

Industry Overview

by Walter Fagley*

This conference has been a real education for me. I have been greatly impressed with the hard work of the many people at EPA and NIEHS that have struggled to make this such a successful conference.

The conference got off to a good start with an opening address by Dr. Finklea. He hammered home the sulfur problem with a few statistics: in 1940 there were 21 million tons of sulfur oxide in the U.S. atmosphere and this climbed to 34 million tons in 1970. Another item that made me sit up and take notice was that mortality studies compared with sulfate levels indicate that at $25 \mu\text{g}/\text{m}^3$ and above, there is a significant increase in mortality rate over that observed at lower values. More work must be done to define permissible levels, but this starts to give an idea of a level not to be exceeded.

After the opening address we launched into the first session—putting the problem in perspective. Some serious questions were raised and types of emission controls were discussed. A question that startled me for a moment was a two-part question: where is the auto industry going, and will there be an auto industry in 30 years? Now I don't expect to be in it 30 years from now, but I certainly hope it is there. These questions quickly put the problem into perspective for me.

The balance of the morning was spent detailing the sulfate problem. Automotive

sulfate studies of Ford, General Motors, Chrysler, and Esso were compared with those at EPA at Ann Arbor and an EPA study made at Dow. The data showed some similarities but also there were problem areas. There appears to be no official generally accepted measuring technique for sulfates. It would be nice to be able to say that all the techniques are good, and everyone's data are valid, but unfortunately different techniques give different answers.

The effects of oxidation catalysts in motor vehicles on levels of sulfate were next estimated. Some very fine work by the meteorology group, who used carbon monoxide and lead surrogate, led to the conclusion that at some time during the second year of equipping cars with catalysts the adverse effects level would be reached by the added mobile source sulfate emissions.

The last paper of the morning session showed that sulfate and not SO_2 caused adverse effects on asthmatics and that the situation was worse at temperatures above 50°F . Studies in guinea pigs, rats, and monkeys were conducted to determine synergism, if present, with humidity, fly ash, sodium chloride, sulfur dioxide gas, and sulfur dioxide particulate in sulfates. The combination of sulfur dioxide, sodium chloride, and 80% humidity showed an increased resistance to flow during breathing. The sulfuric acid mist and fly ash produced the same effect at levels of 0.99 and $0.5 \mu\text{g}/\text{m}^3$, respectively.

Noble metal toxicological overview started our afternoon session. Here again we find a

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need for more data. It is already known that water-soluble platinum salts are involved in platinosis, but we do not have complete data on the nature of noble metal as it impregnates the alumina. It is thought to be either as a noble metal or its oxide which is insoluble.

Session III brought out some interesting problems. A clever automatic technique for measuring sulfates in CVS diluted auto exhausts developed at EPA was described. Next, a method for measuring sulfur dioxide was presented. It was also automated and gives very accurate results. Conversion of SO_2 to sulfate in the LA basin was described. The worst case condition was analyzed by use of some very comprehensive model equations. An important item was the higher rate of conversion of SO_2 to sulfate than the generally accepted 2%/hr.

Kipp showed a very good technique for measuring sulfuric acid in auto exhausts. Great pains were taken to ensure proper sample handling. We can all profit from his explanation of proper method for sulfate analysis.

My colleague Max Teague further stirred up the pot. One item was methadate as a technique for analyzing exhausts. Another, a pebble catalyst and monolith catalyst, showed about equal sulfate emissions when you take into consideration the storage in the catalyst itself. Lead is not the catalyst poison most people have given it credit for, instead it is ethylene dibromide, according to Teague's studies. He has 300 hr at 1.5 g/gal of lead and compared that with 300 hr of 1975 lead-free fuel. They were equivalent, as far as poisoning the catalyst.

Another thing that came out was that hydrogen sulfide is present in exhausts from catalyst cars during cold start with the choke on. Phosphine (PH_3) is present in exhausts at high catalyst temperatures. Neither the hydrogen sulfide nor the phosphine is present in toxic quantities according to our preliminary studies, but these compounds do have a serious nuisance value.

Dr. Bradow next described the EPA-ORD measurement studies which is a new measurement technique. It is hoped that a meaningful program will resolve the analytical discrepancies that currently plague the emission data on sulfates.

The fourth session described particulate emission measurements, trace metal studies, and a process for desulfurization of fuel. The technique described for desulfurization of fuel was quite interesting and made the job sound simple. All that is required is time and money. I appreciated that the total cost of sulfur reduction was given instead of the cost on a per gallon basis. I hate to see these costs per gallon emphasized because it tends to minimize the true costs of the economy.

Now that we have hit the highlights of the conference, let's see where we go from there. First, the sulfate problem is already serious and is likely to be aggravated by the rules and regulations we must comply with in the immediate future. A multi-pronged attack should be avidly followed, including reduction of the fuel sulfur in the problem areas. A possible method would be to ship in fuels that are naturally low-sulfured to be mixed with those that form high-sulfur areas. Another possibility would be to explore for the low-sulfur crudes and blend them with the local crudes as you manufacture the gasoline. This might make it a lower sulfur crude. It should be emphasized that Government regulations should not go in for an overkill in the sulfur problem. It is axiomatic that a cost effective general reduction can be initially achieved when properly administered. One is tempted to say let's not put on catalysts to achieve the 1975 interim standards. It's a little late to start that kind of an approach although it could probably be done. If we had another year I believe that we could meet the interim standards without catalysts, but with the certification procedure and development work required it could not be done in time for 1975. It is not too late to stay with 1974 standards but this also would create problems and expenses.

At Chrysler we are currently in production with our suppliers building a large number of catalytic converters for use on 1975 production vehicles. This program required our suppliers to make brand new facilities to

make monolithic substrate and a new plant to impregnate the catalyst on the substrate. The toxicity of platinum and palladium must be further evaluated and the amounts and nature of the pollutants must be determined.