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# CONSUMER FUEL DISCLOSURE ACT OF 1975

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## HEARING

BEFORE THE

### SUBCOMMITTEE FOR CONSUMERS

OF THE

### COMMITTEE ON COMMERCE

### UNITED STATES SENATE

NINETY-FOURTH CONGRESS

FIRST SESSION

ON

## S. 1508

TO REQUIRE THAT CERTAIN INFORMATION ABOUT  
GASOLINE BE DISCLOSED TO CONSUMERS

OCTOBER 29, 1975

Serial No. 94-53

Printed for the use of the Committee on Commerce



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# CONSUMER FUEL DISCLOSURE ACT

WEDNESDAY, OCTOBER 29, 1975

U.S. SENATE,  
COMMITTEE ON COMMERCE,  
SUBCOMMITTEE FOR CONSUMERS,  
*Washington, D.C.*

The subcommittee met at 9:40 a.m. in room 5110 of the Dirksen Senate Office Building; Hon. Vance Hartke presiding.

## OPENING STATEMENT BY SENATOR HARTKE

Senator HARTKE. Good morning, everyone. The purpose of these hearings is to inquire into the question of octane rating postings, and to specifically consider legislation proposed by my distinguished colleague from New Hampshire, Senator Thomas McIntyre.

Octane ratings and the posting of those ratings at retail outlets while seeming to be a simple matter has generated substantial controversy within the Government, among oil companies, and between consumer groups. Unanimous agreement on the desirability of posting octane ratings is lacking; some major oil companies have taken the position, so I am told, that all the consumer needs to know is if he is buying regular, premium, or unleaded regular.

The octane characteristics of gasoline are determined by the research method and the motor method. Identical gasoline yields a different number when subjected to these different methods. The difference between them is referred to as the "sensitivity" of gasoline. It is a common error to assume that the research and motor methods are merely different measures of the identical characteristic. In fact, research octane and motor octane refer to subtle but distinct properties of gasoline, properties that may be of immense importance to the life and performance of the automobile.

Before 1968 and the advent of emission controls, those characteristics of gasoline summarized by the motor method of octane rating were not particularly significant. Due, however, to structural changes in the design of engines, they have become increasingly important.

Automobile knock—the premature explosion of the gas-air mixture in the cylinder—results when octane levels, research and motor, are too low for the engine design. Repeated knocking will result in serious harm to engine life and wear, and great cost to the consumer.

In 1970, the Federal Trade Commission (FTC) proposed to require gasoline retailers to post octane ratings. In an attempt to

Staff member assigned to this hearing: Edward A. Merlis.

meet the needs both of motorists requiring motor octane and those requiring research octane information, the formula  $R+M/2$  was developed. The formula is a simple, unweighted average of 2 minutes.

Before the FTC was able to implement its plan, a group of oil companies took court action. The case is still pending. In the interim, the Federal Energy Administration (FEA) adopted the FTC plan and promulgated rules requiring gasoline stations to display octane ratings at each of their pumps. These rules, I might add, have only been partially enforced.

Recently, I am informed, the FEA has held hearings to consider the possibility of scrapping the  $R+M/2$  formula in favor of a simple posting of the research number. I understand that the FEA hearing panel rejected that alternative, and I hope that the FEA spokesman will address that question today.

Technically, I believe that there is a consensus that  $R+M/2$  represents the best compromise. Unfortunately, it does not serve the best interests of the consumer. On the average, motor octane runs 5 to 10 points lower than research octane. Most owners manuals since 1970 specify a minimum requirement of 91 research octane. When motor octane and research octane are averaged, as in the FTC-FEA formulation, the net result is an across-the-board lowering of the octane rating number. Thus the consumer seeking to fulfill the minimum requirements of his owner's manual may find that the only octane number sufficiently high is at the premium pump. In other words, because of the difficulties associated with developing a unified system for octane rating postings, many automobiles designed to operate on regular gasoline may now be operating on premium. Not only does this increase the owner's operating costs, but it represents an immense net waste of energy and adds unnecessary pollution to the atmosphere.

In my view, octane ratings postings serve two basic purposes. First, they provide consumers with information essential to the making of informed decision. Second, and perhaps more important, they represent an implicit standard for gasoline refiners. Octane level is not a matter of chance for the refiner, but a matter of choice. That holds equally for the level of research and the level of motor octane. By forcing disclosure, we insure that refiners continue to produce a high quality product with a reasonable level of both research and motor octane.

Senator McIntyre's legislation offers an interesting alternative. It rids, first, any doubt as to whether the Federal agencies involved have the statutory authority to require octane posting by the simple expedient of mandating it. It modifies the FTC-FEA  $R+M/2$  formula by adding 4 to the quotient. This accomplishes two purposes. First it brings the posted number back to approximately the research number upon which most owner's manuals are based. Second, it does this while still retaining the average of research and motor to insure that refiners keep those two elements in balance.

[The bill follows:]

**S. 1508**

---

**IN THE SENATE OF THE UNITED STATES**

APRIL 23 (legislative day, APRIL 21), 1975

Mr. McINTYRE (for himself, Mr. BAYH, Mr. HUMPHREY, Mr. KENNEDY, and Mr. MONDALE) introduced the following bill; which was read twice and referred to the Committee on Commerce

---

**A BILL**

To require that certain information about gasoline be disclosed to consumers.

1       *Be it enacted by the Senate and House of Representa-*  
2       *tives of the United States of America in Congress assembled,*  
3       That this Act may be cited as the "Consumer Fuel Dis-  
4       closure Act of 1975".

5       SEC. 2. The purposes of this Act are—

6               (1) to assist consumers in avoiding the purchase  
7       of automotive gasoline with octane ratings unnecessarily  
8       high for the proper operation of their automobiles; and  
9               (2) to enhance competition in the sale to consumers  
10      of automotive gasoline.

11      SEC. 3. As used in this Act, the term—

1           (1) "Administrator" means the Administrator of  
2 the Federal Energy Administration or any successor  
3 agency;

4           (2) "automobile" means any vehicle driven or  
5 drawn by mechanical power manufactured primarily for  
6 use on the public streets, roads, and highways, except  
7 any vehicle operated exclusively on a rail or rails;

8           (3) "consumer" means any person who purchases  
9 gasoline for an automobile for purposes other than  
10 resale;

11           (4) "gasoline" means gasoline used in automobile  
12 engines, but does not include fuel dispensed for use in  
13 airplane engines, boat engines, or other engines used  
14 in nonautomotive forms of transportation;

15           (5) "interstate commerce" means commerce be-  
16 tween any place in a State and any place in another  
17 State, or between places in the same State through  
18 another State;

19           (6) "octane rating" means the measurement of the  
20 antiknock characteristics of gasoline for use as an auto-  
21 motive fuel, measured as half the sum of research  
22 octane number plus the motor octane number, plus four;

23           (7) "retail distributor of gasoline" means a person  
24 who sells gasoline to a consumer; and

25           (8) "State" means each of the several States, the

1 District of Columbia, the Commonwealth of Puerto Rico,  
2 Guam, the Virgin Islands, the Canal Zone, and Ameri-  
3 can Samoa.

4 PROVISION OF FUEL INFORMATION

5 SEC. 4. (a) (1) After the effective date of this section,  
6 the shipment, transportation, or sale of gasoline in interstate  
7 commerce, or the shipment, transportation, or sale of gasoline  
8 which has been shipped in interstate commerce, is prohibited  
9 unless the person offering such gasoline for shipment, trans-  
10 portation, or sale to one other than a consumer has certified  
11 in writing at or prior to the time of delivery of such gasoline  
12 to the person receiving such gasoline for resale or distribution  
13 the octane rating.

14 (2) After the effective date of this section, the sale to  
15 a consumer of gasoline which has been shipped, transported,  
16 or sold, or is offered for sale, in interstate commerce, is pro-  
17 hibited unless the person offering such gasoline for sale to  
18 consumers has affixed to the unit from which gasoline is  
19 dispensed to the consumer a label clearly stating the octane  
20 rating.

21 (3) After the effective date of this section, no gasoline  
22 which has been shipped or transported in interstate com-  
23 merce shall be sold or offered for sale to any consumer unless  
24 all advertising and other promotional information about such  
25 gasoline clearly discloses the octane rating and such other

1 information about such gasoline as the Administrator shall  
2 by regulation prescribe.

3 (b) No automobile manufactured after the effective date  
4 of this section which has been manufactured, shipped, or  
5 transported in interstate commerce shall be sold or offered for  
6 sale to a consumer unless the manufacturer of such automobile  
7 provides written information to the buyer of such automobile  
8 stating the octane or octanes of gasoline appropriate for use  
9 in the engine of such automobile.

10 (c) The information required to be disclosed under sub-  
11 section (a) shall meet such requirements as to form and  
12 content, and any label required to be displayed shall be  
13 affixed in such location on the unit from which gasoline is  
14 dispensed, as the Administration shall by regulation pre-  
15 scribe. The information required to be disclosed under sub-  
16 section (b) shall be posted in or on the automobile or in-  
17 cluded in literature furnished by the manufacturer to the  
18 buyer of the automobile, or both, as the Administrator shall  
19 by regulation prescribe.

20

## PENALTIES

21 SEC. 5. (a) (1) Violation of the provisions of section  
22 4(a) (1) of this Act or any regulation promulgated pursu-  
23 ant to such section is a misdemeanor punishable by a fine  
24 not in excess of \$5,000 for each day in which any delivery  
25 of such gasoline is made.

1           (2) Violation of the provisions of section 4 (a) (2) of  
2 this Act or any regulation promulgated pursuant to such  
3 section is a misdemeanor punishable by a fine not in excess  
4 of \$100 for each day on which any sale of such gasoline  
5 is made.

6           (3) Violation of the provisions of section 4 (a) (3) of  
7 this Act or any regulation promulgated pursuant to such  
8 section is a misdemeanor punishable by a fine not in excess  
9 of \$5,000 for each publication of an advertisement.

10          (4) Violation of the provisions of section 4 (b) of this  
11 Act or any regulation promulgated pursuant to such section  
12 is a misdemeanor punishable by a fine not in excess of \$300  
13 for the sale of an automobile by a manufacturer, and not in  
14 excess of \$100 for the sale of an automobile by a person  
15 other than the manufacturer.

16          (b) Violation of any provision of this Act or any reg-  
17 ulation promulgated under this Act is an unfair or deceptive  
18 act or practice in commerce under section 5 (a) (1) of the  
19 Federal Trade Commission Act.

20                           STANDARDS, STUDIES, AND ENFORCEMENT

21           SEC. 6. The Administrator shall—

22                   (1) establish standard methods to measure octane  
23 and to establish other methodologies and testing proce-  
24 dures to insure the purity and content of gasoline;

25                   (2) conduct a full and complete study of the quality

1 of performance of various brands of gasoline of which  
 2 substantial sales in interstate commerce are made, the  
 3 impact of such gasoline on automobile deterioration, and  
 4 the feasibility of standardizing gasoline formulae, and  
 5 report the findings of such study to the Congress; and  
 6 (3) perform spot tests of the quality of various  
 7 brands of gasoline which have been moved in interstate  
 8 commerce or in commerce affecting interstate commerce,  
 9 and provide semiannual reports on such testing procedure  
 10 and the results disclosed by such tests.

#### 11 TIME FOR ISSUANCE OF REGULATIONS

12 SEC. 7. The Administration shall issue regulations pre-  
 13 scribing the form, content, and location of the information  
 14 required under section 4 not later than six months after the  
 15 enactment of this Act.

#### 16 AUTHORIZATION OF APPROPRIATIONS

17 SEC. 8. There are authorized to be appropriated such  
 18 sums as may be necessary to carry out the provisions of this  
 19 Act.

#### 20 EFFECTIVE DATE

21 SEC. 9. Sections 4 and 5 of this Act shall take effect one  
 22 year after the date of enactment of this Act.

Senator HARTKE. Senator McIntyre is unable to appear this morning due to a Defense Department briefing. I have his statement, which will appear in the record at this time.

[The statement follows:]

STATEMENT OF HON. THOMAS J. MCINTYRE, U.S. SENATOR FROM  
NEW HAMPSHIRE

Mr. Chairman, I am pleased that the Subcommittee is holding this day of hearings on S. 1508, a bill I introduced last Spring to require that octane ratings be posted on gasoline pumps and in automobile manuals.

Were this requirement to be met, motorists could shop around for the gasoline that best suits their car needs—at the best price. And in this day of 60 cents a gallon gasoline, the savings promised through the use of such buyer guidelines could be considerable.

One estimate holds that by purchasing higher octane gasoline than his car really needs, the motorist who is "overbuying" gasoline is throwing away as much as \$24 a year. I am told we use an extra 63,500 barrels of oil every day because of overbuying. It also takes another 7,900 barrels of oil per day to produce that unneeded high octane gasoline. Thus, we are wasting enough oil to produce 1.24 million gallons of gasoline every day.

Mr. Chairman, I am convinced that S. 1508 helps the consumer avoid "overbuying," thus saving him money without hurting his car's performance.

And I like to think it will have another salutary effect, Mr. Chairman, I believe it will force the American oil companies to compete in octane—gasoline's most important value.

Under the octane posting system established by the Cost of Living Council two years ago, consumers buy gasoline which is rated through the averaging of two numbers—the research octane number familiar since World War II, and the motor octane number, which is considered an important component in this time of sustained, high-speed driving.

Unfortunately, Mr. Chairman, this system has confused the consumer. For when the system went into effect, the octane numbers posted on pumps were four numbers lower than the numbers consumers had used as a buying guide for the last thirty years. And the numbers in car manuals were thus four higher than the numbers on the pumps.

Traditionally, research octane numbers translated to mean that premium equals 100, regular 94, and economy 91. Many car owner manuals specifically state that a new car engine requires at least 91 octane, meaning research octane. But under the current rating system, many motorists feel that they must use high octane gasoline because that is the only gasoline that they perceive would have an octane number over 91.

As a result, they have been buying higher octane gasoline than their cars really needed—in other words, "overbuying."

This misleading, and costly, rating system—which, incidentally, was first proposed by Texaco, the Nation's second largest oil company—was adopted and invoked by the Federal Energy Administration and is still in effect.

To solve this problem, my bill would require that the number four be added to the total now posted on pumps.

This will mean that the motor octane number and research octane number are balanced in the gasoline, and the consumer will see a posted number that he has known for years and can evaluate accordingly.

The Environmental Protection Agency already supports the system proposed in my bill, while the Federal Energy Administration and the Federal Trade Commission prefer the present system. I should point out, however, that the FEA has no technical objection to the system I am proposing.

Mr. Chairman, I ask that the technical information on this bill be inserted in the record at this point.

But providing for a change in the system of posting octane ratings is not the only provision of S. 1508. The bill would also provide specific authority to one agency to require octane postings.

Today there is no specific authority. The existing octane posting requirement is the result of a trade regulation first issued by the Federal Trade Commission on December 30, 1970. Controversy over this culminated in a ruling by the U.S. Court of Appeals for the District of Columbia upholding Commission's authority to enforce trade regulation rules.

But the way to settle this question once and for all, and to establish a specific authority of requiring octane postings, is to do it by law, Mr. Chairman. So my bill specifically provides that the FEA require gasoline octane posting and that the power pass to its successors if the FEA ceases to exist.

That one agency would be authorized to enforce regulations and to maintain one specific, uniform octane posting system.

Now, Mr. Chairman, I recognize that rating systems other than the one I have outlined in my legislation have been proposed. But after examining each of these proposals, I have concluded that they would not be as helpful to the consumer. Indeed, the symbol values inherent in these alternative proposals are such as to hide the octane value of gasoline and, once again, save the major oil companies from having to compete on the octane value of gasoline.

Octane, after all, is the single most important value component of gasoline. Change octanes, and you change your car's performance for better or for worse.

Posting octane ratings according to the system I have proposed will provide motorists with the information they need—in terms they understand—to buy the octane they truly need at the best price they can get. Thus the motorist can save money and protect his car at one and the same time, and see more healthy competition in the gasoline sales market.

Mr. Chairman, from the day I introduced this bill, I was aware of the major oil companies' opposition to it. This doesn't bother me, because it is surely not the first time that the majors and I have locked horns on an issue. Furthermore, the oil companies have as much right to object to my proposal and to work against its passage, as I have to work in its behalf.

All I ask is that the contest be conducted in the open, where everybody knows the players by the numbers on their jerseys.

In this particular contest, this has not always been the case.

For instance, the Secretary of the Committee that oversees octane ratings of the supposedly independent American Society for Testing and Materials, R. R. Wright, wrote a letter to the members of the Society's committee on petroleum products and lubricants suggesting that if they had strong thoughts about my octane rating proposal, which he cast in negative terms, they should advise their elected representatives of their views.

Now if Mr. Wright had lobbied on his own stationery, instead of ASTM stationery, and had identified himself in the body of the letter as a director of the refining division of the American Petroleum Institute, the major oil lobby in Washington, I would not object. But he did use the ASTM letterhead, and he did not call attention to his API position. And that I do object to.

Mr. Chairman, there's room for honest disagreement over how best to handle this matter of posting octane ratings. If the process of disagreeing is kept as honest as the disagreement, then there's reason to believe we can resolve this matter in the best interests of everyone concerned.

I thank you for holding this hearing on S. 1508 and for the opportunity to present this testimony.

[The following information was subsequently received for the record:]

AMERICAN PETROLEUM INSTITUTE,  
Washington, D.C., November 5, 1975.

Hon. THOMAS J. MCINTYRE,  
U.S. Senate,  
Washington, D.C.

DEAR SENATOR MCINTYRE: This letter prompted by your testimony before the Senate Commerce Consumer Subcommittee on October 29, during which you registered an objection to my letter of May 2 to my colleagues on the ASTM Committee on Petroleum Products and Lubricants (Division A).

I have previously responded at length to similar criticisms and I am enclosing for your convenience copies of correspondence between myself and Jack Anderson (July 29), Louis V. Lombardo (May 27) and John K. Coleman (May 27).

For the reasons set forth in the enclosures, I believe that my identity and interests were not misrepresented and that it was not inappropriate for me to alert ASTM Committee members via ASTM letterhead stationery where my

name and API affiliation were listed. Please note that I sent you a contemporaneous copy of my letter to Mr. Lombardo.

Yours very truly,

R. R. WRIGHT,  
*Director, Refining.*

Enclosures.

RAYMOND R. WRIGHT, JR.,  
*Washington, D.C., July 29, 1975.*

Mr. JACK ANDERSON,  
*1401 16th Street, NW.,  
Washington, D.C.*

DEAR MR. ANDERSON: In the July edition of the Washington Post, under the subhead, "Oily Business," you accuse me of lobbying against proposed legislation that would require the addition of four numbers to the Federal Energy Administration's current octane posting and rating system, based on the average of ASTM Motor and Research antiknock ratings.

It is no secret that I am director of Refining of the American Petroleum Institute and was until June 1975, secretary of the American Society for Testing and Materials' Committee on Petroleum Products and Lubricants. Also you are correct that I wrote to ASTM members last May about the proposed legislation on the organization's letterhead in my capacity as secretary of the ASTM group. But I do not believe a request to inform a congressman of an individual's view is "lobbying." In my letter, I explained that ASTM had no official position on the legislation.

On the general subject of octane posting I, personally, would welcome general agreement on a technically reasonable system that would be available to consumers. However, the proposed legislation is not the answer. Indeed, the number that would result would be about equal to the research octane rating, which most experts will tell you is the least satisfactory method of measuring antiknock values. (The motorist who wants a number can read the more accurate Research plus Motor octane average posted, as required by law.)

The statement that the enactment of such legislation will save U.S. motorists \$3 million (per day, per year, per century?) has no basis in fact, since the amount of high octane number fuel now sold is about equal to the number of cars that require it (21 percent vs. 21 percent). Thus, there is no "overbuying." Octane ratings are, at best, guidelines. Octane requirements vary widely from car to car—even those of the same make produced at the same time. The most practical way for a motorist to determine whether a particular gasoline will suit his car is to try a tankful. If knocking occurs, he should use a higher octane fuel. Conversely, if no knocking occurs he may elect to try a lower octane.

Your statement that the adoption of the proposed legislation will result in lower atmospheric lead concentrations had no basis in fact. You can have a high octane gasoline that is lead free and a low octane fuel that contains lead. As more and more catalytic muffler cars require unleaded gasoline, the lead emissions will dwindle and hopefully so will the emotional issue about lead emissions.

Sincerely,

R. R. WRIGHT.

MAY 27, 1975.

Mr. LOUIS V. LOMBARDO,  
*Public Interest Campaign,  
9711 MacArthur Boulevard,  
Bethesda, Md.*

DEAR LOUIS: Your letter of May 16 went to some lengths to address the substance of my letter of May 2 to Division A on Gasoline.

My letter had one purpose only, and that was to alert the members of Division A on Gasoline that there was a proposed bill, S. 1508, and that Senator McIntyre might receive a wider spectrum of opinion on octane posting from individual members of Division A than he may have received up until this time. Since most members of Division A do not regularly read the Federal Register or have particular knowledge that this bill had been proposed, I can't see what grievous damage has been done to call the group's attention to this proposed legislation.

You are aware that there is no consensus of opinion in the petroleum industry regarding octane posting. I am aware of no API opinion on the subject. Some

companies post; others do not post, but do not object to posting; and some are vehemently opposed to it. If you are trying to look to me as someone who has tried to stimulate or influence legislation in this area, I believe you will have to look elsewhere.

On the other hand, if there were a consensus of opinion on any octane posting system in ASTM and a recorded vote of the ASTM members on the question, and that consensus was reflected in an ASTM standard, I see no reason why ASTM couldn't comment to Senator McIntyre or any other legislator who had an interest. ASTM and its membership are part of the community of the United States as of this time. We are not withdrawn from the world or from the concerns of society and the consumer. A copy of my letter to John Coleman of the State of Maryland is attached. Coleman raised questions similar to yours as to whether ASTM had a role in commenting on descriptors for ultimate consumer goods or commenting to public officials regarding such descriptors.

There was a time when the ASTM philosophically was concerned mainly with the scientific descriptions, through tests and specifications of the "materials of engineering." This is no longer accurate. The ASTM is placing more emphasis on ultimate consumer information. The letter calling attention to legislation is unusual; but, the involvement of ASTM in the gasoline symbol system is also unusual.

My crack concerning a "horde of civil servants" is debatable. You apparently believe that S. 1508, if passed, would not result in the creation of a Federal bureaucracy to administer it; I think that it would. However, I'm not sure any additional correspondence would convince either of us to the opposite point of view.

Sincerely,

R. R. WRIGHT.

MAY 27, 1975.

Mr. JOHN K. COLEMAN,  
*Gasoline Tax Division, P.O. Box 1751, State Treasury Building, Annapolis, Md.*

DEAR MR. COLEMAN: With reference to your letter of May 13, 1975:

I don't know of any sharp lines that can be drawn between the work of ASTM in the area of methods of test and specifications for materials, and comments made to arms of government that relate to methods of test or specifications for materials.

At one time, there was a general consensus in the management of ASTM that it should not concern itself with ultimate consumer goods or descriptors for ultimate consumer goods. This consensus has become blurred.

For example, Margaret Dana, Consumer Relations Council, Research Center, RR #1, Box 48, Chalfont, Pa., is a member of the ASTM Board of Directors. Several new ASTM committees address themselves to: Protective equipment for sports (F-8), tires (F-9), meat and meat products (F-10), vacuum cleaners (F-11), safety and traction for footwear (F-13), and consumer product safety (F-15).

ASTM has supplied comments to Department of Transportation (flash point and classifications of hazardous materials) and most recently to the Hart Subcommittee, U.S. Senate, on the voluntary standards system.

The ASTM work on motor gasolines provides information on basic gasoline quality for bulk purchase, and has been extended through the outgrowth of a request to SAE by the State of Wisconsin which led to the SAE-ASTM Gasoline Performance and Information System. This is designed for ultimate consumers of gasoline.

If ASTM had a consensus on any posting system, ASTM could comment to Sen. McIntyre for information of his committee, after clearance with ASTM Headquarters. I know there are a variety of opinions in Division A regarding octane posting, and that some members do not regularly read the Federal Register. Since informed opinion exists, the only purpose of the letter of May 2, 1975, was to alert the Division to the posting proposal and suggest individual comment. On re-reading the letter, certain biases of my own show through. However, I find no evidence that these carry any particular weight with the committee.

In retrospect and after some years of hard experience, I have concluded that technologists and engineers do not provide the best forum for proposing descriptors for ultimate consumer goods. However, we have become involved; and as I have attempted to show, the ASTM is involved in several areas dealing with consumer products.

Sincerely yours,

R. R. WRIGHT.

COMPTROLLER OF THE TREASURY,  
GASOLINE TAX DIVISION,  
Annapolis, Md., May 13, 1975.

Mr. R. R. WRIGHT,  
Committee D-2, American Society for Testing and Materials,  
Philadelphia, Pa.

DEAR MR. WRIGHT: Your letter of May 2, 1975 directed to members, Technical Division A, on gasoline concerns me in respect to the true function of ASTM. It has always been my opinion that ASTM limits itself solely to recommended specifications and test procedures and not address itself to the posting of octane or any other consumer oriented or government function.

I would sincerely appreciate copies of whatever extract of the rules and by-laws of ASTM that permits the involvement in the aforementioned area.

Very truly yours,

JOHN K. COLEMAN,  
Chief, Gasoline Tax Division.

Senator HARTKE. The first witness is the Honorable Louis L. Goldstein, Comptroller of the Treasury of the State of Maryland.

**STATEMENT OF LOUIS GOLDSTEIN, COMPTROLLER OF THE TREASURY, STATE OF MARYLAND; ACCOMPANIED BY JOHN COLEMAN, CHIEF OF THE MARYLAND GASOLINE TAX DIVISION; AND ARTHUR PRICE, CHIEF MOTOR FUEL INSPECTOR**

Mr. GOLDSTEIN. Thank you, Senator.

As State comptroller, it is my responsibility to regulate the gasoline business and motor vehicle fuel in our State.

For the record, my name is Louis L. Goldstein. I'm comptroller of the treasury for the State of Maryland.

With me today are John Coleman, chief of the Maryland gasoline tax division and Arthur Price, chief motor fuel inspector for that division. We appreciate the opportunity to testify today on Senate bill 1508, the Consumer Fuel Disclosure Act.

The sponsors and the committee are to be congratulated for their interest in protecting the consumer, especially in today's confusing maze of gasoline brands, grades, generic names, and additives. S. 1508 begins to meet a nationwide need for adequate policing of the petroleum industry.

In Maryland I have the responsibility for collecting the motor fuel tax and administering the motor carrier law. Today, I would like to divide my testimony into two parts. First, I will describe our motor fuel inspection activity and experiences in Maryland, and second, I will address myself to S. 1508 specifically.

Our investigations of State motor fuel tax fraud in the 1960's led us to the conclusion that a program of quality control of gasoline and other fuels was needed. As a result, the Maryland General Assembly authorized the comptroller to establish a motor fuel inspection unit in 1969. The unit began functioning in 1970, and today includes 15

field inspectors who take samples of fuel from Maryland's 4,400 retail service stations, storage areas, and terminals. Samples are also acquired from trucks and waterborne vessels that make deliveries of motor fuel. The samples are then tested in our own motor fuel testing laboratory located in Jessup, Md., which is considered by the petroleum industry to be one of the most modern and complete laboratories in the Nation. The laboratory is located between here and Baltimore right off Interstate Route 95 and the Baltimore-Washington Parkway.

At the laboratory, technicians and chemists perform as many as 18 different tests on various fuels, including gasoline, diesel fuel and heating oil. Ten different tests are conducted on gasoline alone. We perform octane tests in compliance with Federal standards, but I feel it is important for the committee to understand that there are many other specifications that determine the actual quality of the gasoline delivered to the consumer. It is vital to include these other characteristics in order to insure that you and I as consumers are getting what we are paying for.

For example, the distillation test is very significant as it determines the fluxation in the "light ends" present in given sample of fuel. These "light ends" could, if not present in the right proportions, result in fewer miles per gallon from that fuel. We have adopted the standards of the American Society for Testing and Materials—ASTM—for our inspection, testing, and enforcement purposes. When samples are found to be defective, the material is effectively removed from the marketplace since we forbid its sale until the defect is corrected. We stop the sale of that product as quickly as possible. In many instances, premium gasoline which is octane-deficient is downgraded to regular. This can be done very quickly at the retail location in the interest of both the retail service station dealer and the consumer. This results in a minimum loss of sales and minimum loss of income for the small businessman. We try to restrict the downtime for each class of trade because their very livelihood is dependent upon their being able to do business. This approach also keeps as much fuel as possible on the market, an important fact in Maryland, because 80 percent of our workforce depend on their cars to get them to work.

During fiscal year 1975, which ended June 30, 1975, we sampled 370,359,049 gallons of gasoline and found 35,512,490 gallons defective in one or more of the tests. This means nearly 10 percent of the gasoline sampled did not meet commonly-accepted standards. And that 10 percent is in Maryland, a State with a widely known inspection program. What would the figure be elsewhere in the other 49 States?

Ninety-five percent of the defective fuel was restored to the marketplace by making the product acceptable for sale through downgrading or other chemical means. I am attaching an exhibit detailing the tests performed and the violations in each category and grade for fiscal year 1975.

A vital part of a program of this type is to establish grades, with a minimum octane for each such grade. In Maryland, we place a decal on the face of each dispensing pump which shows the grade, the minimum octane, and further indicates the amount of lead permitted in the fuel dispensed from that pump.

The significant point here is to establish the grade with a minimum octane in order to prevent constant change of octane posting on the face plate of the pump by the dealer, who may not be knowledgeable about the octane of any particular grade of fuel he receives. He has to depend on a company to give him that product.

Our motor fuel inspection program has been the vehicle for numerous cooperative programs. We began a price gouging survey with the original cost of living council and continued it with the Internal Revenue Service as a part of the first such cooperative venture in the Nation. We are currently cooperating with the Environmental Protection Agency in monitoring lead content of gasoline sold in Maryland. We are continually providing representatives of other States and even foreign governments with information regarding our inspection program. Recently, we were visited by members of your staff; namely, Mr. Cohen, staff counsel, and Mr. Gray, staff investigator. We provided much information to them of a general nature and also supplied much reference material to enable them to do further research.

We have been providing information to the Congress for a long time. I came to Senator Hart's Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary on February 9, 1972, and revealed many of our findings regarding petroleum industry practices in interstate transportation and storage. Inasmuch as no action was forthcoming at the Federal level, the Maryland General Assembly took steps that required oil companies to register with us information concerning the chemical makeup and point of insertion of their additives and the details of their terminal and exchange agreements. It is quite common to find two or three brands stored in the same tank. Exchanges between company "A" and company "B" are almost a matter of routine. Some brands insert additives at the loading rack, some do not. Through our complete inspection program and the requirement of annual filing of specifications, we are able to insure that consumers are getting the brand, grade, and quality of fuel that they are paying for.

We have been a pioneer in this, Senator. We are able to watch closely for fraudulent advertising and inferior fuel. It should be noted here that exchange agreements have increased dramatically since 1973, which indicates much of this type of activity is going on in other States throughout the Nation. These points are mentioned in order that you might consider the overall industry activity throughout the country.

Now I would like to address myself to S. 1508 in particular, passing on observations based on our experience in Maryland. In S. 1508, there is nothing mentioned regarding interface material. Interface is a variable mixture of heating oils, kerosene, jet fuels, and various grades of gasoline, caused by a mixing of adjacent fuels flowing through the pipelines. It is an industry practice to inject this mixture into regular gasoline. While there is no adequate test to determine the presence of interface, we know it can affect the performance of the fuel if it is blended in amounts approaching 5 percent. For this reason we eliminated blending of interface entirely. I recommend the same be done in this legislation. I know this is controversial, but the interface material is where they make the money.

S. 1508 does not address itself to diesel fuel or No. 2 fuel oil which is sold by most companies as a combination fuel for both heating and for on the road application. There certainly should be provisions for the protection of the growing numbers of diesel car owners and the trucking industry.

Section 2 of S. 1508 appears to deal with retail service stations. Perhaps it is meant to include, and certainly it should, the commercial consumer customer who receives product from a company for its own consumption. A typical example is a taxicab company or a trucking company buying in bulk for delivery into its own storage tanks.

Section 4 mentions the octane of gasoline appropriate for the use in the engine of an automobile. The statute should consider and include marinas as many boats utilize a normal automobile engine and in many instances, marinas sell product from one common storage tank to boats and automobiles. In Maryland we have 5,000 miles of shoreline in our State. We have that combination throughout. We know from our personal experience.

Referring to section 6 concerning the posting of octane ratings, I would encourage the grading of gasoline as premium, midpremium, regular, et cetera, and tying these grades to a minimum octane number for each grade.

The State of Maryland is not opposed to the determination of octane measured as half of the sum of research octane number plus the motor octane number plus 4. I do wish to point out as dramatically as possible that this is another change in measuring octane. The consuming public must be educated to whatever system is adopted, perhaps along the line we pursued in Maryland where we published an octane guide that compared the various methods of octane rating, a copy of which is attached to my presentation. We distributed thousands of these through every gasoline station in our State so the public would be acquainted with it.

We recommend the penalties provided in section 5 be carefully reviewed and properly worded so as to protect the small businessman. We suggest providing for the removal of defective material without a fine unless there is a deliberate attempt to adulterate the fuel, in which case, we wholeheartedly endorse the fine.

I would like to point out that any policing or inspection system relies on a short time lag between the taking of the sample and the finding of defective fuel. I would suggest that our experience with the EPA indicates the advisability of State-Federal cooperative programs wherever possible. Without this cooperation, the product may already be dispensed and replaced with new fuel before action may be taken. In a word, the damage will already have been done, and the law useless.

When we check unleaded fuel for the EPA and find excess lead, we stop sale of that fuel, remove it from the marketplace and advise the EPA of all findings, enabling them to respond. Taking advantage of existing State laboratories and programs prevents duplicate effort and therefore, saves the taxpayer money.

In conclusion, I would once again congratulate the sponsors of S. 1508 for providing a beginning point in adequate protection for the consumers of petroleum products, but I would hasten to ask that you give consideration to the points I have raised. It is our interpretation that the intent of S. 1508 is to provide the consumer with adequate information and protection concerning the fuel that he or she is buying.

This purpose will be greatly strengthened by the prohibition of interface activity, adequate education on octane ratings, and a close watch on all forms of motor fuel for the various qualities that assure the consumer of the performance he or she expects.

We consider it an honor to address your committee and share our thoughts and experiences. If you have any questions concerning the day-to-day details of our program, Mr. Coleman and Mr. Price are here for just that purpose.

Thank you once again.

[The attachments referred to follow:]

#### TESTS PERFORMED ON GASOLINE IN MARYLAND

Corrosion, dried vapor pressure, vapor liquid ratio, distillation, resin, sulphur, gum, water and sediment, lead, and octane.

## GASOLINE ANALYSIS SUMMARY—VIOLATIONS

REGULAR NO. 1 (R+M  
2 -87)

|           | Samples analyzed | Corrosion | RVP | V/L | Distillation | Residue | Sulfur | Gum | Water and sediment | Lead | Octane | Total violations | Gallons pailed | Gallons sampled |
|-----------|------------------|-----------|-----|-----|--------------|---------|--------|-----|--------------------|------|--------|------------------|----------------|-----------------|
| July      | 190              |           |     |     | 1            |         |        |     | 1                  | 2    | 8      | 12               | 10,947         | 2,672,080       |
| August    | 227              |           |     |     | 5            |         |        |     |                    | 2    | 3      | 12               | 752,356        | 10,439,215      |
| September | 181              |           |     |     | 2            |         |        |     |                    | 1    | 4      | 10               | 12,849         | 8,089,207       |
| October   | 159              |           |     |     | 2            |         |        | 3   | 3                  | 1    | 1      | 7                | 8,848          | 9,782,071       |
| November  | 144              |           |     |     |              |         |        |     |                    |      |        |                  |                | 9,262,532       |
| December  | 133              |           |     |     | 2            |         |        |     |                    |      |        | 2                | 1,771          | 1,151,705       |
| January   | 243              |           |     |     |              |         |        |     | 1                  | 2    | 3      | 6                | 15,443         | 7,015,165       |
| February  | 214              |           |     |     |              |         |        |     |                    |      | 4      | 4                | 4,587          | 5,860,065       |
| March     | 241              |           |     |     | 4            |         |        |     | 1                  |      | 6      | 11               | 14,586         | 3,048,018       |
| April     | 260              |           |     |     | 2            |         |        | 2   | 2                  |      | 2      | 6                | 1,239,598      | 6,381,463       |
| May       | 240              |           |     |     | 3            |         |        |     |                    |      |        | 3                | 854            | 2,473,989       |
| June      | 233              |           |     |     |              |         |        |     |                    | 4    | 1      | 5                | 21,885         | 9,636,645       |
| Subtotal  | 2,460            |           |     |     | 26           |         |        |     | 8                  | 12   | 32     | 78               | 2,110,724      | 76,012,155      |

REGULAR NO. 2 (R+M  
2 -89)

|           | Samples analyzed | Corrosion | RVP | V/L | Distillation | Residue | Sulfur | Gum | Water and sediment | Lead | Octane | Total violations | Gallons pailed | Gallons sampled |
|-----------|------------------|-----------|-----|-----|--------------|---------|--------|-----|--------------------|------|--------|------------------|----------------|-----------------|
| July      | 294              |           |     |     |              |         |        |     | 2                  |      | 1      | 3                | 2,553          | 2,485,239       |
| August    | 296              |           |     |     | 7            |         |        |     | 2                  |      | 6      | 15               | 135,903        | 23,157,013      |
| September | 261              |           |     |     | 1            |         |        |     | 1                  |      | 2      | 6                | 333,336        | 15,924,347      |
| October   | 235              |           |     |     |              |         |        |     | 1                  |      | 4      | 3                | 1,169,312      | 15,147,616      |
| November  | 186              |           |     |     | 1            |         |        |     |                    |      | 1      | 2                | 9,286          | 17,313,885      |
| December  | 175              |           |     |     |              |         |        |     |                    |      | 1      | 1                | 2,930          | 2,593,094       |
| January   | 303              |           |     |     |              |         |        |     | 2                  |      | 1      | 3                | 5,000          | 16,389,684      |
| February  | 256              |           |     |     | 1            |         |        |     | 2                  |      |        | 5                | 16,825         | 10,666,925      |
| March     | 298              |           |     |     | 4            |         |        | 1   | 2                  |      | 2      | 10               | 775,633        | 10,216,007      |
| April     | 333              |           |     |     | 4            |         |        |     | 4                  |      | 3      | 9                | 4,833          | 9,507,153       |
| May       | 306              |           |     |     | 2            |         |        |     |                    |      | 4      | 7                | 970,600        | 21,611,554      |
| June      | 293              |           |     |     |              |         |        |     | 3                  |      |        |                  |                |                 |
| Subtotal  | 3,236            |           |     |     | 16           |         |        |     | 1                  | 17   | 25     | 60               | 3,447,414      | 163,428,272     |

MIDPREMIUM  $\left(\frac{R+M}{2} - 91.5\right)$

|                |    |  |  |  |  |  |  |  |         |
|----------------|----|--|--|--|--|--|--|--|---------|
| July.....      | 2  |  |  |  |  |  |  |  | 7,853   |
| August.....    | 2  |  |  |  |  |  |  |  | 3,374   |
| September..... | 2  |  |  |  |  |  |  |  | 2,399   |
| October.....   | 1  |  |  |  |  |  |  |  | (1)     |
| November.....  | 13 |  |  |  |  |  |  |  | 16,066  |
| December.....  | 9  |  |  |  |  |  |  |  | 14,561  |
| January.....   | 10 |  |  |  |  |  |  |  | 11,890  |
| February.....  | 16 |  |  |  |  |  |  |  | 19,911  |
| March.....     | 8  |  |  |  |  |  |  |  | 2,073   |
| April.....     | 8  |  |  |  |  |  |  |  | 107,980 |
| May.....       | 12 |  |  |  |  |  |  |  | 15,612  |
| June.....      | 10 |  |  |  |  |  |  |  | 10,260  |
| Subtotal.....  | 84 |  |  |  |  |  |  |  | 211,979 |

PREMIUM  $\left(\frac{R+M}{2}\right) - 95$

|                        |       |  |  |  |  |  |  |  |            |
|------------------------|-------|--|--|--|--|--|--|--|------------|
| July.....              | 243   |  |  |  |  |  |  |  | 1,441,698  |
| August.....            | 250   |  |  |  |  |  |  |  | 17,610,817 |
| September.....         | 225   |  |  |  |  |  |  |  | 17,557,417 |
| October.....           | 224   |  |  |  |  |  |  |  | 19,437,272 |
| November.....          | 244   |  |  |  |  |  |  |  | 15,517,666 |
| December.....          | 162   |  |  |  |  |  |  |  | 1,307,187  |
| January.....           | 287   |  |  |  |  |  |  |  | 225,459    |
| February.....          | 267   |  |  |  |  |  |  |  | 4,517,106  |
| March.....             | 287   |  |  |  |  |  |  |  | 4,790,112  |
| April.....             | 349   |  |  |  |  |  |  |  | 7,268,986  |
| May.....               | 281   |  |  |  |  |  |  |  | 8,306,952  |
| June.....              | 256   |  |  |  |  |  |  |  | 9,082,903  |
| Subtotal.....          | 3,075 |  |  |  |  |  |  |  | 1,296,904  |
| Total, all grades..... | 8,855 |  |  |  |  |  |  |  | 29,943,395 |

† Not available.

## WHAT THE CONSUMER SHOULD KNOW ABOUT GASOLINE: AN OCTANE GUIDE FOR MARYLAND MOTORISTS

### HOW IS GASOLINE GRADED?

You are aware of the different accepted ways of measuring distance and temperature. We measure distance by yards or meters. We measure temperature using the Fahrenheit or centigrade scale. Gasoline octane may be measured by both the familiar Research Method and the Motor Method of testing. The Research Method was used more frequently in the past, just as yards have been used to measure distance and Fahrenheit to determine temperature.

Due to changes in automobile engine design requiring emission control devices, it is necessary to change from the Research Method to a new method of testing for octane. The new method makes use of two separate laboratory tests, the Research octane test and the Motor octane test. The two test results are added together and divided by two. The result is the actual octane number. This octane number will be lower than the one with which you have been familiar.

The lower octane numbers in no way indicate a decrease in gasoline quality, only a change in the way it is measured and graded.

### HOW WILL OCTANE RATINGS CHANGE?

After November 25, 1973, the State of Maryland will be testing and labeling each retail pump with a decal stating the grade of fuel being sold. Each grade of gasoline thus identified will aid the motorist in purchasing a fuel that will satisfy the requirements of his car at the least possible cost.

| These grades will be: | <i>Octane</i> |
|-----------------------|---------------|
| Premium -----         | 95.0          |
| Mid-premium -----     | 91.5          |
| Regular -----         | 89.0          |
| Economy -----         | 87.0          |

It is essential that you use a sufficiently high grade of gasoline to prevent knock in your vehicle. It is equally important you do not buy a higher octane grade than your car requires. The higher octane will be most costly and will not improve your car's performance.

### HOW CAN I USE MY AUTOMOBILE MANUAL TO SELECT PROPER OCTANE?

Automobile Manuals recently have recommended selection by research numbers. The 1974 Manuals recommend you select a regular gasoline with a research octane rating of at least 91 octane. The Manual also refers to gasoline symbols with numbers to grade gasoline and therefore, recommend a rating of at least number two (2) for your 1974 automobile.

|                  | Change in octane rating |      | Automotive gasoline performance system |   |
|------------------|-------------------------|------|--|---|
|                  | Old                     | New  | Gasoline symbol No.                    | Car application   |
| Economy -----    | 91                      | 87.0 | 2                                      | For most 1971 and later model cars.   |
| Regular -----    | 94                      | 89.0 | 3                                      | For most 1970 and prior model cars designed to operate on "regular" gasoline.   |
| Midpremium ----- | 96                      | 91.5 | 4                                      | An "intermediate" designation which will meet the lower antiknock needs of some cars designed to run on "premium" gasoline, and the higher antiknock needs of some cars designed to run on "regular." |
| Premium -----    | 100                     | 95.0 | 5                                      | For cars with high compression ratio engines designed to run on "premium" gasoline.   |

Note: Old was by research method; new is by research method and motor method/2.

### HOW CAN OCTANE GRADES SAVE ME MONEY?

If your car is a 1972, or prior year model, you can select a gasoline that operates it satisfactorily, and for the least money by the following procedure.

1. Observe the grade on the pump from which you now purchase gasoline that operates your car without knocking.

2. The next time you need gasoline let the tank get low and add about  $\frac{1}{4}$  tank from a pump identified by the next lower grade.

3. If your car does not knock on this gasoline, the next time you need fuel buy about  $\frac{1}{4}$  tank of the next lower grade.

4. Continue to drop to the next lower grade until the car begins to knock. Then move back up to the next higher grade. This should satisfy the anti-knock requirements of your car at a minimum fuel cost.

Don't be alarmed if your car "pings" slightly during rapid acceleration, or a short hard pull. When operating at maximum efficiency under normal driving conditions, such a "ping" will occur under these temporary abnormal conditions.

As cars become older antiknock requirements can increase due to engine deposits, and you may find it necessary to move up to a fuel of higher octane grade designation to operate your vehicle "knock free".

#### IS OCTANE THE ONLY MEASURE OF GASOLINE QUALITY?

No! Maryland has established minimum specifications and performs five additional tests to insure the motorist should not be stranded on the highway due to water in his gasoline or experience stalling due to vapor lock. These tests also insure against gum forming in the carburetor or corrosion of copper parts within the engine.

#### DO THE STATE OF MARYLAND MOTOR FUEL SPECIFICATIONS ASSIST IN CONTROLLING AIR POLLUTION?

Yes! Tests are conducted to control sulphur content in accordance with specifications established by the Environmental Protection Agency. Tests are also conducted on all gasoline sold in the State of Maryland to establish the lead content in gasoline. The Maryland Law limits the allowable amount of lead to 3 grams per gallon.

#### ARE OTHER TESTS FOR LEAD CONDUCTED?

Yes! All unleaded and low leaded gasolines are tested for lead content. In the event violations of any specification is found, stop sale notices are immediately issued and the product removed from the marketplace.

Senator HARTKE. Let me ask you a question about what you have done in Maryland. Did you specify in the legislation or was there just general authority for the comptroller to proceed to set the standards?

Mr. GOLDSTEIN. We had definite legislation we sponsored.

Senator HARTKE. Did it go into the question of octanes and light ends and things like that?

Mr. GOLDSTEIN. We have regulatory authority to do that.

Senator HARTKE. I'm asking now not in regard to the specifics, but are the regulations adopted under the general legislation? Is that what happened or did you have specific legislation dealing with these various points?

Mr. COLEMAN. We had specific legislation setting up the authority to promulgate regulations to set the standards, so we can advertise over a 90-day period any time we have to change these.

Senator HARTKE. What I'm getting to is the fact, in other words, that you did not deal with how to set the formula or how to set the posting or the inspection system. All that was done was that regulatory authority was given to you under the legislation.

Mr. COLEMAN. Yes, sir.

Senator HARTKE. Do you have a copy of that bill?

Mr. COLEMAN. Yes, sir.

Mr. GOLDSTEIN. There is a copy of article 56.

Senator HARTKE. I will include this by reference. The question that keeps reoccurring in my mind—

Mr. GOLDSTEIN. Here is a copy of the regulations you are referring to.

Senator HARTKE. The question comes to my mind, how do you really make sure that the consuming public knows what in the world is going on? If he is going to have to read a manual and read the regulations and everything else, he will not do that. Maybe he should do that in good conscience and some people who are concerned—

Mr. GOLDSTEIN. Here's what we have posted on the various pumps that are dispensing gasoline.

Senator HARTKE. Is that written big enough so that people can see it?

Mr. GOLDSTEIN. Yes, sir, I think so. That is put on the face of the gasoline dispensing pump.

Senator HARTKE. What if I had a 1963 Plymouth. I walked up there and I looked at that, how would I know what I would do?

Mr. GOLDSTEIN. That is the reason we put out these folders. We say right in here, you say you have a 1963 Plymouth. For most 1963's you would buy regular.

Senator HARTKE. Buy regular.

Mr. GOLDSTEIN. That is right.

Senator HARTKE. You tell me it is more than just buying regular. You have to find out what regular is.

Mr. GOLDSTEIN. That is right, but in Maryland we have the program set up. We tested it in our laboratory. We have a good setup in Maryland. We are probably the only State that has it.

Senator HARTKE. What about the story that it doesn't matter which station you go to, because it comes out of the same tank anyway?

Mr. GOLDSTEIN. The greatest lobby that came to Annapolis to beat that bill—remember the ad "Put a tiger in your tank"—we let the public know that wasn't so, that they were mixing the gasoline like mixing molasses and honey to make a gingerbread cake on Halloween.

Senator HARTKE. They don't take it out of the same tank?

Mr. GOLDSTEIN. Yes; they do. At least we know it now, sir.

Senator HARTKE. You know what they are doing if they are taking it out of the same tank.

Mr. GOLDSTEIN. Yes, sir.

Senator HARTKE. Do they still do that?

Mr. GOLDSTEIN. Yes; they still mix it.

Senator HARTKE. If you go to an independent, for example, where the gasoline may be in some places around here 54.9 or 55.9, and you go down the street and see the same type gasoline is 60—in other words, here let's take regular gasoline 89 octane. If you went to the various filling stations, for example, and you went to one where it was 55.9 and the other one down the street says regular gasoline 89 octane, 60.9. Would there be the same general benefit to the car?

Mr. GOLDSTEIN. It could be.

Senator HARTKE. Would there be?

Mr. GOLDSTEIN. Is it cutrate; is it a secondary station? We have a situation in Baltimore on York Road where the Exxon advertises this beautiful gasoline. Right up the street we have an Alert where it is 5 to 6 cents a gallon cheaper. We have a copy of major oil company terminal and exchange agreements from 1971 through 1974.

Senator HARTKE. What I am asking you is how does the consuming public know whether to pay the 4 cents more a gallon?

Mr. GOLDSTEIN. I would advise him to buy the cheaper gasoline.

Senator HARTKE. Would he get the same utilization, same economy, same effect on his automobile?

Mr. GOLDSTEIN. I would say so, yes, sir.

Senator HARTKE. In other words, you have sufficient control over this to guarantee uniformity?

Mr. GOLDSTEIN. We don't have 100 percent, but we are getting close to it. We are the first State to do it. We are checking the gasoline in laboratory tests. We are on the right road. We started. It was tough. We had to fight this big vested interest. It took a lot of guts and a lot of time. I'm an elected official. I'm not an appointed official. Senator, what we are trying to do is protect the consumer in this great Nation. In Maryland, we have 2,500,000 licensed drivers of motor vehicles. We know we have a lot of people consuming gasoline or diesel oil from that retail dispensing pump. We feel they are entitled to protection. They have no idea what is coming out of the ground. We are trying to educate them and we have done it, I believe, in our State.

Senator HARTKE. This legislation deals primarily with octane. You have indicated there are other factors which may be just as important or are important, as well as octane; is that right?

Mr. GOLDSTEIN. Correct, sir.

Senator HARTKE. You have tried to do that with the stickers, is that to identify what is going on?

Mr. GOLDSTEIN. Right.

Senator HARTKE. Most of the motor-going public, if they have anything whatsoever, they come in and octane may mean something to them and, generally, they say, give me unleaded or premium or regular. Now that is most pumps.

Mr. GOLDSTEIN. Right, sir.

Senator HARTKE. He walks up there. How is he going to know what he is doing under the present system? Is there any way?

Mr. GOLDSTEIN. In our State law we have tried to educate them through this folder.

Senator HARTKE. That deals with octane only.

Mr. COLEMAN. No, sir.

Senator HARTKE. In other words, what about the other factors? Is it necessary to go ahead and give them more information about these other factors or is that a matter just to be controlled before it gets that far.

What about the so-called light ends? What do light ends mean? It doesn't mean anything to me.

Mr. PRICE. The point the Comptroller is making is grade that gasoline and identify it with an octane number. The car driver could associate that with what is specified in his manual.

Senator HARTKE. That assumes No. 1, they read the manual.

Mr. PRICE. Yes, sir.

Senator HARTKE. If you have over 10 percent who read the manual, I think it is high.

Mr. PRICE. This is an additional reason for the publication of the brochure. "Cars prior to should use and cars after should use." We think there are other characteristics that go into the quality of the gaso-

line that we say are important to gasoline, in addition to octane, becomes a function and part of the regulations and specifications that we have adopted and tested for and continue to test for, in accordance with the American Society Testing and Materials wherever applicable. By controlling that gasoline, controlling in quotes, to insure its total overall quality, I think the problem before the committee and before us initially was to identify that product to the customer. We have insured that wheat is wheat and hay is hay. Premium is premium and regular is regular. At that point in time we are accustomed to 100 octane premium and 94 octane regular, for example.

This is the way the consumer associated the premium gasoline with the old research method. It is the octane number that becomes the advertising flag or sticker to point him toward the pump or product he wishes to buy. The other material brought forth this morning is that we wanted to point out to the committee the other characteristics that are important to the quality of that gasoline which, as a regulatory agency, we can control through a series of minimum specifications and insuring that the product meets those specifications.

Senator HARTKE. In Maryland then, as far as you are concerned, when you have this regular gasoline, 89 octane, everything else other than the octane level has been determined by your regulation, and you have corrected that in relation to that type of regular, minimum standards.

Mr. PRICE. Correct.

Senator HARTKE. Those minimum standards are applicable to that gasoline, as it comes on into the filling station.

Mr. PRICE. That is correct.

Senator HARTKE. As far as you are concerned then, you measure the octane. Does that vary?

Mr. PRICE. That is one test that is performed, that octane. We also measure other things, in addition to that.

Senator HARTKE. As far as the new rating system is concerned with the so-called research octane and motor octane levels, doesn't that complicate the matter?

Mr. PRICE. It complicated the matter at the initial outset. That was another point the Comptroller was making. There was a tremendous education program that was needed. You and I were accustomed to 100 octane premium and 94 octane premium. When R plus M divided by 2 was adopted, we followed suit and that resulted in a lower number. The consumer thought he was buying an inferior product.

Senator HARTKE. If you add Senator McIntyre's plus 4 would that correct it?

Mr. COLEMAN. We have addressed our consumer in Maryland with the brochure. We can live with R plus M divided by 2 plus 4, or we can stay where we are. We can give the Maryland consumers what we feel is a good grade of gasoline.

Senator HARTKE. That would clear up the question about the manual being in conflict with the stated octane on the pump.

Mr. COLEMAN. It would be the easiest route to go back and get all the consumers back to 100 octane which they were educated to.

Senator HARTKE. Your sticker would be at variance with the manual.

Mr. COLEMAN. Correct.

Senator HARTKE. If I went through and I picked up the manual—that is Opal, an import taking our jobs away from us.

Now, what is this one. GM. Your Buick engine is designed to operate on unleaded gasoline of at least 91 research octane. Here is a copy of the owner's manual as to octane requirements for 1971-75 GM cars. This comes—I will include all of this in the record. This is from GM, from Mr. William Chapman, the manager of the technical group. He says the Buick is designed to operate only on unleaded gasoline at 91 research octane. If he went to the filling station then won't he go in there under this system and say I have to take midpremium gasoline

Mr. PRICE. That is a significant point. No question about it, Senator. When the R plus M divided by two was adopted federally, and Maryland followed suit, the situation such as this is left hanging in the balance.

Senator HARTKE. But in other words whereas really he should go ahead and get regular gasoline which costs 89 cents a gallon.

Mr. GOLDSTEIN. It probably costs 60 cents.

Senator HARTKE. Now all right, what he should buy is that unleaded 87 octane gasoline.

Mr. GOLDSTEIN. Yes, sir.

Senator HARTKE. He goes to the filling station and pump, giving a very astute individual like a U.S. Senator who has read his manual. He reads it and says I have to have 91 research octane, unleaded. The only thing unleaded is 87. He says I can't get gasoline here. I have to find 91 octane. The only thing with 91 is maximum lead content, 3 grams per gallon. Since I know what a gram is I'm utterly confused at that stage. Here I have a situation where all they have every place I go is that premium gasoline with over 91 octane, which is leaded, premium, and then I have the unleaded at 87. I know I will ruin my car if I used leaded gasoline. I will ruin my car if I don't get at least 91 octane. So I go back to horse and buggy. Isn't that the substance of the problem?

Mr. GOLDSTEIN. Maybe in Indiana you could use a horse and buggy.

Senator HARTKE. I know you easterners want to run the country, but we will not let you run the country yet. We midwesterners—

Mr. GOLDSTEIN. We use a horse and buggy occasionally down home.

Senator HARTKE. With all due respect, this hasn't clarified the situation unless you have the blue sheet with you. Isn't that the heart of the problem here?

Mr. GOLDSTEIN. I think it is incumbent on the great petroleum industry to be honest with the consuming public to help and let them know what they can use in their cars and put it on the pump. They are putting the monkey on our back.

Senator HARTKE. We will move along. Some of these people will dispute what you have said, I think.

Mr. GOLDSTEIN. That is the way it should be.

Senator HARTKE. Now we will have three people up here at one time. Mrs. Joan Bernstein, Acting Director of Bureau of Consumer Protection, the Federal Trade Commission. Robert Montgomery, General Counsel of FEA, and Robert Baum, the Deputy Assistant Administrator for General Enforcement of the EPA.

We have five. Who is in charge?

STATEMENTS OF JOAN Z. BERNSTEIN, ACTING DIRECTOR, BUREAU OF CONSUMER PROTECTION, FEDERAL TRADE COMMISSION; ACCOMPANIED BY ROGER FITZPATRICK, STAFF MEMBER; ROBERT E. MONTGOMERY, ASSISTANT ADMINISTRATOR, OFFICE OF REGULATORY PROGRAMS, FEDERAL ENERGY ADMINISTRATION; ACCOMPANIED BY PETER LUBKE; AND ROBERT L. BAUM, DEPUTY ASSISTANT ADMINISTRATOR FOR GENERAL ENFORCEMENT, ENVIRONMENTAL PROTECTION AGENCY; ACCOMPANIED BY JIM SIDELASKI

Mrs. BERNSTEIN. I would like to identify Roger Fitzpatrick who is on the staff of the Bureau of Consumer Protection, and is a real expert in the technical aspects of octane posting.

Senator HARTKE. That puts you on the spot, sir.

Mrs. BERNSTEIN. I want to state for the record that I'm from the Midwest.

Mr. MONTGOMERY. I'm Bob Montgomery, the General Counsel of FEA. Peter Lubke is sitting back here with me.

Mr. BAUM. I'm Bob Baum, EPA, and Jim Sidelaski is to my left.

Senator HARTKE. OK. Mrs. Bernstein, will you be starting first?

Mrs. BERNSTEIN. Thank you.

Mr. Chairman, I thank you for the opportunity to participate in these hearings to discuss S. 1508, the Consumer Fuel Disclosure Act of 1975.

I should point out at the outset that the remarks in this testimony represent only the views of a member of the FTC's staff. They are not intended to be, and should not be, construed as representative of an official Commission policy.

Mr. Chairman, the FTC is no stranger to the issue of posting octane information on gasoline pumps.

Because of its interest in assuring that consumers are provided meaningful product information, the Commission, on December 16, 1971, promulgated a trade regulation rule which declares that failure to post the minimum octane number on gasoline pumps constitutes an unfair method of competition and an unfair or deceptive act or practice in violation of section 5 of the Federal Trade Commission Act.

The rule was challenged by several gasoline associations and oil companies.

On April 4, 1972, the U.S. District Court for the District of Columbia ruled that the Commission's trade regulation rule relating to the posting of octane numbers was null and void as being in excess of the Commission's statutory authority—*National Petroleum Refiner's Association v. FTC* (D.C. 1972) 340 F. Supp. 1343.

On June 27, 1973, the U.S. Court of Appeals for the District of Columbia Circuit ruled that the Commission did have statutory authority to issue a regulation such as the octane posting rule and therefore reversed and remanded the decision of the U.S. District Court—482 F. 2d 672 (D.C. Cir. 1973) cert. denied, 415 U.S. 951.

The case is presently before the U.S. District Court for the District of Columbia.

On July 28, 1975, Judge Robinson ordered the Commission to prepare an environmental impact statement under the National Environmental Policy Act—42 U.S.C. 4321.

Octane posting is no less important for consumers today than it was 4 years ago when the Commission promulgated its rule.

Accordingly the Bureau of Consumer Protection wholeheartedly supports legislation which will require the posting of octane numbers on gasoline dispensing pumps.

The purpose of the Commission's posting regulation is to provide the consumer with more information to utilize in the selection of a gasoline and thereby effect a more educated purchase.

Section 2 of S. 1508 outlines similar goals: (1) To assist consumers in avoiding the purchase of automobile gasoline with octane ratings unnecessarily high for the proper operation of their automobiles.

The Commission, in its octane rulemaking proceedings, concluded that there is a relationship between the cost of gasoline and the octane number of that gasoline, that there is a relationship between the octane rating of the gasoline and the octane requirements of the automobile engine, and that different engines need different octane rated gasolines; that most marketers of gasoline do not disclose to the consumer the octane rating of the gasoline being sold at the pump in a readily available manner; consequently consumers are unaware that octane requirements of their particular automobile may permit the use of a gasoline with a lower octane rating, and as a result are paying higher prices needlessly for gasolines of a higher octane number. Statement of basis and purpose accompanying octane trade regulation rule, pp. 39-40.

The Bureau believes that posting of octane numbers on gasoline pumps will do much to correct the octane overbuying noted above.

Legislation, such as S. 1508, is therefore highly desirable and necessary for the benefit of the millions of automobile users who purchase gasoline.

It provides the purchaser with a salient piece of information to effect an educated purchase of gasoline.

For these reasons the Bureau wholeheartedly supports the octane posting requirement envisioned by S. 1508.

I would like to compare the approach as taken to the octane problems by S. 1508 and the Commission's trade regulation rule.

S. 1508 requiring the disclosure of octane information is similar to the Commission's rule in many respects. It requires, as does the rule, an affirmative disclosure of the octane rating of the gasoline being dispensed.

The disclosure shall be by label clearly stating the octane rating.

The bill's octane posting provisions vary in certain respects from those set out in the rule.

Unlike the rule, section 3(6) of the bill specifies that octane rating means the measurement of the antiknock characteristics of gasoline for use as an automotive fuel measured as half the sum of research octane number plus the motor octane number, plus four, that is  $(R+M)/2+4$ .

The Commission's rule requires that the number to be posted on the pump be the average of the research and motor octane number, that is,  $(R+M)/2$ .

S. 1508 does not require that the minimum octane number be posted, nor does it explicitly key the posted octane number to the American Society for Testing and Materials Standard Specifications for Gasoline.

Conversely, the Commission's rule requires the posting of a minimum octane number derived from the formulation of  $(R+M)/2$  as described in the ASTM Standard Specifications for Gasoline.

The key difference between S. 1508 and the Commission rule is the selection of the number required to be posted. The Commission chose  $(R+M)/2$  after a great deal of deliberation. The drafters of S. 1508 have selected  $(R+M)/2+4$  as the number to be posted.

The question was raised during the Commission's trade regulation rule proceedings as to what was the proper number for the Commission to utilize for purposes of its posting regulation.

The Commission considered the merits of utilizing the research octane number or adopting  $(R+M)/2$  as the number required to be posted.

After receipt of written comments and the recommendation of its consultant, the Commission concluded that the use of  $(R+M)/2$  was the best to adequately reflect the road octane performance of fuels for the overall car population; that it was technically more precise and it was a meaningful parameter having applicability to automobile engines.

The Commission was also persuaded to the use of  $(R+M)/2$  by the fact that at the time both industry representatives and Government agencies dealing with automobile gasoline appeared to be shifting to the use of  $(R+M)/2$  as a benchmark in evaluating gasoline's octane capabilities. Statement of basis and purpose accompanying octane trade regulation rule, pp. 54-59.

As I understand it, the rationale for adopting the use of  $(R+M)/2+4$  is to avoid possible confusion on the part of automobile owners who may have been familiar with research octane number recommendations that appeared in some owners manuals, despite the fact that research octane numbers were not, as a rule, posted on pumps.

The addition of the Number 4 to the  $(R+M)/2$  requirement is designed to result in the posted number being approximately equivalent to the research octane number that appeared in these car manuals and therefore eliminate confusion in the minds of those who may have been familiar with the research octane number.

As the committee is aware, the Federal Energy Administration has in effect a posting regulation utilizing the  $(R+M)/2$  number.

However, the FEA is presently deliberating as to whether it should substitute in its place  $(R+M)/2+4$ .

Mr. Chairman, octane numbers will not achieve maximum significance in consumers' minds unless and until a universal posting system is effected and the corresponding octane information is also provided to automobile owners by automobile manufacturers.

The Bureau recognizes there are some who feel strongly that  $(R+M)/2+4$  is a better number to utilize for octane posting purposes.

We would not, in the interest of obtaining gasoline posting legislation, withdraw support for legislation enacted that utilized an octane number different from that currently used by the Commission.

The Bureau is only interested in the long-term benefit of increased consumer information on energy usage.

We believe that S. 1508 would supply that necessary information.

Section 4(b) imposes upon automobile manufacturers the obligation to provide to the buyer written information "stating the octane or

octanes of gasoline appropriate for use in the engine of such automobile."

The refiner of gasoline supplies the octane rating to the retailer; the retailer, through posting on the pump provides the information to the consumer who will be able to determine the octane requirements of his automobile from the information required of the automobile manufacturer.

Turning now to other features of S. 1508, we have the following comments:

Section 4(a) (1) requires shippers of gasoline to certify in writing to the party receiving the gasoline, the octane rating of the gasoline.

This, of course, places the burden on the refiners who ship gasoline to furnish the octane information to the retailer.

Section 4(a) (3) requires that all gasoline advertisements and other promotional material clearly disclose the octane ratings and such other information about such gasoline as the Administrator of the FFA shall by regulation prescribe.

There is some question in my mind as to the desirability of requiring every advertisement to disclose octane numbers.

I say this based on the possible overemphasis of octane information by advertisers that might occur; and, second, upon the conclusion that if octane information is made available at the pump and to the auto owners in their manuals, this may be sufficient for consumer information purposes.

Presumably the goal of this legislation is not to promote octane but rather to make the information available for consumers. That, in my judgment, is the purpose of the Commission's rule.

Section 5 of the bill provides for specific monetary penalties for violations of certain provisions, and further provides that violation of the act or any implementing regulation is an unfair or deceptive practice under section 5 of the FTC Act.

It is not clear whether the Commission is granted authority to enforce the act or whether violations are to be enforced by the Department of Justice.

If it is the intention of the drafters to place administrative enforcement authority in the Commission's hands; language specifically stating this should be added.

As an example, in both the Truth-In-Lending Act and the Fair Credit Reporting Act, Congress specifically indicates its intent that the Commission be responsible for administrative enforcement of the act to the extent the Commission had jurisdiction over the business involved.

If, however, the intent is to provide the Commission and the Department of Justice cumulative remedies, this should be spelled out more specifically.

Section 6 of the bill imposes significantly broad responsibilities upon the FEA including establishing technical standards, methodologies for testing procedures relating to gasoline content and purity; conducting a full study of gasolines effect on automobile deterioration and of gasoline formulas; performing spot tests of the quality of various brands of gasoline and finally making reports to Congress.

Since the requirements of section 6 impact on the FEA rather than the FTC, I will leave any further analysis of section 6 of the bill to their competent judgment.

Mr. Chairman, let me state in conclusion that the Bureau of Consumer Protection, subject to the qualifications stated previously, heartily endorses the need and desirability of octane posting legislation such as S. 1508.

Thank you for allowing me to appear before you today.

Senator HARTKE. Thank you.

The next witness is Mr. Montgomery.

Mr. MONTGOMERY. In the interest of time, I will not read my statement.

Senator HARTKE. Your entire statement will appear in the record.

Mr. MONTGOMERY. First of all, FEA does support and believe in the dissemination of octane number information. We believe this is a very useful tool for consumers, both in terms of making better informed judgments as to the appropriate type of gasoline, the most economic type which will run correctly in their cars, and we also recognize the desirability of minimizing the lead levels in gasoline that is burned on the Nation's highways.

As you know, we, in addition to the FTC, have been interested for some time in the octane posting.

We inherited from the Cost-Of-Living Council a program they initiated which required retail gasoline dealers to post on their pumps the maximum local price and the octane number of the gasoline they were selling.

Shortly after we undertook to enforce that obligation and incorporate it in our price regulations, we initiated and conducted a rule-making designed to question our authority under the Emergency Control Allocations Act.

We concluded on the basis of that rulemaking that we had the authority on the rationale that the octane of a gasoline is an element of the quality or is indicative of the quality of that gasoline and to require retailers to maintain the stated price of the gasoline we needed to require likewise that they needed to post the octane.

By reducing the octane, they could in effect lower the value of the gasoline sold at the same price and accomplish a disclosed or more or less secret price on the product.

We have maintained in our price regulations the requirement that the octane number using the formula  $(R+M)/2$  plus the maximum local price be posted.

At the time the Cost-Of-Living Council implemented this program, they printed and distributed, using the Postal Service, to all retail outlets, or as many as they could reach, a standard form which was used for this purpose.

After that authority, under the Economic Stabilization Act expired, we made the judgment that the distribution of that form was too expensive to be cost effective, that the task, the chore of maintaining supplies and distributing them through the Postal Service was not a reasonable way to go and we determined to amend our rule and did so to allow the retailer to post on his pump in his own form or format this information.

We required only that the numbers be posted at the certain size, no less than 1/2-inch letters, and they be comprehensible and legible at all times.

I think our experience has been, Mr. Chairman, as others have said here today, that there is a good deal of confusion as to the formula to be used.

The Cost-of-Living Council before us, and FEA, have both used the formula  $(R+M)/2$ .

There are reasons which have been covered previously by witnesses.

We in the first instance yielded to the FTC as having the expertise in this area. Then under the suggestion of various members of the public, we instituted our own reevaluation of that question with a second rulemaking.

A large number of comments have been received and we have not made a final decision.

It appears to us that  $(R+M)/2$  is the most accurate and the most technically reliable measure of the antiknock properties of gasoline.

We recognize from a consumer education standpoint and we note our authority presently arguably does not extend to the responsibility or authority to engage in consumer education efforts of this kind, but from the consumer education standpoint and looking at a matter in terms of its usefulness, there is definitely a good deal of confusion in the minds of the automobile owners as to what the  $(R+M)/2$  number means.

There is a definite residue in the minds of some people on the basis of owners' manual information that use the research octane number.

This has led us to give serious consideration to the addition of the 4 proposed by those who would favor the  $(R+M)/2+4$  formula.

The legislation we are considering today does in effect address or deal with the question prematurely. Our own rulemaking is still under way. We are not as yet adequately prepared to take this question head-on.

The problem when you get down to it is not which formula you adopt, but how effective your consumer education efforts are.

The mere adoption of a formula, although a necessary prerequisite, doesn't get to the heart of the matter as to how to inform consumers what the number means and what number they should use.

I think in closing, Mr. Chairman, I would say they are not definitely opposed to this legislation.

We see that there is a need for a number. We think that the primary usefulness of this whole exercise will be to determine what the appropriate number should be and hopefully come to some kind of decision and conclusion and approach throughout the Government as a whole as to how the consumer should be educated to that number.

We believe this formulation in S. 1508 is questionable in that it provides for criminal penalties and it would insert the Federal Government in an area which is extremely complicated involving characteristics that go beyond octane itself and in which Maryland has taken a fairly complicated and sophisticated step.

We question at this stage of the game whether or not major Federal involvement is the most cost-effective and sensible approach.

We in our program of implementing and enforcing the price regulations have been extremely impressed with the difficulty of policing over 300,000 retail outlets.

When you impose a requirement such as this bill would impose and make violations misdemeanors, you are establishing a problem for law enforcement people, primarily U.S. attorneys, I suppose, to the extent you make violation a violation of the FTC Act.

That is a major proportion.

We would be inclined to suggest consideration of a more voluntary approach using perhaps only the FTC group, using ASTM and its

standard-setting procedures and the aid of the industry association such as retail dealers, wholesale dealers, and refiners as a more cost effective and in the long run a more efficient means of dealing with this problem.

Thank you.

Senator HARTKE. Thank you, Mr. Montgomery.

Mr. BAUM. Senator, if I may, I would like to submit my statement and try to concentrate on a couple of areas.

We at EPA do support the purpose of the bill. There is no question that there is a real need for a uniform system of identifying the octane rating of gasoline and communicating that to the public. I would like to emphasize something that everyone has touched on, I think. That is the need for public education. It will not make a great deal of difference what formula is used if the public is not aware of the purpose to which they should put that information.

There are segments of the public who think that by buying higher octane gasoline they will get better fuel mileage or more power in their car.

There is one thing I would like to point out in the bill; throughout it you use the term "octane rating" and that is defined. You use the method that you are discussing here. However, in section 4(B), where you refer to the automobile manufacturer, that term is not used. Section 4(B) says, "No automobile manufactured should be offered for sale unless he provides information to the buyer stating the octane or octanes of gasoline appropriate for use." I just question why the defined term "octane rating," is not used in section 4(B). I assume that the marketplace would take care of this and if the gasoline pumps were marked with a certain number as you or FEA defined it, the manufacturer would put that same number in his manual.

This law would not require him to, and I point that out for your staff's consideration.

Again, I have already stated our support on the fourth page of our statement for the necessity of a public education campaign in this area.

As to the method itself, I think really one helpful way of looking at it is to divide it into short- and long-term problems. For the long-range solution, I don't think the method is as important as it is for the short range. At some point if there will be a uniform method in manuals and on gasoline pumps, I think it could be any number of methods. For the short range we do have a substantial problem with almost anything we do. About 50 percent of the owners' manuals of the cars now in use, use the research octane number. That number is essentially the same as the one proposed in the legislation. It is 4 points higher than the one presently in use.

Again we agree that the method FEA has required is a more accurate indication of what gasoline should be used. What I'm trying to get to in a round-about way is that we agree with FEA that it would be well to allow them to finish their rulemaking process and finish their deliberations on this matter. There are any number of ways of accomplishing the purposes of the act in a manner which would address both the short-range and long-range problems.

I would like to call your attention to one method of octane labeling which could be used to educate the motoring public. While we don't necessarily believe this is the best way, the ASTM and the American

Society of Automobile Testing Engineers have suggested a "symbol" method. Again it is not very important what formula you use to employ this system. But the ASTM method is a simple system where owners' manual instructs the car owner to use gasoline of a certain symbol. It would be one single number. If, in fact, the person bought that gasoline and experienced knocking with his car engine, he could use gasoline of the next higher symbol. With that system in use you would have to also post the research octane number. I don't claim this is necessarily the best method. I merely state it to point out that this is one other alternative which FEA will be looking at in trying to resolve this issue. To legislate now might very well be premature.

That concludes my statement.

Senator HARTKE. Three agencies here. Why can't you get together? You talk about regulatory reform. Why doesn't the President get people in charge of these agencies that will meet and come up here, instead of presenting this in the form of legislation. Why can't EPA and FEA and FTC sit in a room and get their heads together, instead of coming in here and complaining to Congress.

Mr. MONTGOMERY. We are not complaining at all.

Senator HARTKE. You are at variance with each other. It is the job of the President. If we can keep him home here and let him run the Government we wouldn't have these problems.

Mr. MONTGOMERY. We are not at variance in any respect.

Senator HARTKE. FEA disagrees with enforcement provisions which, I think, is a poor excuse. That is No. 1. I don't want the law so I say why enforce it.

You can inspect meat which is used almost by the same group of people that use gasoline. You inspect all the meat that goes through the country, all the food that goes to the country but you can't inspect gasoline.

Mr. MONTGOMERY. First of all, if you will look at our statements and consider what we have said we are pretty much in agreement here. All three of the agencies here today support the purpose of the bill.

Senator HARTKE. You are not in agreement on what the enforcement policy should be there.

Mr. MONTGOMERY. We agree there should be some means of enforcement.

Senator HARTKE. I read your statement, sir.

Mr. MONTGOMERY. I said in my remarks that I felt that—

Senator HARTKE. Maybe I misinterpreted it.

Mr. MONTGOMERY. What I objected to and I couched it in rather qualified language was the imposition of criminal penalties for these violations. My suggestion was, if we are going to make this a Federal requirement, which we may well have to do, and I do support the FTC rule, then we have to have some means of enforcement, but making the violation a violation of the FTC Act does accomplish that.

To go beyond that and make this a misdemeanor, it brings you precisely into the food and drug area. It is FEA's view at this point that gasoline is not analogous to food and drugs. The Federal Government does regulate very carefully those substances. The quality of which can be seriously deleterious to human health.

Senator HARTKE. What about gas pipelines? We have inspection of gas pipelines allegedly. Not very good?

MR. MONTGOMERY. We do that because the danger of explosion and the danger to human life. All we are saying, Mr. Chairman, is that at some point the Federal Government could regulate everything. We could look at the quality of every single product.

Senator HARTKE. Mr. Montgomery, let's go to what you said and what the situation is. There is overutilization of higher octane with lead in it. The claim is that there is as much as 400,000 pounds a day, which is emitted, which is not necessary. That is out there polluting the atmosphere and you make this statement that our experience with mandatory allocation programs, especially during the 1972 oil embargo, demonstrated the magnitude in regulating the retail gasoline sector. The energy benefits that would occur by reason of this legislation measured in terms of decreasing this Nation's dependence on foreign energy would be marginal in comparison with the resources necessary to carry out the mandate of the bill. Are you saying the FTC agrees with that.

MR. MONTGOMERY. I haven't discussed that statement with them.

Senator HARTKE. Do you say the FTC agrees with that?

Mrs. BERNSTEIN. May I hear the provision you read?

Senator HARTKE. The statement is, "nonetheless FEA has reservations as to the wisdom of adopting new legislation which would mandate procedures to require octane posting enforceable by criminal penalties which would require the use of specific octane posting formula involving a significant commitment of Federal resources to implement it effectively. Our experience with the mandatory allocation program, especially during the 1973 oil embargo, demonstrated the magnitude of regulating the entire retail gasoline sector, and in general we believe the energy benefits that would occur by reason of this legislation—measured in terms of decreasing this Nation's dependence on foreign energy—would be marginal when compared to the resources necessary to carry out the programs the bill would mandate."

Do you agree with that?

Mrs. BERNSTEIN. It's too long to agree or disagree with. Basically our position is that we believe there is a need for legislation in this area along the lines that we discussed to settle this issue once and for all. We believe octane posting is necessary and in the way that I described. Our only consideration in regard—

Senator HARTKE. Do you believe you should require octane posting?

Mrs. BERNSTEIN. Yes.

Senator HARTKE. How will it be enforced? Criminal penalties, civil penalties?

Mrs. BERNSTEIN. Insofar as we are concerned it seemed to us that the civil penalty provision was adequate as far as our enforcement was concerned. Insofar as the bill made it a violation of section 5, it seemed to us that is adequate. That is how we enforce any of our regulations. We have had new civil penalty sanctions as you know and we think they are adequate.

Senator HARTKE. EPA, what is your position?

Mr. BAUM. We tend to agree. Both witnesses said there should be mandatory posting and an enforcement mechanism. We have not addressed ourselves to whether or not this enforcement provision is a good or bad one. That is FEA responsibility. We have only civil

penalties in enforcing the nonleaded fuel regulations and they have been adequate.

Senator HARTKE. Are all of you in agreement or are you in disagreement?

Mr. MONTGOMERY. Each of us represents an agency with a different mission.

Senator HARTKE. I know each of you represents a different agency, and no one coordinates the agencies. You have three different governmental agencies fighting among themselves about what you should do. Finally you come and lay it in the laps of Congress when you should lay it in the lap of the President. He is the administrator of these agencies.

Mr. MONTGOMERY. That is not technically true, Mr. Chairman.

Senator HARTKE. Frankly, I will tell you maybe we better bring in whoever is the Chairman of EPA. Why do you dump this in the laps of Congress?

Mr. MONTGOMERY. We didn't dump this in the lap of Congress. Evidently you come in and say octane posting is necessary and it's not being done. You people can't get it done without us. We think it's necessary and we believe we are doing a pretty good job of it. The problem we have got is one the FTC authority has been questioned. It has been challenged and as you know it's in litigation. The FTC feels it would be useful to get this matter resolved by a new statute. We have no problem with that.

Senator HARTKE. Since 1969 you have been fooling around with this thing. That is a fact. Now here you're coming in and you say that the problem is that you think you're doing an adequate job and FTC doesn't think you're doing an adequate job.

Mrs. BERNSTEIN. No, I don't believe so. Our problem in regard to this was that we were tied up in the courts and are still tied up in the courts regarding our trade regulation rule. We got into this area early because we recognized the problem. I think our rule was more than adequate at the time.

We have no control over the judicial challenge which still resides in the district court. It seemed to us the quickest way to resolve it was by legislation. If that does not happen, we would pursue the trade regulation rule.

We do coordinate with other agencies, FEA specifically and EPA as well when there are overlapping areas.

Senator HARTKE. Let me ask a question again. You can't settle the matter is what you're telling me. It amounts to that. That is fine. We will come back and try to settle it. When you come down to it and a man drives into a filling station and he sees as far as a new car is concerned—why won't you be better off to say all cars of 1971 use unleaded gas? Is that right?

Mr. BAUM. No, sir.

Senator HARTKE. Well, it says on all new cars I have seen, it says use unleaded gas on the dashboard and right next to the place where you put the gas in, the gas tank. It says use unleaded gas only on the dashboard. When you go into a filling station today are you telling me all the unleaded gas is the same?

Mr. BAUM. No, sir.

Senator HARTKE. What is there that will change this by posting the octane? No matter if you post it R plus M over 2 or you use the old system, he can only get one type of unleaded gas; isn't that right?

Mr. BAUM. There are other brands of unleaded gas available. There are a number of unleaded gases available with different octane ratings. However these different grades of lead-free fuel are not available at every station.

Senator HARTKE. You're trying to get that uniform, right? Why should it be uniform?

Mr. BAUM. We are not trying to get it uniform. I think the purpose of this bill and the purpose of FEA regulation is simply to make sure the consumer knows what he's buying.

Senator HARTKE. You mean to say there is that much variety in the type of cars as to what type of octane he should use, what type of gasoline he should use? Let's take every car after 1971. My understanding is you use unleaded gas.

Mr. BAUM. No, sir. You're thinking most cars after '71 use regular gas. Not necessarily unleaded gas.

Senator HARTKE. Do they use R plus M over 2, 91, 89 regular? What is the difference?

Mr. MONTGOMERY. There is a variation, Mr. Chairman. The whole problem here results from the fact that cars do not burn the same octane and not only do they not require the same octane when they are all built or brand new but they all change to some extent over their lifetime. I want to ask two questions and I want the industry people to listen—he makes a statement that, in fact, Americans do road test their cars to select the right gasoline for their cars. They do not need octane posting on which they may overrely. Do you agree with that statement? I'll bet there is not a person in this room that road tested a car for an octane rating except some Texaco representatives.

Mr. BAUM. I disagree with that.

Mrs. BERNSTEIN. I disagree.

Senator HARTKE. I bet the news people don't know what I'm talking about.

Mrs. BERNSTEIN. I disagree strongly with it. It is based on our own proceedings. Our findings were that people did not road test their own cars but they didn't even know what they were supposed to be road testing for.

Senator HARTKE. There is this other question in here. Is there validity to their statement, in other words, that there is such a wide variety of elements which really control the octane which should be used for the same model car, that it's impossible to provide the type of rating which would be satisfactory?

Mr. MONTGOMERY. Mr. Chairman, I don't think that that is categorically correct on the basis of what we know. But it is not a clear-cut situation that the octane information is all the person needs. As I mentioned earlier, a new car, even if you had a requirement that every automobile manufacturer publish his new car manual or even put on the dashboard the octane number according to a uniform system that that car should have that, there will be changes and differences during the car's life; what kind of engine wear it experienced will alter the minimum octane requirement. There are other factors going into a gasoline besides the octane which influences performance.

We don't believe the octane number answers all the questions. We believe the octane information is useful and would assist the consumer along with other things such as listening to the way the engine sounds, doing road testing and trial and error and so forth.

We think the octane number is useful information and will help him make the right choice. For that reason we support the requirement. We don't agree at this point that the R plus M over 2 formula is the best one and we don't think the criminal statutes involved here are necessary or appropriate.

Senator HARTKE. Texaco testimony says it has not been unusual to observe a spread of 8 to 10 or more octane numbers in the anti-knock requirements.

Do you agree with that?

Mr. MONTGOMERY. Not by itself.

Senator HARTKE. "Among different makes and models the variation may be greater.

"Table 1 shows a 15-number spread between 16 1970 cars we have tested."

Is that statement correct?

Mr. MONTGOMERY. Neither I nor FEA has done the technical work to critique that statement. Even if it is true, the basic information we are talking about here would be useful. We don't claim putting the octane number on the pump will enable every car owner to immediately select the right gasoline, but it would help to select the right gasoline.

Senator HARTKE. There is no question for the informed person. How many people do you think know what "knock" is in a car?

Mr. MONTGOMERY. Most drivers have experienced it at one time or another.

Senator HARTKE. They know it is noisy. How many people know it is caused by the octane utilization and is it always done that way?

Mr. BAUM. Sir, again, here I would emphasize the need for an education dimension to the program to supplement a reliable, consistent, and uniform octane rating system.

Anyone who has experienced knock in a car knows what it is. I am told very often a car will knock, yet an untrained driver will not be able to detect it. At least to the extent the public knows that when a car knocks, you need a higher octane gasoline, and that number is posted and there is a uniform system. That is what we are talking about.

Senator HARTKE. My understanding is FTC has conducted two independent technical reviews on the octane rating systems contained in S. 1508.

Mr. FITZPATRICK. I won't say technical reviews have been conducted. We have consulted on occasion with the State of Maryland and our former consultant on the question of R plus M over 2, vis-a-vis R plus M over 2 plus 4, and have received their opinions on that matter.

Senator HARTKE. These are consultants.

Mr. FITZPATRICK. Yes, sir.

One was a consultant, former consultant of the Commission, Dr. Scott Samuelson. He assists the Commission staff with these technical questions. He consulted also with the State of Maryland.

Senator HARTKE. What did he say?

Mr. FITZPATRICK. The question posed to Dr. Samuelson and to the State of Maryland was, considering R plus M over 2 vis-a-vis R plus M over 2 plus 4, were there any technical difficulties, No. 1; and No. 2, did they think R plus M over 2 plus 4 was a superior number to R plus M over 2.

The answer to the first question, as I recall, from both the State of Maryland and Dr. Samuelson was that there was no particular superiority between R plus M over 2 as opposed to R plus M over 2 plus 4 in terms of technical matters.

Both felt, however, from the standpoint of a posting program that R plus M over 2 was still the best number to use and that the answer to our question, basically.

Senator HARTKE. That left you with nothing.

Mr. FITZPATRICK. I didn't consider it nothing. I think the answers were valid and are still valid, and are helpful.

Senator HARTKE. As I understand it, there is no question that R plus M over 2 is more reliable than R plus M over 2 plus 4. That is not the question.

That is an incorrect assessment, as I understand it.

Mr. MONTGOMERY. Mr. Chairman, I think Mr. Goldstein put his finger on this thing. The question is do you want to go back to where we were generally in the late 1960's, or whether you want to take the position the R plus M over 2 formula is the most accurate one and then educate the public as to what that means.

You made a statement in your opening remarks that you thought about 10 percent of the owners read their operating manuals. I would guess you are right. There are very few.

We don't know how many people are still relying on material they read 5 or 6 years ago when they first got their car.

Senator HARTKE. I imagine in most secondhand cars the operator's manual is not in the car.

Mr. MONTGOMERY. The extent to which the people are attuned to the research number is impossible to determine.

Senator HARTKE. What would prevent a refiner or somebody who is in this from lowering the motor octane number and raising the research number to maintain the same overall number.

Could that be done?

Mr. MONTGOMERY. I am sorry, Mr. Chairman. I don't know.

Senator HARTKE. In other words, you have the motor octane number and you have the research number, right?

Mrs. BERNSTEIN. Right.

Senator HARTKE. They are not the same. What if you lowered the motor octane number? That is more expensive to sustain, isn't it?

If we can't get agreement on that, we may as well quit.

Mr. BAUM. I don't know.

Mr. MONTGOMERY. I don't know.

Senator HARTKE. We will put that question in the record and you can find an answer for us.

What would prevent the refiner from lowering the motor octane number and raising the research number and still maintain the same R plus M over 2 octane number.

Mr. PRICE. This happens every day. The motor octane number can be lowered and research octane number raised to average to the R plus M divided by 2.

Senator HARTKE. What is the effect?

Isn't it more difficult to maintain the motor octane number?

Mr. PRICE. To keep it up, yes.

Senator HARTKE. What would be the net result on the sensitivity?

Mr. PRICE. Sensitivity index is that phrase used to measure the difference between the two, research and motor.

Senator HARTKE. What happens in such a case?

Does that materially affect the gasoline?

Mr. PRICE. It could affect it, depending on the application on the road.

Senator HARTKE. What would happen then, in other words, the Buick engine is designed to operate only on unleaded gasoline of at least 91 reserve octane. The gasoline should have a motor octane of at least 83.

Mr. PRICE. One is basically a test at higher speeds versus loads at lower speeds.

Senator HARTKE. I am reading from the manual now, and I have a Buick between 1971 and 1975. A man has a Buick between 1971 and 1975, and he goes in there and goes to the filling station and he reads there that he has an R plus M over 2 of 91.

How do I know I have a 91 research octane. And at least an 83 motor octane.

Mr. PRICE. You won't know it, sir, unless it is posted in that manner.

Senator HARTKE. If you post, then, this R plus M over 2, you still don't know what you are getting.

Mr. PRICE. That is correct.

Senator HARTKE. Okay, goodbye. Thank you, gentlemen.

[The statements follow:]

STATEMENT OF ROBERT E. MONTGOMERY, JR., GENERAL COUNSEL FEDERAL ENERGY ADMINISTRATION

Mr. Chairman, Members of the Subcommittee, I am pleased to have the opportunity to appear before you today to discuss S. 1508, the "Consumer Fuel Disclosure Act of 1975." The bill is intended to prevent consumer purchases of gasoline of an octane higher than that actually required for operation of their automobiles.

Let me begin by summarizing what FEA believes to be the major features of the bill. S. 1508 would prohibit the interstate shipment, transportation or sale of gasoline unless the person offering such gasoline certifies in writing at or prior to delivery the octane rating of such gasoline. "Octane rating" would be measured under the bill as half the sum of the research and motor octane numbers, plus four. Retail sellers of gasoline would be required to post written notice of the octane rating on the pump used to dispense such gasoline, and advertisers of gasoline would be required to state the octane rating.

The bill would require that automobiles manufactured after enactment bear written information to the buyer stating the octane of gasoline appropriate for use in such automobiles.

S. 1508 also would require the Administrator of the FEA to establish standard methods to measure octane and to establish testing procedures to ensure the purity and content of gasoline. The Administrator would also be required to perform a study of the performance of various brands of gasoline and spot tests of the quality of various brands of gasoline.

The subject of octane posting is a familiar aspect of the Mandatory Petroleum Regulations. FEA has since its inception administered a price and octane posting regulation adopted pursuant to the Emergency Petroleum Allocation Act of 1973.

FEA supports the concept to the continued availability of octane information to the motoring public, and has not been alone in addressing this matter. As you know, the FTC has promulgated a trade regulation rule requiring the posting

of octane ratings, and I understand the FTC representative will speak further to the relationship of S. 1508 to the FTC rule.

FEA endorses efforts to provide consumers with information that will enable them better to make informed choices with respect to the purchase of gasoline. Such information can be helpful, for example, in assisting consumers to purchase the most economical gasoline required for their particular vehicles, and that which contains the lowest lead levels necessary for their particular automobiles.

Nonetheless, FEA has reservations as to the wisdom of adopting new legislation which would mandate procedures to require octane posting enforceable only by criminal penalties, would require the use of any specific octane posting formula, and would involve a significant commitment of Federal resources to implement effectively. Our experience with the Mandatory Allocation Program, especially during the 1973 oil embargo, demonstrated the magnitude of regulating the entire retail gasoline sector, and in general we believe the energy benefits that would occur by reason of this legislation—measured in terms of decreasing this nation's dependence on foreign energy—would be marginal when compared to the resources necessary to carry out the programs the bill would mandate.

FEA currently requires retail sellers of gasoline and No. 2-D diesel fuel to post in a prominent place on each pump used to dispense such fuels the maximum lawful price of the product and the average research and motor octane number— $(R+M)/2$ —of the gasoline dispensed from that pump. The rule as adopted by the Federal Energy Office (FEO) in early 1974, appeared at that time substantially in the form that had been promulgated originally by the Cost of Living Council (CLC), and called for posting on CLC forms, which were made available to retail sellers. When authorization for those forms lapsed, their subsequent unavailability made compliance with the posting rule difficult for many sellers. Moreover, the statutory authority under which CLC initially adopted the posting regulation expired in April of 1974.

Accordingly, FEA proposed to revise the prescribed method of posting to eliminate the requirement that CLC forms be used. At that time also, FEA solicited comments on its authority to amend the regulation "in light of the changes in statutory authority which have occurred since the initial issuance of the regulation." Based upon the premise that "octane numbers are primary indication of the quality of gasoline and that a reduction in octane numbers without a change in price is the same as a price increase," FEA made the preliminary determination that the Emergency Petroleum Allocation Act of 1973 (Allocation Act) provides sufficiently broad statutory authority to support the adoption of the proposed regulation.

FEA held a public hearing in November 1974, at which three interested parties presented oral statements with emphasis in two major areas: (1) FEA authority to promulgate an octane posting regulation, and (2) alternative octane computation methods.

In February 1975, after consideration of all the comments and oral presentations FEA determined that the amendment should be adopted substantially as proposed. The February amendment differed from the previous posting requirement in that it eliminated the required use of CLC forms, and looked ahead to the eventual effective date for the FTC's octane posting regulation by providing that sellers may comply with the FEA regulation by complying with the FTC's proposed regulation, whether required by the FTC to do so or not. The February amendment reflects the current FEA price and octane number information posting requirement.

During the course of the rulemaking proceeding that culminated in the February amendment, FEA received certain materials in support of a proposal that FEA adopt a revised formula for the computation of octane number. The proposal was that FEA adopt the  $[R+M/2] + 4$  formula, which approximates the research octane number by adding four numbers to the average of the research and motor numbers.

FEA considered the points in support of the alternative formula but concluded that FEA should defer to the conclusion of the FTC based upon the Commission's previous in-depth consideration of the issue of posting formulae. Moreover, sound policy considerations dictated that the potential for conflicting posting requirements by FEA and FTC be avoided.

Since the February amendment, FEA has undertaken an independent technical analysis of the formula issue, the conclusions of which are included in "Automo-

bile Octane Requirement, Fuel Economy and Petroleum Conservation," a general staff study of the issues connected with octane posting prepared by FEA's senior physical scientist.

In light of the preliminary conclusions reached in the staff study, FEA, recently gave notice of a proposed rulemaking and public hearing to consider whether to amend the present definition of octane number. Comments have been solicited from interested parties on FEA's proposal to specify the research octane number and on any other alternative methods of determining the appropriate octane number to be posted (including but not limited to,  $(R+M)/2$ ,  $[(R+M)/2] + 4$ , and the Motor Octane Number). In the August 1975 hearing on this subject testimony was received addressed to whether there has been any octane over-buying since implementation of the current system. At the present time, FEA is analyzing the comments and oral testimony received in that proceeding to determine whether an alternative formula should be used.

FEA believes that adoption of this bill before the conclusion of the pending rulemaking might lead to the innocuous result that FEA regulations require a posting formula not supported by the findings of its own rulemaking.

Finally, section 6 of the bill would establish a completely new role for FEA which would tend needlessly to inject the Federal government into the marketing of gasoline. This provision would require a comparative performance evaluation of various brands of gasoline, and would mandate that FEA perform spot checks on the quality of various brands of gasoline. The Federal government has been traditionally hesitant to involve itself in the testing or comparative evaluation of goods where a public health or safety standard is not involved, and FEA does not view this particular proposal as an efficient or effective investment of finite Federal resources which should be devoted to programs that will substantially reduce this nation's dependence on foreign energy.

I wish to express my thanks for the opportunity to present the views of the FEA on this legislation. I hope that these comments will prove useful to the Committee as it considers S. 1508.

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STATEMENT OF ROBERT L. BAUM, DEPUTY ASSISTANT ADMINISTRATOR FOR GENERAL ENFORCEMENT, ENVIRONMENTAL PROTECTION AGENCY

Mr. Chairman and members of the Committee, it is a pleasure to appear before you today to discuss the views of the Environmental Protection Agency concerning S. 1508, the Consumer Fuel Disclosure Act.

Substantial confusion currently exists in the minds of the motoring public regarding the subject of gasoline octane. This confusion can be attributed to at least three causes: (1) the existence of a number of different methods for measuring octane, (2) the lack of knowledge among consumers regarding the different types of octane measures, and (3) the general misunderstanding concerning the proper use of octane information. There is a common misconception among consumers which relates the use of high octane motor fuel to increased engine power and improved mileage.

EPA's primary concern regarding this issue is to ensure that the consumer will receive the information necessary to enable him to reduce octane over-buying and to operate his automobile in an economical manner. In general, the amount of lead in a leaded gasoline product is positively correlated to the fuel's octane level; that is, the higher the octane, the greater the lead content. Thus, the consequences of using gasoline with unduly high octane characteristics include increased airborne lead emissions, potentially adverse health effects, energy waste in the use of petroleum, and a monetary loss for the consuming public.

Octane over-buying can occur when the octane rating of gasoline is expressed by a different measurement method on the pump and in the automobile owners' manual. This situation currently exists because an Antiknock Index must now be displayed on the pumps, yet many owner's manuals refer to the proper octane level in terms of the Research Octane Number. Both measuring scales are shown numerically but the Research Octane Number is approximately four octane numbers higher than the Antiknock Index for the identical gasoline. Consequently, a car owner may regularly purchase motor fuel with an unnecessarily high octane rating in an effort to comply with the specifications established by his car's manufacturer.

The Environmental Protection Agency supports the premise underlying S. 1508 which is to assist consumers in avoiding the purchase of gasoline with octane ratings that are unnecessarily high for the proper operation of their automobiles.

However, we question the use of the "octane rating" method as set forth in section 3, subsection 6 of the proposed bill as the most appropriate standard for the entire disclosure program. There are several octane measurement methods available for use in an octane disclosure program. The FEA-sponsored R&M/2 technique and the system suggested by the American Society for Testing and Materials are but two approaches. However, since the Federal Energy Administration is presently empowered to promulgate octane-posting regulations, we believe that the FEA should exercise this authority and select the most uniform and easily-understood technique.

Since this bill is being actively considered, I would like to briefly comment on one aspect of it. There appears to be an inconsistency in the language used in section 4. Section 4(a) of the Act is concerned with the disclosure of octane information in various phases of the gasoline marketing process; specifically, the shipment and sale of motor fuel to the retailer, the sale of gasoline to the consumer, and the advertising and promotion of the product. Each subsection of section 4(a) uniformly requires that the gasoline being offered for sale be identified by its "octane rating." This term is defined by the statute. However, the following subsection 4(b) which deals with fuel specifications appearing in owners' manuals describes the gasoline octane information in different terms. The apparent intent of this provision is to insure that consumers have the information available to make informed purchases of motor fuel containing the proper octane level. Due to the differences in language used in these two sections, this purpose could be frustrated. Section 4(b) speaks in terms of "octane or octanes" while section 4(a) uses the defined term of "octane rating." Consequently, the octane rating which must appear on the gasoline pump and in advertisements may not necessarily be required to be expressed in the same terms in the vehicle owner's manual. Thus, if the goal of providing the consumer with understandable information is to be achieved, the octane terminology of these two sections should be made consistent.

Finally, in the event that S. 1508 is enacted, another concern arises. As stated earlier, one of the major problems in this area is the lack of knowledge regarding the proper use of octane information. Popular wisdom contains many myths regarding the properties of gasoline octane as it relates to automobile fuel economy and engine performance. Thus, any action which establishes uniformity in the presentation of octane information to the consumer, but does nothing to eliminate the consumer's misconceptions regarding its use, may not discourage octane over-buying. Therefore, in conjunction with the legislation being considered, I believe that Congress should clearly express its intent that the administering Agency educate the motoring public about the proper use of octane information. An effort should be made to inform consumers that the high octane gasoline will not improve engine performance or fuel economy.

Mr. Chairman, that concludes my prepared statement. I will be glad to answer any questions the Committee may have.

Senator HARTKE. Mr. Louis Lombardo, president of the Public Interest Campaign. I hope you can straighten us all out. Please summarize and you try to go ahead and bring order out of chaos.

#### STATEMENT OF LOUIS V. LOMBARDO, PRESIDENT, PUBLIC INTEREST CAMPAIGN, BETHESDA, MD.

Mr. LOMBARDO. I can leave the statement for a few minutes and just continue the dialog.

Senator HARTKE. Your entire statement will appear in the record. You speak up so I can hear you.

Mr. LOMBARDO. The first thing is that—one of the first questions you asked was whether or not all gasolines are really interchangeable and that goes to the question of what they call the fungibility of gasoline. Basically, with gasolines, as Mr. Goldstein pointed out—there are an awful lot of exchanges going on. Exxon buys from Chevron; Texaco buys from Exxon. There is a lot of that. When they exchange they do buy and sell gasoline on the basis of certain specifications. So that by

and large it is true that as far as the consumer is concerned, gasolines are interchangeable.

Now, you just cannot say that as a blanket statement, across the board, that that is true. Gasolines do vary with respect to octane and they do vary with respect to light ends, as you pointed out, and other characteristics. From a consumer's standpoint, octane is probably the most important factor—I'm not saying light ends and other factors aren't important too, because they are.

Senator HARTKE. If you have to identify the most important element, is that what you are saying?

Mr. LOMBARDO. Yes, sir, and octane is increasing in importance also.

Now, there have been a lot of misstatements added to the record this morning. One of them was that accuracy of the  $(R+M)/2$  versus the  $(R+M)/2+4$ . Mathematically, they both have the same accuracy, and from a reliability standpoint, they are absolutely identical. In other words, if you compare both rating systems, all that the +4 does is add a consumer adjustment factor so that the posted rating on the pump is meaningful and useful to a consumer rather than misleading. Addition of 4 points does not alter the reliability or the accuracy of the rating system one iota.

Senator HARTKE. I have a blue pamphlet given to me by Mr. Goldstein. It says "old and new." Do you have one of these? You are smart enough to understand this. Change in octane ratings. Automotive gasoline performance systems. Economy, old would be 91. New would be 87, so understand the new 87+4, it would get you right identically on the target.

Mr. LOMBARDO. Correct.

Senator HARTKE. 89+4 would bring you to 93. The old is 94. You say that is a difference without a distinction.

Mr. LOMBARDO. Yes; it just so happened that they may have rounded the 89. It may have been 89.4 rounded to 89 instead of 89.5 rounded to 90 or they just picked a regular which was 89. If you add 4, that is not going to give you an absolutely perfect adjustment?

Senator HARTKE. But the margin of difference?

Mr. LOMBARDO. The margin of difference is insignificant from the consumer's standpoint. The consumer won't be misled.

Senator HARTKE. The same is true with the midpremium. If you added 4 to the 91½, you would get 95½ instead of 96.

Mr. LOMBARDO. Half an octane point doesn't make a difference to the consumer. We recommend that they round the octane rating to the nearest whole number.

Senator HARTKE. I understand that. OK.

Mr. LOMBARDO. Mr. Montgomery said to you this morning that it is premature for the Congress to get involved. Well, I can tell you from my standpoint that that is an outrageous statement. We have been prodding the FEA and asking them to look into this question now, for nearly 2 years. Back in February 1974, I wrote to Administrator William Simon at the time he was Administrator of the FEO. I told him about this confusion. I said you could rectify it by adding a four for a consumer adjustment factor. Mr. Simon wrote me a polite letter saying he would welcome the assistance and expertise of the Public Interest campaign to educate the Nation's motorists to the four point

difference between the ratings posted and the ratings motorists were accustomed to in their car manuals.

We operate on a \$5,000 a year budget. Mr. Simon's position is the height of fuelishness. It is ridiculous. This is what they are about to do. FEA is about to put on the top of the pump, on a large sign, an octane rating which would be confusing to the consumers. And then FEA proposes to have a large scale public education campaign to unconfuse them. That is the height of ridiculousness. It would be throwing Federal dollars down a rathole.

You raised an excellent point when you said the assumption that the consumers read the owner's manual is a false one. Maybe only 10 percent do. That is probably true. But one must ask why have consumers disregarded the information in their owner's manual, and the reason has been because they have had an octane rating in the manual but none on the pump. The first issue of "Consumer Reports," back in 1937, the year I was born, said consumers should be given the octane rating so they wouldn't waste 2 or 3 cents a gallon. We still don't have posted gasoline octane ratings.

As you pointed out this morning, the legal mess and confusion has been going on since 1969. If the consumers had not only the instructions in the owner's manual, but a rating on the pump to which they could relate easily and without confusion, then you could expect a larger percentage of the motorists to begin using that information and buying intelligently.

The oil companies don't want the consumers to have that information. It is more profitable to them to the tune of about \$3 million per day, due to the octane overbuying and the confusion. The oil companies also don't want any constraints. They don't want to be held accountable by State officials.

Senator HARTKE. What if you went out there now, and I guarantee you that most people, when they go on through, they will buy from, say, one of the big outfits like Mobile, Texaco, Sunoco, or somebody like that. They buy it primarily because it happens to be somebody in their neighborhood they like, or maybe in some people they have the idea they are getting a better quality than they are when they go to one of the independents which is lower priced.

Why wouldn't the suggestion made by Texaco where they talk about the fact if you are going to have this type of disclosure you would be better off to identify on the pump not the octane rating but to go ahead and say this gasoline is for a certain type of car.

Mr. LOMBARDO. You have 100 million cars out there. In any given model year you have a variation in the number of makes, models, and engines—Volvo may have been built for 96 research octane; Volkswagen for 89 research octane. Engines vary. General Motors, up until 1970, built a lot of cars that ran on regular or low octane and some that ran on premium, high octane. There is a whole range of octane requirements out there.

Senator HARTKE. Most filling stations you can't get that whole range of octanes. You can get premium, regular, and unleaded.

Mr. LOMBARDO. It is a good point. Octane is becoming more important for a number of reasons. Take the consumer, the owner of a 1975 car. It has to run on unleaded gasoline. It was designed to run on 91 research octane, unleaded octane.

Senator HARTKE. Ninety-one research and 83 motor.

Mr. LOMBARDO. What you have here is a situation where the auto manufacturers originally said it would have to run on 82 motor octane and the oil companies would like to give as little octane as possible. It is expensive for oil companies to boost the octane. With 1975 cars, GM said the way we design our systems it now needs 83 motor octane. They put that specification in there to avoid engine knock. You have a situation where the auto manufacturers, to squeeze every mile per gallon out of their car, are adjusting engines so that cars need more and more octane.

In other words, there is less margin for error. The oil companies try to maximize profits and shave the octanes in the gasoline in the other direction; that is, as low as possible.

Visualize the plight of an owner of a 1975 automobile. The auto manufacturers say that after 10,000 miles, perhaps 5 percent of the car engines will knock on 91 research octane. The lead additive manufacturers who would like to scare people away from use of lead-free gasoline, say we can expect about 60 percent of the 1975 cars to begin knocking after about 10,000 miles. I think a reasonable estimate will be somewhere in the middle. Maybe a third of the 1975 cars will begin knocking on 91 research octane.

What does the consumer do? He is faced with a situation where his car begins knocking. If he lives on the east coast, he has some choice. There are 13 States where Amoco offers a higher octane unleaded. He could go and buy that, pay more and buy that gasoline and maybe get a little bit more in the way of fuel economy. If he lives outside of that area, or if he is ignorant about octanes, he may be forced to go back to his dealer. He says to his dealer, "I just bought this car, it has only 10,000 miles, it is beginning to knock." The dealer says, "I will adjust the spark timing for you and it will not knock anymore." So he does that and the motorists loses 4 to 6 percent in fuel economy. Either way the consumer loses. Either he has to buy up to a very high octane premium like Amoco (probably too high an octane) or he has to have the timing adjusted and lose fuel economy.

If there were clear and intelligible octane postings, consumers could shop around. Shell, for example, offers an intermediate high octane unleaded; it offers 95 research octane. It may be only a penny more a gallon. He tries it and it works, perhaps. If the octane ratings are clear and unmisleading in the first place, then with a public education campaign, consumers could be educated to buy by octane. And octane is increasingly important to them.

Senator HARTKE. All right. Does it make any difference, then, if he has research octane or motor octane, then?

Mr. LOMBARDO. You are raising the question of whether or not he has the motor octane. That is not an issue that has really been discussed, of course. Basically speaking, most gasoline has a minimum specification of 82 so generally oil companies don't go below that. There is variation above that.

So the consumer really is sort of taken care of. What we are saying is that the R plus M over 2, along with the consumer adjustment factor +4 is adequate. It weights the motor octane and research octane each 50 percent. We say, let the oil companies be free to alter the motor and or research octane ratings of their fuel, within limits, any way

they want to do it. As long as oil companies disclose the combined octane rating of their product in a clear and unmisleading fashion to the consumers, consumers will be protected.

Suppose, for example, Shell wants to offer their 95 research octane. If it is R plus M over 2 plus 4, it may still be posted at 95 or it may be 94.

If Exxon wants to offer a lower octane, let them offer a lower octane, but let them disclose it so the consumer knows there is a difference, and that difference may be important to him or her.

Senator HARTKE. Which is the more expensive, the motor octane?

Mr. LOMBARDO. Yes. The oil companies hold that kind of information very, very confidential. I think on the public record, from what I have been able to find out, the motor octane is a little more expensive to produce than the research, but in fairness, it does vary from refiner to refiner, from location to location in the country, depending on a number of factors that influence which is more costly. The way a refiner operates is they get a barrel of crude and process it. Out of that barrel of crude oil, approximately half becomes gasoline and the other half goes into a series of other products.

Whether they boost or lower the motor octane, or boost or lower the research depends on what the other half barrel of crude will be made into.

Senator HARTKE. Let me ask you, could he come in with a 70 motor octane—

Mr. LOMBARDO. No. They do meet the minimum specifications of 82. It doesn't drop that far. Theoretically—

Senator HARTKE. What would happen in the performance?

Mr. LOMBARDO. A lot of cars would have a lot of problems if oil companies maintained a research octane level but lowered drastically the motor octane rating of their product.

Senator HARTKE. Why is there so much confusion about all of this?

Mr. LOMBARDO. It is profitable to the oil companies. You saw how the agencies were here before you today.

Apparently, when consumers go to a Federal agency like FEA and say, look, this is in the consumer's interest to clarify this and straighten out this confusion; if it doesn't cost the oil companies anything, they will listen to you, if it will step on the toes of the oil industry, no way do they listen.

Senator HARTKE. All right. Now, what about these other things that Mr. Goldstein was talking about, those other items. Are those unnecessary to be dealt with?

Mr. LOMBARDO. Only in the sense that I think the legislation covers it. The legislation says do some studies. Have the executive branch agencies do some studies, and determine what is necessary in the way of purity, content, volatility and other properties of gasoline.

We think that the State of Maryland is way out in front. They have done a magnificent job. In the testimony I warn about the fallacy of one of the arguments brought before you this morning, that is, the "horde of civil servants"—I think that was put forth by the representatives of FEA. This argument is constantly being tendered by the oil companies and the American Petroleum Institute.

I point out in my testimony that if you look at Maryland's operation, it consists of less than 30 civil servants, operating on a budget of about \$600,000 a year, or 20 cents per taxpayer per year. One of

the benefits being—and this is just one of the benefits—that in 1974 alone, Maryland taxpayers were protected from being ripped off on 35 million gallons of low-octane gas that would have been sold as premium, had it not been for Maryland's gasoline quality control program.

In 1974 Maryland saved its consumers \$1.75 million plus unquantified savings in engine damages. So Maryland has been protecting the consumer.

Really, that is what is at issue here. The oil companies would have you not get involved in holding them accountable. I think that the evidence presented by Mr. Goldstein shows that it would be in the consumer's interest for an effective and efficiently run program. That is another credit to Mr. Goldstein. While it is true you can have a Federal agency that won't run its program efficiently or get anything done it is clear from Mr. Goldstein's operation that such programs need not be inefficient or ineffective.

Senator HARTKE. I think some of the Federal agencies are efficient.

Mr. LOMBARDO. Some are efficient or inefficient?

Senator HARTKE. Both.

Let me ask, in your testimony you refer to overbuying. What is overbuying? I understand the FEA had a Halldane Report which says that octane overbuying is minimal. Do you agree or disagree?

Mr. LOMBARDO. We disagree. We pointed out in the FEA hearing record that Mr. Halldane completely misunderstood our petition and the premises and calculations. We set forth before the agency an enormous amount of documentation. We set forth our rationale for our estimates; the data, conclusions, and methodology.

It has been before three Government agencies: FEA, FTC, and EPA for 2 years.

It has been presented to the oil companies. Nowhere have we been given estimates (with a rationale) that conflict or any critique that differs with our estimates.

As all estimates, they may be wrong. Some are high, and some are low perhaps, but they are the best we had and they have stood the test of time.

Senator HARTKE. Could you supply those to be included in the hearing by reference?

Thank you. I appreciate your testimony.

[The statement follows:]

STATEMENT OF LOUIS V. LOMBARDO, PRESIDENT, PUBLIC INTEREST CAMPAIGN

Mr. Chairman, Senators, ladies and gentlemen. I am Louis V. Lombardo, President of the Public Interest Campaign, an independent citizen organization working on consumer and environmental protection problems. I personally have worked on automotive pollution control problems for nine years—in the Federal air pollution program for the first six, and as a citizen for the past three years.

FEA is about to help the oil companies pick the taxpayers' pockets. FEA is preparing to fool as many of the people as many times as possible into the purchase of premium gasoline when consumers could use lower octane, lower priced gasoline.

A handful of elected representatives, Senators McIntyre, Bayh, Humphrey, Kennedy and Mondale, and Representatives Dingell and Conte are trying to steer FEA back onto the straight and narrow path by introduction of S. 1508, the Consumer Fuel Disclosure Act, and H.R. 6520, the Truth in Octane Act.

FEA, in a perversion of their mandate to conserve energy, is about to require the posting of gasoline octane ratings on large signs above the gasoline pump.

Perverted—because FEA officials plan to utilize an octane rating formula proposed by Texaco:  $(R+M)/2$  or sometimes known as the average octane rating, i.e., the average of the research (R) and motor (M) octane ratings. This Texaco rating would result in a posted rating which is typically four points lower than the research (R) rating which is used in some 50 million owner's manuals to recommend the gasoline octane consumers should use.

Visualize the plight of an owner of a 1971, 1972, 1973 or 1974 automobile. Virtually all vehicles sold in the U.S. of those model years were designed to run on 91 "Research" octane gasoline. About half the owners manuals specify "use of gasoline of at least 91 research octane." Such gasoline has been economy graded or unleaded. Regular has commonly been about 94 research octane and premium commonly 99 or 100 research octane.

Under the Texaco formula, however, these grades would typically be posted as 87, 90 and 96 octane. NOTE, the only grade with a rating of at least 91 would be premium. From Texaco's (and other oil companies) point of view, consumers would be misled into purchasing the most profitable gasoline. From the consumer's point of view, consumers would be misled into purchase of the choice which would be most economically wasteful, most energy wasteful, and the choice which results in the highest amount of pollution.

In our petition which for nearly two years has been before the three Federal agencies (FEA, FTC, and EPA) testifying before you today, we carefully documented nationwide estimates of octane overbuying and its effects. For the year 1974 we found that nationwide overbuying was: (a) Costing consumers nearly 3 million dollars per day; (b) wasting nearly 1 million gallons of gasoline energy per day; and (c) resulting in the unnecessary emissions of nearly 400,000 pounds of lead air pollutants per day.

Our petition not only documented and quantified the extent of the nation's octane overbuying problem; the petition also asked for adoption of a simple remedy—clear and unmisleading disclosure of octane ratings by the addition of 4 points to the Texaco formula. This is the remedy called for in S. 1508.

In normal times one might expect that a government agency receiving such a petition would give it careful consideration, and if meritorious adopt it. In a government for, by, and of the people, one would expect such behavior from government officials. But today we apparently have government for, by and of the powerful.

After two years of effort we have found that:

1. FEA still has not conducted a careful technical review of our petition and is about to ignore it again.
2. FTC denied our petition after months of "consideration." Nearly a year later we discovered that FTC had denied our petition without having conducted a technical evaluation of our petition.
3. After months of criticism, EPA only reluctantly evaluated our petition and finally, and reluctantly, agreed with it.

These are only a sampling of the outrages we have experienced to demonstrate the failures of the administrative process which make legislative intervention a necessity.

#### FEA—LET THE PUBLIC BE DAMNED

"Let the public be damned" is a good description of FEA's attitude on gasoline octane posting. Despite a hearing record which overwhelmingly supports the remedy in S. 1508, FEA's hearing panel has recommended that FEA first require the posting (on large signs) of the confusing Texaco octane rating. This is to be followed by an extensive (and expensive) public education campaign to unconfuse the public! For these recommendations taxpayers have paid these FEA officials over \$100,000 over the past year. Oil company executives privately applaud such behavior. The reaction of informed citizens would be another matter.

I would like to excerpt now the following from my testimony before FEA (submitted herewith):

"This Administration has riddled, fiddled, and diddled with the taxpayers' money to the detriment of the public's health, the consumer's pocketbook and the nation's energy resources, all this to the profit of the big oil companies.

"At first I thought it was just plain old bureaucratic incompetence. Now I believe it is more complicity than incompetence that has caused the government to mislead, confuse, and maintain in ignorance U.S. motorists for over two years. . . .

"Since February 1974, when our petition was filed with FEA, nonfeasance and mal-feasance by FEO and FEA officials has resulted in failure to effectively

deal with the problem of octane overbuying through octane disclosure. Since February 1974, the nation has suffered the following estimated adverse consequences from octane overbuying.

"1. Enough money was wasted (nearly 4 billion dollars) to pay for the hospitalization, treatment, and institutional care bills of all the nation's lead poisoned children for two years.

"2. Enough energy was wasted (nearly 500 million gallons of gasoline) to provide for the gasoline needs of 500,000 families for over a year.

"3. Enough lead was emitted into the air (nearly 200,000,000 pounds of fine particulate lead) to have manufactured 5 million car batteries.

"4. Enough children have been afflicted by lead poisoning (to which gasoline lead additives have contributed)—An estimated 600,000 children have suffered dangerously high blood lead levels, an estimated 6,000 have suffered neurological handicaps including mental retardation, and an estimated 200 have died.

"And what have FEA officials done? FEA officials have not only failed to act to mitigate the octane overbuying problem; FEA has acted to aggravate the problem by promulgating the Texaco octane rating system.

"As early as Spring of 1974, FEO could have promulgated an octane posting rule which would have resulted in clear, unmisleading, permanent, visible, useful and reliable octane ratings and then mounted a helpful public education campaign to minimize octane overbuying. But FEO and FEA did not.

"The public is entitled to know:

"a. Why didn't you use the consumer adjustment factor to give the maximum number of consumers a reliable octane rating they could relate to and rely on?

"b. Why didn't you do it early in the Spring of 1974?

"c. Why have you still not done so?

"d. Why did you specify rating according to the Texaco formula when you knew it would result in consumer confusion and aggravation of octane overbuying?

"e. Why did you specify the posting to be only ½ inch high?

"f. Why did you permit oil companies to post on the outside of the pump and on stickers which could weather away?

"g. Why did you permit oil companies to pencil in the octane rating?

"h. Why didn't you mount a public education campaign?

"i. Why didn't you enforce the regulations? . . .

"If not to serve the public interest, what is the purpose of these FEA panels and hearings? . . . What did the taxpayers receive for their money? Regulations which were not enforced, but had they been enforced would have further helped the oil companies pick the taxpayers' pockets. To the extent that oil companies pay taxes, at least some taxpayers got their moneys worth."

You will also find submitted for the record copies of my correspondence with FEA since the hearing which further documents FEA's refusal to objectively consider the public's interest on octane posting.

I also wish to include my letter of September 29, 1975 to you, Senator Hartke, wherein I enclose FEA's hearing panel recommendations to Administrator Zarb. It includes an FEA Office of Regulation Development "position" paper on octane posting dated September 16, 1975 from Mr. Paul Leiman. It is a technically sophomoric paper which erroneously selects and uses data provided by Atlantic Richfield Company (ARCO) and deliberately avoids points and documentation we have provided for the record to arrive at a predictable conclusion desired by the oil industry. It is also riddled with misstatements of fact and misinterpretations of data.

For example, on Page II it states "given that 50% of all vehicle miles travelled in passenger cars are for trips 10 miles or longer (see Attachment A)." But if one turns to Attachment A, one finds 75% to be the figure, not 50%.

On page 3, it states that "Generally, in order to raise the MON by a factor of one it costs 3 to 8 times more than to raise the RON a similar interval." This statement is grossly inaccurate and standing without amplification is meaningless at best.

On page III (note the pages aren't even numbered properly) of the position paper our views are distorted into the false proposition that present overbuying is due to posting of the Texaco rating system. Since FEA's regulations have not been enforced, and we have documented widespread non-compliance, we have never made such a charge. What we have said is that if the regulations were enforced with large legible octane ratings posted and promoted, then use of the

Texaco rating system would aggravate the existing overbuying problem and that, conversely, if the plus-four rating system were used, octane overbuying could be reduced.

#### ASTM'S SLIPPERY SYMBOL SYSTEM

Testifying before you today will be representatives of the American Society for Testing and Materials on behalf of an alternative octane posting scheme known as the symbol system. It is my belief, as I stated in my testimony before FEA, that use of the symbol system would perpetrate a fraud and a deception upon consumers.

Their system calls for gasoline to be graded by octane behind a scale of numbers one through six. But if one examines the scale carefully, one finds that in practice, there are virtually no gasolines of grades 1, 4, and 6. Thus, the symbols which would appear in the market are only 2, 3 and 5. Or, in other words the old oil company "screen" names of economy, regular, and premium. By the way, if we have to rely on names, I wonder if ASTM and the oil companies would go along with a name change to "economy," "regular" and "extravagant."

ASTM purports to be an independent technical society with balance on its committees between producers and consumers. But after nearly a year of participation in ASTM I find that from the consumer's point of view, ASTM is not independent, and it is certainly unbalanced.

A look at the roster of ASTM's Committee on Petroleum alone clearly indicates domination by oil industry representatives. And ASTM itself is heavily dependent upon the oil industry financially. One oil company alone provides over \$4,000 per year to ASTM through the purchase of its books of standards.

By putting forth a slippery symbol system, therefore, ASTM and the oil companies have joined forces to recommend a deceptive trade practice, which is what the Federal Trade Commission found failure to post octane ratings to be.

The theory is to give the consumers as little information as possible so that the oil companies will not have to compete on gasoline quality. In fact, an Exxon representative at the last ASTM meeting proposed a lowering of the octane ratings which are used to define the numbers 1 through 6.

This ability to change the definition of the symbol has the advantage to oil companies that gasoline quality in the tank can change while the consumer unknowingly is left with the same number on the pump. ASTM call this the advantage of a "living system." I call it the disadvantage of the "engine killing system" because the motorist who doesn't recognize an engine knock due to the lowered octane of the gasoline is likely to suffer engine damage.

Finally, it is apparent from the only empirical data we have on the effectiveness of the symbol system that it would be a complete failure in reducing octane overbuying. Hawaii, the only State in the Union to use the system (since February 1973) experienced in 1974 the highest amount of gasoline octane overbuying in the nation.

Over 60 percent of the gasoline sold in Hawaii in 1974 was premium when only about 10 percent should have been premium. Or, in other words, Hawaiians were kept in ignorance and ripped off to the tune of about \$4,000,000 in 1974 on overbought premium gasoline. This works out to be about \$10 per motorist.

I recommend that you consider ASTM's view on gasoline octane posting as little more than the views of the oil industry cloaked in the garb of ASTM. As further evidence I refer to my FEA testimony submitted for the record where in it is documented that I put before ASTM's Technical Division A on Gasoline the following proposal: "I propose that Technical Division A consider by letter ballot before the next meeting, amendment of the Symbol System to replace the numbers 1-6 with an octane rating based on the formula  $[(R+M)/2]+4$ ."

That proposal to consider, not necessarily adopt, our views was voted down 26 to 2 with 3 abstentions. The only two votes in favor were mine and that of an EPA representative. Note that these 26 votes are negative votes without technical justification in writing. Under ASTM rules, negative votes are supposed to be justified on technical grounds, not economic interests. When a powerful company or industry makes a proposal, you can be assured the spirit and letter of ASTM's rules will be followed. But when a mere consumer representative makes a proposal it apparently is a different matter.

In order to assess the Society's bias in recommending the symbol system, I request you ask, for the record, for an accounting from ASTM of all revenue received from oil industry representatives in calendar or fiscal year 1974, identifying amounts, companies, dates and purposes.

## MARYLAND'S CONSUMER PROTECTION PROGRAM

On the subject of the oil companies arguments likely to be put forward that it would take a "horde of civil servants" to administer S.1508, I recomend you carefully note the testimony of Maryland's Comptroller, Louis Goldstein, scheduled to appear before you today. The State of Maryland's Gasoline Tax Division operation is an excellent rebuttal to this argument against S. 1508. I believe you will find that their total operation consists of less than 30 civil servants operating on a budget of about \$600,000 per year, or about 20¢ per taxpayer per year. One of the benefits being that in 1974 Maryland taxpayers were protected from being ripped off on some 35,000,000 gallons of low octane gasoline which would have been sold as premium had it not been for Maryland's gasoline quality control program. Maryland saved its consumers nearly 1.75 million dollars in differential costs between premium and regular, plus unquantified savings in engine damage. In the aggregate then, Maryland's taxpayers saved at least three dollars for every dollar spent through prevention of this deceptive practice. In addition, this same "horde" carries out the entire posting function for all stations in the State.

In truth, the oil companies argument is not to save taxpayers money, but to save themselves the money and trouble needed to provide consumers with a product of the quality claimed. Oil companies do not want to be held accountable. They are not alone. FEA and ASTM join their ranks.

Senator HARTKE. We will go right ahead to Mr. John Tessieri, vice president, research and technical department, Texaco; and Mr. T. A. Burtis, executive vice president of Sun Oil.

Which one wants to go first?

Your entire statement will appear in the record.

**STATEMENT OF JOHN E. TESSIERI, PH. D., VICE PRESIDENT, RESEARCH AND TECHNICAL DEPARTMENT, TEXACO, INC., WASHINGTON, D.C.**

Mr. TESSIERI. Mr. Chairman, members of the subcommittee, my name is John E. Tessieri. I am the vice president in charge of the research and technical department of Texaco Inc.

My company appreciates the invitation to testify on S. 1508, the Consumer Fuel Disclosure Act.

Texaco Inc. has extensive gasoline retail distribution throughout the country with marketing outlets in all 50 of the United States. Based upon our considerable experience, we do not believe that the consumers' interest would be served by this proposed legislation.

Texaco does not believe that the consumer will benefit from posting of octane information in any form. Octane posting misleads the consumer into erroneously believing that octane rating is the one characteristic of gasoline which is of overriding importance and that the best gasoline for his car can be mathematically determined without regard to road testing his particular car under his particular driving pattern.

To understand why we do not believe octane posting will benefit the consumer a few remarks may be helpful on the interrelationship between automobile octane requirements and gasoline octane numbers. It is important to recognize that the octane requirement of a car is not a finite value. It can vary widely depending upon driving habits, accumulated mileage, mechanical adjustments and atmospheric conditions. Likewise, with cars of the same make and model tested under identical operating conditions, it has not been unusual to observe a spread of 8-10 or more octane numbers in their antiknock require-

ments. Among cars of different makes and models, the variation may be even greater. As an example, table 1 shows a 15-number spread between 16 1975 cars we have recently tested. Further, operation at various altitudes in different sections of the country will affect octane requirement. From this, it is obvious that a wide variety of appetites for gasoline octanes exist among all the cars making up the country's total car population and it is impossible to tailor gasolines to each car's requirements.

Additionally, the actual octane requirement of groups of cars is not directly relatable to either research or motor octane numbers alone. On the average it may be related to some weighting between these two values. This relationship has varied in the past for new cars from complete dependence on a research rating to complete agreement with motor. For the total present car population, however the average  $(R+M)/2$  provides the best available, simple correlation between car demands and laboratory octanes. This does not mean such a relationship will continue indefinitely. It is possible that at some future date a different and better correlation will occur as the makeup of the car population changes. In this case, either  $(R+M)/2$  or  $(R+M)/2+4$  would have to be changed. Thus, one important reason why it would be unwise to legislate any octane number posting scale is that a congressional act would be required to make a change if future circumstances required it.

Because of the wide variations in octane requirement just mentioned, a posted octane number can at best be only a very rough guide to a carowner trying to match the octane of the gasoline he purchases against the octane requirement of his car. In the final analysis he will still have to road test different brands in his own car. And it might well also turn out his choice of gasoline would be determined by factors other than octane. In fact, Americans do road test their cars and they do not need octane postings on which they may overrely.

As a major gasoline marketer, we are obviously concerned with satisfying the octane needs of the present and future car populations. In consideration of this, we have developed a computer program from which we can estimate gasoline grade and volume requirements. We show in table 2 the relative mix of premium, regular, and lead-free gasolines we estimated would be required by the total car population on the road in 1974 together with the actual mix we marketed. The first column is our estimate of the mix required. It has taken into account actual passenger car octane requirements regardless of manufacturers recommended values as well as quantities of fuel used in applications other than passenger cars and light trucks. The second column indicates Texaco's sale of these products in December 1974. With the accuracy of the computer model, it can be seen that premium grade sales essentially matched our best technically derived estimate of requirements. To update this, we have included our most recent information for the month of September 1975. As expected, sale of premium gasoline has declined even further while the purchase of lead-free gasoline has increased significantly. From this, we conclude that as of today, there is no real overbuying of octanes by the consumer and the need for protection against it is unnecessary.

All gasolines are not the same. Gasolines embody significant differences. Every refiner starts with the same basic ingredient—crude

oil—which, in itself, can vary widely in quality and type. He then, by selective processing, manufactures finished products having characteristics most suitable for his trade. Gasoline is an extremely complex mixture composed of literally thousands of various types of hydrocarbon molecules, each with its own boiling point, freezing point, and flash point. In the manufacturing process, the refiner pulls apart and rebuilds the molecular structure of many of these compounds to produce a fuel he feels will give the motorist the best overall performance. The result of this complicated chemical juggling is a blend in which about 80 percent of the molecules are custom made. The same grade of gasoline made by one company may differ distinctly from season to season and from one part of the country to another. Some marketers provide higher octanes than others; some control volatility more closely; and some provide significant improvements through the use of additives to a greater extent than others. Octone posting tends to cause the motorist to ignore these various important characteristics of different gasolines.

It is Texaco's considered judgment that posting of the octane value of motor gasoline in the form required by S. 1508  $(R+M)/2+4$  rather than using  $(R+M)/2$  as now required by FEA will not clarify matters for the consumer and ultimately could cause more confusion.

If it is considered necessary to adopt some form of posting, we believe a grade designation system would be superior to the use of octane numbers. We have previously presented our views on this to the FTC in letters dated March 18, June 14, and September 17, all in 1971. We reiterated some of these views as well as our opposition to research number posting in a letter to the Federal Energy Administration of August 21, 1975. I should like to submit copies of these for the record.

Senator HARTKE. They will be included by reference.

Mr. TESSIERI. Essentially, use of a I, II, III, IV grade designation as proposed to the FTC by Texaco, or a symbol system similar to that proposed by the Society of Automotive Engineers/American Society for Testing and Materials, or the five star system as used in Great Britain to identify gasoline grades would be more advantageous. It would standardize a grade description which would be uniform countrywide regardless of variations in octane due to altitude. The octane parameter used in the grade designation system could be varied as car requirements dictated without changing the identifying designation on dispensing pumps. This would eliminate the need for periodic changes in posting which would confuse the customer. It would be easily understood by the public since it is analogous to other rating systems, such as motor oil classifications, with which most motorists seem to be familiar. Additionally, it would mean no interruption of the presently standardized  $(R+M)/2$  system which is widely used for manufacturing control, standardization, Federal, State, and commercial specifications and contract purchases.

In view of the foregoing, it is our opinion that in the event this subcommittee should conclude that some form of posting must be adopted a grade designation system would be more beneficial to the consumer, the Government, and industry than any other system proposed.

In addition to the selection of a posting classification, the bill contains several other provisions which are unwarranted and of concern to us.

Section 4(a)(3) requires that advertising and other promotional material for gasoline shipped in interstate commerce must clearly disclose the octane rating and such other information as the Administrator of the FEA or any successor agency shall by regulation prescribe.

This provision would create an impossible situation for nationwide marketers in their national printed and TV advertising. Because marketed octanes vary with geographic area due to altitude as previously mentioned, inclusion of specific octanes in a national advertisement would complicate and confuse the consumer. Furthermore, this provision appears to require that octane ratings be disclosed even though they may be irrelevant to the subject of the advertisement. There are other previously noted important quality characteristics of gasoline apart from octane, such as volatility control to provide good starting, warmup, and overall driveability, and additives, such as those for carburetor cleanliness, which provide benefits not attainable otherwise. Gasolines, as we stated, are not all alike and marketers should have the right to advertise those features for which they have technical justification. This bill's provision, with its "blank check" requirement for octane information and such other information as the Administrator shall prescribe could effectively dictate the content of advertisements and require overemphasis on octane ratings.

Section 6 provides for duplication of several activities which are already in existence and serve the purposes required by the bill. Specifically, (6)(1) calls for "establishment of methods to measure octane and to establish other methodologies and testing procedures to insure the purity and content of gasoline."

No definition is given to the vague terms "purity" and "content" and these are not common to the petroleum industry. However, standardized test procedures are available through the American Society for Testing and Materials (ASTM) which can be used to comprehensively measure gasoline characteristics. Many of these have been in existence since the 1920's. They are updated regularly as technology and new developments warrant. New methods are also developed when needed. ASTM methods, too, have worldwide recognition and use in commerce. All of this is done with balanced participation from producers, consumers, and general interest members. Any attempt to develop replacements would be unnecessarily duplicative, costly, time consuming, and disruptive of practices which now satisfactorily meet this requirement.

(6)(2) Proposes a study of the quality of performance of various brands of gasoline, the impact of such gasoline on automotive deterioration and the feasibility of standardizing gasoline formulas.

Again, no definition is given of the vague terms "quality of performance" or "automotive deterioration." The potential scope of work associated with such wording is tremendous. To illustrate, it is not unusual to require tests running several months simply to evaluate one characteristic such as a gasoline detergent additive's capabilities in one fuel and one series of engines. To multiply this by the number of fuel brands available and the number of cars manufactured under a variety of operating conditions, would become a staggering, never

ending task. Further, it is difficult to see what useful purpose this would serve since there is to our knowledge no demonstrated need for it.

Further any attempt to fix the formula for gasolines would have disastrous consequences for the Nation. The quality of gasoline is much higher today than it was 20 or even 10 years ago. It might be well to ask: "Why is this so?" We believe that it is because of the vigorous competition among oil companies that provides the incentive to improve quality through constant research. Would this investment continue to be spent if gasolines were determined to be a fungible commodity that lost their identity as soon as they left the refinery gate? In controlling gasoline as a fungible product, the lowest common denominator of quality specifications would be used, thereby reducing the quality level of products now available on the market. Continued improvements in the mutually dependent fuels and automotive engine fields are demanded today for reasons ranging from economy to ecology. The best way to secure the advancements necessary at lowest costs is through research programs carried on by manufacturers of branded products spurred by normal competitive pressures. Reducing gasoline to a commodity status would eliminate such research. An attempt to force a standardized formula for all gasolines could lead to massive requirements for modifications to refineries and severe shortages of gasoline production. Again, there is no justification to support such a course of action.

(6) (3) Requires the administrator to perform spot tests of the quality of various brands of gasoline which have been moved in interstate commerce \* \* \*, and provide semiannual reports on such testing procedure and the results disclosed \* \* \*.

Semiannual reports on the quality of gasoline marketed in the United States are already published by the Energy Research and Development Administration at Bartlesville, Okla. This is a recognized reference of information on gasoline quality that has been available for many years. In addition, the Motor Vehicle Manufacturers Association conducts its own survey, and members of the petroleum industry conduct their own surveys. We fail to see how this further duplicating provision of S. 1508 would provide any information to Government, the consumer, or industry that is not already available.

Section 6 also grants the Administrator undefined and unlimited authority to establish regulations in the various areas covered without benefit of public hearings or requirements for supporting justification. Such broad and unchecked authority obviously offers the potential for abuse and erroneous action. It is our belief that the Administrator should not be granted such powers without a provision for industry to present its views and a requirement for findings which will justify new regulations.

In conclusion, Texaco Inc. (1) cannot support the need for an octane-posting system; (2) would recommend that a numerical grade designation rather than an octane number formula be used if posting must be adopted; and (3) recommends that since section 4(a) (3) and section 6 in its entirety, are impractical, unnecessary, or duplicative of existing practices, they be deleted from this bill or any modification of it.

Thank you and I shall now be pleased to answer any questions the subcommittee may have.

[The attachments referred to follow:]

TABLE 1.—1975-model car octane requirements full boiling range reference fuel  
[Octane requirement,<sup>1</sup> full throttle]

| Vehicle make: |      |
|---------------|------|
| A-1           | 91.0 |
| A-2           | 87.0 |
| B-1           | 84.0 |
| B-2           | 88.0 |
| B-3           | 82.0 |
| B-4           | 88.0 |
| C-1           | 84.0 |
| C-1           | 85.0 |
| D-1           | 96.0 |
| D-2           | 95.0 |
| D-2           | 95.0 |
| E-1           | 88.0 |
| E-1           | 93.0 |
| F-1           | 90.0 |
| F-2           | 81.0 |
| G-1           | 93.0 |

<sup>1</sup> Test procedure used to determine octane require: "Research Technique for Determination of Octane Number Requirements of Passenger Cars"—Coordinating Research Council designation 5-15-75.

TABLE 2.—GASOLINE DEMAND VERSUS MARKET BY GRADE

|               | Estimated gasoline grade mix versus sales per cent |                            |                             |
|---------------|--|----------------------------|-----------------------------|
|               | 1974 estimated grade mix                           | December 1974 Texaco sales | September 1975 Texaco sales |
| Premium.....  | 23.5   | 22.4                       | 18.4                        |
| Regular.....  | 74.9   | 72.4                       | 70.6                        |
| Leadfree..... | 1.6  | 5.2                        | 11.0                        |

Senator HARTKE. Let me ask you if you had this problem here. Take the new car manual says that you should have a 91 octane gasoline.

A Shell advertisement said that they have several grades of gasoline. They were 91 and then 96. If you go into Maryland and the service station and found the pumps indicated there was 89 leaded, 89 unleaded and 94.

Considering what the advertisement said and owner's manual said, which gasoline would you purchase?

Mr. TESSIERI. You have identified part of the confusion we are dealing with. These numbers should not be posted so you would not have this confusion. As you have seen in the attachment to our statement, there is a wide variety of octane requirements between all automobiles. We think that the grade system we have lived with or the designated system we propose would better enable the consumer to make a choice in an excellent way.

If he chose what would be No. 1 or the three star or whatever, and he found he ran into difficulty—in knocking, there is an audible noise he does hear—then he would go to the next grade.

This grade would be designated as an increase in octane levels. I cannot support posting octane numbers, because I don't believe that is the system we should be dealing with.

Senator HARTKE. I go back to my manual and it says Buick engine is designed to operate on unleaded gasoline of 91 research octane.

I go to Exxon and they have 87, 89, 94, 95, it says I have to have 91 unleaded in my manual. Unleaded gasoline is essential for proper emission control operation. It will minimize spark plug fouling, et cetera.

Now, a service station gasoline pump has a similar symbol to the one below. Use unleaded gasoline with the symbol No. 2. If the pump has a label indicating gasoline and octane in terms of average and research octane, R. plus M. over 2, use a gasoline number of at least 87.

What will I do? I have gone to the Shell station and I said I want 91 unleaded and he says, "We have 89 leaded, 89 unleaded, and 94 unleaded."

At Exxon they say "We have 87, 89, 94 and 95 leaded." If I am going to use leaded, of course according to my manual, the use of that leaded gasoline can damage or reduce the effectiveness of the emission control and result in loss of warranty.

I don't want to lose the warranty. I don't want to use the 87 because I have to use the 91. What will I do?

Mr. TESSIERI. In our case, we have issued information that indicates that the unleaded gasolines we are dealing with meets the requirements both in the Government regulations and the requirements of the new cars as the manuals indicate.

Senator HARTKE. The statement in the service and maintenance manual is—

Mr. TESSIERI. The unleaded gasoline meets those requirements.

Senator HARTKE. This is Mr. William C. Chapman, General Motors, manager, technical liaison group, industry-Government relations. Attaches a copy of our owner's manual as to owners of octane requirements for 1971, 1975 cars. Signed, W. C. Chapman.

Mr. TESSIERI. We have quite a mix-up between 1971 and 1975. The requirement for unleaded gasoline with emission controls was not a part of these cars before 1975.

It's only the late model cars that have this constraint and this concern; 1975 is the first year the catalytic muffler was put on. That is when the lead-free gasoline was required.

Senator HARTKE. What am I going to do. I'm that motorist. What do you suggest I do?

Mr. TESSIERI. What year car do you have?

Senator HARTKE. A 1973 Buick.

Mr. TESSIERI. I would say use regular gas.

Senator HARTKE. Leaded or unleaded?

Mr. TESSIERI. Leaded.

Senator HARTKE. How do I know that?

Mr. TESSIERI. You would know that because the 1973 manual would not have this broad statement in it.

Senator HARTKE. Why do they have the octane in the manual then if you are not going to have it on the pump?

Mr. TESSIERI. Octane is an indication, and you, in driving your car, would learn what gasoline best fits you, not only from the octane standpoint, but from other standpoints.

Senator HARTKE. They have the octane in there if it doesn't make a difference. On one hand you say you don't need it and then on the other hand you say you do need it.

Mr. TESSIERI. Our suggestion is you go to a graded system rather than octane number posting.

Senator HARTKE. You say to go to a graded system. Would you then agree what we ought to do is pass the legislation, pass a legislation requiring the posting of symbols or some types of designations with minimum standards for those symbols.

Mr. TESSIERI. If there is going to be legislation to deal with this problem that is the one we suggest.

Senator HARTKE. Won't that in effect go ahead and require all the gasoline to be relatively the same octane?

Mr. TESSIERI. No, sir. Minimum allows you—only to define the bottom of the octane range for each grade.

Senator HARTKE. Why should you have more than a minimum?

Mr. TESSIERI. Customers know what is going on and they respond to your product and competition forces you to take cognizance of this.

Senator HARTKE. What research do you have in terms of customers knowing what is going on?

You say the customers know what is going on in this field. How do you know that?

Mr. TESSIERI. The customer has made a significant change according to table 2.

Senator HARTKE. I read your testimony. Go ahead.

Do you want me to tell you what you said?

Mr. TESSIERI. It indicates that as the octane requirement of the automobiles he dealt with changed, he has changed his buying habits in the ratio of premium and regular grade of gasoline purchased.

Senator HARTKE. You have those new cars coming out saying use regular gasoline on them. There is a sign that says use regular. It doesn't say anything about octane. It says use regular gasoline.

Mr. TESSIERI. That system then was effective and did work.

Senator HARTKE. That doesn't mean he knows what is going on.

Mr. TESSIERI. It says their choice of gasoline met the requirements of their automobiles.

Senator HARTKE. He saw it said use regular, and he used regular, period. You don't have research on this do you, really?

Mr. TESSIERI. This is based on technical information, sir.

Senator HARTKE. You don't have any research out there to show that the customer knows what is going on other than the fact that I can almost guarantee these results. You ask them what is going on and they will tell you, I have a 1973 book and it said use regular gasoline and I use regular gasoline.

I don't have any idea whether it works any better, doesn't work any better, whether it pings, knocks, doesn't keep running, or keeps on running when I turn the switchkey off.

Mr. TESSIERI. Our research, per se in the area I am responsible for did not reach into the marketplace, in answer to your specific question.

We feel we can monitor what happens in that marketplace by following this type of information which we have presented. We monitor the requirements for cars and statistically try to determine what they will need.

When we see a response in the marketplace which correlates with the cars' needs, then we have to conclude that we think the consumer is exercising some choice in this marketplace.

Senator HARTKE. A man has a 1973 Buick out here——

Mr. TESSIERI. It says he can use 91 octane gasoline, or regular.

Senator HARTKE. Can a manufacturer make a decision he has to use 91 octane gasoline and put that in his manual and you say you can't do it for the pump.

Is the manufacturer wrong?

Mr. TESSIERI. Sir, I would respectfully decline to comment on the automotive industry and its problems.

Senator HARTKE. You are in this barrel of worms together, so you better try to get out of it.

Mr. TESSIERI. I will be glad to comment on the factual information we have presented to you.

Senator HARTKE. These owner manuals in 1973 Buick Skylark—is that manufactured in the United States?

Mr. TESSIERI. Yes, sir.

Senator HARTKE. 1973 Buick Skylark—don't all of the manuals for 1973 say use regular gasoline?

If they say that, why would they say that and then you say they can make the determination as to what needs to be put in the owner's manual and he reads that thing and he reads that and he says, I go to the gasoline station and they can't tell me that. I have to know some way how to make the thing work.

Mr. TESSIERI. Because of the variations in the octane requirements of cars as they come off the production line, even with that statement and even if the octane number were posted on pumps in gasoline stations, sir. I am afraid you still will have to try the gasoline and by your own experience determine what is its performance.

Senator HARTKE. What is a fair conclusion from that statement is that the automobile manufacturers are misleading the American people.

Mr. TESSIERI. Automobile manufacturers are having difficulty in the narrowness of the control of the octane requirements.

Senator HARTKE. They are misleading the American people, right? Isn't that right?

Mr. TESSIERI. That could be one conclusion.

Senator HARTKE. If I assume our statement is correct, then I have to assume that the automobile manufacturer is misleading the American people.

I can't go both ways. I can't assume he knows what he is talking about and you don't know, or you say he doesn't know what he is talking about.

Mr. TESSIERI. In essence, the statement presumes to know his motives. I would not like to make that statement, Mr. Chairman.

Senator HARTKE. I am assuming he knows what he is talking about to begin with, and I am assuming you know what you are talking about to begin with.

I make the assumptions and I come to the conclusion where one of you is absolutely saying one of you is wrong. Isn't that right?

Mr. TESSIERI. That is what you are saying, yes.

Senator HARTKE. You are in this business here. We are trying to straighten the matter out. I am not trying to go ahead and be biased on one side or the other.

I think with all fairness to the consuming American public, he has the right to rely on that manual, or we have an obligation to reveal to the public that the manual cannot be relied upon. You have to rely upon it, or you shouldn't rely upon it. One of the two.

If you are going to tell me that gasoline recommendation to use unleaded or low-lead fuel, 91 research octane number or higher as commonly sold in the United States and Canada, what does that mean.

Should you use it higher?

Mr. TESSIERI. Through your experience, if you find the automobile needs it, the answer is yes. It is a generalization, rather than a specific in this manual.

Senator HARTKE. I am saying to you that someplace along the line we have to get the manufacturer and dispenser of gasoline together, if it means something.

If it doesn't mean anything, that is a different thing.

Everybody here agrees, and you agree it means something.

Mr. TESSIERI. Yes, sir.

Senator HARTKE. You don't agree it is the most important characteristic? You said that is not true.

Mr. TESSIERI. Yes, sir.

There are other properties of gasoline extremely important—

Senator HARTKE. Especially the content of water in it, isn't that true?

Mr. TESSIERI. Content of water is important to the gasoline.

Senator HARTKE. Then water ought not be in it.

Mr. TESSIERI. The solubility of water is slight in gasoline. Its content is relatively small. Water has been used in internal combustion engines at times.

Senator HARTKE. Don't start selling me water. Let me put my own water in the gasoline.

You don't want to get after—we have had some Maryland people here. One of the items they test for is water and sedimentation.

Mr. PRICE. Yes, sir.

Senator HARTKE. The violations, in July you had two. Anyway, we are not back on that yet.

Let me comment on your statement. The result of this complicated chemical juggling is a blend in which 80 percent of the molecules are custom made. The same grade of gasoline made by one company may differ greatly from season to season and from one part of the country to another.

What difference does it make what I buy? Does it vary enough to make a difference?

Mr. TESSIERI. Yes, sir.

Senator HARTKE. Why don't we require you to keep that variation down?

Mr. TESSIERI. Because there are certain advantages to these variations depending on what you emphasize—what the particular marketer wants to emphasize.

The processing equipment he has will determine the type of gasoline he turns out. If someone decides in their minds that the thing most important to the customer's volatility control—

Senator HARTKE. From that it becomes obvious there should be minimum standards in this field.

Mr. TESSIERI. The standards for the gasoline are well established from experience and from the ASTM specifications.

The tests in the control system that Maryland has used were based on these which are minimal standards, accepted in commerce.

Senator HARTKE. Don't you think there should be some requirement that there be minimum standards across the board?

Mr. TESSIERI. The States in many situations, have these established, and these are met. We have our own specifications which we control.

Senator HARTKE. Let me come back to the basic question again then.

I mean, if I am in the position where I am relying on a manual which says it is going to destroy my warranty if I use something else, that is not just a minor item. Why shouldn't we then require that there be some type of way in which the consuming public can go out and make a determination that he is not doing one of two things—on the one hand destroying his warranty; second destroying his car and saving his warranty; or third, spending more money than he should be spending?

Mr. TESSIERI. We believe the grade system would allow you to do that.

Senator HARTKE. If you believe that, then it appears to me what you are doing is endorsing some type of legislation to require minimum standards in these fields and certain designations according to those standards.

Maybe we should have six different standards, and then you could put down in your manual, use standard 1, 2, 3, 4, 5 or 6, right?

Mr. TESSIERI. The present state of our ability to control these things does not allow you to use octane as a finite specific number in a manual for cars. This is one reason we talk in terms of grade systems because it does give you a range within which you can accommodate car-to-car variations.

Senator HARTKE. Now I want that statement from the record pulled out and I want it taken and I want it directed to all of the major manufacturers of automobiles, and have them reply for the record what is their reply.

This is a direct statement that the manuals are wrong. I want to know why, if the manuals are wrong, what we are going to do about it.

Somebody has us confused.

Do you really seriously suggest every person ought to road test his car?

Mr. TESSIERI. Road testing is the experience of driving one's own automobile and knowing how it operates.

Senator HARTKE. I drove a car out this morning and the thing stuttered. Well, I will drive in all this traffic in Washington, so I thought, I don't want to pull out and have it die on me driving down the middle of a block. I can't change anything, it just went. I started it again.

Should I change gasoline?

Mr. TESSIERI. What year car do you have?

Senator HARTKE. 1975.

Mr. TESSIERI. I would suggest you shop for gasoline.

Senator HARTKE. Where do I shop?

Mr. TESSIERI. If you find that continues, you should go back to your dealer. It could be a warmup.

Senator HARTKE. Should I go to Texaco?

Mr. TESSIERI. I would suggest that be your first stop, sir. Normally, if it is the fuel that is causing this, it relates to the light ends that were referred to earlier. It is the distillation range. It is the proper control of these light materials, proper balance of them that enables you to start your car.

These affect both the car's ability to warmup and start at the same time. These must be rebalanced according to the climatic conditions several times a year.

Senator HARTKE. It changes for each car, or for each model?

Mr. TESSIERI. I asked you about the car because the previous cars, just previous to the 1975's, the balance between emission controls and drivability was a closely designed parameter in order to meet the emission standards without the catalytic muffler at that stage.

In 1975 the automobile manufacturers were able to relax this tight tradeoff of emissions and drivability because the catalytic muffler allowed more hydrocarbons to go out of the engine.

I would suggest that if you are having warmup and driveaway problems, that yes, the fuel could be causing this and there are differences in the volatilities of the fuels.

Senator HARTKE. I think there should be some type of minimum standards for fuel, if that is the case.

The second thing is we have to resolve this question between manufacturers' manuals and what goes on in the marketplace.

From what you say there appears to be a distinct difference of opinion.

That is all the questions I have.

Mr. TESSIERI. Thank you very much, sir.

Senator HARTKE. Sun Oil. Mr. Theodore Burtis, executive vice president.

Your entire statement will appear in the record.

#### STATEMENT OF THEODORE A. BURTIS, EXECUTIVE VICE PRESIDENT, SUN OIL CO.

Mr. BURTIS. I am Theodore A. Burtis, executive vice president of the Sun Oil Co.

Today I am in support of the objectives of the proposed legislation, but I will express strong reservations about some of the means that are chosen to achieve them. I am also particularly speaking to you from our company's background of 17 years of having tried to achieve the same objectives by somewhat the same means. It seems to me there are two distinct, but closely related objectives in this legislation.

The first is to provide to the purchaser at the point of sale an accurate index of the quality of the fuel he is purchasing. The second and perhaps the most important is to induce the customer to make his purchasing decision in a way which is in his own economic interest and in the economic and conservation interest of the country.

I would like to comment on both of these. I will not belabor the technical part of it. It has been discussed a great deal.

It is generally agreed in industry, Government and academia that the truly most accurate way of measuring antiknock quality is the road rating system, because it is determined in production vehicles and on the road. Also it is a complicated and expensive type of system.

There is agreement that some other day-to-day control mechanism is more appropriate and  $(R+M)/2$ , the antiknock index is generally agreed upon. This has been debated extensively.

We and others have testified before a number of agencies and pointed out the possibilities of confusion. Nevertheless, as a reasonable compromise, not as accurate as road, but more indicative of engine needs than either research or motor— $(R+M)/2$ —seems to be appropriate. In this case I emphasize that adding an arbitrary adjustment factor of four does nothing to address the underlying accuracy of this kind of index.

We are concerned that this legislation would give official sanction to a new set of numbers to be displayed to the public.

Senator, you indicated some of that already. Owners manuals have in recent years talked about research octane, motor octane, antiknock index, or the symbol system. We fail to see how adding another set of numbers will help that situation much.

We share the concern of the inflexibility that would be engendered here if we embedded something like that in legislation. As has been pointed out before, engine requirements have been changing. The chances are they will continue to do so. If in the future a more suitable index were required, we would have to come back and have legislation.

We think this could be handled by legislation and it would be better to provide, for example, that quality posting index in some familiar terms be displayed, but leave the writing of specific recommendations to the appropriate agency.

This leads to the second point. That is inducing the public to make the decisions in their own interest.

I would like to repeat here our own experience. It may be enlightening. Beginning in 1958, the Sun Oil Co. adopted a custom blending system under which we offered as many as eight grades of gasoline ranging from subregular at the low end to a super premium at the top.

The reason for doing this was we thought by such a system we could in fact permit the individual buyer to match the needs of his automobile precisely to the fuel he could buy, recognizing the variation.

Now, the grades were identified by numbers. They were not octane numbers. They are an arbitrary series of numbers and they contained no name designation. At each pump island we displayed a chart which showed for each make of car, each model year, what grade of gasoline conformed to the manufacturer's specification.

We urged and encouraged the station attendants to call this to the attention of the buyer and to show him how he could by trial and error select the proper grade of gasoline to take into account the difference between the engines as they are produced.

Well, after about 10 years of experience with this we had some extensive market surveys and we found out from that that about 51 percent of our customers felt they understood the system. We have no way of knowing what the perception of non-Sunoco buyers were.

We went back to the pump and added to the grades the familiar names, economy, regular, super regular, premium, and super premium. Then we went back again and repolled the customers to find out how they felt. At this point the understanding of the system had gone from 51 percent to 73 percent. We thought this was a significant change.

We found in the earlier survey that this display of numbers, eight on the pump intimidated some people. They don't want to or didn't know how to make the choice. When we went to the naming system, the understanding improved. I cannot say in all candor that we noticed a marked change toward the overbuying, to buy a higher grade than in fact the technical needs of the car would dictate.

I'm not making a value judgment here except to say there are other things that influence the purchase of gasoline other than the technical requirement or octane number.

On the basis of this experience, we suggest to you that the purposes may be better served if we had in fact, whether by legislation or otherwise, a series of standards with minimum quality guarantees. In this particular case, from our experience we would lean toward using familiar names which are already there.

We have provided a table, Unleaded, Regular, Super Regular, Premium, Super Premium. We suggest also that the minimum octane quality index be in effect—it is ASTM D-439 and it uses  $(R+M)/2$ .

We propose that the name appear on the pump and the explanation of the system be available at the station. We think that by using these familiar names rather than numbers that the danger of misleading the customer, of continuing the debate of rating method and the potential disagreements of the significance and accuracies of the posted numbers could be avoided.

This kind of system could be matched to the owners manual. I suspect that what you're seeing with the owners manual is the difficulty that the industry faces on there not being any generally accepted standards, particularly in the last 2 or 3 years.

We think the system has the advantage if, in fact, as engine characteristics change some other standard to better measure the quality of the fuel, this system could be adapted to that and would not result in a change of what the customer was seeing at the pump.

I will not comment further on the bill. I would like to second the thought that section 6 appears to be redundant. Methods for octane and other gasoline qualities have been developed over many years. They are well known. They are accepted worldwide. Quality surveys have also been made. It was mentioned that ERDA already publishes one, the interaction between fuels and engines is well known. Government purchasing agencies are extremely knowledgeable in this area and have made their own tests. Much of what is in section 6 is redundant, because these things are being done.

If I may summarize, we think adopting particularly a legislation of  $(R+M)/2+4$  which is an attempt to get the number back to something close to research octane number doesn't serve much purpose and is unlikely to achieve the objective of the legislation.

The public would be assured more, I think, by the use of familiar names. How you educate the consumer once the information is available to them, to make that kind of decision is rather beyond us. We have tried for a long time. I don't think we have had notable success in this.

Senator HARTKE. I traded for some time at Sunoco. I see the various items in there. What you're saying, basically, to me, is the numbers in and of themselves—what you have is the numbers plus the name. That does not present an insurmountable difficulty to you in your merchandising.

Mr. BURTIS. No, sir.

Senator HARTKE. You're suggesting you should have minimum standards.

Mr. BURTIS. Yes, sir.

Senator HARTKE. Now, let me ask you a question.

Do you have any trouble in Maryland in their system?

Mr. BURTIS. No; we have lived with that statement. We market in Maryland. I think we haven't had any trouble.

Senator HARTKE. What you say makes a great deal of sense. I'm not saying I have gone into it in depth. What you're saying is you give them the octane and you say instead of complicating it with the +4 is use names which are familiar to the people such as regular.

Mr. BURTIS. With the assurance that that represents a level of quality through the specifications.

Senator HARTKE. The terminology you suggested is really  $(R+M)/2$ .

Mr. BURTIS. Yes, sir. You can look at numbers which say  $R+3M/4$  would be more accurate. Considering the variability of the engines, it hardly seems worth the trouble to get that that finely tuned on this sort of thing.

Senator HARTKE. What you ought to do, with an educational program, you're saying that as far as the ratings are concerned—in other words, if you wanted to you could say the 87 unleaded grade gasoline meets the requirement of a 91—

Mr. BURTIS. One thing that hasn't been mentioned here today, with the unleaded fuels on the market for the 1975 cars, there is a special nozzle. If you have a car that requires unleaded gas, you cannot put leaded gasoline into it because the nozzle will not fit.

Senator HARTKE. That is right. My wife experienced that. She was mad as the devil. She was up in Canada where they don't have unleaded gas.

All right, thank you. Your testimony has been quite helpful really. [The statement follows:]

STATEMENT OF THEODORE A. BURTIS, EXECUTIVE VICE PRESIDENT, SUN OIL CO.

Mr. Chairman, I am Theodore A. Burtis, Executive Vice President of the Sun Oil Company. I am appearing before you today to support the objectives of the proposed octane posting regulation while expressing strong reservations about the means chosen to achieve them. I am also speaking to you from our Company's background of 17 years of trying to achieve the same objectives by somewhat the same means.

It appears to us that this legislation is trying to achieve two separate but closely related objectives. The first of these is to provide to the gasoline purchaser, at the point of sale, an accurate index of the quality of the fuel he is purchasing. The second is to induce the consumer to make his purchase choice in such a manner as to serve his own economic objectives and the economic and conservation objectives in the country. I should like to comment on both of these objectives.

First, as to the selection of  $(R+M)/2$  Plus 4 as an indicator of quality, without belaboring the point, I believe it to be true that Road octane is accepted by government, industry and academia as the most accurate indication of antiknock quality since it is determined in production vehicles under actual road conditions. It is also generally accepted, however, that because of the complexity and

cost of this kind of Road octane testing, Antiknock Index is more practical to use in day-to-day quality control.

The selection of a suitable antiknock quality index has been debated for the last several years, and we and others in testimony before the FEA, FTC, and other bodies have demonstrated that its inaccuracies could result in misleading the public. Nevertheless, the Antiknock Index,  $(R+M)/2$ , has now been generally accepted by industry and government as at least a reasonable compromise, admittedly less accurate than Road octane numbers, but more indicative of engine requirements than either Research or Motor ratings. The addition of an arbitrary adjustment factor, in this case "Plus 4", does nothing to alter the quality of the numbers.

We are concerned that the proposed legislation would now give official sanction to still a new set of numbers to be displayed to the public. In recent years, car owner manuals have referred to Research octane, Motor octane,  $(R+M)/2$ , and the Symbol System published jointly by ASTM and the Society of Automotive Engineers. We believe that an additional set of numbers will only add to the confusion, and I will comment on this later in my testimony.

We are also concerned about the inflexibility of  $(R+M)/2$  Plus 4 if it is embedded in legislation. As I said earlier,  $(R+M)/2$  is generally recognized now as a reasonable representation of the requirements of automobile engines in their present state of development. Engine requirements have been changing over recent years, and it may be expected that they will continue to do so. If an arbitrary addition of "Plus 4" to the Antiknock Index was legislated, we would find that any change in the accepted measure of antiknock quality would introduce still another set of unfamiliar numbers to the public. A possible solution to the problem could be the enactment of legislation requiring that the octane number or index posted should allow the customer to determine octane quality levels based on some terminology which is technically sound but also familiar to the public. The writing of specific regulations carrying out this legislation could then be assigned to an appropriate agency.

This leads me to the consideration of the second objective, namely to induce the customer to make a buying decision which is in his own best interest and particularly to avoid overbuying.

In testimony that we have presented earlier before the FTC, FEA, and the state of Florida, we described our own experience which had convinced us that using numbers to identify gasoline grades alone was counterproductive and confusing to the public. Beginning in 1958 with the adoption of the Custom Blending System, Sun Oil Company offered to the public as many as eight grades of gasoline ranging from a subregular at the low end to two super premiums on the high end. It was our intention then to permit the buying public to purchase fuel which would precisely meet the needs of his automobile. The grades were identified by numbers only (not octane numbers) and carried no name designation. At each pump island, there was prominently displayed a chart which listed for each make of car and each model year, the grade of gasoline which would best match the design specifications of the vehicle. Station attendants were urged and encouraged to explain the system to the customer and to show how by experiment he might match the appropriate fuel to the needs of his own automobile. After nearly ten years of experience with this system, we found through marketing surveys, that only about 51% of our own regular customers understood this system, and we had no way of measuring, of course, what the perception of non-Sunoco users might be. We found also that the choice by numbers only, to some degree intimidated some of our customers. We, therefore, added to the pump face under the appropriate grade number, the familiar names: Economy, Regular, Premium, and Super Premium. Market surveys taken after this change indicated that the level of understanding had risen from 51% to 73%, which we considered to be a significant improvement. We cannot say to you that we discovered any modification in the rather wide-spread tendency of the motorist to buy a higher octane rated fuel than this car really needed. This indicates to us that steps taken to make consumers more clearly understand what they are purchasing will not necessarily eliminate overbuying.

On the basis of this experience, however, we do suggest to you that a name classification system using that terminology most familiar to customers, such as regular grade, premium grade, etc., would better serve our purposes, provided that a minimum quality standard for each designated grade be established. The best basis for establishing the minimum quality for each grade would be "Road Octane". However, in view of the complexity and expense of establishing road

ratings for each grade of gasoline, we would propose as a compromise solution the establishment of a minimum quality for each gasoline grade using ASTM Specification for Gasoline (ASTM D439-74). Proposed terminology and grade levels for such a system would be:

| Grade:                      | ASTM antiknock index (min.) <sup>1</sup> |
|-----------------------------|--|
| Unleaded or subregular..... | 87.0                                     |
| Regular.....                | 89.0                                     |
| Super regular.....          | 91.5                                     |
| Premium.....                | 95.0                                     |
| Super premium.....          | 97.5                                     |

<sup>1</sup> (R+M)/2.

We proposed that the name appear on the pump and that an official explanation of the system would be available at the station. We believe that by using designations with familiar names rather than specific numbers, the danger of misleading the customer, the continuing confusion over rating methods, and the potential disagreements over the accuracy of posted numbers would be avoided. Such a system could be easily matched to the car owner's manual and would be readily adaptable to changes in auto engine requirements, either in the direction of Research octane orientation, Motor octane orientation, or any combination of the two. Further, if technical evidence should indicate that a downward revision in minimum quality should be desirable in the interest of conservation, as has recently been suggested, this change could be accommodated without requiring a change in the posting.

As a final comment, we believe that the administrative procedures discussed under Standards, Studies and Enforcement (Section 6) are unnecessary. Standard methods for measuring gasoline quality have been evolved over many years by ASTM and are universally accepted by both industry and government. The compatibility of gasoline with the automobile is already well understood, having been the subject of continued scrutiny by both the automobile and refining industries and U.S. Government agencies for many years. Regular, periodic quality surveys are already taken both by private industry and by the U.S. Energy Research and Development Administration which publishes semi-annual octane surveys of motor gasoline based on over three thousand samples of fuel sold in the United States. We do believe, however, that administrative steps should be taken to insure the proper posting and registration of octane quality, should posting be required.

In summary, we believe that the posting of (R+M)/2 Plus 4, which appears to be an effort only to return the posted number to the general range of what would have been Research octane numbers, is unlikely to achieve the objectives of the legislation. It is our strong belief that the public would be better served if grades of gasoline were identified by the names with which they are already familiar. Quality assurance would be based on the establishment of minimum specifications using (R+M)/2 which is an index already accepted by both industry and government.

Mr. Chairman, I would be pleased to answer any question.

Senator HARTKE. We're down to the last witness. Mr. William T. Cavanaugh, managing director of ASTM, Mr. Andrews, Mr. Krynitsky.

**STATEMENT OF WILLIAM T. CAVANAUGH, MANAGING DIRECTOR, AMERICAN SOCIETY FOR TESTING AND MATERIALS; ACCOMPANIED BY SYDNEY D. ANDREWS, DIRECTOR, DIVISION OF STANDARDS, FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES; AND JOHN KRYNITSKY**

Mr. CAVANAUGH. I have heard our name mentioned a few times this morning. I am managing director of the American Society for Testing and Materials. In the interest of time I will compress some of the statement we have here this morning. I did want him to hear what I was going to say next.

Mr. MERLIS. Why don't you proceed with something else and then when he is in here do it next?

Mr. CAVANAUGH. From long experience of appearing before congressional sessions of this sort I always come with a precis so it would be difficult to take anything out of here that would be less than important. Let me say this, I have with me Mr. Sydney D. Andrews, director of the division of standards, Florida Department of Agriculture and Consumer Services. Mr. Andrews is chairman of our committee D-2 on petroleum products and lubricants and is an authority on the subject before the committee this morning. John A. Krynitsky is director, office of technical operation, of the Defense Fuel Center. Dr. Krynitsky is chairman of committee D-2 technical division A on gasoline.

It is in the latter group, Tech "A," we call it affectionately, that the subject matter before this session this morning is actively discussed. You got back in time because the next line is important.

Dr. Krynitsky is responsible for the Federal Government, for the purchase or use in a multitude of vehicles of more gasoline than probably any other single person in the world. I am delighted that we have these two people with us this morning from our committee Tech "A."

The next part of our presentation is a description of ASTM and how it operates. I am with the core management of the society. D-2 since 1904—these people have not been involved since 1904—Mr. Andrews for 25 years and Dr. Krynitsky for 15 years, has been developing standards and related technical publications having important commercial and regulatory impact, it is—under ASTM's strict procedures—known as a "classified" committee. Without going into great detail, this means that in order to operate, the committee has to conform to ASTM's standards development procedures which provide, among other things, for a balance of interest within the committee, and for the adherence to the ASTM principles of due process, as the committee addresses itself to standards problems.

At the moment, the committee has jurisdiction, that is to say it is responsible, for over 342 standards and some very important related published materials.

Having provided this background, it is probably timely for me to say now that ASTM has no position on whether or not there ought to be an octane posting program, as envisioned by this legislation. This again is the result of ASTM's basic policy which is related in turn to its chartered purpose. With the exception of standards development methodologies as these may be included in legislation such as this, ASTM takes no position on matters of public policy. We have no mechanism to develop those. Further, the society has long felt that to enter contention on either side of public policy questions would derogate the prestige and credibility ASTM has developed in almost an 80-year period in the field to which it confines its activities—voluntary consensus standards.

I have given you a couple of examples of the consistency of this policy that society has. So the ASTM position on the matter of octane posting is the same. While we have no position on whether or not there ought to be such a program, we have, since the suggestion was first made, I believe by the FTC in 1971, been working in committee D-2

to develop the various methodologies that would be required if such a program were indeed inaugurated, either through legislation or in some other way.

The pertinent ASTM document to these discussions is D439-75, ASTM's standard specifications for automotive gasoline. I am somewhat apologetic concerning the quality of this copy, but the document, as are most other ASTM documents, is under constant revision as it is now. I thought it better to present a copy of the revised D439 than the immediately prior edition. I have copies of that which are far more legible if you want them.

Perhaps it would be appropriate for me to mention that his document is a very active one in use daily in many, many parts of the world in transactions involving automotive gasoline.

The formula  $(R+M)/2$  used in ASTM automotive gasoline specifications, D439, will identify the antiknock performance as technically sound. It is based on the average octane numbers determined by the research and motor methods which are, themselves, ASTM standard methods of test. A section of technical division "A" on gasoline committee D-2 has been assigned the specific responsibility of studying engine-fuel antiknock relationships. This section has concluded from its studies of technical data available on this subject that this average more nearly correlates the actual performance of today's gasolines in today's car population than any other combination of laboratory methods. This section is dedicated to keeping this value current and viable through continuous review and revision.

To add an arbitrary constant of "4" to the antiknock index simply to produce a fictitious number approximately equal to the research octane number formerly appropriate for designating the antiknock performance in earlier automotive engines, will only add to the confusion of motorists by giving them still another number to remember regarding antiknock performance. The arbitrary addition of the number 4 to the antiknock index assumes all gasolines have a sensitivity of 8, which is an erroneous assumption.

Senator HARTKE. On the sensitivity factor, is that a factor the public should know about?

Mr. KRYNITSKY. It's not important for the public to know about the sensitivity of the gasoline. What the public has to have is a minimum motor octane number and adequate R plus M over 2.

Senator HARTKE. Adequate what?

Mr. KRYNITSKY. R plus M over 2  $(R+M)/2$  average value.

Mr. CAVANAUGH. Some commercial gasolines available have sensitivity less than 5 while others have a sensitivity of more than 10. Also, this constant is invariable although it is already obvious to technical division "A" that the weighted effect of motor and research values will have to be varied as car engines change. Consequently, the relationship of these numbers must be flexible to retain the most accurate correlation possible.

Perhaps it would be a useful comment that from an overall ASTM point of view our long years of experience indicate that the specific technology in a fast moving field such a gasoline and its uses is better not included in legislation since legislation normally follows technological change rather slowly, if at all. Our suggestion would be that the definition of octane rating in this legislation be left to a method

to be determined by the administrator of the program in the Federal Energy Administration or in any successor agency as is defined in the legislation. In short, technical details are best left out of law.

One further and final formal comment. Section 6, line 24 includes the words "purity" and "content." Here again we have in D439 all the technology necessary to determine and control these quality considerations.

This concludes our formal statement, gentlemen. We would be delighted to respond to any questions you may have.

Senator HARTKE. Let me ask a technical question. Would it be possible in the interest of the consumer to establish minimum standards which would be applicable generally within five grades.

Mr. KRYNITSKY. It depends on how you establish these standards, Senator. To sit down today and write a specific set of standards say giving minimum R plus M over 2 and say this is a standard from now on would be a dangerous thing, because the requirements of cars change and so do the fuels that they use. We know—

Senator HARTKE. Let me ask you a question. That is not the question I'm driving at. It is possible to establish those minimum standards today.

Mr. KRYNITSKY. For today's car population it is possible.

Senator HARTKE. All you would have to do then is change it in relation to the new cars.

Mr. KRYNITSKY. You may have to have some new standards for new cars.

Senator HARTKE. Let me ask you on this. Taking the Sun Oil's position—

Mr. KRYNITSKY. Grades.

Senator HARTKE. If you did that, in addition to putting on and using the R plus M over 2, as he has in his testimony, for example, he had under the grade unleaded or subregular, the ASTM antiknock minimum of 87. If you put in parenthesis after that old 91 wouldn't that be a true statement?

Mr. KRYNITSKY. It wouldn't be a true statement. It would be approximately old 91.

Senator HARTKE. Somebody here said this morning that that was a difference that didn't really make that much difference.

Mr. KRYNITSKY. If you said approximately old 91 that would be correct. It could be old 90, old 92, depending on the sensitivity of the fuel.

Mr. ANDREWS. It doesn't designate a significant difference. The arbitrary figure of four doesn't say anything. It puts us back to some point in time where there is a myth existing that a vast number of motorists know about the research octane number, and if you gave them this information, they could use it intelligently.

Senator HARTKE. I've a Volkswagen manual. It says fuel and lubricants. It is for 1970 models. I have a 1970 Volkswagen, and it says your Volks will run satisfactorily on regular fuels that fulfill the octane requirement of the engine (91 octane). It has more statements then. Then you look back over here and if I use the R plus M over 2, I get what is the equivalent—I buy what is 91 under R plus M over 2, I would get super-regular, which is roughly the old 95, right?

Mr. ANDREWS. In the first place, Senator—

Senator HARTKE. That is the problem.

Mr. ANDREWS. You are reading from a 1971 manual. There have been many cars produced since 1971 that have additional better information available. Those in the 1970 model have to get with the new technology and learn what is applicable by the new technology or their purposes.

Senator HARTKE. I don't disagree with that. It is like going to the metric system, if you change over. That is something which is going to cause a lot of trouble in this country, they tell me. If we are going to change you are going to have to give them both of them. You know, I know that you know the difference between a kilometer and a mile, but you explain that to—

Mr. ANDREWS. And I can hardly wait to respond to that, Senator, because less than 4 weeks ago I sat at this table before another subcommittee testifying on behalf of the metric bill. I'm delighted that you mention the metric system, because it gives me a chance to say that the arbitrary addition of the four to the antiknock position of gasoline is the same as arbitrarily adding 3.37 inches to our present yard and continue to call it a yard, after we adopt the metric system.

Senator HARTKE. It does, in my judgment, say if you are going to go out on the highway and I don't know who made the decision, but I think it is a pretty good idea, and I compliment whatever bureaucrat did this—that is that it says on there some of these roads, Evansville which is a noble city, where I was mayor. So many miles, so many kilometers. There is nothing wrong with that. You will have to have an education system. That is what we are talking about here. That is not really what we are talking about to me. As far as that consumer, I'm not interested as much—I will have to change that statement, because the press would misinterpret that. I'm interested in his education. I'm far more interested in him saving and not spending money which he doesn't need to spend and in order to keep him from spending the money he doesn't need to spend, we will have to have an education process along with what I think was a very good recommendation from the Sun Oil Co. people.

Mr. ANDREWS. Senator, I couldn't agree with you more. Most of the testimony I presented here 2 weeks ago was on the theme of we must have an educational program, if the metric system will be successful. At the risk of being cited for contempt of Congress, the correct pronunciation is kil-o-meter. It must be pronounced kilo to indicate 1,000 meters and not kil-om-e-ters.

Senator HARTKE. English corrupted the German.

I think I understand your testimony very well. What you are saying is you are not going to take a position on whether or not you should have the legislation. But you say there are standards which should be applied and they should be ones understood by the public.

Mr. CAVANAUGH. That is correct.

Senator HARTKE. You feel it is possible to come in with minimum standards in this field?

Mr. CAVANAUGH. The technology on which you have to base that is in place.

Mr. ANDREWS. The system is already here. You have heard it discussed this morning.

Senator HARTKE. All we have to do is put it in effect.

Mr. ANDREWS. My managing director has criticized me now. I will take off my hat now as chairman of the committee D-2 and speak as the director of standards in Florida. Maryland is Johnny-come-lately in this program, because we have been in it since 1919. We have been making octane number determinations since 1937. We have been involved in this type of program. We have for years advocated the adoption of a posting system to declare the octane value of gasoline for the benefit of motorists and at the point of sale. This is all in place. Years ago the ASTM, SAE, and at that time the API got together and developed a fine system for identifying an antiknock level of gasoline and displaying them for the benefit of motorists.

Senator HARTKE. What happened to it?

Mr. ANDREWS. Shortly after the system was put in final form and published by the ASTM as a technical publication and by the SAE as a recommended practice, the automotive industry started in 1973 using this symbol system in their owner's manual to identify the antiknock level of gasoline that should be used in that automobile, at least as a suggestion of what you should try in it to start with.

Regretfully, the API withdrew their support from the system and the petroleum industry never adopted it on a voluntary basis. Several companies did. In the State of Florida after it became obvious it would not be adopted on a voluntary basis, we promulgated a regulation requiring this.

Senator HARTKE. If I were API listening to the committee today, I would try to figure out how to get in there and work this thing out, so it will be something they would like to work with. Say, look, something is coming and we better get in and see that it is in the best interests of the public and one which will work rather than have the complaints afterward about how the Congress and bureaucrats mess it up.

Mr. ANDREWS. I have been pleased to see two of the major manufacturers of gasoline endorse a grading system identical to the technology of the symbol system. The Texaco representative endorsed the symbol system by saying, using number designations, 1 through 6. Here is one of the original symbols.

Senator HARTKE. I hear that. That has problems in it. Now on the numbering system, the numbering system you use, I have here an Amoco chart. Do you have an Amoco chart? If you have an owner's manual that says purchase 96 research RON gasoline which ASTM grade symbols would be appropriate, above what number should the R plus M over 2 number be?

Mr. ANDREWS. You have to know the motor octane number, because the antiknock index is based on the average of the motor and research number. You can't tell by knowing one.

Senator HARTKE. That is what the manual says.

Mr. ANDREWS. To give you the research number only does not give you reliable information.

Senator HARTKE. You are saying those manuals for all intents and purposes, whether you are right or wrong, what you are saying is that the manuals are wrong.

Mr. ANDREWS. No, and I'm glad you asked that because you asked that question of other witnesses. I'm not here to defend the automotive

companies. They have put several different means of selecting the fuel for that engine, because there is no unanimity in the system by which the motorists can make this determination. In an effort to give them any system they might find, here is a key you can use for that system.

Senator HARTKE. This is out of a GM manual. It says according to what they sent us that it is out of the 1971-75 GM cars. Let me give you this question: your Buick engine is designed to operate only on unleaded gasoline of at least 91 research octane?

Mr. ANDREWS. That would be 1975 model only. You are not talking about 1971 models. Not when you talk about operating only on unleaded gasoline.

Senator HARTKE. I accept your correction of the memorandum from General Motors.

This is what it says. Let's assume it says on 1975 models for the moment. My problem with your rating system is this: I have my manual. It says your Buick engine is designed to operate only on unleaded gasoline of at least 91 research octane. I go back here to your chart of at least 91. The nearest thing I can do is go to what is a typical research octane number of 92. Or the antiknock index—I get to No. 2. Now then it says the use of leaded gasoline can damage or severely reduce the effectiveness of the emission control, and then says the loss of your warranty.

I go back to 2 and go back to Amoco 92 and it says it is leaded.

Mr. ANDREWS. I have no reply for that, Senator, because I seriously question the correctness of that statement you are reading there, even though, as you say, it was presented by the company themselves. There is no justification for a statement saying that an engine needs only unleaded gasoline, unless it happens to be an engine equipped with a catalytic converter.

They had not come on the engines, that piece of equipment until 1975.

Senator HARTKE. What do I use in the 1973 Opel?

Mr. ANDREWS. Unless they gave you information in there regarding the antiknock index, then you would have to—

Senator HARTKE. Gasoline recommendation, use unleaded or low-lead fuel of 91 research octane number.

How would I do that?

Mr. ANDREWS. The way to bridge the gap between that manual and the current system would be to have additional information.

Senator HARTKE. I hear you clearly and I understand what you have to do.

Mr. ANDREWS. We have been in this business a long time. We have tried our best to help the public because that is our primary function. We even have the name Consumer Services.

One of the reasons we favored the symbol system was because of its simplicity. In my humble opinion, Senator, in 42 years of dealing with the motoring public, if you do not keep it simple they would not use it or understand it.

If they don't understand it, they will not learn it. The symbol system has that appeal, 1 through 6, and you rarely see anything but 2 through 5. A small educational program should educate the customer. You have to educate them.

In all the years I have been in this business, I have never met anyone born with a knowledge of octane numbers or antiknock values. You have to learn. Education is the key to that.

The fine pamphlet that the people from Maryland showed you is an example of what a public agency can do to help the citizens narrow that gap.

I hasten to say, the man who drew up the pamphlet admits he stole most of the information from a pamphlet I wrote in the State of Florida when we went to the simple system.

Somewhere you have to give the information to the motorist if he is to use it successfully.

Let me give you my reasons for not favoring the name system as advocated by the Sun Oil Co. and others. It perpetuates, in my opinion, a misleading of the public that actually can lead to overbuying.

That is what I mean.

By the use of the word "premium," you are inferring that it is a better quality gasoline than one that is identified as "regular."

I think most people will agree to that when in fact in many cases the gasoline quality is either similar or identical, and only the antiknock level is different.

May I pause at this moment to emphasize strongly one consideration, Senator? That is when we are talking about antiknock level we are not talking about quality. We are talking about the antiknock requirement of a vehicle that must be satisfied and in order to do that, you must have a gasoline of high enough antiknock value or antiknock level to meet that satisfaction.

I was interested in the early part of testimony with what you said about beef grading. My boss is an old farm boy. The only way I sold him on the symbol system was relating it to the grading of beef.

It is a grading, but not necessarily quality. You can still have quality within grades. You can have the finest quality and still have low octane or low antiknock.

May I give an analogy?

If you went to the shoe store to buy a pair of shoes, you would be interested in having the best quality you could afford. You would want nice uppers that were soft and comfortable, yet take a good shine. You would want them durable. You would want a good structured di-sole, so you could walk around and not be having to replace them frequently. You would not want the sole so stiff that you had difficulty walking. You would want a good heel. You would want it resilient enough that when you came down hard, it wouldn't jar your brains.

That is overall quality.

If that salesman sold you a size 8 and your foot was a size 9, he hasn't done you one bit of good. You have not satisfied the requirements of your foot.

The same is true of an automobile engine. You can have the finest quality gasoline that the manufacturers can produce, and unless it is at a high enough antiknock level to satisfy that requirement of your vehicle, you have not got the right gasoline for your vehicle.

You will knock and lose power. If you knock severely long enough, you will damage your engine.

Let's understand that we are separating overall quality from antiknock level. The overall quality is already protected by the basic ASTM specifications. You can't sell poor quality gasoline in the State

of Florida because we have minimum specifications covering corrosion, volatility, et cetera.

In addition to that, you must have the antiknock level necessary to satisfy the requirements of your engine and unless somebody tells you what it is, how are you going to know?

Would you buy shoes from a shoe store that didn't put numbers on the boxes?

Senator HARTKE. I hear you. I appreciate that.

I just want to give Consumers Union a pat on the back because in their issue for May 1936, vol. 1, No. 1, they make some of these same points.

It says if your car is older than 1931, use the cheapest gasoline you can find.

I want to point out if you had it today, you could afford to use the most expensive because that car would be worth money.

Mr. ANDREWS. I hate to admit I am that old. As a charter subscriber to Consumers Union, I gave them the information on which that was based.

[The statement follows:]

STATEMENT OF WILLIAM T. CAVANAUGH, MANAGING DIRECTOR, ASTM

Mr. Chairman and members of the subcommittee: I am William T. Cavanaugh, Managing Director of the American Society for Testing and Materials (ASTM), a nonprofit corporation organized according to the laws of the Commonwealth of Pennsylvania for the "development of standards on characteristics and performance of materials, products, systems, and services; and the promotion of related knowledge."<sup>1</sup>

I have with me this morning Mr. Sydney D. Andrews, Director of the Division of Standards, Florida Department of Agriculture and Consumer Services, who is the Chairman of Committee D-2 on Petroleum Products and Lubricants; and Dr. John A. Krynitsky, Director, Office of Technical Operations, Defense Fuel Supply Center who is chairman of Committee D-2's Technical Division "A" on Gasoline. It is in the latter group, Tech "A," that the specific problem to which the subcommittee addresses itself in these hearings has been studied and deliberated upon.

In order properly to comment on the proposed legislation which is the subject of this hearing, I need, first, to say a thing or two about ASTM itself and then about Committee D-2 on Petroleum Products and Lubricants. As I proceed, it would be helpful to all of us if we could think of ASTM in the shape of a solar system with 126 main technical committees in orbit around the central management core. This concept is important because it emphasizes the Society's main role in life—the development of voluntary consensus standards—and also the fact that the technical expertise in any area to which the Society addresses itself is located—not in the central administrative management core—but in one or the other, or perhaps in several, of its technical groups. ASTM Committee D-2 on Petroleum Products and Lubricants is one of these groups.

The main function of the core management organization is to ensure understanding and adherence to ASTM's procedures in standards development. It also provides various administrative and management services which are so essential in a management system for the development of consensus standards.

Since the technical area assigned to Committee D-2 is so large, the committee itself is organized into a main committee, then is subdivided into technical divisions on matters such as gasoline, automotive lubricants, fuel oil, jet fuels, etc., and then further subdivided into sections and task groups. The total membership of Committee D-2 at the moment and of its subdivisions is about 1400. It is probably appropriate for me to add that it is without question the most impressive collection of technical expertise across the broad spectrum of petroleum use, organized as an ongoing entity, anywhere in the world.

Since Committee D-2 has for many, many years—since 1904—been developing standards and related technical publications having very important commercial

<sup>1</sup> ASTM charter.

and regulatory impact, it is—under ASTM's strict procedures—known as a "classified" committee. Without going into great detail, this means that in order to operate, the committee has to conform to ASTM's standards development procedures which provide, among other things, for a balance of interest within the committee, and for the adherence to the ASTM principles of due process, as the committee addresses itself to standards problems.

At the moment, the committee has jurisdiction, that is to say it is responsible, for over 342 standards and some very important related published materials. I have with me this morning a copy of each of the principal results of the committee's work, in the area of gasoline description and specification.

The scope of Committee D-2 is as follows :

"The promotion of knowledge of petroleum, of petroleum products (including products derived in part from petroleum), of aliphatic, olefinic, naphthenic, and aromatic hydrocarbons and hydrocarbon products, and of lubricants, and the recommendation of standards pertinent to these materials."

Under ASTM procedures, this scope describes the field of technical activity within which the committee has been authorized by the ASTM Board of Directors to work. The scope of Technical Division "A" on Gasoline is :

"Specifications, methods of test, and nomenclature for motor gasoline." This scope in turn was approved by the main committee of D-2.

I have with me a current listing of the membership of Technical Division "A" which I would be pleased to make available to the subcommittee.

Having provided this background, it is probably timely for me to say now that ASTM has no position on whether or not there ought to be an Octane Posting Program, as envisioned by this legislation. This again is the result of ASTM's basic policy which is related in turn to its chartered purpose. With the exception of standards development methodologies as these may be included in legislation such as this, ASTM takes no position on matters of public policy. We simply do not have a mechanism of any kind within the Society to develop these kinds of positions. Further, the society has long felt that to enter contention on either side of public policy questions would derogate the prestige and credibility ASTM has developed in almost an 80-year period in the field to which it confines its activities—voluntary consensus standards.

Just to indicate the consistency of this policy, let me provide for you, briefly, an example or two of recent date.

ASTM has no position on whether or not there needs to be a Consumer Product Safety Commission. Since the inception of the Commission several years ago, however, ASTM's management system for standards development has been used by various interested parties, including the Consumer Product Safety Commission itself, to produce product safety standards in numbers greater than all other organizations in the United States put together.

ASTM has no position on whether or not there ought to be a medical devices bill, as is under consideration now in the Congress. We were, however, pleased at the request of the Honorable Paul G. Rogers, chairman of the House Subcommittee on Health and the Environment, Committee on Interstate and Foreign Commerce, to appear recently before his subcommittee jointly with the American National Standards Institute to comment on the standards aspects of H.R. 5545, "Medical Devices Amendments of 1975." We felt that our experience in dealing with a similar situation under the Consumer Product Safety Act provided us with knowledge that would be useful to the committee. It turned out that we were correct.

So ASTM's position on the matter of octane posting is the same. While we have no position on whether or not there ought to be such a program, we have, since the suggestion was first made, I believe by the Federal Trade Commission in 1971, been working in Committee D-2 to develop the various methodologies that would be required if such a program were indeed inaugurated, either through legislation or in some other way.

We are here in response to your invitation to provide the committee with the results, thus far, of the technical deliberations in Committee D-2.

The subject at hand is, of course, extremely complex technically. That is the reason I have with me the gentlemen I earlier introduced. Mr. Andrews has been active in Committee D-2 for 25 years. He has long been associated with weights and measures, and consumer related activities in the state of Florida. He is here today as chairman of ASTM Committee D-2. Dr. Krynitisky has been active in Committee D-2 since 1964 and has been chairman of Technical Division "A" on Gasoline since 1974. I am certain that together they can respond very construc-

tively to the detailed questions you may have concerning the technology of gasoline and its implications for the proposed Octane Posting Program.

The pertinent ASTM document to these discussions is D439-75, ASTM's Standard Specifications for Automotive Gasoline. I am somewhat apologetic concerning the quality of this copy, but the document, as are most other ASTM documents, is under constant revision as it is now. I thought it better to present a copy of the revised D439 than the immediately prior edition. I have copies of that which are far more legible if you want them. Incidentally, the current revision lowers the lead content to conform to the EPA regulatory limits. It also provides precision data for the R+M/2 octane parameter.

Perhaps it would be appropriate for me to mention that this document is a very active one in use daily in many, many parts of the world in transactions involving automotive gasoline. Also it is widely used by federal agencies, including the Environmental Protection Agency. It is referenced in military specifications on gasoline, VV-G-76B, and VV-G-001690A (for unleaded and low lead).

The formula R+M/2 used in ASTM automotive gasoline specifications, D439, will identify the anti-knock performance as technically sound. It is based on the average of octane numbers determined by the research and motor methods which are, themselves, ASTM standard methods of test. A Section of Technical Division "A" on Gasoline in Committee D-2 has been assigned the specific responsibility of studying engine-fuel anti-knock relationships. This Section has concluded from its studies of technical data available on this subject that this average more nearly correlates the actual performance of today's gasolines in today's car population than any other combination of laboratory methods. This Section is dedicated to keeping this value current and viable through continuous review and revision.

To add an arbitrary constant of "4" to the anti-knock index simply to produce a fictitious number approximately equal to the research octane number formerly appropriate for designating the anti-knock performance in earlier automotive engines, will only add to the confusion of motorists by giving them still another number to remember regarding anti-knock performance. The arbitrary addition of the number 4 to the anti-knock index assumes all gasolines have a sensitivity of 8 which is an erroneous assumption. Some commercial gasolines available have sensitivity less than 5 while others have a sensitivity of more than 10. Also, this constant is invariable although it is already obvious to Technical Division "A" that the weighted effect of motor and research values will have to be varied as car engines change. Consequently, the relationship of these numbers must be flexible to retain the most accurate correlation possible.

Perhaps it would be a useful comment that from an overall ASTM point of view our long years of experience indicate that the specific technology in a fast moving field such as gasoline and its uses is better not included in legislation since legislation normally follows technological change rather slowly, if at all. Our suggestion would be that the definition of octane rating in this legislation be left to a method to be determined by the administrator of the program in the Federal Energy Administration or in any successor agency as is defined in the legislation. In short, technical details are best left out of law.

One further and final formal comment. Section 6, line 24 includes the words "purity" and "content." Here again we have in D439 all the technology necessary to determine and control these quality considerations.

This concludes our formal statement, gentlemen. We would be delighted to respond to any questions you may have.

[The following information was subsequently received for the record:]

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES,  
Tallahassee, Fla. October 31, 1975.

HON. WARREN G. MAGNUSON,  
Chairman, Committee on Commerce, U.S. Senate,  
Washington, D.C.

DEAR SENATOR MAGNUSON: In response to the request in your letter of October 14, it was my pleasure to appear before the Consumer Subcommittee of the Committee on Commerce during the hearings on S. 1508 on October 29. I was there in my capacity as Chairman of Committee D-2 on Petroleum Products and Lubricants to answer any technical questions following the testimony presented by Mr. William T. Cavanaugh, Managing Director of ASTM. I hope my responses to questions for Chairman Hartke were of some value.

Following these questions I requested of Senator Hartke, and was granted, permission to offer some views on the subject matter of S. 1508 in my capacity as Director of the Division of Standards of the Florida Department of Agriculture and Consumer Services. In addition to the remarks I made, and answers I gave to Senator Hartke's questions following these remarks, I would appreciate the enclosed statement entered into the record if such is permissible. I am not familiar with the rules under which your committee hearings operate, and if I am asking for something which cannot be allowed please discard this material and except my thanks for the opportunity afforded me to make oral comments.

Sincerely,

SYDNEY D. ANDREWS,  
*Director, Division of Standards.*

Enclosure.

STATEMENT OF SYDNEY D. ANDREWS, DIRECTOR, DIVISION OF STANDARDS, FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES AND CHAIRMAN, ASTM COMMITTEE D-2 ON PETROLEUM PRODUCTS AND LUBRICANTS

I, Sydney D. Andrews, appreciate the invitation to appear before the Committee as Chairman of Committee D-2 on Petroleum Products and Lubricants of the American Society for Testing and Materials to answer technical questions which may be asked of Mr. William T. Cavanaugh, Managing Director of ASTM at the conclusion of his prepared testimony regarding the society and their views on S. 1508 which is being considered.

In addition to answering questions in my capacity as Chairman of Committee D-2, I would appreciate the opportunity to submit some testimony on this bill as Director of the Division of Standards of the Florida Department of Agriculture and Consumer Services.

The State of Florida has had a petroleum inspection program for the benefit of consumers since 1919. One of the bureaus under our division of standards is the bureau of petroleum inspection. We have constantly improved our petroleum inspection program over the years to keep pace with improved technology, both in the petroleum industry and the industries manufacturing equipment which uses petroleum products. We are proud to be an acknowledged leader in this field.

Our standards and specifications, as well as the test methods used for checking compliance, are those of ASTM in their latest versions. Our standard for automotive gasoline is ASTM D-439 and includes an antiknock index requirement currently based on the average of octane numbers determined by both the ASTM research and motor methods (R+M/2). This antiknock index requirement is recognized by ASTM as the combination of motor and research octane number determinations which more nearly correlate with the average road octane requirements of the present car population.

Since we in Florida have for many years provided petroleum inspection and information for the benefit of consumers, we support the basic purpose of S. 1508 which is to assist consumers in avoiding the purchase of automotive gasoline with octane ratings unnecessarily high for the proper operation of their automobiles. However, we strongly disagree with section 3(6) which defines the term "octane rating" as meaning half the sum of research octane number plus motor octane number *plus four*.

The arbitrary addition of the number 4 to the ASTM antiknock index has no technical basis, and would only further confuse motorists by adding still another number to be used in describing antiknock performance. We have been told that the purpose of adding the number 4 to the AKI is to produce a number approximately equal to the research octane number with which motorists were familiar, even though RON no longer correlates well with road octane number.

This arbitrary addition of 4 to the antiknock index of gasoline makes no more sense than arbitrarily adding 3.37 inches to our current measurement of 1 yard, and continuing to call it a yard instead of a metre, even after this country converts to the metric system of measurements, simply because many people are still more familiar with a yard, and what it represents, than they are with a metre.

Actually, this fictitious number would only perpetuate the myth that the vast majority of motorists in this country know all about research octane numbers, and could use them intelligently if they were displayed. Based on my many years

of experience in Florida working closely with motorists, as well as service station personnel (owners and managers as well as operators), I have found that very little is known about octane numbers of any kind, and what little is known is generally incorrect.

Although I believe it was true in the past, I question whether "overbuying" is a serious problem in this country today. Owner's manuals in cars beginning with 1971 models have advised motorists to buy "regular" gasoline, and most who have found it satisfied their engines. Also, the dramatic increase in the price of gasoline which began in late 1973 has caused many motorists who formerly used so-called "premium" gasoline to switch to "regular", and find that it operates knock-free in their vehicles. These two factors have contributed greatly to reducing the "overbuying" that once existed.

The yearly percentage of "premium" sales in this country, as compared to all automotive gasoline sales, have been declining since reaching a peak of 41.9 percent in 1970. In 1974 they were down to 24.5 percent, and the percentage has continued to drop each month in 1975. This percentage now very nearly approximates the percentage estimates of cars on the road which actually require "premium" gasoline.

I have long been an advocate of the automotive and petroleum industries adopting a technically sound, easily understood system that would be beneficial to motorists. I feel the system should be used by engine manufacturers to recommend the proper antiknock gasoline for their vehicles, and by the petroleum industry at the point of sale to identify the antiknock level of fuels available. This would not be unique. The two industries, through cooperative effort, years ago devised a system for classifying and identifying the viscosity of engine oils that has served both industries well, and has been very beneficial to motorists.

This paved the way for the two industries to get together and develop a system for identifying quality considerations. This system has also been very beneficial, and is constantly being improved. Speaking of a system for identifying quality, ASTM standard D-439 has quality standards as well as antiknock designations, and if these requirements are specified a good quality gasoline is assured anywhere in the country, at any time of the year. However, I would like to emphasize that the antiknock level does not indicate quality, per se. It is possible to have gasoline with a high antiknock value but of poor quality. Conversely, some high quality gasoline is low in antiknock performance.

Actually, antiknock designations are more relatable to size identifications. They help the motorists get the right "fit"—a gasoline that will satisfy the antiknock requirements of their vehicles, without "overbuying"—for antiknock value above that required to meet the needs of an engine is of no benefit to the motorist.

I further feel the success of any posting scheme designed to help motorists will depend entirely on an educational program to teach them how to use it—not on the hope that they already possess such knowledge, or remember even if they once had it. In my 42 years of petroleum regulatory work I have yet to meet anyone born with knowledge about octane numbers, or antiknock performance. Everyone must be taught, and if we expect them to learn we must adopt a system simple enough that they can understand, logical enough that they can remember how to use, and technically sound so that it will actually be beneficial to them.

Such a system is available. Several years ago ASTM, the Society of Automotive Engineers and the American Petroleum Institute jointly began the development of the "Automotive Gasoline Performance and Information System." Ultimately, it was to identify four considerations that are important to motorists in selecting a satisfactory fuel for their vehicles. The system used a simple, easily understood symbol to identify these factors.

The antiknock designation, and lead content designation, were developed and incorporated into the symbol as a beginning, with cleanliness and driveability to be added when methodology was developed to quantify them. ASTM issued special technical publication 510 on this system, and SAE published it as recommended practice J282. Beginning with 1973 models the system was widely used by the automotive industry in their owner's manuals for making fuel recommendations. Regrettably, API withdrew their support from the system and it was never extensively used by the petroleum industry, but a few gasoline companies adopted it on a voluntary basis.

In my opinion, this system, although not perfect, has more merit than any yet devised for helping motorists purchase the proper antiknock level of gasoline to satisfy the requirements of their engines. Its limited use in those areas where it has been utilized proves it can be effective, especially if an educational program is conducted to teach motorists how to use it. It still has a commitment from both ASTM and SAE to keep it current and viable. If this committee feels there should be antiknock posting throughout the country I hope consideration will be given to adopting the "symbol system," but whatever system is adopted, I urge you to require it to be technically sound and based on the antiknock index specified in ASTM standard D-439.

Senator HARTKE. These hearings are adjourned.  
[Whereupon, at 1:10 p.m., the hearing was adjourned.]

## ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

### STATEMENT OF GENERAL MOTORS CORPORATION

General Motors appreciates the opportunity to submit comments on S. 1508, the Consumer Fuel Disclosure Act of 1975. These comments are primarily addressed to Section 2(6) which defines the formula for calculating fuel octane rating. We hope our comments will be helpful in developing a system for octane rating which will serve consumers better than the formula prescribed in S. 1508.

#### SECTION 2(6)—OCTANE RATING

We believe the most feasible system of expressing octane rating is the SAE-ASTM index which was developed jointly by the Society of Automotive Engineers (SAE) and the American Society for Testing and Material (ASTM).

Briefly stated, this SAE-ASTM index provides a symbol method for identifying the four gasoline performances requirements considered the most important to the consumer. They are: (1) Antiknock performance, (2) compatibility with emission control system, (3) induction system cleanliness, and (4) driveability performance.

The method employs a round symbol to identify the gasoline characteristics. At the present time, the symbol consists of two elements: a single digit number 1 through 5 that identifies antiknock performance and the word "unleaded" or "leaded" which relates to compatibility with emission control systems. For example, a "2" in the center of the symbol means the gasoline meets the antiknock needs of most 1971 and newer model cars. The SAE and ASTM are working on developing suitable performance tests for the other two gasoline performance requirements. Attachment A contains detailed information about the SAE-ASTM index.

GM believes the SAE-ASTM index is superior to both the averaging method, particularly when a constant is added in, and the RON method for several reasons. The reasons are:

(1) Each gasoline pump and each car owners manual would exhibit one, single digit number which the consumer can quickly and easily recognize as identifying the correct gasoline for his car.

(2) The single digit number will be the same for a particular car regardless of the altitude at which the gasoline is marketed. With either the averaging or the RON methods, gasoline sold at locations in high altitudes will be labeled with a lower number than gasoline sold at low altitudes, although both gasolines will perform adequately in the same car when it is operated at the altitude at which the gasoline is sold. The owner benefits because the gasoline is manufactured to be compatible with the single digit number. The customer need only concern himself with buying gasoline with the one symbol.

(3) The single digit number will remain the same regardless of changes in the relative importance of the Research Octane Number and Motor Octane Number to the octane requirements of cars on the road. The single digit number is designed to relate to car octane requirements, while the Research and Motor Numbers are derived from laboratory test engines. At present, the averaging method gives the best correlation with car octane requirements for the current car population, but there is no guaranty this will continue to be the best correlation for future car populations. Again, it is better to keep the single digit constant and change the gasoline formulation to comply with it than to advise owners to change to another gasoline.

(4) The method was developed and will be monitored by technical experts. This ensures that the method is, and will continue to be, technically correct.

(5) The SAE-ASTM method has the built-in capability to encompass additional gasoline performance features of interest and value to the customer.

General Motors has urged that the SAE-ASTM method be adopted for FEA for its octane posting requirement. We also urge that the Senate Commerce Committee adopt the SAE-ASTM system as the definition of octane rating in S. 1508.

## SECTION 4(B)—MANUFACTURER RESPONSIBILITY TO SUPPLY OCTANE INFORMATION

A literal reading of Section 4(b) would indicate that the manufacturer of an automobile, whether that automobile was new or used at the time it is sold to a consumer, must supply that consumer with octane rating information. This is patently impossible for the manufacturer to do. With respect to used car sales, the manufacturer would normally not even be aware that the sale took place or the identity of the new owner. Even for new car sales reported to the manufacturer by his authorized dealers, the report of sale is made after the sale is completed and after the new car is delivered to the consumer.

A manufacturer should only be required to furnish octane information on new automobiles to his authorized dealers with instructions that the information be furnished to the consumer who buys the automobile from the independent dealer. An appropriate manner in which this suggestion could be accomplished is to amend Section 4(b) to read as follows: "No new automobile manufactured after the effective date of this section and which has been shipped in interstate commerce shall be sold or offered for sale to a consumer unless the manufacturer of such auto has provided written instructions to the dealer stating the octane or octanes of gasoline appropriate for use in the engine of such automobile. No dealer shall sell such automobile to a consumer without providing the aforesaid written information to such consumer."

## SECTION 5(A)—CRIMINAL PENALTIES

The penalties provided in Section 5(a) are criminal penalties. These criminal penalties purport to apply both to violations of provisions of the Act itself and of "... any regulation promulgated pursuant to ..." the applicable section. Criminal penalties are inappropriate and far too harsh for the subject being regulated under this proposed bill. Moreover, the imposition of criminal penalties for violation of Administrative regulations which are developed by a federal agency and not by Congress itself is an unwise and impermissible delegation by Congress of criminal lawmaking authority.

## SECTION 5(B)—RULEMAKING

With respect to Section 5(b), the provision assumes that the Federal Energy Administration will promulgate rules which, in substance, will be the equivalent of trade regulation rules that define what is an unfair or deceptive practice under the Federal Trade Commission Act. To this extent, there would be a transfer of authority for promulgating trade regulation rules from the Federal Trade Commission to the Federal Energy Administration. General Motors suggests that it is unwise to fragment the trade regulation rulemaking authority in this manner.

The Federal Trade Commission has developed expertise in the area of trade regulation over many years. The recent Magnuson-Moss amendments to the Federal Trade Commission Act recognize this expertise and set forth a comprehensive procedure to be followed by the Federal Trade Commission in promulgating trade regulation rules that will complement the general proscriptions of Section 5(a) (1) of the Federal Trade Commission Act. The procedure under the Magnuson-Moss amendments is designed to assure consideration during the rulemaking process of all relevant factors, provide for participation by all interested persons and provide for judicial review of the procedure and of the trade regulation rule itself.

It is, therefore, unnecessary to grant specific trade regulation rulemaking authority to another agency that does not have the same expertise in trade regulation matters. It may very well be improper to place such unique responsibility in a separate federal agency that is not primarily involved in the area of "unfair or deceptive" trade practices. Accordingly, we recommend that Section 5(b) be deleted.

## OTHER AMENDMENTS

Section 5(a)(4) should also be amended at lines 14 and 15 to substitute the phrase "by an authorized dealer of the manufacturer of the automobile" for the phrase "by a person other than the manufacturer." This amendment complements the suggested amendment above to Section 4(b). Finally, the amount of any civil penalty imposed under a revised Section 5(a)(4) should treat both groups of sellers of new automobiles equally.

PUBLIC INTEREST CAMPAIGN,  
*Bethesda, Md.*

Today Federal Energy Office (FEO) Administrator, William E. Simon, was petitioned to amend the gasoline octane posting regulations to correct the new octane numbers on pump labels which were found "confusing to consumers." The petitioning citizen organization, the Public Interest Campaign, submitted a detailed report which found present federal octane regulations contributing to overbuying.

Octane overbuying (purchasing gasoline of a higher octane grade than required by the car's engine) is occurring with over forty percent of the gasoline sold, according to the report. This amount of overbuying results in the waste of the equivalent of 1 million gallons of gasoline per day, the wasteful expenditure of over 1 billion dollars per year by consumers, and the unnecessary emission from automobile tailpipes of 405,000 pounds of lead per day in the form of trillions of tiny particles of toxic air pollutants.

The present Federal octane posting regulations which have been in effect since September 1973, require the posting of an octane number determined by a new formula proposed to the government by Texaco, Inc. The new formula averages two different octane rating systems—the research octane number and the motor octane number. The new posted number is generally 4 numbers lower than the research number which has commonly been used for years in articles, advertising, and automobile owner's manuals. Consumers accustomed to associating premium grade gasoline with 100 octane (research), regular with 94 octane, and economy grade with 91 octane are now faced with gasoline pump stickers rating premium as 96 octane, regular as 90 octane and economy as 87 octane.

Consumers following their owner's manual instructions to purchase "at least 91 research octane gasoline," thus find only premium grade with at least a 91 rating at the gas station. The result often is the purchase of premium grade when regular or economy grade is actually required.

According to the Campaign's report, consumer confusion over gasoline octane ratings is resulting in an aggravation of the energy crisis, the cost of living crisis, the air pollution crisis, and the confidence in government crisis.

The Campaign has petitioned Administrator Simon to propose and promulgate an amendment to the federal octane posting regulations to simply add 4 octane numbers to the posted numbers to minimize and avoid consumers confusion, waste of energy, waste of consumer dollars and pollution of the air presently occurring. Campaign president, Louis V. Lombardo, stated that "The government should not continue to be a party to an arrangement which is helping to mislead 40 percent of the nation's motorists into buying more octane than they need."

The complete technical report is available for \$85 from the Public Interest Campaign, 9711 MacArthur Blvd., Bethesda, Maryland 20034.

BEFORE THE UNITED STATES DEPARTMENT OF THE TREASURY, FEDERAL ENERGY  
OFFICE

PETITION FOR RULEMAKING PROCEEDING AND ISSUANCE OF RULES BY THE ADMINISTRATOR, FEDERAL ENERGY OFFICE, SUBMITTED BY THE PUBLIC INTEREST CAMPAIGN, INC., AND LOUIS V. LOMBARDO

## PETITION

1. This is a petition pursuant to the Administrative Procedures Act 5 U.S.C. § 1003 requesting the Administrator, Federal Energy Office to propose and ultimately promulgate a gasoline octane posting regulation based on a formula for the determination of octane numbers which will not tend to confuse and mislead motorists into overbuying gasoline octane. Petitioners contend that this action is justified administratively to mitigate the energy crisis, to protect the public health and welfare from excessive emissions from overbought gasoline, to protect the consumer from unnecessary expense and inflation of the cost of living, and to restore confidence in the ability of governmental administrative processes to act in the public interest.

## I. STATEMENT AS TO JURISDICTION AND DESCRIPTION OF PARTIES

2. This petition arises under the laws of the United States. The Secretary of the Treasury and the Administrator of the Federal Energy Office have authority to grant relief requested under the Economic Stabilization Act Amendments of 1971, 85 Stat. 743.

3. Petitioner Public Interest Campaign, Inc. is a non-profit educational and charitable association dedicated to protecting the public health and welfare. It maintains offices at 9711 MacArthur Boulevard, Bethesda, Maryland. It is supported by tax deductible contributions, foundation grants, and subscriptions to its Monthly Washington Report, Clean Air. The purposes of the Campaign are to monitor the performance of government programs in standard-setting, enforcement, research and development activities affecting the public health and welfare. The Campaign provides expert testimony at judicial and administrative proceedings; provides technical assistance to other consumer and environmental groups needing expertise in automotive emission control; and informs the public on progress and setbacks in controlling air pollution. The Campaign and its members thus have a special interest in combatting auto-caused air pollution and in disseminating information on the subject.

4. Petitioner Louis V. Lombardo is a member and President of the Public Interest Campaign with a special interest in securing for consumers the benefits associated with the posting of clear and unmisleading gasoline octane ratings. He is a person interested in securing the relief requested by this petition. He has spoken publicly on behalf of the Campaign on the octane posting issue. On July 30, 1973, petitioner Lombardo filed formal comments with the Cost of Living Council on the Council's proposed rule to require the posting of research octane numbers. The comments urged the Council to either promulgate the rule as proposed or alternatively, if the Council was persuaded that there was merit in a system which combined research octane numbers and motor octane numbers, the Campaign urged adoption of a formula to which four (4) octane numbers were added to the average of the research and motor octane numbers. These comments are attached and incorporated herein as part of Appendix G. Appendix G also includes articles on the subject which have appeared in the Campaign's Monthly Washington Report entitled Clean Air, written and edited by petitioner Lombardo.

## II. STATEMENT OF FACTS

5. This is a petition requesting an adjustment to and subsequent extension of the gasoline octane posting regulations now in effect and administered by the Federal Energy Office. This petition requests a change in the formula used in determining the octane number posted on gasoline dispensing pumps. The present regulations require the posting of an octane number which is the average of the research octane number (RON) and the motor octane number (MON). This averaging procedure results in the posting of an octane number which is generally four numbers lower than the widely used RON. The Campaign is concerned that the immediate result is a numbering system which is confusing to

consumers. Concomitant results are feared to be an aggravation of (a) the energy situation, (b) the air pollution problem, (c) the cost of living crisis, and (d) the government's credibility gap.

6. This petition requests that the octane posting regulation be amended to require the posting of an octane number based either solely on the research octane numbering system or on the present system with amendment of the formula from  $(R+M)/2$  to  $[(R+M)/2]+4$ . The simple addition of 4 to the present numbers or adoption of the research numbering system would help consumers avoid being misled into the purchase of gasoline of higher octane than required by their vehicle's engine. Overbuying is the purchase of gasoline of higher octane than necessary.

7. The chronology of octane posting regulation has been as follows:

a. On July 30, 1969, the Federal Trade Commission (FTC) published a Notice of Proposed Rule Making to require the posting of research octane ratings on gasoline pumps.

b. On December 30, 1970, the FTC promulgated a rule requiring the posting of minimum research octane ratings on gasoline dispensing pumps by June 28, 1971.

c. On April 13, 1971, the FTC announced a postponement of the effective date of the rule from June 28, 1971 to September 1, 1971. This action was taken on the basis of questions raised by Texaco, Inc. regarding the reliability of the research octane number, despite the fact that research octane was, and remains, the prime determinant of price in inter-industry sales of gasoline.

d. On August 19, 1971, the FTC announced it was postponing the effective date of the research octane posting rule—"indefinitely." The FTC, furthermore, proposed a new formula to be used for octane ratings in lieu of the research octane rating. The proposed formula at Texaco's suggestion would be the sum of the research octane rating and the motor octane rating divided by two.

e. On December 16, 1971 the FTC promulgated the Texaco formula as the octane posting law of the land to be effective March 15, 1972.

f. On December 20, 1971, four days later, 34 oil companies and two petroleum industry associations filed suit for injunctive relief from the FTC regulation.

g. On February 9, 1972 Judge Aubry E. Robinson, Jr. granted the oil industry a stay on the effective date of the rule. And on April 4, 1972 Judge Robinson ruled that the FTC had exceeded its authority in setting the octane posting rule.

h. On June 27, 1973 U.S. Court of Appeals' Judges David L. Bazelon, J. Skelly Wright, and Spottswood W. Robinson, III reversed Judge Aubry Robinson.

i. On July 13, 1973 the oil industry filed a motion for a rehearing; and now an appeal to the Supreme Court is anticipated. If the case goes to the Supreme Court the question which will be decided is whether or not the FTC has the authority to promulgate an octane posting rule. The adequacy or inadequacies of the Texaco formula will not be at issue.

j. Also in July of 1973, the Cost of Living Council (CLC) entered the octane posting field and proposed the original FTC rule to require the posting of research octane numbers. The Campaign filed formal comments (included herein as part of Appendix G) on the CLC Notice supporting the proposed research numbering system and alerting the CLC that the oil industry might urge the adoption of the  $(R+M)/2$  formula. The Campaign also urged that if the CLC was tempted to adopt the  $(R+M)/2$  numbering system, that it adopt it with the formula modification of plus four, i.e.  $[(R+M)/2]+4$ .

k. On August 17, 1973, without explanation, the CLC promulgated the  $(R+M)/2$  formula making it the law of the land. Thus, beginning in September 1973 gasoline dispensing pumps began carrying stickers with "octane" numbers. These gasoline pump octane numbers typically showed premium 100 RON gasolines as 96 octane, regular 94 RON gasolines as 90 octane, and economy 91 RON gasolines as 87 octane. The result has been inevitable confusion with the research numbers which for years have been printed in owner's manuals (Appendix H); posted on gasoline pumps in Maryland by law since 1969 (Appendix K); posted on inde-

pendent brand gasoline pumps across the nation voluntarily for years; used in gasoline advertising for years; and used extensively in automobile articles in newspapers, periodicals and books.

8. Octane overbuying was a growing national problem even before the CLC aggravated the situation with the misleading numbering system. Petitioners believe a clear numbering system consistent with the public understanding of octane is needed because of the adverse consequences of octane overbuying on the nation's desperate situation in four sectors: energy, economy, environment and confidence in government.

*Energy benefits of true octane posting*

9. To determine the potential energy benefits from an elimination of octane overbuying, the Campaign calculated the extent of octane overbuying currently occurring in the U.S. Table I below lists the results of our calculations on the extent of overbuying by grade for the years 1970 through January 1974. At the beginning of 1974 overbuying amounted to the following: an estimated 21.3 percent of all gasoline sales were unnecessarily premium or 100 RON grade; while an estimated 20.6 percent of all gasoline sales were unnecessarily regular or 94 RON grade. Thus an estimated 41.9 percent of all gasoline sales presently are overbought.

10. Since more crude oil is required to produce higher octane gasoline than low-octane gasoline, there is a crude oil penalty associated with octane overbuying. Moreover, since more energy is consumed in the petroleum refining process in producing higher octane gasoline than lower octane gasoline, there also is an energy penalty associated with octane overbuying.

11. Campaign calculations indicate that the national crude oil penalty resulting from present overbuying amounts to 63,500 bbls of crude oil per day or 4.5 percent of the 1973 year-end national crude oil shortfall of 1.4 million bbls per day.

12. Campaign calculations also reveal that the nation's overbuying, in forcing the misallocation of 63,500 bbls of crude oil per day to the production of unneeded higher octane gasoline results in the wasteful consumption of 7,900 bbls of crude oil per day in the refining processes needed to produce the extra octane. This estimated 7,900 bbls of crude oil daily is equal to approximately 0.57 percent of the 1973 year-end national energy shortfall of 1.4 million bbls per day.

13. Examination of the crude oil penalty from the standpoint of alternative use reveals that the 63,500 bbs per day presently misallocated to needless octane could be better used in the production of additional gasoline of the needed lower octane. If the 63,500 bbls of crude oil per day were being used in the production of gasoline of octane matched to vehicle needs, the nation's refineries could be producing an additional 1.24 million gallons of gasoline per day—or nearly 10 percent of the current national daily gasoline shortfall.

14. At a time when on the order of 100,000 auto workers have been laid-off due to the energy shortage, along with thousands of others in the economy with jobs dependent upon the auto industry, and the countless thousands of others who indirectly have also lost their jobs due to the energy shortage, the nation cannot afford to continue to waste precious crude oil resources. Petitioners contend such waste cannot be tolerated especially when it is caused by missing or misleading octane numbers on gasoline pumps as a result of government inaction or misdeed. For indeed, for the government to mislead is a misdeed.

15. The 4.5 percent of the daily crude oil shortfall allocated to the production of unnecessary octane alone might be translated into at least 4,500 autoworkers' jobs—clearly a waste, not only of oil, but something more precious—human resources. Misleading octane numbers not only create waste, they create a great deal of human misery which the public pays for in many ways, but wants in no way.

*Economic costs of overbuying to the consumer*

16. Since premium gasoline costs about a nickel more per gallon than economy grade; and regular costs about 3 cents more than economy grade, it can be seen that habitual overbuying can cost an average consumer (using 735 gallons per year) \$35 per year extra for unneeded octane. In California it has been estimated that over half the gasoline sold is overbought. And as can be seen from the figures in Table I, 41.9% of the gasoline sold nationwide is now overbought.

17. Figuring only the overbought premium (21.3 percent of all gasoline sold) the cost to the consumers purchasing premium rather than economy grade amounts to over 1 billion dollars per year for 21,300,000,000 gallons of overbought premium each year.

18. The estimated national amount of regular octane overbuying is 20.6 percent of all gasoline sold. The cost to consumers purchasing regular, rather than economy grade at a differential of 3 cents per gallon could amount to an additional \$620,000,000 per year for 20,600,000,000 gallons of overbought regular each year. Figures on the difference in cost between regular and economy grades are not readily available; therefore, this estimate may be less accurate than that given for the premium overbuying economic penalty. However, if the figure is accurate then the two figures total to a national overbuying bill of over 1.6 billion dollars per year being paid by American consumers for unneeded octane.

19. Moreover, the costs of overbuying are regressive. Their net impact hurts the poor much more than the rich. The FTC, in a report issued with its now stalled rule, noted this discriminatory aspect of the problem as follows: "The uneconomic choice of a higher octane gasoline than is needed can be costly according to Senator Proxmire of Wisconsin . . . 'the average consumer does not know how to find out the octane ratings of the various gasoline brands, and, thus, is liable to be spending much more money for gasoline than he needs to. This is particularly true for poor people who have to spend a large percentage of their income for gasoline in order to get to work. According to the President of Sun Oil Company, Americans who earn less than \$3,000 a year spend an average of 6.2¢ of every dollar on gasoline compared to 1.5¢ for the \$15,000 plus income group. A savings of \$60 or \$50 a year is very important to them."

*Environmental and health costs of overbuying*

20. The poor pay more for overbought gasoline not only with their dollars but with their lives. The growing evidence of gasoline lead additives contributing to the lead poisoning of children of our urban poor recently caused the U.S. EPA to adopt a gradual, phased reduction in the use of lead additives over the rest of the decade of the seventies. By 1980 gasoline lead additives are scheduled to be reduced approximately 65 percent from current levels. By contrast elimination of present-day overbuying could reduce lead additive emissions by 35 percent from current emission levels. Overbought gasoline, at rates prevalent at the beginning of 1974, is resulting in the emission of 405,000 lbs. of lead per day in the form of trillions of tiny particles. These particles are so small they are invisible to the naked eye. (Appendix G contains additional information on the contribution of lead in gasoline to the lead poisoning hazard.)

21. Along the heavily travelled streets of our cities, children breathe and orally ingest (unavoidably eat) these lead particles. The result is an, as yet, unquantified contribution to the national lead poisoning problem which results in an estimated 200 deaths per year, 6,000 children suffering neurological handicaps including mental retardation, and 600,000 children with dangerously high blood lead levels. Ironically, too, from a conservation point of view, projections indicate that on our present course, the world will run out of lead before it runs out of petroleum.

22. Lead is not alone as a pollutant resulting from the use of gasoline of an octane number different from the octane required by the vehicle. As the FTC

was concluding that the failure on the part of gasoline marketers to post the minimum research octane number constituted an unfair or deceptive practice in violation of Section 5 of the Federal Trade Commission Act, the Commission found: "the use of a gasoline which is either too high or too low in octane rating for that particular automobile tends to create excessive emissions which contribute to air pollution."

23. Use of gasoline of an octane lower than required by a vehicle's engine results in increased emission of hydrocarbons, carbon monoxide and nitrogen oxides. Carbon monoxide is a highly toxic gas. Hydrocarbons and nitrogen oxides are the primary ingredients of photochemical smog. These pollutants cause the air pollution alerts increasingly experienced in Washington, D.C. and other cities across the nation.

*Costs of continued octane overbuying to the growing crisis of confidence in government*

24. On January 30, 1974 in prepared remarks to the National Association of Manufacturers and the National Chamber of Commerce, F.E.O. Administrator, William E. Simon, cited the deterioration of confidence in government as a problem of concern in attempts to deal with the nation's energy problems.

"Last December 3, on the day before the Federal Energy Office was created, Lou Harris, of the Harris Poll, appeared before a Senate subcommittee to report on a survey of public attitudes of confidence in American Government.

"Here's a quote from Mr. Harris' remarks, 'There may be islands of hope across the broad land of ours, but a central fact is that as a nation, as a people, disaffection and disenchantment abound at every turn. . . . On a scale of powerlessness, cynicism, and alienation used by the Harris firm since 1966, an average of 55 percent of the American people expressed disenchantment, compared with not more than 29 percent who felt that way only seven years ago.'

"According to Mr. Harris, the American people are disenchanted with nearly every dimension of the social and economic spectrum: medicine, organized religion, organized labor, major companies—declined in their expression of confidence.

"What most impressed me about these findings, however, was that people want change not change to overthrow the system, but to *make it work* the way they think it should. (emphasis in the original)

"In the two months since the Federal Energy Office was established, I have found myself oftentimes reflecting on these problems. The questions of 'confidence,' and the 'willingness to participate' are crucial to this quest for energy independence.

"When people ask me 'Is there really an energy crisis?' or 'Isn't the energy crisis contrived?', I am disturbed. We are faced today with a very *real* crisis." (Emphasis in the original.)

25. While the public's mistrust of government in general is growing, the octane overbuying problem is also growing. Overbuying is also evidence that the government is not working well. In a time when credibility gaps are numerous and wide, the federal government's record on octane posting is another specific instance where a credibility gap exists. Nor is the government's credibility on octane posting likely to be easily restored without decisive action to resolve the problem. In Appendix K instances are shown where in the summer of 1973: (a) gasoline refiners were found to have lowered the octane rating of their products to produce more fuel but had neither notified consumers, nor reduced prices commensurately; (b) gas stations placed false "out of gas" signs on pumps dispensing regular, thereby forcing motorists to purchase more expensive premium to increase revenue; and (c) where a State agency found it necessary to attempt a public education campaign as a result of the new federal (CLC) octane numbering system "because the opportunities for misunderstanding, error, confusion and dealer frustration are so great. . . ."

26. The F.E.O. Administrator's decision on this petition will determine whether the CLC octane posting regulations will be continued after April 30, 1974, or

modified, or abandoned. The decision also will contribute one way or another to the confidence in government crisis, the energy crisis, the cost of living crisis, and the air pollution crisis.

*Proposed modification of the CLC octane numbering system*

27. This petition requests the modification of the CLC octane number system based on the formula: the octane number to be posted = (Research ON + Motor ON) / 2. The CLC formula results in a number which generally is 4 numbers lower than the research octane number. (See Appendix B, Figure 1, which shows the national average difference between research and motor octane has been a constant 8 octane numbers since 1960.)

28. This petition requests that the CLC formula be modified to bring the two numbers (Research and CLC) into agreement so that confusion will be minimized and made inconsequential. The CLC formula simply amended to add four numbers, half the 8 octane point difference between research and motor, to the formula can accomplish the goal of minimizing confusion. A formula of  $[(R+M)/2] + 4$  would maintain the advantages of a system which combines research numbers and motor numbers, plus have the advantage of boosting the resulting numbers sufficiently to make them comparable to the research numbers.<sup>1</sup>

29. Why is comparability with research octane numbers so important? Several historical factors have worked to ingrain both a conscious and subconscious understanding the premium is 100 octane gasoline; that 100 octane is the highest grade of gasoline; that more octane is better than less octane; and that 100 octane, as the highest octane, results in the most power, performance and miles per gallon. Advertising by auto companies and gasoline companies has created such fuzzy understanding of octane by consumers. The grain of truth that high octane gasoline in a high performance engine does result in higher performance has led consumers to erroneously conclude that high octane gasoline always results in better performance, even in a low performance engine. Half truths, along with such aphorisms as "you get what you pay for," and "it costs more, so it must be better," and "100 is premium or tops," all lead to the consumer's vague understanding of octane.

30. Add to these, several other facts. Owner's manuals for most vehicles have recommended octane requirements in research numbers with even 1974 models still recommending research numbers (see owner's manuals and G.M. and Ford 1974 brochures in Appendix H). Looking to the future, vehicle owners will be reading those recommendations into the 1980's. Looking to the past, gasoline advertising has historically referred to octane numbers based on the research method. The State of Maryland has posted octane numbers on gasoline pumps in research terms since 1969. Articles in newspapers and periodicals nearly always referred to research octane numbers. Many independent gasoline stations differentiate their grades simply by numbers: premium 100, regular 94, economy 91—research octane numbers.

31. Thus one can readily envision the results of posting the CLC numbers which yield premium 96, regular 90, and economy 87. First confusion, and then continued overbuying to be sure of getting at least "91" octane. To get at least 91 octane RON called for in the manual, one has to purchase premium grade 96 CLC octane to protect the engine and the warranty. ("Better to be safe than sorry.")

32. What can be done to overcome or at least mitigate the overbuying in the face of the long history of misconceptions conveyed? More importantly what

<sup>1</sup> In the relatively few instances where the research and motor octane numbers differ by more or less than 8 numbers, the "plus four" formula will still help avoid the confusion which presently occurs between premium and economy grades. For example, as shown in the chart in Appendix G (*Clean Air* Sept-Dec 1973, p. 2), presently a motorist looking for at least 91 "octane" gas must purchase a premium grade which is posted at 95 "octane" since even the regular will be posted at 90 octane. Under the "plus four" formula the motorist might find an economy grade posted at 90 octane if the difference between motor and research were greater than 8 numbers, say 10 numbers. But even in this unusual situation the tendency to overbuy will have been reduced to the purchase of one grade.

can be done by the Federal Energy Office Administrator and done easily? Society has learned that it is very difficult to change behavior patterns and ingrained misconceptions of one hundred million people. Thus a public education program to educate the public that the present 87 octane is equivalent to 91 octane is likely to be difficult, expensive and in the end, not effective. Better then, to take an action which capitalizes on the existing conceptions and misconceptions and minimizes the tendency towards more confusion and overbuying.

33. Amendment of the octane posting regulation to base the octane number on the modified formula of "plus four" can be accomplished by a stroke of the pen. By measuring octane according to the "plus four" formula, octane numbers will become comparable to the long used research numbers. In fact, to the vast majority of motorists, use of the "plus four" formula will never be known, understood, or even distinguishable from the research octane numbers they have been exposed to for years.

34. A simple notice of proposed rulemaking proposing this modification to the CLC octane determination formula should demonstrate to the satisfaction of objective observers that the suggested "plus four" formula would result in major benefits and negligible disadvantages to the public. Promulgation of the suggested formula will then result in an elimination of a source of motorist confusion and overbuying and the creation of a clear guide to help consumers avoid the overbuying presently contributing to the energy waste, pollution, inflation, and distrust of government.

35. The Public Interest Campaign, in September 1873 filed an amicus curiae brief in the U.S. Temporary Emergency Court of Appeals in a suit brought by the National Petroleum Refiners Association, et al., v. John T. Dunlop, et al. The Campaign's position on the posting of gasoline octane generally is that it is necessary and desirable in the interests of informing consumers. The Campaign believes, however, that the octane posting regulations of the Cost of Living Council (now part of the Federal Energy Office) are misleading, deceptive and confusing and would result in a consequent loss of consumer purchasing power, unnecessary environmental degradation and a waste of energy resources.

36. The Campaign's brief asserted the beliefs that :

a. The Council's octane posting regulation requirements were arbitrary, capricious, contrary to fact, unsupported by any reasonable basis, and thus failed under traditional standards of judicial review of administrative action.

b. The Council's octane posting regulations were unaccompanied by an impact statement, in clear defiance of the National Environmental Policy Act which requires that a "detailed statement" accompany all "major Federal actions significantly affecting the quality of the human environment."

c. The Council's octane posting regulations were issued without a concise general statement of their basis and purpose and, indeed, without any adequate explanation in contravention of the procedural protections of the Economic Stabilization Act Amendments of 1971.

### III. FIRST REQUESTED CLAIM FOR RELIEF

37. Under the law, the Administrator, Federal Energy Office has the authority to issue an amended octane posting regulation requiring the posted octane number to be determined by the "plus four" formula of  $[(R+M)/2]+4$ . Petitioners request the Administrator to so act.

### IV. SECOND REQUESTED CLAIM FOR RELIEF

38. Alternatively the Administrator, Federal Energy Office, has the authority to issue a notice of proposed rulemaking to require the posted octane number to be determined by the "plus four" formula of  $[(R+M)/2]+4$ . In the alternative, the petitioners request the Administrator to so act.

Respectfully submitted.

LOUIS V. LOMBARDO,  
*President.*  
WILLIAM H. RODGERS, Jr.,  
*Attorney for Petitioners.*

## PUBLIC INTEREST CAMPAIGN CALCULATIONS

## ESTIMATED OVERBUYING BY OCTANE GRADE AND CONSUMER NEED

The estimates presented in Table I were derived as follows:

1. The percentage of cars needing premium grade gasoline on the road, and the percentage of gas sold as premium in each of the three years 1970-1972 were obtained from published figures in the National Petroleum News Fact Book 1973. The figures for the years 1973 and 1974 (as of January 1) were obtained by extrapolation of the prior three year trend.
2. The percentage of gasoline needing to be premium was obtained by adjusting the figures for the percentage of cars on the road needing premium with factors for the decreasing use of pre-1971 model year vehicles, with age, as given in Compilation of Air Pollutant Emission Factors, EPA second edition p. 3.1.2-8 (also reproduced below as Table 3.1.2-7).
3. The percentage of gasoline needing to be economy grade was then estimated for each of the years by again using the annual travel figures found in Table 3.1.2-7 for 1971 and later model year vehicles. These figures for the percentage of gasoline needing to be economy grade were further adjusted to reflect a 5 percent fuel penalty associated with the decreased compression ratios and other emission control techniques used in 1971 and later models.
4. It was assumed that for the years after 1971, through the present, economy grade gasoline accounted for 5 percent of all gasoline sales. This assumption was arrived at after consulting marketing experts in both government and industry who gave such a figure as a high limit on their estimates of economy grade sales. Moreover, their estimates are borne out by the Bureau of Mines' Mineral Industries Surveys Motor Gasolines which showed the cumulative percentages of samples of all grades by research octane was less than five percent during these years. (See Tables 8 and 9, Motor Gasolines, Winter 1972-73 reproduced in Appendix B.)
5. The percentage of gasoline to be regular was derived by subtracting from 100 percent the sum of the percentages of gasoline needing to be premium and economy.
6. The percentage of gasoline sold as regular was obtained for 1970 from the Fact Book 1973 and adjusted downward to reflect the assumption of 5 percent sold as economy grade for the years after 1970.
7. Overbuying figures for premium and regular then were obtained from the difference between figures for "percentages of gasoline needed" and "gasoline sold," by grade and by year.

## ESTIMATED CRUDE OIL PENALTY AND ENERGY PENALTY DUE TO OVERBUYING

The crude oil penalty and energy penalty associated with present day gasoline octane overbuying were derived as follows:

1. First, a national clear (lead free) pool average octane value had to be estimated. This was done using the gasoline characteristics found in the Bureau of Mines Mineral Industry Survey Motor Gasolines, Winter 1972-1973 (Appendix B) and lead susceptibility curves. Using Table I, "Summary of values, motor gasoline survey, winter 1972-73" (reproduced below in Appendix B) a value of 1.8 grams lead per gallon was found to be the average lead content of regular grade gasoline and 2.34 grams per gallon was the average lead content of premium grade gasoline. Using these figures and standard lead susceptibility curve data, the graph, Figure 1, was constructed. Using the data from the same Bureau of Mines study that economy grade contained about 0.5 grams lead per gallon and had a 91 RON rating, the three curves for premium regular and economy were drawn.

From the curves in Figure 1, plus substantiation from other sources, the clear RON values were determined for the three grades of gasoline. This data combined with the estimated present and potential (no overbuying) useage of

each grade from Table I, "Octane Overbuying," were placed in the following two equations to derive the national clear pool average:

| 1974                                      | Premium |     | Regular |     | Economy |      | Clear pool<br>Average<br>RON |
|---|---------|-----|---------|-----|---------|------|------------------------------|
|   | Percent | RON | Percent | RON | Percent | RON  |                              |
| Present usage (overbuying).....           | (33.6)  | 93  | (61.4)  | 88  | (5.0)   | 87.5 | 89.6                         |
| Potential usage (no overbuying).....      | (12.3)  | 93  | (4.0)   | 88  | (46.9)  | 87.5 | 82.2                         |
| National difference due to overbuying.... |         |     |         |     |         |      | 1.4                          |

2. The difference between present national clear octane requirements and potential clear octane requirements was then used to determine the crude oil penalty (C.O.P.) and energy penalty (E.P.) associated with the production of an additional 1.4 clear RON for the nation's pool of gasoline. From the UOP process curve reproduced below as Appendix D, and the table appearing in Appendix E, it can be seen that at the low end of the curve (in the range of 89 RON clear pool) it requires 0.45 bbls of crude oil per 100 bbls of crude oil processed to produce the additional 1.4 clear RON necessary to meet present day overbuying octane demand. Thus the C.O.P. factor is 0.45 bbls per 100 bbls processed or 0.0045 percent.

3. The energy penalty factor associated with processing the additional crude oil to produce the nation's overbought octane was obtained from the table in Dr. Vladimir Haensel's statement (Appendix E). The energy penalty factor associated with producing 1.4 clear RON at the 89 RON clear pool level is approximately 0.056 bbls of crude per 100 bbls processed or 0.00056 percent.

4. Using these C.O.P. and E.P. factors, the crude oil penalty and energy penalty associated with octane overbuying can then be estimated. Converting our present national annual gasoline consumption rate of 100 billion gallons of gasoline per year into a daily crude oil requirement for gasoline production one obtains a figure of 14.1 million bbls of oil per day required to produce a day's supply of gasoline. Applying our crude oil penalty factor to this figure results in a crude oil penalty estimate of 63,500 bbls of crude oil per day being used to produce the extra octane needed to meet the overbuying demand. Similarly, applying the energy penalty factor results in an energy penalty estimate of 7,900 bbls of crude oil per day used in the refinery processes needed to produce the extra octane required as a result of the overbuying.

5. These figures of 63,500 bbls per day (C.O.F.) and 7,900 bbls per day (E.P.) can then be compared with the 1973 year-end national energy shortfall of 1.4 million barrels per day. The octane C.O.P. turns out to be 4.5 percent of the December 1973 daily crude oil shortfall. The octane energy penalty turns out to be 0.57 percent of the December 1973 national daily crude oil shortfall.

CITIZENS' ADVISORY COMMITTEE ON ENVIRONMENTAL QUALITY,  
Washington, D.C., January 29, 1975.

The PRESIDENT,  
The White House,  
Washington, D.C.

DEAR MR. PRESIDENT: At its last meeting, the Committee discussed a subject that has a direct bearing upon your efforts to stimulate energy conservation. It is one of those rare actions which cost nothing and will have immediate effect.

Major savings of energy could be achieved through improvement of current procedures for posting of octane ratings on gasoline pumps at service stations.

This has been the subject of extensive controversy and confusion for several years, primarily because there are several different systems of octane ratings in general use. The current regulation, issued by the Cost of Living Council on 1973 and very poorly enforced, calls for the posting of an octane rating that is four numbers lower than the figure which appears in nearly half of car owners' manuals.

This discrepancy contributes to the widespread purchase of a higher grade of gasoline than is necessary for proper automobile operation. This in turn causes a substantial waste of scarce energy, an increase in toxic lead emissions, and the unnecessary expenditure of consumer dollars.

The Federal Energy Administration has for some time been considering a revision in the octane posting regulation. The Committee recommends that the new regulation be issued as soon as possible and that it include the following provisions:

(1) The octane rating should be conspicuously posted on all service station pumps.

(2) The posted rating should correspond with that which appears in the largest possible percentage of owners' manuals for cars now on the road (the proposal made by the Public Interest Campaign of Bethesda, Maryland, to the Federal Energy Administration that the posted rating be the "average number plus 4" appears to meet this criterion).

(3) Car manufacturers should be required to include in all future owners' manuals the figure corresponding to the posted rating. In addition, the Federal Government should launch an extensive public education campaign to reduce buying of unnecessarily high octane fuel.

The Committee believes that the implementation of these recommendations would produce major public benefits in the form of energy conservation, reduced lead emissions, anti-inflationary reduction of consumer spending, and improvement in the Nation's balance of payments. It would appear that most of the recommended steps could be taken in a matter of weeks and start producing benefits immediately thereafter.

The Committee stands ready to assist in efforts to encourage citizens to conserve energy by purchasing gasoline with the proper octane rating.

A copy of this letter is being sent to the Secretary of the Interior, the Administrator of the Federal Energy Administration, the Chairman of the Council on Environmental Quality, and the Administrator of the Environmental Protection Agency.

Sincerely,

HENRY L. DIAMOND,  
*Chairman.*

PUBLIC INTEREST CAMPAIGN,  
*Bethesda, Md., October 17, 1974.*

Mr. ALLN KIRK,

*Assistant Administrator for Enforcement and General Counsel, U.S. Environmental Protection Agency, Washington, D.C.*

DEAR MR. KIRK: This is to provide you with our comments on the briefing memorandum prepared by your office recommending an octane posting regulation which would combine the symbol system with an explanatory statement of equivalency with the RON rating.

At first glance this appears to be an appealing compromise option. On further study, however one finds the disadvantages inherent in the symbol system far outweigh any advantages the symbol system may have, either alone or in combination with the RON equivalency statement. One is left with the conclusion that addition of the symbol system would detract from, rather than enhance, the plus-four or RON equivalency statement. It would be worse than redundant.

## SPECIFIC COMMENTS REQUESTED

You asked that I especially address the con argument as set forth in the briefing memo on the AKI+4 proposal. These points, quoted as follows, are addressed first:

*Con a.*—The formula (AKI+4) has no technical rationale due to the +4 factor and would be dismissed by technical societies and industry as arbitrary.

The technical rationale for use of +4 as an adjustment factor is that +4 is half the average sensitivity (sensitivity is defined as Research Octane Number minus Motor Octane Number) of all gasolines sold in the U.S. Moreover, the average sensitivity has been extremely constant for at least ten years—regardless of the changes in the orientation of vehicles to either the Motor or the Research ratings. The plus-four adjustment factor is simply added to the AKI rating, the  $(R+M)/2$  rating, to achieve comparability with the research ratings in consumer manuals.

Addition of the +4 adjustment factor to the formula does not alter the scientific or technical validity or accuracy of the AKI or  $(R+M)/2$  formula one iota. It maintains the  $(R+M)/2$  mathematical relationship intact. It merely shifts the curve of the relationship so that the resultant rating can be useful to the largest possible number of motorists. Use of such adjustment factors is a common technical practice.

*Con b.*—The value perpetuates the AKI and RON confusion, and indeed, compounds it when an explanation of the posting requirement is attempted.

On the contrary. The plus-four adjustment factor eliminates the AKI and RON confusion for motorists by making the two ratings comparable or indistinguishable. The plus-four adjustment factor makes the  $(R+M)/2$  rating meaningful, interchangeable, and reliable to motorists needing an RON rating.

It may, however, take some explaining in technical circles as to why the plus-four adjustment factor was adopted. But it is a relatively small cost for several hundred engineers and scientists to adjust, as compared to the cost of educating 100 million motorists to RONS, MONS and AVONS, as one local TV news reporter recently put it.

## GENERAL COMMENTS ON SYMBOL SYSTEM AND SYMBOL +4

Several general principles or aims which I believe ought to be kept in mind in deciding the octane posting issue:

1. Which option provides the greatest potential for reducing octane overbuying to the greatest degree—and soonest?
2. Which option offers the least potential for consumer confusion and will require the least amount of public education?
3. Which option provides consumers with the most accurate possible index of octane quality?

Consider the data in Table I, attached. Shouldn't the consumer be apprised of the difference between the octane quality of Exxon's 87 AKI octane, symbol (2), and that of Getty's 88.5 AKI octane, also symbol (2). Since the avowed purpose of the symbol system is to phase it in over a period of years and phase out the plus-four equivalency statement, at some time in the future motorists would be deprived of the information showing these differences in octane quality. Wouldn't the nation be better served by disclosure of such differences rather than by concealment under the symbol system?

The symbol system should be recognized for what it is—an attempt to avoid octane disclosure by offering consumers a slightly disguised version of a grading system—sub-regular (2), regular (3) and premium (5). Grades (1), (4) and (6) are likely to be offered in relatively few instances.

The symbol system makes it costly for a refiner to boost his octane rating. For example, assume a refiner was offering a 96 RON gasoline (4) and felt that he could profitably serve a market of vehicles needing 97 RON gasoline. Under the plus-four system he could offer the 97 RON as such. Under the symbol system he would be forced to raise his octane to 99 RON before his symbol would change to the next higher number (5). Clearly the symbol system would discourage that refiner from competing on the basis of octane quality. And, of course, the consumer would be deprived of the choice of a 97 RON gasoline. He or she would have to buy up (overbuy) at the 99 RON level.

## ADDITIONAL COMMENTS ON THE SYMBOL SYSTEM VS. PLUS-FOUR

Regarding the argument for the simplicity of the symbol system, an example might illustrate why I believe the plus-four system provides even greater simplicity (because of its ability to clearly convey useful information recognizable to consumers). I purchased a 1962 Mercedes and the owner's manual instructs me to use at least 96 RON gasoline. Under the symbol system, government would have to provide me with some conversion factor so that I could relate the two ratings. Under the plus-four system I could compare my owner's manual directly with the number on the pump without any explanation or conversion tables. With the continuous and frequent transfer of used cars, it is not easy to provide the public with the necessary conversion information and assure its proper use.

Regarding the ability of the symbol system to provide a uniform rating on pumps regardless of altitude, I see no reason why the plus-four formula could not include the same altitude adjustment factor in the definition of "octane", so that a uniform plus-four rating can appear on pumps across the nation.

Regarding the possibility of needing different formulae in the future, the advantage of flexibility in the symbol system carries with it the disadvantage that at some future time owner's manuals with symbols based on one formula will be outdated by posted symbols based on a newer formula. Indeed, the very SAE Technical Report, J282, which describes the symbol system carries the caveat: "This SAE Recommended Practice is intended as a guide toward standard practice, but may be subject to frequent change to keep pace with experience and technical advances. Hence its use where flexibility of revision is impractical is not recommended."

Unless we are prepared to frequently recall millions of owner's manuals for revision, the nation needs a more durable octane rating system.

The plus-four formula, on the other hand, weights research and motor octanes equally. Such weighting is probably the best approximation we can make to fit the cars of yesterday, today, and tomorrow (at least as far as our headlights permit us to see into the dark and unpredictable future).

Continuing on this point of the need for changing formulae, I believe much of the discussion has been misfocused on the need to match the general formula to the general future vehicle population needs. More precisely, three separate things are needed: one is a reasonable index of octane quality on the pumps to which the present vehicle population can relate; the second is an index of octane quality on the pumps to which Detroit engineers can relate in recommending to consumers the octane requirement they design into future vehicles, and the third is a minimum octane specification in the EPA lead regulations to assure adequate octane quality in unleaded grades of gasoline. These three needs should not be confused, but understood as distinctly separate requirements. In the first two instances, the need applies to the octane index. In the latter instance the need applies to the actual octane quality.

The merit of the plus-four system lies in its potential to reduce overbuying most, soonest. Because many more of the cars on the road have owner's manuals in RON terms than symbols or any other octane rating system, it makes most sense to devise a system to which the owners of these vehicles can relate—with the minimum amount of public education. Any system will require public education. An effective public education program should be implemented. However, I had been assured first by FTC, then CLC, then FEA that a public education campaign would be mounted with the  $(R+M)/2$  formula, and then witnessed years pass without such a program.

From such a sad history I believe it is safe (and wiser) to assume that funds for a public education campaign on octane will be minimal. This fact of the likelihood of a minimal public education campaign underscores the necessity for a system which the greatest number of people can relate to most easily. The plus-four meets this need best since it takes advantage of designations most widely distributed and most extensively used for years in books, manuals, articles and advertising (see attachment 2 for an example of a current ad). It is fair to say that no numbering system is more familiar to the public than the research system. The plus-four simply adjusts the  $(R+M)/2$  formula adopted by FTC, CLC and FEA so that consumers can directly relate it to the familiar research number.

Then there is the question of whether the consumers would be best served by a system which grades gasoline as the symbol system does or by a direct mini-

imum octane rating. I believe the latter is preferable because the system should attempt to accurately reflect the octane quality of the gasoline. Since octane quality generally stays within an octane number of the minimum required in jurisdictions with legal requirements, it is logical to have the manufacturers disclose the minimum octane they are providing in unit octane number intervals. The symbol system permits variable octane intervals between grades ranging from one octane point at the (1)-(2) level to 3.5 octane points at the (4)-(5) level. (And the octanes in the 3.5 range are "bigger" than the octanes at the (1) point range, thus the spread is even greater than it appears.)

There are several disadvantages to the larger and variable intervals in the symbol system:

1. The symbol implies quality grading. Witness the consumer problems when the Department of Agriculture grades meats prime, choice, etc., when virtually all that's intended is percent fat content. If the Dept. of Agriculture said what it meant there probably would be a lot less "overbuying" of meat today. Similarly, it is our belief that if government would tell the octane story "like it is" there would be a lot less overbuying of gasoline today.

2. Behind the facade of the (1) through (6) symbol system, companies are discouraged from competing on the octane quality of the gasoline. For example, the symbol system would act as a disincentive for Shell Oil Co. to continue producing its unleaded 94 RON gasoline or symbol (3). Owners of 1975 vehicles will have owner's manuals recommending symbol (2) grade gasoline. Some as yet undetermined percentage of these vehicles may need more than 91 RON or symbol (2) grade gasoline. These consumers would benefit from the availability of Shell's 94 RON gasoline but the symbol system discourages its use by them.

Conversely, consumers not needing more than 91 RON should not overbuy 94 RON. Under the plus-four direct rating system other refiners who find it economically attractive to produce and price their gasoline at a lower octane can create a diversity of available octane qualities and price.

3. Another example will help explain how the symbol system provides consumers with less choice and less useful information than the plus-four system. Assume under the plus-four system a wide variety of octanes are available in the marketplace—an ideal situation from both the consumer's point of view (maximized choice), and the refiner's point of view (maximized profit). Further assume that, as occurred during last year's energy crisis, several marketers (Gulf, Mobil and SoCal) reduced the octane quality of their product by one octane to increase their quantitative yield of gasoline. Under the plus-four system each product's posted octane would be changed accordingly. Under the symbol system only those products within 1 octane of the grade's minimum would undergo an octane posting change. Thus, under the symbol system, consumers would be deprived of both choice and information about octane.

Under the plus-four system the ideal of the free enterprise, free market, would be approached. The individual refiner could offer the octane fuel which is most profitable for his specific circumstances—and advertise its octane. The consumer would have the widest possible choice of octane qualities—and the information with which to choose no higher octane than needed. Such conditions would minimize economic waste (inflationary), energy waste (also inflationary), and needless environmental lead pollution and its adverse consequences on the health of inner city children.

Sincerely,

LOUIS V. LOMBARDO.

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GULF RESEARCH & DEVELOPMENT Co.,  
PETROLEUM PRODUCTS DEPARTMENT.

#### GASOLINE ANTIKNOCK QUALITY DESIGNATIONS

As part of Phase IV of the Economic Stabilization Program, ceilings have been placed on retail sales of all grades of motor gasoline. The Cost of Living Council (CLC) directed that, effective September 8, 1973, every gasoline retailer in the Nation must post a decal on each pump listing the ceiling price of the gasoline and its octane number (ON). The price information will be readily understood by the motorist but the octane rating is expected to be a source of confusion.

For many years, two laboratory rating methods have been used to define the octane quality of motor gasolines. One, called the Research Method, measures antiknock performance under mild operating conditions. This rating is indicative of fuel antiknock performance in passenger cars and light duty commercial vehicles operating at full throttle and low to medium engine speeds. The other, the Motor Method, measures antiknock performance under more severe operating conditions. This rating is indicative of fuel antiknock performance in vehicles operating at full throttle and high engine speeds.

The Research rating, because it is run under milder conditions, is considerably higher than the Motor rating. In practice, the difference in ratings for commercial gasolines will range from about 5 to 11 ON, with an average of about 8 ON. It is the Research octane number that has generally been used in the past in describing the antiknock quality of gasoline.

The octane rating which is required by the Cost of Living Council to be posted on the service station pumps is the average of the Research rating and the Motor rating; i.e., it is the sum of the Research rating plus the Motor rating divided by two ( $R+M/2$ ).

The minimum Research and ( $R+M/2$ ) octane ratings for Gulf gasolines for most areas of the U.S. are listed below. There is some variation in these numbers in a few areas due to allowances permitted for differences in altitude as well as historic marketing practices.

|                          | Minimum octane rating |           |        |
|--------------------------|-----------------------|-----------|--------|
|                          | Gulftane              | Good Gulf | No-Nox |
| Research Octane No. .... | 91                    | 93        | 99     |
| R+M .....                | 87                    | 89.5      | 95     |
| $\frac{2}{2}$ .....      |                       |           |        |

Since 1971 most car manufacturers have indicated in their owners' manuals that the cars are designed for operation on gasolines having a minimum Research octane number of 91. Gulftane has been recommended for these new cars. The above table shows that the octane rating posted on the Gulftane pump in most places is 87 even though the Research rating is 91. You can assure your customers that Gulftane still meets the car manufacturers' recommendations for octane quality.

Beginning with 1974 models some car manufacturers in their owners' manuals are, along with the 91 Research rating recommendation, recommending a fuel antiknock designation with a minimum numerical value of 2. This is just another method of specifying a minimum ( $R+M$ )/2 of 87. It refers to the American Society of Testing and Materials (ASTM) specification for gasoline. The relationship between the ASTM antiknock designation and ( $R+M$ )/2 is shown in the table below:

| Antiknock designation.....    | 1    | 2  | 3  | 4    | 5  | 6    |
|-------------------------------|------|----|----|------|----|------|
| Minimum $\frac{R+M}{2}$ ..... | 1 87 | 87 | 89 | 91.5 | 95 | 97.5 |

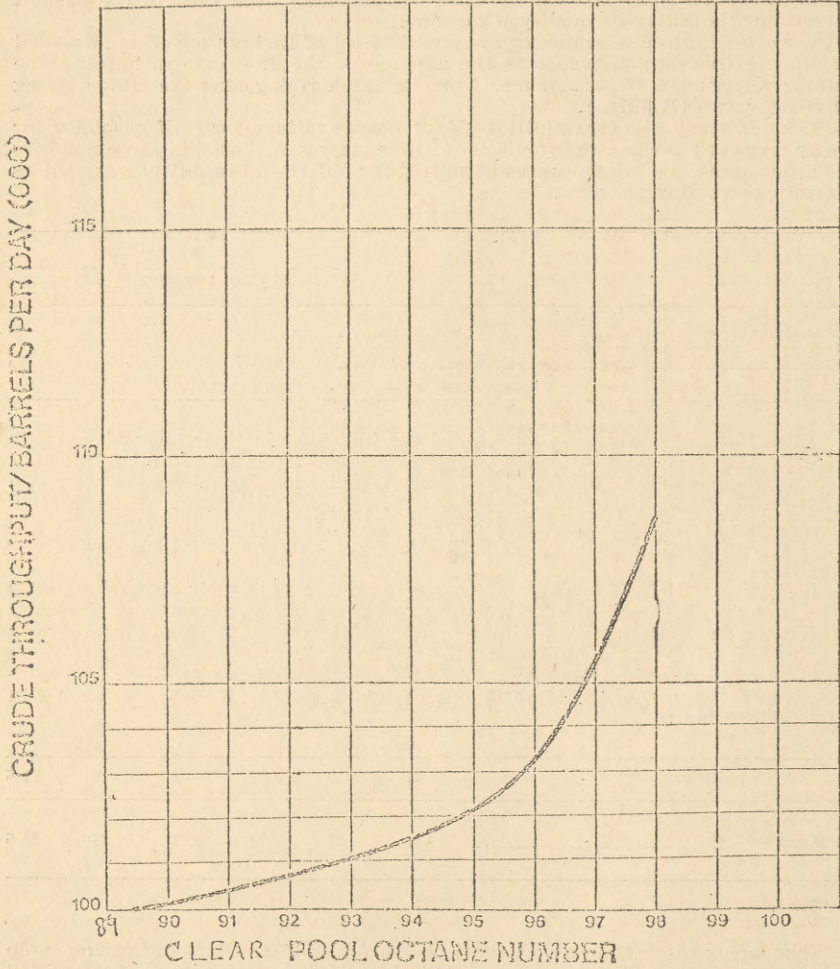
<sup>1</sup> Below.

Comparing these values with those shown for Gulf gasolines in the first table above shows that Gulftane has an ASTM antiknock designation of "2", Good Gulf is "3", and No-Nox is "5". This again supports the fact that Gulftane meets the car manufacturers' recommendations for new cars.

While the new octane postings and car manufacturers' recommendations for gasoline antiknock quality might be confusing, Gulftane can be recommended with confidence to the owners of late model cars. Of course, Good Gulf and No-Nox are very satisfactory for use in these cars and should be offered whenever the vehicle owner asks for a higher quality product.

# ESTIMATED CRUDE OIL REQUIREMENTS

BASIS: CONSTANT PRODUCT DISTRIBUTION  
EAST COAST LOCATION  
100,000 BARREL PER/DAY CAPACITY  
TYPICAL REFINERY



Source: V. Haensel, Energy and Emission Control, Statement delivered September 5, 1973 to EPA.

## STATEMENT ON CLEAR GASOLINE PRODUCTION

Source: V. Haensel, *Statement on Clear Gasoline Production*, January 18, 1974.

The last few months have witnessed a recurring controversy concerning the production of clear gasoline and environmental problems. The energy crisis has reactivated previous claims that clear gasoline production will further deplete our crude supply. Advertisements and other statements in the press both here and in Britain have vehemently proclaimed that this is not the time to think in terms of clear gasoline and catalytic converters.

It has been encouraging to note that the Environmental Protection Agency has taken a positive stand with respect to clear gasoline, and the Senate and House Committees have agreed to continue the 1975 standards for hydrocarbons and CO through 1976 which indicates at least a preliminary approval of catalytic converters and, therefore, of clear gasoline. The rumblings still persist, however, and it is appropriate to clarify the situation.

One of the most frequent myths is that to make clear gasoline of 96.5 research octane number requires 6% additional crude oil, as compared to making a leaded gasoline of the same octane number. UOP's conclusions are that only 3.3% additional crude is needed, of which 2.6% is converted to other valuable products. The net additional crude requirement is only 0.7%, to take care of internal refinery energy. From a total energy requirement viewpoint, this 0.7% is only slightly higher than the energy required to manufacture the lead antiknock compound, so that on a total energy basis, there is essentially no additional energy requirement to make the clear gasoline.

These conclusions are based on a detailed study of the production of clear gasoline. A summary of our findings is given in the attached Table. What we have done is to use a base case of pool gasoline which is currently produced and have examined what happens when higher octane number clear pool gasolines are produced using the 89.5 research clear octane number pool gasoline as our base point. We have also indicated the improvement that one obtains when using a higher octane gasoline in a higher compression ratio engine. The Table clearly indicates that if one makes a pool gasoline with a 96 clear research octane number an additional 3.3 barrels of crude would have to be used in excess of the 100 barrels used in the base case of making the 89.5 clear octane number pool gasoline. What is not realized is that in making the 96 octane number gasoline most of the 3.3 additional barrels of crude is *not lost*, but is largely converted to other forms of energy, that is, LPG and natural gas, and only 0.7 barrel is needed to supply internal refinery energy. This 0.7 is a far cry from the 6% crude loss that is being so widely quoted. When this higher octane number pool gasoline is used in a higher compression ratio engine the relative crude requirement for an equal amount of driving is only 89.4% of the base case for a 89.5 pool octane number gasoline, so that the total energy gain over the base case is 9.9 barrels for over 100 barrels of crude used in making the base 89.5 octane number gasoline.

The present proposals for the production of clear gasoline require it to be of the regular grade. You will observe that at 92 octane number level the incremental internal energy requirement at the refinery is only 0.1 barrel per 100 barrels of crude used in making the base 89.5 octane number gasoline. The 92 octane number gasoline allows the use of somewhat higher compression ratio engines and we can therefore realize a total energy gain of 4.7 barrels for every 100 barrels of crude used.

Let us now consider the issue of simply making a base octane number pool gasoline of 89.5 and using lead to make the regular and premium grades, thereby foregoing the additional refining operation in making the clear gasoline in order to eliminate even that very small amount of crude which is needed for supplying the internal refinery energy. Our calculations indicate that the energy requirement for the production of lead antiknock compounds is equivalent to a major portion of the internal refinery energy requirement during the production of the higher octane clear gasoline. In other words, there is little energy gain through the use of the lead antiknock compounds because a substantial amount of energy has to be used in order to make this material. Furthermore, as reported in the 1970 testimony before the House Sub-Committee on Public Health and Welfare by the Standard Oil Company-Indiana,<sup>1</sup> the motorist who uses a

<sup>1</sup> Testimony before the Subcommittee on Public Health and Welfare of the Committee on Interstate and Foreign Commerce, Washington, D.C., Robert C. Guinness, President, Standard Oil Company (Indiana), March 5, 1970.

clear gasoline will derive a saving of 2-4¢ per gallon. This saving is made up of a 3% increase in mileage and a saving in automobile maintenance cost. The estimate for 1974 is that the gain is closer to 3-5¢ per gallon of fuel used. The 3% increase in mileage represents a further substantial gain in total energy saving so that now on a total energy and economy basis the public will benefit a great deal. This 3% mileage saving which should be in the long run based on our total gasoline production, represents the saving of some 200,000 barrels per day.

Another point which is widely quoted in opposition to the making of clear gasoline is that the refining processes in making the clear gasoline are more costly. It should be indicated that at the present time the same basic refinery processes are used and will be continued to be used in the making of gasoline. The technological improvements in the processes, both from the standpoint of more efficient processing methods as well as better catalysts, have been instrumental in making the high octane gasoline production more economical than 3 or 4 years ago.

Let us now consider the issue of catalytic converters. UOP has maintained for a long time that the engine operation from the standpoint of driveability and fuel economy should be maintained at its optimum and that the catalytic converter should control whatever emissions are coming out of the engine as a result of the optimized engine operation. Thus, the catalytic converter should in no way impose either a driveability or an economic penalty. In addition, as will be observed in the attached figure, we need to return to the high compression ratio engine with its inherent fuel economy in order to provide for further conservation of our crude resources. Further, it should be pointed out that the production of high octane clear gasoline does not represent an immediate shift in refinery operations because the need will be only to take care of the new automobiles manufactured each year. Since this does not represent a large amount of the total gasoline requirement, it is imperative that the new cars should have higher compression ratio engines to take advantage of the lower fuel consumption per horsepower.

Although catalytic converters have become accepted as the most reasonable way to control the exhaust emissions, attempts are still being made to discredit their use. In fact, predictions of platinum and sulfuric acid emission poisoning have become quite common. In a previous statement<sup>2</sup> we have indicated that both platinum and sulfuric acid emission poisoning emanating through the use of catalytic converters are essentially ghosts. As far as possible losses of the non-poisonous platinum metal are concerned these are infinitesimally small, probably totaling less than 40,000 ounces per year on a national basis. It is paradoxical that we are suddenly confronted by this loss as an intolerable potential danger, while we currently tolerate the emission of more than 250,000 tons of lead compounds from automobile exhaust systems. In connection with sulfuric acid poisoning from catalytic converters, it is postulated that since gasoline contains trace amounts of sulfur compounds, these are converted into sulfur dioxide during combustion in the engine; this is followed by a further conversion to sulfur trioxide in passing through the catalytic converter and, in contact with water, this results in the formation of sulfuric acid. This is another ghost, since essentially all sulfur dioxide from any source is converted into sulfur trioxide and hence into sulfuric acid before it settles on the ground. The sulfur dioxide from gasoline combustion represents less than one percent of the total sulfur compounds introduced into the atmosphere. Here again the sudden concern about sulfuric acid is paradoxical since we currently tolerate the emission of hundreds of thousands of tons of chlorine and bromine compounds associated with the use of tetraethyl lead. Upon combustion and subsequent hydration, the gases from an engine burning leaded gasoline will invariably contain hydrochloric and hydrobromic acids. In fact, it seems incredible to state that the EPA has not proved that lead antiknock agents in the air will endanger public health and therefore should not ban the use of leaded gasoline, but in the meantime, the EPA is urged to institute investigation of danger to public health from platinum catalysts!

Attachment.

<sup>2</sup> Statement of Dr. Vladimir Haensel, Vice President-Science and Technology, Universal Oil Products Company, Des Plaines, Illinois, to the Senate Public Works Committee, Washington, D.C., November 6, 1973.

## CLEAR GASOLINE PRODUCTION

| Research octane No. | (1) | Compression ratio (1a) | Crude required in excess of 100 barrels (2) | Barrels of (2) needed for internal refinery energy (3) | Barrels of crude converted to other forms of energy, LPG, and natural gas (4) | Relative crude barrels required for equal amount of driving (5) | Barrels gain due to better efficiency 100-ccl. (5) | Net gain in barrels -col. (2) +col. (7) | Total energy gain in barrels -col. (7) +col. (4) |
|---------------------|-----|------------------------|---|--|---|---|--|---|--|
| 89.5                | --- | 7.8                    | 0.8   | 0.1  | 0.7   | 100.0   | 0.8  | 0.0                                     | 0.7  |
| 92.0                | --- | 8.7                    | 1.6   | .25  | 1.35  | 93.2  | 4.8  | 4.0                                     | 4.7  |
| 94.0                | --- | 9.3                    | 3.3   | .7   | 2.6   | 86.4  | 10.6   | 6.2                                     | 7.55   |
| 96.0                | --- | 9.8                    | 5.5   | 1.4  | 4.1   | 83.6  | 11.4   | 7.3                                     | 9.9  |
| 97.0                | --- | 10.2                   | 8.7   | 2.7  | 6.0   | 81.5  | 12.5   | 5.9                                     | 10.0   |
| 98.0                | --- | 10.6                   |   |  |   |   |  | 3.8                                     | 9.8  |

OFFICE OF THE COMPTROLLER OF THE TREASURY, GASOLINE TAX DIVISION,  
STATE OF MARYLAND

.03.03.07 REGULATIONS GOVERNING MOTOR FUEL INSPECTION

(Authorized by Sections 157A through 157U of Article 56 of the Annotated Code of Maryland (1972 Replacement Volume) as amended by the General Assembly.)

EFFECTIVE JUNE 30, 1975

.01 *Standard specifications for unleaded gasoline.*—Unleaded Gasoline shall meet all the requirements as specified using the latest version of the American Society for Testing and Materials Methods of Tests.

A. DISTILLATION (ASTM D-86)

| Evaporation | December-January-February | March-April, October-November | May-June-July-August-September |
|-------------|---------------------------|-------------------------------|--------------------------------|
| 10 percent  | 131° F., maximum          | 140° F., maximum              | 149° F., maximum.              |
| 50 percent  | 170° F., minimum          | 170° F., minimum              | 170° F., minimum.              |
| 50 percent  | 235° F., maximum          | 240° F., maximum              | 245° F., maximum.              |
| 90 percent  | 365° F., maximum          | 365° F., maximum              | 374° F., maximum.              |
| End point   | 437° F.                   | 437° F.                       | 437° F.                        |
| Residue     | 2 percent maximum         | 2 percent maximum             | 2 percent maximum.             |

B. (1) Reid Vapor Pressure<sup>1</sup> (ASTM D-323), 15.0 PSI Maximum (Dec.-Jan.-Feb.), 13.5 PSI Maximum (Mar.-Apr.-Oct.-Nov.), and 11.5 PSI Maximum (May-Jun.-July.-Aug.-Sept.).

B. (2) V/L Ratio<sup>1</sup> (ASTM D-2533.), 20:1 Maximum, 105° F (Dec.-Jan.-Feb.), 116° F (Mar.-Apr.-Oct.-Nov.), and 124° F (May-Jun.-Jul.-Aug.-Sept.).

C. Corrosion. (ASTM D-130), Copper Strip Scale, No. 1, maximum at 122° F.

D. Sulfur. (ASTM D-1266) 0.10 percent by weight maximum.

E. Existent Gum Content. (ASTM D-381) 5 milligrams per 100 milliliters, maximum (after Heptane wash).

F. Visible Water and Sediment 0.01 percent by volume, maximum.

G. Lead. (ASTM D-3237) Grams per U.S. Gallon maximum Unleaded Gasoline .05.

H. Octane Test: The minimum rating, as determined by the latest version of ASTM Method D-2699+ASTM Method D-2700 divided by 2 shall be as follows:

|                  | Octane |
|------------------|--------|
| Premium gasoline | 95.0   |
| Mid-premium      | 91.5   |
| Regular Number 2 | 89.0   |
| Regular Number 1 | 87.0   |

Tolerance allowed limited to the ASTM reproducibility factor and Regular #1 shall have a minimum research octane rating of 91, subject to the ASTM reproducibility factor.

I. Phosphorus. (ASTM D-3231) Grams per U.S. Gallons max.—.005

.02 *Standard specifications for leaded gasoline.*—Leaded Gasoline shall meet all the requirements as specified, using the latest version of the American Society for Testing and Materials Methods of Tests.

A. DISTILLATION (ASTM D-86)

| Evaporation | December-January-February | March-April, October-November | May-June-July-August-September |
|-------------|---------------------------|-------------------------------|--------------------------------|
| 10 percent  | 131° F., maximum          | 140° F., maximum              | 149° F., maximum.              |
| 50 percent  | 170° F., minimum          | 170° F., minimum              | 170° F., minimum.              |
| 50 percent  | 235° F., maximum          | 240° F., maximum              | 245° F., maximum.              |
| 90 percent  | 365° F., maximum          | 365° F., maximum              | 374° F., maximum.              |
| End point   | 437° F.                   | 437° F.                       | 437° F.                        |
| Residue     | 2 percent maximum         | 2 percent maximum             | 2 percent maximum.             |

<sup>1</sup> An allowance of 15± days will be permitted to accommodate the receipt of new product and disbursement of old stock from the fixed change over date.

- B. (1) Reid Vapor Pressure.<sup>1</sup> (ASTM D-323.), 15.0 PSI Maximum (Dec.-Jan.-Feb.), 13.5 PSI maximum (Mar.-Apr.-Oct.-Nov.), and 11.5 PSI maximum (May-June-Jul.-Aug.-Sept.).
- B. (2) V/L Ratio<sup>1</sup> (ASTM D-2533.), 20:1 maximum, 105° F (Dec.-Jan.-Feb.), 116° F (Mar.-Apr.-Oct.-Nov.), and 124° F (May-Jun.-July-Aug.-Sept.).
- C. Corrosion. (ASTM D-130.) Copper Strip Scale, No. 1, maximum at 122° F.
- D. Sulfur. 0.10 percent by weight, maximum (ASTM D-1266).
- E. Existent Gum Content. (ASTM D-381.) 5 milligrams per 100 milliliters, maximum (after Heptane wash).
- F. Visible Water and Sediment. 0.01 percent by volume, maximum.
- G. Lead Test. (ATSTM D-3341) or (ASTM D-3237).
- H. Octane Test. The minimum rating as determined by the latest version of ASTM Method D-2699 + ASTM Method D-2700 divided by 2, shall be as follows:

|                       | <i>Octane</i> |
|-----------------------|---------------|
| Premium gasoline----- | 95.0          |
| Mid-premium-----      | 91.5          |
| Regular No. 2-----    | 89.0          |
| Regular No. 1-----    | 87.0          |

Tolerance allowable limited to the ASTM reproducibility factor (R + M)/2.

*.03 Specifications for No. 1-D Diesel Fuel.*—All No. 1-D diesel fuel shall meet the requirements of the following specifications, when tested in accordance with the latest version of the American Society for Testing and Materials Methods of Tests.

- A. Cloud Point. (ASTM D-2500). 20° F maximum.
- B. Flash Point. (ASTM D-93). 105° F minimum.
- C. Viscosity. (ASTM D-445). Kinematic at 100° F 1.4 centistokes minimum, 2.5 centistokes maximum.
- D. Visible Water and Sediment. (ASTM D-1796). 0.05% maximum by volume.
- E. Carbon Residue on 10 percent Residuum. (ASTM D-524). .15 percent, maximum.
- F. Ash. (ASTM D-482). 0.01 percent, maximum.
- G. Cetane Number. (ASTM D-613). 40, minimum.
- H. Distillation. (ASTM D-86). 90 percent point, 550° F maximum.
- I. Corrosion. (ASTM D-130.) Copper Strip, 3 hours at 122° F No. 3 maximum.

*.04 Specifications for No. 2-D Diesel Fuel.*—All No. 2-D diesel fuel shall meet the requirements of the following specifications when tested in accordance with the latest version of the American Society of Testing and Materials Methods of Tests.

- A. Cloud Test.<sup>2</sup> (ASTM D-1500.) 20° F maximum.
- B. Flash Point (ASTM D-93). 110° F minimum.
- C. Viscosity. (ASTM D-445). Kinematic at 100° F 2.0 centistokes minimum, 4.3 centistokes maximum.
- D. Visible Water and Sediment. (ASTM D-1796). .05 percent maximum by volume.
- E. Carbon Residue on 10 percent Residuum (ASTM D-524). .35 percent maximum.
- F. Ash. (ASTM D-482) 0.01 percent, maximum.
- G. Cetane Number. (ASTM D-613). 40, minimum.
- H. Distillation. (ASTM D-86). 90% point, 640° F maximum.
- I. Corrosion. (ASTM D-130) Copper Strip, 3 hours at 122° F No. 3 maximum.

*.05 (Reserved).*

*.06 Specification for Kerosene.*—Kerosene shall be free from water and suspended matter and meet the requirements of the following specifications, when tested in accordance with the latest version of the American Society for Testing and Materials Methods of Tests.

- A. Color. (ASTM D-156). The color shall not be darker than +16 Saybolt Scale.
- B. Flash Point. (ASTM D-56), 105° F minimum.
- C. End Point. (ASTM D-86). The end point on distillation shall not exceed 572° F.

<sup>1</sup> An allowance of 15+ days will be permitted to accommodate the receipt of new product and disbursement of old stock from the fixed change over date.

<sup>2</sup> When Cloud Point less than 10° F (-12.2° C) is specified, the minimum viscosity shall be 1.8 cs (32.0 sec. Saybolt Universal) and the minimum 90 percent point shall be waived.

*.07 Specifications for No. 1 Fuel Oil.*—No. 1 Fuel Oil is a distillate oil intended for vaporizing pot-type and similar burners. It shall meet the requirements of the following specifications, when tested in accordance with the latest version of the American Society for Testing and Materials Methods of Tests.

- A. Flash Point. (ASTM D-93) 105° F minimum.
- B. Pour Point. (ASTM D-97) 0° F maximum.
- C. Visible Water and Sediment. (ASTM D-1796) 0.05 percent by volume maximum.
- D. Viscosity. (ASTM D-445) Kinematic at 100° F. 1.4, centistokes minimum, 2.2 centistokes maximum.
- E. Gravity. (ASTM D-287) 35° API, minimum.
- F. Distillation. (ASTM D-86). 10 percent point, 420° F maximum. 90 percent point, 550° F maximum.

*.08 Specifications for No. 2 Fuel Oil.*—No. 2 Fuel Oil is a distillate oil for general purpose domestic heating use in burners not requiring No. 1 fuel oil. It shall meet the requirements of the following specifications, when tested in accordance with the latest version of the American Society for Testing and Materials Methods of Tests.

- A. Flash Point. (ASTM D-93). 110° F minimum.
- B. Pour Point. (ASTM D-97), 20° F maximum.<sup>1</sup>
- C. Visible Water and Sediment. (ASTM D-1796).
- D. Viscosity. (ASTM D-445). Kinematic at 100° F. 2.0 centistokes minimum,<sup>1</sup> 3.6 centistokes maximum.<sup>1</sup>
- E. Gravity. (ASTM D-287). 30° API, minimum.
- F. Distillation. (ASTM D-86). 90 percent Point, 640° F maximum.

*.09 (Reserved).*

*.10 Labeling of Pumps.*—Every pump dispensing gasoline or special fuels at retail shall be clearly labeled by a motor fuel inspector to indicate the minimum octane, grade and lead content. Where blending pumps are used, the faceplate shall clearly indicate to the consumer the grade of gasoline or special fuels being dispensed in accordance with regulations.

*.11 Certification of Taxes.*—Written request for certification of taxes paid shall be filed by June 30 each year for the current fiscal year taxes.

*.12 Registration.*—Annual registration shall be filed no later than July 1 each year.

*.13 Sample Size.*—Sample size for test purposes shall not exceed one U.S. gallon.

*.14 Return of Specification Labels.*—Specification labels affixed to dispensing pumps by the Gasoline Tax Division shall be returned to the Gasoline Tax Division by the lessee or owner of the dispensing pumps whenever said pumps are removed or relocated. Whenever a specification label is lost or destroyed, the Gasoline Tax Division shall be notified by the lessee or owner of the pump upon which the label was affixed.

*.15 "Stop Sale" at Retail Service Stations.*—A "Stop Sale" notice will be issued to Retail Service Station Dealers for gasoline and special fuels failing to meet established specifications. The supplier will be notified accordingly and a release will be awarded only after final disposition has been agreed upon by the Gasoline Tax Division. Confirmation for disposition shall be submitted in writing and contain an explanation for its failure to meet specification. The "Stop Sale" will apply only to the location where sample analysis indicates specification violation. Upon discovery of fuels failing to meet established specifications, meter readings and physical inventory shall be taken and reported in the confirmation for disposition.

*.16 "Stop Sale" at Bulk Storage Plants.*—A "Stop Sale" notice will be issued when petroleum products maintained in bulk plant facilities fail to meet specifications. Confirmation of disposition of "Stop Sale" product in the bulk plant and all such products returned to that bulk plant shall be submitted in writing and contain an explanation for its failure to meet specification. Such registrant shall immediately notify all customers that have received inferior product of our finding and make such arrangements as necessary to replace or adjust to specifications all products failing such specification. All records showing the delivery, notification, return, replacement or adjustment of product shall be made available to the Motor Fuel Inspectors upon request.

<sup>1</sup> Lower or higher pour points may be specified whenever required by conditions of storage or use. When pour point less than 0° F is specified, the minimum viscosity shall be 1.8 centistokes.

.17 "Warning" for Water.—A "warning" shall be issued to the Retail Service Station Dealer and to his supplier, whenever an underground storage tank is found to contain 2 inches or more of water as determined by the use of water finding paste on a gauge stick. A "Stop Sale" order will be issued if the water is not removed within the time period prescribed by the Gasoline Tax Division.

.18 Gasoline or Special Fuel Losses.—Losses of gasoline or special rule resulting from:

A. Theft. Gasoline Tax Division shall be notified upon discovery or by the first business day thereafter.

B. Faulty equipment or any other cause, except theft or temperature correction. The Gasoline Tax Division shall be notified upon discovery or by the first business day thereafter (No claim will be honored if reported to Gasoline Tax Division more than 60 days after occurrence or discovery).

.19 Meter Requirements.—All tank trucks, tank trailers, and tank semi-trailers making metered sales of gasoline or special fuels shall maintain a meter calibrated for that specific fuel being dispensed. Whenever a vehicle is utilized to deliver both gasoline and special fuels, separate meters shall be maintained and calibrated for gasoline and special fuels respectively.

.20 Color Coding of "Fills".—"Fills" for storage tanks at locations dispensing gasoline or special fuels at retail shall be color coded and of uniform color markings as registered with the Gasoline Tax Division by the licensee.

A. Color markings shall be painted or placed around the "fill pipe" or "man-hole" cover in a manner that will readily identify the product grade being stored.

B. "Fill Pipes" shall be coded to include all grades of gasoline individually identified, diesel fuel, heating oil, waste oil and kerosene.

.21 Co-Mingled Products—Interface, etc.—Co-mingled products (interface, interface mix, transmix, and products failing to meet State of Maryland specifications):

A. Shall not be imported, exported, or moved within the State of Maryland without written approval of the Gasoline Tax Division;

B. Shall not be co-mingled, compounded, blended, or inventoried in any gasoline or special fuel storage within the State of Maryland without written approval of the Gasoline Tax Division; once the product is placed into a bulk storage tank it shall not be blended into gasoline or special fuels, provided, however, that nothing herein shall prohibit the upgrading of regular gasoline by compounding or blending with premium gasoline.

.22 Annual Terminal Agreements.—Terminal Agreements shall be filed with the Gasoline Tax Division annually during the month of December for the anticipated succeeding calendar year's activity, on forms provided by the Gasoline Tax Division. Terminal Agreements will be filed by the owner/operator of the terminal that provides storage facilities.

.23 Additional Terminal Agreements.—Subsequent or additional terminal agreements that take place throughout the year, after the initial or annual filing referred to in Regulation No. 22, shall be submitted on the normal form provided, upon the execution of an Agreement with a new or additional terminal partner(s).

.24 Annual Exchange Agreements.—Exchange Agreements shall be filed with the Gasoline Tax Division annually during the month of December for the succeeding calendar year's activity, on forms provided by the Gasoline Tax Division. Exchange Agreements will be filed only by the party or parties that receive product for distribution within the State.

.25 Additional Exchange Agreements.—Subsequent or additional Exchange Agreement activity shall be reported by the first business day after receipt of product to the Gasoline Tax Division, and confirmed via the normal Exchange Agreement form provided by the Gasoline Tax Division, upon receipt of all detailed information necessary for the completion of that form.

.26 Refinery Specifications.—Refinery specifications means typical specifications and designation of all additives placed into each grade of product marketed within the State during the period of filing.

.27 Additive Specifications.—Additive specifications may be filed in detail or by means of an acceptable analytical method to be used to determine the presence or absence thereof.

.28 Trade Secrets.—Refinery or additive specifications considered to be a trade secret should be so indicated and shall meet with the concurrence of the Comptroller.

.29 Condition of Acceptance of Trade Secrets.—If the Comptroller of the Treasury does not accept information indicated as a trade secret, as such, said information will be maintained in a confidential status by the Gasoline Tax Division and

the submitting company notified accordingly. If, after deliberation by both parties, an agreement cannot be obtained as to its acceptable status, the document(s) will be returned to the sender.

*.30 Mailing Instructions for Trade Secret Information.*—Every Manufacturer, Refiner, or Motor Fuel Wholesaler importing gasoline and special fuels shall file refinery (or typical) specifications including additive specifications, regardless of where the additives become a part of the gasoline and special fuels, annually during December of each calendar year. Subsequent changes shall be filed before the product is sold within Maryland. If a trade secret is involved, then it must be so indicated and the information addressed to:

Comptroller of the Treasury,  
Gasoline Tax Division,  
P.O. Box 31,  
Annapolis, Maryland 21404.

*.31 Inventory of Refined Products.*—Under normal operating procedures, all petroleum products refined and imported into Maryland shall be inventoried by the refined product identification used on the shipping or delivery manifest.

*.32 Violations for Which a "Warning" Will Be Issued.*—A "warning" will be issued for the following violations: price sign, color coded fills, and unposted current Certificate of Registration. If, after 15 days, the violation still exists, an operations report will be forwarded to the Maryland State Police for appropriate action.

*.33 Allowance of Time for Product Conversion.*—"Stop Sale" notices and testing of lead will be waived for a period of 120 days when a Manufacturer, Wholesaler, or Retail Service Station Operator has filed notice with the Comptroller of the Treasury that he intends to introduce unleaded gasoline to the retail market in storage previously used for storage of leaded gasoline. A 120-day period is allowed as lead content in leaded gasoline de-escalates as prescribed in Art. 56, Section 157N Annotated Code of Maryland.

*.34<sup>1</sup> Temporary Operation of Service Station by Producer or Refiner.*—

A. A producer or refiner may operate temporarily a previously dealer-operated retail service station while making good faith efforts to locate and install a replacement dealer.

B. Within 5 business days of a producer's or refiner's beginning the operation of a previously dealer-operated service station, the producer or refiner shall apply in writing for approval of such operation to the Gasoline Tax Division.

The application shall set forth: (1) The location of the retail service station; (2) the name and address of the previous dealer; (3) the reasons in detail for the necessity of operation by the producer or refiner; (4) a description of the actions being taken to find another dealer for the service station; and (5) an estimate as to the time required to obtain another dealer.

C. The action of the Comptroller approving, rejecting, or approving with conditions the application shall be set forth in writing and sent by certified mail to the producer or refiner.

*.35 Ban Against Operation of Service Stations by Producers or Refiners, Procedure for Exceptions.*—

A. Art. 56, Section 157E(c), Annotated Code of Maryland, requires that no producer or refiner of petroleum products shall operate, after July 1, 1975, a major brand, secondary brand, or unbranded retail service station in the state of Maryland, with company personnel, a subsidiary company, or a commissioned agent. Reasonable exceptions to this date may be granted by the Comptroller on an individual basis as provided in this regulation.

B. Any producer or refiner seeking exceptions to Art. 56, Section 157E(c) Annotated Code of Maryland, shall file with the Gasoline Tax Division by June 1, 1975, a list by street address of retail service stations which are not expected to be divested by July 1, 1975, setting forth as to each retail service station the reasons for the request for exception, details as to plans to accomplish divestiture, and the anticipated date of cessation of the producer's or refiner's operation.

<sup>1</sup> Enforcement of rules and regulations .34 through .36 by the Comptroller of the Treasury will not be considered or undertaken until such time as there is a final decision by the Circuit Court of Anne Arundel County on the cases of Exxon Corporation, et al., v. Marvin Mandel, Governor, et al., Equity nos. 22,069, 22,091, 22,216, 22,461 and 22,502, (challenging the constitutionality of Chapter 854 of the Laws of Maryland 1974), and leave of said court is requested and received.

C. Action taken by the Comptroller approving, rejecting, or approving with conditions, the requests for exceptions shall be set forth in writing and sent by certified mail to the producer or refiner.

.36 *Formal Hearing Procedure; Extension of Cessation Date.*—

A. A producer or refiner dissatisfied with the action of the Comptroller under .34 or .35 may request, within 10 business days after receipt of the notice of action of the Comptroller, a formal hearing.

B. Formal hearings will be held at the Annapolis offices of the Comptroller and will be presided over by the Comptroller or his designee.

C. If the action of the Comptroller specifies a date by which producer's or refiner's operation of a retail service station shall stop, and the producer or refiner subsequently desires an extension thereof, application setting forth the reasons for such extension shall be made to the Gasoline Tax Division in writing not less than 30 days before such date. A producer or refiner who is dissatisfied with the action of the Comptroller with respect to his application for extension may request a formal hearing as provided in A of this regulation.

D. A producer or refiner may continue to operate a retail service station during the pendency of any proceeding provided for by this regulation or by .34 or .35.

GTFL 33 12-73

STATE OF MARYLAND  
COMPTROLLER OF THE TREASURY  
GASOLINE TAX DIVISION  
87 OCTANE GASOLINE

**UNLEADED**

SHALL BE DISPENSED FROM THIS PUMP IN COMPLIANCE  
WITH MARYLAND LAWS AND REGULATIONS.

Tests are conducted periodically for the following:  
CORROSION — SULFUR — DISTILLATION —  
REID VAPOR PRESSURE — GUM CONTENT —  
WATER AND SEDIMENT — OCTANE

**No 4124**

GTFL-12 REV. 11/73

STATE OF MARYLAND  
COMPTROLLER OF THE TREASURY  
GASOLINE TAX DIVISION  
REGULAR GASOLINE 89 OCTANE

**MAXIMUM LEAD CONTENT 3.0 GRAMS PER GALLON**

SHALL BE DISPENSED FROM THIS PUMP IN COMPLIANCE  
WITH MARYLAND LAWS AND REGULATIONS.

Tests are conducted periodically for the following:  
CORROSION — SULFUR — DISTILLATION —  
REID VAPOR PRESSURE — GUM CONTENT —  
WATER AND SEDIMENT — OCTANE

**No 11741**

GTFL-11 REV. 11/73

STATE OF MARYLAND  
COMPTROLLER OF THE TREASURY  
GASOLINE TAX DIVISION  
MID - PREMIUM GASOLINE 91.5 OCTANE

**MAXIMUM LEAD CONTENT 3.0 GRAMS PER GALLON**

SHALL BE DISPENSED FROM THIS PUMP IN COMPLIANCE  
WITH MARYLAND LAWS AND REGULATIONS.

Tests are conducted periodically for the following:  
CORROSION — SULFUR — DISTILLATION —  
REID VAPOR PRESSURE — GUM CONTENT —  
WATER AND SEDIMENT — OCTANE

**No 25125**

GTFL-14 REV. 11/73

STATE OF MARYLAND  
COMPTROLLER OF THE TREASURY  
GASOLINE TAX DIVISION  
PREMIUM GASOLINE 95 OCTANE  
MID - PREMIUM GASOLINE 91.5 OCTANE  
REGULAR GASOLINE 89 OCTANE  
ECONOMY GASOLINE 87 OCTANE

SHALL BE DISPENSED FROM THIS PUMP IN COMPLIANCE  
WITH MARYLAND LAWS AND REGULATION.

Tests are conducted periodically for the following:  
CORROSION — SULFUR — DISTILLATION —  
REID VAPOR PRESSURE — GUM CONTENT —  
WATER AND SEDIMENT — OCTANE

**No 35606**

GTFL-10 REV. 11/73

STATE OF MARYLAND  
COMPTROLLER OF THE TREASURY  
GASOLINE TAX DIVISION  
PREMIUM GASOLINE 95 OCTANE

**MAXIMUM LEAD CONTENT 3.0 GRAMS PER GALLON**

SHALL BE DISPENSED FROM THIS PUMP IN COMPLIANCE  
WITH MARYLAND LAWS AND REGULATIONS.

Tests are conducted periodically for the following:  
CORROSION — SULFUR — DISTILLATION —  
REID VAPOR PRESSURE — GUM CONTENT —  
WATER AND SEDIMENT — OCTANE

**No 17155**

## GASOLINE GALLONAGE—PURCHASES AND EXCHANGES BETWEEN MOTOR FUEL DEALERS, SALES AND EXCHANGES BETWEEN MOTOR FUEL DEALERS

|                               | 1971           |               |         | 1972           |               |         | 1973           |               |         | 1974           |               |         |
|-------------------------------|----------------|---------------|---------|----------------|---------------|---------|----------------|---------------|---------|----------------|---------------|---------|
|                               | Number dealers | Total gallons | Percent | Number dealers | Total gallons | Percent | Number dealers | Total gallons | Percent | Number dealers | Total gallons | Percent |
| Amerata Hess Corp.:           |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 1              | 38,129,027    |         | 2              | 13,121,036    | -66     | 9              | 30,351,275    | 131     | 7              | 53,316,091    | 76      |
| Sales/exchanges to.....       | 4              | 8,031,380     | -9      | 2              | 7,306,572     |         | 9              | 25,397,407    | 248     | 6              | 37,617,701    | 48      |
| Amoco Oil Co.:                |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 1              | 358,065       | 525     | 2              | 2,236,603     |         | 3              | 5,012,077     | 124     | 2              | 4,819,353     | -4      |
| Sales/exchanges to.....       | 1              | 831,852       | -54     | 2              | 381,330       |         | 5              | 5,870,463     | 1,439   | 2              | 170,742       | -97     |
| Ashland Oil, Inc.:            |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 3              | 27,077,559    | 76      | 6              | 47,610,760    |         | 4              | 67,802,734    | 42      | 5              | 74,957,479    | 11      |
| Sales/exchanges to.....       | 1              | 358,065       | 1,895   | 5              | 7,144,221     |         | 8              | 17,532,834    | 145     | 5              | 76,330,973    | 335     |
| Atlantic Richfield Co.:       |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 4              | 2,835,285     | -5      | 5              | 2,680,720     |         | 7              | 5,929,057     | 121     | 3              | 26,746,816    | 351     |
| Sales/exchanges to.....       | 4              | 2,853,775     | 40      | 2              | 3,984,060     |         | 4              | 2,139,841     | -46     | 2              | 5,533,770     | 159     |
| BP Oil Co.:                   |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 2              | 4,452,957     | -69     | 2              | 1,382,907     |         | 8              | 7,374,563     | 433     | 9              | 5,486,626     | -26     |
| Sales/exchanges to.....       | 4              | 6,554,426     | 83      | 6              | 11,987,934    |         | 9              | 13,944,003    | 16      | 7              | 45,401,517    | 226     |
| Cities Service Oil Co.:       |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 7              | 10,861,144    | 181     | 6              | 30,527,615    |         | 9              | 40,686,469    | 33      | 10             | 23,129,438    | -43     |
| Sales/exchanges to.....       | 7              | 35,940,107    | -9      | 6              | 32,700,757    |         | 7              | 27,814,861    | -15     | 8              | 25,034,413    | -10     |
| Chevron Oil Co.:              |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 2              | 7,300,725     | 6       | 1              | 7,743,784     |         | 2              | 7,525,579     | -3      | 3              | 7,508,172     | -0023   |
| Sales/exchanges to.....       | 4              | 5,523,817     | -57     | 2              | 2,363,728     |         | 3              | 1,357,081     | -75     | 2              | 334,241       |         |
| Continental Oil Co.:          |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 6              | 30,993,596    | -64     | 6              | 11,067,252    |         | 6              | 10,880,352    | -2      | 5              | 79,079,406    | 629     |
| Sales/exchanges to.....       | 4              | 54,262,615    | -48     | 5              | 28,364,894    |         | 9              | 18,487,055    | -35     | 9              | 94,233,874    | 410     |
| Exxon Corp.:                  |                |               |         |                |               |         |                |               |         |                |               |         |
| Purchases/exchanges from..... | 3              | 3,437,238     | 39      | 2              | 4,771,316     |         | 2              | 12,851,704    | 169     | 3              | 14,370,265    | 12      |
| Sales/exchanges to.....       | 1              | 491,234       | -100    | -----          | 0             |         | 2              | 2,472,460     | 100     | 1              | 1,497,318     | -39     |



TEXACO, INC.,  
Washington, D.C., August 21, 1975.

EXECUTIVE COMMUNICATIONS,  
Federal Energy Administration,  
Washington, D.C.

DEAR SIR: As provided for in the *Federal Register*, Volume 40, No. 149, Page 32349 of Friday, August 1, 1975, Texaco Inc. is filing the following comments on the proposed amendment to change the octane number posting requirement from  $(R+M)/2$  to Research Octane Number (RON).

It is Texaco's opinion that the posting of the octane value of motor gasolines in the form of Research Octane Number (RON) rather than using  $(R+M)/2$  will not clarify matters for the consumer and could cause confusion on his part and others.

Extensive research has proven that  $(R+M)/2$  is the best parameter for measuring the motor gasoline antiknock performance in the overall car population. For this reason, posting of  $(R+M)/2$  provides the consumer with a better quality determination than the posting of RON alone. For example two fuels may have the same RON but different motor octane numbers (MON). The fuel with the lower MON will have a greater tendency to knock and the posting of  $(R+M)/2$  would reflect this tendency, which would allow the consumer to avoid fuel of this quality in the future if it caused knocking in his automobile. The posting of RON only would not enable the consumer to make this selection.

In addition to reducing possible confusion on the part of the consumer, it is our opinion that it is significant that other government agencies have accepted the parameter of  $(R+M)/2$  as the best indicator of antiknock performance. This parameter is, also, included in ASTM and Federal gasoline specification and it is used as a primary control of antiknock performance in Texaco's manufacturing process. The parameter of  $(R+M)/2$  is commonly used in the industry for quality determination of bulk sales or exchanges of motor gasolines and is used in some industry price postings. In considering the above factors plus the fact that the existing regulations have been in effect for several years, it seems inappropriate to change to a different parameter for octane postings.

The suggestion in the FEA staff study, "Automobile Octane Requirement, Fuel Economy and Petroleum Conservation," that a grading system be established has been considered in the past and would reduce consumer confusion provided it was based on the proper parameter, currently  $(R+M)/2$ . In this regard, the Society of Automotive Engineers (SAE), the American Society for Testing and Materials (ASTM), and the American Petroleum Institute (API) have developed the "Automotive Gasoline Performance and Information System" which is a consumer oriented system to provide information on the performance of gasoline. This proposed system has SAE approval and it is anticipated it will be approved by ASTM. Texaco believes that this system would provide the necessary performance data to consumers and others; it is suggested that the FEA consider this system.

In summary, Texaco is opposed to the proposed change in octane postings to RON because it appears to be arbitrary and would not assist the consumer or others in the evaluation of gasoline antiknock performance. Also, it is suggested that the FEA consider the "Automobile Gasoline Performance and Information System" developed by API, ASTM and SAE.

Yours very truly,

WILLIAM K. TELL, Jr.,  
Vice President.

TEXACO, INC.,  
Washington, D.C., September 17, 1971.

ASSISTANT DIRECTOR FOR INDUSTRY GUIDANCE,  
Bureau of Consumer Protection,  
Federal Trade Commission,  
Washington, D.C.

DEAR SIR: In a news release dated August 19, 1971, the Federal Trade Commission invited comments on a proposed regulation to require posting of the average of a gasoline's Research (R) and Motor (M) method octane numbers. This method would replace the Research Octane Number method originally proposed by the Commission.

Texaco is gratified with the Commission's acceptance of  $(R+M)/2$  as the octane parameter to measure fuel antiknock performance for today's over-all

population of cars requiring premium-grade gasoline and the majority of cars requiring regular grade gasoline.

However, Texaco is seriously concerned about the intent of the Commission to require the posting of actual  $(R+M)/2$  octane numbers on gasoline pumps. In our judgment, the posting of octane numbers in any form has serious disadvantages and none of the compensating features of the alternate approach presented in my letter of June 14, 1971, to the Commission. That letter cited the following strong and compelling justification why the posting of specific  $(R+M)/2$  numbers would not serve the best interests of the motoring public:

First, a change from  $(R+M)/2$  to some other octane parameter will be necessary a few years from now if the current trend toward increasing importance of motor method octane ratings continues. If  $(R+M)/2$  numbers are posted and the public gradually becomes accustomed to these numbers, a change to new numbers will cause confusion and require a new clarification program. Arbitrary continuance of  $(R+M)/2$  posting, after this parameter ceases to be a meaningful indicator of road performance, would then mislead the consumer. Secondly, motorists traveling in or out of altitude areas would be confused by the octane number changes which the refiner builds into his gasoline to compensate for altitude. Finally, new model cars designed to produce lower exhaust emissions have lower octane requirements, and lower octane unleaded or low lead gasolines which help to reduce emissions are being marketed for these cars. Posting of octane numbers at this time would tend to place undue emphasis on octanes, confusing the consumer rather than encouraging him to use the gasolines specifically designed for these cars.

The alternate approach given in my letter of June 14 presented what we feel is the most viable way to provide a useful indication to motorists of the anti-knock qualities of gasolines. That approach is by means of an *octane grade system*. We would like to briefly review for your consideration our recommendation.

#### OCTANE GRADE SYSTEM

The system proposed is based on minimum values for the sum of Research and Motor octane rating divided by two, commonly referred to as  $(R+M)/2$ . The designations could be any symbol, Roman or Arabic number or letter. For the purpose of our discussion we have chosen to use Roman numeral designations.

#### GRADE DESIGNATION AND MINIMUM VALUES

To prevent possible confusion and eliminate unnecessary complexity, four grade designations are proposed. This number is sufficient to provide the motorist with an adequate range of octanes from which to choose.

Because a car engine's octane needs decrease with increasing altitude, compensation for altitude should be built into a grade designation system to assure the motorist of receiving quality adequate for the area. Thus, we have included proposed Geographic divisions (see accompanying map) of minimum  $(R+M)/2$  values. Grade designations and their corresponding geographic division values are shown in the following table.

| Octane grade designation | Minimum $(R+M)/2$ octanes, geographic division |    |    |    |
|--------------------------|--|----|----|----|
|                          | 1  | 2  | 3  | 4  |
| I.....                   | 95   | 94 | 93 | 95 |
| II.....                  | 92   | 91 | 90 | 92 |
| III.....                 | 89   | 88 | 86 | 89 |
| IV.....                  | 87   | 86 | 84 | 87 |

Federal Specifications VV-G-76B and VV-G-001690 also take into consideration the altitude aspect and specify minimum  $(R+M)/2$  octanes by geographical division. However, our boundaries for Geographic Divisions II and III differ somewhat from the State Groups II and III of the Federal Specifications. Where the Federal Groups for the most part adhere to State lines, our boundaries are located to better define areas of major altitude difference. Thus we believe our geographic divisions provide a more technically correct recognition of altitude.

The minimum  $(R+M)/2$  values shown above for Grades I, III, and IV in Geographic Division I are the same as those for premium, regular, and special grades respectively of Federal Specification VV-G-001690. In the other geo-

graphic divisions, the minimums differ slightly in some cases from the Federal Specification values because of altitude considerations. The Federal Specifications do not provide for a grade intermediate between premium and regular grades such as Octane Grade II in the above table. We include Grade II in recognition of the fact that products of this octane level are being marketed. Octane increments between our four grades are approximately equal.

The minimum  $(R+M)/2$  values would apply to all gasolines, regardless of the amount of their lead additive content. To display an Octane Grade III designation in Groups 1 and 4, for example, any fuel—lead-free, low-lead, or fully leaded—would have to meet the 89 minimum  $(R+M)/2$ .

#### ADVANTAGES OF THE PROPOSED OCTANE GRADE SYSTEM

Texaco believes the proposed octane grade system would accomplish the Commission's basic objective of providing the consumer with the most meaningful indication of gasoline antiknock quality. In addition, our proposal offers three distinct advantages to the motoring public:

1. Historically, the relative importance of research and motor method octanes in relation to road performance has been changing, and it will probably be necessary to change from  $(R+M)/2$  to a new parameter within a few years to keep octane controls on a meaningful basis. Such a change in the basis for the octane grades can readily be made without changing postings on pumps and without causing concern and confusion among the gasoline consuming public.

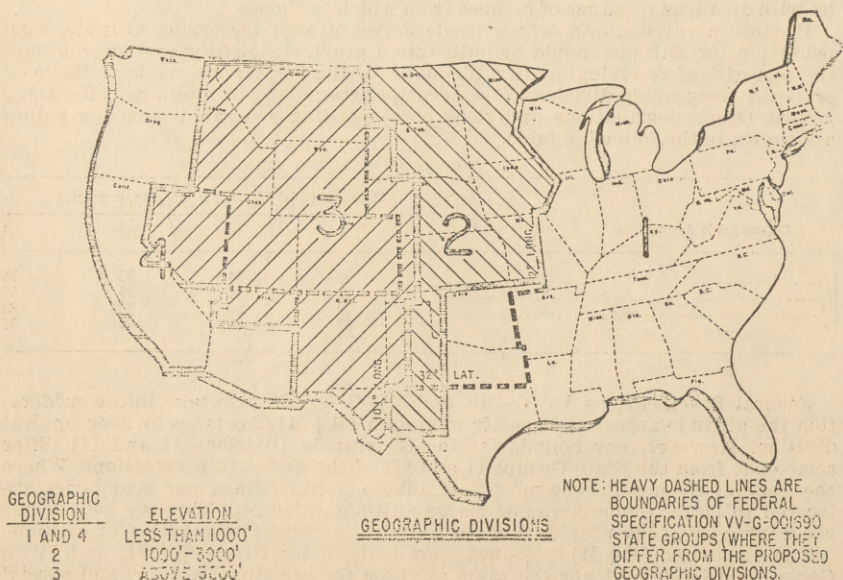
2. Compensation for altitude is built into this proposal via changes in octane minimums for different groups of states, classified by altitude.

3. The proposal avoids undue emphasis on octane ratings. This is especially important at a time when efforts to reduce exhaust emissions are in the direction of lower-octane cars and new low-lead or unleaded gasolines of lower octane designed for these new low-emission cars. Emphasis on octane numbers could also lead to an inflationary octane race, during the country's efforts to curb inflation.

We respectfully urge that the Commission give serious consideration to an octane grade system. Although Texaco does not believe that any form of mandatory posting of gasoline quality information should be imposed by the Commission, if posting is required, we sincerely believe that our proposal is in the best interests of the motoring public.

Respectfully,

JAMES H. PIPKIN,  
*Executive Vice President.*



TEXACO, INC.,  
Washington, D.C., June 14, 1971.

ASSISTANT DIRECTOR FOR INDUSTRY GUIDANCE,  
Bureau of Consumer Protection,  
Federal Trade Commission, Washington, D.C.

DEAR SIR: This is in response to the notice published in the Federal Register on Saturday, April 17, 1971 inviting "written data, views and comments regarding the appropriateness of reliance upon the Research method of measuring octane rating, including suggestions for alternative methods of measurement."

As you know, the views of Texaco on the shortcomings of Research Octane Number posting were provided with my letter of March 18, 1971 to FTC Chairman Miles W. Kirkpatrick. I would now like to submit our suggestions for alternatives to Research Octane posting, for consideration by the Commission. In brief, we think any alternate system should be built around the use of the *sum of Research (R) and Motor (M) octane ratings divided by two*; this is referred to as the averaged laboratory octane number and is commonly written and referred to as  $(R+M)/2$ . This parameter is the simplest technically meaningful indicator of road octane performance for premium grade requirement cars on the road and also for the majority of regular grade requirement cars. While  $(R+M)/2$  does not apply as well to some small portions of the car population as other combinations of R and M, we think it is the best compromise choice for the overall car population. This has been recognized by the Army and other groups responsible for Federal gasoline specifications, and  $(R+M)/2$  is the controlling octane requirement in Federal Specification VV-G-76B dated March 20, 1970 and also in proposed specification VV-G-001690 (Army-MR) for Low Leaded and Unleaded Automotive Gasoline. Furthermore, ASTM through Technical Division A on Gasoline of Committee D-2 on Petroleum Products is currently considering revision of ASTM D439 Gasoline Specifications to include minimum  $(R+M)/2$  as the primary octane control.

We believe that the objectives of the Commission can best be accomplished by the use of an Octane Grade Designation system with minimum  $(R+M)/2$  requirements established for each grade. This system will provide a useful indication to motorists of the relative anti-knock qualities of gasolines on the market.

We do not think minimum  $(R+M)/2$  numbers need to be posted on pumps. This approach has certain disadvantages, such as requiring a program to try to educate the public as to the meaning of  $(R+M)/2$ , the influence of altitude on the automobiles' requirement for octane, and the prospect that a changing characteristic of the car population may require alteration of this number.

Our specific proposal and its advantages are described in Attachment I. While we have tried to make the attachment self-sufficient, we realize there may be aspects on which you will have questions or would like additional information. In particular, we would like to call your attention to the recommendation in the attached proposal that State Groups 2 and 3, as outlined in specification VV-G-001690 and referred to in the attachment, be redefined by an appropriate committee if it should be decided that a regulation along the lines of this proposal satisfies the Commission's basic objective. We shall be glad to answer your requests for supplementary information and would welcome the opportunity to meet with you and your associates for further discussion of this matter.

I would also like to take this opportunity to briefly mention the related subject of enforcement of whatever regulation may finally be decided upon. While this can best be a subject for separate correspondence and discussion, we do want to emphasize that fairness of a regulation to all competitors will depend on sound and complete enforcement, including recognition of testing tolerances for the knock test methods. We are confident this will be the policy of the Commission.

Respectfully submitted.

JAMES H. PIPKIN,  
Executive Vice President.

Attachments.

#### ATTACHMENT I

TEXACO INC., PROPOSED ALTERNATE TO RESEARCH OCTANE POSTING

#### SUMMARY

This proposal sets forth an octane grade system based on minimum valued for the *sum of Research (R) and Motor (M) octane ratings divided by two*; this is commonly written and referred to as  $(R+M)/2$ . Suggested Octane Grade Desig-

nations and their corresponding minimum  $(R+M)/2$  values by State Groups are described in the following sections. Only the Grade Designation would appear on the service station pump.

GRADE DESIGNATIONS AND MINIMUM OCTANES

| Octane grade designation | Minimum $(R+M)/2$ octanes, State group |    |    |      |
|--------------------------|--|----|----|------|
|                          | 1                                      | 2  | 3  | 4    |
| I.....                   | 95                                     | 95 | 93 | 95.0 |
| II.....                  | 92                                     | 92 | 90 | 92.0 |
| III.....                 | 89                                     | 88 | 86 | 88.5 |
| IV.....                  | 87                                     | 86 | 84 | 86.5 |

STATE GROUPS

Federal Specifications VV-G-76B and proposed VV-G-001690 specify minimum octanes by state groups. It is understood that these state groups for VV-G-001690 are as shown on Figure 1, attached. The basic purpose of the state groups is to take altitude into consideration in recognition of the fact that octane requirements of cars decrease with increasing altitude (about one O.N. per 1000 ft.). In principle, this approach to octane specifications is straightforward and for illustrative purposes the state groups in the above table may be considered to be the same as those in Figure 1. However, State Groups 2 and 3 as defined in this figure do not adequately take altitude into account because state boundaries do not exactly follow altitude contours. To properly treat the altitude aspect, some parts of State Group 2 should be added to State Group 3; these would be the western portions of South Dakota, Nebraska and Kansas, plus part of the Texas panhandle, all of New Mexico and the northern portion of Arizona, where altitude is above 3000 ft. Rather than attempting to unilaterally present specific boundaries at this stage, this proposal includes the recommendation that State Groups 2 and 3 should be redefined by an appropriate committee made up of industry and government representatives.

DISCUSSION

This proposal accomplishes the FTC's basic objective of providing the gasoline consuming public with a meaningful indication of the anti-knock qualities of gasolines on the market. While a greater number of grades could be established, the system would then tend to become confusing and unnecessarily elaborate. The four grades indicated provide an adequate range of octane from which the motorist can choose. The term  $(R+M)/2$  is proposed because of its close historical correlation with average Road octane quality in automatic transmission cars which represent about 90 per cent of the car population. While some small segments of the car population respond to other octane parameters—that is, manual transmission regular-grade requirement cars have in the past had a greater appreciation for Research octanes whereas new model regular-grade cars (particularly '69 and '70 models) have much greater appreciation for Motor method octanes— $(R+M)/2$  is the best over-all compromise. This has been recognized in Federal Specification VV-G-76B for Automotive Gasoline and in proposed Specification VV-G-001690 for Low Leaded and Unleaded Automotive Gasoline.

The minimum  $(R+M)/2$  values shown above for Grades I, III and IV are the same as those contemplated for VV-G-001690. The Federal specifications do not provide for a grade intermediate between premium and regular grades such as Octane Grade II in the above table. Grade II is included in recognition of the fact that products of this octane level are being marketed. With the four grades as shown there are approximately equal octane increments between grades.

The minimum  $(R+M)/2$  values would apply to all gasolines regardless of the amount of lead anti-knock compound contained therein—e.g., to display an Octane Grade III designation in States Groups 1 and 4, gasoline would have to meet the 89 minimum  $(R+M)/2$  whether it is lead-free, low-lead, or conventionally leaded.

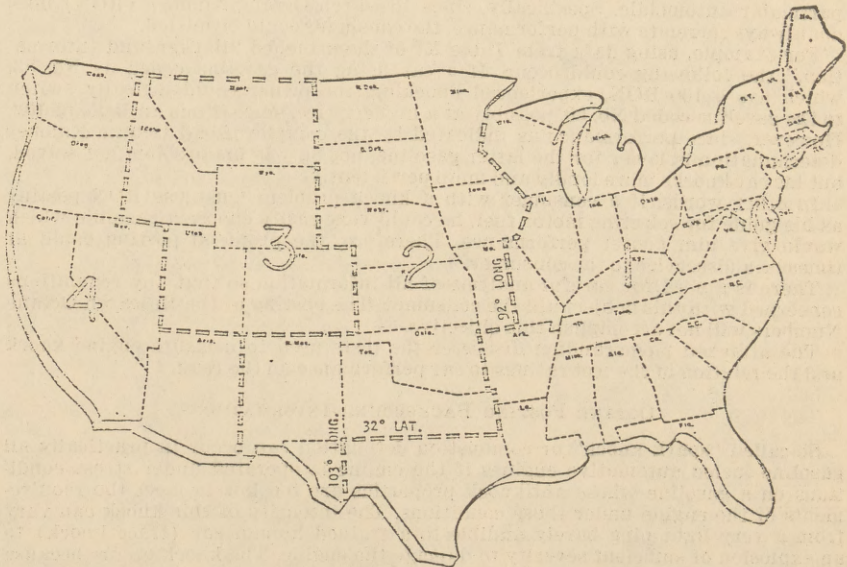
In addition to satisfying the basic objective of the Commission, this proposal has the following distinct advantages to the motoring public:

1. At some point in the future it may be necessary to change the octane parameter to keep the octane grades on a meaningful basis in relation to road performance; e.g., if the increasing importance of Motor method octane ratings noted in late model cars continues to prevail in future cars, road octane performance of fuels in the car population a few years from now will be best represented by a parameter which places greater emphasis on Motor octanes. With this proposal, such a change in the basis for the octane grades can readily be made without changing postings on pumps and without causing concern and confusion among the public, assuming of course that gasolines are manufactured to satisfy the new parameter.

2. Compensation for altitude is built into this proposal via the change in  $(R+M)/2$  minimums for the various state groups, such that motorists driving into a higher altitude area can be assured of receiving octane quality adequate for the area without having to become concerned or confused with differences in posted numbers between sea level and altitude.

3. Due to the complexities of gasoline manufacture and the economics of transportation, occasionally an individual company will supply gasoline with an octane considerably above the average in a given location. Octane of gasoline supplied in this manner is higher than that actually required for the location and the higher octane provides no real advantage to the public. If the higher number were to be posted on the pump, the public may be misled into purchasing a product which offers no significant benefit. The system of Octane Grade Designations eliminates this problem.

4. The country has entered a period of major change in automobiles and gasolines, all directed toward reduction of exhaust emissions. Changes to date are in the direction of lower octane requirement cars and new low-lead or unleaded gasolines of lower octane designed for the new cars. Posting of actual octane numbers at this time would tend to place undue emphasis on octanes, confusing the consumer rather than encouraging him to use gasolines that directionally would reduce emissions. The simple, straightforward Octane Grade Designation system avoids this.



STATE GROUP DISTRIBUTION

FIGURE 1

TEXACO, INC.,  
Washington, D.C., March 18, 1971.

Mr. MILES W. KIRKPATRICK,  
Chairman, Federal Trade Commission,  
Washington, D.C.

DEAR MR. KIRKPATRICK: I would like to express to you again, both for myself and on behalf of my colleagues from Texaco, our gratitude for the time you and your associates gave us on Thursday, February 25, and for your very pleasant and productive conduct of the meeting.

In brief, our discussion with you emphasized that no single octane test properly characterizes gasoline. A car owner who depends on the Research Octane Number of a gasoline as a guide in selecting a fuel that would solve an engine knocking problem, could be misled. He could pay more money for a fuel with a higher Research Octane Number and get even worse performance from his car. This would be contrary to the objective you have in mind.

I am attaching an introductory statement and a supporting memorandum which discusses in some detail the material which we presented to you during our meeting. You mentioned your desire to circulate this material to interested parties, and we have therefore deleted all reference to, or mention of, Texaco from its text and figures. You are, of course, perfectly free to use our name in connection with the memorandum if you wish. You will note that we have refrained from making any specific suggestions since we feel these should appropriately develop by consensus of an informed group. We will be most happy to suggest several alternatives to Research Octane Number posting if you so desire.

As stated to you, we stand ready to supply additional information, and will meet with you and your associates at any time suggested.

Respectfully submitted,

JAMES H. PIPKIN,  
Executive Vice President.

Attachments.

#### OCTANE POSTING INTRODUCTORY STATEMENT

No single octane rating test accurately predicts a fuel's performance in any particular automobile. Specifically, since Research Octane Number (RON) does not always correlate with performance, the consumer could be misled.

For example, using data from Table XI of the attached "Background Information," the following could occur. If a car using the gasoline coded as No. 83, which has a 100 RON, experienced knocking, the owner could logically switch to the gasoline coded No. 60, possibly at a higher price, since it has an RON of 102. However, since performance as indicated by the complex Road Octane Number determination is lower for the latter gasoline, not only is his problem not solved, but his car knocks more loudly and more persistently.

In other words, if a consumer with a knock problem must use RON posting as his guide for selecting motor fuel, he could very easily choose a gasoline which would give him poorer performance. Therefore, the proposed posting could at times be a disservice to the consumer.

There is a need for careful analysis of all information so that any regulations concerned with this subject aid the consumer. The posting of the Research Octane Numbers will not accomplish this objective.

The attached memorandum discusses the tests used to measure engine knock and the relation of the test ratings to car performance on the road.

#### OCTANE POSTING BACKGROUND INFORMATION

So-called "spark knock" or combustion detonation can occur in practically all gasoline-fueled automotive engines if the engine is operated under stress conditions on a gasoline whose antiknock properties are too low to meet the requirements of the engine under those conditions. The intensity of this knock can vary from a very light ping barely audible to a trained human ear (trace knock) to an explosion of sufficient severity to damage the engine. The knock occurs because the flame front traveling across the combustion chamber from the spark plug compresses and heats the unburned combustible mixture ahead of it causing it to ignite prematurely. This results in a sharp, uncontrolled pressure rise which can be audible and damaging.

Many parameters of engine design and operation and fuel composition affect the knocking phenomenon. Some of these parameters are:

*Engine design.*—Compression ratio; manifold temperature; fuel distribution; fuel/air ratio; and ignition timing.

*Engine operation.*—Engine RPM; acceleration rate; throttle position; load; and engine temperature.

*Fuel composition.*—Percent saturated hydrocarbons—straight chain and branched chain; percent unsaturated hydrocarbons—straight chain and branched chain; percent aromatic hydrocarbons; percent naphthene hydrocarbons; and lead alkyl content.

Altitude, ambient air temperature, and humidity also affect the knocking characteristics of an engine and, finally, the driving habits of the driver himself can influence the octane of a fuel required to prevent knocking in his automobile as he drives it.

The practical limitations on manufacturing tolerances and on those factors beyond the manufacturers' control which influence the antiknock performance of an engine make it quite impossible for the engine manufacturer to specify octane requirement of his engine with any degree of precision. It is understood the Commission is completely cognizant of this situation and accepts it as a fact. In this connection, it is possibly of interest that the octane requirement of an engine normally increases one to as many as six members over the first 3,000–5,000 miles and then varies above and below a mean as deposits develop in the combustion chamber and flake off from the walls of the chamber and the piston head during normal operation. This octane requirement increase is affected by many factors, including engine design, engine operating conditions, and the composition of the fuel burned in the engine.

From the above, it is apparent that no single evaluation technique, even the most cumbersome or complicated, could be expected to predict accurately the performance of any particular fuel in any specific engine, except the combination of that particular fuel in that specific engine. It is necessary therefore to develop and standardize one or more methods of test which will provide a reasonable approximation of field performance. In the United States, there are two well standardized and widely accepted laboratory tests utilizing single cylinder engines for experimentally determining "octane number" in a rapid and practical fashion. These are ASTM Tests No. D-2699 and D-2700, methods for determining the so-called Research Octane Number (RON) and the Motor Octane Number (MON), respectively. These two methods almost always give different numbers on any particular level, depending primarily upon its hydrocarbon composition. The Research Octane Number is usually higher by 6 to 10 units than the Motor Octane Number, although in extreme cases the difference may be as low as 0 or as high as 14. This difference is called the "octane sensitivity" of a fuel. Commercial fuels rarely have an "octane sensitivity of less than 4 or more than 12 units.

There is one widely used road test called the Modified Uniontown Technique which determines a so-called Road Octane Number (RdON) of a fuel in an automobile. A brief description of the Modified Uniontown Technique is presented in Figure 1, and the operating conditions for the two ASTM methods are presented in Table I. It is apparent that each of these methods determines a different octane characteristic of the fuel. The one common property of all octane tests is the definition that isooctane has an octane number of 100 and normal heptane has an octane number of 0. The octane number is equal to the percentage of isooctane in a blend of isooctane and normal heptane whose antiknock performance equals that of the unknown fuel under the same combustion conditions.

Obviously, the question of primary importance is, "Which of these tests correlates best with the antiknock requirements of the total car population and individual cars in that total population?" A vital consideration for the purposes of octane posting is whether the posted number correlates directly with antiknock performance in all cars or whether the possibility exists of a reversal such that a higher octane by the method posted will actually give lower antiknock performance in a car on the road.

Prior to and during World War II, the Motor Octane Number was used almost exclusively for controlling manufacture of fuels, and it provided both the marketer and the automobile manufacturer with an adequate estimate of antiknock performance in the cars manufactured at that time.

Fuel manufacturing techniques and facilities developed during World War II provided higher antiknock availability in motor gasolines across the country, and the automobile manufacturers utilized this increased octane "pool" to improve the efficiency of their engines by increasing compression ratios. The standardized Research Octane Number (ASTM Test No. D-2699) seemed at

that stage to provide a better correlation with automobile performance, and its generally higher number gradually became accepted as the antiknock standard for motor fuels. The invention of catalytic reforming and its widespread introduction as a refinery process during the 1950's resulted in a rapid increase in octane capacity, and the automotive industry rapidly raised compression ratios. This "leapfrogging" by the petroleum and automotive industries developed into a compression ratio-octane race which continued until developments became limited by other phenomena associated with high compression ratio gasoline engines.

During this period of time, it became apparent that neither the Research Octane Number nor the Motor Octane Number gave a satisfactorily unique measure of actual road antiknock performance, and the average of the two  $M+M^1/2$  came to be used for general estimation of road antiknock performance. The Federal Government in its most recent specification (VV-G-76B) includes this definition in its antiknock performance requirements. Beginning in about 1963 and continuing through 1970, the Research Octane Number has been of decreasing significance in predicting road antiknock performance. (See attached Tables II through VI. Table II describes a program for developing equations to predict gasoline performance in cars. Table III outlines the scope of a program conducted by the Coordinating Research Council (CRC) in 1969. Table IV lists a prediction equation for 1969 cars and also similar equations developed in earlier years for 1963 and 1965 cars. Table V lists the important conclusions from the CRC programs. Table VI indicates the greater importance of Motor Octane Number in 1970 cars.) A much more satisfactory prediction of road antiknock performance is obtained for 1970 cars by an equation which combines 0.8 of the Motor Octane Number with 0.2 of the Research Octane Number. Preliminary evaluations of 1971 cars indicate a continuing increase in emphasis on the Motor Octane Number as shown in attached Table VII and Figures 2 and 3.

The increasing influence of the Motor Octane Number in the determination of road antiknock performance has resulted in commercial fuels with high Research Octane Numbers frequently giving lower road antiknock performance than fuels with lower Research Octane Numbers and higher Motor Octane Numbers (that is, having a reduced "octane sensitivity"). Examples of commercial fuels which illustrate this situation are given in Tables VIII through X. Data on two series of fuels illustrating the lack of correlation between Research and Road Octane Numbers are shown in Figures 4 and 5. The attached Table XI, Page 6 from the *Summer 1970 DuPont Gasoline Survey*, further illustrates this point. The different fuels in this table were obtained at service station dispensing pumps, as are all of those reported in such surveys.

It is apparent that no single practical test can predict accurately the antiknock performance of a particular gasoline in a particular car. It is also apparent that no single practical test can predict the relative antiknock performance of different fuels in a significant car population.

Equations combining Research Octane Number and Motor Octane Number with appropriate constants and coefficients can predict within reasonable tolerances the antiknock performance of a gasoline in a large number of cars. While such equations may not accurately predict the performances of fuels in a particular car, they will give good relative prediction of performance in essentially all cars.

The coefficients and constants for an equation applicable to new cars are changing rapidly now and probably will continue to change rapidly over the next few years as car manufacturers modify engines in an attempt to meet the emission requirements specified for 1975 and subsequent models. To complicate matters, it must be remembered that the car population is composed of approximately ten per cent of current model-year cars and some ninety per cent of cars from preceding model-years.

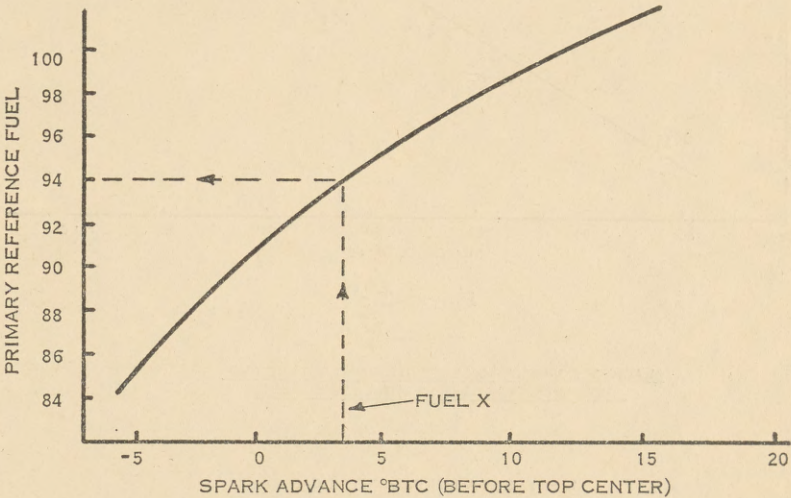
<sup>1</sup>  $R+M/2=0.5\text{ RON}+0.5\text{ MON}$ .

The introduction of low-lead and lead-free gasolines resulting from the automotive industry's stated need for such fuels for the successful development of future devices to reduce exhaust emissions has resulted in a reversal of the traditional octane-price relationships and has emphasized the relative importance of other properties of fuels, particularly those related to engine and fuel system cleanliness.

The widespread introduction and promotion of many new motor fuels in the recent past have served to confuse the gasoline retailers, their staffs, and the public. This situation emphasizes the need for sound and solid facts to guide all actions by responsible groups to avoid as far as possible confusion and possible exploitation of the consumer.

The objective of octane posting is to permit the customer to discriminate in selecting the fuel which will perform satisfactorily in his car. As described in the foregoing, posting on Research Octane Numbers will not accomplish this objective.

MODIFIED UNIONTOWN TECHNIQUE



ACCELERATIONS ARE MADE ON PRIMARY REFERENCE FUELS WHILE VARYING THE SPARK ADVANCE UNTIL TRACE KNOCK IS OBTAINED. THUS FOR EACH PRIMARY REFERENCE FUEL A SPARK ADVANCE VALUE IS OBTAINED AND A GRAPH SIMILAR TO THE ABOVE IS DRAWN. ACCELERATIONS ARE THEN MADE ON THE UNKNOWN FUEL AND THE SPARK ADVANCE IS INCREASED UNTIL TRACE KNOCK OCCURS. THAT SPARK ADVANCE IS RECORDED AND AN OCTANE VALUE IS ASSIGNED TO THE FUEL FROM THE GRAPH AT THE CORRESPONDING SPARK ADVANCE VALUE.

EXAMPLE: FUEL X EXHIBITS TRACE KNOCK AT A SPARK ADVANCE OF 3.4°BTC. ENTERING AT 3.4 ON THE ABSCISSA AND FOLLOWING THE DASHED LINE VERTICALLY TO THE CURVE AND THEN HORIZONTALLY TO THE ORDINATE ASSIGNS AN OCTANE NUMBER OF 94 TO FUEL X BY THE MODIFIED UNIONTOWN METHOD IN THIS PARTICULAR CAR.

FIGURE 1

WITHIN LIMITS OF THE TEST THE ROAD OCTANE IN THE 1971 PROTOTYPE CAR  
CORRELATED WITH MOTOR OCTANE NUMBER

$$RdON = 0.63 \text{ MON} + 34.2$$

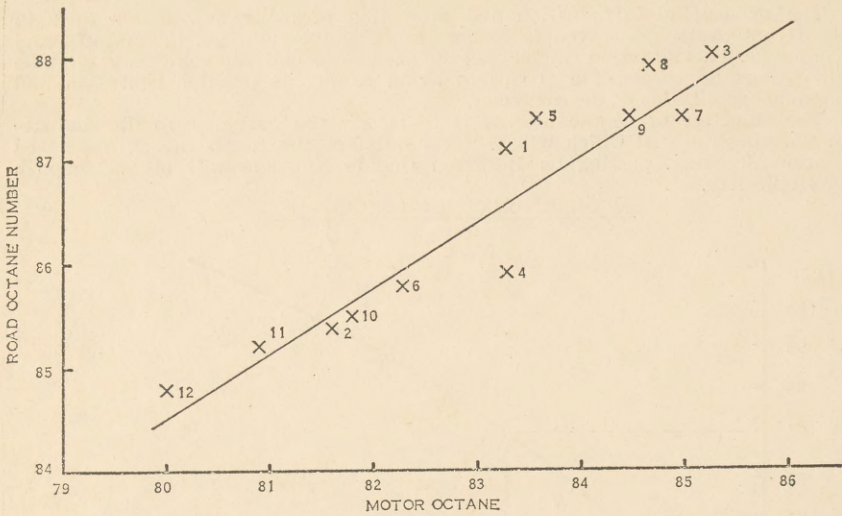


FIGURE 2

LACK OF CORRELATION BETWEEN ROAD OCTANE AND  
RESEARCH OCTANE IS SHOWN BY THIS PLOT

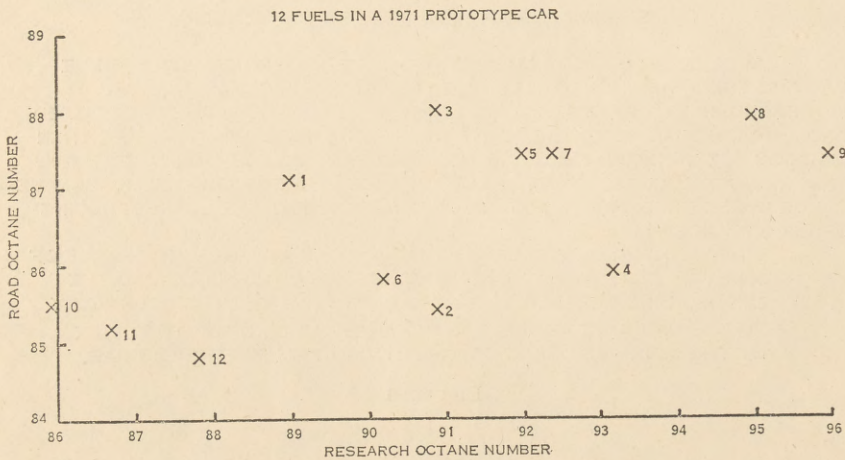


FIGURE 3

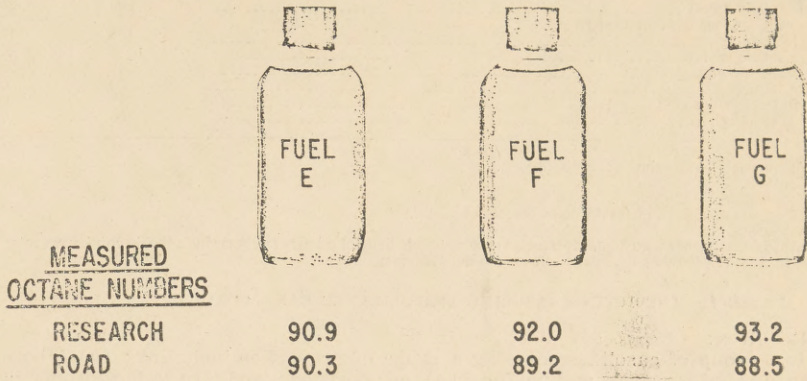
"91" OCTANE GASOLINES FOR 1971 CARS

FIGURE 4

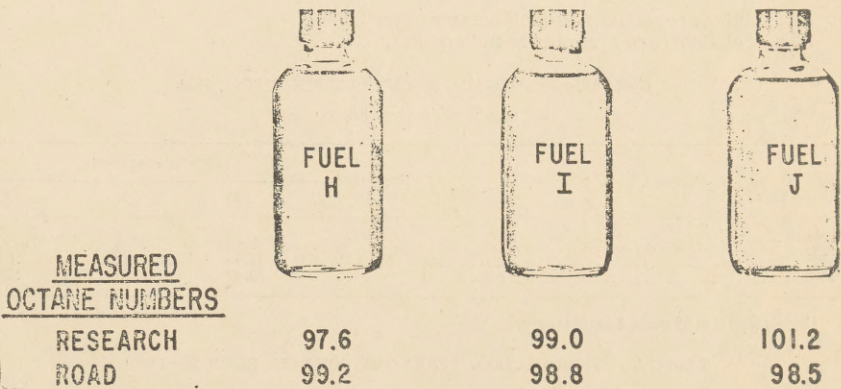
PREMIUM RANGE GASOLINES

FIGURE 5

TABLE I.—OPERATING CONDITIONS FOR ASTM ANTIKNOCK ENGINE KNOCK TEST METHODS

|                                    | Research method | Motor method |
|------------------------------------|-----------------|--------------|
| ASTM No. (D).....                  | 2699            | 2700         |
| Engine speed (RPM).....            | 600             | 900          |
| Temperatures (degrees fahrenheit): |                 |              |
| Intake air.....                    | 125             | 100          |
| Manifold mixture.....              | 1100            | 300          |
| Water jacket.....                  | 212             | 212          |
| Spark advance.....                 | (2)             | (3)          |
| Degrees before TDC.....            | 13              | (4)          |
| Fuel to air ratio.....             | (5)             | (6)          |

<sup>1</sup> Approximate-temperature not controlled.

<sup>2</sup> Constant.

<sup>3</sup> Variable.

<sup>4</sup> 14 degrees at 10/1 CR increasing to 26 degrees at 5/1 CR.

<sup>5</sup> Max-knock.

Note: Knocking tendencies of unknown fuels are compared to those of primary reference fuels that have a known octane value in order to determine the octane value of the unknown fuel.

TABLE II.—PREDICTING GASOLINE PERFORMANCE CARS (ROAD OCTANE R<sub>DN</sub>)

Requires:

1. A group of gasolines covering a range of properties including: (a) laboratory octanes—research and motor; (b) composition; and (c) other properties thought to be important.

2. A fleet of cars to test the fuels.

3. A computer to arrive at best mathematical model, that is, find the best coefficients for the correlation equation.

Example of linear model:

$$RdON = b_0 + b_1 RON^1 + b_2 MON^2 + b_3 \text{ aromatic percent} \\ + b_4 \text{ OLEFIN percent} + b_5 \text{ (fuel property } X) \\ + b_6 \text{ (fuel property } Y)$$

TABLE III.—COORDINATING RESEARCH COUNCIL REGULAR GRADE GASOLINE PROGRAM

32 gasolines covering research octane range 92–96.

35 model 1969 cars (regular requirement).

TABLE IV.—COORDINATING RESEARCH COUNCIL REPORT, 1969

$$[RdON = b_0 + b_1 RON + b_2 MON]$$

| Year      | Number of cars rated | Regression coefficients |                |                |
|-----------|----------------------|-------------------------|----------------|----------------|
|           |                      | b <sub>0</sub>          | b <sub>1</sub> | b <sub>2</sub> |
| 1963..... | 30                   | 2.64                    | .048           | 0.52           |
| 1965..... | 36                   | 17.15                   | .32            | .53            |
| 1969..... | 35                   | 20.47                   | 1.10           | .73            |

<sup>1</sup> Nonsignificant at 95 percent confidence level.

TABLE V.—COORDINATING RESEARCH COUNCIL REPORT—1969

1. Road octane could be predicted from laboratory (research and motor) octanes alone without using other fuel properties.

2. Motor octane was the most significant fuel variable.

3. Since 1963 the importance of research octane has decreased and the importance of motor octane has increased.

TABLE VI.—1970 MODELS

Road-research-motor octane correlation—equation coefficients may differ for individual cars but the trend to greater motor octane importance continued in 1970 as indicated by high motor coefficients.

<sup>1</sup> RON = Research Octane No. ASTM method D-2699.

<sup>2</sup> MON = Motor Octane No. ASTM method D-2700.

## SURVEY DATA: CAR EFFECTS ON ROAD OCTANE CORRELATIONS

| Car <sup>1</sup>       | Cubic inch displacement | Compression ratio | Horsepower | Coefficients |      |
|------------------------|-------------------------|-------------------|------------|--------------|------|
|                        |                         |                   |            | RON          | MON  |
| Chevelle V-8.....      | 307                     | 9.0               | 200        | 0.18         | 0.82 |
| Chevrolet A V-8.....   | 350                     | 9.0               | 250        | .11          | .89  |
| Chevrolet B V-8.....   | 350                     | 9.0               | 250        | .10          | .90  |
| Chrysler.....          | 383                     | 8.7               | 290        | .38          | .62  |
| Chrysler.....          | 383                     | 8.7               | 290        | .30          | .70  |
| Ford.....              | 390                     | 9.5               | 265        | -.02         | 1.02 |
| Ford.....              | 351                     | 9.5               | 250        | .43          | .57  |
| Ford (1969).....       | 351                     | 9.5               | 250        | .42          | .58  |
| Ford.....              | 302                     | 9.5               | 220        | .40          | .60  |
| Plymouth.....          | 318                     | 8.8               | 230        | .21          | .79  |
| Pontiac.....           | 350                     | 8.8               | 255        | .08          | .92  |
| Oldsmobile (1969)..... | 455                     | 9.0               | 310        | -.12         | 1.12 |

<sup>1</sup> 1970 regular requirement, automatic transmission cars.

TABLE VIII—THE TREND CONTINUED IN 1971 MODELS AS SHOWN BY THE EQUATION FOR 12 UNLEADED GASOLINES IN A 1971 PROTOTYPE CAR

$$RdON = 3.68 - 0.03 (\text{nonsignificant}) \quad RON + 1.03 \text{ MON}$$

TABLE VIII.—ROAD OCTANE NUMBERS IN 1965 CAR FLEET  
[CRC equation for 36 1965 regular cars]

| Gasoline                       | A    | B    |
|--------------------------------|------|------|
| Research octane.....           | 96.0 | 93.5 |
| Motor octane.....              | 86.0 | 87.0 |
| Road octane <sup>1</sup> ..... | 93.5 | 93.2 |

<sup>1</sup> Calculated using data shown in table IV.

Note: Conclusion: Gasoline A has higher research octane than gasoline B and would perform better (0.3 road octanes) in 1965 and older cars.

TABLE IX.—ROAD OCTANE NUMBERS IN 1969 CAR FLEET  
[CRC equation for 35 1969 regular cars]

| Gasoline             | <sup>1</sup> A | <sup>2</sup> B |
|----------------------|----------------|----------------|
| Research octane..... | 96.0           | 93.5           |
| Motor octane.....    | 86.0           | 87.0           |
| Road octane.....     | 92.9           | 93.3           |

<sup>1</sup> Same gasoline as in table VIII.

<sup>2</sup> Calculated using data shown in table IV.

Note: Conclusions: The research octane number of gasoline A is 2.5 numbers higher than B but it does not perform (0.4 road octanes lower) as well as B in 1969 automobiles.

TABLE X.—ROAD OCTANE NUMBERS IN 1969 CAR FLEET  
[CRC equation for 35 1969 regular cars]

| Gasoline                       | C    | D    |
|--------------------------------|------|------|
| Research octane.....           | 96.5 | 94.0 |
| Motor octane.....              | 86.2 | 86.6 |
| Road octane <sup>1</sup> ..... | 93.1 | 93.1 |

<sup>1</sup> Calculated using data shown in table IV.

Note: Conclusion: Gasoline C is 2.5 research octanes higher than D but has equal road performance in 1969 cars.

TABLE XI.—SUMMER 1970 DUPONT GASOLINE SURVEY: PHILADELPHIA-BALTIMORE, PREMIUM

|  | Code No. 1 |       |       |       |       |       |       |       |       |       |       | Average |       |
|--|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|-------|
|  | 6          | 13    | 5     | 83    | 69    | 9     | 50    | 88    | 27    | 59    | 36    |         | 60.1  |
| Road octane numbers (V-8, automatic):      |            |       |       |       |       |       |       |       |       |       |       |         |       |
| 9-car average                              | 99.7       | 99.6  | 99.6  | 99.5  | 99.5  | 99.4  | 99.2  | 99.1  | 99.0  | 99.0  | 99.0  | 97.0    | 99.3  |
| 1970 Buick, 455 CID                        | 100.6      | 100.3 | 100.0 | 100.6 | 100.4 | 101.0 | 99.6  | 100.0 | 99.5  | 100.0 | 99.9  | 97.7    | 100.2 |
| 1970 Cadillac, 472                         | 99.1       | 98.8  | 98.7  | 99.0  | 99.0  | 98.9  | 99.0  | 99.0  | 98.8  | 98.8  | 99.0  | 96.1    | 98.9  |
| 1970 Chevrolet, 350                        | 100.4      | 99.1  | 98.7  | 99.8  | 99.8  | 100.1 | 99.7  | 99.1  | 99.0  | 99.0  | 98.6  | 97.2    | 99.6  |
| 1970 Chrysler, 440                         | 99.9       | 99.7  | 99.8  | 99.8  | 99.6  | 99.8  | 99.3  | 99.6  | 99.2  | 99.1  | 98.9  | 97.6    | 99.6  |
| 1970 Ford, 429                             | 99.2       | 99.0  | 99.1  | 99.1  | 99.1  | 99.1  | 99.1  | 98.7  | 99.2  | 98.9  | 98.8  | 96.9    | 99.0  |
| 1970 Ford, 429                             | 99.5       | 99.8  | 99.5  | 99.8  | 99.8  | 99.0  | 99.8  | 99.1  | 99.6  | 99.2  | 99.1  | 98.0    | 99.6  |
| 1970 Oldsmobile, 455                       | 100.5      | 100.4 | 100.0 | 99.8  | 99.6  | 99.7  | 99.8  | 99.3  | 99.6  | 99.2  | 99.1  | 98.0    | 99.6  |
| 1970 Oldsmobile, 455                       | 99.0       | 99.2  | 99.1  | 99.9  | 99.4  | 99.8  | 99.8  | 98.8  | 98.7  | 98.8  | 98.6  | 96.3    | 99.5  |
| 1970 Pontiac, 455                          | 99.4       | 99.1  | 99.1  | 99.1  | 99.1  | 99.2  | 98.4  | 98.6  | 98.6  | 98.6  | 98.6  | 96.1    | 98.9  |
| 1970 Pontiac, 400                          | 99.4       | 99.1  | 99.1  | 99.1  | 99.1  | 99.2  | 98.4  | 98.6  | 98.6  | 98.6  | 98.6  | 96.8    | 98.9  |
| Laboratory octane numbers:                 |            |       |       |       |       |       |       |       |       |       |       |         |       |
| R+M 2                                      | 96.8       | 96.6  | 96.7  | 96.1  | 96.2  | 96.5  | 96.6  | 95.8  | 95.8  | 96.3  | 96.6  | 96.4    | 96.3  |
| Research                                   | 100.7      | 101.1 | 99.9  | 100.0 | 99.5  | 100.4 | 101.1 | 100.2 | 100.5 | 100.4 | 101.1 | 102.0   | 100.4 |
| Motor                                      | 92.8       | 92.1  | 93.5  | 92.2  | 92.8  | 92.6  | 92.2  | 91.4  | 91.2  | 92.2  | 92.1  | 90.5    | 92.2  |
| Sensitivity                                | 7.9        | 9.0   | 6.4   | 7.8   | 6.7   | 7.8   | 8.9   | 8.8   | 9.3   | 8.2   | 9.0   | 11.2    | 8.2   |
| Inspection data:                           |            |       |       |       |       |       |       |       |       |       |       |         |       |
| Lead content, grams lead per gallon        | 3.19       | 2.68  | 2.67  | 2.78  | 2.70  | 2.97  | 2.96  | 2.84  | 2.14  | 3.44  | 3.04  | Nil     | 2.86  |
| Hydrocarbon analysis:                      |            |       |       |       |       |       |       |       |       |       |       |         |       |
| Aromatics, volume percent                  | 34         | 38    | 22    | 22    | 32    | 29    | 31    | 25    | 35    | 32    | 20    | 49      | 28    |
| Olefins, volume percent                    | 1          | 3     | 2     | 8     | 0     | 6     | 8     | 7     | 5     | 5     | 11    | 2       | 5     |
| Saturates, volume percent                  | 65         | 59    | 76    | 70    | 68    | 65    | 61    | 68    | 60    | 60    | 69    | 49      | 67    |
| Existent gum, milligram per 100 milliliter | 0          | 0     | 0     | 0     | 0     | 0     | 1     | 0     | 0     | 0     | 0     | 0       | 0     |
| RVP, pounds                                | 10.6       | 9.9   | 10.4  | 9.2   | 10.8  | 9.4   | 10.2  | 9.8   | 9.9   | 11.0  | 10.3  | 10.8    | 10.1  |
| Gravity, API 1                             | 56.9       | 55.5  | 62.7  | 62.0  | 57.6  | 58.4  | 57.3  | 59.8  | 56.8  | 58.1  | 62.5  | 51.5    | 58.9  |
| ASTM distillation:                         |            |       |       |       |       |       |       |       |       |       |       |         |       |
| 1BP, degrees Fahrenheit                    | 87         | 88    | 85    | 88    | 85    | 88    | 86    | 88    | 87    | 87    | 84    | 84      | 87    |
| 5 percent recovered, degrees Fahrenheit    | 111        | 108   | 100   | 108   | 106   | 108   | 105   | 110   | 107   | 112   | 104   | 105     | 107   |
| 10 percent                                 | 126        | 119   | 110   | 116   | 118   | 120   | 117   | 120   | 121   | 129   | 129   | 119     | 120   |
| 20 percent                                 | 154        | 143   | 130   | 141   | 138   | 148   | 140   | 144   | 148   | 156   | 139   | 150     | 144   |
| 30 percent                                 | 180        | 171   | 153   | 164   | 162   | 178   | 168   | 168   | 176   | 185   | 164   | 183     | 170   |
| 40 percent                                 | 205        | 199   | 185   | 188   | 189   | 208   | 198   | 195   | 203   | 211   | 188   | 216     | 197   |
| 50 percent                                 | 226        | 224   | 218   | 210   | 218   | 228   | 221   | 221   | 226   | 233   | 208   | 224     | 222   |
| 60 percent                                 | 247        | 250   | 239   | 232   | 244   | 243   | 250   | 245   | 246   | 252   | 232   | 245     | 244   |
| 70 percent                                 | 270        | 282   | 258   | 258   | 269   | 260   | 274   | 270   | 269   | 273   | 252   | 258     | 267   |
| 80 percent                                 | 299        | 309   | 286   | 283   | 293   | 281   | 300   | 299   | 296   | 297   | 284   | 278     | 293   |
| 90 percent                                 | 352        | 349   | 324   | 325   | 330   | 324   | 330   | 339   | 329   | 336   | 320   | 320     | 333   |
| 95 percent                                 | 376        | 367   | 350   | 357   | 362   | 351   | 362   | 370   | 362   | 379   | 390   | 359     | 371   |
| End point, degrees Fahrenheit              | 386        | 386   | 392   | 397   | 395   | 395   | 397   | 411   | 381   | 381   | 408   | 379     | 397   |
| Recovery, volume percent                   | 97.0       | 96.0  | 98.0  | 97.5  | 97.0  | 98.0  | 97.5  | 98.0  | 97.5  | 96.0  | 97.5  | 97.0    | 97.5  |
| Residue, volume percent                    | 2.0        | 2.5   | 0.5   | 1.0   | 2.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.5   | 1.0   | 1.0     | 1.0   |
| Loss, Volume percent                       | 2.0        | 2.5   | 0.5   | 1.0   | 2.0   | 1.0   | 1.5   | 1.0   | 1.5   | 2.5   | 1.5   | 2.0     | 1.5   |

1 Unleaded. Not included in averages.

AMOCO OIL Co.,  
Chicago, Ill., October 28, 1975.

Hon. WARREN G. MAGNUSON,  
Chairman, Committee on Commerce,  
U.S. Senate,  
Washington, D.C.

DEAR SENATOR MAGNUSON: We thank you for the invitation given Mr. Swearingen to provide testimony at the October 29 hearing on S. 1508, the Consumer Fuel Disclosure Act. While we first indicated that we would testify, we later decided that we could present our views equally well in written form, which would conserve both your time and ours.

We do not believe that any numeric system of octane labelling, whether it is Research, Motor, (Research+Motor)/2 or (Research+Motor)/2+4, would benefit consumers. Octane number is an abstract term to most people, and few have the technical knowledge to interpret the information that a numeric octane labelling system attempts to provide. The only aspect of octane quality important to a motorist is the rating a particular gasoline has in his own car. The rating of a gasoline in any one car cannot be defined with high precision from simple laboratory octane tests because the rating depends on the specific composition of the gasoline, design of the engine and how the car is operated. Further, the octane rating of a gasoline is significant only in comparison to the octane requirement of the car in which it is being used. Octane quality in excess of a car's requirement is meaningless. All cars do not have the same octane requirement because of tolerances in manufacture and subsequent adjustments made to the car. There is no practical way for the car manufacturer to determine the numeric octane requirement of every car he makes or for the car owner to determine the requirement of his car.

Because of these factors, it is not feasible to label gasolines numerically and label cars numerically and then match them up at the service station. But fortunately, a motorist can find the proper gasoline for his car by the easiest way imaginable. He has many choices of brands, and all he has to do is try one and see if it knocks. No numeric label is needed on either the gasoline or car. However, some sort of broad grade identification may make a motorist's selection a little easier by eliminating one or a few steps (tankfills) as he searches for the optimum gasoline.

We think a system that classifies gasolines according to simple names or a symbol provides all the information on octane quality that motorists need or can use. The industry has historically used names such as "regular" or "premium," and we think they have been adequate for this purpose. However, with availability of the new unleaded gasolines, perhaps a slightly more sophisticated system, such as the ASTM/SAE Automotive Gasoline Performance and Information System (ASTM Special Technical Publication 510A and SAE Recommended Practice J282), would be appropriate. This system identifies grades of gasoline with increments of two to three units in (Research+Motor)/2, which is about the smallest difference between grades that is meaningful to an individual motorist when he makes an initial choice of gasoline. Two highly significant advantages of this system are that, as car designs and gasoline compositions evolve, the basis of expressing octane quality can be changed without confusing motorists, and the system can be expanded to encompass other quality features if the need arises. We have supported this system from its inception because it represents a good practical balance between accuracy and simplicity, and all of our gasoline pumps dispensing the new grade of unleaded gasoline are labeled with the appropriate ASTM/SAE designation.

Claims have been made that certain methods of numeric octane labelling, especially (Research+Motor)/2+4 as employed in S. 1508, would allow motorists to select gasolines closer in octane number to their car's requirements, and thus eliminate overbuying. We think this is wrong for several reasons. First, we doubt if many motorists will heed any numeric labelling system, but of those that do, it may encourage some to want the best and buy up instead of down. Second, there is little overbuying now. Nearly all 1975 and 1976 cars must use unleaded gasoline and most service stations sell just one grade of unleaded gasoline that meets EPA requirements.

Motorists who must buy unleaded gasoline generally have no choice of grades. Motorists who use leaded gasoline do have an opportunity to overbuy premium instead of regular. While there was significant overbuying of leaded premium gasoline five years ago, at present our sales of leaded premium are only slightly above the real need for it and they are declining rapidly.

In summary, we do not see great need for octane labelling. We doubt if numeric labelling in any form would benefit motorists, but we think use of the ASTM/SAE Gasoline Performance and Information System might be helpful. We strongly recommend that if your Committee proceeds with legislation requiring gasoline octane labeling, the regulations be based on the ASTM/SAE system.

Very truly yours,

K. E. CURTIS,  
*Vice President of Marketing.*

AMERICAN AUTOMOBILE ASSOCIATION,  
*Falls Church, Va., November 26, 1975.*

Senator FRANK E. MOSS,  
*Chairman, Subcommittee on Consumer Affairs, U.S. Senate, Russell Senate Office Building, Washington, D.C.*

DEAR CHAIRMAN MOSS: The American Automobile Association commends you for seeking a cure for the inter-agency wrangling over the posting of gasoline octane ratings at service station pumps. Such posting has long been needed.

Though we differ with the particular octane posting required in S. 1508, we believe the legislation's intent is admirable. Motoring consumers must have a clear indication that the gas they buy meets their vehicles' octane needs.

We support this intent and said so to the Federal Energy Administration a considerable time ago. Our September 3, 1974 statement to FEA on the matter is attached and we request your permission to have it placed in S. 1508's hearing record.

Thank you.

Yours sincerely,

JOHN DE LORENZI,  
*Managing Director, Public Policy Division.*

Attachment.

AMERICAN AUTOMOBILE ASSOCIATION,  
*Falls Church, Va., September 3, 1974.*

Mr. JOHN C. SAWHILL,  
*Administrator, Federal Energy Administration, Washington, D.C.*

DEAR MR. SAWHILL: On Friday, August 9, 1974, the Federal Energy Administration published in Vol. 39, No. 155 of the Federal Register a notice of proposed rulemaking with regard to the "Requirements of Octane and Price Posting." This statement is in response to the FEA's invitation to comment on these regulations before they go into effect.

The American Automobile Association, which has 890 clubs and branch offices throughout the U.S. and Canada and serves a membership of more than 16 million, wholeheartedly supports the concept of posting gasoline octane ratings prominently on service station fuel pumps. Car owners must have a clear indication that the gas they buy meets the octane needs of their vehicles, especially in this period of soaring fuel prices.

FEA's proposed regulations, as we understand them, do not affect the ongoing octane posting program that FEA has enforced since January 1974. They merely re-affirm the agency's power to continue the program under the Emergency Petroleum Allocation Act of 1973. They also attempt to make it easier for service station operators to comply with the program.

Nevertheless, we take exception to the proposed regulations because they fail to go far enough to eliminate the present confusion caused by FEA's octane posting program. It is our observation that the public in general has not yet been able to decipher the octane rating found on most if not all service station pumps. This is because the FEA octane rating is not the same as the motorist finds in his car owner's manual.

Consequently, motorists probably are "buying up," i.e., choosing a higher octane gas than they need. The reason is that FEA's octane rating system gives an octane normally four points below the research octane number in auto manuals. For example, owners of 1974 model cars are advised to buy fuel that has at least 91 Research octane, normally a gas that is labeled "regular". However, FEA's octane rating system labels regular gas at 87 octane. So, it is possible that car owners meeting this difference would choose to buy what some companies call a

"super regular" that FEA labels at 91.5 octane at a higher cost. This buying up is totally unnecessary.

AAA had assumed the FEA would quickly put an end to this confusion after it formally became a part of the Executive Branch in July. However, the current proposed regulations leaving this rating system intact lead us to wonder about FEA's sincerity in protecting consumers in their fuel purchases.

Instead of the FEA, it is the major U.S. auto makers and a few oil companies who are trying to put an end to the confusion. Buyers of 1975 model cars will be advised to look for a new "Gasoline Classification Method" posted voluntarily by certain fuel marketers. Gasoline octane will be designated by a simple symbol that will correspond to the symbol found in new car manuals. It should eliminate the questions of octane for new car owners. AAA believes the new symbols should be adopted by all filling stations.

But what about the millions of present car owners whose owner manual number can't be matched at the pump?

We suggest that FEA require all service stations post a new chart explaining clearly (a) the marketer's various grades of gas; (b) the new Gasoline Classification symbol that corresponds to each grade; and (c) for owners of older model cars, a complete listing of auto engine categories which can use each of those grades of fuel.

If FEA demands that its own octane rating system be posted, such posting should be far enough away from the chart we've suggested so as not to confuse motorists any further.

Once prominently displayed, this chart should enable motorists to find the proper fuel for their vehicles without having to seek out advice from service station personnel. It certainly would not meet much opposition from the nation's gasoline marketers since it would relieve them of the duty of continually explaining FEA's octane rating.

Most important, such a chart would need to be changed only once a year when new cars debut. Hence, FEA or any other agency involved would have sufficient time to make sure that the auto engines listed on the chart could indeed operate on the recommended gasoline grade.

We think this suggestion goes a long way in accomplishing the educational and regulatory aims of FEA's octane posting requirements. It certainly relieves FEA of the enormous task of trying to make the public understand its own present octane rating method.

Yours sincerely,

JOHN DE LORENZI,  
*Managing Director, Public Policy Division.*

DECEMBER 10, 1975.

Mr. WILLIAM McNEALY,  
*Group Vice Chairman,  
American Motors Corp.,  
Detroit, Mich.*

DEAR MR. McNEALY: On October 29, 1975 the Senate Commerce Committee's Consumer Subcommittee held a hearing on the subject of gasoline octane posting. Questions were raised at this hearing concerning auto company recommendations of gasoline in their owner's manuals. To assist the Committee in its consideration of this subject, the following information is requested.

1. A sample copy of your owner's manual for the model years 1971, 72, 73, 74, 75, and 76.
2. Some owner's manuals recommend use of a gasoline of at least 91 research octane, yet FEA regulations have called for posting of an (R+M)/2 octane rating. Do you provide information which would enable owners of your vehicles to relate the two ratings?
3. Other than the owner's manual, have you or do you plan any programs to educate motorists to choose the correct gasoline?
4. What is the research and motor octane requirement levels which you designed your vehicles to operate on for each of the model years in question?
5. Should there be minimum federal specifications for gasoline characteristics such as research and motor octanes? If so, why? If not, why not?
6. What percentage of each given model year do you expect will experience engine knock on the recommended fuel after engine stabilization (roughly 10,000 miles)?

7. For each model year, what alternatives does the motorist have if one finds one's car knocking?

8. It has been stated that "the present state of our ability to control these things (octane requirements of vehicles and octanes of gasolines) does not allow you to use octane as a finite specific number in a manual for cars." Do you agree or disagree? In either case explain the reasons for your response.

Your assistance in providing the requested information will be of great value to the Committee in its work, and if you or a member of your staff should have questions, please feel free to contact a member of my staff, Mr. Edward Merlis, at (202) 224-9321.

Sincerely yours,

WARREN G. MAGNUSON,  
Chairman.

AMERICAN MOTORS CORP., January 16, 1976.

U.S. SENATE,  
COMMITTEE ON COMMERCE,  
Washington, D.C.  
(Attention of Hon. W. G. Magnuson, Chairman).

DEAR SENATOR MAGNUSON: This responds to your inquiry of December 10, 1975, requesting certain information from American Motors concerning gasoline octane recommendations.

Answers to your specific questions are contained in the attachment to this letter. The answers are listed in the same order as the questions in your letter. We trust that this information will meet the needs of your committee.

Sincerely,

F. A. STEWART.

Attachment.

ANSWERS TO QUESTIONS CONTAINED IN LETTER OF INQUIRY FROM SENATOR W. G. MAGNUSON OF DECEMBER 10, 1975

1. Included with this response are copies of Owner's Manuals for American Motors Corporation passenger cars for each model year 1971 through 1976.

2. Since 1975, American Motors has attempted to provide information which will enable our vehicle owners to relate research octane and (R+M)/2 octane ratings (see paragraphs in Owner's Manuals entitled, "Fuel Recommendations" and "Octane Rating").

3. American Motors believes that statements currently contained in the Owner's Manual are adequate.

4. Following is a listing of the fuel octane requirements to which American Motors vehicles were designed for the years listed:

| Year: | Engine               | Research octane | Motor octane (minimum) |
|-------|----------------------|-----------------|------------------------|
| 1971  | 401 CID V-8          | 199             | 91                     |
|       | All others (minimum) | 194             | 86                     |
| 1972  | All (minimum)        | 291             | 83                     |
| 1973  | All (minimum)        | 291             | 83                     |
| 1974  | All (minimum)        | 191             | 83                     |
| 1975  | All                  | 91              | 83                     |
| 1976  | All                  | 91              | 83                     |

<sup>1</sup> Although not stated in the owner's manual, motor octane number was assumed to be 8 numbers less than research octane, according to prevailing commercial practice.

<sup>2</sup> References to regular or "low lead" fuel in the owner's manual do not pertain to octane quality of these fuels but rather to lead content.

5. AMC does not believe that minimum Federal specifications for characteristics of gasoline such as octane are warranted or desirable. Our primary concern is that such specifications will in fact be counter-productive to the desired intent in that a fixed minimum requirement may tend to relieve natural market pressures to up-grade octane requirements. That is, a federal minimum specification might limit the interest of gasoline marketers to provide higher octane fuels and, thereby, limit our ability as car manufacturers to develop engines which can utilize higher octane fuels for improved fuel economy. Presently, there are at

least two marketers of gasoline supplying unleaded fuels substantially higher than 87 AKI. If more gasoline marketers were to follow their lead, we believe that significant fuel economy benefits could accrue through engine design changes that could efficiently use these higher octane fuels. Any action by the federal government that might limit the natural market pressures to provide higher octane fuel would, we believe, ultimately penalize the public.

6. From our past experience, approximately 10 percent of the cars produced by American Motors for any one model year might be expected to "knock" under certain conditions on the recommended fuel after deposit stabilization has occurred. We have reason to suspect that this percentage may be somewhat higher for cars using unleaded fuel exclusively. However, this suspicion has not yet been borne out by data from the field, although we believe that our field service data base has been limited by the lack of exclusive use of lead free fuels in our vehicles prior to 1975 model vehicles.

7. If any American Motors vehicle owner wishes to eliminate or reduce engine knock, he has two practical alternatives as stated in the Owner's Manual: (a) Retard the ignition timing and (b) select an alternate source of fuel.

8. American Motors agrees that the question of fuel combustion characteristics as measured by so-called octane ratings and fuel quality requirements of a vehicle as stated as a given octane number are far too complex to allow the use of a single finite specific number to match a fuel and a vehicle for all situations.

At the present there are at least three "octane" values in use which relate to the matching of a fuel and a vehicle, Research Octane Number, Motor Octane Number, and Road Octane Number. Research and Motor Octane numbers are ratings for fuels determined by laboratory tests under well defined and controlled test conditions using a well defined and controlled single cylinder test engine. Road Octane is a rating applied to the fuel demand exhibited by test vehicles operating under various conditions using actual specific fuels of varying Research Octane Rating, Motor Octane Rating, and other characteristics. While research and motor octane are the primary fuel characteristics relating to road octane performance, other fuel characteristics, such as, aromatic and olefin compositions also are factors. Therefore, two fuels with equal research and motor octane values could conceivably give different road octane performance.

Further, two cars of the same make and model with similar equipment can produce significantly different road octane numbers with the same test fuel due to normal manufacturing tolerance variations. In addition, both the research and the motor methods have inherent reproducibility and repeatability variations. Finally, variations in knock ratings reported from trained driver to trained driver in the road octane rating are significant.

VEHICLE ENVIRONMENTAL AND ENERGY REGULATIONS STAFF.

JANUARY 13, 1976.

U.S. ENVIRONMENTAL PROTECTION AGENCY,

Washington, D.C., January 9, 1976.

Hon. WARREN G. MAGNUSON,  
Chairman, Committee on Commerce,  
U.S. Senate,  
Washington, D.C.

DEAR MR. CHAIRMAN: Thank you for your inquiry of December 11th regarding the testimony of Mr. Robert Baum on October 29, 1975 at the Commerce Consumer Subcommittee hearings on the subject of gasoline octane posting.

In your correspondence, you posed four questions concerning this Agency's position in regard to octane posting. I will address each question in the order you presented them.

1. The first question was concerned with Mr. Baum's statement that the octane posting system that "FEA has required is a more accurate indication of what gasoline should be used." In the context of the testimony being given, the statement was ambiguous. You interpreted it to indicate that EPA considers the  $(R+M)/2$  method required by FEA to be more accurate than the  $[(R+M)/2+4]$  "octane rating" defined in S. 1508. However, Mr. Baum did not intend such a comparison. The statement referred to a comparison of the  $(R+M)/2$  method with either the Research Octane Number (RON) or the Motor or Octane Number (MON) by itself. Automobiles of different years and models may exhibit greatest knock sensitivity to either RON or MON or some combination of the two. No single method is the best indicator for all cars. Knock sensitivity of the current mix

of high compression (pre-1971) and low compression (1971 and later) vehicles is best described by a combination of RON and MON. This is the basis for the  $(R+M)/2$  method. Mr. Baum's statement was intended merely to reflect these facts which are generally accepted by the technical community and not as a comparison of the relative merits of the  $(R+M)/2$  and  $[(R+M)/2+4]$  methods.

2. Your second question referred to an octane posting system suggested by EPA in an October 30, 1974 letter from Alan G. Kirk, then Assistant Administrator for Enforcement and General Counsel, EPA to Robert Montgomery, then Acting General Counsel, FEA. In that letter, EPA suggested that the ASTM symbol system be combined for the near term with an octane number based on  $[(R+M)/2+4]$ . Posting of the octane number would be discarded when cars containing owner manuals with only the RON designation are phased out of the vehicle population mix.

Your question referred to the confusion which could develop among the motoring public if the octane range associated with each symbol were changed from time to time. We agree that any such change would lead to motorist confusion. In our opinion, a consumer education campaign each time the range was changed would not be a satisfactory solution to the potential problem. In order to avoid such a problem if the symbol system were implemented, we would suggest that the Federal agency responsible for administering the octane posting program adopt the symbol system by regulation. If such were the case and the ASTM changed the octane range associated with any particular symbol, an ASTM change would not modify the Federal octane posting system established by regulation. The Federal system could be modified only if the administering agency amended its regulations. Any proposed amendment would be subject to public scrutiny as required by the Administrative Procedure Act, as well as to review by other Federal agencies.

3. In your third question you requested an assessment of the percentage of cars built since 1971 "which should be operating an unleaded gasoline to minimize lead emissions." I have attached a list which includes fuel usage recommendations of the four major American manufacturers for vehicles built since 1971.

All 1971 and subsequent model year (MY) vehicles manufactured by General Motors were designed to enable the use of unleaded gasoline. All Ford and Chrysler 1972 and subsequent model year vehicles can also use unleaded. Unleaded gasoline is not recommended for use in any 1971 MY Chrysler vehicle. Depending on the particular model, Ford recommends the use of unleaded gasoline in some 1971 MY Ford cars, but not in others. American Motors did not recommend the use of unleaded gasoline until the 1974 MY. In that year unleaded gasoline was recommended for use in all American Motors cars. For the 1975 MY, all American Motors cars except the Jeep Cherokee, Wagoner, and Truck were designed to use unleaded product.

In general, post-1971 but pre-1975 vehicles were designed to operate on either leaded or unleaded product. For some particular models built during this period, the manufacturer recommended that every fourth tank full of gasoline should be leaded. Most models built during the 1975 MY were designed to use only unleaded fuel in order to avoid contamination of catalytic converters.

4. Your last question asked whether EPA considers it important to minimize lead emissions as much as possible and as soon as possible to protect the public health. This Agency has promulgated regulations which require a gradual reduction in the lead content of gasoline from current levels to a refinery pool average of 0.5 gram of lead per gallon after January 1, 1979. EPA's authority to require such a reduction is currently under challenge in litigation before the U.S. Court of Appeals for the District of Columbia Circuit. We believe that in order to protect the public health it is important that these regulations be upheld so that the regulatory reduction can be achieved. We also believe it is important that airborne lead emissions which result from octane overbuying be minimized. Thus, as indicated in Mr. Baum's testimony, we support the objectives of S. 1508. In our view, the particular octane designation system that is implemented to achieve this objective is not crucial. Any posting system which achieves uniformity and provides the consumer with sufficient information to avoid overbuying is acceptable to EPA. Any such system should be accompanied by a public education campaign designed to inform the motoring public of the proper use of the posted octane information.

Sincerely yours,

RUSSELL E. TRAIN, *Administrator.*

Enclosure.

## AUTOMOTIVE GASOLINE PERFORMANCE AND INFORMATION SYSTEM

In order to properly interpret the fuel requirements on the attached tabulation the following identifies the performance characteristics :

## ANTIKNOCK REQUIREMENTS

| Number designation | Application  | Antiknock index <sup>1</sup> minimum (RON+MON)/2 |
|--------------------|--|--|
| ②                  | Meets antiknock needs of most 1971 and later model cars.....   | 87   |
| ③                  | For most 1970 and prior designed to operate on "regular" gasoline, and for 1971 and later model cars that require higher antiknock performance than provided for in "designation 2"..... | 89   |
| ⑤                  | For most 1970 and prior model cars with high compression ratio engines designed to run on "premium" gasolines, and for later model cars with high compression ratio engines.....         | 95   |

<sup>1</sup> One-half the sum of the research octane number (RON) and motor octane number (MON): The antiknock index of gasoline for use in areas where altitude is greater than 2,000 ft (600 m) may be reduced  $\frac{1}{2}$  (0.5) number for each succeeding 500 ft (150 m) but not to exceed a total of 3 numbers.

<sup>2</sup> In addition, the minimum motor octane number must be 82.

<sup>3</sup> In the following States, this minimum may be reduced by  $\frac{1}{2}$  (0.5) number: Arkansas, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin, and Texas west of 99° longitude.

## DEFINITION OF UNLEADED GASOLINE

No intentional addition of lead compounds. May not contain more than 0.05 grams of lead per gallon and 0.005 grams of phosphorus per gallon.

## AMERICAN MOTORS CORP. CARS FUEL REQUIREMENTS 1966-75

| American Motors products (includes Jeep)                | Gasoline symbol number designation |           |           |
|---|------------------------------------|-----------|-----------|
|   | ② Unleaded                         | ③ Regular | ④ Premium |
| 1966-69:  |                                    |           |           |
| All IV, 2V carburetor.....                              | No.....                            | Yes.....  |           |
| All 4V carburetor.....                                  | No.....                            | No.....   | Yes.      |
| 1970:   |                                    |           |           |
| All 6-cylinder and V-8 2V carburetor.....               | No.....                            | Yes.....  |           |
| All V-8 4V carburetor.....                              | No.....                            | No.....   | Yes.      |
| 1971:   |                                    |           |           |
| All 6-cylinder, V-8 304 and 360.....                    | No <sup>1</sup> .....              | Yes.....  |           |
| V-8 401.....  | No.....                            | No.....   | Yes.      |
| 1972-73: All.....                                       | No <sup>2</sup> .....              | Yes.....  |           |
| 1974: All.....  | Yes.....                           | Yes.....  |           |
| 1975: All except Jeep Cherokee, Wagoneer and truck..... | Yes.....                           | No.....   | No.       |
| 1975: Jeep Cherokee, Wagoneer and truck.....            | No.....                            | Yes.....  | Yes.      |

<sup>1</sup> Occasional use of no-lead (designation ② minimum) fuel is acceptable.

<sup>2</sup> Regular leaded or low lead (designation ③ minimum) fuel preferred. If no lead is used, every 4th tank full should be leaded fuel.

## CHRYSLER CORP. CARS FUEL RECOMMENDATIONS 1966-75

| Chrysler products                                  | Gasoline identification |                        |                       |                    |
|--|-------------------------|------------------------|-----------------------|--------------------|
|  | ② through unleaded      | ② Sub regular low lead | ③ Regular (leaded)    | ③ Premium (leaded) |
| 1966-70 Chrysler and Imperial:                     |                         |                        |                       |                    |
| Except 383 2V.....                                 | No.....                 | No.....                | No.....               | Yes.               |
| 383 2V.....  | No.....                 | Yes <sup>1</sup> ..... | Yes.....              | Yes.               |
| 1971 Chrysler and Imperial:                        |                         |                        |                       |                    |
| Except 440 high performance.....                   | No.....                 | Yes.....               | Yes.....              | Yes.               |
| 440 high performance.....                          | No.....                 | No.....                | No.....               | Yes.               |
| 1972: Chrysler and Imperial.....                   | Yes <sup>2</sup> .....  | Yes.....               | Yes.....              | Yes.               |
| 1973-74: Chrysler and Imperial.....                | Yes.....                | Yes.....               | Yes.....              | Yes.               |
| 1975: Chrysler and Imperial.....                   | Yes.....                | No <sup>3</sup> .....  | No <sup>3</sup> ..... | No <sup>3</sup> .  |
| 1966-70 Dodge:                                     |                         |                        |                       |                    |
| 1V, 2V carburetor.....                             | No.....                 | Yes <sup>1</sup> ..... | Yes.....              | Yes.               |
| 4V, 2-4V, 3-2V carburetors.....                    | No.....                 | No.....                | No.....               | Yes.               |
| 1971 Dodge:  |                         |                        |                       |                    |
| All except V-8 340, 426, 440 high performance..... | No.....                 | Yes.....               | Yes.....              | Yes.               |
| V-8 340, 426, 440 high performance.....            | No.....                 | No.....                | No.....               | Yes.               |
| 1972: Dodge: All.....                              | Yes <sup>2</sup> .....  | Yes.....               | Yes.....              | Yes.               |
| 1973-74 Dodge: All.....                            | Yes.....                | Yes.....               | Yes.....              | Yes.               |
| 1975 Dodge: All.....                               | Yes.....                | No <sup>3</sup> .....  | No <sup>3</sup> ..... | No <sup>3</sup> .  |
| 1966-70 Plymouth:                                  |                         |                        |                       |                    |
| 1V, 2V carburetor.....                             | No.....                 | Yes <sup>1</sup> ..... | Yes.....              | Yes.               |
| 4V, 2-4V, 3-2V carburetors.....                    | No.....                 | No.....                | No.....               | Yes.               |
| 1971 Plymouth:                                     |                         |                        |                       |                    |
| All except V-8 340, 426, 440 high performance..... | No.....                 | Yes.....               | Yes.....              | Yes.               |
| V-8 340, 426, 440 high performance.....            | No.....                 | No.....                | No.....               | Yes.               |
| 1972 Plymouth: All.....                            | Yes <sup>2</sup> .....  | Yes.....               | Yes.....              | Yes.               |
| 1973-74 Plymouth: All.....                         | Yes.....                | Yes.....               | Yes.....              | Yes.               |
| 1975 Plymouth: All.....                            | Yes.....                | No <sup>3</sup> .....  | No <sup>3</sup> ..... | No <sup>3</sup> .  |

<sup>1</sup> May be used for city-suburban type driving characterized by light loads and normal car speeds. Engine adjustment may be required if detonation occurs.

<sup>2</sup> Uninterrupted use of unleaded gasolines in V-8 engines is not recommended. At least 1 in 4 tankfuls should be a leaded grade of gasoline.

<sup>3</sup> Leaded or unleaded gasoline may be used in vehicles not equipped with catalytic converters. Unleaded fuel only must be used in vehicles equipped with catalytic converters.

## FORD MOTOR CO. CARS FUEL REQUIREMENTS 1966-75

|  | Gasoline symbol number design |                      |                   |
|--|-------------------------------|----------------------|-------------------|
|  | Unleaded <sup>1</sup>         | Regular <sup>1</sup> | Premium           |
| Ford products                          |                               |                      |                   |
| 1966-70 Bronco                         | No                            | Yes                  |                   |
| 1971-74 Bronco                         | Yes                           | Yes                  |                   |
| 1966-70 Comet, Montego:                |                               |                      |                   |
| 1V and 2V                              | No                            | Yes                  |                   |
| 4V, 2-4V                               | No                            | No                   | Yes.              |
| 1971-74 Comet: All                     | Yes                           | Yes                  |                   |
| 1975 Comet: All                        | Yes                           | Yes <sup>2</sup>     | Yes. <sup>3</sup> |
| 1971 Torino: 1V and 2V                 | Yes                           | Yes                  |                   |
| 1966-70 Fairlane, Torino: 1V and 2V    | No                            | Yes                  |                   |
| 1966-71 Fairlane, Torino: 4V           | No                            | No                   | Yes.              |
| 1972-74 Torino: All                    | Yes                           | Yes                  |                   |
| 1975 Torino: All                       | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1966-70 Falcon:                        |                               |                      |                   |
| 1V and 2V                              | No                            | Yes                  |                   |
| 4V                                     | No                            | No                   | Yes.              |
| 1966-68 Ford big series:               |                               |                      |                   |
| 6-cylinder, V-8 289, 352, 390 2V       | No                            | Yes                  |                   |
| 70 390 V4, 427, 428                    | No                            | No                   | Yes.              |
| 1969 Ford big series:                  |                               |                      |                   |
| 6-cylinder, V-8 302 and 351 2V         | No                            | Yes                  |                   |
| 390, 429 2V high-compression, all 4V   | No                            | No                   | Yes.              |
| 1971 Ford big series:                  |                               |                      |                   |
| 6-cylinder, V-8 2V except 429          | Yes                           | Yes                  |                   |
| 429 2V, all 4V                         | No                            | No                   | Yes.              |
| 1972-74 Ford: All                      | Yes                           | Yes                  |                   |
| 1975 Ford: All                         | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1966-71 Lincoln Continental: All       | No                            | No                   | Yes.              |
| 1972-74 Lincoln Continental: All       | Yes                           | Yes                  |                   |
| 1975 Lincoln Continental and Mark: All | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1966-67 Mercury big series:            |                               |                      |                   |
| 2V carburetor                          | No                            | Yes                  |                   |
| 4V carburetor                          | No                            | No                   | Yes.              |
| 1968-70 Mercury big series:            |                               |                      |                   |
| 390 2V (265 hp)                        | No                            | Yes                  |                   |
| 390 2V (280 hp), 429 2V, all 4V        | No                            | No                   | Yes.              |
| 1971 Mercury big series:               |                               |                      |                   |
| 2V except 429                          | Yes                           | Yes                  |                   |
| 429 2V, all 4V                         | No                            | No                   | Yes.              |
| 1972-74 Mercury: All                   | Yes                           | Yes                  |                   |
| 1975 Mercury: All                      | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1971 Mercury Montego:                  |                               |                      |                   |
| 1V, 2V                                 | Yes                           | Yes                  |                   |
| 4V                                     | No                            | No                   | Yes.              |
| 1972-74 Mercury Montego: All           | Yes                           | Yes                  |                   |
| 1975 Mercury Montego: All              | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1971 Mustang: 1V and 2V                | Yes                           | Yes                  |                   |
| 1966-70 Mustang: 1V and 2V carburetor  | No                            | Yes                  |                   |
| 1966-71 Mustang: 4V carburetor         | No                            | No                   | Yes.              |
| 1972-74 Mustang: All                   | Yes                           | Yes                  |                   |
| 1975 Mustang: All                      | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1966-71 Thunderbird: All               | No                            | No                   | Yes.              |
| 1972-74 Thunderbird: All               | Yes                           | Yes                  |                   |
| 1975 Thunderbird: All                  | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1966-70 Cougar: 2V                     | No                            | Yes                  |                   |
| 1971-74 Cougar: 2V                     | Yes                           | Yes                  |                   |
| 1966-71 Cougar: 4V                     | No                            | No                   | Yes.              |
| 1972-74 Cougar: 4V                     | Yes                           | Yes                  |                   |
| 1975 Cougar: All                       | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1970 Maverick: 1V and 2V               | No                            | Yes                  |                   |
| 1971-74 Maverick: 1V and 2V            | Yes                           | Yes                  |                   |
| 1975 Maverick: All                     | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1975 Granada: All                      | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1975 Monarch: All                      | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |
| 1972-74 Pinto: All                     | Yes                           | Yes                  |                   |
| 1975 Pinto: All                        | Yes                           | Yes <sup>2</sup>     | Yes. <sup>2</sup> |

<sup>1</sup> In all pre-1975 vehicles in which unleaded fuel or the unleaded versions of symbol ③ and ④ fuels are used, it is recommended that leaded fuel be employed every 3d or 4th tank full where sustained high speed and/or heavy load driving conditions are encountered to help prolong engine exhaust valve life.

Also, for 1966-74 model year engines inclusive, in the event of either installation of new cylinder heads or regrinding of valves, it is recommended that a minimum of 10 gallons of leaded fuel be used for break-in prior to any operation on unleaded fuel.

<sup>2</sup> Only unleaded versions of symbol ③ and ④ fuels are acceptable for this model year.

## GENERAL MOTORS CORP. CARS FUEL REQUIREMENTS, 1966-75

| General Motors products   | Gasoline symbol number designation |                        |                        |
|---|------------------------------------|------------------------|------------------------|
|   | Unleaded <sup>(2)</sup>            | Regular <sup>(3)</sup> | Premium <sup>(4)</sup> |
| 1966-69 Buick:  |                                    |                        |                        |
| All 1V and 2V carburetors.....  | Yes.....                           | Yes.....               |                        |
| All 4V carburetors.....   | No.....                            | No.....                | Yes.                   |
| 1970 Buick:   |                                    |                        |                        |
| 6-cylinder and V-8 350 low compression.....   | Yes.....                           | Yes.....               |                        |
| V-8 350 high compression and V-8 455.....   | No.....                            | No.....                | Yes.                   |
| 1971-74 Buick: All.....   | Yes.....                           | Yes.....               |                        |
| 1975: All.....  | Yes.....                           | No.....                | No.                    |
| 1966-70 Cadillac.....   | No.....                            | No.....                | Yes.                   |
| 1971-74 Cadillac.....   | Yes.....                           | Yes.....               |                        |
| 1975: All.....  | Yes.....                           | No.....                | No.                    |
| 1966-67 Chevrolet:  |                                    |                        |                        |
| Big series, Chevelle, Chevy II, Nova: 4-, 6-cylinder and 283 V-8.....                     | Yes.....                           | Yes.....               |                        |
| All other V-8's.....  | No.....                            | No.....                | Yes.                   |
| 1966-69 Corvair:  |                                    |                        |                        |
| 95 hp.....  | Yes.....                           | Yes.....               |                        |
| 110 hp, 4-1V carburetor or turbo.....   | No.....                            | No.....                | Yes.                   |
| 1966-70 Corvette.....   | No.....                            | No.....                | Yes.                   |
| 1967 Camaro:  |                                    |                        |                        |
| 6-cylinder and V-8 2V.....  | Yes.....                           | Yes.....               |                        |
| V-8 4V.....   | No.....                            | No.....                | Yes.                   |
| 1968-69 Chevrolet:  |                                    |                        |                        |
| Big series, Camaro Chevelle, Chevy II, Nova: 4-, 6-cylinder, V-8 2V and 327 (250 hp)..... | Yes.....                           | Yes.....               |                        |
| All other V-8's.....  | No.....                            | No.....                | Yes.                   |
| 1970 Chevrolet:   |                                    |                        |                        |
| Big series, Camaro, Chevelle, Monte Carlo, Nova: all 1V and 2V carburetors.....           | Yes.....                           | Yes.....               |                        |
| All 4V carburetors.....   | No.....                            | No.....                | Yes.                   |
| 1971-74 Chevrolet: Big series, Camaro, Chevelle, Corvette, Monte Carlo, Nova.....         | Yes.....                           | Yes.....               |                        |
| 1975: All.....  | Yes.....                           | No.....                | No.                    |
| 1966-67 Oldsmobile:   |                                    |                        |                        |
| 6-cylinder, V-8 low compression.....  | Yes.....                           | Yes.....               |                        |
| V-8 high compression, all 4V carburetors.....   | No.....                            | No.....                | Yes.                   |
| 1968-69 Oldsmobile big series:  |                                    |                        |                        |
| V-8 2V low compression.....   | Yes.....                           | Yes.....               |                        |
| V-8 high compression, all 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| Oldsmobile F-85, Cutlass:   |                                    |                        |                        |
| 6 cylinder, V-8 2V.....   | Yes.....                           | Yes.....               |                        |
| V 8 4V.....   | No.....                            | No.....                | Yes.                   |
| 1970 Oldsmobile:  |                                    |                        |                        |
| All 1V and 2V carburetor.....   | Yes.....                           | Yes.....               |                        |
| All 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| 1971-74 Oldsmobile: All.....  | Yes.....                           | Yes.....               |                        |
| 1975: All.....  | Yes.....                           | No.....                | No.                    |
| 1966:   |                                    |                        |                        |
| Pontiac big series:   |                                    |                        |                        |
| V-8 389 low compression.....  | Yes.....                           | Yes.....               |                        |
| All others.....   | No.....                            | No.....                | Yes.                   |
| Tempest, Le Mans:   |                                    |                        |                        |
| 1V carburetor, V-8 2V carburetor.....   | Yes.....                           | Yes.....               |                        |
| All 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| 1967-69:  |                                    |                        |                        |
| V-8 2V carburetor.....  | Yes.....                           | Yes.....               |                        |
| V-8 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| 1967-69:  |                                    |                        |                        |
| Pontiac big series:   |                                    |                        |                        |
| V-8 2V carburetor.....  | Yes.....                           | Yes.....               |                        |
| V-8 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| Tempest, Le Mans, Firebird:   |                                    |                        |                        |
| 1V, 2V carburetor, except GTO 400 2V high compression.....                                | Yes.....                           | Yes.....               |                        |
| GTO 400 2V high compression.....  | No.....                            | No.....                | Yes.                   |
| All 4V carburetor.....  | No.....                            | No.....                | Yes.                   |
| 1970 Pontiac all:   |                                    |                        |                        |
| 1V, V-8 350 2V 400 2V (265 hp).....   | Yes.....                           | Yes.....               |                        |
| V-8 400 2V (290 hp) all 4V.....   | No.....                            | No.....                | Yes.                   |
| 1971-74 Pontiac: All.....   | Yes.....                           | Yes.....               |                        |
| 1975: All.....  | Yes.....                           | No.....                | No.                    |

CHRYSLER CORP., January 14, 1976.

Hon. WARREN G. MAGNUSON,  
 Chairman of the Committee on Commerce, U.S. Senate,  
 Washington, D.C.

DEAR SENATOR MAGNUSON: This is in reply to your recent letter to Mr. Eugene Cafiero in which you requested information relative to gasoline octane. Following are the questions in your letter and our response:

*Question 1.* A sample copy of your owner's manual for the model years 1971, 72, 73, 74, 75, and 76.

Answer. Representative copies of Chrysler Corporation Owner's Manuals for model years 1971 through 1976 (Fury manual, typical) are enclosed. Fuel statements for each model year are shown on the pages indicated for each respective manual: 1971—page 22 and enclosed card insert; 1972—page 4; 1973—page 7; 1974—inside back cover; 1975—inside back cover; and 1976—inside front cover.

*Question 2.* Some owner's manuals recommend use of a gasoline of at least 91 research octane, yet FEA regulations have called for posting of an  $(R+M)/2$  octane rating. Do you provide information which would enable owners of your vehicles to relate the two ratings?

Answer. Yes, since the adoption of the  $(R+M)/2$  regulation, effective with the 1975 Owner's Manual, the minimum anti-knock index value (87), based on  $(R+M)/2$  and the comparable Research Octane Number (91) have been included in all Chrysler Corporation fuel statements.

*Question 3.* Other than the owner's manual, have you or do you plan any programs to educate motorists to choose the correct gasoline?

Answer. We do not have programs relative to the direct education of motorists regarding proper selection of gasoline. This type of information is provided, however, to Corporate dealers in the form of Technical Service Bulletins and Master Technicians Service Conference film and literature. A typical Technical Service Bulletin is enclosed.

*Question 4.* What is the research and motor octane requirement levels which you designed your vehicles to operate on for each of the model years in question?

Answer. Since the 1971 model year, all Chrysler Corporation models have been designed to operate on gasolines of 91 Research Octane, 83 Motor Octane, except the following high performance engines:

For Model Year 1971—340 cubic inch displacement; 426 cubic inch displacement; 440 cubic inch displacement high performance; and 440 cubic inch displacement with three 2-barrel carburetors.

The above-listed engines were designed to operate with Premium gasoline, e.g. 100 Research and 92 Motor Octane.

*Question 5.* Should there be minimum federal specifications for gasoline characteristics such as research and motor octanes? If so, why? If not, why?

Answer. We do not believe that minimum federal specifications for gasoline characteristics are necessary, or that they would be beneficial. Historically, competitive marketing pressures have been adequate to produce a satisfactory combination of engine octane requirements and gasoline octane quality. With the exception of some infrequent "problem engines" or occasional low quality gasoline, we do not recognize the existence or future likelihood of engine knock difficulties that would justify the need for federal specifications on octane quality.

*Question 6.* What percentage of each given model year do you expect will experience engine knock on the recommended fuel after engine stabilization (roughly 10,000 miles)?

Answer. All engines are designed to be satisfied with 91 Research Octane, 83 Motor Octane Gasolines. Manufacturing variables may result in the production of some units not satisfied by these fuels. Variations in operator techniques and driving habits result in an unpredictable number of unsatisfied engines. Although we cannot respond to this question precisely, our experience indicates that the number of vehicles experiencing any noticeable knocking tendency will be less than 10% in any of the model years included in your question.

*Question 7.* For each model year, what alternatives does the motorist have if one finds one's car knocking?

Answer. The motorist has available two basic alternatives to eliminating engine knock—one is to change the gasoline used to another type or brand with better antiknock performance, and the second is to reduce the knock tendency of the engine. Typically, the motorist will first attempt to eliminate a knocking problem by changing fuel. For the model years through 1974, and on those 1975 and 1976 vehicles not equipped with catalysts, changing gasoline type from un-

led to leader will provide substantially better octane quality. This can be accomplished easily, and in most cases will resort in a lower cost to the motorist. For 1975 and later vehicles equipped with catalysts, unleaded gasolines with anti-knock quality substantially above the 91 Research/83 Motor Octane are available in the market.

The other alternative, that of reducing the knock tendency of the engine, requires the services of a trained mechanic. Setting the engine timing and carburetion to the specifications shown in the service manual and on the Vehicle Emission Control Information Label located in the engine compartment is the first step in this procedure. If this does not eliminate the knock tendency, the mechanic may adjust the settings. Tolerances for these settings are included in the service manual instructions and on the Information Label. Recommendations to the field to make adjustments beyond these tolerances would require approval by the EPA.

*Question 8.* It has been stated that "the present state of our ability to control these things (octane requirements of vehicles and octanes of gasolines) does not allow you to use octane as a finite specific number in a manual for cars." Do you agree or disagree? In either case explain the reasons for your response.

*Answer.* We agree that it is not possible to define the antiknock requirement of an engine family by a finite specific number. First, inherent dimensional variations in individual components of a mass produced vehicle give a rather substantial range of anti-knock requirement among vehicles of the same basic model. It is not unusual for this range to be 4 or 5 octane numbers for clean engines.

Second, the anti-knock requirement of an engine normally increases with mileage accumulation. Typically, this increase is 4 to 5 numbers and stabilizes after 8,000 to 12,000 miles. However, requirement of an individual vehicle may increase by more than 5 numbers, and may continue to increase beyond 12,000 miles. This increase is related primarily to combustion chamber deposits which are related to a variety of factors, including fuel properties other than octane number, engine oil composition, driving pattern, engine design, and other variables. Third, whether or not an individual vehicle will experience engine knock on the road is dependent on a variety of factors which include ambient temperature, humidity, altitude, engine warm-up condition, driving patterns, and the anti-knock performance of the gasoline relative to the specific operating condition, which is not precisely defined by the Research and Motor Octane numbers.

To provide a single finite value of anti-knock quality required to satisfy all of the variables encountered would result in over specification for the vast majority of engines under most operating conditions.

I trust that these comments will be helpful to your committee.

Sincerely yours,

S. L. TERRY,

*Vice President, Public Responsibility and Consumer Affairs.*

Enclosure.

SERVICE DEPARTMENT TECHNICAL SERVICE BULLETIN, NOVEMBER 19, 1973

This Technical Service Bulletin is published to acquaint you with the new gasoline octane numbers that are now posted on all gasoline dispensing pumps and to provide information to assist you in recommending the type of gasoline for use in Chrysler built vehicles.

Posting of the new gasoline octane numbers became a Federal requirement, effective September 8, 1973, under the Phase IV Cost of Living Council Regulation. The number posted on each pump represents the average value of the motor and research octane numbers of the gasoline dispensed. The resultant number is lower in value than the more commonly used research octane number. The minimum research octane number of 91, recommended in Corporate fuel statements since 1971, for instance, is equivalent to a minimum octane number of 87 as determined by the (R+M)/2 Method, (the sum of research octane and motor octane numbers, divided by 2), of octane definition.

There are now three methods of expressing gasoline octane quality with which you should be familiar. A brief description of each method is outlined below. A chart comparing values determined by each classification method and the common term (such as "regular", "premium", etc.) is attached to aid you in recommending the appropriate gasoline for use in various Chrysler built vehicles.

## GASOLINE CLASSIFICATION METHODS

1. *Research method.*—This method defines the anti-knock characteristics of gasoline as determined by a laboratory engine test and is expressed in terms of a research octane number. This has been the most commonly used method of defining gasoline octane in the field.

2. *(R+M)/2 method.*—This method defines the anti-knock characteristic of gasoline as determined by two different laboratory engine tests, the Research Octane Method (described above) and the Motor Octane Method (not commonly used for reference in the field). The resultant octane number is the average of values obtained by these methods. This new number more accurately describes the gasoline anti-knock performance in vehicles than the research octane number.

3. *Gasoline classification system.*—This system provides an effective means of expressing the minimum anti-knock characteristic of gasoline, as determined by the (R+M)/2 Method through the use of a symbol  $\odot$  containing a representative numerical value. A number, ranging from 1 through 6, representing the minimum anti-knock index, is located in the center of this symbol. An expression of lead content of the fuel (unleaded, low lead, leaded) is also shown in the upper portion of the symbol. The symbol system is currently used in the State of Hawaii and is under consideration in other states.

J. D. MORTON,  
*Manager-Technical Service,  
 U.S. Automotive Parts Sales and Service.*

Attachment: Comparison of fuel octane designations.

## COMPARISON OF FUEL OCTANE DESIGNATIONS

| Suggested application   | "Common name"                             | Recommended fuel <sup>2</sup>    |                       | Gasoline classification number |
|---|---|----------------------------------|-----------------------|--------------------------------|
|   |   | Research octane number (typical) | octane number (R+M)/2 |                                |
| Not recommended.....  | None.....                                 | 91.0 <sup>1</sup>                | 87.0 <sup>3</sup>     | ①                              |
| Recommended for most 1971 and 1972 vehicles and all 1973 and newer vehicles.  | Sub regular (low octane).<br>Regular..... | 91.5 <sup>2</sup>                | 87.0                  | ②                              |
| Recommended for most 1970 and older vehicles designed to operate on "regular" gasoline. Recommended for those 1971 and older vehicles requiring higher anti-knock performance than provided in the above fuels. | Super regular.....                        | 95.0 <sup>3</sup>                | 89.0                  | ③                              |
| This is an intermediate type fuel recommended for those vehicles requiring antiknock properties above that normally found in "regular" fuel and some vehicles normally requiring a "premium" fuel.              | Premium.....                              | 96.5                             | 91.5                  | ④                              |
| Recommended for most 1972 and older vehicles equipped with high compression engines.  | Super premium.....                        | 100.0                            | 95.0                  | ⑤                              |
| Recommended for those 1972 and older vehicles equipped with high compression engines requiring higher than normal antiknock qualities.  |   | 102.5                            | 97.5                  | ⑥                              |

<sup>1</sup> There may be exceptions to some of the above applications due to factors such as engine variations and vehicle mileage  
<sup>2</sup> Reference should be made to the fuel statement shown in the operator's manual for the appropriate model year expressed in 1 or more of the fuel designations shown.

<sup>3</sup> Below.

TEXACO, INC.,  
 January 19, 1976.

Senator WARREN G. MAGNUSON,  
 Chairman, Consumer Subcommittee, Committee on Commerce, U.S. Senate,  
 Washington, D.C.

DEAR SENATOR MAGNUSON: Your December 11 letter to me raised four questions relating to my October 29 testimony before the Commerce Committee's Consumer Subcommittee on S. 1508, the Consumer Fuel Disclosure Act of 1975.

Attached hereto are our comments which I trust will answer these inquiries. However, should you have any further questions, we shall be happy to discuss the subject further.

Sincerely yours,

JOHN E. TESSIERI,  
 Vice President, Research and Technical Department.

Attachment.

ATTACHMENT—REPLIES TO QUESTIONS RAISED IN DECEMBER 11, 1975 LETTER FROM SENATOR WARREN G. MAGNUSON TO DR. JOHN E. TESSIERI, VICE PRESIDENT, RESEARCH AND TECHNICAL DEPARTMENT, TEXACO INC.

*Question 1.* In Table II of your testimony you show an estimated 1.6 percent of the 1974 gasoline sales in 1974 would be required to be lead free. How does this compare with the fact that most cars sold in the U.S. since 1971 were designed to operate on 91 research octane gasoline (low-lead or lead free)?

Answer. The first firm requirements for unleaded gasoline arose with the 1975 model cars introduced in the fall of 1974. Owners did not have the option of using lower cost leaded gasoline because the 1975 models were equipped with catalytic converters and/or had been EPA-certified using unleaded gasoline. The estimate of 1.6 percent demand for unleaded gasoline noted in our Table 2 was based on 1975 model cars which entered the total gasoline consuming vehicle population in 1974.

Prior to July 1, 1974, unleaded 91 Research octane number (RON) gasoline was available only on a very limited scale in the United States. Therefore, most owners of 1971-74 model cars purchased either low-lead or normally leaded regular grade gasolines. Both of these are included in the Regular Grade category of Table 2 of our testimony.

Further, although the automotive industry had a general design target of 91 RON octane requirement for new cars starting with the 1971 model year, many of the cars manufactured had higher octane requirements due to changeover problems and production tolerances. Regular grade gasoline provided a higher anti-knock satisfaction level in these cars than 91 RON unleaded gasoline and was a lower cost fuel. Thus, there was very little incentive prior to the 1975 model year for new car owners to use unleaded gasoline.

*Question 2.* Does the computer program on which your estimates are based include adjustment for the decreasing usage or annual vehicle miles traveled for older cars? For example, have the facts that cars requiring premium were all manufactured prior to 1971 and are driven less than newer models been taken into account?

Answer. Our computer model does include a factor for decreasing annual operation of cars with age. An incremental reduction in annual mileage for each year of age assigned until a minimum mileage level is reached for cars 15 years old and older.

*Question 3.* How do you square your figures on percent premium sold with data from the 1975 National Petroleum News *Fact Book*, which shows that in 1974 retail sales of premium averaged 31 percent in 52 metropolitan areas and that in 22 of the areas averaged over 33 percent premium?

Answer. The National Petroleum News values are not at variance with our estimates since the former are calculated on a different base and represent only selected, localized segments from the total car population. It is well known that in certain metropolitan areas of the country (Los Angeles, for example) the car mix is distorted in favor of more premium requirement cars compared to the overall national car mix. In these areas, one would expect to see higher premium gasoline sales. It is erroneous, however, to conclude that such figures are representative of the needs or buying patterns of the United States as a whole. Our computerized estimate, in contrast, dealt with the requirements of the entire car population existent in the country and is, therefore, more representative of the total gasoline grade mix required to satisfy all of the cars on the road.

*Question 4.* If the gasoline changes but the posted designation does not, how is the motorist to relate the new gasoline with the old designation in his owner's manual?

Answer. There is a serious misconception among proponents of posting octane numbers that a car manufacturer can specify precisely the octane requirement of new cars and that an owner can then purchase precisely that octane in a fuel. This is a fallacy which was discussed in pages 1-3 of our testimony. Any posting system can only be a guide. The motorist must eventually determine by trial which brand (or Symbol Number) gasoline provides satisfactory performance (from anti-knock and other standpoints) in his individual car under his driving conditions.

Relative to other octane posting systems, use of a symbol system to denote octane gradations would have many advantages. Of major importance, it would

provide the motorist with a more easily understood, constant expression of fuel grading. Adoption of the SAE/ASTM symbol system, for example, would provide a gradation maintained by experts in car-fuel relationships and car population octane requirements, with due regard for both new and older cars. There would be no radically large or abrupt changes in fuel octane levels. Rather, changes would be evolutionary to match changing car population requirements. As a result, once a motorist determined that a particular symbol grade fuel satisfied his car, he would be able to continue to purchase the same symbol grade in subsequent years with reasonable expectation that it would continue to satisfy his car.

In addition, other relative advantages to the motorist of a symbol or grade system would include built in compensation of octane for altitude variations in different parts of the country and availability of a standardized, non-confusing method of expressing fuel requirements in new car owners manuals.

FORD MOTOR CO.,  
Dearborn, Mich., January 19, 1976.

Hon. WARREN G. MAGNUSON,  
Chairman, Committee on Commerce, U.S. Senate, Washington, D.C.

DEAR SENATOR MAGNUSON: This is in reply to your letter of December 10, 1975 to Mr. L. A. Iacocca regarding Ford Motor Company recommendations on gasoline for our products. Clearly this is an important subject to us, as well as to the Senate Commerce Committee's Consumer Subcommittee, and we are pleased to respond to your questions on this subject. Our replies follow.

*Question 1.* A sample copy of your owner's manual for the model years 1971, 72, 73, 74, 75, and 76.

Response. Sample copies of owner's manuals for Ford passenger cars for 1971 through 1976 models are enclosed. You will note that with the exception of a fraction of our 1971 engines, the gasoline octane requirements have remained the same (at 91 RON min) for these six model years of our cars. Of course, our 1975 and 1976 models require unleaded fuel.

*Question 2.* Some owner's manuals recommend use of a gasoline of at least 91 research octane, yet FEA regulations have called for posting of an (R+M)/2 octane rating. Do you provide information which would enable owners of your vehicles to relate the two ratings?

Response. Ford Motor Company owner's manuals for 1974, 1975 and 1976 model years specify fuel octane requirements in both research octane and the (R+M)/2 rating method. Also, for model years 1973, 1974 and 1975, Ford showed the gasoline symbol designation. This symbol designation refers to the SAE/ASTM Gasoline Performance and Information system which uses a single number, based on (R+M)/2, to designate anti-knock properties. This symbol method seemed to offer advantages of simplifying the subject of gasoline selection for the consumer. It has not been adopted widely, however, and Ford has deleted reference to the symbol method in its 1976 owner's manuals.

*Question 3.* Other than the owner's manual, have you or do you plan any programs to educate motorists to choose the correct gasoline?

Response. We believe that our owner's manuals, service publications and service personnel are keeping our vehicle owners properly informed on this matter, particularly when combined with the information furnished to the public by petroleum companies. Each year Ford conducts special training sessions for its own field service personnel and the service personnel of its dealers in which new devices and requirements, including new gasoline requirements, are explained in detail. Should any new developments significantly alter the need for furnishing new or revised information on fuel selection to vehicle owners, we of course would implement appropriate changes.

*Question 4.* What is the research and motor octane requirement which you designed your vehicles to operate on for each of the model years in question?

Response. Ford Motor Company passenger cars for model years 1971 through 1976 were designed for 91 RON, 83 MON fuel, except for 351-4V and 429-2V and 4V engines in 1971. These 1971 engines were designed for 99 RON, 90 MON fuel ("premium" grade).

*Question 5.* Should there be minimum federal specifications for gasoline characteristics such as research and motor octanes? If so, why? If not, why not?

Response. Ford believes the current EPA regulations that govern certain properties of unleaded fuel (min. RON, max. lead and phosphorus content) and require its availability at service stations have served a very useful and necessary function. They set an important "stake in the ground" at a time when the petroleum and automotive industries were changing to unleaded fuel and needed a common definition of fuel properties. Ford believes there is a continuing need for federal regulations on unleaded gasolines specifying maximum allowable levels for lead and phosphorus. We need definite lead and phosphorus specifications to design and test our future control systems since these additives importantly affect catalyst efficiency with mileage.

Ford does not believe, however, that there is any need to continue the federal regulation of octane quality of unleaded gasoline. Octane requirements of in-use vehicles vary widely, and a customer will perceive quickly when the octane of the fuel he is using is too low for his vehicle and type of operation. We believe that normal market forces are strong enough to control octane satisfactorily without the need for federal regulation. In fact, requiring vehicle owners to use fuels having an octane rating higher than they need would be wasteful of energy and probably would increase fuel costs unnecessarily.

*Question 6.* What percentage of each given model year do you expect will experience engine knock on the recommended fuel after engine stabilization (roughly 10,000 miles)?

Response. A precise answer to this question is not possible since many factors outside of our control determine whether or not a customer will experience knock. In general, we estimate that approximately 5 to 10% of our customers experienced spark knock at one time or another on our 1971 through 1974 models, and a somewhat higher percentage experienced knock on our 1975 and 1976 models. We refer here to spark knock caused for any reason, including engines set out of specification. As indicated below, the vast majority of spark knock occurrences on Ford vehicles are correctable by minor engine tuneups and adjustments or by changes in fuel or driving habits.

*Question 7.* For each model year, what alternatives does the motorist have if one's car knocking?

Response. Probably the most common solution employed by motorists on model year cars up through 1974 was simply to switch to a fuel of higher octane rating. Retarding the ignition spark timing also reduces spark knock, and for 1975 and 1976 models, EPA has authorized the use on Ford-built cars for this purpose of up to 6° of spark retard. If knock is the result of the engine being out of tune, appropriate adjustment to manufacturers specification or repair would solve the knock problem. A change in driving habits may also correct knock in some instances, for example, by downshifting instead of "lugging" in high gear.

*Question 8.* It has been stated that "the present state of our ability to control these things (octane requirements of vehicles and octanes of gasolines) does not allow you to use octane as a finite specific number in a manual for cars." Do you agree or disagree? In either case explain the reasons for your response.

Response. Vehicle octane requirements are a function of original design specifications, manufacturing variability, driving habits, tuneup condition and climatic conditions. If we calibrated our engines to ensure that none of our vehicles under any conditions would ever experience spark knock on gasoline of a specified octane, fuel economy would be penalized severely and a portion of the nation's critical energy supply would be wasted. Accordingly, we believe it would be impractical and unwise to try to specify the precise octane requirements of our cars so as to assure that knock would not occur. Currently we designate octane requirements of our products in a manner which we believe is informative and useful to the car owner, recognizing that a certain small percentage of customers may encounter knock, but that adequate corrective measures are available in such instances.

I trust that our replies will be helpful to you.

Sincerely,

D. A. JENSEN,  
 Director, Automotive Emissions Office,  
 Environmental and Safety Engineering Staff.

GENERAL MOTORS CORP.,  
 Detroit, Mich., February 17, 1976.

Hon. WARREN G. MAGNUSON,  
 U.S. Senate,  
 Washington, D.C.

DEAR SENATOR MAGNUSON: As promised in our December 23 letter to you, we are now sending General Motors answers to questions you asked on the subject of gasoline octane posting.

In addition, we are supplying copies of the owner's manuals requested and a copy of letters sent last year by Howard H. Kehrl, executive vice president of GM, to oil companies on octane questions.

Your letter last month requested information in response to nine questions related to your prior hearing on gasoline octane posting. Following are our responses to these questions:

1. Q. A sample copy of your owner's manual for the model year 1971, 72, 73, 74, 75, and 76.

A. Attached are Chevrolet Owner's Manuals for the years specified. These illustrate GM's approach to the problem discussed in the December 10, 1975, letter.

2. Q. Some owner's manuals recommend use of a gasoline of at least 91 research octane, yet EPA regulations have called for posting of an (R+M)/2 octane rating. Do you provide information which would enable owners of your vehicles to relate the two ratings?

A. Our 1975 and the first edition of our 1976 manuals refer to both the research and the (R+M)/2 octane ratings, thus allowing owners of vehicles from these model years to relate the two numbers. However, a history of the octane number recommendations, and the reasons for them, for the years 1971-1976 can place the problem of octane posting versus owner's manuals recommendations in much better perspective.

General Motors' 1971 and 1972 owner's manuals recommended gasoline with a minimum research octane number (RON) of 91. We did not include any other octane numbers (such as motor) because RON was the most meaningful number to the average driver. However, our manuals advised that RON does not completely describe the octane quality of gasoline, and suggested that drivers try other gasolines to eliminate engine knock. This was a reasonable recommendation at the time, since those cars could use unleaded, low-lead, or leaded gasolines of sub-regular, regular, or premium quality.

Our 1973 and 1974 manuals continued the use of RON for the reasons already given, but in addition recommended gasoline octane on the basis of the then newly developed SAE-ASTM symbol/system which is fully described in Attachment 1. General Motors had been instrumental in the development of the symbol/system, and was and is vigorously supporting its use. Our views on the symbol/system and our reasons for supporting it have been repeatedly and widely aired, most recently in our comments submitted to the Consumer Subcommittee of the Senate Commerce Committee, reproduced in Attachment 2.

General Motors' 1975 owner's manuals recommended for the first time, the exclusive use of unleaded gasoline. In practical terms this meant that drivers of our 1975 cars were limited to the use of 91 RON unleaded gasoline meeting the requirements of the Environmental Protection Agency (EPA). However, the EPA specification did not adequately describe the octane quality of this gasoline since it did not contain the descriptive aspect a minimum motor octane number (MON). Therefore, we decided to include in our owner's manuals a MON recommendation. This was done primarily to emphasize to gasoline producers, marketers, and users that RON alone did not adequately describe the gasoline's octane quality. Of course, we continued using the RON and symbol/system recommendations, but a recommendation based on (R+M)/2 was also added.

The latter action was taken in response to the Cost-of-Living Council's requirement that service stations post the (R+M)/2 values on their gasoline dispensing pumps. We recognized that using four different octane quality expressions could be confusing. However, we felt that for this first critical year of the exclusive recommendation for unleaded gasoline, the benefits of mentioning all four expressions outweighed the disadvantages.

Gasoline octane recommendations in the first edition of our 1976 owner's manuals were simplified by eliminating references to MON and the symbol/system. MON was eliminated because not only had we made our point about the importance of MON, but also when RON and  $(R+M)/2$  are specified, the MON is automatically fixed. The symbol/system was dropped because the vast majority of the oil companies had not used, and apparently, had no intention of using it on their gasoline dispensing pumps.

For the second edition of our 1976 owner's manuals, we made a further change. We deleted all references to octane numbers and relied on the definition of unleaded gasoline contained in EPA regulations.<sup>1</sup> We took this step because we were unable to satisfy requests by oil companies to include in our owner's manuals the lower octane numbers permissible for gasoline sold at high altitudes. Oil companies wanted this to help motorists in matching the  $(R+M)/2$  number posted on gasoline pumps with the appropriate owner's manual recommendation for various altitudes.

We could not satisfy this seemingly simple request for two reasons. First, the EPA regulation designates reductions in octane quality with increasing altitude in terms of RON only, and not  $(R+M)/2$ . Second, there is uncertainty about which octane number will actually be required by posting regulations.

If oil companies, and the federal and state governments had followed our lead and were using the symbol/system, none of this confusion would be with us today, and there would be no need for drivers to be relating RON to  $(R+M)/2$ , or anything else. We still believe that use of the symbol/system is the best compromise, not the ideal solution, to this octane number problem, and as indicated in Attachment 2, we strongly prefer the symbol/system.

3. Q. Other than the owner's manual, have you or do you plan any programs to educate motorists to choose the correct gasoline?

A. We will continue our owner's manuals as the primary source of such information. However, if the symbol/system were adopted, we would work through the SAE and ASTM to develop an educational program to be used by both the petroleum and automotive industries in educating drivers in the correct use of the new system.

4. Q. What is the research and motor octane requirement levels which you designed your vehicles to operate on for each of the model years in question?

A. Beginning with the 1971 model year, all General Motor Cars and light duty trucks have been designed to operate on unleaded gasolines having a minimum octane quality of 91 RON and 83 MON. For the years 1971-1974 inclusive, low-lead and leaded gasolines of the same minimum octane quality were also acceptable.

5. Q. Should there be minimum federal specifications for gasoline characteristics such as research and motor octanes? If so, why? If not, why not?

A. General Motors does not believe that federal specifications are needed for octane quality especially if there is a federal requirement for posting the octane quality of gasoline. Actually, octane posting would serve motorists better than minimum specifications for several reasons. First, the driver will be able to match his owner's manuals' recommendations with the posted value. Second, if he knows the octane quality of the gasoline he is buying, he can shop around to find the octane quality he actually needs at the lowest possible price. Third, oil companies will be better able to respond to changing market needs if they do not have to meet some arbitrary minimum specification which may no longer be related to the octane requirements of the car population. Fourth, oil companies can formulate their own independent marketing strategies which may vary because of peculiarities in crude supply, refinery configuration, and the like. The last two reasons would help keep prices down and conserve energy.

General Motors is not opposed to all federal gasoline specifications. For example, we supported the EPA's unleaded gasoline regulation which contains a minimum specification for RON because unleaded gasoline was at the time a new product whose availability at the right octane quality level had to be ensured, in order to utilize the fuel saving catalytic converter technology. For that same specification we supported maximum limits for lead and phosphorus, since excessive amounts of these materials would also poison catalysts. General Motors believes that this EPA specification for unleaded gasoline is all that is currently needed.

<sup>1</sup> As mentioned previously, EPA regulations specify a minimum RON of 91, but contain no limits for either MON or  $(R+M)/2$ .

Furthermore, if the symbol/system were used for posting purposes, a specification would indeed exist for all gasolines, since the symbol/system is directly related to the ASTM D439 specification which contains minimum octane requirements for all grades of gasoline. Thus, a new federal specification, and even the current EPA specification would be redundant.

6. Q. What percentage of each given model year do you expect will experience engine knock on the recommended fuel after engine stabilization (roughly 10,000 miles)?

A. One source of data to answer this question is that reported in the annual surveys of car octane requirements conducted by the Coordinating Research Council (CRC). It is not a complete answer, however, because a) the CRC ratings are obtained by trained observers listening for trace knock; b) there is a large variation among cars and non-trained drivers with respect to the occurrence of and response to knock. For these reasons, the CRC data could lead to the wrong conclusions. This is especially true when the intent of the question is to establish how many of the owners or drivers of cars from the general public will hear knock frequently enough and of sufficient intensity to cause them to seek remedial action.

The CRC is currently conducting research to establish the difference in response to knock between trained observers and the general driving public. Therefore, we believe that a more meaningful answer to this question can be obtained by reviewing our field experience since 1971.

Although General Motors' 1971-1974 cars were designed to operate on unleaded gasoline of 91 RON, 83 MON, they were not restricted to that fuel. Consequently, most drivers purchased the cheaper, more readily available, and higher octane leaded, regular grade gasoline. As a result, virtually all of these cars have been operating practically knock-free. Customer complaints and inquiries about knock decreased from even their minimal levels during these years.

In contrast, 1975 and 1976 model year General Motors cars require the exclusive use of unleaded gasoline, and most of the unleaded gasoline marketed today has a RON of 91. Despite the relative unavailability of higher than 91 RON unleaded gasoline, neither the General Motors service departments, nor the oil companies who market this unleaded gasoline have reported to us an unusual number of customer complaints about knock. Therefore, we conclude that even in this critical time, most owners and drivers of 1975 and 1976 General Motors cars find the available gasoline satisfactory for their cars' octane requirements.

In addition, we should mention that because they are experienced, CRC's trained observers of this phenomenon are more sensitive to detect engine knock than the average driver. Consequently, the average driver may not sense engine knock in some operational modes where trained observers would. Thus, if cars are designed to be totally knock-free—even to trained observers—their fuel economy would decrease, and unnecessarily so. Light, occasional knock is not harmful to the engine, is not noticeable to most drivers and allows us to maximize fuel economy. Only heavy and persistent or continuous knock cause engine damage.

7. Q. For each model year, what alternatives does the motorist have if he finds his car knocking?

A. As mentioned previously in the answer to question six, 1971 through 1974 model year cars can use leaded gasoline; therefore, regular or even premium leaded gasoline could be used to avoid knock. For the 1975 and 1976 cars, only unleaded gasoline is permitted. Only a few unleaded gasolines with RON and MON greater than 91 and 83, respectively, are available for cars which may knock. These gasolines will help if available to the driver involved.

In order to alleviate the situation where higher octane unleaded fuel is not available, General Motors has obtained permission from the EPA to retard the basic spark timing up to a maximum of four degrees for those cars which are brought to the dealer because of excessive spark-knock. However, General Motors has not found it necessary to issue a bulletin advising all General Motors dealers that this remedy is available, because very few complaints about knock have been received.

There is another mechanism by which drivers can avoid engine knock. They can "drive around it." This is not particularly difficult with recent model year cars which usually experience knock at wideopen-throttle conditions. Thus, a driver needs only to avoid "flooring" the gas pedal to avoid knock, and save gasoline.

S. Q. It has been stated that "the present state of our ability to control these things (octane requirements of vehicles and octanes of gasolines) does not allow you to use octane as a finite specific number in a manual for cars." Do you agree or disagree? In either case explain the reasons for your response.

A. General Motors agrees with the statement. Many of the reasons for our agreement have been either explicitly stated or implied in our answers to some of the previous questions. Summarized, the reasons are:

(a) The octane requirements of some cars are best satisfied by the RON of gasoline, whereas other cars are satisfied by the MON, and still others are satisfied by some combination of RON and MON  $((R+M)/2$ , for example).

(b) Not all cars, even those of the same make and model, have exactly the same octane requirements, even when brand new. This is due to normal production variations, and a function of how the car is driven by its owner, and of the type of gasoline and engine oil being used.

(c) Car octane requirements increase with car use. However, the increase is far from being the same in either rate or magnitude even among cars of the same make and model. The type of driving, gasoline, and engine oil to which car engines are exposed, strongly influence octane requirement increase.

(d) Car octane requirements also depend on altitude, ambient temperature, and humidity. Therefore, they will vary as those conditions change.

As explained in Attachment 2, use of the symbol/system would minimize some of these problems, and would allow a better method by which octane quality recommendations could be included in car owner's manuals and octane quality of gasoline would be displayed on dispensing pumps.

Additional technical information on this subject is contained in an SAE paper entitled "Some Factors Which Affect Octane Requirement Increase" prepared and presented by Jack D. Benson of the General Motors Research Laboratories, Fuels and Lubricants Department (see Attachment 3).

If I can be of further assistance in your consideration of this matter, please let me know.

Sincerely,

E. M. ESTES, *President.*

Enclosures.

GENERAL MOTORS CORP.,  
Detroit, Mich., August 29, 1975.

Mr. HARRY D. BROOKBY,  
*Executive Vice President,*  
*Phillips Petroleum Co.,*  
*Bartlesville, Okla.*

DEAR MR. BROOKBY: In your letter to Mr. Estes of July 21, 1975, you indicated a concern by your marketing people regarding the statement in our owner's manual that the fuel requirement of 87  $(R+M)/2$  is recommended for our 1975 automobiles. We agree with your concern as to the possible confusion on the part of our customers and, as a result, issued a revision to our 1976 owner's manual. This revision will be made in the second edition printing.

The original statement has been changed to eliminate reference to octane numbers. Instead, reference is made to unleaded gasoline only which, by Federal regulation, must have a minimum octane number. The Federal regulation specifies the minimum octane number both at sea level and at high altitudes. Therefore, by recommending unleaded gasoline as defined by Federal regulations, the altitude problem is automatically solved.

Thank you for your interest in this matter.

Sincerely,

HOWARD H. KEHRL,  
*Executive Vice President.*

GENERAL MOTORS CORP.,  
Detroit, December 8, 1975.

Mr. H. J. HAYNES,  
*Chairman of the Board,*  
*Standard Oil of California,*  
*San Francisco, Calif.*

DEAR MR. HAYNES: During our recent meetings with oil company representatives, some concern was expressed that our "Fuel Requirements" statement in our Owners' Manuals might be confusing because of the several alternative ways currently in use for defining octane quality and because lower octane levels than those noted in our manual are permissible at higher altitudes.

I am attaching a representative copy of the revised Fuel Requirements Section of the second printing of our 1976 Owners' Manual in which the fuel requirements have been restated in the simplest form to provide the owner with the necessary information. As you will note, we have removed all reference to octane level since the minimum value for "UNLEADED GASOLINE" has been defined by EPA for sea level as well as higher altitudes. Further, they have required that the words "UNLEADED GASOLINE" appear on pumps dispensing this fuel.

As we indicated during our meeting with you, it is General Motors' intention to continue to design our engines to provide customer satisfaction on unleaded fuels of 91 RON/83 MON.

Sincerely,

HOWARD H. KEHRL,  
*Executive Vice President.*

Attachment.

SERVICE AND MAINTENANCE  
MAINTENANCE SCHEDULE

For owner convenience, a separate maintenance folder has been provided with your car which contains a complete schedule and brief explanation of the safety, emission control, lubrication and general maintenance it requires. The maintenance folder information is supplemented by this section of the Owner's Manual as well as a Warranty Information folder also furnished with your car. Read all three publications for a full understanding of car maintenance requirements.

FUEL REQUIREMENTS

Your Oldsmobile engine is designed to operate only on unleaded gasoline. Unleaded gasoline is essential for proper emission control system operation, and it will minimize spark plug fouling. The use of leaded gasoline can damage or severely reduce the effectiveness of the emission control system and result in loss of warranty coverage.

Use unleaded gasoline meeting the minimum octane specifications established by the Federal government. In compliance with Federal regulations, pumps dispensing such gasoline are labeled with the word UNLEADED and are equipped with dispensing nozzles which fit the filler neck of your car's gasoline tank.

Supplementary gasoline additives which contain lead and/or phosphorus should not be used under any circumstances. Such additives can severely reduce the effectiveness of your catalytic converter.

FUEL FILLER LOCATION

On all series except Cutlass S and station wagons, it is located behind the rear license plate holder. On the Cutlass S, it is located behind a hinged door directly below the trunk compartment lock. On station wagons, fuel filler cap is located on the left rear fender.

Fuel Tank Filler Tube—To help prevent refueling with leaded gasoline, the fuel filler tube has a built-in restrictor and deflector. The opening in the restrictor will only accommodate the smaller unleaded fuel nozzle spout which must be fully inserted to bypass the gas deflector. Attempted refueling with the leaded fuel pump nozzle or failure to fully insert the unleaded fuel nozzle spout can result in gasoline splashing back out of the filler tube.

ASTM,

*Philadelphia, Pa., February 18, 1976.*

HON. WARREN G. MAGNUSON,  
*Chairman, U.S. Senate Committee on Commerce,  
Washington, D.C.*

DEAR SENATOR MAGNUSON: I am pleased to send you ASTM's response to your letter of December 11, posing two questions on the octane rating problem. Our response to the questions has been approached in the same manner as the testimony we presented on the Consumer Fuel Disclosure Act, that is, the questions were sent to Messrs. Sydney D. Andrews, Director of the Division of Standards, Florida Department of Agriculture and Consumer Services, who serves as Chairman of ASTM Committee D-2 on Petroleum Products and Lubricants, and John A. Krynetsky, Director of the Office of Technical Operations, U.S. Defense Fuel Supply Center who is Chairman of ASTM Committee D-2's Technical Division "A". Following is a summary of their response which we hope you find useful.

Addressing Question 1.—The octane rating in S. 1508 will not always be the same as the research octane number. The octane number in S. 1508 is based on the formula  $R+M/2+4$  which formula is, in turn, based on the assumption that the fuel sensitivity of gasolines will always be 8. However, the fuel sensitivity of gasolines varies from 0 to 12 or perhaps even higher. Therefore, if a purchaser relied on the research rating shown in a vehicle owner's manual when purchasing gasoline by the formula  $R+M/2+4$ , he could be misled.

Since August 1973, drivers have been aware of the  $(R+M)/2$  rating system, along with the research octane rating. Owner's manuals have referenced both types of ratings, and some have even referenced the symbol system "antiknock designation" number. S. 1508 now proposes a variation as if to meld two of the ratings by the addition of an arbitrary number. The concern is not so much that consumers need to know that there is a difference between any of these ratings but simply that they need to be knowledgeable. Two facets of knowledgeability are dominant. Consistent and uniform information and rating of the gasoline octane parameter is first. This should be coupled with the most technically correct and practically appropriate rating parameter for actual car performance, that which best describes the octane needs of the current car population, both high-compression and low-compression engines.

Addressing Question 2.—Beginning with the 1973 model cars, Ford, Chrysler, and General Motors started referencing information in their owner's manuals to tell the user how to purchase gasoline for that particular vehicle, using the Symbol System. They continued this through the 1975 models. However, owners of 1971 and 1972 models of these three manufacturers, as well as all year models of all of the other manufacturers of automobiles, would have to furnish specific information describing which gasoline would be satisfactory for their vehicles using the Symbol System.

Concerning the method of conveying the necessary information to owners of pre 1973 models, the State of Florida has had some very extensive experience which Mr. Andrews passed along in his letter as follows:

"When we planned to introduce this system into Florida we had prepared a massive educational program for the benefit of the motoring public which took many forms. There were newspaper articles, radio and television programs, as well as magazine and trade journal articles using the various media. Also, we had been assured by some of the gasoline companies marketing in Florida that they would publish leaflets for distribution at their service stations to inform motorists as to which of their gasolines should be purchased for specific vehicles. A facsimile of this type of leaflet which was published by the Standard Oil Company of California for distribution at their stations in Hawaii, where the Symbol System was introduced, is enclosed. Also enclosed is a copy of a leaflet we prepared in our department for distribution throughout the state to assist motorists in using this gasoline identification system."

Whatever means is ultimately adopted for posting octane and car performance information, whether by regulation or otherwise, it must contain three elements if it is to be beneficial to motorists. First, it must be technically sound. Otherwise it will not deserve, and certainly not receive, the confidence of consumers. Second, it must be simple. Otherwise motorists may not take the trouble to learn it, or have difficulty remembering how to apply it successfully for their benefit. Third, it must be universally acceptable by the majority of automotive manufacturers, gasoline producers, and the motoring public itself so that there will be the incentive for all to use it from a beneficial basis.

I hope the comments we have provided will be of assistance to you and your committee. As always, we would be pleased to hear from you again should you require further information.

Sincerely,

WILLIAM T. CAVANAUGH, *Managing Director.*



