cc: Dr. R. A. Kehoe
Mr. O. B. Lewis

Mr. C. E. Colvin — New York

Dr. H. A. Beatty — Detroit

Evaporation of Leaded Gasoline — September 30, 1946

Many thanks for your constructive remarks on our LTD 46-47. The possibility of retention of TEL by sludge and scale (even after flushing with gasoline) is certainly something to be kept in mind; we know from experience that it is very difficult to leach out all the TEL from such solids, although we have no full-scale test data.

Harold A. Beatty

B:C

KE 0005936

N 7437

Dr. R. A. Kehoe
Mr. O. B. Lewis

Dr. G. Calingaert — Detroit

Mr. C. E. Colvin — New York

LTD 46-47 - Air Evaporation of a Binary Solution of TEL and a Volatile Diluent — September 19, 1946

Even though this report is outside my immediate field I was interested in reviewing it for the reason that even after eight years I have not entirely lost my curiosity as to the whys and wherefores of tank cleaning hazards. If you can bear with gratuitous comments from the sideline, I feel inclined to make one or two just on the off-chance that some part of it may be relevant.

This report, buttressing LTD 44-57, it seems to me is sufficient to do two things. First, spot-light to us a highly hazardous category of tanks and, secondly, furnish the technical backing for an extremely convincing story to our customers on where and what the hazards are and the need for adequate precautions.

The highly hazardous category can be described as large, terminal storage tankage. There is a great deal of such tankage throughout the world. From what accident records I have seen I believe almost all our difficulty has been in this category. In retrospect it is rather easy to see why. In the first place, large tanks require men inside for cleaning and for sizeable exposure periods. Then, terminal storage is such that there are idle periods between filling and emptying seasons. Also, terminals are generally short on facilities. These two factors set the stage for a line-of-least-resistance cleaning method, i.e. open up the tank top and bottom, let them sit until dry, when "safe" put the crew in to clean.

Your work shows that tanks so subjected to evaporation are never "safe". While the gasoline may evaporate to a point where there is no health or fire hazard from the gasoline itself, the tetraethyl lead remains behind on evaporation. It is easily calculated that 30 pounds of TEL will remain behind when 98% of the gasoline evaporates in an 80-foot tank for each inch of residual gasoline evaporating. (When this is so in all leaded fuel tanks, the question of "spiking" in a few becomes entirely irrelevant).

Anyone can appreciate the health hazard when organic lead in such quantity is stirred up during a cleaning process. Your work demonstrates that this kind of quantity is actually the case. Our Safety people can make a story of this which cannot help but impress those responsible for such tank cleaning work.

KE 0005037

N 7437.01

All this is recited merely for background since I believe everyone is at least aware of the implications. The next question that occurs to one is what parallel situation exists when the gasoline is steamed out rather than evaporated naturally. If you have not already experimented on this question of steaming or plan to do so, I believe it would be worth considering because the results might specify the relative hazard in another large category of tankage, those in the refineries. If steaming takes the lead out with the gasoline, perhaps the hazard is far less than in the terminals. If it does not (sufficiently), then the hazard may be comparably as great.

This experimentation may be a bit involved because of size effect. For example, I can visualize a large (80') tank acting as a reflux condenser. Even though the TEL may be vaporized with the gasoline, sizeable quantities may condense on the walls and reflux back into the bottoms.

Answering another question on steaming may be of value. What happens when a tank which has evaporated to relative dryness is steamed? Would the steam take out the 30 pounds of TEL in the bottom sludge? I personally cannot conceive of it doing so beyond an inadequate partial extent. Furthermore, if only partially, might not this be worse than none in that the effect is simply to increase the lead concentration of the atmosphere in the tank? It may well be that in view of these possibilities we would want to discourage steaming under at least some circumstances.

I have wondered on occasion concerning another possible factor, but with no basis at all to judge the possibilities or probabilities, or even the significance. Do any of the materials which are cleaned from tanks, sludge of various types or sidewall scale, have a property of selective absorption for TEL? In other words, will sludge and/or scale hold onto significant quantities of organic lead even though the tank is emptied of gasoline entirely by drainage and flushing? In the latter case, of course, the 30 pounds mentioned above would drain out with the gasoline, thus greatly reducing the lead hazard. But if over the period of leaded fuel storage, the sludge and/or scale enriched itself with organic lead by selectively absorbing, the hazard still remains -- and might even be greater than supposed on the basis of the evaporation effect alone.

Please do not interpret that I personally want an answer to all these questions. I merely pose them as occurring to me in event some part may be useful to those of you who are directly concerned with the complicated problem of tank cleaning safety.

C. E. Colvin

2:4

KE 0005038