Final Action

Sampling systems (and procedures) will be required to be designed such that testing of a vehicle or engine that emitted the maximum allowable level of methanol (e.g., 0.95 g/mi methanol, or 14 g/FTP, for a 0.41 g/mi THCE [3] standard), or emitted formaldehyde at a level that was twenty percent of the maximum emission level of the lowest applicable THCE or NMHCE (e.g., 0.082 g/mi formaldehyde, or 1.2 g/FTP, for a 0.41 THCE standard) during the first phase of the test would result in analyte concentrations that were at least 25 times higher than the levels of detection for the instruments used. As proposed, systems that do not meet this requirement due to high limits of detection will be allowed, provided that the resultant methanol concentration is greater than 25 mg/l, and the resultant formaldehyde concentration is greater than 2.5 mg/l. For any vehicles or engines that have an applicable formaldehyde standard, the analyte concentrations used for design would be those that would result from the maximum emission level allowed by that standard. The Agency is also requiring that the amount of methanol collected in the secondary impinger not be more than ten percent of the total amount collected.

Also, the Agency will allow other types of flow meters to be used, provided that they meet the accuracy specifications of §§ 86.120–90 or 86.1320–90. The specifications of these sections require accuracy of ±1 percent of the maximum operating range and ±2 percent of the reading.

3. Proportional Sampling

Proposal

Prior to this action, there were only two methods allowed by the regulations for obtaining proportional samples when testing light-duty vehicles: the Positive Displacement Pump-Constant Volume Sampler (PDP–CVS) method and the Critical Flow Venturi-Constant Volume Sampler (CFV–CVS) method. However, EPA proposed a third option for methanol-fueled vehicles. This method is based on the current CFV–CVS system, but allows proportional sampling of methanol and formaldehyde to be maintained by electronically monitoring the CVS flow rate and electronically controlling the sample flows. Similar approaches have been used for some years in heavy-duty diesel testing and in light-duty research testing. When using this approach, the ratio of sample flow to CVS flow was to be required to remain within ±5 percent of the set-point ratio.

Public Comments

AAMA supported the Agency's proposals, and added that flow controllers should vary the sample flow rate inversely with the square root of the bulk stream temperature. EPA agrees, and has added such language to the regulations.

Final Action

EPA is finalizing this revision as proposed. The Agency is not requiring that these electronically-controlled sampling systems also include separate flow meters to measure total sample volumes, but will allow them. It should be emphasized that even though this option is only being specified for methanol and formaldehyde sampling systems, the Agency would consider allowing similar approaches for other samples as equivalent procedures. (For example, paragraph (a)(5) of § 86.109–94 specifically allows the use of sampling procedures other than those specified in that section, provided that they can be shown to ''yield equivalent or superior results''.)

4. Prevention of Condensation

Proposal

Exhaust from methanol-fueled vehicles generally has much higher water vapor content than conventional vehicles, which can lead to water condensation under certain testing conditions, when the gas comes into contact with surfaces at temperatures below its dew point. Such condensation can create very significant problems with respect to testing accuracy, since both methanol and formaldehyde are soluble in water. However, if the gas comes into contact with very hot surfaces, the methanol can undergo decomposition reactions. For these reasons, in the previous rulemaking, EPA required that sample lines and transfer systems be heated to 235±15 °F (as measured at the surface in contact with the raw and diluted exhaust gases). Some manufacturers, however, have indicated a concern that this temperature requirement may be too high for their systems. The Agency proposed to change its regulatory focus from specifying the temperature requirement, toward allowing manufacturers to determine the most appropriate temperatures for their own individual systems. The requirements to heat many of the components remained, but EPA proposed changing the lower limit to the maximum dew point of the exhaust mixture. Comments were requested on whether it will be necessary to measure dew point continuously for each test.

It had also been suggested that heavy-duty engine manufacturers should be allowed to use ducts up to 32 feet in length to transfer the exhaust from the engine to the dilution tunnel. Testing by Southwest Research Institute (SwRI) showed no significant difference between the emission results from test systems using ducts 13 and 32 feet in length.[4] Therefore, the Agency proposed to allow transfer ducts up to 32 feet in length (as is currently allowed for petroleum-fueled engines). However, since the SwRI testing did not provide data for systems in which the duct temperature exceeded 315 °C, this allowance required that the maximum duct temperature not exceed 315 °C.

EPA also proposed allowing heating and dehumidifying the dilution air, with some restrictions. The proposed restrictions limited the maximum temperature and affect how the dilution air flow rate is calculated.

Public Comments

The comments received regarding the prevention of condensation were generally supportive of the Agency's proposals. AAMA stated that, based on their testing experience, measurement of the dew point is not necessary, provided that dilution systems are designed properly. EPA agrees that continuous measurement of the dew point is not necessary, and thus will also allow the absence of condensation to be demonstrated through engineering analyses.

Detroit Diesel Corporation (DDC) supported EPA's proposal to allow longer unheated exhaust transfer ducts for heavy-duty engines, but requested that the Agency raise the maximum temperature from 315 °C (as proposed) to 350 °C. Further, they indicated that they believed that a limit on the average temperature of the duct would be more appropriate than a limit on the maximum temperature.

EPA recognizes that the 315 °C limit was based on testing of only one engine, and that other larger engines could easily result in higher temperatures of the duct. However, the Agency does not consider it to be unreasonable to expect manufacturers to make the slight modifications to the duct that would be necessary to prevent the maximum duct temperature from exceeding 315 °C. Simple modifications such as the

[3] THCE and NMHCE are replacing OMHCE and OMNMHCE; see discussion in ''15. Other Issues.''

[4] ''Effect of Exhaust Pipe Length on Emissions From a Heavy-Duty Methanol Engine,'' SwRI–4962, May 1992, Docket Item A–92–02–II–D–7.