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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
AIR AND RADIATION

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Meeting with Ethyl Corporation
October 12, 1990
U.S. EPA Motor Vehicle Emission Laboratory

Attendees

EPA

Dick Lawrence, Office of Mobile Sources; Engineering Operations Division (EOD)
J. Bruce Kolowich, EOD
Jim Carpenter, EOD
Sue Cook, EOD
Paul Reece, EOD
Dave Garter, EOD
Dwight Atkinson, Office of Policy, Planning and Evaluation

Ethyl

D. P. Hollrah, St. Louis
I. L. Smith, Baton Rouge
F. J. Marsee, ECS, Novi
D. L. Lenane, (Livonia), St. Louis
D. G. Oberding, Baton Rouge
D. L. Bugg, Baton Rouge

Before the meeting began, Dave Garter passed out the data he had compiled. Ethyl stated that the data was basically the same as that given to them by Mary Smith when they met with her last Tuesday, October 2nd. Prior to receiving the data from M. Smith they had received a copy from Ethyl's office in Washington.

At 1:05 pm, Dick Lawrence officially began the meeting. He first discussed the agenda, what Ethyl would like to see at the lab, and what questions they had about EPA's data and/or procedures. Jim Carpenter informed the group that Sue Cook was taking notes at FOSD's request and that the notes would be sent to FOSD for the docket.

Ethyl stated that the range of manganese in EPA's test results was what they had expected. EPA's particulate results, however, were ten times that found by Ethyl, and their main interest was in finding out why this difference occurred. They wanted to determine if the difference was in the procedure or the equipment. Ethyl also indicated that they obtained the same particulate results as EPA when they tested a clear car. But, when they add MMT, they only see 1% of what EPA's data shows (of the total particulate). The main concerns they wanted to address were: How EPA runs particulate tests, what are the test site differences, what is EPA's filter analysis procedure, and what is EPA's filter weighing calculation.

It was agreed to first tour the Chem Lab and test site, and then return to discuss calculation differences and other questions which might arise during the tour.

One Ethyl representative stated, several times, that if the weight on the filter number being fed into the calculations is ten times greater than that on a clear car, it made sense that the numbers would be ten times higher. Therefore, it would not be as important to review the calculations as to look at filter weights and test procedures.

Ethyl indicated that their main concerns, if adding MMT caused the total particulates to increase by a factor of 10, were:

(1) What is it?
(2) Why can't Ethyl do it? What are they missing, and why?

Dick Lawrence asked how many particulate tests Ethyl had run.

Ethyl indicated they had run around 20 to 25 3-bag tests where each bag filling ran through a separate filter. Ethyl tested the 6 Ethyl cars which EPA tested, plus 2 additional vehicles. All Federal Test Procedure (FTP) tests at Ethyl's contractor lab, ECS, were run according to the FTP, except without heat builds. Ethyl felt the addition of MMT should have no effect on evaporative emissions. Ethyl also felt EPA's single filter over the 3-bag test should not be the cause of the difference.

Ethyl said they had tested at both a 0.8 and a 1.8 flow rate on a 3-bag test this past week, and seemed to find no difference. They stated they would provide this data. They are specifically trying to find the reason for the difference between clear and MMT fuel particulate emissions at EPA and Ethyl.

Ethyl also asked if EPA still had the Dynasty and Sunbird vehicles. Bruce Kolowich indicated the Sunbird, as well as the Canadian cars, were gone. EPA still had the Dynasty on lease and could keep it another week if necessary.

At this point, the group adjourned to the Chem Lab. Dr. Bruce Kolowich, Chem Lab Manager, showed the various pieces of equipment, primarily discussing the Perkin-Elmer Atomic Absorption Spectrometer.

Dr. Kolowich explained how the manganese standards were made. He said they were made with $Mn(NO_3)_2$ (purity N6M), with $KMnO_4$ (primary standard) as a Quality Control check. The primary manganese standards consistently agreed with the $KMnO_4$ check sample, but Mn_3O_4 were not as precise. Sixty gallons of fuel were mixed at a time for testing, with fuel samples run through the x-ray spectroscopy unit before testing to verify the manganese concentration. All exhaust Mn analysis was done in 10% HCl on the Perkin-Elmer, and no inconsistencies were seen on blanks, standards, or spikes.

After a discussion on background particulate, Dr. Kolowich explained that the EPA data indicates particulate in solution concentration of less than 1 in 20,000, so particulate diffraction is not a concern. He added that all solutions are filtered before being run. Ethyl suggested running the samples several nanometers from the current setting, but it was decided this wasn't critical.

In the large soak Dr. Kolowich showed Ethyl the fuel cart used to control the fuel temperature. At the diesel test site Paul Reece explained how the EPA particulate tests were run. Dick Lawrence and Paul Reece showed Ethyl the dilution tunnel, particulate sample probe location, sample lines, heated FID, and the hookup from the tunnel to the car.

The following differences were noted between Ethyl's and EPA's test equipment and procedures:

(1) EPA's exhaust connector is insulated; Ethyl's is not.

(2) EPA's tunnel is 10" in diameter; Ethyl's is 18" in diameter.

(3) EPA's tunnel is at ground level; Ethyl's is 6' off the ground.

(4) EPA runs heat builds prior to the emission test; Ethyl does not.

After viewing the analysis area, the group went to the filter weighing room. In this area, Dave Garter explained that EPA uses 47mm filters, one double filter for each 3-bag test.

Ethyl indicated they thought their filter handling and weighing procedures were similar to EPA's.

In response to an Ethyl question about the appearance of test filters from cars with and without MMT, Dick Lawrence explained that the MMT cars showed up darker on the filter, indicating a higher level of particulate was present.

At the conference room, Dave Garter produced a packet of test data from test vehicle number 0020, an Ethyl MMT car, for Ethyl to review.

Ethyl mentioned that they had just started a program with a Dynasty. So far, in the clear car, whether they used one filter or three made no difference in the results. When they switched to MMT, Ethyl only saw a small change in the total particulate, not ten times greater as at EPA.

Ethyl felt the increase in horizontal velocity caused by EPA's smaller diameter tunnel should not be a big difference. They said they would have to look at the data again.

Dwight Atkinson asked Ethyl why their MMT car tests would show such a difference from EPA's while the clear cars did not show a similar difference. Mr. Atkinson suggested isokinetic sampling might be one way to find out.

Ethyl responded they would not expect higher particulate results using isokinetic sampling. The particles don't change direction to enter the sample probe, and isokinetic sampling is not needed for airborne particulates. Ethyl should be testing with isokinetic soon anyway, but they expect to see no significant difference. They may also try lowering their tunnel to ground level to see if that makes a difference. Ethyl felt the tunnel diameter and distance from the floor were the major physical differences.

Ethyl indicated that all the tunnel testing they have done in the last ten years has been diesel, not gasoline. They may try gasoline testing. Ethyl said they felt EPA might be closer to total particulates and Ethyl closer to airborne particulates.

In reviewing the data provided by Dave Garter at the start of the meeting, Ethyl pointed out that, on car 0018 (an Ethyl MMT vehicle), EPA's New York City Cycle (NYCC) numbers showed a marked difference. Ethyl thought they might try running this cycle, as they had not used it in the past, to see if it might give them more particulate. The NYCC is run for 1.2 miles in 600 seconds (ten minutes). Dave Garter explained the test data and how the filter weight might be determined. He showed Ethyl his log of particulate filter test data sheets.

Ethyl raised a question about the accuracy of the scales.

Dave Garter explained that they were balanced to +/- 1 microgram before weighing samples. The elapsed time between sampling and weighing of the filters at EPA and Ethyl appeared approximately the same.

Ethyl was also interested in the tunnel temperature during the MMT test. Dave Garter showed Ethyl the EPA test traces, which indicated the test on vehicle 0020 (an Ethyl MMT vehicle) on Site 7 peaked near 50°C and the CVS flow rate was approximately 350 CFM. He also indicated that recent GM diesel tests on the same site had showed good correlation with GM.

The main questions Ethyl had about the test were the weight of the sample and the temperature of the test tunnel. Ethyl felt the weight couldn't be the cause of the difference. They had no problem with the calculations used. Both EPA and Ethyl are using the same filters (Pallflex T 60A20) and relative weighing times. Ethyl speculated that the problem was most likely in the tunnel itself, either in the height off the ground or the diameter.

Ethyl's preliminary conclusion, therefore, was that the difference might have arisen from the following differences in the tunnels:

(1) Ethyl's dilution tunnel is 6' off the ground; EPA's is on the ground. Perhaps EPA's ground-level tunnel is picking up something that isn't making it up to Ethyl's higher tunnel.

(2) Ethyl's tunnel is 18" in diameter; EPA's is 10". Since the same flow rate setting of approximately 350 CFM is used, the smaller tunnel will move the particulate matter through faster than the larger tunnel.

After a short discussion of when the Ethyl cars would be returned, the meeting adjourned at 2:34 pm.