



# TECHNICAL DATA

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## #137ULSW DIESEL TREAT 2000 ULTRA LOW SULFUR WINTER PREMIUM

### Application

Diesel Treat 2000 Ultra Low Sulfur Winter Premium is a multifunctional ultra low sulfur compliant diesel fuel additive that is specifically formulated to provide Ultra Low Sulfur Diesel Fuel maximum cold temperature protection against fuel gelling, waxing, and fuel line freeze-up, in addition to providing improved fuel efficiency, increased power, increased fuel lubricity, improved injector cleanliness and improved fuel stability.

Diesel Treat 2000 Ultra Low Sulfur Winter Premium can also be used in all types of diesel fuel including low sulfur diesel fuel and biodiesel blends.

### Features and Benefits

Diesel Treat 2000 Ultra Low Sulfur Winter Premium contains a highly concentrated multi-functional additive package, which allows the product to provide the following performance benefits when used at the recommended treatment ratio.

1. Improvement of the fuel's cetane rating up to two points.
2. Easier cold weather starting.
3. Reduced misfiring at lower air inlet temperatures.
4. Faster warm-up.
5. Cummins L-10 Injector Depositing Test and Cummins N-14 Injector Corrosion Test Performance.
6. Detergency to provide cleanliness throughout the entire fuel system.
7. Clean up and keep clean performance for the entire fuel system.
8. Dispersion of insoluble gums and varnish present in low quality fuels.
9. Excellent deposit control for light duty and medium duty in direct injected diesel engines.
10. Improved combustion of the fuel by completely vaporizing the fuel into smaller particles, thus providing better fuel economy and preventing a significant loss in engine power.
11. Improved fuel economy up to 3%.
12. Modification of existing injector deposits, allowing for their removal and safe passage into the combustion chamber where they can be burned.

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13. Reduced emissions exhaust smoke and particulates.
14. A reduction in black smoke.
15. Excellent anti-wear protection for injectors and fuel pumps, especially for those engines burning low sulfur diesel fuel and ultra low sulfur diesel fuel.
16. Supplemental ring and valve-train anti-wear protection.
17. Lubrication of the upper cylinders, fuel pumps and injectors.
18. Increased thermal stability to the diesel fuel in order to provide the ability to resist thermal degradation.
19. Inhibition of oxidation during storage.
20. Extended storage stability.
21. Rust and corrosion protection to the entire fuel system.

Coupled with this multifunctional additive package is a non-alcohol jet fuel deicer/water dispersant. This non-alcohol jet fuel deicer/water dispersant eliminates the problems associated with entrained and/or dissolved water present in the fuel by dispersing the water into tiny droplets. These tiny droplets are suspended in the fuel so they can be carried with the fuel in controlled amounts through the fuel filters, fuel lines, and into the combustion chamber to be burned with the fuel. By having any remaining water dispersed and suspended in the fuel, Diesel Treat Ultra Low Sulfur Winter eliminates the formation of ice crystals that can block fuel lines and plug fuel filters and prevents the formation of stable fuel-water emulsions.

### **Improved Low Temperature Operability**

Changes in the refining process of middle distillates to make Ultra Low Sulfur Diesel Fuel have resulted in chemical changes that can significantly impact the low temperature operability of the Ultra Low Sulfur Diesel Fuel. These chemical changes have resulted in an increase in the amount of total wax (n-paraffins) and wax-to-wax ratios present in the fuel. This results in the wax particles in Ultra Low Sulfur Diesel Fuel being more concentrated and harder to disperse. As the temperature of the Ultra Low Sulfur Diesel Fuel drops, these increased amounts of wax molecules can begin to rapidly precipitate out of the fuel and form either large flat crystals or irregular crystals that can quickly plug fuel lines and filters.

Diesel Treat 2000 Ultra Low Sulfur Winter Premium contains a proprietary wax crystal modifier, cold flow improver; heavy wax modifier polymeric type additive system that when added to the diesel fuel before the fuel has reached its cloud point helps to prevent the formation of wax crystals. The proprietary polymeric additive system modifies the individual wax crystals by encapsulating and dispersing them as they are formed. This not only drastically reduces the size of the wax crystals, but also prevents the growth of larger wax crystals and their adhesion to each other. This in turn allows the wax crystals to flow through the fuel filters and lines and into the combustion chamber with the fuel.

By the addition of Ultra Low Sulfur Diesel Premium Winter, the gelling point and low temperature operability of the fuel can be significantly improved. **This improvement in low temperature operability is dependent upon the refining method or process used to make the Ultra Low Sulfur Diesel Fuel and the response of the Ultra Low Sulfur Diesel Fuel to the additive.**

### **Prevention of Settling of Wax Crystals at Low Temperatures**

Diesel fuel tends to exhibit reduced flow at reduced temperatures due in part to formation of solids in the fuel. The solids, which are wax crystals, have a slightly higher density than the diesel fuel at a given temperature, and as a result there is a tendency for the wax to settle to the bottom of the storage container. The reduced flow of the diesel fuel affects the transport and use of the diesel fuel not only during storage but also in an internal combustion engine. If the diesel fuel is cooled to below a temperature at which solid formation begins to occur in the fuel, generally known as the cloud point (ASTM D 2500) or wax appearance point (ASTM D 3117), solids forming in the fuel in time will essentially prevent the flow of the fuel, plugging piping during transport of the fuel, and in inlet lines supplying an engine. Under low temperature conditions during consumption of the diesel fuel, as in a diesel engine, wax precipitation and gelation can cause the engine fuel filter to plug. Wax formation and settling can occur in the fuel tank after an extended period of non-use, such as overnight, and increase the chances of engine failure because of non-uniform wax enrichment. The same problem of wax settling can occur on a larger scale in fuel storage tanks. Under conditions where the fuel still flows after solids have formed in the fuel, an effect known as channeling may occur. When the outlet valve on the container is opened, the initial fuel flow will be wax enriched. Then, a channel is created in the wax layer, allowing a quantity of liquid fuel depleted in wax to flow. The low-wax fuel will continue to flow if the container is not refilled or agitated. The final portion of fuel flowing from the container will then be highly wax enriched.

With the changes in the refining process of middle distillates to make Ultra Low Sulfur Diesel Fuel and the increase in the amounts of total wax (n-paraffins) and wax-to-wax ratios present in the fuel these components will begin to precipitate out rapidly as the temperature of the diesel fuel is lowered. These wax crystals which separate from the diesel fuel initially appear as individual crystals and more crystals form in the fuel, they tend begin to agglomerate and eventually reach a particle size which is too great to remain suspended in the fuel. The wax crystals forming in a fuel normally have a slightly higher density than the liquid fuel portion resulting in these wax crystals to settle to the bottom of the vehicle fuel tanks and the fuel storage tanks.

Diesel Treat Ultra Low Sulfur Premium Winter contains a proprietary wax anti-settling agent (WASA) that is designed to prevent the paraffins and other waxy components which can plug and clog filters and other fuel system components from dropping out of the fuel and settling out over extended periods of time.

This helps increase the diesel fuel's cold weather operability and reduces downtime and maintenance costs.

### **Increased Lubricity Protection with Synshield™**

Today's diesel powered vehicles feature low emission engines that are more susceptible than ever to diesel fuel related wear. Diesel engine designs are employing the use of higher fuel injection pressures, hotter fuel return temperatures, higher operating temperatures and complex engine geometry to control emissions. All of these factors result in increased fuel system wear and can shorten engine life.

With the mandate by the United States EPA to reduce the sulfur content of diesel fuels to control emissions, this has resulted the elimination of certain naturally occurring polar compounds that aid in protection of the fuel system from wear by forming a protective layer on the metal surfaces of the fuel injection system. The increased use of the hydrotreating and hydrocracking refining processes to reduce the sulfur content of the diesel fuel in order to meet the mandated **Ultra Low Sulfur Diesel Fuel specification of 15 ppm** causes these naturally occurring polar compounds to become either chemically altered or completely removed, thus resulting in increased engine and fuel system wear.

To protect today's diesel engines from fuel system related wear Schaeffer Mfg. Company has further blended into the Diesel Treat 2000 Ultra Low Sulfur Premium Winter a proprietary lubricity additive called Synshield™. Synshield™ is one of the few lubricity additives that not only surpasses industry standards for diesel fuel lubricity but also exceeds the EPA's new standard by being the only lubricity additive that does not contain sulfur or sulfur containing compounds. Synshield™ prevents fuel system wear and injector scoring by forming a protective layer on the metal surfaces of the fuel system and injectors that provide boundary lubrication between metallic parts in critical fuel system components. This protective boundary lubrication film not only reduces friction and wear between the fuel system surfaces that are in relative motion but also increases fuel system component life, thus leading to less downtime and increased longer equipment life.

**BULK TREATMENT RATIO:**

One gallon of Diesel Treat 2000 Ultra Low Sulfur Winter Premium to 1,000 gallons of diesel fuel.

For hard to treat or unresponsive Ultra Low Sulfur Diesel Fuels use one gallon of Diesel Treat 2000 Ultra Low Sulfur Winter Premium to 750 gallons of diesel fuel.

**STORAGE REQUIREMENTS:**

**It is recommended that this product be stored 15 degrees above its pour point.**

Diesel Treat 2000 Ultra Low Sulfur Winter Premium is registered for use and meets the US EPA requirements for blending into low sulfur and ultra low sulfur diesel fuels. When used at the recommended treatment ratio, Diesel Treat 2000 Ultra Low Sulfur Premium Winter will not have any measurable effect on the cetane index or aromatic and sulfur content of the diesel fuel.

**THIS DIESEL FUEL ADDITIVE CONTAINS LESS THAN 15PPM OF SULFUR AND COMPLIES WITH THE FEDERAL LOW SULFUR CONTENT REQUIREMENTS FOR USE IN DIESEL MOTOR VEHICLES AND NON-ROAD ENGINES.**

**THIS DIESEL FUEL ADDITIVE IS COMPATIBLE AND APPROVED FOR USE WITH DIESEL FUELS THAT MEET ASTM D975 AND BIODIESEL THAT MEETS ASTM D6751 AND BIODIESEL THAT MEETS EN 14214.**

**TYPICAL PROPERTIES**

Specific Gravity	0.9232
Flash Point °F/°C PMCC (ASTM D-93)	113°/45°
Pour Point °F/°C (ASTM D-97)	-30°/-34.4°
Ash Content %wt. (ASTM D-482)	0
Copper Strip Corrosion Test (ASTM D-130)	1a
Sulfur Content ASTM D-7039	<15 ppm