

CC: Medical Department-Cincinnati
St. Francis Hotel ✓

Dr. Robert A. Kehoe

Cincinnati

Richard F. Cook

New York

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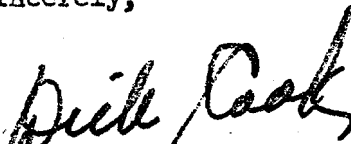
Dear Dr. Kehoe:

In the hope of catching you as promptly as possible, we are sending copies of this memo to you at your San Francisco and Cincinnati addresses simultaneously. Attached, as you will see, is a copy of an article on the 4th cc and Motor 33 Mix which has been prepared for the soon-to-go-to-press issue of ETHYL NEWS.

We will be very grateful if you will kindly review the article from our medical viewpoint and return it to us just as promptly as you possibly can with any comments or corrections that may be necessary noted on it.

Thank you for your prompt cooperation. With kindest regards,

Sincerely,



Richard F. Cook

RFC:ag
Enc.

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4th CC AND MOTOR 33 MIX

TWO SIGNIFICANT advances in the use of antiknock compounds that will help oil refiners produce the important top octane numbers in automotive gasoline more economically and with greater refinery flexibility have been scored recently. The first is related to the use of increased amounts of tetraethyl lead, the antiknock agent now used in 98 out of every 100 gallons of gasoline. The second involves the use of a new additive made possible by a research breakthrough achieved in Ethyl Corporation laboratories.

Greater use of TEL became available to refiners when they were notified of an increase in the maximum permissive concentrations of tetraethyl lead in automotive gasoline from 3 to 4 cc per gallon. This permissive increase followed receipt of a report by a committee appointed by the Surgeon General of the United States Public Health Service to study such an increase.

The second advance followed closely on the heels of the first. It came in the form of a new antiknock compound for motor gasoline developed by Ethyl and now available to refiners in commercial quantities. The product, "Ethyl" Antiknock Compound - TEL - Motor 33 Mix, combines lead and manganese to form the most effective antiknock

compound to be marketed in over 35 years.

Both new advances in the use of antiknock compounds are important to refiners since they can help increase gasoline yields per barrel of crude oil, permit greater flexibility in current operations, and enable refiners to defer or eliminate expensive capital investments in octane improvement facilities.

The significance of the advances and their contributions to refinery operations and to the general public are discussed on this and the following pages.

4th CC

Higher permissive concentrations of tetraethyl lead in motor gasoline--in effect since the report by a special committee appointed by the Surgeon General was received--will give refiners greater flexibility and economy in meeting gasoline quality requirements of the motoring public both now and in the future.

Although this is the first change in maximum TEL concentrations for motor fuels in 33 years, it is not anticipated that there will be any marked change in prevailing average national concentrations for some time. Rather, it is expected that they will increase gradually as oil refiners

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use higher available concentrations--primarily in premium and super-premium gasolines.

Tetraethyl lead concentrations in September averaged 2.47 cc per gallon of premium and 1.84 cc per gallon of regular.

The committee was appointed by the Surgeon General following a request by the tetraethyl lead industry that the increase in TEL concentrations be considered. In making the request, the TEL suppliers reported that a number of oil companies had expressed interest in using more than 3 cc of TEL, and that there was sound economic justification for such an increase.

After thoroughly studying the subject, the committee concluded that a change in maximum concentrations from 3 to 4 cc per gallon "would not increase the hazards involved in the manufacture and distribution of leaded gasoline." It further stated that available data "do not indicate that such change would significantly increase the hazard to public health from air pollution."

The previous limit of 3 cc was voluntarily adopted by the TEL industry in 1926 for economic rather than public health reasons. Since then, TEL has come into widespread use as succeeding reductions in the price of the product have made

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higher concentrations economically advantageous--
in competition with refinery processing--in adding
octane numbers to gasoline.

While 3 cc of TEL have been the previous limit
in motor gasoline, concentrations of up to 4.6 cc
have been used in aviation gasoline for many years.

Besides helping refiners produce high quality
gasolines simply and economically, the higher con-
centrations will make possible substantial sav-
ings in the capital investments which would other-
wise be required to install octane improvement
processes. They will further aid in the conser-
vation of oil resources.

Added to the octane gains presently achieved
with 3 cc of TEL, the fourth cc will add another
1 to 2 octane numbers. In terms of Research octane
number, it will add 0.8 octane number on the av-
erage and 1.4 at the maximum. In terms of Motor
octane number, the average increase is 1.0 octane
number and the maximum 2.1. The average gain in
road octane numbers is 1.1, and the maximum in
this category is 1.9.

Extensive tests by Ethyl Corporation have shown
that gasolines containing 4 cc of tetraethyl lead
have no overall adverse effect on automobile en-
gine performance. These tests included four

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million miles of testing in all types of vehicles, 12,000 hours of tests in farm tractors, and 2,000 hours of laboratory engine testing.

Gasoline containing 4 cc of TEL did not affect valve life adversely, did not affect engine cleanliness, and had no significant effect on oil oxidation or bearing corrosion with high quality oils. Further, it had no significant effect on the octane requirement increase of engines or their tendency toward surface ignition. At the same time, the weight of combustion chamber deposits tended to be reduced.

In making its report to the Surgeon General, the special committee recommended that the oil industry proceed cautiously in increasing lead concentrations in gasoline so that there will be no large abrupt increase in any one year. It also suggested that the Public Health Service continue to study the matter of lead in the atmosphere and in the human body in collaboration with the TEL industry, the oil industry and others.

As the pioneer and leading producer and distributor of tetraethyl lead, Ethyl Corporation has, for more than 35 years, conducted continuing research investigations into the effects of lead discharged in the atmosphere from automobile

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exhausts. The findings of these studies establish that: (1) many sources, other than automobiles operating on gasoline containing TEL, contribute to the total lead in the atmosphere; (2) the total amount of lead dispersed in the atmosphere from all sources--even in highly populated urban centers--is well below hazardous limits; and (3) the present increase in TEL concentrations will not add significantly to the total.

Motor 33 Mix

A superior antiknock compound that substantially increases the economic usefulness of tetraethyl lead to refiners and to the motoring public, "Ethyl" Antiknock Compound - TEL - Motor 33 Mix is one of the most significant advances in the technology and importance of antiknock additives since the introduction of TEL in the early 1920's.

In fuels in which it is most responsive, Motor 33 Mix provides octane numbers at a lower cost than is available either from TEL alone or from refinery processes. Moreover, it contributes to higher gasoline yields and better utilization of various refinery streams and makes possible gasolines of better road performance than at present.

The new compound consists essentially of a mix-

ture of tetraethyl lead and methylcyclopentadienyl manganese tricarbonyl. It is the result of intensive research work by Ethyl Corporation laboratories on potential new antiknocks and of important discoveries in the field of organometallics (see pages 14-17).

A few years ago, the laboratories found that small amounts of certain organic compounds of manganese had a unique effect in promoting the antiknock action of tetraethyl lead. One of the most promising of these compounds was methylcyclopentadienyl manganese tricarbonyl, which for convenience was labelled AK-33X. Accordingly, AK-33X was subjected to exhaustive road and laboratory tests as a supplement to tetraethyl lead.

During the last year, 31 refiners in the United States and abroad have tested the new antiknock formulation of lead and manganese in their gasolines. Over 125 million gallons of gasoline so treated were used by the public, with highly satisfactory results. Previously, the new antiknock had been subjected to over 100,000 hours of dynamometer testing in the Ethyl laboratories, was tested in over 7 million vehicle miles in automotive test fleets, and was further tested in another $1\frac{1}{2}$ million miles of driving by Ethyl personnel.

As a supplement to tetraethyl lead, the manganese compound was found to have the greatest effectiveness in those hydrocarbons and gasolines in which TEL shows good effect. It is most effective in alkylates and paraffinic naphthas, moderately effective in olefins, and least effective in aromatics. Furthermore, tests showed that the greatest "promoter" benefits of the manganese compound occurred at higher concentrations of tetraethyl lead.

In the new antiknock compound, TEL and the manganese compound are combined in a proportion of 0.05 grams of manganese for each cc of tetraethyl lead. As compared with the use of tetraethyl lead alone, 3 cc of TEL as Motor 33 Mix can add as many as 3 octane numbers to the most responsive gasolines. Moreover, Motor 33 Mix can supply these additional octane numbers at a cost that can be as much as 50 percent less than the comparable cost of refinery processing.

At the same time, Motor 33 Mix permits many refiners to use less severe catalytic reforming--thereby increasing gasoline yields per barrel.

It also encourages greater use of natural gasoline or virgin light naphthas, and thus contributes to gasoline blends with improved road antiknock performance.

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The new product can be handled in the same tetraethyl lead mixing plants already installed at refineries, without any change in equipment.

Eventually, it is believed, Motor 33 Mix will be widely used in premium and regular gasolines, particularly those requiring higher TEL concentrations. #

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The following paragraph to be substituted for paragraph 2, page 1.

A somewhat greater and more strategic use of tetraethyl lead has been offered to refiners through an increase in the maximum concentration of tetraethyl lead in automotive gasoline from 3 to 4 milliliters per gallon, ~~promulgated, on their own responsibility, by the manufacturers and distributors of antiknock compounds containing tetraethyl lead, after consultation with the Surgeon General of the United States Public Health Service.~~

The following paragraphs to be substituted for those beginning under the heading "4th CC", on page 2, through page 3 and up to paragraph 3 on page 4.

It has been apparent for some time that an increase in the concentration of tetraethyl lead in motor gasoline above the permissible upper limit of 3 cc would give refiners greater flexibility and economy in meeting the gasoline quality requirements of the motoring public. The previous upper limit of 3 cc per gallon, established by informal agreement with the U.S. Public Health Service in 1926, had been grounded in the earlier experience of the industries concerned and based on technical and economic considerations. A change from 3 to 4 cc was now justified on similar grounds, and available evidence indicated that no threat to the public health would arise out of such a change. In accordance with precedent and policy, the advice of the Surgeon General of the Public Health Service was sought in this connection. An Ad hoc Committee was appointed by the Surgeon General to review the facts. The Committee, after a thorough study of the subject, concluded that the proposed change "would not increase the hazards involved in the manufacture and distribution of leaded gasoline." It

further stated that available data "do not indicate that such change would significantly increase the hazard to public health from air pollution."

sentance added here by rycC graph - see later

The levels of concentration of tetraethyl lead in motor gasoline 1959 in September/averaged 2.47 cc per gallon of premium and 1.84 cc per gallon of regular. Thus the maximum concentration of 3 cc per gallon has not been reached in the large proportion of the pooled gasoline of the country. (Concentrations up to 4.6 cc per gallon have been used present in aviation gasoline for years.) The/change in the maximum concentration of tetraethyl lead in motor gasoline - the maximum of 3 cc per gallon has remained unchanged for 33 years - is not expected to affect any marked alteration of the average national concentrations for some time. Rather, it is expected that there will be gradual increases in the future as in the past, as oil refiners use the higher available concentrations - primarily in premium and super premium gasolines.

Suggested change in paragraph 3, line 2, page 5.

the --- Ad hoc Committee referred to previously - recommended that the oil

In the last paragraph, line 3, page 5.

has, for more than 35 years, - sponsored - continuing