

DIESEL

What is cetane number?

Cetane number is a measure of the ignition quality of distillate fuels. It is measured using a single-cylinder engine that determines the compression-ignition quality. Higher cetane value improves cold start performance, reduces noise and may reduce emissions. An increase in cetane number above the engine's requirement may not improve performance. A cetane number of 40 is the current U.S. minimum requirement for diesel fuel.

What is lubricity?

The EPA mandate to reduce emissions from diesel engines by lowering the sulfur to 15 ppm has prompted studies in regards to fuel pump wear and fuel lubricity. Hydrogen treating (or hydrotreating) is the most common process used by many refineries to reduce the sulfur content of diesel fuels. Sulfur and nitrogen-containing compounds and heavier compounds including heavy aromatics that are natural lubricating agents are reduced or removed under severe hydrotreating. Fuels with reduced levels of these compounds can cause accelerated wear in pump and injection systems. Catastrophic fuel injection failure can occur as experienced in Sweden in 1991 when low sulfur and low aromatics diesel fuel was introduced. Although technology exists that can manufacture injection and pump systems that can tolerate lower lubricity fuels, it is essential that existing fleets that do not have these advanced systems be protected by providing fuel with sufficient lubricity.

Diesel fuel lubricity is a characteristic that has a significant effect on fuel pump wear. Since the pumps have to be designed with close clearances in the areas where the fuel is being pushed, there is some potential for the surfaces of the pumps to contact, causing wear. Since it is the fuel that is being pumped, the fuel must act as its own lubricant. It has been found that the lubricating properties of the fuel are somewhat enhanced by:

1. The sulfur-containing compounds in the fuel
2. The nitrogen-containing compounds in the fuel
3. Some of the heavier compounds in the fuel (including heavy aromatics)
4. The inherent viscosity (resistance to flow) of the fuel

Since Ultra-Low sulfur diesel fuel requirements affect some of these characteristics, the introduction of such fuels has caused lubricity concerns. However, it appears highly likely that greater use of lubricity additives will solve the lubricity problems resulting from diesel fuel hydrotreating.

What is "winterized" diesel?

Diesel is seasonally blended for optimal performance during winter. Diesel contains waxy components that may solidify or gel at low temperatures and plug fuel lines and filters. A diesel's cold flow performance is typically determined by measuring its cloud point. The cloud point is the temperature at which the first formation of wax is observed. The lower the cloud point the better the fuel will perform at colder temperatures. Addition of kerosene/No. 1 diesel is traditionally blended into diesel to improve the cold flow performance because kerosene has a cloud point below -40°F and dilutes the diesel's wax components.

Cold flow improver (CFI) additives may be added to the fuel to improve its cold flow performance. These additives alter the size and formation of waxes, and allow the fuel to flow well below its cloud point. The performance of these additives is determined by measuring the fuel's Cold Filter Plugging Point (CFPP). CFPP is the temperature at which the fuel will no longer pass through stainless steel wire mesh gauze with a $45\ \mu\text{m}$ (micrometer) nominal aperture size.