



# TECHNICAL DATA

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## #300ULSW ARCTIC SHIELD + ULTRA LOW SULFUR CONCENTRATE

### Application

Arctic Shield + Ultra Low Sulfur Concentrate is a highly concentrated ashless ultra low sulfur complaint 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.

Arctic Shield + Ultra Low Sulfur Concentrate can also be used in all types of diesel fuel including low sulfur diesel fuel and biodiesel blends.

### Protection Against Moisture Contamination

Arctic Shield + Ultra Low Sulfur Concentrate contains 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, Arctic Shield + Low Sulfur Concentrate 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.

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Arctic Shield + Ultra Low Sulfur Winter Concentrate 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 Arctic Shield + Ultra Low Sulfur Winter Concentrate 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.

Arctic Shield + Ultra Low Sulfur Winter Concentrate 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.

#### **BULK TREATMENT RATIO:**

One gallon of Arctic Shield + Ultra Low Sulfur Winter Concentrate to 1,500 gallons of diesel fuel.

For hard to treat or unresponsive Ultra Low Sulfur Diesel Fuels use one gallon of Arctic Shield + Ultra Low Sulfur Winter Concentrate to 750 gallons of diesel fuel.

Arctic Shield + Ultra Low Sulfur Winter Concentrate 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, Arctic Shield + Ultra Low Sulfur Winter Concentrate will not have any measurable affect on the cetane index or aromatic and sulfur content of the diesel fuel.

#### **STORAGE REQUIREMENTS:**

**It is recommended that this product be stored above 0°F**

**THIS DIESEL FUEL ADDITIVE CONTAIN 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**

<b>Specific Gravity</b>	0.8916-0.9175.
Flash Point °F/°C PMCC (ASTM D-93)	88°-120°/ 31°-49°
Pour Point °F/°C (ASTM D-97)	-10°/-23°
Ash Content %wt. (ASTM D-482)	0
Copper Strip Corrosion Test (ASTM D-130)	1a
Sulfur Content ASTM D-7039	<15 ppm

Packaging: #300ULSW Arctic Shield + Ultra Low Sulfur Winter Premium is available in 275 gallon totes, 55-gallon drums, 30-gallon drums, 5 gallon pails and 4X1 gallon cases, 2X2 ½ gallon cases and 24 pints per case.