

February 1, 1933

Dr. Graham Edgar  
Ethyl Gasoline Corporation  
Chrysler Building  
New York City  
New York

Dear Doctor Edgar:

Pursuant to our conversation of last Thursday, in Detroit, I am outlining the various points which seem important from the point of view of safety, in relation to the proposed use of tetraethyl lead in lubricating oils. I have previously indicated to you my interest in certain physical and toxicological properties of the mixture of oil and tetraethyl lead, which must be subjected to experimental examination, namely - (1) the rate of vaporization of tetraethyl lead from oil at various temperatures; and, (2) the extent of the skin absorption of tetraethyl lead when diluted with lubricating oil; (3) the rate of decomposition of tetraethyl lead when mixtures of oil and tetraethyl lead are subjected to use in motors. I have also raised the question of the ultimate disposition of such oil as may be discarded after use.

Regardless of the answers to these questions certain hygienic problems arise in connection with the preliminary experimental work which Wakefield proposes to undertake, and also in the future preparation of a product for market. Any method of handling or using tetraethyl lead must be influenced by a knowledge of its physiological behavior, and for this reason I am attaching to this letter two reprints which give the available facts as to the behavior of this compound. Particular attention should be called to three facts, - (1) that the vapor pressure of tetraethyl lead, at ordinary temperatures is such, that air saturated at such temperatures contains approximately 5 milligrams of lead per liter; a concentration of tetraethyl lead which causes the death of rabbits after two hours of continuous exposure; (2) that tetraethyl lead is absorbed directly through the unbroken skin; (3) that when tetraethyl lead is absorbed into the body at a rate which will not produce immediate illness, it tends to accumulate in the tissues and to produce chronic lead poisoning after the manner of other lead compounds. Safety, in any instance, then, depends upon the avoidance of inhalation of the vapors, and the prevention

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and the handling of the material.

Precautions in Preliminary Experimental Work.

Presumably undiluted tetraethyl lead will be supplied in limited amounts in small containers, for admixture with oil, and for experimental tests in the hands of technically trained personnel. The lead as supplied should be delivered in unbroken packages to persons who should be made responsible for its disposition in such a way that none of it gets into the hands of unauthorized persons. All handling of the material should be limited to selected, instructed persons whose technical training has fitted them to deal with poisonous materials. As a safeguard against real or imagined illness, such persons should have a physical examination prior to entering upon this work, and should be under medical supervision.

Tetraethyl lead may be handled with complete safety in a properly constructed and ventilated hood, if precautions against skin contact are observed. Simple measuring devices, such as glass graduates are more suitable for a laboratory scale of procedures, than are more complicated devices which are difficult to clean and repair. Due care should be exercised against bringing about the exposure of diners, wash boys, janitors etc. in permitting them to handle contaminated glassware, apparatus, to clean up spilled material etc. All laboratory operations should be devised with the maximal degree of simplicity and cleanliness, and all open or contaminated containers or apparatus should be kept in a hood, until they have been cleaned or otherwise disposed of.

Except as experiments may prove to the contrary, mixtures of tetraethyl lead and oil should be handled as though they consist of pure tetraethyl lead. Exposure to vapors, and contact of the skin should be avoided. In the event of accidental skin contact with either tetraethyl lead or mixtures of the latter in oil, the skin should be thoroughly cleansed with a suitable solvent. Kerosene is satisfactory for this purpose.

Precautions in the Shipment of Tetraethyl Lead.

Amounts of tetraethyl lead of any quantity must be transported in such a way that the safety of carriers and handlers is reasonably assured. Spillage in transit is fraught with significant difficulties. Therefore, packages must be prepared with due regard for strength, avoidance of leakage, ease of disposition in event of fire, accident or other emergency. Further, the size and character of the package, as well as the state of the contents, (i.e. whether in pure form, or mixed with other ingredients) must be determined by the means available for handling the material at the point of delivery. It may be that the means eventually devised for mixing lead

with oil will include suitable provisions for the handling of pure tetraethyl lead without the possibility of exposure to vapors. Or it may be advisable to incorporate tetraethyl lead in some medium which will obviate danger from its vaporization. In any event, these matters should be determined in relation to the question of maximal safety.

Precautions in Blending Tetraethyl Lead with Oil.

Safety measures in relation to the methods which may ultimately be chosen for blending tetraethyl lead and lubricating oil, cannot be laid down in any detail. In principle, such measures must provide for the limitations of the potential hazards to the smallest possible number of persons, and for the avoidance of actual danger through the use of simple and easily operated equipment. The persons who carry out this work should be selected on the basis of physical fitness, reliability and willingness to carry out the details of instructions. They should be under medical supervision, and they should be instructed in the avoidance of exposure. They should not have other opportunities for exposure to lead so long as they are employed in this work. In general the operation of blending equipment should be guided by the precautions which have proven their effectiveness in the mixing of Ethyl Gasoline. To this end, the general rules and regulations which apply to the latter work may be employed as an example of what should be provided.

Very truly yours,

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