

North American Ultra Low Sulfur Diesel Fuel Properties

Engine manufacturers support the introduction and use of ultra low sulfur diesel (“ULSD”) fuels (i.e., fuel \leq 15 ppm sulfur) having uniform properties. Specifically, the Engine Manufacturers Association recommends that, at a minimum, all ULSD fuel distributed in North America meet the requirements of ASTM D 975, as well as the following additional performance requirements:

(i) Cetane. Using ASTM D 613, ULSD fuel should have a minimum cetane number of 43. Although ASTM D975 currently requires a minimum cetane number of 40, EMA has asked ASTM to revise the standard to require a minimum cetane number of 43. EMA and its members believe such an increase will improve the sociability aspects of diesel fuel performance, such as white smoke, engine starting and engine combustion noise.

(ii) Lubricity. Regardless of the fuel sulfur level, ASTM D975 currently requires lubricity specified as a maximum wear scar diameter of 520 micrometers using the HFRR test method (ASTM D6079) at a temperature of 60°C. Based on testing conducted on ULSD fuels, however, fuel injection equipment manufacturers have required that ULSD fuels have a maximum wear scar diameter of 460 micrometers. EMA recommends that the lubricity specification be consistent with the fuel injection equipment manufacturers’ recommendation.

(iii) Thermal Stability. ASTM D975 does not include a specification for thermal stability; however, the standard does include thermal stability guidelines for normal and severe use. For severe use, the guideline indicates that fuel should have a minimum of 80% reflectance after aging for 180 minutes at a temperature of 150°C when tested per ASTM D6468. EMA recommends that this severe use guideline for thermal stability apply to all diesel fuels. The requirement is particularly important with respect to ULSD fuels, however, inasmuch as the natural thermal stability of diesel fuel is expected to decrease as sulfur is removed during the refining process used to produce these fuels.

(iv) Oxidation Stability. ASTM D975 does not include a specification for oxidation stability. EMA recommends that all diesel fuel, regardless of sulfur level, provide a maximum of 10 g/m³ sediment level when tested per ASTM D2274. It is particularly important that ULSD fuels meet the requirement inasmuch as the natural anti-oxidation properties of diesel fuel are expected to decrease as sulfur is removed during the refining process.

Finally, in considering ULSD fuel properties, it also is important to recognize the need to maintain the cleanliness of ULSD fuel from the time it leaves the refinery until it is delivered to the vehicle. Use of a filter smaller than five (5) microns at the point where the fuel is dispensed into the vehicle helps to assure the needed cleanliness.

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