhaust gas recirculation is the only one of these 20 systems given any probability of reaching the third goal level for hydrocarbons and carbon monoxide. Its probability of success is given as 80–90 percent, while the catalytic system with nonleaded fuel is given a probability of zero. The reactor system also outranks the catalytic system with respect to nitrogen oxide control.

EXHAUST PARTICULATE

We have talked up to the present time about gaseous emissions. I would now like to speak particularly about exhaust particulates.

At present there are no standards for the control of exhaust particulate, however, the National Air Pollution Central Administration has recently announced its intention that such a standard be established. Although particulate has not been defined and neither measuring technique nor test cycle has been specified, it is proposed to reduce exhaust particulate matter substantially. The goal levels are 0.1 gram per mile by 1975 and 0.03 gram per mile by 1980. It has been assumed that these standards cannot be met with lead in gasoline.

To date, we know of no meaningful information that is available regarding total particulate emission rates from vehicles under realistic driving conditions. It is known that automotive exhaust contains solids such as lead salts, carbon, and iron rust, as well as semisolid or heavy liquid materials such as "tars" and oil mist, but little is known about the relative amounts or composition of these materials. Further, there is no clear definition at the present time for the term "particulate matter", as it pertains to exhaust. Do such materials as the "tars" and oil mists fall into this classification? This lack of information on "particulare matter" is due to the fact that measuring and characterizing particules is an exceedingly difficult task and the techniques and hardware needed to make these measurements are only now being developed.

Considerable progress has been made in developing suitable particulare sampling systems and analytical procedures. Our efforts initially have been directed toward the measurement and characterization of lead compounds and other of the more readily collectible and easy-to-analyze solid materials such as iron rust. These techniques have been developed and are now being used on a routine basis. Attention is now being focused on the total particulate emission measurement problems, and vehicle tests are now in progress to measure these emission rates on a gram per mile basis.

In limited testing our data show that appreciable amounts of particulate are emitted using both leaded and unleaded gasoline. At least at this time, it appears that some way of removing particulate from the exhaust stream other than changing fuel composition will be needed to meet the proposed standards. Our work has shown that substantial amounts of particulate matter can be separated from the exhaust gas stream and retained in the exhaust system. One of the more effective means to accomplish separation and retention of the particulate matter is to employ an inertial device such as a cyclone. The exhaust gas is cooled in its passage through the exhaust pipe so that the particulate matter will become solid and thus separable from the remainder of the exhaust gases. The agglomerated particles are then removed from the exhaust gas stream in a cyclone separator and retained in a collection box.

Long-term tests both on a programed chassis dynamometer and on the road show that such devices can reduce substantially the amount of particulate material which would normally be emitted to the environment. For example, in a 67,000-mile test on a programed chassis dynamometer lead emission rates were reduced to 0.1 gram per mile. This is the 1975 standard. A similar car without the separation device gave emission rates of 0.2–0.3 gram per mile. With a somewhat more complicated system the emission rate was reduced to 0.03 gram per mile in a 26,000-mile test, and this is the 1980 goal.

Studies are continuing to define how much reduction of the total particulate matter, both inorganic and organic, can be achieved by such devices. Systems based on other separation principles are also being examined. These studies are encouraging and indicate that substantial reductions in particulate emissions can be attained with practical systems.

I have described only briefly the technical details of the emission control systems with which we are working, systems which are fully capable of being applied to new cars. More complete technical information is contained in the statement which was presented by Du Pont to the National Petroleum Refiners Association at its recent annual meeting. A copy of that statement is attached for the record (see p. 838).

I would like to turn now to the problems posed by cars on the road if lead antiknocks were to be removed from gasoline. Cars already on the road were designed to operate on fuel of the octane equality prevailing at the time of their sale, and it was assumed that fuel of this quality would be available for the normal lifetime of these cars. In order to satisfy this requirement, gasoline of today's octane rating must be readily obtainable as long as these cars are operating. If it were arbitrarily decided to remove lead from gasoline, the octane rating would drop to such an extent that the cars on the road simply would not operate satisfactorily. Nor would it be practical to adjust the 85,000,000 cars on the road to operate on lower octane fuel. To maintain the necessary octane quality without the use of lead, the petroleum industry would be forced to change its refining practices drastically. The composition of gasoline would change substantially and, in particular, gasoline would have a much higher aromatic content than at present.

The increased aromatic content of gasoline would result in an increased emission of polynuclear aromatic compounds. The concern with emission of these compounds was summarized in a discussion at a symposium of the American Chemical Society in Minneapolis in April 1969 by Dr. Herbert C. McKee of Southwest Research Institute. Dr. McKee, who also is chairman of the Texas Air Pollution Control Board, said:

> The presence of polynuclear aromatic compounds in vehicle exhaust brings up another question related to the lead content. Various suggestions have been made in the past for substantially reducing the lead content of motor fuel even though, as the discussion at this symposium indicates, there is no clear evidence that the present atmospheric lead levels are detrimental to human health.
>
> An increase in the aromatic content of fuel inevitably leads to an increase in the polynuclear aromatic content of the exhaust, although this relationship is not necessarily on a one-for-one basis. The exact role of polynuclear aromatic compounds in causing cancer is not known and may not be completely understood for many years. However, 3,4 benzpyrene and other polynuclear aromatic compounds do induce tumor formation in experimental animals, which at least points a finger of suspicion at these materials as hazards to human health. Epidemiological evidence would indicate that the hazard is likely small since it appears that smoking is a much more dominant factor in causing lung cancer than air

pollution. Also polynuclear aromatic compounds in the atmosphere come from a variety of sources in addition to motor vehicles, especially in coal-burning cities. While there is no reason to suspect that serious hazards exist at this time, any control measures which would cause a considerable increase in the polynuclear aromatic content of the atmosphere should be viewed with suspicion until more information is available. Therefore, cutting down on the lead content of motor fuel to reduce a suspected, but unknown and unproved health hazard, might increase another health hazard that is suspected but equally unknown and unproved. Trading one unknown hazard for another hardly seems appropriate, especially since lead additives have been used in motor fuel for over 40 years. After that period of time, and after all the experimental work performed, the hazard must not be too great if scientists still debate the question at meetings such as this. No urgency is evidence which requires immediate action, and it would seem prudent to wait, in the hope that a better estimate can be obtained in the next year or two concerning the relative hazards of both lead and polynuclear aromatic compounds. Any necessary control measures could then be initiated, and avoid the danger that action taken to reduce a presumed hazard might create a separate but possible greater hazard.

The change in gasoline composition necessary to maintain comparable quality without lead antiknocks also might substantially affect the photochemical reactivity of the exhaust and thus its air pollution potential. In discussing this problem investigators from the U.S. Bureau of Mines reported recently:

The fuel alterations from leaded to unleaded changed emission characteristics so that the pollution effect was increased by as much as 25 percent.

In further comment on this finding, Mr. R. W. Hurn of the Bureau of Mines said at a recent meeting of the California Air Resources Board—March 5, 1970—

I would add to that quote the further observation that if exhaust emissions alone are considered * * * as should be done in the case of autos with evaporative losses controlled * * * the value just quoted becomes not 25 percent but 38 percent.

The most frequently advanced argument for removing lead from the gasoline for cars now on the road is that it would reduce their emission of hydrocarbons caused by the accumulation of combustion chamber deposits. It must be recognized that the accumulation of deposits causes hydrocarbon emissions to increase with both leaded and unleaded fuel. The question is the difference, if any, in this increase attributable to the presence of ead. There has been for some time a dispute as to the magnitude of this difference in the existing car population. Intensive study of all the available data obtained by the auto, oil, and lead antiknock industries leads to the conclusion that the best estimate of this so-called "lead effect" is a 5- to 10-percent increase in hydrocarbon emissions in normal consumer driving. In view of the Bureau of Mines statement that a change to unleaded fuel might increase air pollution by 38 percent, this does not seem like a reasonable tradeoff. Thus, the changes in fuel composition and their effect on air pollution which would result if lead were removed from all gasoline, while maintaining the octane quality necessary to keep the cars on the road operating, should be carefully evaluated before concluding that the removal of lead antiknocks would have only beneficial effects.

In conclusion, let me briefly try to summarize our position regarding the proposed legislation under consideration as far as it relates to the control of pollution from automobiles. Du Pont believes that the solution of the automotive problem will be most rapidly and efficiently effected if the Federal Government establishes vehicle emission standards and requires that those standards be met by adequate legal sanctions. We do not feel that Government should limit the means of meeting these standards or require needless expenditures of money to achieve a solution where alternative methods less costly would serve as well. There are a number of technical approaches available to reach our objective and it is desirable to consider all the available alternatives before adopting any law or regulation which could foreclose the development and use of any proposed system. By controlling tailpipe emission, all industries involved are able to continue to seek the best technical solutions and the most economical methods to reach the emission standards.

From our work in this field, we conclude that the public can have the best of both facets of this problem, namely, clean air and economical gasoline at octane ratings appropriate for past, present, and future engines.

Our position is as follows:

1. The 1975 standards for hydrocarbon, carbon monoxide and nitrogen oxide emissions can be met using today's fuels and today's engines. The 1980 Federal goals also seem within reach. The most practical and effective system to achieve these results is the exhaust manifold thermal reactor combined with exhaust gas recirculation, which will operate satisfactorily on leaded gasoline. Costly changes to unleaded fuel and the production of new cars with reduced performance and fuel economy is not required.

2. Lead is only one source of particulate matter in the exhaust. Pending further definition of "particulates" and testing methods, it seems entirely possible to meet proposed standards with relatively simple particulate separation devices. Their use may be required even with unleaded fuels.

I might add here, Mr. Chairman, that such a system employing the cyclone separator is installed on the car which is on display downstairs.

3. The elimination of lead antiknocks from the gasoline necessary to fuel the 85 million cars now on the road would require changes involving major practical and economic considerations. Satisfactory operation of these vehicles requires maintenance of today's octane levels. To do this without lead antiknocks requires enormous costs in new plant investments, processing, expense, and increased crude oil demand. The resulting changes in fuel composition may make air pollution worse, not better. This matter should receive most careful study.

4. If emission standards are applied to automotive exhausts, no more is needed. By whatever device, whatever technology ultimately chosen, the desirable end result—clean air—will be obtained. Therefore, we should not limit methods of achieving this goal; particularly when such limitations could needlessly cost the American people and this Nation billions of dollars.

Thank you very much. We will be happy to answer any questions you may care to ask.

(The attachment to Dr. Diggs' statement, referred to, follows:)

43-933 O—70—pt. 2——24

EXHAUST MANIFOLD THERMAL REACTORS - A SOLUTION TO THE AUTOMOTIVE EMISSIONS PROBLEM [1]

J. J. Mikita and E. N. Cantwell
E. I. du Pont de Nemours & Co. (Inc.)
Petroleum Chemicals Division
Wilmington, Delaware

This paper will describe an exhaust emission control system developed by Du Pont which will meet the 1975 gaseous exhaust emission standards proposed by the U.S. government. These proposed standards can be met without any changes in present-day fuel composition and, more specifically, without restrictions on the use of lead antiknocks. The paper also will present data which give promise that the 1980 goal for gaseous emissions also can be met with further development of the system.

The gaseous emission control system combines two major devices. These are:

1. An exhaust manifold thermal reactor to control the hydrocarbons and carbon monoxide to very low levels. This device has been shown capable of controlling emissions for the normal lifetime of the car witbout attention or maintenance.
2. An exhaust gas recirculation system to control nitrogen oxide levels. Although not yet tested as extensively as exhaust manifold reactors, the exhaust gas recirculation system has been operated for 25,000 miles without maintenance.

In addition to the system for controlling gaseous emissions, two separate systems have been developed to reduce particulate matter in the exhaust. Data will be presented to show that these systems are very effective for removal of particulate lead salts from the exhaust. One system has been operated on a car for 67,000 miles without maintenance or attention, the other for 26,000 miles.

EMISSION STANDARDS

Before examining the performance of these emission-control systems, consider first the standards put forth by the U.S. government and the State of California for emission levels from automobiles. Shown in Table 1 are the maximum allowable concentrations in grams per mile of the various components of the exhaust for the different years. The proposed standards for 1975 require that hydrocarbons be reduced to less than 0.5 gram per mile, carbon monoxide to 11 grams per mile, nitrogen oxides to 0.9 gram per mile and particulate matter to 0.1 gram per mile. For the year 1980, goals of approximately one-half of the 1975 standards have been proposed.

[1] For presentation at the 68th annual meeting of the National Petroleum Refiners Association, April 5-8, 1970, San Antonio, Texas.

TABLE 1

EXHAUST EMISSION STANDARDS AND GOALS

	Emission Levels, Grams Per Mile			
Year	HC	CO	NO_x	Particulate
1970	2.2	23.0		
1971*	2.2*	23.0*	4.0*	
1972*	1.5*	23.0*	3.0*	
1973	2.2	23.0	3.0	
1974*	1.5*	23.0*	1.3*	
1975*	0.5*	12.0*	1.0*	
1975	0.5	11.0	0.9	0.1
1980	0.25	4.7	0.4	0.03

Evaporation Losses - 6.0 grams per test in 1970 in California and 1971 nationwide

*California only

EFFECTIVENESS OF THERMAL REACTOR SYSTEMS

Shown in Table 2 are the exhaust emission levels obtainable with exhaust manifold thermal reactors and an exhaust gas recirculation system installed on two 1970 models of a popular four-door sedan. The vehicles are equipped with V-8 engines and automatic transmissions. Emission levels are 0.2 gram per mile of hydrocarbon, 8 grams per mile of carbon monoxide and 0.7 gram per mile of nitrogen oxides. Comparing these values to the 1975 and 1980 levels, it is clear that the gaseous emissions from these vehicles are well below the 1975 levels in all cases and, in the case of the hydrocarbons, are below the 1980 levels.

TABLE 2

COMBINED SYSTEMS MEET 1975 GASEOUS STANDARDS

	Emission Levels, Grams Per Mile		
	HC	CO	NO_x
1975 U.S. Std.	0.5	11.0	0.9
Car A*	0.17	8.3	0.7
Car B*	0.20	6.8	0.7
1980 U.S. Goal	0.25	4.7	0.4

* Reactors and Exhaust Gas Recirculation

These low-emission levels are achieved with little sacrifice in economy or vehicle performance. As shown in Table 3, the fuel economy of these equipped vehicles averaged about 14.5 miles per gallon when driving a city-suburban course on the road as compared with 15.3 miles per gallon average for two production 1970 vehicles of the same model. This loss of 0.8 mile per gallon represents only a 5 percent loss in fuel economy to achieve these very low emission levels. Similarly, only slight losses occur in terms of full-throttle acceleration capability. The general driveability of the vehicles is quite good. They start readily when cold, they warm up normally, and the warmed-up driveability is equivalent to current production vehicles in all respects.

TABLE 3

COMBINED SYSTEMS HAVE LITTLE EFFECT ON ECONOMY

	Fuel Economy, MPG City-Suburban Road Course
1970 Std. Car*	15.3
Car A	14.7
Car B	14.4
	-0.8 (-5%)

* Average of two cars

HOW THERMAL REACTORS WORK

The exhaust manifold reactors are mounted on the engine in place of the conventional exhaust manifolds and air is injected into the exhaust ports from the air injection system used on many production cars. The reactors provide a high-temperature zone in which the hydrocarbons and carbon monoxide are oxidized thermally to carbon dioxide and water. No catalytic device is employed. The reactor, as shown in Figure 1, consists of an outer shell in which is mounted a tubular core and a shield to insulate the hot core from the cooler outer shell. Exhaust gases mixed with the air supplied by the air injection system first enter the tubular core which is designed to promote mixing and initiate oxidation. The reacting gases then pass sequentially through the spaces between the core and the shield and between the shield and the outer shell.

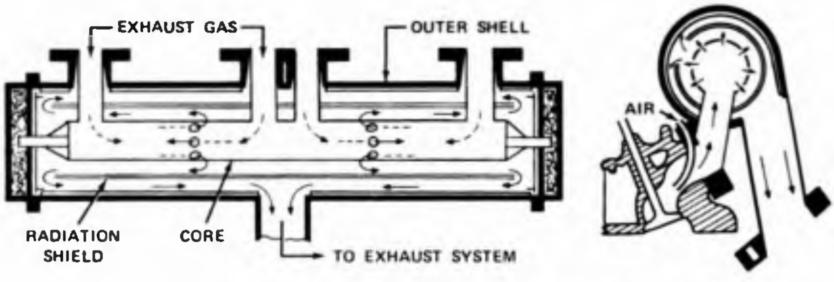


Fig. 1 – Type V Shielded Exhaust Manifold Reactor.

Fig. 2 — Cutaway View of Type V Reactor.

Fig. 3 — Type V Reactor Installed on Car.

Oxidation is completed during this passage before the gases exit into the conventional exhaust system. Shown in Figure 2 is a photograph of one of the exhaust manifold reactors cut away to reveal the details of the inner core and the radiation shield. Shown in Figure 3 is a set of reactors mounted on the engine in the car in place of the exhaust manifolds. Air is delivered to the reactors from the air pump to a manifold with individual branches leading to each of the exhaust ports.

The capability of exhaust manifold reactors in controlling emissions of unburned hydrocarbons and carbon monoxide when used alone without exhaust gas recirculation is shown in Table 4. Hydrocarbons are less than 0.25 gram per mile and carbon monoxide less than 4.5 grams per mile. These levels are well below both the 1975 proposed levels and essentially at the 1980 goal levels. As mentioned before, the reactors have little effect on vehicle economy or performance. Shown in Table 5, the fuel economy of the vehicle equipped with the exhaust manifold reactors is essentially equivalent to that of the standard 1970 vehicle equipped with the conventional emission-control system. Furthermore, the performance as measured in terms of the time in seconds required to accelerate at wide-open-throttle from 0 mph to 60 mph on a level road is essentially equivalent to that of the production model.

TABLE 4

REACTORS MEET 1980 GOAL LEVELS

	Emission Levels, Grams Per Mile	
	HC	CO
1975 U.S. Std.	0.5	11.0
Type V Reactors	0.20	4.5
Type VI Reactors	0.23	4.3
1980 U.S. Goal	0.25	4.7

TABLE 5

FUEL ECONOMY FOR TYPE V REACTORS

	Fuel Economy, MPG City-Suburban Road Course
1970 Std. Car	15.3
Type V Reactors	15.1
	Acceleration Time, Seconds 0 to 60 MPH
1970 Std. Car	11.0
Type V Reactors	11.4

DURABILITY OF THERMAL REACTORS

Long-term tests of reactors show that they are capable of controlling hydrocarbons and carbon monoxide emissions for the normal life of the vehicle or 100,000 miles without any maintenance or attention. Shown in Figures 4 and 5 are the emission results of a test covering 100,000 miles of operation using a car equipped with an earlier model of the exhaust manifold reactors. These reactors were not as effective as the current designs. Figure 4 shows the exhaust hydrocarbon levels for the 100,000 miles; they were less than 0.4 gram per mile throughout the entire test. In Figure 5 it can be seen that the carbon monoxide levels were approximately 15 grams per mile for the test, showing little tendency to increase with mileage. Mileage was accumulated on a programmed chassis dynamometer following the driving schedule specified for the Federal certification of emission control devices. A commercial gasoline containing lead was used and only normal vehicle maintenance was performed. No maintenance of the exhaust reactor system was required.

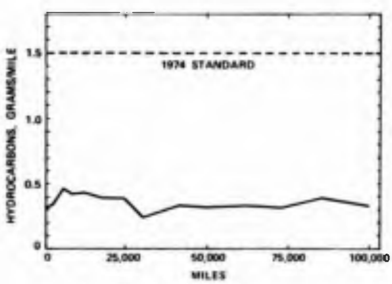


Fig. 4 – Hydrocarbon Emission Levels with Exhaust Manifold Reactor.

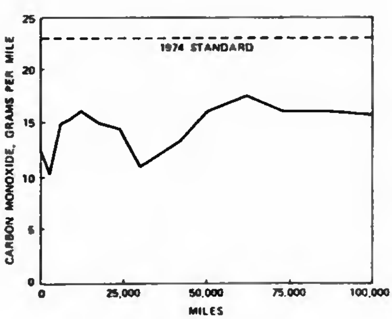


Fig. 5 – Carbon Monoxide Emission Levels with Exhaust Manifold Reactor.

At the conclusion of this 100,000-mile test on an earlier Type I model of the reactor, it was found that holes had been eroded in each of the two baffles within the reactor. In this particular reactor design the baffles, in close proximity to the exhaust ports, served to direct the hot gases to the center of the core. Although the erosion did not affect emission control performance, the core was redesigned to eliminate the baffles. Laboratory engine tests under severe-duty conditions for extended periods show that with this improved design erosion of the reactor core has been reduced by 3 to 4 orders of magnitude. A car equipped with this new design, the genesis for Type V and VI reactors, is now being evaluated in an endurance test on the programmed chassis dynamometer.

Because the temperatures in the interior of the reactors are of the order of 1650 F during normal operation, the inner core must be constructed of materials which can withstand these temperatures for long periods of time. Such a material, Incoloy 800, was used in the test described. Another useful material for this application is 310 stainless steel. Both of these alloys are relatively expensive, \$1.20 to \$1.40 per pound, because they contain significant quantities of nickel. In an effort to reduce the cost of exhaust manifold reactors, the help of several speciality steel companies was solicited to develop lower cost materials of construction. Several new, and promising, alloys have been tested in long-term tests on the engine dynamometer stand. These newly developed materials do not contain costly or strategic elements such as nickel and are considerably less expensive. The composition of one of the typical alloys under consideration is 18 percent chromium, 2 percent aluminum, and 1 percent silicon. Long-term vehicle testing of the latest design reactors constructed of these low-cost materials soon will be under way.

OTHER CONSIDERATIONS

Exhaust manifold reactors at the current state of development are larger than the conventional exhaust manifolds and, therefore, because of space limitations, cannot be installed on all vehicles produced today. Some vehicles would require redesign of the cylinder heads and relocation of some of the components within the engine compartment.

A second consideration bears on reactor temperatures. Excessively high temperatures in the interior of the reactor may possibly occur under some unusual operating conditions. As an example, should the reactors be at an abnormally high temperature because of prolonged severe load and high speed which might occur as a car pulls a trailer up a long mountain road at or near full throttle, and should a spark plug misfire at this time, the unburned air/fuel mixture coming from the misfiring cylinder may burn in the reactors, releasing considerable energy and raising the temperature of the reactors to the melting point of the materials used. This does not occur in normal operation. Partial control of these high temperatures can be achieved by simply cutting off the injected air to the reactors and thus lowering their temperature under the severe-duty operation. However, in addition to such an air-cut-off system, a high-temperature sensing device will have to be incorporated to warn the driver of the engine malfunction and reactor over-temperature. This warning would require that the driver reduce the power output of the engine and turn it off as soon as practical. This over-temperature warning system would then function in the same manner as the warning of the loss of engine oil pressure or coolant system over-temperature does on current vehicles.

CONTROL OF NITROGEN OXIDES

While exhaust manifold reactors provide excellent control of hydrocarbons and carbon monoxide, they do not by themselves have any effect on nitrogen oxide emissions. To control simultaneously hydrocarbons, carbon monoxides and nitrogen oxides requires a combination of systems. Exhaust gas recirculation is presently the preferred method for nitrogen oxide control and in combination with exhaust manifold thermal reactors will control all gaseous emissions.

Several systems to provide exhaust gas recirculation have been studied. The one currently being used was developed by Esso Research and Engineering Company and is shown schematically in Figure 6. Exhaust gases are taken from the exhaust pipe just ahead of the muffler and are directed into the carburetor between the venturi section and the throttle plate. The amount of exhaust gas which enters the carburetor is metered by an orifice located in the recirculation line. A simple vacuum-operated, on-off valve shuts off the recirculation at idle to give smooth engine operation and also at wide-open-throttle to prevent loss in vehicle performance. A small cyclone separator to remove particles which might plug the recirculation system can be incorporated in the recirculation line if needed. The introduction of the exhaust gas into the carburetor dilutes the incoming fuel/air mixture to the engine with the inert material (exhaust gas) and lowers the peak combustion temperatures within the cylinder, thus reducing the formation of nitrogen oxides.

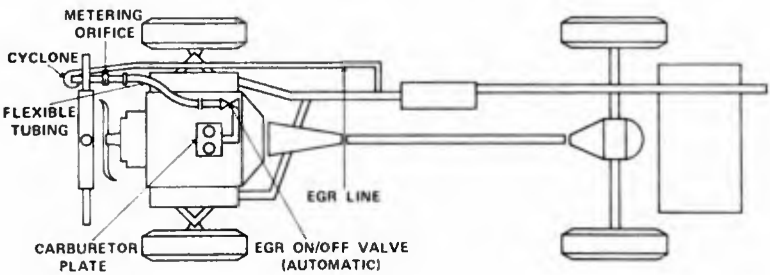


Fig. 6 – Exhaust Gas Recirculation System.

Such a system has been installed on a 1970 vehicle equipped with a V-8 engine and an automatic transmission. The system was set to give a recirculation rate of approximately 15 percent which was sufficient to reduce the nitrogen oxide levels of this vehicle to the 1974 California standards of 1.3 grams of nitrogen oxides per mile. The vehicle has been operated on a programmed chassis dynamometer for 25,000 miles on a non-detergent fuel containing 3 grams of lead per gallon and without a cyclone separator in the exhaust gas recirculation line. During this entire test the exhaust gas recirculation system has required no maintenance. The gas recirculation rate has remained at 15 percent and the nitrogen oxide levels have been unchanged. Some deposits have started to accumulate in the throttle section of the carburetor. Additional tests will be conducted with a fuel containing a carburetor detergent.

PARTICULATE EMISSIONS

The combination of exhaust manifold reactors and exhaust gas recirculation has demonstrated the ability to control all of the gaseous emissions to quite low levels. One additional emission standard has been proposed recently; the control of particulate matter in the exhaust system. The U.S. government bas announced its intention to establisb standards for the years 1975 and 1980. Althougb particulate matter has not been defined, and neither measuring technique nor test cycle has been specified, it is proposed to reduce the exhaust particulate matter substantially. The government has estimated that current vehicles emit approximately 0.3 gram per mile of particulate matter. A standard of 0.1 gram per mile has been proposed for 1975, witb a 1980 goal level of 0.03 gram per mile.

To date, no meaningful information has been available regarding <u>total particulate</u> emission rate from vehicles under realistic driving conditions. It is known that automotive exhaust contains solids such as lead salts, carbon, iron rust, and semi-solid or heavy liquid materials such as tars and oil mists, but little is known about the relative amounts or composition of these materials. Further, there is no clear definition at tbis time of the term "particulate matter" as it pertains to exhaust. Do such materials as the tars and oil mists fall into this classification? This lack of information on "particulate matter" is due to the fact that measuring and characterizing <u>all</u> particles in the exhaust is an exceedingly difficult task and the tecbniques and hardware needed to make tbese measurements are only now being developed.

Considerable progress bas been made in Du Pont's Petroleum Laboratory in developing suitable particulate sampling systems and analytical procedures. Initially, efforts were directed towards the measurement and characterization of lead compounds and other more readily collectible and easy to analyze solid material, such as iron rust. These techniques have been well developed and are now used on a routine basis. Attention is now being focused on the total particulate emission measurement problem and vehicle tests are in progress to measure these emission rates on a gram per mile basis.

Witb regard to the removal of lead particulate from the exhaust gas stream, one of the more effective ways to accomplish separation and retention of sucb particulates is to employ an inertial device, sucb as a cyclone. To trap effectively lead particulates three important functions must be accomplisbed by the trapping system. First, the exhaust must be cooled so that the potential particulate matter can solidify in the exhaust stream. Secondly, the fine particles must be agglomerated into larger particles so that they can be easily separated from the gases. Finally, the particles must be separated from the gas stream with some device such as a cyclone and then retained in the exhaust system.

A schematic diagram of an exhaust particulate trapping system employing these three principles is shown in Figure 7. This system will be called SYSTEM A. The cooling of the exhaust gas as it passes through a dual exhaust system is enhanced by the use of fluted pipes which provide more surface area than ordinary pipes and thus more effective cooling. Eacb exhaust line empties into a trap box in which the exhaust

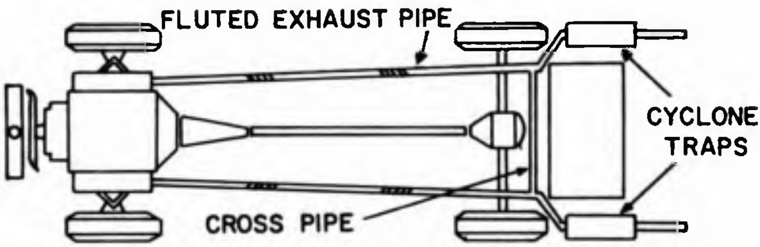


Fig. 7 -- Exhaust Particulate Matter Trapping System A.

gas first passes through wire mesh to agglomerate the particles and then througb a cyclone separator to separate the particles from the gas. The separated particles are collected in one portion of the box and the exhaust gas exits to the atmosphere through a tailpipe. The boxes have sufficient capacity to store all the separated lead salts for the life of the car, or 100,000 miles. The connection betwecn the two exhaust lines just ahead of the trap boxes merely serves to balance the pressure in the two exhaust lines. A photograph of a trap box cut away to sbow the cyclone separator is shown in Figure 8. The wire mesb packing is omitted to permit a view of the cyclone separator.

A photograph of a more effective trapping system, SYSTEM B, as installed on a car is shown in Figure 9. Note that a portion of each of the dual exhaust lines a short distance from the engine incorporates two pipes. These pipes are lined internally with wire mesh to help agglomeration of the particles. In addition, this system differs from System A in that each side of the dual system exhausts into one box filled with wire mesh. The gases flow from this box to two cyclone separators, one in eacb of the rear fender wells. These two separators are the same as those used in System A.

The effectiveness of the two systems is illustrated by the data shown in Tablc 6. Trap System A maintained lead salt emission rates at 0.1 gram per mile in a 67,000 mile test on the programmed chassis dynamometer. A similar car but without traps will have an emission rate of 0.2 gram to 0.3 gram per milc. Thc emission rate for trap System B in a 26,000-mile test was 0.03 gram per mile. Whether trap System B really requires the two pipes on each side of the vcbicle has not yet been determined.

TABLE 6

TRAPPING SYSTEMS REDUCE EXHAUST PARTICULATE LEAD

	Lead Salt Emission Rate, Grams Per Mile
1967 Std. Car	0.2 to 0.3
1967 Car With Trap System A	0.1
1967 Car With More Complex Trap System B	0.03

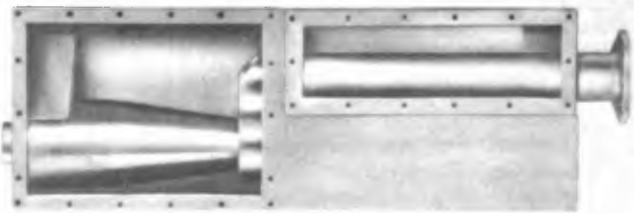


Fig. 8 – Cyclone Separator and Collection Box (Screen Removed) for Particulates.

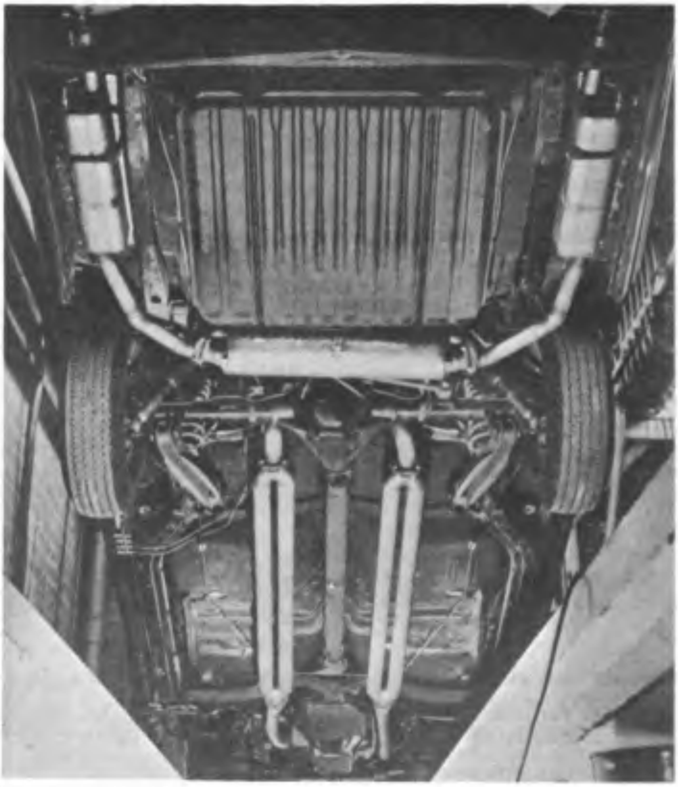


Fig. 9 – Exhaust Particulate Matter Trapping System B.

As indicated earlier, materials other than metallic salts are emitted as particulate matter in the exhaust system. Such materials are difficult to measure, but one specific class of these materials, polynuclear aromatic compounds, has been measured accurately in the exhaust of vehicles. These compounds have been shown in various laboratory tests to be carcinogenic in terms of producing cancerous tumors when painted on the backs of mice. As shown in Table 7, trap System B was quite effective in reducing the amount of one of the more potent of the polynuclear aromatics, benzo [a] pyrene, in the exhaust. The traps brought about a several-fold reduction in the amount of this material when the vehicles were new and also after mileage had been accumulated.

TABLE 7

	Benzo [a] pyrene Emission Rate Micrograms Per Gallon of Fuel Consumed	
	0 Miles	15,000 Miles
1969 Make A	147	306
1969 Make A With Traps	85	67
1969 Make B	66	228
1969 Make B With Traps	24	6

Studies are continuing to define how much reduction of total particulate matter, both inorganic and organic, can be achieved by trapping systems. Systems based on other separation principles also are being examined. These studies are encouraging and indicate that substantial reductions in total particulate emissions can be obtained.

SUMMARY

1. Exhaust manifold thermal reactors combined with exhaust gas recirculation will control hydrocarbons, carbon monoxide, and nitrogen oxides to the levels proposed for 1975 by the U.S. government.

2. Exhaust manifold thermal reactors will operate satisfactorily with leaded fuels and it is believed, based on data contained in this paper, that an exhaust gas recirculation system can be developed which also will operate satisfactorily with leaded fuels.

3. Lead particulate emissions from the exhaust can be reduced to the level of 0.1 gram per mile with a relatively simple trapping system. A somewhat more complex system will reduce the level to 0.03 gram per mile.

4. Because the thermal reactor system can be used with leaded fuels, its commercial adoption would make it possible to attain very low levels of hydrocarbon, carbon monoxide and nitrogen oxides in the exhaust without changing fuel composition. Accordingly, it would make unnecessary major disruptions in the refining and marketing of gasoline and would result in the lowest overall cost to the motorist.

Mr. JARMAN. Thank you, Dr. Diggs, for a very comprehensive statement.

At the beginning of your statement you refer to the fact that the Du Pont Co. is a major supplier of lead antiknock compounds to the petroleum industry.

For the record, can you indicate the total amount of Du Pont sales of lead antiknock compounds?

Dr. DIGGS. I would prefer not to answer that question, Mr. Chairman. We do not usually like to reveal sales of individual products in our company. I can tell you that this is a very large business. The total domestic sales in lead antiknocks is approximately $500 million a year and Du Pont is a major supplier in this market.

Mr. JARMAN. Can you state it in terms of the percentage that it constitutes in Du Pont's total?

Dr. DIGGS. Here again I would prefer not to be precise, but it is very small.

Mr. JARMAN. On page 6, you refer to the initial cost of the thermal reactor system. You said it should be no higher than the cost of other projected systems. Can you give us a present estimate of the cost of the thermal reactor system?

Dr. DIGGS. We have estimated that for a V-8 engine which would require two manifold reactors, one on each bank of the engine, that the manufacturing cost consisting of materials and fabrication would be approximately $44.

Mr. JARMAN. $44.

Dr. DIGGS. Yes, sir. This is for the reactors themselves to equip the V-8 engine.

Mr. JARMAN. Let me ask one more question. Toward the end of your statement you say, "If emission standards are applied to automotive exhaust, no more is needed."

Would you care to comment on whom the Government should hold accountable if the standards are not achieved?

Dr. DIGGS. Well, I would respond to that by saying that I think the same situation would prevail as prevails now. The automobile manufacturers since they are the—since it is their vehicle which is being controlled by the emission standards, it would seem to me they bear the final responsibility in this regard.

Mr. JARMAN. Thank you.

Mr. Rogers?

Mr. ROGERS. Chrysler doesn't seem to think much of your device. I wonder why that is. Have you any idea?

Dr. DIGGS. Well, I would not agree with that. I believe Mr. Heinen said it was the finest device of which he had any knowledge.

Mr. ROGERS. Well, they told us they didn't know of any device that would work. They didn't see anything that had come about. American Motors doesn't think they can have anything by 1975 and I thought you had the solution here. I was encouraged by the fact that perhaps you did.

Dr. DIGGS. Well, our feeling on the manifold reactor is that the technology has been demonstrated, that the conceptual arrangement of the reactor from a thermal dynamic point of view, if you will, has been thoroughly demonstrated and I don't think anybody would quarrel with that, and that the emission levels which we have demonstrated and which are mentioned in the statement are the lowest of which we have any knowledge.

Now, the problem is in adapting that technology to every car which is made by every automobile manufacturer, and each manufacturer has his own idea of what tests he must run in order to satisfy himself before he takes this position. And I think what you have heard from the automobile industry today is varying degrees of concern as to their ability to do this by any given time period.

There are problems with this device, there is no question about that. Problems of durability, of cost effectiveness. In other words, we have got to continue to engineer the system, to minimize costs and optimize the length of time that this will operate under the most variety of conditions that you can find.

Mr. ROGERS. What is the cost? I thought you said the cost was fairly low.

Dr. DIGGS. Well, the manufacturing cost as I responded to the chairman's question, we estimate is at $44, but obviously if we can make those costs lower, it becomes more attractive.

Mr. ROGERS. Well, if it is mass produced, I suppose you could make it lower, couldn't you?

Dr. DIGGS. Well, that is a question I think which might better be addressed to those more skilled in mass production than we are in the metals field.

Mr. ROGERS. You don't know about that. You haven't looked into that possibility.

Dr. DIGGS. Well, again the estimate which I gave you is the best that we are able to come up with with the resources at our command. We have not, for example, asked the automobile industry for their judgment as to the manufactured cost of this device, but I don't think it is——

Mr. ROGERS. Well, your estimate, is it based on 10 million cars, say, or 4 million or 1 million or none?

Dr. DIGGS. It is based on supplying the current automobile market in production lots of 200,000 apiece.

Mr. ROGERS. In lots of 200,000 up to 10 million for the year.

Dr. DIGGS. Yes.

Mr. ROGERS. In other words, you figured the whole 10 million.

Dr. DIGGS. We figured to equip——

Mr. ROGERS (continuing). In arriving at your cost.

Dr. DIGGS. The annual production of vehicles.

Mr. ROGERS. Yes, which would be about 9 million to 10 million. So you have figured the mass production cost.

Dr. DIGGS. Well, we have figured this, yes.

Mr. ROGERS. Well, yes.

Dr. DIGGS. But I would again point out to you that this is not——

Mr. ROGERS. They may not agree with you.

Dr. DIGGS. That is the point.

Mr. ROGERS. The basis of your figure is on a mass production.

Dr. DIGGS. That is true.

Mr. ROGERS. Yes. That is what I wanted. Well, that certainly is better than some of the estimates some of the automobile companies gave for some of their systems.

Now, what is it about the testing that you have done that would differ so much from what they would do?

Dr. DIGGS. Well, the automobile——

Mr. ROGERS. Don't you still have basic tests on all of these things?

Dr. DIGGS. Yes. We have run basic tests on all of these devices. We have run as the statement points out a 100,000 mile durability test according to the Federal certification procedure which the exhaust manifold reactor performed admirably. The automobile industry as I have indicated likes to run very severe kinds of durability tests to assure them selves that under almost any conceivable circumstances as to the performance of the components which they are testing. We have not run all of these tests. We have run certain kinds of tests on laboratory engines designed as well as we can to simulate this kind of automobile industry practice and we are confident on the basis of these results that the reactor scheme is sound. But we have not run all of the automobile industry type durability tests.

We are in the process of doing this as fast as we can.

Mr. ROGERS. About how long would this take, do you think, before you will have run all of the tests that the industry normally would run?

Dr. DIGGS. Well, I would hope that within the next 6 months we can have accomplished a major portion of this. One of the difficulties, of course, is that long terms are involved. In other words, even if we run 24 hours a day to accumulate 100,000 miles requires a year's operation.

Mr. ROGERS. Well, do you have to run it 100,000? Can't you run it 50,000.

Dr. DIGGS. Well, yes, but our design objective with these systems is that we should operate satisfactorily for the normal lifetime of the car without attention on the part of the motorist, and this we estimate to be 100,000 miles.

Mr. ROGERS. Have you taken this up with the air pollution agency to see if they are testing——

Dr. DIGGS. Yes.

Mr. ROGERS. Are they testing?

Dr. DIGGS. They are fully aware of what we are doing. For the most part they have asked to be informed and have not evinced any particular desire to test these devices themselves. I think they have generally agreed that our tests are responsive to types of information which they want to seek.

Mr. ROGERS. Well, now, suppose there is a disagreement as to the adequacy of the equipment. For instance, you say it does, another company says they didn't think much of it.

Now, who should have the final say here?

Dr. DIGGS. Well, by the very nature of the situation the automobile industry must assure themselves I think that these devices would perform satisfactorily in the hands of their customers.

Mr. ROGERS. Well, suppose they say now we can't find any device. You say this proves out. You run all the tests. It proves out. Should the air pollutioners or the Secretary have some right to say, this is an authorized and approved device or system?

Dr. DIGGS. No. I would not think that this would be wise. I think the appropriate course for the Secretary or for the Government is to set the emission standards and I am sure that under those conditions the automobile industry will find a way to do the job, and we are trying to help with the development of this technology.

I don't think there is likely to be a major disagreement when both sides have conducted all the tests which the automobile industry, for example, agrees are necessary in their judgment.

Mr. Rogers. So you think all we should do is emission standards.

Dr. Diggs. Yes, sir.

Mr. Rogers. Shouldn't get into any composition or any component part of gasoline or oil.

Dr. Diggs. No. Our feeling is that if you specify the emissions which you wish to control and you set levels at which you wish these emissions to be controlled, this provides the best system for industry to apply its technology to a solution of the problem.

Mr. Rogers. Well, now, suppose the oil industry says we don't want to take lead out and the automobile industry says, well, we can't make devices until you do. Who decides this?

Dr. Diggs. Well, I think——

Mr. Rogers. Is all the burden to be placed then upon the automobile industry to make all of its devices, all of its products? It must be the one to take out all of whatever you may put in gasoline?

Dr. Diggs. No. And I think you see functioning today the system which provides for the kind of problem you are mentioning. The automobile industry has said that we require lead free gasoline and the petroleum industry has said, well, if indeed you do require lead-free gasoline and you do produce engines which require this, we will supply it.

Now, we have some reservations as to whether technically this is necessary, but certainly they are responding to the position that the automobile industry has taken.

Mr. Rogers. Well, then, you leave the final decision with the automobile industry. Is that what you are telling me?

Dr. Diggs. Well, I think we leave the final decision with the necessity for satisfying the standards, and since the automobile companies wish to continue to sell cars and the petroleum companies wish to continue to sell gasoline, I think the normal forces in the marketplace will get these people together, and as I said, this is already happening.

Mr. Rogers. Suppose it doesn't get them together soon enough?

Dr. Diggs. Well, I think then we can face that situation when it arises. My judgment——

Mr. Rogers. No. This is what this committee has got to face now.

Dr. Diggs. Well, my——

Mr. Rogers. The necessary authority to act in the case you don't get together. I don't see any real time schedule set up here that is perhaps sufficient to meet the problem. Here are two companies. They are not sure when they are going to get around to doing this. Not even sure they can meet 1975 standards. There are two others who said they could meet it. You tell us your device would assure them, even go to 1980.

Isn't somebody going to have to make a considered judgment?

Dr. Diggs. Well, Mr. Rogers, I would again respond to that by saying there seems to be considerable progress toward meeting these goals and standards which have been established, and as long as this progress is maintained, it would be my judgment that the system is functioning adequately.

Now, if at some point in the future we can all see that this is not the case, then perhaps we would change our view.

Mr. Rogers. Well, this is what I am concerned with now. I want to lay a foundation in raw where some decision can be made and what I am asking you, should we give the decision to the automobile company, to the oil company, to HEW, to Commerce or to whom?

Dr. DIGGS. Well, I think I have responded.

Mr. ROGERS. You see, we have got to make some decision on how this is going to be resolved.

Dr. DIGGS. I understand and again I would reiterate our judgment is the best decision to make is to set emission standards and rely on the normal forces in the industry to assure that these are met, in the least costly way to the public.

Mr. ROGERS. Well, of course, I have great respect for American enterprise but I am not sure that I am quite as optimistic as you on this particular problem. And I do think we may have to give some authority to the proper officials to bring some resolution of this problem fairly quickly because our time is running out.

Now, let me ask you this. You say, "We also know that if a course is chosen restricting lead content of gasoline, it will be more costly to the motorist."

Now, this may be questionable, wouldn't you agree?

Dr. DIGGS. Well, I think the evidence before us now is certainly that the unleaded gasoline will cost more than the gasoline of today containing lead. If this were not so, people would not be using lead today.

And secondly, the automobile industry says that they will reduce compression ratios on their forthcoming production. This inevitably will reduce the efficiency of the engines and cause them to burn more gasoline. I think there is no question about this.

Mr. ROGERS. Well, now, Amaco claims that right now their product which is lead free, their octane, high octane, they are not only saving the motorist in mileage, they claim they are getting additional mileage.

Dr. DIGGS. Yes, but their gas——

Mr. ROGERS. And further, they are keeping a cleaner engine which saves the fouling of the parts which have to be replaced more often which is an additional cost to the motorist. So I am not sure but this may more than balance out.

Now, they charge 1 cent more.

Dr. DIGGS. Well, and they also operate—this is a very high octane gasoline and therefore——

Mr. ROGERS. Yes.

Dr. DIGGS. It can be operated in high compression ratio engines which are efficient. Now, if the octane number of the product is dropped, which is what we are talking about here, the engine by its very nature must be reduced in compression ratio and your mileage will suffer. I see no way out of this at all.

Mr. ROGERS. You may suffer some mileage, but what is the average, 10,000 miles, about the average?

Dr. DIGGS. 10,000 to 12,000 miles.

Mr. ROGERS. For what, $721 for the year?

Dr. DIGGS. Well, in the aggregate this is a fairly staggering sum of money.

Mr. ROGERS. Well, except for the fact you don't have to put in plugs. This extends them twice the life. Mufflers twice the life, plus the labor cost. And no telling what else the fouling has done. Don't you think that is a rather considerable expense?

Dr. DIGGS. Well, I think this requires more documentation before we can assure ourselves that in truth we are going to save money.

Mr. ROGERS. Well, let us try to get documentation and they have provided it and are going to provide more. The companies said they would. It seems to me there may be a balancing here.

Dr. DIGGS. That is possible.

Mr. ROGERS. Where the costs may not be too much out of line. So to make a very definite statement, I am not sure yet that all the facts are in on that.

Now, you say on this study that Interior did, they said if you take some lead out it might increase pollutants.

Dr. DIGGS. Yes, sir.

Mr. ROGERS. Now, that I presume as I recall reading some of their statement in California, that was qualified, was it not?

Dr. DIGGS. It was qualified only to the extent that the octane level of the gasoline was maintained.

Mr. ROGERS. That is right. In the compression of the ingine——

Dr. DIGGS. That is the——

Mr. ROGERS. And that is what is proposed.

Dr. DIGGS. Yes.

Mr. ROGERS. The automobiles are proposing—the automobile companies are proposing to reduce the compression.

Dr. DIGGS. No, but the——

Mr. ROGERS. And to use a lesser octane, are they not?

Dr. DIGGS. The portion of the statement to which that refers has to do with cars on the road and that addresses itself to the fact that if lead is to be removed from all gasoline, octane numbers must be maintained for cars on the road, and then we get into the situation which Interior studied.

Mr. ROGERS. Well, it has given the impression that if you are taking lead out of gas, everything is going up, and——

Dr. DIGGS. Well, again, Mr. Rogers——

Mr. ROGERS. New cars that wouldn't be true on.

Dr. DIGGS. That is with the new cars, that is right. You are absolutely right. But the new cars constitute——

Mr. ROGERS. A qualification is not given in your statement nor is it given in the Interior study.

Dr. DIGGS. The statement of mine is divided into two parts and the quote to which you referred comes in that section which says now let us talk about the problem of cars already on the road, and that is the point to which the Bureau is addressing itself by saying that we must maintain octane numbers for cars on the road and if we do this without lead, certain problems may arise.

Mr. ROGERS. Well, you know, I am not even so sure of that because I don't think they have tested the normal octane where you don't even have to—the octane that is 94 which they add lead to make high octane, if that was produced for the car, they don't have to add great aromatics to that. That is a pool gas.

Dr. DIGGS. Yes, but if you are going to maintain the octane level——

Mr. ROGERS. I am talking about for the regular gas, 94.

Dr. DIGGS. That is correct. That is right. If you take all the lead out of regular gasoline, the octane would drop to something in the vicinity of 87.

Mr. ROGERS. That isn't true according to the testimony before this committee. There are many oil companies that refine the gas up to 94. In fact, 96 and 97——

Dr. DIGGS. Yes.

Mr. ROGERS. Without adding lead or putting aromatics in. That is their pool. They can even do that in effect in their pool, and they use that to make the high octane gas. That is what they use to make high octane gas.

Dr. DIGGS. You are referring to the premium pool.

Mr. ROGERS. Exactly.

Dr. DIGGS. That is right.

Mr. ROGERS. Now, suppose premium pool is produced for regular gasoline. Then that statement would not be true at all, would it?

Dr. DIGGS. Then you have nothing left to fuel the premium grade cars.

Mr. ROGERS. Well, what is the production of the premium grade cars, 16 to 20 percent of the production?

Dr. DIGGS. No. It runs more like 40 percent.

Mr. ROGERS. At least the automobile companies tell us 16 to 20 percent.

Dr. DIGGS. Well, the sales ratio shows that approximately 40 percent of the gasoline sold is premium.

Mr. ROGERS. Well, that doesn't mean that that is the type of car that is produced. I may want to use premium in a car that could use regular. You can't judge the production of cars by the consumption of the gasoline.

Dr. DIGGS. I know, but that is what the consumer wants to do, and we think he should continue to have that choice.

Mr. ROGERS. Well, you may think that and we may think differently in order to clean up air pollution.

Dr. DIGGS. I understand.

Mr. ROGERS. Now, what about this statement now, the initial cost of the thermal reactor system should be no higher than the cost of other projected systems and maintenance cost will be lowered since thermal reactors will not require servicing during the lifetime of the car. That is from your testing, I presume?

Dr. DIGGS. Yes, sir.

Mr. ROGERS. Would you warrant your product for the lifetime of the car? Would you be willing to——

Dr. DIGGS. Well, I would point out that, first this is not our product. We have announced that this——

Mr. ROGERS. Well, I thought it was.

Dr. DIGGS. No. We are developing technology here and we have announced this technology is in the public domain and Du Pont neither plans to make nor sell these devices.

Mr. ROGERS. I will call it the Du Pont product and I commend you for doing it. But what I am saying is; it is reasonable to expect a warranty on this or not? Maybe not for the life of the car, maybe for 25,000 miles, or what?

Dr. DIGGS. Well, we would see this as far as the automobile industry is concerned as a replacement of the normal exhaust manifold and our design philosophy has been to construct this system so you don't have to look at it for the life of the car just as you don't have to look under almost any conceivable circumstances at the present exhaust manifold on the car, and it would not, for example, require periodic replacement of the elements as such would probably be the case with catalytic systems.

Mr. Rogers. But you would have no objection, would you, to seeing that these devices have a warranty?

Dr. Diggs. Oh, no.

Mr. Rogers. To assure the public?

Dr. Diggs. Oh, no.

Mr. Rogers. Now, what about particulates? Do you think if we don't take lead out we can really reduce——

Dr. Diggs. Oh, yes, no question about it. There is no question about it. The devices which are relatively simple, and if you would like to crawl under our car downstairs we can show it to you, I think you will be impressed with the simplicity of this device and it will remove almost 80 percent of the particulates in the exhaust stream, again qualified as to how the Federal Government will define particulates.

Mr. Rogers. And when is that demand——

Dr. Diggs. We will have an inertial device, cyclone separator, which takes the particles out of the exhaust gas stream and shoots them into what we call a retention box, and they stay there for the normal lifetime of the car.

Mr. Rogers. Does that have to be removed?

Dr. Diggs. No, sir.

Mr. Rogers. Any lead deposited throughout the rest of the system?

Dr. Diggs. Yes, there is an equilibrium deposit of lead throughout the exhaust system in any type of a vehicle exhaust system.

Mr. Rogers. So there would still be lead in the valves, and so forth.

Dr. Diggs. Yes.

Mr. Rogers. Now, suppose evidence is developed that lead is harmful. Would that change your—harmful to health. Would this change your position?

Dr. Diggs. Oh, yes. Yes. If evidence were developed that lead is harmful to health, we would certainly support restrictions on its use.

Mr. Rogers. Have you actually contacted the major automobile companies asking that they test your device?

Dr. Diggs. Oh, we have been working with all of them very closely for several years.

Mr. Rogers. Several years?

Dr. Diggs. Yes, indeed.

Mr. Rogers. And they still haven't tested it?

Dr. Diggs. Oh, yes, indeed they have. You heard some of their testimony earlier on their testing of the reactors.

Mr. Rogers. I thought maybe you had perfected it since?

Dr. Diggs. Well, this is an evolutionary process and as I pointed out to you, it takes a very long time to run even a 50,000 mile test and by the time we have finished with this we have several better devices, so we are always a little bit better ahead of what we can supply the automobile people.

Mr. Rogers. Should such devices be certified and approved by the Air Pollution Agency?

Dr. Diggs. Well, if they are installed on vehicles, they must be.

Mr. Rogers. No. I mean where an individual company like your company could go with your system to the Federal Air Pollution people and they say we have certified this, we tested it and we certify it. It might be you. Would this be an encouragement to automobile companies to move into it?

Dr. DIGGS. Oh, yes. I think this would be. And we have in essence done that. You see, in the testimony the results of the California Air Resources Board obtained, and then it would only be necessary for us to run the 50,000-mile certification tests which I am sure we could pass handily.

Mr. ROGERS. Do you plan to do this?

Dr. DIGGS. No. We do not plan necessarily to burden the government with the testing of these devices. We will continue to do this ourselves and make the results available, using the approved test procedures.

Mr. ROGERS. Yes, but if the government does it, a number of them don't take your testing results, do they?

Dr. DIGGS. We really have had no problem with that. I think people generally——

Mr. ROGERS. Accepted the standards?

Dr. DIGGS. Nobody said that to my knowledge.

Mr. ROGERS. Who was it that said that earlier today?

Dr. DIGGS. They are concerned about durability.

Mr. ROGERS. Isn't that part of the standards?

Dr. DIGGS. No.

Mr. ROGERS. Might be——

Dr. DIGGS. No, because the standards, the testing which is done to achieve the standards is in the automobile industry's judgment not comparable to that which we would do—I mean which they do for their own evaluation as far as durability is concerned.

Mr. ROGERS. You don't have to have testing of so many miles seeing that it will last before it would be acceptable?

Dr. DIGGS. Well, the Government insists on this. HEW has test procedures which say you must run 50,000 miles and my response to your question was that the automobile industry does not think that these test procedures are sufficiently severe to assure durability from their point of view.

Mr. ROGERS. Now, does your device—has it been tested from cold starts?

Dr. DIGGS. Oh, yes. All the results which you see in our——

Mr. ROGERS. All the various——

Dr. DIGGS. Yes, indeed.

Mr. ROGERS. As it would be normally used?

Dr. DIGGS. Yes, sir. All the numbers which are in our published papers are on the Federal cold start procedure.

Mr. ROGERS. All right. Thank you very much. Thank you, Mr. Chairman.

Mr. JARMAN. Mr. Satterfield.

Mr. SATTERFIELD. Thank you, Mr. Chairman.

I want to get back to something that came up here and it seems to me that there may be some confusion about it. I think the record may be confused and I am talking now about the question of octane.

It seems to me that you have something you wanted to add a few minutes ago when perhaps we got off on something else. But let me ask you this.

When we talk about octane without lead, is it possible to produce 94 octane gas which is your premium pool in the quantity needed for all automobiles across this country without changing the petroleum industry's process of producing gasoline?

Dr. DIGGS. I don't think so.

Mr. SATTERFIELD. I wonder if you would take a minute, if you don't mind, to explain just what happens. How do you produce the 94 octane gas without lead and what happens to the overall pool? I think you said that the overall pool is 87 octane.

Dr. DIGGS. Well, what the petroleum industry usually does is to refine gasoline from the crude oil and then separate it into two pools, one of which has an octane number of approximately 87, 88, on a nationwide basis, which is termed regular grade gasoline pool and to which they add varying amounts of lead raising the octane number to an average of, say, 92 to 94. They have another pool of gasoline which has an average research octane number of 94 without lead to which they add various amounts of lead to raise it approximately to 100 octane number, and the current marketing situation is that approximately 40 percent of the gallonage sold is of the premium octane grading and the remainder of it is the regular grade octane numbers.

Now, obviously if the refining industry had to make a pool of 94 octane number, all together, they must change their refining processes since now an appreciable portion of their pool is only 86.

Mr. SATTERFIELD. What would happen if they were to make their entire pool 91? Could they do that without changing their process?

Dr. DIGGS. No. This is a little bit higher. If you put both the regular and premium grades together I think you will find that the pool is about 88 or 89, and thus even to reach 91 pool would require some change in refining.

Mr. SATTERFIELD. You would still have to add something.

Dr. DIGGS. You would still have to add something. You would have have to do something different than you are doing today.

Mr. SATTERFIELD. So that what we are really saying, if we went to a nonleaded gasoline at 91 octane we are going to have to put something in our pool that may produce pollutants other than——

Dr. DIGGS. Well, now, we must distinguish between whether we are going to do this in all the gasoline or whether we are only going to do it in a portion of it, and the proposition being advanced now, of course, is that only a small proportion of the total pool be 91 octane gasoline, only sufficient to fuel the new cars which the automobile industry will produce.

Mr. SATTERFIELD. Well, eventually you are going to get to the point where it all has to be 91.

Dr. DIGGS. Well, if that is the case, yes, then the refining practices must change, but if in fact the automobile industry does not raise compression ratios and if the succeeding production will operate on 91 octane gasoline, then this is a less restrictive situation than if all the gasoline had to be made this way.

Mr. SATTERFIELD. But in time you are still faced with the problem that as you phase out the prsent population of automobiles you are going to have to produce more and more nonleaded 91 octane gasoline.

Dr. DIGGS. That is right.

Mr. SATTERFIELD. I was interested in a statement you had on page 3 when you were discussing how your thermal reactor is constituted, that the reacting gases pass sequentially through the spaces between the core and shield and then through the space between the shield and outer shell.

Now, have you experienced any difficulty in the passage of these gases in terms of buildups from lead of hydrocarbons and other deposits?

Dr. DIGGS. No. The temperatures inside these reactors are quite high and there is essentially no deposition on the surfaces of the internal parts.

Mr. SATTERFIELD. So it doesn't really make any difference so far as this operation is concerned whether you have leaded gasoline or not.

Dr. DIGGS. Well, I wouldn't say that that is completely so. Careful attention must be paid to the design of the reactor to make sure that these problems do not occur, and in design as which are not satisfactory, there can be problems attributable to this, But our view is that these problems can be handily solved by appropriate design of the reactor.

Mr. SATTERFIELD. And this obviously takes experimentation and long periods of tests.

Dr. DIGGS. Yes, sir.

Mr. SATTERFIELD. On page 13 you made a statement to which I would like to direct your attention. You said that you didn't feel that Government should limit the means of meeting the standards or requiring needless expenditures of money to achieve a solution, where alternative methods less costly would serve as well. I assume from what you say there and the questions that you have answered already you are taking issue, then, with the provision in pending legislation before us that would delegate to the Department of HEW the right to set standards as to the content of fuels.

Dr. DIGGS. Yes. We believe that this authority is not needed and that the appropriate course for the Secretary to pursue is that which is already his statutorily to set emission standards and leave the means of meeting these standards to the industries affected.

Mr. SATTERFIELD. Do you feel that if HEW was given the power to set these standards and as a result, determined that certain additives to fuel could not be put into fuel, and let us say specifically that lead would be excluded since this is what we have been talking about, would this then limit in your estimation the experimentation and the research that would be necessary to develop systems compatible with leaded gasoline as opposed to the catalytic devices that we have been hearing about?

Dr. DIGGS. Well, in some instances I think this might have an inhibiting effect on some people in this research. I don't think, however, that this, you know, would cause research to halt. I think more importantly, however, if in your specific case the Secretary were to say this, why, this would cause the petroleum industry to necessarily take certain steps to get ready for this which would be by their nature costly.

Now, if it turned out somewhat later that the automobile industry made a decision in favor of the exhaust manifold reactor, let us say, then this expense which had already been incurred would have been unnecessary and in our view by holding the emission standards before those who must comply without saying you must do it this way or you can't do it that way, then we reduce the opportunity or reduce the possibility that these kinds of things may happen.

Mr. SATTERFIELD. And you feel, then, having emission standards and having it meet those standards through proper enforcement, you are really stimulating the industry to come through and solve the problem.

Dr. DIGGS. That is our view, sir.

Mr. SATTERFIELD. And at the same time you are leaving available to industry as many options as possible to explore in its efforts to solve the problem.

Dr. DIGGS. Yes, sir.

Mr. SATTERFIELD. Some question was raised a moment ago by Mr. Rogers, about what do we do, should the people who develop systems come to the point where they say there is a system which works and the automobile industry is willing to say that this system works also, but that nonleaded gasoline or some other specific gasoline is required, and the petroleum industry indicates that it is not willing to go along to produce it. I frankly question whether or not this would occur. It would seem to me that if you developed an engine that required a certain kind of fuel, the economics of the matter would dictate that that kind of fuel would be supplied, but assuming you got to such an impasse, is it your feeling that we should consider legislation now to deal with it or do you completely reject the need to set the means for action now or to authorize the mechanics whereby such an impasse could be resolved?

Dr. DIGGS. Well, I think it is premature to set such machinery into motion at this time, and I would associate myself with your remarks that this is an unlikely situation to occur. And as I have already indicated, I think we have a current example of how the industries will move together to solve this common problem. As long as this is working, it would be our view that it should not be impeded.

Mr. SATTERFIELD. In your experience with the other side of this coin, fuel for higher compressioned engines, have you known of any problem between the automobile industry and petroleum industry insofar as providing the specific fuel that would be needed?

Dr. DIGGS. No. I don't believe so. There has been, I think, very close cooperation between the automobile and petroleum industries on these problems. There are sometimes differences of opinion as to the appropriate course to pursue but these have traditionally been worked out on the basis of technical facts involved.

Mr. SATTERFIELD. Since you deal with fuel, if you were suddenly presented with a situation that all the new automobiles were designed and certified to operate without leaded gasoline, would there be any hesitancy on your part of producing nonleaded gasoline?

Dr. DIGGS. We are not in the gasoline business. So this option is not available to us.

Mr. SATTERFIELD. I have no other questions. Thank you.

Mr. JARMAN. Are there further questions?

If not, Dr. Diggs and Mr. Welsh, we appreciate your being with us.

Dr. DIGGS. Thank you very much, Mr. Chairman.

Mr. JARMAN. Our final witness today—and this will conclude the hearings—will be Mr. Leo Seybold, vice president, Air Tansport Association of America.

STATEMENT OF LEO SEYBOLD, VICE PRESIDENT, AIR TRANSPORT ASSOCIATION OF AMERICA; ACCOMPANIED BY ROGER FLYNN, DIRECTOR, DOMESTIC OPERATIONS; AND ROBERT R. HUMPHREYS, ASSISTANT TO THE VICE PRESIDENT, FEDERAL AFFAIRS

Mr. SEYBOLD. Thank you, Mr. Chairman. Mr. Tipton regrets very much that he was unable to be here for your hearing because of a conflict.

I have with me Mr. Roger Flynn, our director of operations, and Mr. Robert Humphreys, assistant to the vice president.

Mr. ROGERS. Mr. Chairman, may I interrupt? Off the record.

(Discussion off the record.)

Mr. SEYBOLD. We know that the time of the committee is running short and I would like to suggest that the statement of Mr. Tipton be submitted for the record and then I will try to summarize it briefly and we will be available to answer your questions.

Mr. JARMAN. The committee will be glad to receive the statement.

Mr. SEYBOLD. The purpose of the airlines in appearing before this committee is to urge that the bill pending before the committee to amend the Clean Air Act be amended to include aircraft emission coverage.

Some years ago the airlines realized that it was necessary to try to eliminate the smoke emissions from airplanes, and with that in mind they went to the manufacturers and asked them to develope a process which would help to eliminate those emissions.

It happens that the most prominent emission that is visible is the one that comes from the JT8-D engine which is on half of our aircraft fleet. Yet the emissions from that engine produce about 70 percent of the visible emissions from all airplanes.

The manufacturer did experiment, did develop a so-called burner can which the airlines are in the process of ordering and installing in the engines which are used on the 727, the 737 and the DC-9 aircraft. As you know because of the standards that the airlines specified in ordering the new aircraft, these aircraft—the 747, LION, and Delta—will be virtually smoke free. By and large they will be clean engines. Thus, when this program which the airlines are now engaged in, and which they initiated in cooperation with the manufacturers, and on which they are cooperating with the Government, is completed, the great bulk of the visible emissions from aircraft engines will be eliminated.

They are also engaged in examining what may be done with other aircraft engines and in looking to other aspects of the pollution problem.

With respect to the bill before you, we ask for Federal preemption. You already have preemption in the motor vehicle field. We think that the problem of movement throughout the States is certainly more pertinent in the case of aircraft than in the case of motor vehicles.

There has been a great show of interest in pollution abatement activity by the States. When the Secretary of HEW submitted his report in March of 1969, pointing out that there was no need for legislation or regulatory action in the aircraft field, he stated that obviously when action was taken, it should involve Federal preemption. And so we asked that that be incorporated in the bill.

However, we do have a problem with the approach of giving certification authority to the Secretary of HEW. He, of course, is the person who is the expert on pollution and pollution standards and we recommend that he be the official who establishes those standards. But the person who has the responsibility for certification of aircraft and aircraft engines and what must be done to those engines to require that they operate safely is the Federal Aviation Administrator. We feel that the application of the standards developed by the Secretary of HEW should be in the hands of the Administrator insofar as aircraft engines are concerned.

Third, we feel that the present law with respect to the control of fuel additives insofar as aircraft fuel is concerned should be amended. In other words, for years the Administrator of the Federal Aviation Administration has had the power to decide what fuels must be used and what additives may be put in those fuels for use in aircraft engines. At the present time there are no additives to aircraft fuels.

Consequently, there is a potential conflict on that point between the Secretary of HEW and the Administrator.

To summarize, we hope that the committee will amend the act to include Federal control of aircraft emissions and that the standards for the pollution emissions will be established by the Secretary of HEW and the application of those standards to aircraft engines should be left in the hands of the Administrator.

Thank you, Mr. Chairman.

(Mr. Tipton's prepared statement follows:)

STATEMENT OF STUART G. TIPTON, PRESIDENT, AIR TRANSPORT ASSOCIATION OF AMERICA

Mr. Chairman, my name is Stuart G. Tipton. I am President of the Air Transport Association, the trade and service organization which represents virtually all the scheduled, certificated airlines of the United States. I would first like to thank you for providing us this opportunity to present testimony with respect to H.R. 15848 and to discuss the industry program to abate jet aircraft smoke emissions. It is our special purpose to recommend to the Committee that H.R. 15848 be amended to cover aircraft emissions.

THE AIRLINE ANTI-POLLUTION PROGRAM

Several years ago the airlines decided that smoke emissions from jet engines should be reduced to the lowest pratcical level, even though they represented a very small percentage of pollutants from all sources, and even though little, if any, government attention had been directed to aircraft emissions. In fact, as recently as March 1969 the Secretary of Health, Education and Welfare indicated in his report to Congress on aircraft emissions that statutory authority or other federal regulatory action was unnecessary at this time.

The airline industry joined with the engine manufacturers in a program to produce an experimental combustor for the JT 8-D engine, which powers Boeing 727 and 737, and the McDonnell Douglas DC-9. The JT 8-D engine was selected because it emits a plume of smoke which appears denser than that of other jet engines, and because the three aircraft types using the engine make up up half the current airline fleet. It was estimated that if an improved combustor could be designed to virtually eliminate smoke from the JT 8-D, the result would be the elimination of about 70 percent of airline smoke emissions.

A new technology combustor, or "burner can," was not an easy thing to achieve. About 99 percent of jet exhaust gases are non-contaminating elements such as carbon dioxide, water vapor, oxygen and nitrogen. Much of the remaining one percent is non-toxic unburned carbon caused by incomplete combustion. The crux of the problem, then, was to further reduce this already minute jet emission product.

To make a long story short, the job was done, and pending successful flight testing of the new combustor, the airlines made plans to retrofit all JT 8-D engines.

While this program was being formulated and before even half the flight testing had been completed, a number of states began to show interest in jet aircraft emissions. Law suits were brought in New Jersey and Illinois. Subsequently, Michigan, New York, California, Missouri, Minnesota, Massachusetts and Maryland either filed suit, demanded through legislation that airlines cease polluting the air, or asked the carriers to submit schedules for smokeless burner can replacement.

In January of this year the Secretary of Health, Education, and Welfare and the Secretary of Transportation held a meeting with the airlines at which 31 airlines agreed to a schedule of JT 8–D engine retrofit which would be substantially completed by the end of 1972—about one year sooner than planned. The carriers are now making preparations to install the new combustors subject to timely delivery by the manufacturers.

The airlines have been guided in their efforts by the logic that environmental problems (including aircraft emissions) should be approached in two phases. The objective of the first phase would be to stop pollution from increasing. The aim of the second phase would be to reduce the problem to an acceptable level.

With respect to smoke emissions the airlines have completed the first phase. The new wide bodied jets—the Boeing 747, the Lockheed 1011, and the McDonnell-Douglas DC–10—will be virtually devoid of smoke. Ninety-five percent of planned aircraft investment is for these new generation airliners. All new 727, 737 and DC–9 engines will be fitted with the new smokeless combustor, and as the JT 8–D engines on existing aircraft are retrofitted, smoke will be progressively reduced. The airlines will soon be well along into the second phase. I would guess that few other industries could claim similar results in the war against pollution.

The effort to eliminate smoke from jet aircraft will be a success. Although we do not yet know how to control smoke from currently used engines other then the JT 8–D, the airlines have addressed the engine manufacturers to develop a solution for the JT3, which powers the Boeing 707 and McDonnell-Douglas DC–8. Work on that problem is in progress.

Aside from curing the smoke problem, what about the non-visible emissions? We know the amount is quite small. We also know that the new generation aircraft engines emit relatively fewer nonvisible pollutants than current ones. Quite frankly, however, no one has the answers to the myriad questions which could be raised about this subject. As of now the problem, if there is one, has not yet been defined. To what extent, if any, do these nonvisible emissions contribute ot pollution of the air? No one—neither government, science, nor ecology experts—have been able to tell us. As a result, the airlines are trying to find the answers on their own. We have created a top-level committee of airline officers whose sole function is to get those answers. Members of the committee include legal, medical, meteorological, and engine specialists—all experts in their fields. If the answers are to be found, you can be sure we shall find them.

I might say at this point that we have developed a slide presentation which depicts the airline-manufacturer smoke abatement program, and which graphically demonstrates the success of this effort. It has been pared to about five minutes, and I would urge you, Mr. Chairman, to permit us to show it to you and your Committee.

AIRCRAFT EMISSIONS SHOULD BE COVERED IN H.R. 15848

The Public Works Committee in the other body recently held hearings on S. 3229, which legislation adds aircraft and their engines to the pollution sources covered by the Clean Air Act, With several changes, which we have recommended, S. 3229 has our industry's support. We urge that this Committee likewise include aircraft and aircraft engines in the provisions of H.R. 15858.

We believe that, with respect to aircraft, the Secretary of Health, Education, and Welfare should establish emission standards which would be applied by the Federal Aviation Administration. We believe very strongly that, to avoid the proliferation of state aircraft emission standards, rules and regulations, Title II of the Clean Air Act should be amended to give the Federal government exclusive authority in this area. However, we do not believe that the Secretary of HEW should be involved in the certification of aircraft or their engines, and have so stated in our testimony on S. 3229. We also suggest a corrective amendment to Section 210 of the Clean Air Act, relating to fuel additives.

Let me now discuss in greater detail those provisions we believe are necessary and appropriate for H.R. 15848.

1. *Application of Emission Standards.*—We know that HEW has the experts on pollution. It is fitting and proper that standards, rules and regulations dealing with all forms of pollution should be issued by that Department. We recommend that the Committee add aircraft and their engines to those sources already covered. On the other hand, the Federal Aviation Administration has the experts on safety, operation and engineering of aircraft and aircraft engines. Neither agency should interfere with the proper function of the other. In this case, we feel strongly that while HEW should set the standards, FAA must retain authority over the application and enforcement of such standards to aircraft and their engines. We therefore recommend the addition of language to accomplish this purpose in Section 202 of the Clean Air Act.

2. *Certification.*—We think efficient regulation requires that there be no certification of aircraft and aircraft engines by the Secretary of HEW under Section 206, as has been proposed in S. 3229. Under that section, the Secretary of HEW is directed to test, in such manner as he deems appropriate, any aircraft or engine to determine whether it is in conformity with Section 202 regulations. The Secretary may issue a certificate of conformity upon such terms as he may prescribe. Aircraft and engines used in commerce are to be "periodically certified under such procedures as the Secretary may by regulation prescribe."

This provision would impose the flat duplication of a function which FAA already performs very thoroughly. Based upon a clear division of responsibility between HEW and FAA, we strongly recommend that the Federal Aviation Administrator continue to be the sole source of certification. If the Secretary of HEW is given authority in Section 202 of the Act to set standards with respect to aircraft emissions as we have suggested, this should provide the Secretary of HEW with all the authority he needs or should have with respect to aircraft and aircraft engines.

3. *State Standards.*—As Title II of the Act now reads, Section 208, relating to federal preemption of emission standards, does not include aircraft and aircraft engines. We believe that it should. This can easily be done by inserting the words "aircraft" and "aircraft engines" in the appropriate places. As the Committee knows, the federal government exercises very extensive regulation over the airline industry, and in the case of safety, such regulation is total. We are certain you will agree that the same exclusivity of jurisdiction should exist in the case of aircraft emissions. As the report of the Secretary of HEW to Congress entitled Nature and Control of Aircraft Engine Exhaust Emissions states:

"[It is the] Department's conclusion that adoption and enforcement of State or local emission control regulations pertaining to aircraft cannot be adequately justified at this time. The Department recommends that, if and when regulations become necessary, the rationale used to develop Federal rather than local emission standards for motor vehicles be applied to aircraft."

(Sen. Doc. No. 91–9, at page 5.)

The case for a single, Federal standard for aircraft emissions is, of course, far more compelling than for motor vehicle emissions. The great preponderance of the aircraft of U.S. certificated airlines operate into many states in a single day. By way of illustration, the schedule of one aircraft of a major carrier shows that in the course of a single day, 10 points are served in 9 states. The aircraft flies over a total of 17 states in that 24-hour period. It would be onerous in the extreme to expect an airline company to comply with a different air pollution standard in each of the states or localities it serves.

There is no reason to apply to aircraft Section 208(b) of the Act, relating to waiver of preemption, however. Again, the problems of motor vehicles and aircraft are widely disparate. We can conceive of no circumstance which would warrant a state aircraft emission standard, rule or regulation to be at variance with the Federal one. Nor should subsection (c) apply to aircraft, since the authority of states with respect to intrastate regulation of aircraft is clearly established under the Federal Aviation Act of 1958, and aviation safety is clearly an exclusive Federal function under that Act. The courts have so held.

4. *Fuel Additives.*—In reviewing the Clean Air Act, we discovered a preexisting provision, Section 210, which gives the Secretary regulatory power over all types of fuel. If this were to be applied to aircraft fuel, it would duplicate authority already residing in the Federal Aviation Administration, which certification process, approves specifications for fuels permitted to be used in each type engine. Neither fuels nor fuel additives are permitted to be used unless they are approved by FAA.

The authority that we propose be given the Secretary of HEW in Section 202 to set standards to determine the acceptable levels of exhaust emissions would seem to be adequate for the purpose of improving air quality. It is difficult to see why additional authority over aircraft fuels is necessary, especially in the light of FAA's existing authority. We therefore urge the Committee to amend the bill to exempt aircraft fuels from the application of Section 210.

CONCLUSION

The programs we have described will virtually eliminate smoke pollution from airline aircraft engines within the next few years. As soon as we determine the facts with respect to non-visible emissions, the airlines will engage in a vigorous program aimed to do all we can to eliminate these.

Unquestionably these programs will be expensive. In one way or another the funds to pay for them will come either industry or the government. These funds must be extracted either from customers or the taxpayers.

In any event, the more that industry can accomplish with its outlays, the less the government will have to do. This means that both the government and the airlines have a large stake in a businesslike, well planned and efficient program of environmental improvement. We are establishing such a program. We hope the government will support it and resist the temptation to engage in crash programs; for while these make headlines today they will result in added costs to the public tomorrow.

If the amendments we urge today are adopted, H.R. 15848 can be highly useful mechanism for the elimination of aircraft emissions. The airline industry is a responsible one, fully imbued with awareness of its duties to the public. With the cooperation of the government, we shall vigorously respond in the fight of cleaner air.

Mr. JARMAN. I think you have made an excellent summary of the statement that you submitted for the record. The Chair will hold questions for you, Mr. Rogers.

Mr. ROGERS. Thank you.

I commend the ATA for coming in and in this spirit of cooperation realizing the problem, and I know the industry already has in the agreements that it has worked out to have accomplished the retrofit in new aircraft by 1972, as I recall it—isn't this the schedule?

Mr. SEYBOLD. Yes. By the end of 1972. Actually I believe that that is speeded up. Mr. Flynn might comment.

Mr. FLYNN. Well, not new aircraft. These are for the JT8D engines that are on the 727's and 737's.

Mr. ROGERS. Those already on the——

Mr. FLYNN. Yes. We are going through a retrofit program. We have some 3,000 engines in the fleet. Our carriers have ordered and we expect to have the fleet substantially cleaned up by the end of 1972.

Mr. ROGERS. All right.

Now, what about new—they will be taken care of?

Mr. FLYNN. The new aircraft coming in, they are being powered by new engines called the high bypass ratio engines. For instance, the 747 is powered by such an engine. The DC-10's, the Lockheed 1011's will also have similar designs produced by Rolls Royce and General Electric. So we are confident that as we move ahead now, we are passing the era of the smoky engine.

Mr. ROGERS. Well, yes.

Now, are you telling me then that the new engines will be——

Mr. FLYNN. Virtually smoke free.

Mr. ROGERS. Virtually smoke free. You might let us have what percentage it looks like to you. I realize you may not have this now. I mean for the record.

Mr. FLYNN. Let me say that the current JT8D engine, say, on a Ringlemann scale, which goes from 1 to 5, emits smoke that varies between 2½ to 4 in the Ringlemann scale. As we finish the clean-up, it will go down to about half a Ringlemann.

Mr. ROGERS. It is going up to 4 now?

Mr. FLYNN. Yes. Sometimes in certain parts of the cycle of the take-off operation it will go, depending where the observer is, it will be somewhere between 3 and sometimes as high as 4. It will go down to a half Ringlemann.

Mr. ROGERS. You use only a 5-Ring scale.

Mr. FLYNN. Yes, 5 in degrees of blackness.

Mr. ROGERS. Are these the new engines?

Mr. FLYNN. No. These are the ones we are working on. Now, on the new engines, they are down to about a half Ringlemann or less. You can just barely see a wisp sometimes coming out.

Mr. ROGERS. And the retrofit engines will also come——

Mr. FLYNN. Come down to that standard. Yes, sir.

Mr. ROGERS. Now, as I understand it, you do believe that the Secretary of HEW should have authority to set emission standards?

Mr. FLYNN. Yes.

Mr. ROGERS. So that the Secretary should have the right of mission control.

Now, you are concerned about fuel, in other words, where the FAA is setting standards for fuel. It would be well to have some consultation peerhaps with HEW to see that emissions——

Mr. SEYBOLD. We presume that would take place but, of course, their Administrator has had that power for years.

Mr. ROGERS. What I am saying is that we would ask that to either leave it with the Administrator simply saying he will consult HEW as to any control of fuels or additives regarding emissions.

Mr. SEYBOLD. That is correct.

Mr. ROGERS. All right. Could you submit language to the committee on these proposals?

Mr. SEYBOLD. We will be glad to.

Mr. ROGERS. Could we get them tomorrow?

Mr. SEYBOLD. Yes, you could.

(The information requested was not available to the committee at the time of printing.)

Mr. ROGERS. Sorry to ask that but we are going to start work tomorrow, we understand. Thank you.

Thank you, Mr. Chairman.

Mr. SEYBOLD. Thank you, Mr. Chairman and members of the committee.

Mr. JARMAN. Mr. Satterfield?

Mr. SATTERFIELD. Thank you, Mr. Chairman.

In view of the time, I will not ask any questions but I will certainly carefully consider your statement, Mr. Seybold.

Mr. SEYBOLD. Thank you, Mr. Satterfield.

Mr. JARMAN. Let the Chair ask just one clarifying question.

On page 4 of your statement you say, "We believe that with respect to aircraft the Secretary of Health, Education, and Welfare should establish emission standards which would be applied bv the Federal Aviation Administration."

The setting of emission standards, of course, would include the prescribing of a timetable for the achievement of such standards.

What is your thinking as to where the authority should lie regarding the setting of the timetable respecting the standards?

Mr. SEYBOLD. Of course, it depends in part on the actual feasibility of obtaining the equipment and applying the standards. I would hesitate to say at this point which of the two officials should have that particular jurisdiction. Perhaps Mr. Flynn has a comment.

Mr. FLYNN. Well, we would visualize that perhaps the Secretary might set a standard, we will say, for nitrous oxide emissions with respect to aircraft engines and I think it would be up to the Administrator of FAA and with the expertise that he would have available to him in the engine field to see if in fact this would be achieved, and if so, when. And then I think he should then advise the Secretary as to what steps he intends to take to meet the standards that the Secretary of HEW has laid down.

In tinkering with an engine and the safety of people it is not a simple matter sometimes to get corrections, but I think they are available to us. Fortunately our engines do not put out very much in the way of noxious substances. So that perhaps it will not be too difficult for us to come in with whatever the Secretary of HEW demands.

Mr. JARMAN. Well, gentlemen, thank you for your testimony and for adding to the hearing.

Mr. SEYBOLD. Thank you.

Mr. JARMAN. Let the Chair announce that completes the hearings on the bill. The record will be kept open until next Monday, April 20, for additional statements.

The subcommittee will stand adjourned.

(The following statements and letters were received for the record:)

STATEMENT OF HON. WILLIAM F. RYAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. Chairman, I appreciate the opportunity to offer testimony before the Public Health and Welfare Subcommittee of the House Interstate and Foreign Commerce Committee. We are all aware—and the general public is becoming increasingly aware—of the awesome havoc we have wreaked upon our environment. Perhaps more than any other problem facing this nation, pollution intrudes on every citizen's life every single day. Its severity may be most immediately apparent to the city dweller, but even the most isolated farmer in the most remote section of the country is likewise exposed to it.

Before discussing the legislation which I have proposed to amend the Clear Air Act, I should like to make some mention of the severity of the problem now at hand. Something approaching 200 million tons of contaminants are now hurled into the atmosphere every year. These pollutants range from the noxious and highly visible soot pouring out of industrial smokestacks to the colorless and odorless, but potentially lethal, carbon monoxide produced by automobiles.

Periodically, this infusion of gases and solid particles into the atmosphere reaches a point of over saturation. We are then subjected to the killer smogs which have hit Donora, Pennsylvania, New York City, Los Angeles, and other communities. It is, almost literally, pure luck that the disasters thusfar have not been even more acute in number of victims and in duration.

Let me just point to a few statistics on pollutant levels to demonstrate the daily hazards we endure. While the carbon monoxide content in clean, dry air near sea level is .1 parts per million, the average daily content in midtown Manhatten often exceeds 15 parts per million during business hours. The oxidants component in clean, dry air near sea level is .02 parts per million; the average daily content at East 121st Street in Manhattan is .04 ppm's. As compared to .001 parts per million of nitrogen oxide in clean, dry air near sea level, the average daily content at East 121st Street is 109 ppm's. And the comparative figures for sulphur dioxide are .0002 ppm's in clean dry sea level air and .111 ppm's at East 121st Street. Finally, suspended particulates average 124 micrograms per cubic meter in Manhattan's air.

These statistics are not unique. Nor are they unusual. Anyone who has traveled through Gary, Indiana, Chicago, Los Angeles, Cleveland, or a hundred other cities, has seen the layer of smog overhanging their skylines. Anyone who suffers from emphysema or asthma or bronchitis has experienced the agonies of polluted air. Anyone who has been caught in a traffic jam, or who has driven the streets of any town or city, has been subjected to a small part of the over 90 million tons of contaminants spewed forth from automobile exhaust systems.

Perhaps even more frightening is the very real peril that the entire world's heat balance is going to be irreversibly altered and that all of human life—not just people peculiarly susceptible to the noxious pollutants filling our air—will be endangered.

We are all victims of our own folly. And yet we are all culprits, as well, for each of us is a polluter. Certainly it would be more comfortable to place the blame on impersonal entities—"the system," "the establishment," or "big business." But, while corporate action and governmental inaction have played a major role in bringing us to our present disastrous condition, they have been ably assisted and abetted by each individual, ready to reap the personal benefits of convenience and ease. Every enzyme pre-soaking, every aluminum can, every weekend car rental, every pre-packaged cook-and-serve dinner contributes to a polluted environment.

Of course, moralizing is no answer. Nor, in fact, is it even fair to say that we have arrived at our calamitous state solely because of greed or indifference. There are very real conflicts in legitimate social goals. We may now understand the effects of insecticides on the ecological balance, but who will argue that underdeveloped nations must continue to live with plague and widespread disease? We may recognize that massive urban construction poses massive disposal problems, but who will tell the poor that they must continue to live in sub-standard housing?

We will not resolve our conflicts by arguing for a return to a pre-technological society. But we can, and indeed we must, begin to act rationally in choosing between competing alternatives to achieve a desired end.

There is no question that transportation for commuters into the inner cities is essential. But there is very real cause to consider whether hundreds of thousands of large, internal combustion engined automobiles, each driven by a lone commuter, are the most beneficial means to achieve this end. There is no question that speedy travel between the coasts is needed, but it may well be that the extra hour or two gained by larger and faster jets is not worth the accompanying noise.

These are just two examples of the approach which we, as individuals and as legislators, must begin to follow—assessing our actions, and the programs and activities to which we commit funds, in terms of their impact upon our environment, and choosing those which minimize that impact, even if the expense is thereby higher.

This approach looks to the long term reordering of our consumption habits. But the short term, as well, offers us opportunity to undertake effective and immediate steps to ameliorate air pollution and remediate its causes. The legislation which I have introduced mandates and enables aggressive action to these ends.

H.R.17113, which amends the Clean Air Act, 42 U.S.C. 1857, provides several distinct components, each of which is strong by itself, and which together provide a coherent, stringent strategy to meet the challenges which clearly have not yet been met, and which the Administration bill clearly fails to meet.

Perhaps most important, the bill provides power to enforce the law. Hitherto, the Secretary of Health, Education, and Welfare has only had the authority, under Section 108(k) of the Clean Air Act, to request the Attorney General to seek an injunction to abate pollution sources "upon receipt of evidence that a particular pollution source or combination of sources (including moving sources) is presenting an imminent and substantial endangerment to the health of persons, and finding that appropriate State or local authorities have not acted to abate such sources. . . ."

This provision is brigaded with language diminishing its utility—"imminent and substantial endangerment." It is susceptible to use only if the State or local authorities have not acted, and a finding has been made to this effect. H.R. 17113. on the other hand, gives strong and powerful enforcement authority. The Secretary may issue cease and desist orders, the regional commission which the bill creates in another section may do so, and similarly, the States are required to include such power within the plans they must tender for approval to the Secretary.

I have just made mention of regional commissions, and I want to more fully explain this reference. H.R. 17113 authorizes the Secretary of Health, Education, and Welfare to establish air quality regions, and Air Quality Control Commissions to set standards for these regions. These standards may be more stringent than the nationally applicable standards set by the Secretary, and, in such case, they will then supersede the Federal standards, as well as State standards which are weaker.

I recognize that the Clean Air Act now provides, in Section 105, for interstate air quality agencies or commissions. However, these bodies do little, and have virtually no power.

The commissions I propose do have major functions, and they have firm authority to enforce the standards they establish. And these two characteristics are essential. Air pollution is virtually by definition a problem which knows no man-made boundaries. City borders and state lines have significance for taxing bodies, but they are irrelevant in terms of deterring the smoke of the steel plants in Gary from polluting the skies over Chicago. The stench of the New Jersey chemical plants is shared in unwilling comity by New York City, and the DDT sprayed over the farms of California disperses in the air over Arizona and Nevada.

Regional commissions, mandated to set firm air quality standards, and armed with the Secretary's authority to issue cease and desist orders, are the key to dealing with air pollution rationally and effectively.

H.R. 17113 not only provides adequate enforcement power, and it not only creates regional commissions equipped to abate pollution. It further authorizes the Secretary of Health, Education, and Welfare to set nationally applicable standards for ambient air quality, and for designated industries. The need for national standards naturally follows from the pervasiveness of the problem, and the wide dispersal from their sources of pollutants. It accomplishes little for New York State to establish meaningful pollution control standards if her neighboring states set only minimal restrictions.

In the same vein, national standards for designated industries are a distinct need apart from nationally applicable standards of ambient air quality. While the latter establish pollution levels in terms of the presence of gases and particles in the air, the former go directly to governing the processes of particular industries which call for special provisions. Thus, the steel industry must be governed by restrictions which address the particular methods and systems which it employs, and those pollutants for which it is most directly responsible.

H.R. 17113 also embodies a provision which I believe especially important in putting meaningful penalty behind the fine rhetoric which is so common in condemning polluters. Acts of pollution are made civil offenses, and polluters are subject to fines ranging from $50 to $2,000 for each violation. Thus, not only is cease and desist authority provided by my bill to stop acts of pollution, but monetary fines are also authorized to punish those who are patently guilty of degrading our environment. What is more, in those instances, should they arise, where the Federal Government fails to bring an action to recover these penalties, the private citizen is authorized to bring suit in the name of and on behalf of the United States against the polluter.

This is far reaching legislation, but it is necessary. We have seen that the government has done too little and even that has been done too seldom. Yet, our air continues to decline in quality. This degradation of our environment is not going to await the arousal of bureaucracies; concerned citizens must be given the opportunity to protect themselves and society by bringing suit when the government fails to do so.

There are several other provisions of H.R. 17113 to which I want to allude briefly. The bill contains a section providing for Federal assistance to those workers whose plants have been ordered to cease and desist their polluting activities, and who have thereby had to either lower their output or cease operation while readjusting their manufacturing methods.

My bill also bans the making of leaded gasoline. I think the evidence abundantly clear that the lead which is entering our atmosphere through the use of leaded gasoline in automobiles is one of the most perilous pollutants, and, yet, also one of the most easily eradicable pollutants in terms of cutting off further entry into the air. Thus, H.R. 17113 gives just one year to cease manufacture of this product.

My bill also provides for a state motor vehicle pollution control inspection program. The Secretary of Transportation would be able to impose, before approving any state's highway safety program, a requirement that the program include, as a part of vehicle inspection, procedures to assure the adequacy of performance of emission-control devices in motor vehicles. The Secretary of Transportation would establish standards based on pollution emission standards established by the Department of Health, Education, and Welfare. Grants would be available to assist in meeting the cost of this program.

Finally, H.R. 17113 repeals that section of the Clean Air Act—section 105(c)—which places a percentage limitation on the amount of Federal funds which may be received by any one state. It is obvious that industrialized states such as New York, California, and Illinois, have far more severe pollution problems than do the rural state. Consequently, their need for funds is far more acute, and repeal of section 105(c) recognizes this fact.

Obviously, money is a prime requisite and H.R. 17113 recognizes this by authorizing for the Clean Air Act $200 million for fiscal year 1971, $250 million for fiscal year 1972, and $300 million for fiscal year 1973. In addition, $50 million is authorized to conduct and accelerate research into and development of alternatives to the internal combustion engine.

I also want to briefly discuss the problem of waste disposal and the legislation which I have introduced—H.R. 642—to meet this problem. The statistics here are no less stark than those I recited earlier concerning air pollution. On the average, each person in this country generates about 7 pounds of trash a day.

About 73 percent of refuse now goes into open dumps; 15 percent is incinerated; 8 percent goes into sanitary land fills; 1 percent into compost; and only about 3 percent is salvaged.

Obviously, the need for solid waste disposal facilities is enormous. H.R. 642 would meet this need. It would permit the Secretary of Health, Education, and Welfare to make grants for surveys by state, interstate, municipal, and intermunicipal agencies of solid waste disposal practices and problems within their jurisdiction. Money would also be available for these agencies to develop solid waste disposal plans. In addition, the Secretary would be able to make grants for construction of solid waste disposal facilities, including completion and improvement if existing facilities.

At present, the national average expenditure on waste disposal is $6.81 a year per person. This amount in no way comes close to meeting the costs which must be incurred if we are to grapple in any way adequately with the annual total of 180 million tons of solid waste. I recognize that to some degree this paltry total of $6.81 per person reflects a reluctance upon the part of local communities to meet their responsibilities. But, the overwhelming problem is not one of failure to recognize the problem, but rather, a lack of funds to deal with it.

H.R. 642 provides such funds. It raises the funding for those portions of the program administered by the Secretary of Health, Education, and Welfare for fiscal year 1970 from $19,750,000 to $152 million, and it authorizes $216 million for fiscal year 1971 and $236 millon for fiscal year 1972. And for those portions of the program administered by the Secretary of the Interior, there is authorized $15 million for fiscal year 1970, $18 million for fiscal year 1971, and $21.5 million for fiscal year 1972.

In summary, I want to emphasize that the degradation of our environment calls for effective and forceful legislation. H.R. 17113 and H.R. 642 answer this call. But, equally as important, there must be a commitment, on our part, on the part of the Executive branch, and on the part of every citizen and business, to stop the slow but steady suicide we have embarked upon. We can deplore and we can implore endlessly, but rhetoric is no more than empty air—and in this case very dirty empty air. We can legislate and we can appropriate. But legislation and money are only allies of action and for enforcement. We are truly using up our trump cards, and the game may soon be over—permanently. I do not want to sound overly ominous or to be a prophet of doom, but the peril allows no less.

Statement by J. L. Kimberley, Executive Vice President, Lead Industries Association

As executive vice president of the Lead Industries Association, I am submitting this statement on behalf of our 62 member companies engaged in the mining, production, manufacturing and fabrication of lead and lead products.

(House Bill 15848, Sec. 5)

Senate Bill 3229 Sec. 210 would have serious ramifications for the lead industry as well as many other important segments of U.S. industry. This section of the bill would empower the Secretary of Health, Education and Welfare to register and regulate fuels and fuel additives. This is of particular concern to the lead industry because lead antiknock compounds are the major additive in today's gasoline. We oppose the granting of this power for reasons given below.

We have monitored your subcommittee hearings and heard many inaccurate contentions and accusations pertaining to lead additives. We will endeavor to state our position in light of the material you already have before you.

We commend and support all efforts to reduce harmful emissions into the air from automobiles and other sources. However, we question that it is necessary to give the Health, Education, and Welfare Secretary the broad power of determining how fuels shall be made. His concern is properly what is *emitted* from an auto exhaust—not what fuel combinations or control systems achieve low emission. Banning lead will not in itself accomplish control of major automotive emissions. Indeed there is good evidence that removal of lead may even increase certain noxious gaseous emissions.

Much progress has been made on developing emission control systems that will work with leaded gasoline, whereas we do not know of any systems that have been tested out to work with non-leaded gasoline.

The California Air Resources Board has completed tests on a Du Pont thermal reactor system on a conventional automobile that came well under the 1975 goals set by that State and the Federal government and came near to meeting the 1980 goals. And this was with leaded gasoline!

We are told the official results on a Du Pont system showed hydrocarbon emissions of 0.22 grams per mile, compared with the 1975 California standard of 0.50 grams per mile, and the 1980 Federal goal of 0.25 grams per mile. Carbon monoxide emissions in the ARB test were 7.4 grams per mile, compared with the 12.0 grams per mile set in the 1975 California standards and the 4.7 grams per mile projected in the 1980 Federal goal. Oxides of nitrogen emissions from the reactor-equipped car, with a supporting exhaust gas recirculation system, were 0.41 grams per mile. This compares with 1.0 grams per mile in the 1975 California standards and 0.4 in the 1980 Federal goal.

If the Health, Education and Welfare Secretary were to ban lead additives, he might be shutting off the very real possibility that more complete emission control could be accomplished soon with present cars and gasoline. The banning of leaded gasoline might well leave only the unproved and undemonstrated alternative of improving emission controls with unleaded gasoline.

Furthermore, it is universally agreed that if unleaded gasoline is mandated, the public would have to absorb the higher cost of motor vehicle operation, and that the drawdown of petroleum reserves may be increased by as much as 6 to 8 per cent per year.

This uncharted course will seriously affect the petroleum and automobile industries and their customers as has already been testified. The lead industry also would be adversely affected. Lead for gasoline additives accounts for 20 percent of total annual lead consumption in this country, and a higher percentage of all lead mined in the United States. Significant as this market is to the lead industry, I am authorized to say that we would withdraw our objections to the removal from gasoline if we were convinced that this is necessary to solve the auto emission problem or if lead's removal were necessary to remove a known health hazard to the public.

We are not convinced that the removal of lead will have all the benefits purported.

For these and other reasons which I will discuss, we urge you not to enact legislation that would put such power in the hands of the Department of Health, Education and Welfare.

In support of our position, I offer these major points for consideration:

First: It is astounding to find gross misconceptions, misrepresentations and false conclusions are being used officially to support the drive to "get the lead out." A document that was used as a guide for California legislators in recent hearings contains examples, a few of which I will cite shortly.

Second: The most advanced emission control devices that have actually been demonstrated—and are presently available for adapting to mass production for use on present cars have been shown to be effective with today's leaded gasolines. Auto industry testimony before the subcommittee substantiates this.

Third: No clear definition has been given of any presently developed system that will be used with non-leaded gasolines to control the truly noxious emissions that are the major target of this abatement effort.

Fourth: As a corollary to the third point, there is considerable belief, and evidence to support that belief, that non-leaded fuels could actually increase, rather than decrease, the more noxious and obnoxious auto fumes. This is a vast unknown that is being ignored by many.

Fifth: All the problems involved in removing lead would be worth tackling if there were to be shown any need for getting lead out of gasoline on the grounds of public health or even nuisance. Lead is not involved in photochemical smog formation, nor in irritation of eyes or other membranes, nor has lead in the air, from whatever sources, been shown to present a danger to public health.

Sixth: As to control of particulate emissions from auto exhausts in the future, this is the fuzziest area yet encountered. So far as I can find, no one has defined what is even meant by "particulates." This is important because lead alone amounts to about one-third and probably no more than 40 percent of total auto particulate emissions. Thus even the complete removal of lead from gasolines would not in itself achieve the particulate emission goals projected by the Federal government. Nevertheless, we believe it is important that any control systems should include control of particulate emissions. And such controls are part of most test systems being demonstrated today particularly by Du Pont and Ethyl Corporation. Even so, the particulate problem is admittedly a small part of the total auto emission problem.

I would like to elaborate on some of these points. As to the first, my comments refer to a document entitled "Lead and Gasoline" which was used to brief members of the California Assembly Transportation Committee before whom I appeared April 2. After seeing this misleading material, I can better understand why some legislators believe they should act against leaded gasoline.

This document says: "The auto manufacturers have supported the removal of lead from gasoline; the oil industry has promised to provide unleaded fuel when it is needed."

My comment is: The implication of enthusiastic support is very suspect. My information strongly suggests that the auto insustry acted under the pressure of the emission goals projected for 1975 and 1980. They singled out lead for a dramatic statement without giving much more than a promise that removing lead would ease the way for them to meet the later control standards. In fact, this was confirmed by the auto companies in recent Washingron subcommittee hearings. Certainly the oil companies did not respond enthusiastically or even unanimously. Small refiners are faced with huge problems, including the possibility of being forced out of business. But the major companies are saying they can provide non-leaded gasoline—at a cost—if the demand is there.

The briefing paper used in California starts out with these statements or rather, mis-statements: "The human body has no beneficial use for lead. Yet each year the concentration of lead in the bodies of people living in our metropolitan areas is increasing. Most of the lead in our bones has been assimilated out of the air we breathe."

Each one of these sentences is prejudicial and either misleading or erroneous.

As to the first, it is not known whether or not the human body has beneficial use for lead. Admittedly, no such use has been shown to date. But it is only in recent years that the role of trace metals in biology has been studied and understood. It is now known that metals such as iron are necessary to body functions in amounts of about 6 grams, copper in amounts of about 250 milligrams, zinc in amounts of about 3 grams and so forth. Yet each of these essential metals can also be toxic in excessive amounts. Thus the acknowledged fact that excessive amounts of lead can be toxic does not rule out the possibility (now being studied) that the small amounts of lead normally found in human bodies may not perform some necessary function.

I know of no evidence to support the second sentence that the concentration of lead in people in cities is increasing yearly. Published evidence generally belies that statement. It is true that certain people exposed to unusual—not normal—amounts of lead may show increased lead levels in their blood. But in tests among the general public lead levels are shown to be well within the normal safety range.

On the third statement saying that most lead in bones comes from air, I know of nothing to support it. Carefully controlled studies of lead intake by human beings over a number of years have established that the major sources of lead entering the human body are food and drink—most of it from naturally occurring sources. And lead excretion from the body generally balances with lead intake.

There are other such prejudicial statements intended to incite action against lead. I will comment on only one more.

The document says: "Health officials fear that, if we wait until toxic concentrations are reached, we may be faced with widespread lead poisoning before the situation can be reversed."

This raises an emotional spectre for which there is no rational basis. I know of no evidence that lead in the ambient air is sustained at levels near the proposed ambient air standard of 10 micrograms per cubic meter of air on a 30-day average.

This standard, as recommended by the American Industrial Hygiene Association, in itself has a large built-in margin of safety. Further, experience in lead industrial installations where the accepted threshold limit value is 200 micrograms per cubic meter of air for a work week has demonstrated that "widespread lead poisoning" does not occur at these levels or even higher levels that may sometimes be reached under certain work conditions.

Referring to the points on control systems, it is strange that so much reliance is placed on rather vague promises of emission control approaches that may be developed after there is lead-free gasoline. Stranger still is the delay in adopting and improving control methods that have already been shown to work with existing gasolines and automobiles.

It stands to reason that if the emotional drive succeeds to force the automobile public to use non-leaded gasoline, this may well close off one promising alternative to the solution of automobile exhaust problems, today the most advanced and demonstrated methods for such emission control work with leaded gasoline. Should leaded gasoline be banned, obviously research on and further development of such systems compatible with leaded gasoline will be greatly hampered, if not brought to a standstill.

The uncertainties about results if non-leaded gasoline is required emphasize the need to be sure the Health, Education and Welfare Secretary does not have arbitrary power over additives. Dr. Richard D. Cadle of the National Center for Atmospheric Research, and a recognized authority on the composition of the atmosphere, explained his concern in the April 20, 1970 issue of *Chemical & Engineering News:*

"In connection with any possible health hazard from the lead compounds that automobiles send into the atmosphere, Dr. Cadle believes that there is reason for alarm, but warns that quick solutions could build into problems of an entirely different stripe. He suggests, for example, that gasoline manufacturers who hope to replace leaded alkane gasoline with high-aromatic fuels should look at least twice before they leap.

"It's conceivable that some of these aromatics could lead to the formation of carcinogenic by-products in the combustion process, although I don't know of any hard evidence to support that idea. Nevertheless, aromatic compounds generally are toxic, irrespective of whether or not they're carcinogenic.

"Also, certain aromatic compounds have been found to be a couple of orders of magnitude more severe as eye irritants than the peroxyalkyl nitarics formed from comventional gasolines. What I'm really saying here is that in the whole area of air pollution control, we shouldn't rush ahead with one solution before trying to anticipate the larger problems it may create."

We have raised these points in our conviction that unless it can be satisfactorily demonstrated that lead's removal from gasoline will greatly facilitate the control of noxious emissions, there is no urgent reason for seeking a ban on leaded gasoline. This is particularly true since there will apparently be no additional control devices on new cars for at least two more model years.

The lead industry has pioneered in research on occupational and other hazards from overexposure to certain lead compounds. We continue to support and press for expertly planned and executed studies on health aspects of lead in the environment, including the atmosphere. Such studies are being carried forward now, by the International Lead Zinc Research Organization alone or cooperatively with the U.S. Public Health Service, the American Petroleum Institute and others.

Before final decisions are made on lead in gasoline, either by legislation or government pressure, we urge further careful study and development of:

I. Existing methods for reducing undesirable gaseous automobile emissions with systems that are known to work with present gasolines.

II. Techniques and devices that will reduce all particulate emissions from gasoline, including lead.

III. Polluting effects including adverse health effects if automobiles are forced to use non-leaded gasoline.

In view of all these uncertainties, we feel no action should be taken to empower the Secretary of Health, Education and Welfare to ban the use of lead additives until there are proven benefits or a demonstrated need far more definite than exist today—particularly without full hearings, without proper coordination, and without complete knowledge.

We would be most happy to answer any questions you may have.

STATEMENT OF WILLIAM S. JONES, PRESIDENT, NATIONAL OIL JOBBERS COUNCIL

Mr. Chairman, Members of the Subcommittee, I would like to thank you for allowing me to present this statement on behalf of the 10,000 independent petroleum marketers represented by the National Oil Jobbers Council. As a group, they dispense approximately one-third of the automotive gasoliue consumed in the United States.

The National Oil Jobbers Council fully supports all reasonable efforts to prevent or eliminate pollution of any aspect of America's environment.

The Subcommittee is to be highly commended on holding this hearing. It is significant that yours is the only open, indeed, non-secret, proceeding in Washington on this subject. At the present time, Secretary Finch of the Department of Health, Education and Welfare and his staff are conducting an investigation. No public record is being compiled however. A technical advisory board created for that purpose by the Department of Commerce is also conducting hearings on the proposed transition to unleaded gasoline. Here again, however, I regret to report to you today that there is no public transcript; sessions are closed.

Because of these circumstances, your hearing, being conducted publicly as it is with the transcript available for study by all desiring it, is apparently the only reassurance available as to the validity of the democratic processes on this subject in our Nation's capital.

While I have no special insights as to what goes on behind the official closed doors in our Nation's capital, it has been widely reported that the Attorney General has refused to allow a meeting at which both gasoline refiners and distributors and automotive manufacturers could participate with respect to the proposed transition to unleaded gasoline. This, of course, seems mildly incredible since precisely the same thing took place recently before the California Anti-pollution Authority. Many of us would regret thinking of Sacramento as more innovative than Washington, but the present state of the record strongly suggests that this is so.

The overwhelming majority of all oil jobbers are small businessmen. The average number of their employees is 8.7. 73.2 per cent of all oil jobbers are corporations. The remaining 26.8 per cent are either partnerships or sole proprietorships.

The average annual gross income of the corporate jobber was just slightly more than $1 million. For the partnerships and sole proprietorships, the average was approximately one-third of a million dollars in annual gross sales. In addition to carrying out the wholesale function, jobbers are also integrated retailers. The average jobber owns 5.5 service stations.

I am proud to be here as their spokesman. Traditionally, oil jobbers are the most efficient marketers in the industry. Their competition comes primarily from those refiners who are also their suppliers. Typically, the jobber is representative of the best of the American small business tradition. They tend to be resourceful and independent as well as efficient.

As non-technicians we find ourselves confused by the barrage of claims and counter-claims. Recognized experts variously have stated that leaded gasoline prevents the required reduction in emission levels, that unleaded gas will produce worse pollution than leaded, that devices exist which at low cost will pass the most stringent emission level requirements using leaded gas—to cite but a few. We urge you to study carefully all these possibilities.

To say that the Nation's oil jobbers are concerned with the possible need to add a third pump would be a vast understatement. They are not just concerned; they are *alarmed*. Indeed, mauy of them quite properly regard the transition to unleaded gasoline as a crucial threat to their very existence. Let me explain why this is so by providing you with specific instances of the sort of economic impact that the installation of a third pump and tank to dispense lead-free regular gasoline (in addition to regular leaded and premium leaded) would have upon independent petroleum marketers.

A small country jobber in the southeast portion of the United States tells me that he presently makes an annual profit of $25,000 a year and takes a depreciation for tax purposes of some twelve thousand dollars per year. All of this together with an additional two or three thousaud dollars would be required to pay for the conversion to the third pump.

An upper midwest-western jobber, with 150 retail outlets, estimates his cost of transition at one million dollars.

A south central jobber, with between 60 and 65 stations, estimates his total cost at $720,000.

At the conclusion of this statement, you will find an exhibit showing that the jobbers' share of the conversion to a third pump would be over a quarter of a billion dollars. This clearly would be ruinous to a perfectly staggering percentage of our members.

This, gentlemen, vividly portrays the harsh nature of the economic impact which will be inflicted on jobbers by the proposed transition. It comes, as you know, at a time when the money market is tight, when interest costs are reaching an historic high and the forces of inflation have increased prices substantially. While I certainly shall not presume to go into the technical aspects of your mission, I would like to urge as strongly as possible that you thoroughly study and consider the possibility of finding a way to achieve such reduction in emission levels as you deem necessary without the necessity of installing the so-called third pump and tank. A number of specific suggestions have been made by members of the industry and, indeed, by the heads of other federal agencies as to specific methods by which this could be achieved.

It is not clear that independent marketers will be able to obtain a sufficient number of pumps to effect the transition. The Wall Street Journal of April 8, 1970, estimates that ". . . the nation's six pump manufacturers currently turn out only 120,000 pumps a year." Industry sources were quoted to the effect that they would be hard pressed to double that amount.

It has been estimated that there are something over 300,000 service stations in this country. The majority of these, of course, have more than one island of pumps. While it is true that some stations currently are equipped with a third pump, the vast majority are not. Thus, it can be readily seen that the demand for new pumps will run far in excess of the amount available.

Against this background, consider the fact that the major refiners who own the majority of these service stations will be placing orders for a perfectly enormous number of pumps. The most current NPN Fact Book, considered the industry bible, as an example, reveals (on pages 82, 83, and 84) that the major oil companies have the following number of branded service stations. (Rounded to the nearest thousand): 29,000, 13,000, 8,000, 10,000, 7,000, 32,000, 30,000, 4,000, 26,000, 22,000, 23,000, 4,000, 8,000, 9,000, 17,000, 40,000, 17,000; total 299,000.

The overwhelming majority of these major-branded stations are owned by the integrated refiners, whose brand they carry.

We allege no predatory intent on the part of the refiners, but the fact is that when a refiner places an order running into the thousands of units, the pump manufacturer is almost literally forced to give this order more favorable consideration than the average jobber with his 5.5 stations.

If the decision is made for a rapid transition to unleaded regular in a manner requiring a third pump, simple justice requires that provisions be made to ensure equitable participation by jobbers in pump procurement.

At the outset, I stated that NOJC and the individual jobbers belonging to our member associations in the several states fully support all reasonable efforts to eliminate pollution of any aspect of our environment.

We, of course, do not manufacture the gasoline. Nor, to my knowledge, are any of our members fortunate enough to own an automobile factory. So, in a sense, we are captives. We market the product available to us which is utilized by the motorist in the engines available to him. Nonetheless, we are being asked, collectively with the refiners and automotive manufacturers, to absorb the enitre social cost of any changes in manufacture and distribution required to reduce those pollutants in the air resulting from automotive emissions.

Putting in a third pump will not increase our volume.

Putting in a third pump will not increase our profit.

Unleaded gasoline will inevitably result in a higher price to the consumer, (6¢ a gallon more if the practice of one major marketer already offering unleaded proves typical), both as a user of automotive gasoline and in a myriad of ways not yet fully discernible. An example of this latter is if, as many suppose, one of the methods used in the transition to unleaded gasoline is the increased use of aromatics, industry experts estimate that the price of these aromatics which are vital to the petrochemical industry will rise substantially. This increase will be reflected in the cost of the petrochemical industry's products.

Since the oil jobber is being singled out in the typical American town as the only local citizen being asked to pay a part of the price for any transition needed to clean up the atmosphere, it seems to us that he has the right to ask that consideration be given to the problems thereby created for him.

We feel that consideration should be given to finding a way to utilize the considerable research which has already taken place under such programs as the

Inter-industry Emission Control program. It would be our hope that no action be taken toward a system which would be less than fully adequate, resulting not in the optimum job in cleaning up the air, but, in the long run, resulting in additional costs to both the industries and the consumer when a second transition to a more adequate system became necessary.

It is our thought that voluntary solutions are always preferable to legislative solutions. For that reason, we are most hopeful that the Americau Petroleum Institute will see fit to sponsor a voluntary industrial standard for all gasoline below 97 octane. Initially, this standard should provide for a half gram of lead per gallon until 1975, and thereafter, regular grade gasoline would be lead-free. A number of refiners have endorsed the low lead approach, as has the president of General Motors. If the Nation's refiners would voluntarily adopt such a standard, legislation would thereby become unnecessary. The mechanics for drafting and promulgating such a standard are well established and should present no insuperable antitrust problems. Should the industry fail to take this action, then in all probability legislation would become necessary. The point must be made that a number of the largest major refiners evidently are seizing upon the furor incident to the unleaded controversy as a cover to get into the so-called third grade to obtain a marketing advantage.

Thus, it would seem imperative that such legislation provide that no automotive gasoline under 97 octane could be marketed unless it complied with the statute. The effect of this would be in line with the White House recommendation to maintain the present premium and regular grades; no third pump would be necessary. The public would be fully protected, something in excess of a billion dollars would be saved and the harmful impact upon small business would be minimized.

It is our hope that in your considerations of this complex and important issue, you will give full recognition to the problems it poses to the small businessman engaged in the distribution of petroleum products.

A Statement of Edison Electric Institute

The electric utility industry has been concerned with air quality since its earliest days. One of the continuing reasons for substituting electric energy for some other energy form for such uses as lighting, stationary motors, space heating, and transportation has been the cleanliness of electricity. Balanced against this cleanliness at the point of use must be the impact of the combustion process involved in converting coal, gas or oil to electric energy. Nationally, only a small proportion of the total of air pollutants in this country is attributable to fuel-burning power plants, although over half of the nation's coal is used for power generation. Electric utilities are working in many ways to reduce this proportion to a minimum.

For decades, no industry has practiced more careful control over its fuel-burning operations than the electric utility industry. Improved combustion processes, changes in stack design, use of low-sulfur fuels, development of techniques to eliminate special emission problems, and continuing research and development have all been part of the continuing industry effort.

The most recent survey of electric utility expenditures on air quality control shows that 125 companies spent a total of about $193 million for this purpose in 1968—over 50 percent more than similar expenditures in 1967. It is estimated that the entire electric utility industry has spent more than one billion dollars over the years on air pollution control facilities.

In 1967 there was considerable discussion in the Congress and the nation over the desirability of uniform, national ambient air quality standards and national emission standards. Edison Electric Institute expressed its concern over national emission standards at that time and presented testimony before Congress stating that view. We continue to believe that the most effective way to achieve desired air quality throughout the nation is to have regional or air basin emission standards which reflect differences in weather conditions, topography, pollution sources, hours of operation, operating conditions, stack heights, and other variables. The effect of uniform national standards with respect to emissions from classes or stationary sources could be to impose unnecessary restrictions on the use of coal and other fuels in thermal electric generating facilities. Sound development and utilization of the nation's fuel resources could be disrupted. Nuclear and fossil fuels are close competitors in many areas of the country, and this competition works in the interests of consumers of electricity by holding down plant and fuel costs. It would not be in the national interest for a particular fuel to be priced or regulated out of possible use by steam electric generating units because of a requirement to install unnecessary emission control devices.

It appears to us that the Bill now under consideration is not intended to apply to radioactive emissions from nuclear generating units. Certainly these emissions currently are adequately regulated by the Atomic Energy Commission. It may be that appropriate language in the Bill would clarify any question which might arise on this point.

We believe that any pollution source—stationary or mobile, new or old—which is extremely hazardous to health should be acted against promptly. The Secretary of Health, Education and Welfare can now act effectively against such pollution where it originates in one state and affects another state, or where there is presented an imminent and substantial danger to the health of persons, and state authorities refuse to act.

We would support national minimal ambient air standards, if Congress concludes they are necessary. With respect to emission standards, however, the Clean Air Act was based on the concept that this is essentially a local, state or regional matter. We believe the present approach to emission control is sound and should be given the opportunity to succeed before a new statutory program is enacted.

Statement of Karel A. Weits, President, Industrial Gas Cleaning Institute, Inc.

Mr. Chairman, members of the Subcommittee, I, as President of the Industrial Gas Cleaning Institute, Inc., a national association of manufacturers of air pollution control equipment, have written this Statement with the hopes that it will be included in the record of the public hearings which have been held by this Subcommittee on the pending Clean Air legislation.

When this Institute testified before the U.S. Senate Subcommittee on Air and Water Pollution on May 18, 1967 at the hearings on the Air Quality Act, we stated that:

1. We recognize that there is an air pollution problem in the United States that has become critical in many areas;
2. We recognize that the solution must come from cooperative efforts of industry and the general public with Federal, state and local governments;
3. We recognize our industry's obligation to aid in the solution of this problem;
4. We believe our industry has the necessary skills and facilities to develop equipment to meet many unsolved problems once they are defined as problems, and that such problems will satisfactorily be solved in the fastest manner possible if done on a completely competitive basis;
5. We firmly believe that air quality criteria should be developed as a prerequisite to the establishment of emission standards;
6. We strongly believe that control ordinances should be passed only after thorough study to insure that the desired ends will be obtained;
7. We believe more in incentives than penalties to obtain compliance with air pollution regulations because we feel that unjust burdens should be avoided, if at all possible, commensurate with good air quality; and
8. We firmly believe that additional research is needed to develop better methods for the accurate, quantitative measurement of air pollutant sources and effects.

As the result of developments in air pollution control since then, we have modified our position in one area. We now believe that the Federal government should set Federal ambient air standards and Federal emission standards on a regional basis as quickly as possible.

The Air Quality Act of 1967 provides for the development of air pollution control regulations through a process known as "air resource management". This process consists of:

- The development of air quality criteria,
- The establishment of ambient air quality standards, and
- The establishment of emission standards.

Air resource management appears to be a logical, orderly and scientific approach to air pollution control. However, in carrying out the air resource management procedure, some weaknesses in the "logic" and "science" of these methods have become apparent. Some of them are:

1. Interpretations of air quality criteria have been over-simplified and have led to many erroneous conclusions and debates.

2. At various public hearings throughout the United States, the public has indicated that it wants the air to be as clean as possible, in some instances approaching "zero" emissions, and done in the shortest possible time. It should be pointed out that such an approach is not consistent with the air resource management concept.

3. Because ambient standards are approaching background levels, emission standards are approaching zero.

4. Various techniques are being employed to develop emission standards from ambient air quality standards. The most often used technique is to obtain emission inventory information and calculate (by diffusion modeling) what rollback would be necessary to achieve the desired standards. There are many inaccuracies in this technique, including the reliability of emission inventory information and the accuracy of diffusion modeling formulae. There are also many questions with respect to the significance of annual and other relatively long-term means with regard to air pollution problems. Most of the modeling techniques empoly mean concentrations.

All of these problems are leading to a good deal of subjective input in developing emission standards. The states are approaching this problem in many different ways, and it appears that there will be many different types of emission standards adopted. There is no requirement that the states adopt uniform or consistent regulations.

Unless some corrective action is soon initiated, it appears that nationally we will be faced with a chaotic situation with a hodgepodge of unrelated regulations. Such a situation renders the task of industry and the suppliers of control equipment far more difficult than necessary if not impossible. It appears that present programs not only have built-in delays, but are leading to cumbersome, confused and possibly impractical regulations.

We believe that the best air pollution controls will only be attained when firm, definite and lasting requirements are established with which polluters can endeavor to comply without the fear that the regulations will soon be altered, thus making the control systems inadequate just before or shortly after their installation. The user will then know what is required and have no reason not to comply. It is interesting to note that an article in the *Business Week Letter* of March 2, 1970, reported that some management consultants are advising their clients to put off the purchase of control equipment because the Federal, state and local governments haven't decided as yet what the rules will be. The most effective regulation can best be established by one overriding authority which expeditiously establishes standards that will remain unchanged for a specific period and cannot be superceded by other authorities. We feel that this authority should be the Federal government for the reasons explained prevously. We recognize the attendant legal and legislative problems and the vital issue of States rights that are involved, and our recommendation is made without regard for political philosophies or practicalities which may render it impotent. However, considering only the best air pollution control procedure, it is our opinion that it can best be attained by:

1. Having adequate standards set by one authority and not permitting other authorities to supercede them, and

2. Having such standards remain in effect long enough for industry to comply with them without rendering the equipment obsolete before it is operational.

When installing control equipment in many existing plants, it can often take from two to three years from the time of the original concept to operation. New plants can require from three to four years. Under present conditions, air pollution control requirements can change two or three times in that period. In retrospect, would we not have been further ahead today, and wouldn't the public have had cleaner and healthier air during the intervening years, if in 1963, definite standards on particulate emissions had been set, giving industry three years to comply and keeping the standards unchanged until 1970? The arguments against such a procedure are that it obviates the possibility of better control through improved techniques, and overlooks the possible increased pollutions in a given area which would reduce the air quality standards below the acceptable limits.

Such arguments are valid, if true. We must, however, take a realistic look at the possibility of a scientific breakthrough and at the same time examine what has been developed since 1963. How long will the present, economically feasible methods of air pollution control remain as the principle means of control? We believe, long enough to hold standards static so as to permit industry to comply. In addition, air quality standards can be set so as to eliminate the fear of deterioration below acceptable limits. We feel that this can only be done by the Federal government, and we therefore recommend the establishment of Federal standards.

You will note that I have used the term *Federal* emission standards instead of *national* emission standards. The word "national" has an inherent implication that the standard must be uniform for all areas of the country. We believe, and the Air Quality Act was based on this principle, that different areas have different geographical and atmospheric conditions, plus different concentrations of industry and population. Their needs are, therefore, different. Since a good deal of work has gone into the regional concept and the principles remain valid, there is no point in negating that effort. *Federal* standards only imply that they are set by the Federal government. They could, therefore, be established on a regional basis and conform with the programs established under the existing Air Quality Act.

In opposition to regional standards, it is argued that it is unfair to require similar industries to install more costly controls in one area than in another; and further, that less stringent controls would invite an influx of industry into such areas, thereby increasing pollution above acceptable limits. In rebuttal to these arguments, we must remember there are many inequities throughout the country; such as, labor rates, freight rates, taxes, etc. Air pollution control is a factor to be considered in locating a new plant, but it is only one of many. We do not believe that air pollution controls in and by themselves would ever cause an influx on industry into any given area. We see no reason to change from the regional basis or any inequities resulting from this concept.

As previously stated, we favor incentives rather than penalties to encourage good control. We, therefore, do not wholly agree with the provision for a $10,000 or more per day fine which we consider punitive to the point of being destructive. Our disagreement is more one of degree than of principle because we recognize that in some cases a fine is a form of incentive and may be necessary. We do not believe that it is the Government's intent to destroy industry, but in many cases a fine of that magnitude could do just that.

As in all things, the cost of pollution control will ultimately be paid by the American public either in the form of higher taxes, higher prices or lower dividends. The question is, how fast and how equitably can the burden be transferred. Immediate transfer through government financing is wholly unacceptable. On the other hand, many companies could find the total costs prohibitive and thus be forced out of business. Here the immediate sharing of part of the burden may be wise and justified. The best and most equitable way to share this burden is through tax relief. Since some sort of fine may be necessary for non-compliance, isn't a bonus in the form of a tax credit equally justified? We, therefore, suggest that consideration be given to allowing tax credits on all control systems that exceed the standard. We readily admit that such a plan would be difficult to administer, and consideration would have to be given to many facets of pollution control; such as, plants that switch to more expensive fuels to reduce particulate and SO_2 emissions. Under this plan, emission standards could not be set so high as to be unattainable or insurpassable. Such standards would not work in any event. The tax credit would have to increase exponentially since the difficulty of surpassing a standard increases similarly.

We believe that the procedure instituted by the State of New Jersey whereby a large percentage of the fine is placed in escrow and returned to the polluter if he rectifies the condition satisfactorily within a specified time, is well worthy of consideration and should be provided for in the law.

In summary, we wish to reemphasize some of the points presented in our earlier testimony:

1. There is equipment available today that can reduce particulate emissions from industrial sources to the currently acceptable limits. There is no necessity to delay control of particulates due to lack of equipment. There is no necessity for government research in this area since industry has and will continue to perform whatever research is necessary. A competitive economy is still the best means of solving the problem.
2. In regard to gaseous pollutants, now that some of the problems in this area have been defined, industry will produce the necessary equipment faster and more efficiently than it can be produced any other way.
3. We recommend and urge the early establishment of *Federal* emission standards on a regional basis, and that these standards remain in effect for a specified period of time which is long enough for industry to comply with the standards and then utilize the equipment once it is installed,
4. We urge caution and judicial assessment of fines, and the enactment of some compensating form of incentives.
5. We strongly urge that additional research be undertaken to develop a better method for the accurate, quantitative measurement of air pollutants at the source; and finally,

6. We believe there should be increased efforts to develop more uses for as well as some economical means for disposing of the rapidly increasing quantities of waste materials being collected.

Statement of Richard C. Glogau, Senior Vice President, Engelhard Minerals & Chemical Corporation

Mr. Chairman and members of the Committee, my name is Richard C. Glogau and I am a Senior Vice President of Engelhard Minerals & Chemicals Corporation and Executive Vice President of the Engelhard Industries Division of that corporation. The Engelhard Industries Division is a major manufacturer of precious metal catalysts for the chemical, petro-chemical and petroleum industries. Our petroleum catalysts and processes are installed in approximately 25 percent of the free world's petroleum reforming units. We also are one of the two major domestic platinum refiners. Engelhard occupies a unique position being both a major refiner and supplier of platinum metals to industry and a major producer of platinum metals products. We have a sizeable research division, much of whose work is devoted to the catalytic properties of the precious metals, especially the platinum metals, and their application in industry.

I am giving you this background, so that you will understand our capability in this field.

My testimony will be directed to the steps which can be taken under the present state of the art which will have a significant effect on decreasing air pollution caused by automotive exhaust.

And this bears on a point which ought to be made at these hearings. If it has been made, it will bear repeating. That is simply this: When this subcommittee focuses on automotive air pollution, as it has done so productively, it focuses on the segment of our environment which gives promise of early results at relatively low cost. The internal combustion engine accounts for at least 50 percent of the nation's air pollution. Some experts put the estimate as high as 65 or 70 percent. In urban areas, some say 90 percent of the air pollution comes from cars, buses and trucks. The question of what to do about solving this problem has been tackled from many different directions and while some progress has been made it is obvious that an adequate solution has not been developed.

In our view, the problem logically divides itself into two parts:

1. The elimination of lead compounds from automotive fuels.
2. The treatment of exhaust emission.

There has been a rather prolonged debate about the economic feasibility of removing lead from automotive fuels. The automotive industry now says engines requiring lower octane fuels will be available in the near future. Under this circumstance, we believe the petroleum industry, using advanced refining techniques, can achieve the goal of producing lead free fuel at a cost commensurate with the benefit obtained. The technology for accomplishing this has been materially advanced in the last year or two by new process technology and by the development of reforming catalysts having much higher stability. These permit the production of higher octane fuel, while minimizing capital expenditures required to obtain the additional reformate required to increase the octane number of unleaded fuel.

Some questions have been raised as to the adequacy of precious metal supplies to implement such a program. We have examined this question carefully, and are quite certain that required supplies of precious metals and catalysts can, and will be made available for this program as it develops.

It is obvious, of course, that the goal of removing lead from automotive fuel provides a primary benefit in that it eliminates the 500 million pounds of lead which is currently being emitted from the exhaust pipe of the nation's automotive fleet.

The second benefit, however, is in our judgment even more important. This is that it makes this job of cleaning up the exhaust emission much simpler by the use of catalytic devices of demonstrated capability.

For the past 5 to 6 years we have had on the market a catalytic device for use on internal combustion engines utilizing unleaded fuels. This device called a PTX Purifier has a demonstrated life of thousands of hours and has been tested in a variety of hard service conditions.

The State of California has certified this device for use in conjunction with liquid propane fueled vehicles following exhaustive test procedures conducted under the supervision of the California Air Resources Board.

Although, as previously noted, this device has not been used on automobiles, because the lead component of ordinary fuel poisons the catalysts, we have made tests on standard cars using unleaded fuel to determine the efficiency and life of the unit.

A typical result obtained under the California test conditions is as follows:

	Hydrocarbons gr/mile	CO gr/mile
PTX purifier	0.20	1.7
Proposed Federal standards:		
1975	.60	11.5
1980	.25	4.7

While much more test data has been developed the above is cited only to give the committee an indication of the type of performance that is now available from catalytic devices which are commercially in use on vehicles using unleaded fuels. Road tests of cars using this device have indicated that a life of 100,000 is not impossible.

While the PTX unit in its present form does not solve the oxides of nitrogen problem, recent laboratory work indicates that there are various combinations of this unit which, with other types of catalysts, will effectively control nitrogen oxide emission. However, with these devices it is still imperative that they operate in a lead free environment.

There is a great deal of work going on in many laboratories looking toward the best solution for dealing with the problem of air pollution caused by automotive exhaust. To try and predict what the best solution is at this juncture, I think, would be most unwise. However, I think certain generalizations can be made that will be of help to the committee in its deliberation.

A. Removing lead compounds from gasoline as speedily as possible is highly desirable on two counts:

1. Decreased contamination of the atmosphere by lead is beneficial per se, and
2. The elimination of lead makes the use of catalytic devices already developed a complete feasibility. (Other devices under development are not compatible with lead, either.)

B. The technology and commercial resources for accomplishing the above programs are available.

C. The implementation of the program to produce unleaded gasoline will require increased quantities of precious metals particularly platinum. These quantities will be available as needed.

D. The use of precious metal catalytic devices seems to be very attractive from the standpoint of the technology and the economics involved. The quantities of platinum involved in this use are admittedly greater by an order of magnitude than those required in the program to supply unleaded gasoline. Adequate known reserves of platinum have been developed and, with proper planning, these supplies can be made available for use in the production of catalytic devices.

Mr. Chairman and members of the committee, I would like to express my thanks for the opportunity to bring these views on a very complex problem to your attention. It is extremely important for all of us that steps be taken to reverse the path in environmental pollution down which we have been drifting, and I would like to commend the committee for its dedication to that cause.

I shall, of course, be glad to answer any questions within my competence.

Statement of W. W. McClanahan, Jr., Executive Vice President, National Coal Policy Conference

In just the last few years the term "ecology" has come into common usage. The people have developed a rightful concern about their environment, and at both ends of Pennsylvannia Avenue responsible Government officials are seeking to meet that concern, to protect and enhance that environment.

But because further efforts may be needed does not mean we should do the wrong thing just to do "something." Let us not deceive ourselves nor the public.

The rush to new legislation significantly restructuring the Air Quality Act of 1967 may give the appearance of Governmental action, but that is only an appearance, not a reality.

The Air Quality Act of 1967 provides major and effective tools to clean up the air—and many of those tools today, in 1970, are still almost new, untested, unused. There are two major reasons for this—lack of money, and lack of trained manpower, at the Federal, state, and local levels. It may sound heretical, but isn't it about time we provided adequate funds and staff to make the Air Quality Act effective, rather than drastically revising its procedures and embarking on another paper program, more ambitious in scope and more untried in concept? Certainly if recent experience has any value as a guide, and in light of announced budgetary requirements and indicated funding capabilities, the legislative proposals now pending are unrealistic in their major aspects.

We are not proposing that the objective of improved air quality either be delayed or diminished. On the contrary, we propose to accomplish this objective in the quickest, most effective, and most economical way, and in a manner most consistent with other important national needs. Nor do we oppose some changes in the Air Quality Act. What we do oppose are changes which make it difficult to achieve improved air quality in a rational, economically sound manner, and, by diverting scarce resources will delay its accomplishment.

Simply stated, the pending legislation proposals have three undesirable characteristics that override any possible benefits they may contain. First, they will divert the clearly limited resources available for air quality control from where they are most urgently needed. Second, by significantly restructuring the organizational and procedural requirements provided in the Air Quality Act, they will delay rather than speed up the necessary actions at all levels of Government, as well as in industry. Third, they will eliminate the flexibility of approach which the authors of the Air Quality Act recognized as essential in view of the state of technology and the variety of problems in different localities, as the requirements of national economy.

Central to the Administration bill is the proposal for national emission standards relating to new major stationary sources of potential pollution, and to existing stationary sources which may cause extreme hazards to health. With respect to stationary sources which pose immediate hazards to health, the present law provides prompt and effective remedies. With respect to new major stationary sources of potential pollution, two comments are pertinent, one general and one more specifically relating to the coal industry.

As a general matter, the Air Quality Act of 1967 specifically authorized a study to be made by the Department of Health, Education, and Welfare on national emission standards. That study has been going forward for two years. There is legislation pending to authorize the printing of the report which I assume is the result of that study. That report has not been made available for study by industry, nor to my knowledge by members of the Congress. It has not been testified upon by the Department of Health, Education, and Welfare. Whether or not the National Coal Policy Conference would agree or disagree with that report, it makes very little sense to be going forward with pioneer legislation on this subject without first giving those interested and concerned in and out of the Congress an opportunity to study the report and to comment thereon.

On the specifics, and with particular reference to sulfur oxide emissions, unless the technology is available adequately to control or reduce sulfur oxide emissions for coal-fired power plants, it will make no difference whether the emission standards are national or local. The critical element is not the emission standard in this instance but the development of the economically and technologically feasible means of control and reduction of sulfur oxide emissions. As far back as 1963 the Congress directed that the Executive Branch take the necessary steps to develop such means of control. This was reemphasized in the Air Quality Act of 1967. The fact of the matter is that neither the funds nor the necessary effort have been expended.

This critical area is capable of resolution—but no amount of statutory words will do the job. Just as soon as technologically and economically feasible techniques exist, I have no doubt that the electric utility industry will seize upon them and utilize them in major new power plants. This will be true under existing law as surely as if there were national emission standards.

On the other side of the coin, any national emission standard, or any state emission standard for that matter, which effectively precludes the use of coal would be wholly unrealistic. In the last few weeks the Chairman of the Federal Power Commission and the Chairman of the President's Office of Science and

Technology have projected major power shortages in the United States, and in particular in the Northeast, with some blackouts and brownouts likely this year. There is a shortage of power plants, and today there is a shortage of coal, as well as of other fuels. This is a result of many causes which I will discuss shortly. In any event, however, the electric energy requirements of the United States will greatly increase in the next decade. There is no question but that significantly more coal than is utilized today for the generation of electric power must and will be utilized for that purpose in the coming years—and by this I mean an increase in annual consumption of hundreds of millions of additional tons of coal by 1980.

If I can borrow a word and phrase from the young people, and talk about what is relevant, and tell it like it is, certainly as far as coal-fired electric power plants are concerned, technology and technology alone is the key to effective air pollution control and abatement.

With respect to national air quality standards, it is our view that they are the wrong approach at the wrong time. First, the Administration bill would appear to eliminate the present requirement of the development and publication of air quality criteria and other pertinent information on which standards should be based.

Second, as the existing criteria have made clear, there are many considerations in establishing an air quality standard. There is health as the primary consideration. There are economic considerations. There are aesthetic considerations. The present law provides that the Department of Health, Education, and Welfare has the right of approval on all standards, and that they must be consistent with the criteria and control technology issued. Patently, a community with older plants, for example, so long as the health requirements are met, may properly be allowed to sacrifice some of the asethetic objectives in order to permit those plants to remain open and to provide jobs for the people in that community. On the other hand, a residential or resort area may feel that aesthetics should get considerably greater emphasis in order to enhance the quality of that area.

This important flexibility, written into the Air Quality Act of 1967, would be destroyed by national air quality standards. If they were written at the least restrictive level, with health alone being protected, they would tend to discourage further community action to protect or enhance the air for economic or aesthetic reasons. If they were written at the most restrictive level with aesthetics dominating, they would virtually destroy a great many industrial complexes and establishments contrary to the desires of the people in those communities.

The job of cleaning up the air is massive and we should neither strive to achieve, nor will we achieve, uniform results.

Let me turn now from the specific legislative proposals to a matter which I consider most important of all in terms of the needs of the United States, and in terms of any rational determination of Federal policy with respect to air pollution control, as applied to electric power plants. We respectfully suggest that the entire approach taken to date by government, and by industry, has been too parochial, too narrow.

If we are to meet our national responsibility for cleaning up the air, and for cleaning up the water, and for providing to the American people the low-cost, plentiful supply of electric power on which our entire economy and our great industrial progress are based, it is indispensable that the United States of America formulate a comprehensive national fuels and energy policy. The threatened power shortages, the imbalance of fuel supplies, the rising cost of fuels, and of electric power, even the dissatisfaction that progress in air and water pollution controls has not been rapid enough, are directly attributable to the failure of this nation to face up to the need for a national fuels and energy policy.

Numerous Federal, state, and local agencies are involved in formulating policies and regulating various aspects of the fuels and energy industries. Any compatibility among these varied policies and regulations emanating from the numerous agencies involved is happenstance rather than the result of careful planning.

Permit me to summarize the various and varied sources of policy and regulation which bear on this matter. The electric utility industry is subject to regulation by state commissions and by the Federal Power Commission. It is also directly affected by the Atomic Energy Commission, to the extent that nuclear power plants are involved. The natural gas industry is regulated by the Federal Power Commission.

Air pollution control is within the jurisdiction of the Department of Health, Education, and Welfare, and state and local agencies. Water pollution control is within the jurisdiction of the Department of the Interior and state and local agencies. Radiation and thermal pollution problems are within the jurisdiction of the Atomic Energy Commission and possibly state agencies.

Nuclear research is controlled by the Atomic Energy Commission. Coal research is within the jurisdiction of the Department of the Interior, but is also under the jurisdiction, as it relates to air pollution, of the Department of Health, Education, and Welfare.

Oil imports, which of course include the question of imported low-sulfur fuel oil, are subject to the jurisdiction of the Department of the Interior, as delegated by the President. They also are subject to the Office of Emergency Preparedness. Gas imports from Canada are subject to the control of other agencies of governments. Tax policy as it affects production of oil, gas, or coal, or the installation of pollution control devices, resides in the Treasury Department, and in various state agencies.

In addition, we have a new committee on air pollution in the Department of Commerce, we have the President's Environmental Council, the President's Office of Science and Technology, etc., etc. We have new laws on mine safety which will directly affect fuel costs and availability, administored by the Bureau of Mines and the Public Health Service.

If we are going to have tho energy we need at reasonable cost to the American public, and at the same time clean up the air and the water, it is obvious that the policies and regulations formulated by all these different groups must have some real coordination.

Moreover, the allocation of funds and resources by government must bear far greater relationship to our energy needs and to our pollution control requirements than has been the case to date. One striking example of gross disparity in this regard is the annual multi-billion dollar allocation of Federal resources to assist the nuclear power industry as compared with the insignificant allocation of funds for either coal research or pollution control research. In this connection may I respectfully point out that had but a small part of the funds expended by the Federal government for the development and promotion of nuclear power been expended for research and development in air pollution control with respect to conventional fuels sources, we would have long since resolved the air pollution problems as they relate to coal-fired electric power plants.

Further, it makes no sense for a state or Federal agency to decide that air pollution control will be resolved by building nuclear power plants instead of conventional power plants, if, as is now clearly the case, sufficient problems have developed with respect to nuclear power plants, so that the already committed plants are now years behind schedule, and even if they were on schedule they would only fill a comparatively small part of our growing energy needs. It makes no sense to talk about substituting natural gas for coal or oil when in fact our reserves of natural gas are wholly inadequate, the price of natural gas has risen sharply, and it is clear that natural gas can do but a small part of the job.

What we must do is take the broad look and determine (1) what our energy needs will be in the decades ahead; (2) where we have the greatest potential in terms of energy resources for meeting those needs; and (3) what technological and other problems must be overcome so that we can deliver this energy at a low-cost and consistent rate with our need to clean up and protect the environment.

What I am saying is not defeatist about either meeting our energy demands or resolving our pollution problems. For example, I am extremely optimistic about the future of coal in America. It is America's most plentiful, low-cost fuel. It is located throughout the United States. Every farsighted person knows that one day coal will be a significant source of oil and gasoline and gas, as well as continuing to be a major fuel for electric power plants. But our economy will pay a frightful cost and we will be subject to great disappointments in the area of pollution control unless we make a comprehensive review of our national fuel and energy needs, and gear our policies, our regulations, and our programs so that they are designed to meet those needs as well as our other important national objectives.

Thus, I would propose a very specific program today which I believe would do far more to clean up the air, and do so for less money in the long run, and probably in the short run, than the legislation now being considered. Moreover, the program I propose also will take the very important steps, not included in any of the proposed legislation, of assuring that this nation fills its energy requirements as well as its environmental requirements.

First, I would establish a National Commission on Fuels and Energy Policy. This Commission should be required to report back within one year with respect to the following:

(*a*) The nation's energy needs; with particular reference to electric power plants for the next ten years;

(*b*) The fuel resources available to meet those needs, including a program of research and development to make realities of such major technological advances as magnetohydrodynamics which will greatly enhance our supply and ability efficiently to use our fuels resources;

(*c*) The air and water pollution problems which these expanded power refinements will generate, including the technological problems which must be overcome if those pollution problems are to be resolved, and a program to overcome those problems promptly and efficiently; and

(*d*) The compatibility of other major Federal and state policies and programs with the objectives of both meeting the energy needs and resolving the pollution aspects of those needs, including recommendations for change, where change is required.

Second, I would immediately fund and direct that the research and development immediately required with respect to such matters as sulfur oxides and particulate pollution, and possibly now also with respect to the forthcoming criteria for nitrous oxides to establish on a greatly accelerated basis commercially feasible methods of pollution control.

Third, with these two programs underway, I would go forward under the existing Air Quality Act, where considerable progress has already been made.

At the beginning I pointed out that the nation's resources in money and men in this are are still far too scarce. There is immediate need for funding the training of additional personnel; there is need for funding better instrumentation for measuring emissions and air quality; and there is need for funding more research in the basic cause-effect questions relating to air pollution and health and safety.

There is also an immediate need for recognition that under the Air Quality Act, or any revision thereof, cognizance be taken of the fact that our fuels and energy economy already has been thrown into considerable imbalance and uncertainty by the many conflicting policies, or in some instances the lack of policies, which now exist. It is imperative that timetables for controls be established which, subject to immediate health needs, also are consistent with energy and pollution control requirements for the next decade. In other words, hasty, unrealistic solutions today may adversely affect both energy and pollution control requirements of tomorrow.

With these steps, and the experience of one more year under the Air Quality Act of 1967, this Congress will be in a far better position to assess the past, predict the future, and revise our air pollution control and other related laws.

If we take these steps, I respectfully submit that within the next two or three years we will have made dramatic progress toward bettering our environment and at the same time assuring that our national economy and our national security are protected by a rapidly expanding, low-cost electric energy base.

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., March 11, 1970.

HON. JOHN JARMAN,
Chairman, Subcommittee on Public Health and Welfare, Committee on Interstate and Foreign Commerce, House of Representatives.

DEAR CHAIRMAN JARMAN: I am enclosing literature and reports concerning a device which appears to hold great promise for a solution to the automobile pollution problem. This information was directed to me in my capacity as HEW Appropriations Subcommittee Chalrman, but I believe it would be of primary interest to you.

The stature and credentials of Dr. C. E. Miller impress me as much as the claims he makes for the described Pollution Master System. It is my understanding that Dr. Miller has no connection with the firm that manufactures the system. He is on the staff of the very reputable Roswell Park Memorial Institute of Buffalo, New York. That organization was charged by the New York State Department of Health with the task of objectively investigating all available automotive pollution control devices, with a view toward establishing the standards for New York State. In the course of these investigations, he evaluated the system he describes and recommends. I am informed that New York State is prepared to follow his recommendations.

Three aspects of the system appeal to me. First is the fact that the described system results in reduction of automotive pollutants below those established by the Federal Standards. The second is a resulting operating economy reflected in fuel savings and lower maintenance costs. The third is the fact that the system can be readily installed not only on new cars, but on older cars as well.

I feel that anything that would hold the potential for eliminating pollution immediately, instead of ten years from now, would do it better than is presently expected, and would pay for itself while doing all this, would be of interest to you.

Accordingly, I have taken the liberty of forwarding this data to you, and suggesting that Dr. Miller—who I understand is available—might be a constructive and instructive witness in any committee hearings you may plan on automotive pollution control legislation.

Sincerely,

Daniel J. Flood,
Member of Congress.

Our Automobiles Can Be Cleaner

(By C. E. Miller, Ph. D., Director, Air Pollution Center, Roswell Memorial Institute, Buffalo, N.Y.)

In 1961 the State of California agitated to initiate legislation to require devices to be installed in motor vehicles for the purpose of controlling the hydrocarbons coming from automotive crankcases. By 1968 all new American made automobiles operating in the United States, by a Federal mandate contained a closed crankcase ventilation system. Today, most all garage mechanics know that our crankcases have been sealed off to the atmosphere and that our vehicles contain a device known as the PCV valve, or the Positive Crankcase Ventilation Valve. Thus, during the last eight years Americans have achieved a certain amount of automotive exhaust emission control. This achievement was made, however, at the expense of making the crankcase a vertable "cesspool" for all the blow-by gases coming from the cylinders of our automobiles.

The PCV valve has one important cleansing operation. During periods of acceleration, the intake manifold vacuum is about two inches of Mercury (2 in. Hg). The valve opens wide and about 5 cubic feet per minute (CFM) of air containing hydrocarbons flow into the intake manifold. These hydrocarbons mix with the incoming air and fuel mixture from the carburetor and are burned in the ensuing combustion. During all other modes of engine operation, such as cruise and deceleration, the intake manifold vacuum is between 8 and 22 in. Hg. and the flow through a perfectly operating PCV valve is about 2 to 3 CFM.

In 1961 it was contended that applicaiion of this valve to our vehicles would solve the hydrocarbon pollution problem in our internal combustion systems by 40%. By sealing off the crankcase to the atmosphere, and periodically cleansing the crankcase, more attention could then be brought to bear upon the methods of decreasing the hydrocarbons and carbon monoxide coming from the tail pipe. Since that time we find that the scientific literature relates facts indicating much dissatisfaction with the vehicles operating with PCV valve attachments. We read of outlets being plugged, oil caps filled with sludge, carburetor gasket bases being clogged, and PCV valves themselves becoming inoperative after only 4000 miles of vehicle operation. We read also of the necessity of developing new oil composition to decrease sludge and corrosion in the moving engine parts due to the inefficient operation of the PCV valve and contamination in our crankcases due to the "cesspool" effect. In essence, it appears to the reader of this scientific literature that the crankcases of the present day vehicles are more contaminated than those vehicles prior to 1966 which contained vented crankcases by way of road draft and breather tubes.

Further, during the 60's the automotive industry prodded by increasing demands of the California legislature improved the pollution content of the exhaust gases coming from the tail pipe. Most concentration was placed upon the hydrocarbon and carbon monoxide content of these exhaust gases. At present it appears that technology has reached the stage where the Federal government can require that all new vehicles have tail pipe emissions that contain no more than 275 parts per million (PPM) of hydrocarbons and no more than 1.5 per cent (%) carbon monoxide.

In August 1969 a new system was displayed in Cleveland, Ohio, that indicated that our vehicles could be made cleaner. The new system is called "The Pollution Master," and contains two distinct units, a crankcase scavenger, and an exhaust scavenger.

The crankcase scavenger shown in Figure 1 is mounted in an upright position on the fire wall or fender well of the vehicle in any convenient location. Tube attachments are made to its inlet and outlet side so that in essence it replaces the PCV valve discussed above. Hence, all gases coming from the crankcase pass through the scavenger and enter the intake manifold below the carburetor. The scavenger contains a filter at the bottom on the inlet side of the unit followed by 8 compression chambers each separated by plates containing small holes called venturi ports. The vacuum in the intake manifold creates a very strong force in each compression chamber in the unit. The venturi ports are calibrated and positioned to give a high resistance to the gas flow coupled with a high degree of swirling motion in each compression chamber. The gases are compressed, atomized, and homogenized as they are drawn through the unit.

The exhaust scavenger unit shown in Figure 2 is a bent tube containing a one-way valve at the center. The unit is mounted on the exhaust manifold by drilling and tapping two holes in the manifold and mounting the ends of the tube into place. A small filter cap is placed on top of the one way valve. The fast moving gas in the exhaust manifold reduces the pressure in the distributor tubes causing air to flow through the valve from the atmosphere into the exhaust stream. During periods of positive pressure created in the exhaust stream the valve is closed preventing gas from escaping into the atmosphere.

The flow through the crankcase scavenger is about 5CFM for intake manifold vacuum between 12 and 21 in. Hg. The air flow is relatively constant through this range of vacuum and is approximately the same as that achieved by the PCV valve during the acceleration mode of the vehicle. Hence, it appears that the crankcase scavenger is cleansing the crankcase during all the vehicle modes of cruise and deceleration. During acceleration the intake manifold vacuum becomes about 2 in. Hg. and flow through the scavenger falls off markedly. Hence, only small amounts of hydrocarbons are moving into the intake manifold during acceleration. The engine operates with a lean undiluted air-to-fuel mixture coming from the carburetor giving more "zip" to the acceleration. In this manner, the crankcase scavenger is acting like a super-charger during acceleration. The intake manifold temperatures are constant and vetween 30% and 50% less than the crankcase temperatures after the scavenger is installed. It would appear that the device is acting as a heat regulator to the gases entering the intake manifold. The volumetric concentration of hydrocarbons entering the intake manifold is about 1000 ppm less than the volumetric concentration in the crankcase in all modes of vehicle operation except acceleration. Most of the hydrocarbons appear to be passing through the device to be burned again in the engine. Such a condition indicates that the plugging and sludging possibilities could be very low. The static pressure on the inlet side of the device is nearly zero and independent of the intake manifold static pressure. Such a condition indicates that the flow is regulated by the manifold vacuum and the venturi ports in the crankcase scavenger.

The volumetric flow through the exhaust scavenger is proportional to the volumetric flow in the exhaust manifold. For an exhaust flow of 26 CFM the flow in the distribution tubes of the exhaust scavenger is about 0.1 CFM. The pressure needed to seal the valve against the upper seat is less than 0.09 in. Hg. and the minimum pressure needed to open the valve is zero since the valve falls to the lower seat under the force of gravity alone. The maximum flow rate through the filter is far above the critical flow rate through the distribution tubes and the pressure drop across the filter is negligible. The relatively small flow rate of air through the valve does not appreciably change the flow rate in the exhaust manifold. Further, the small quantity of air added to the exhaust manifold does not change the temperature in the compression chamber of the cylinders. For example, in one vehicle, a temperature test was made before and after installation of the exhaust scavenger, and it was found to be 190°C in both instances. The unit itself does not pick up any incompletely combusted gases but by the addition of small quantities of air controlled by the exhaust gas flow burns the incompletely combusted gases further. The close proximity of this afterburning process to the cylinders decreases dilution of the gases in the cylinders during periods of valve overlap without appreciably increasing the temperature. The value of the exhaust scavenger was demonstrated by measuring some of the contents of the exhaust gases in the tail pipe of several vehicles. It was shown that the volumetric content of carbon dioxide increased, whereas the volumetric content of hydrocarbons and carbon monoxide decreased. In some cases it was shown that the carbon monoxide was as low as 0.2% and the hydrocarbons were about 100 ppm. This appears to be in dramatic contrast to the 1.5% and 275 ppm for carbon monoxide and hydrocarbons required by the Federal government.

When the two devices are installed in a vehicle it is observed that the rpm of the engine increases about 200 rpm, and the air to fuel ratio also increases. The rpm is increased due to the added air entering the intake manifold (about 5CFM). The carburetor can be adjusted readily to bring the rpm back to factory specifications. The increased air-to-fuel ratio is measured by a thermal conductivity technique and hence is merely a record of the increased carbon dioxide content of the exhaust gas in the tail pipe. The idle jets are adjusted to give an optimum CO_2 content, coupled with a minimum CO and low stable HC content of the exhaust gas. This insures proper engine operation without misfiring in the cylinders.

Historically, the problem of pollution has been attacked with the philosophy of removing the pollution to some place where it would not annoy man. Such a philosophy created the PCV valve which made a "cesspool" of automotive crankcases. The technology employed in the Pollution Master System follows the philosophy that the pollution problem can be solved by using up all fuel with a minimum amount of waste. It appears to this author that the system is achieving its goal and gives great promise for developing better air, longer engine life, and low engine maintenance costs.

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., April 17, 1970.

Hon. JOHN JARMAN,
Chairman, Public Health and Welfare Subcommittee, 2125 Rayburn House Office Building.

DEAR MR. CHAIRMAN: It is respectfully requested that you include the attached copy of a letter from the Executive Director of the Missouri Oil Jobbers Association, Mr. John Hahn, in the record of the hearings of your subcommittee on the Clean Air Act of 1970. The position of the Missouri Oil Jobbers Association on the use of leadless gasoline as a means to abate air pollution is well constructed as presented and will, I believe, be of special import and benefit to your subcommittee.

Your cooperation will be appreciated.

Sincerely yours,

RICHARD H. ICHORD,
Member of Congress.

MISSOURI OIL JOBBERS ASSOCIATION,
Jefferson City, Mo., March 30, 1970.

CONGRESSMAN RICHARD H. ICHORD,
House of Representatives,
Washington, D.C.

DEAR DICK: Thanks so much for your good letter of March 25. Since writing you before, I have come across information in seminars in Chicago and Denver which startle me about the efforts to take the lead out of gasoline.

I am coming to the conclusion that we are being swept along more on a basis of publicity than of facts.

By removing the lead out of gasoline, they will remove less than one per cent of the pollutants escaping from the exhaust. There is a very serious probability that what we have to do to the gasoline in removing the lead will add more pollutants to the air than we are taking out of it. This would be in the form of aromatics which are more offensive.

If we maintain a 94 octane leadless gasoline, it would cost a minimum of three cents a gallon more. The lead in gasoline is a very important lubricant and without it the valves will stick sooner, the cars will wear out quicker, they will be less effective from the beginning and the spark will have to be retarded as much as six per cent, compression ratios will be very unsatisfactory.

Outside of the fact that the removal of lead will involve the addition of more pollutants than we'll be eliminating, the fact that it will cost three cents a gallon more, that cars will wear out sooner and be more troublesome and less effective, it may be a pretty good idea.

If detailed scientific documentation is desired on this, I can arrange to have it sent to you. What truly is needed is a systems engineering approach to this problem with emphasis on control of what comes out of the exhaust pipe and not what goes into the gas tank. For example, Dupont has developed a catalytic muffler. That will eliminate most of the lead as well as other pollutants. Other companies are coming up with other devices. This matter simply has not been given proper study and everybody is going off half cocked.

I still think the great rush to take the lead out, on the part of some marketers, suggests the possibility of a deal on imports. When Mr. Nixon put the recommendation of his cabinet task force on imports in his desk, the big companies rushed forth to take out lead which makes a lot of good news stories and once the third pump is in we would see a lot of little people we pushed out of business if the pumps are used to sell at prices equal to the independent marketer.

If the Congress will just dig into this, you will find that there is more here than pollution.

Sincerely,

JOHN R. HAHN, *Executive Director.*

THE CITY OF NEW YORK,
THE PRESIDENT OF THE COUNCIL,
New York, N.Y., February 27, 1970.

Hon. JACOB H. GILBERT,
431 The Cannon Building,
Washington, D.C.

DEAR CONGRESSMAN GILBERT: One of the most vexing problems which New York City faces, as you know, is the increasing rate of automobile abandonments. According to the Department of Sanitation more than 57,000 cars were left on the streets and highways of the City during 1969. Unless meaningful methods for dealing with the problem are promptly found, it is entirely likely that this number will increase within the next year or two to about 75,000.

I know that this problem has been of great concern to you, as it has to me. Earlier this week, after exploratory discussions with the City Club of New York, I proposed that Congress establish, on a national basis, a $25 or $30 equity in every automobile sold in the United States.

Under the proposal, the manufacturer (or importer, if that be the case) would pay the equity into a national trust fund. The equity would continue with the vehicle, adding to its value through its usable life. The equity would be refunded to the owner of the car, upon its delivery for scrap at authorized junk or scrap dealers.

This problem of car abandonment has reached national proportions. Many urban communities throughout the United States have been suffering from this blight. And, while the New York City Department of Sanitation has been geared up to the haulage and disposal of the incredible number of abandoned vehicles, the problem will not be reached at its source unless some kind of inducement, in an economic sense, can be developed to stimulate the last owner of the car to see to it that the car is removed from the streets.

Accordingly, I am writing to you, and to all members of the New York City Congressional Delegation, in the hope that you will consider the support of legislation to carry this proposal into effect. My staff and I will be most pleased to provide you whatever assistance we can in furthering this proposal.

As a separate, but related idea, I hope you will assist me in furthering the proposal to establish for every automobile manufactured or imported for sale in the United States, a permanent registration number. Such a number, ineradicably impressed on the engine block, should substantially assist states and localities in tracing those responsible for the abandonment of vehicles. Again, I shall be most pleased to work with you in developing any such proposal.

I have discussed these ideas with many members of the City Council, and find them in general support. Councilmen Saul S. Sharison, Kenneth Haber, and Frank Biondolillo have asked me to advise you that they fully support these proposals.

Sincerely,

SANFORD D. GARELIK, *President.*

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., February 17, 1970.

HON. HARLEY O. STAGGERS,
Chairman, Interstate and Foreign Commerce Committee,
House of Representatives.

DEAR MR. CHAIRMAN: I am enclosing copy of a letter from Warren W. Platten, of Osage, Minnesota, which is in my Congressional District, offering a suggestion as to how the pollution of air by our automobiles might be alleviated.

I hope this will be of interest to you, and can be made a part of the record when hearings are continued on the extension of the Clean Air Act.

Kindest personal regards.

Sincerely yours,

ODIN LANGEN,
Member of Congress.

OSAGE, MINN., *February 14, 1970.*

CONGRESSMAN ODIN LANGEN,
Washington, D.C.

DEAR MR. LANGEN: Just a few lines to you about the air pollution and the main cause of it.

Our cars are loaded down with filters and gadgets to clean the waste gas out of the air but they do not help.

The carborator system still has to put more gas into the manifold in order to get enough to the cylinders to create an explotion strong enough to give the engine its proper power.

The wet gas that is wasted in the manifold is what causes the extra carbonmonoxide gas in the exhaust.

This could all be done away with if the car manufacturers would use an injector system.

The Popular Science carried an article in the January 1966 issue, telling the results of the tests, page 14.

I can not understand why the manufacturers are so reluctant to put this to use, unless they are afraid that we may get a little better gas milage than we do now. It looks like they would rather load the cars down with more gadgets and waste more gas.

This is some thing for you to toss around in the capitol or throw into the Presidents lap what ever you want to do.

Sincerely,

WARREN W. PLATTEN.

IVANHOE JUNIOR WOMAN'S CLUB,
Riverdale, Ill., March 28, 1970.

HON. HARLEY O. STAGGERS,
Committee on Interstate and Foreign Commerce,
Rayburn House Office Building,
Washington, D.C.

DEAR REPRESENTATIVE STAGGERS: Your committee is currently holding hearings on H.R. 14484, a bill which will significantly increase our ammunition against air pollution. We urge you to rush it out of committee in the strongest possible form.

Our organization is composed of 75 women with young children. Our village is adjacent to Chicago's southeast side.

We suffered through the November inversion with our children who had to stay home from school and listened to Mayor Daley say there was no pollution problem of significance. We need measures for air pollution episodes.

We sit helpless as major industries, garbage dumps, etc., continue to pollute because laws are hazy, fines are insignificant and legal action is slow. Individuals need the right to file suit.

And since the worker can ill afford to be laid off as his company Installs abatement equipment, we must remove this as an excuse to industry by providing unemployment compensation for these people.

Many more measures are needed, but those in this bill are an Important step which are urgently needed. The American people cannot afford to have this bill delayed any longer. We urge you to act on it immediately.

I request that this letter be placed in the official record.

Sincerely,

GERALDINE M. BAADER,
Conservation Committee Chairman.

(Whereupon at 5:35 p.m., the subcommittee adjourned.)

O