

Requirements and Cautions to Use Biodiesel¹ in Detroit Engines

DD13, DD15, DD16 engines: Biodiesel blends up to 5% are allowed
Series 60 Engines: Biodiesel blends up to 20% are allowed*
MBE900 / 4000 Engines: Biodiesel blends up to 5% are allowed

Biodiesel blends above 20% are NOT allowed in any Detroit engines

*Engines built prior to MY2004 may contain materials that are not compatible with biodiesel².
Blends above 5% are not recommended in these engines.

Fuel Quality Requirements³:

- Petroleum diesel fuel must meet ASTM D975 or EN590 (prior to blending)
- Biodiesel must meet ASTM D6751 or EN14214 (prior to blending)
- Biodiesel blends up to 5% must meet ASTM D975 or EN590
- Biodiesel blends up to 20% must meet ASTM D7467
- Biodiesel must be sourced from a BQ-9000 Accredited Marketer or Producer

Additional Cautions:

Fuel filter plugging is more frequent with biodiesel blends

- Biodiesel's solvency can clean fuel systems, depositing debris in filters
- Always carry extra fuel filters on-board
- Synthetic filter media is recommended
- After switching to B20, change fuel filters at half the normal interval for the first two maintenance intervals
- Fuel filter replacement is not to be covered under Detroit Diesel warranty
- Secondary fuel system hardware failure attributable to premature fuel filter plugging with biodiesel blends is not covered under Detroit Diesel warranty.

Oxidative stability

- Biodiesel blends are less stable than diesel fuel and should not be stored for more than 3 months
- Biodiesel blends are not suitable for applications involving low frequency use.
- Before parking an engine for an extended time period, the fuel system must be purged of all biodiesel blends and flushed with petroleum diesel fuel

¹ The term "biodiesel" refers specifically to Fatty Acid Methyl Esters or FAME made through the process of transesterification, as defined in ASTM D6751.

² Biodiesel is not compatible with certain sealing materials, such as nitrile and butyl rubber, or yellow metals, such as copper, bronze and brass, or lead, zinc or galvanized iron.

³ Requirements should be confirmed by fuel supplier; always monitor the Certificate of Analysis from each batch of fuel.

Compatibility with Aftertreatment Systems

- B20 blends are compatible with Detroit's aftertreatment devices (DPF and SCR technology) provided that it meets all quality specifications listed above
- Biodiesel blends contaminated with phosphorus, alkali (Na and K) or alkaline (Ca and Mg) metals, not meeting the specification limits, may lead to premature poisoning and plugging of aftertreatment devices

Cold performance is worsened

- Use of biodiesel blends above 5% are not recommended in colder regions
- The cloud point and cold filter plugging point (CFPP) properties of the fuel on the certificate of analysis should be regularly monitored and compared to expected ambient temperature to be encountered in use⁴.
- Cold flow or anti-gel additives may respond differently to biodiesel blends; consult with the fuel supplier to determine actual performance

Water contamination

- Biodiesel is more friendly to water; it will not separate as easily
- Water separator efficiency is significantly reduced. More frequent changes of fuel coalescers may offset the reduced water separation efficiency.
- ASTM D7261 can be run to determine the fuel's water coalescing ability.
- Excessive water contamination may lead to corrosion in fuel system and promote microbe growth
- Fuel injection system failure due to corrosion caused by use of biodiesel fuel blends will not be covered by Detroit Diesel warranty.

Microorganism growth

- Biodiesel has an increased tendency for microbial growth
- Microbial contamination may cause premature fuel filter plugging and/or corrosion in the fuel system
- Laboratory testing for microbial growth is available. Fuel samples must be collected from the bottom of the tank (water layer) to accurately detect the microbes

Engine oil analysis is required

- Using biodiesel blends may require reduced engine oil drain intervals
- Biodiesel may accelerate acid formation in the engine oil
- Biodiesel fuel dilution is very harmful to the engine oil and will not evaporate from the engine oil as easily as diesel fuel
- Biodiesel fuel dilution will reduce the oil viscosity and accelerate oil degradation, requiring reduced oil drain intervals
- Used oil analysis is required for the first few oil changes after converting to B20 to check for fuel dilution and to confirm the proper oil drain interval. Detroit Genuine Oil Analysis Program is recommended (p/n 23520989).

⁴ Refer to ASTM D975 for tenth percentile minimum ambient air temperatures in the United States.

Warranty implications:

- Detroit Diesel is not responsible for the cost of maintenance or repairs due to the lack of performance of required maintenance services or the failure to use fuel, oil, lubricants, and coolants meeting Detroit Diesel-recommended specifications. Performance of required maintenance and use of proper fuel, oil, lubricants, and coolants are the responsibility of the owner. For full details, see the engine operator's guide for your engine.
- Using biodiesel blends does not automatically void Detroit Diesel's warranty. However, any failure, including aftertreatment devices and fuel injection system failures, caused by biodiesel blends not meeting the requirements documented in this publication will not be covered by Detroit Diesel warranty.

If purchasing your own fuel, continuously monitor the certificate of analysis from each batch of fuel delivered, even if you buy from a reputable biodiesel manufacturer. Critical parameters include biodiesel percent, oxidation stability, acid number, free and total glycerin, Na & K, Ca & Mg, water content and cloud point – see Table 1 for limits

Table 1: Critical Biodiesel Properties and Potential Effects of Poor Quality Fuel

Biodiesel Property	Method	Limit	Potential Effect
Biodiesel Percent	ASTM D7371	20%, max	High injector pressures Low oxidation stability Increased acidity Poor cold flow properties
Oxidation Stability - On B20 Blend - On B100	EN 14112	6 hours, min 3 hours, min	Fuel degradation Plugged fuel filters Fuel system deposits Fuel system corrosion
Acid Number	ASTM D664	0.3 mgKOH/g, max	Fuel degradation Plugged fuel filters Fuel system deposits Fuel system corrosion
Free Glycerin Total Glycerin (on B100)	ASTM D6584	0.020%, max 0.240%, max	Plugged fuel filter Fuel system deposits Injector fouling
Na & K Ca & Mg (on B100)	EN 14538	5 ppm, max 5 ppm, max	Injector fouling Piston deposits ATS fouling
Water Contamination	ASTM E203	200 ppm, max	Plugged fuel filter Fuel system corrosion
Water Separation Efficiency	ASTM D7261	70%, min	Fuel system deposits Fuel system corrosion
Cloud Point	ASTM D2500	≥ Ambient Temp	Plugged fuel filters Inadequate cold flow