

# PALM-BASED ADDITIVE TO IMPROVE LUBRICITY OF ULTRA LOW SULPHUR DIESEL

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The adverse effects of sulphur to health and the environment have caused limits to be set for its content in diesel fuel. For example, the maximum sulphur content in the EC Directive 98/70/EC and US Environmental Protection Agency is 50 ppm (starting from year 2005) and 15 ppm (from October 2006), respectively. As a result, the production of ultra low sulphur diesel (ULSD) is increasingly.

However, with the benefits come also the attendant problems. The hydro-treating process to remove sulphur, also removes some of the natural occurring lubricating properties. As diesel is used to lubricate the engine prior to its combustion, this poses a problem. Thus, the lubricity loss would have to be replaced. Indeed, lubricity has been

included in the European automotive diesel fuel standard (EN590) since 1999, some of which are shown in *Table 1*.

## PALM-BASED LUBRICITY ADDITIVE AND ITS PERFORMANCE ON ULTRA LOW SULPHUR DIESEL

A palm-derived compound (*Figure 1*) produced via a chemical process confers superior lubricity to ULSD (sulphur content  $\leq 50$  ppm). The palm additive at less than 500 ppm (0.05%) suffices for ULSD to meet international standards for lubricity (*Figure 2*). An evaluation was conducted using the American Society for Test and Materials (ASTM) method, which measures the wear scar diameter on a specimen ball used under specified conditions.

TABLE 1. STANDARDS AND THEIR RESPECTIVE REQUIREMENTS FOR LUBRICITY IN DIESEL FUEL

Standard	Requirement
European Standard for Automotive Diesel Fuel (EN590)	High Frequency Reciprocating Rig (HFRR) (ASTM D6079)  Max. wear scar diameter: 460 $\mu\text{m}$
Worldwide Fuels Charter	HFRR (ASTM D6079)  Max. wear scar diameter: 400 $\mu\text{m}$
Performance Requirement and Test Method for Assessing Fuel Lubricity (SAE J2265)	HFRR (ASTM D6079)  Max. wear scar diameter: 450 $\mu\text{m}$
Engine Manufacturers Association (EMA)	HFRR (ASTM D6079)  Max. wear scar diameter: 450 $\mu\text{m}$
Diesel Fuel Specification (ASTM D975)	HFRR (ASTM D6079)  Max. wear scar diameter: 520 $\mu\text{m}$





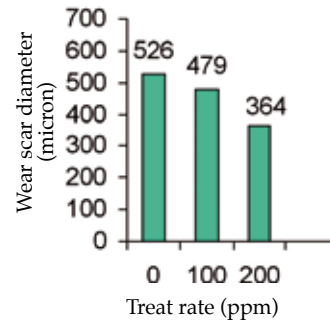
Figure 1. Palm-based lubricity additive.

A bigger scar diameter indicates poor lubricity with the aforementioned international standards stipulating a maximum diameter of between 400 to 520 microns as the acceptable limits.

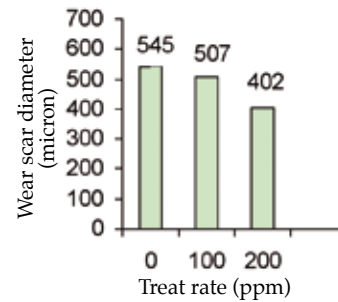
### ADVANTAGES OF PALM-BASED LUBRICITY ADDITIVE

The palm-based lubricity additive greatly improves the poor lubricity of ULSD. It is fully compatible with and blends well with ULSD. Being a product derived from palm oil, it is environmental-friendly and biodegradable. Its low flammability, or high flash point, also provides enhanced safety during storage and transportation.

ULSD  
(Sulphur content: 50 ppm)



ULSD  
(Sulphur content: 42 ppm)



ULSD  
(Sulphur content: 20 ppm)

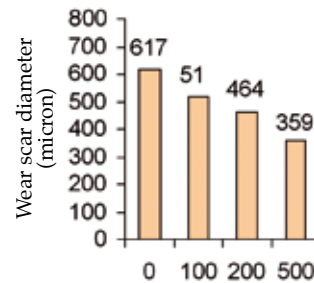


Figure 2. Effectiveness of palm-based lubricity additive on ultra low sulphur diesel (ULSD) with different sulphur contents.

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