

cc: Mr. J. B. Macauley

ETHYL CORPORATION

RESEARCH LABORATORIES

1600 WEST EIGHT MILE ROAD

FERNDALE 20

DETROIT, MICHIGAN

August 16, 1948

Dr. R. A. Kehoe
College of Medicine
University of Cincinnati
Eden Avenue
Cincinnati 19, Ohio

Subject: Health Hazards of Methyl-Ethyl Lead Alkyls

Dear Bob:

Interest is being revived in the possibility of substituting mixtures of methyl and ethyl lead compounds for tetraethyllead in our motor fluid. Our desire to use such a mixture will naturally be based on a comparison of the improved performance with the increased cost. Quite aside from this, however, we will need to consider the additional hazards involved. These as I see it, comprise (a) the danger of accidents on account of instability, (b) the increased health hazard in the plant, due to the higher vapor pressure, and (c) the effect of higher vapor pressure on health hazards outside of the plant.

The danger of accidents will receive our careful consideration, and with the new methods of testing stability as well as of inhibiting decomposition, we should be able to arrive at a pretty clear picture of the situation.

The health hazard in the plant, as I see it, is almost exclusively a question of concentration of lead in the air in various places. The big question then is, what will the effect of vapor pressure be on the concentration? I am attaching a nomograph giving the vapor pressure of all five compounds involved, all the way from 0°C. to 200°C. A simple set of figures easy to remember and sufficient for rough calculations, is that the vapor pressure around room temperature for the five alkyls from tetramethyl to tetraethyl are 0.3, 1.0, 3.0, 10 and 30 mm., tetraethyllead, of course, being the least volatile, and tetramethyl the highest. This shows at once that if the amount of alkyl lead leaking into the air supply is proportional at the point of leakage to the vapor pressure, shifting from tetraethyllead to tetramethyllead would multiply this concentration by 100, a very serious situation, indeed. On the other hand, if the presence of lead alkyl were due only to the direct vaporization of a given amount of liquid, this concentration would be independent of the nature of the compound.

Regarding hazards outside of the plant, I presume that here we can state with certainty that the hazard would be proportional to the vapor pressure. I believe, however, although I am not certain, that we have in this case a much greater margin of safety than we have in the alkylation buildings.

It would assist our overall thinking a great deal if you could give us at this time your considered opinion as to the probable direction and magnitude of the effect on those two health hazards of such an increase in vapor pressure. At some later date, and depending on whether the subject remains promising, we will quite naturally have to discuss some kind of an experimental program.

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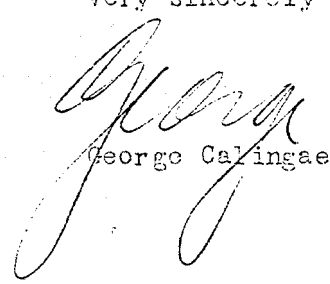
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As a good example on which to work, the particular mix which we have been considering has the following composition:

Tetramethyllead	0.4 mole %
Trimethylethyllead	4.7 " "
Dimethyldiethyllead	21.1 " "
Methyltriethyllead	42.2 " "
Tetraethyllead	31.6 " "

It is quite fair to assume that such a mixture is ideal, i.e., that the vapor pressures are proportional to the vapor pressures of the pure components and the mole fractions. On that basis, I estimate this particular mix to be about five times as volatile as tetraethyllead.

Very sincerely yours,


George Calingaert

C:C