

## FUEL ADDITIVES

### WHY SHOULD YOU CONSIDER AND USE A DIESEL FUEL ADDITIVE AND BTU+?

In a recent article from "Heavy-Duty Trucking Magazine," the Maintenance Council of the American Trucking Association stated, "They cautioned truck users to modify their equipment and maintenance practices to handle substandard diesel fuel...because it is not a problem that is going to go away. It is going to get worse."

In an official release published in "Diesel Equipment Magazine" issued by Caterpillar they stat, "High sulphur fuels have the same effect on Caterpillar engines as they do on Cummins, Detroit Diesel and Mack engines. The use of high sulphur fuels can shorten engine service life as much as 20% or one-fifth the normal life due to corrosive wear."

Abrasive wear causes direct mechanical damage, while corrosive wear results from chemical action. During combustion, sulphur in diesel fuel forms sulphur oxides which combine with moisture in the air and fuel to produce sulphuric and sulphurous acids. These acids attack cylinder walls and piston rings, and can damage exhaust valve guides and engine bearings. Corrosive action is more deceptive than abrasive action. Corrosion quietly destroys the engine as acid products accumulate in the oil.

LE's BTU+ Diesel Fuel Improvers are very effective in helping to offset the effects of high sulphur content in diesel fuel, through the following features:

- **DEMULSIFIERS** – Drops water out of diesel fuel, which reduces sulphur based acid formation. This particularly beneficial in cold temperature operation where suspended water in untreated fuel freezes.
- **DETERGENTS and DISPERSANTS** – Cleans fuel systems, helps prevent rings from sticking; removes deposits from injectors providing uniform spray patterns, and thus complete combustion; extends oil life; reduces smoking by cleaning engine and injectors during usage.
- **OXIDATION INHIBITORS** – Reduces the rate of the oxidation process which occurs in stored diesel fuel. This helps to reduce gum and sludge formation.
- **METAL DEACTIVATORS** – Reduces the catalytic effect that high sulphur fuels have oxidation of the copper and bronze components in fuel systems.

- **COMBUSTION IMPROVERS** – Increases fuel volatility, allows easier starting and better combustion of the fuel, therefore increasing horsepower output and overall engine efficiency.

Caterpillar recommends reducing the oil change interval to one-fourth the normal change interval when a sulphur content of 1% is found in diesel fuel. By changing oil filters at intervals recommended by the manufacturer, monitoring the oil and engine conditions through oil analysis, and through the exceptional benefits imparted by LE's BTU+ Diesel Fuel Improvers, an operator can expect longer oil drain intervals than would otherwise be expected with high sulphur content fuels in service, while at the same time giving his engines protection against wear far exceeding that possible with ordinary diesel fuel additives.

A good quality diesel fuel should contain no more than 0.05% of sulphur, but some diesel fuel contains as much as 2% sulphur...this represents four times the allowable amount established by the American Society of Testing Materials. The most common complaints about lower quality diesel fuel are:

- Poor starting performance.
- Faster engine wear.
- The need to change engine oil more frequently because of the detrimental effect of combustion by-products.

A heavier, sulphur laden fuel thickens up faster in cold weather and causes starting problems. Diesel fuel made from this heavier type crude has a higher percentage of long chain molecules. These molecules have more trouble burning and cause more soot and smoke when burned.

These by-products of incomplete combustion contaminate the lubricant oil. Therefore, a better quality engine oil and a specially formulated diesel fuel additive must be used. The one-two punch of LE'S MONOLEC Engine Oils in combination with LE's BTU+ Diesel Fuel Improvers can specifically help even under such circumstances as described here above.

As has been stated previously and is apparent in a constant stream of media stories, diesel fuel quality is declining. The engine manufacturers are taking note of this fact and carefully drawing it to the attention of their customers.

When using LE's BTU+ Diesel Fuel Improvers in the fuel, water is dropped out reducing the possibility of acid formation from the sulphur along with the fact that the fuel is more completely burned. The oxides are gases, and thus more of them are pushed out through the exhaust system without the opportunity of harming the engine. In addition LE'S BTU+ Diesel Fuel Improvers preserves fuel quality in storage as well as keeping injectors and lines

clean and improving fuel economy:

**BTU+ Applications**

- Diesel Fuel Additive
- Fuel tank
  - Bulk storage tanks

**WINTERIZING WITH LE'S BTU+**

**THE PROBLEMS**

The use of straight No. 2 diesel fuel during cold weather operations continues to be a desire of all diesel equipment operators. These fuels contain the highest BTU content (available energy content) and provide maximum miles per gallon fuel economy. Unlike kerosene blended fuels, they have better lubricity properties component part wear.

Today's No. 2 diesel fuels are much heavier and the paraffin content is much higher than in the past. As the ambient air temperature drops, the paraffin changes from a liquid to solid crystals which clog filters and plug fuel lines.

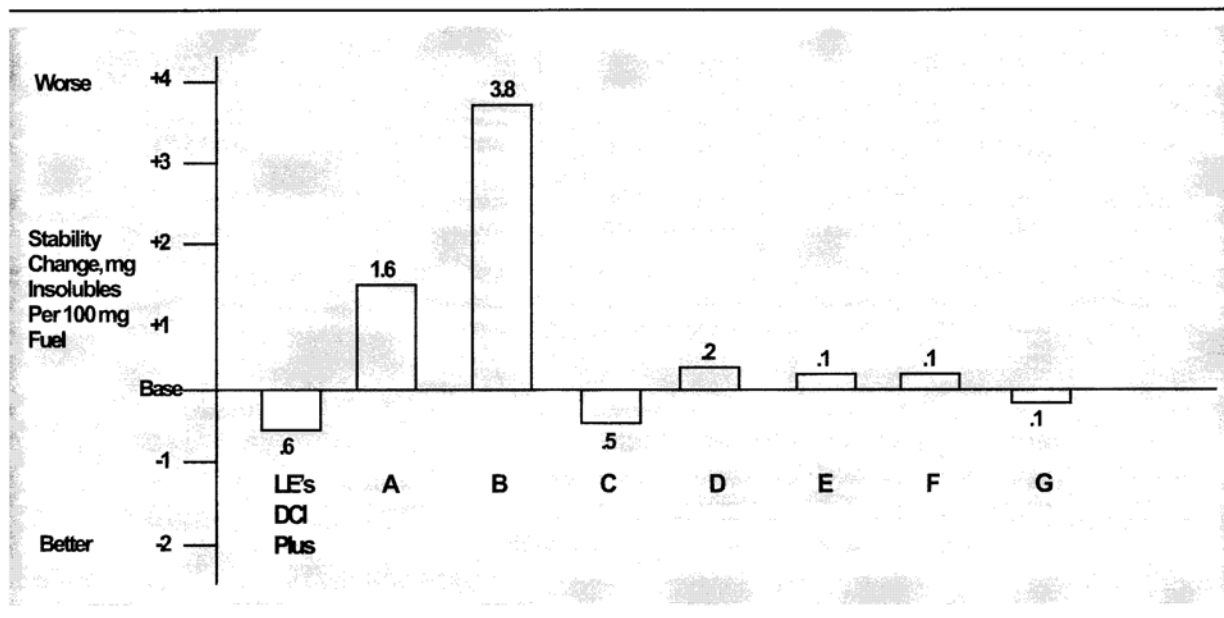
Also, both the cloud point and storage oxidation stability pose potential problems for the diesel fuel user. Cloud point (the temperature at which wax in the fuel congeals and becomes visible) is near the temperature at which fuel filters will plug and restrict fuel flow, thus leading to low-power or engine stoppage. Likewise storage stability problems caused by degradation of the fuel can create headaches during winter and summer operation. Fuel oxidation causes excessive engine smoke, increased particulate emissions, combustion misfire and reduce power. Ideally diesel fuel should be stable during storage and remain so for extended periods of time, especially

**LE'S BTU+ – THE ECONOMICAL DIESEL FUEL PROMBLEM SOLVER**

**LE'S BTU+ PREVENTS DIESEL FUEL DEGRADATION IN STORAGE**

Untreated diesel fuel naturally degrades during storage and forms undesirable solids. LE's BTU+ significantly reduces the oxidation process and stabilizes the fuel as

compared to other fuel additives on the market today as measured by the ASTM D-2274 Oxidation Stability Test results below



## LOWERS USEFUL DIESEL FUEL TEMPERATURE

While most diesel fuel supplements, including BTU+, offer fuel pour reduction (the temperature at which the diesel fuel will no longer flow), the cloud point and especially the cold filter plugging point test are considered to be a better indicator of the lowest useful temperature for diesel fuel.

BTU+ provides outstanding performance in this area. It barely affects the fuels cloud point and significantly reduces the temperature at which wax crystals begin to plug a standard 17 micron filter element

TEST	#2 DIESEL FUEL	
	FUEL ONLY	BTU+ @0.1%VOL
Cloud Point, +°F	18	20
Cold Filter Plugging Point, °F (ASTMD-4539)	8.6	-0.4

## ECONOMICAL TOUSE

Using the recommended treatment levels, LE's BTU+ economically provides the benefits for long term fuel storage as well as in use.

Treatment Level Cost	Diesel Fuel Additive	Cost* Per Gallon Of Fuel
	BTU+	4.2
	A	4.8
	B	8.3
	C	7.8
	D	6.4
	E	7.3
	F	7.5
	G	9.8

\*Purchase price is in small packages (pints & quarts) at manufacturer's recommended treatment levels.

## FUEL DEHAZING – What Is It And How Is It Prevented?

### Q: What is a fuel dehazer?

A: A fuel dehazer is an additive such as LE'S BTU+ Diesel Fuel Supplement that is added to a fuel to improve water separation.

### Q: How is haze measured?

A: Haze is normally determined by visually or optically measuring the transmittance of visible light. Either a visual or transmittance standard issued depending upon the customer specification. Hazy fuel can have a "cloudy" appearance due to water suspended in the fuel.

### Q: Where are dehazers used?

A: Fuel dehazers such as LE's BTU+ Diesel Fuel Supplement are used as a spot fix for it's of hazy fuel or as a water dropping agent to treat bulk fuel storage tanks.

### Q: How is a tank of hazy fuel treated?

A: Dehazers such as LE's BTU+ Diesel Fuel Improvers mix uniformly with hazy fuel either in equipment fuel tanks or in bulk fuel tank areas. This fuel additive mixes thoroughly with diesel fuel, without any agitation required.

### Q: Why is LE'S BTU+ Diesel Fuel Improvers Needed?

A: Water suspended in diesel fuel causes corrosion and malfunction of precision engine parts such as fuel injectors. LE's BTU+ Diesel Fuel Improvers are required to help minimize the amount of water that is suspended in the treated fuel.

### Q: How does a dehazer function

A: LE's BTU+ Diesel Fuel Improvers are designed to facilitate the coalescence of vary small water droplets into larger droplets, which will then separate from the fuel by gravity.

## WHY SHOULD YOU CONSIDER USING A GASOLINE ADDITIVE AND L-X?

The demands placed on today's high performance internal combustion engines are enormous. Most unleaded fuels have significantly lower lubricating capabilities than their leaded counterparts. And with most engines using injectors, deposit formation is a common occurrence causing poor engine performance and placing a severe strain on emission control devices. While gasoline fuel additives have been viewed as a luxury in the past, they are a necessity to keep modern internal combustion engines operating at peak performance

LE's L-X Heavy Duty Chemical Supplement is a combination of oils and chemicals which has been carefully selected utilizing an advanced formulation. It has a unique ability to impregnate metal to help today's internal combustion engines achieve maximum performance. With regular use L-X:

- Reduces Friction Wear – of valve stems, guides and other moving parts in the upper section of the engine. Lubrication of the upper compression ring significantly reduces fuel dilution and blowby.
- Cleans Internal Engine Parts – to yield more efficient engine operation and less maintenance. Cleans existing carbon, varnish and gum deposits.
- Stops Deposit Buildups – further formation are prevented from forming on rings, spark plugs, pistons, PCV valves, carburetors, fuel injectors, valves and other engine parts.

- Extends Engine Life – by reducing friction and wear of internal engine parts because they are kept cleaner.
- Minimizes Fuel Consumption – by keeping the engine clean and promoting more efficient combustion of the fuel.
- Maintains Emission Control Device Efficiency – and keeps emission levels low by keeping the entire system clean (safe for catalytic converters).

Part of any program to have internal combustion engines operating at peak performance is to insure that the fuel used is in as good a condition as the day it was made. This is especially critical if the fuel is stored for any period of time. The use of L-X in bulk storage tanks (1) stabilizes fuel to retard oxidation, prevents gum formation and maintains octane rating of fuel and (2) prevents rust and corrosion.

### Applications

- Gasoline Additive
  - Fuel Tanks
  - Bulk Storage Tanks
- Other Uses
  - Penetrating Oil
  - Gun Cleaner & Lubricant

## WINTERIZING WITH LE'S HEAVY-DUTY CHEMICAL SUPPLEMENT

While the heaviest use for LE's L-X Heavy-Duty Chemical Supplement has been as a fuel supplement, during the coldest weather it has been found that the addition of LE's L-X Heavy-Duty Chemical Supplement to the crankcase oil has made a considerable difference as to whether heavy-duty equipment could or couldn't be started. If such equipment can't be started, it is not going to be productive

Most of the equipment operators in the field are aware that during very low temperature conditions, a "light weight fluid" such as LE's L-X Heavy-Duty Chemical Supplement is necessary. It often makes the difference between being able to start their equipment or not.



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