

## INFORMATIVE DIGEST OF PROPOSED ACTION

### **Amendments to the Designations of the Test Methods Used for Determining the Properties of California Commercial and Certification Diesel Fuels**

Sections Affected: Amendments to California Code of Regulations, title 13, sections 1956.8(b), 1960.1(k), 2281(c), and 2282(b), (c), and (g). Also amendments to the “California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles” and “California Exhaust Emission Standards and Test Procedures for 1988 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles,” as incorporated by reference in sections 1956.8(b) and 1960.1(k), respectively.

#### **Background**

Preexisting Air Resources Board (ARB or Board) regulations establish standards for the sulfur and aromatic hydrocarbon content of diesel fuel distributed commercially for use in motor vehicles in California. The maximum sulfur content limit is 500 parts per million (ppm). The maximum aromatic hydrocarbon content limit is 10 volume percent for diesel fuel produced by large refiners and 20 volume percent for qualifying diesel fuel produced by small refiners.

The regulation on aromatic hydrocarbon content allows refiners to comply by selling a certified alternative diesel fuel formulation that has an aromatic hydrocarbon content greater than the basic aromatic hydrocarbon limit. An alternative formulation will be certified if it is found in an engine test program to result in emissions equivalent to the emissions resulting from diesel fuel meeting the 10 percent aromatic hydrocarbon limit (20 percent in the case of qualifying small refiners). A batch of diesel fuel identified by the producer or importer as a certified diesel fuel formulation will comply with the regulation as long as the diesel fuel meets certain specifications of the “candidate” fuel that was compared to the 10 (or 20) percent aromatic hydrocarbon content “reference” fuel in the engine test program. The required specifications for a certified diesel fuel formulation include maximum total aromatic hydrocarbon, polynuclear aromatic hydrocarbon, nitrogen and sulfur contents. Most of the batches of motor vehicle diesel fuel now being sold in California are identified by the producer or importer as meeting one of various certified alternative diesel fuel formulations. Producers and importers of California motor vehicle diesel fuel are required to sample and test each final blend for aromatic hydrocarbon content, using the specified test method.

#### **Current Amendments**

In this rulemaking the Board has amended the designations of the test methods used to determine whether commercial diesel fuel meets the required specifications for maximum sulfur content, total aromatic hydrocarbon content, and, if applicable, polynuclear aromatic hydrocarbon and nitrogen contents. The newly designated test methods will also be used to determine the pertinent properties of the candidate fuel and the reference fuel used in the engine test program that is conducted for certification of an alternative diesel fuel formulation. In addition, the amendments

identify the newly designated test methods as the method to be used in determining the pertinent properties of the 10 percent aromatic hydrocarbon diesel “certification” fuel in the test procedures for determining whether new motor vehicles and engines qualify to be certified as meeting the ARB’s motor vehicle emission standards. The amendments to the test methods are as follows:

<u>Regulated Component</u>	<u>Previously Identified Method</u>	<u>New Method</u>
Total Aromatic Hydrocarbons	ASTM D1319-84	ASTM D5186-96
Polynuclear Aromatic Hydrocarbons	ASTM D2425-83	ASTM D5186-96
Nitrogen	ASTM D4629-86	ASTM D4629-96
Sulfur	ASTM D2622-82	ASTM D2622-94
Distillation	ASTM D86-82	ASTM D86-96

These new test method designations are based on recommendations from ARB staff after several years of cooperative effort with members of the regulated industry and the Western States Petroleum Association (WSPA), through the WSPA/ARB Test Methods Work Group, and Subcommittee D2 of the American Society of Testing and Materials (ASTM). Staff also evaluated the test methods designated by the U.S. Environmental Agency (U.S. EPA).

**Total aromatic hydrocarbons.** The new method is a supercritical fluid chromatography (SFC) procedure, while the previous method is a fluorescent indicator adsorption (FIA) procedure. ASTM D1319-84 was the only method available for measuring total aromatic hydrocarbons when the limits were originally adopted in 1988. Both industry and ARB staff agree that ASTM D5186-96 is a preferable method. It is more reproducible than ASTM D1319-84, the relative reproducibility is 13 percent vs. 69 percent at the 10 volume percent level. Although the instrument used by the new method is more expensive than the FIA instrumentation, it is not as labor intensive and has a short analysis time. The new method also avoids analysis interferences that occur with dark colored samples under the previous method.

**Polynuclear aromatic hydrocarbons.** The previous method is a mass spectrometry procedure. The new method is the same SFC procedure that has been designated for total aromatic hydrocarbons. It will thus eliminate the need for separate expensive instrumentation for a separate procedure. Unlike the previous method, the new method does not use any sample preparation prior to the analysis, thus reducing possible errors. The new method is also simpler and faster.

**Nitrogen.** The new method is the latest revision of the previously designated method. It contains editorial changes which improve the organization of the list of reagents used in the procedure, and has a new keyword section. Both methods have the same precision.

**Sulfur.** In this case as well, the new method is the latest revision of the previously designated method. They are identical in terms of instrumentation. However, the new method contains improvements in some of the parts used in the instrument and it recommends matrix matching between samples and standards.

**Distillation procedure for petroleum products.** Again, the new method is an update of the preexisting method. The new method contains editorial clarifications making it easier to perform, and it adds a centering device for the temperature sensor used in the automated procedure. These two methods have equivalent precision and accuracy.

### **Comparable Federal Requirements**

The U.S. EPA administers a regulation requiring that on-road motor vehicle diesel fuel have a sulfur content not exceeding 500 ppm, and must either meet a maximum total aromatic hydrocarbon limit of 35 volume percent or have a cetane index of at least 40 (40 CFR section 80.29). The test procedures designated in the federal regulations for determining compliance are ASTM D2622-87 for sulfur and ASTM D1319-88 for total aromatic hydrocarbon contents (40 CFR section 80.30). The federal regulations do not require refiners and distributors of diesel fuel to sample and test the fuel for sulfur and aromatic hydrocarbon content. Given the advantages of the methods adopted in this rulemaking, it is expected that refiners and distributors verifying compliance with the federal requirements will be willing to rely on the results using the new California methods.

The ARB's motor vehicle and engine exhaust emission test procedures allow manufacturers the option of using either of two certification diesel fuels -- the low-sulfur certification fuel specified in the federal test procedures, or a low-sulfur and low-aromatics certification fuel meeting specifications set by the ARB. While the Board has specified the new test methods for determining the pertinent characteristics of the low-aromatics certification fuel, the methods are not specified for determining the characteristics of the federal low-sulfur certification fuel. This will assure that the same batch of certification diesel fuel could be used for determining compliance of vehicles and engines with both the federal and California exhaust emission standards.