



***Preventive
Maintenance Products***

March 2001

**CATERPILLAR POSITION ON THE USE OF BIODIESEL
FUEL**

This document applies, within the stated limitations, to Caterpillar engines.

Introduction:

With increased world interest in emissions and reducing the use of petroleum distillate based fuels, many governments and regulating bodies encourage the use of biofuels. Governmental incentives and/or environmental legislation to use biofuels may have an impact on the sales and use of Caterpillar engines and equipment. This document outlines Caterpillar's criteria and parameters when using biodiesel fuel.

Biodiesel is a fuel that can be made from a variety of sources, primarily from soybean oil or rapeseed oil. Without esterification, these oils gel in the crankcase and fuel tank and may not be compatible with many of the elastomers used in today's engines. In their original form, these oils are not suitable for use as a fuel in compression ignition engines. To use these oils as fuel, they must be esterified. Alternate base stocks for biofuel may include animal tallow, waste cooking oils, or a variety of other feedstocks.

ASTM has recently authored a provisional specification for biodiesel, PS121. Caterpillar recognizes BioFuels meeting the ASTM PS121, DIN 51606 or the Caterpillar biodiesel specification.

Caterpillar certifies its engines using the prescribed EPA and European Certification Fuels. Caterpillar does not certify engines on any other fuel. It is the user's responsibility to use the correct fuel as recommended by the manufacturer and allowed by EPA or other local regulatory agencies. It is the responsibility of the user to obtain the proper local, regional, and/or national exemptions required for the use of biodiesel in any emissions regulated Caterpillar engine.

Warranty and the Use of Biodiesel Fuel in Caterpillar Engines

Caterpillar neither approves nor prohibits the use of biodiesel fuels. Caterpillar is not in a position to evaluate the many variations of biodiesel fuels, and the long-term effects on performance, durability or emissions compliance of Caterpillar products. The use of biodiesel fuel does not affect Caterpillar's materials and workmanship warranty. **Failures resulting from the use of any fuel are not Caterpillar factory defects and therefore the cost of repair would NOT be covered by Caterpillar's warranty.**

Recommendation for the use of Biodiesel Fuel in Caterpillar Engines

For Caterpillar 3046, 3064, 3066, 3114, 3116, 3126, 3176, 3196, 3208, 3306, C-10, C-12, 3406, C-15, C-16, 3456, 3408, 3412, 3500 series, 3600 series, CM20, CM25 and CM32 engines: Biodiesel meeting the requirements listed in Caterpillar's biodiesel specification or, meeting either ASTM PS121 or DIN 51606, are acceptable. They may also be blended in any percentage with an acceptable diesel fuel, provided the biodiesel constituent meets the requirements outlined in the Table prior to blending.

For Caterpillar 3003 through 3034, 3054 and 3056 engines: Biodiesel meeting the requirements listed in Caterpillar's biodiesel specification, or meeting either ASTM PS121 or DIN 51606, may be blended with an acceptable diesel fuel at a maximum of 5% biodiesel fuel blended with 95% diesel fuel. The biodiesel must meet the requirements outlined in the Table prior to blending. Use of more than a 5% biodiesel fuel can cause premature failures whose repair would not be covered under Caterpillar warranty.

When burning biodiesel, or any blend of biodiesel, it is the responsibility of the user to obtain the proper local, regional, and/or national exemptions required for the use of biodiesel in any emissions regulated Caterpillar engine. When using a fuel that meets the Caterpillar's Biodiesel specification, ASTM PS121, or DIN 51606 specifications, and when adhering to the following recommendations, the use of biodiesel should pose no problems.

Recommendations:

- The oil change interval can be affected by the use of biodiesel fuel. Use Scheduled Oil Sampling (SOS) to monitor the engine oil condition and to determine the optimum oil change interval.
- Biodiesel provides approximately 5-7% less energy per gallon of fuel when compared to distillate fuels. To avoid engine problems when the engine is converted back to 100% distillate diesel fuel, do not change the engine rating to compensate for the power loss.
- Elastomer compatibility with biodiesel is still being monitored. The condition of seals and hoses should be monitored regularly.
- Biodiesel fuels may pose low ambient temperature problems for both storage and operation. At low ambient temperatures, fuel may need to be stored in a heated building or a heated storage tank. The fuel system may require heated fuel lines, filters, and tanks. Filters may plug and fuel in the tank may solidify at low ambient temperatures if precautions are not taken. Consult your biodiesel supplier for assistance in the blending and attainment of the proper cloud point fuel.
- Biodiesel has poor oxidation stability, which can result in long term storage problems. The poor oxidation stability qualities may accelerate fuel oxidation in the fuel system. This is especially true in engines with electronic fuel systems because they operate at higher temperatures. Consult the fuel supplier for oxidation stability additives.
- Biodiesel fuel is an excellent medium for microbial growth. Microbes cause fuel system corrosion and premature filter plugging. The effectiveness of conventional anti-microbial additives, when used in biodiesel is not known. Consult your fuel and additive supplier for assistance.
- Care must be taken to remove water from fuel tanks. Water accelerates microbial growth. Water is naturally more prevalent in biodiesel fuels than in distillate fuels.

Caterpillar Biofuel Specification

Property	Test Method	Test Method	Units	Limits
	United States	International	Fuel Specific Properties	
Density @ 15°C	ASTM D1298	DIN/ISO 3675	g/cm ³	0.86-0.90
Viscosity @ 40°C	ASTM D445	DIN/ISO 3104	mm ² /s	4.0-6.0
Flash Point	ASTM D93	DIN/ISO 22719	°C	100 min
Cold Filter Plugging - Summer - Winter	ASTM D4539	DIN EN 116	°C	0 6 below ambient
Pour Point - Summer - Winter	ASTM D97	ISO 3016	°C	-9 max -20 max
Sulfur Content	ASTM D2622	ISO 8754	% weight	0.01 max
Distillation - 10% Evaporation - 90% Evaporation	ASTM D1160	ISO 340	°C	To Be Determined 345
Carbon Residue, Conradson (CCR)	ASTM D189	DIN/ISO 10370	% weight	0.5 max
Cetane Number	ASTM D613	ISO 5165		45 min
Ash Content	ASTM D482	DIN 51575 ISO 6245	mg/kg	0.02 max
Water Content	ASTM D1796	DIN51777-1 ISO3733	g/m ³	500 max
Particulate Matter	DIN 51419	DIN 51419		15
Copper Corrosion	ASTM D130	DIN/ISO 2160		No.1
Oxidation Stability	ASTM D2274	IP 306 mod.	mg/100 mL	15 max
Esterification			% volume	98.0 min
Acid Value	ASTM D664	DIN 51558	mg NaOH/g	0.5 max
Methanol Content	GC Method	DIN 51608	% weight	0.2 max
Monoglycerides	GC Method	DIN 51609	% weight	0.8 max
Diglycerides	GC Method	DIN 51609	% weight	0.2 max
Triglycerides	GC Method	DIN 51609	% weight	0.2 max
Free Glycerin	GC Method	DIN 51609	% weight	0.02 max
Total Glycerin	GC Method	DIN 51609	% weight	1.2 max
Iodine Number	DIN 53241 or IP 84/81	DIN 53241 or IP 84/81	cg I ₂ /g	110 max
Phosphorus Content	DGF C-VI4	DIN 51440-1	mg/kg	0.2

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