

Diesel-powered fleets across the country are now dealing with the reality of Ultra-Low Sulfur Diesel Fuel (ULSDF) and the EPA's new mandate of less than 15 ppm (parts per million) sulfur, a tremendous drop from the previously required <500 ppm. Testing bulk deliveries and additive formulations is vital to meeting the new sulfur requirement and maximizing efficiency and performance.

The EPA's expectation is that the new regulations will improve environmental conditions by reducing unwanted emissions into the atmosphere. ULSDF, along with other required emission-reducing technology such as EGR (Exhaust Gas Recirculation) engines and soot particulate traps, should considerably reduce such unwanted emissions as soot and NOx (Nitrous Oxide). While this is good for the environment, fleet operating expenses are likely to increase and there is much speculation as to the affects on engine performance.

Removing sulfur from diesel fuel reduces the fuel's lubricity, which is necessary for sufficiently lubricated injectors. Preliminary data suggests that the reduction in lubricity causes injector plugging problems. To combat this issue, some fleets and fuel suppliers are adding "non-sulfur" containing lubricity agents.

Reducing sulfur content in diesel fuel also causes the fuel to burn faster which, in turn, will most likely reduce the number of miles per gallon. While there is not enough data to determine how significant a reduction it will be, some fleets are experiencing as much as a 5 - 10% reduction in fuel mileage.

Fleet managers should test bulk fuel deliveries to verify compliance with the new EPA requirements as well as monitor additive levels for maximum engine performance. As an EPA-approved laboratory for confirming that a fuel meets regulation standards, POLARIS recommends the following tests to ensure compliance and to help fleet managers maximize efficiency and reliability:

- **Elemental Metals (ASTM D-5185)** - Elemental analysis identifies any contamination by another fluid such as engine oil, coolant, etc. It can also identify corrosion problems.
- **Cetane Index (ASTM D-4737)** - Calculated according to ASTM D-4737, using API Gravity and mid-boiling point, the Cetane Index is a measure of a



diesel fuel's ignition quality - similar to an Octane rating for gasoline. The minimum Cetane Index for #2 diesel fuel is 40.

- **Viscosity @ 40°C (ASTM D-445)** - Viscosity is the measurement of a fuel's resistance to flow at a given temperature. When viscosity is out of specification, fuel injector performance may be affected.
- **Distillation (ASTM D-86)** - Distillation determines initial boiling point and separation of distillates at different temperatures, identifies dangerous or damaging gasoline contamination and helps verify levels of kerosene added during winter months.
- **Water & Sediment (ASTM D-2709)** - Water and Sediment can clog fuel filters and cause significant power loss, corrosion, fuel system component wear and promote microbiological growth.
- **Thermal Stability (ASTM D-6468)** - A fuel's Thermal Stability is represented by a percentage range that is based on its tendency to produce asphaltenes at high temperatures. Asphaltenes are tar-like, resinous substances most often responsible for clogging fuel filters. Fuel with a Thermal Stability of 80% or greater should not cause filter clogging. Fuels between 60% and 80% could have a marginal affect and values less than 60% will significantly reduce filter life.
- **Bacteria, Fungi & Mold** - The presence of Bacteria, Fungi and/or Mold indicates that fuel storage tanks have not been properly maintained. When present, water separates from fuel and accumulates at the bottom of storage tanks creating an excellent breeding ground for biological growth.
- **Sulfur Content ppm (ASTM D-2622)** - Determining Sulfur Content confirms compliance with the EPA's requirements of <15 ppm (parts per million).
- **HFRR Lubricity (ASTM D-6079)** - This test determines whether or not a fuel meets the lubricity requirements needed to maintain maximum injector performance and can also be used to monitor appropriate lubricity additive formulations.
- **Pensky Marten Flash Point (ASTM D-93)** - This test determines if the fuel will burn at the proper temperature.
- **Water by Karl Fisher (ASTM D-1744)** - Water by Karl Fisher measures water by titration and is reported in either ppm (parts per million) or % by volume - takes Water & Sediment one step further by determining how much water is present.
- **API Gravity (ASTM D-287)** - API Gravity determines fuel density and, along with Distillation, is used to calculate Cetane Index.



- **Cloud Point (Winter) (ASTM D-2500)** - Cloud Point determines at what temperature wax crystals first begin to form - gelling will clog fuel filters.
- **Pour Point (Winter) (ASTM D-97)** - Pour Point determines the temperature at which fuel will no longer flow - winter additives or pour point depressants lower pour point to extremely low temperatures to prevent gelling.

As most fuel deliveries are simply added to existing bulk tank supplies, testing sulfur content should remain routine until older supplies are completely purged and all supplies meet the new EPA requirements of <15 ppm. If adding after-market lubricity agents, testing should also be performed to maintain appropriate blending formulations.

**Contact POLARIS Laboratories** or your fuel supplier for more information. Information on additives, biocides or conditioners can be obtained from your fuel supplier, filter supplier, lube supplier or OEM.