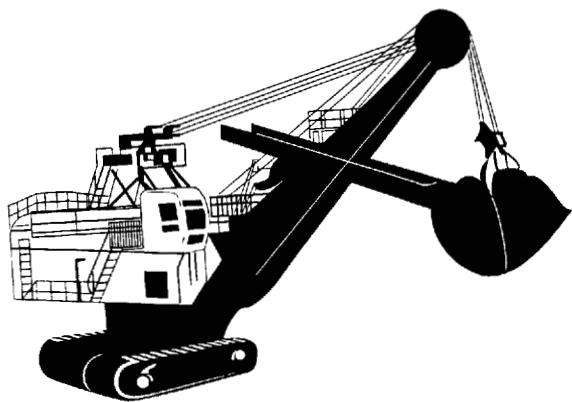


Diesel Fuel

Questions & Answers

For Highway and Off-Highway Use

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Diesel Fuel for Highway and Off-Highway Use

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Grades of Diesel Fuel

1.

Q. What is diesel fuel?

- A.** Diesel fuel is principally a blend of petroleum-derived compounds called middle distillates (heavier than gasoline but lighter than lube oil) and may or may not contain additional additives. During the operation of a diesel engine, diesel fuel is injected into the compressed, high-temperature air in the combustion chamber where it ignites spontaneously.

2.

Q. How many grades of diesel fuel are there?

- A.** The American Society for Testing and Materials (ASTM) in ASTM Standard Specification D 975 defines two grades of low-sulfur diesel fuel for highway use—No. 1-D and No. 2-D. Three high-sulfur grades of diesel fuel are specified for off-highway use—No. 1-D, No. 2-D, and No. 4-D. Federal regulations prohibit the use of high-sulfur diesel fuel for highway use. Federal regulations also require fuel suppliers to add red dye to high-sulfur diesel fuel and to low-sulfur, tax-exempt fuel. California regulations prohibit the use of high-sulfur diesel fuel in all motor vehicles.

ASTM describes diesel fuel grades by their intended primary application. This is usually associated with the tendency for the fuel to vaporize as follows:

Grade No. 1-D—includes the most volatile diesel fuels from kerosene to intermediate distillates. These fuels are usually the lowest cloud and pour point

fuels available. Fuels in this classification are suitable for use in high-speed diesel engines in services involving frequent and relatively wide variations in loads and speeds, such as in stop-and-go bus and door-to-door operations. These fuels are also for use when abnormally low ambient temperatures may be encountered.

Grade No. 2-D—includes the distillates of higher and wider boiling range than the No. 1-D fuels. These fuels normally have higher specific gravity (more dense) and higher cloud and pour points than No. 1-D fuels. These fuels are for use in diesel engines carrying relatively heavy loads at uniform speeds. They are generally used in equipment that operate in climates where cold starting and cold fuel handling are not severe problems but can be winterized to operate at lower temperatures. The No. 2-D grade is the most common and is widely used to satisfy the majority of automotive-type and heavy-duty-type diesel applications. Examples are automobiles, long-haul trucks, construction equipment, total energy units, farm tractors, and railroad diesels.

Grade No. 4-D—includes fuel oil containing distillates that are harder to vaporize and more viscous, as well as some blends with residual fuel oils. These fuels are for use in low- and medium-speed diesel engines in services involving sustained loads at substantially constant speeds and are used mostly in large, high output diesels for stationary power plants and ships.

3.**Q. Why was the sulfur content of diesel fuel lowered?**

- A.** Low-sulfur diesel fuels (less than 0.05 mass percent) are required by federal regulations for highway vehicles to ensure that these vehicles will meet particulate emissions standards to improve the quality of the air we breathe. In California, properties of vehicular diesel fuel are also controlled to help reduce smog.

4.**Q. Is diesel fuel sulfur content important to engine life?**

- A.** Diesel fuel sulfur content may be important to engine life if it is above the current ASTM limit of 0.50 mass percent for high-sulfur fuels. Fuel sulfur content above that level can increase piston ring and cylinder wear unless the type of lubricating oil or the oil drain interval is changed to accommodate higher sulfur levels. Suppliers will recommend specific lubricants for use with higher sulfur fuels.

5.**Q. Why can't all diesel fuel in the U.S. be made to one uniform standard?**

- A.** The properties of diesel fuels vary with the crude oil from which they are made and the processing they undergo, as well as the additives used (if any). In addition, engine fuel requirements change with geographic area and climates. Winter operation in colder, northern states imposes more severe requirements than for the warmer parts of the coun-

try. In cold areas, winterized diesel fuels are marketed by many manufacturers to offer a fuel that will perform better in cold weather. To make all diesel fuel meet the most severe standard would increase the cost of fuel to all customers and would not be energy efficient. Most suppliers provide diesel fuel meeting the requirements of ASTM D 975.

6.

Q. How do I know which grade to use?

A. Most engines are designed to operate on ASTM No. 2-D grade, but some diesel engines in stop-and-go service require No. 1-D diesel fuels in order to perform satisfactorily. Follow the recommendations of the engine manufacturer and a reputable fuel supplier who recognizes that some fuels may have special or additive-derived quality features.

Properties and Specifications

7.

Q. What specification requirements of diesel fuel should concern me?

A. Cetane number (ignition quality), cleanliness, low-temperature operability, and stability are the diesel fuel requirements of principal concern.

8.

Q. What is the significance of each of these requirements?

A. Cetane number is a measure of the ease with which the fuel is ignited in an engine and is most significant in relation to low-



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