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## DETROIT™ BIODIESEL POLICY:

### WHAT IS BIODIESEL?

The term “biodiesel” (B100) refers to a first generation biofuel that consist of medium to long chain fatty acid methyl esters (FAME), and is typically made from vegetable oil, animal fats, used cooking oil, or greases. This fuel is typically created by a process called trans-esterification and is generally blended at a rate of 5-20% (B5-B20) by total volume with petroleum based diesel.

Biodiesel is not “Renewable Diesel.” Renewable Diesel (R100/BTL/HVO) is an alternate biofuel that can be made from the same renewable feedstocks as biodiesel. Detroit Diesel is currently evaluating renewable diesel, and will issue a separate policy statement when the evaluation is complete.

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### ENGINE COMPATIBILITY<sup>1</sup>:

#### **DD5, DD8, DD13, DD15, DD16, MBE900 & MBE4000 Engines:**

- Biodiesel blends up to 5% are compatible provided it meet the specifications listed in this document.

#### **Series 60 Engines:**

- Series 60 engines manufactured prior to 2004 are not recommended to run biodiesel<sup>2</sup> blends higher than 5% provided it meet the specifications listed in this document.
  - Series 60 engines manufactured after 2004 are compatible with biodiesel blends up to 20% provided it meet the specifications listed in this document.
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### GOVERNMENT MANDATES OF BIODIESEL BLENDS IN EXCESS OF 5%:

Detroit Diesel does not warrant damage caused by the use of unapproved fuels. If you are operating in a jurisdiction where biodiesel blends of 6-20% are mandated by law, to minimize the potential for unwarrantable engine damage, Detroit Diesel recommends the following:

- Follow the oil change intervals published [Lube Oil / Fuel / Filter Requirements](#) manual.
- Replace fuel filters at ½ the recommended service intervals published in the engine owner’s guide.
- Biodiesel blends are less stable than diesel fuel and should not be stored for more than 1 month.
- Whenever possible purchase fuel from retailers that sell TOP TIER Diesel Fuel.

<sup>1</sup> Requirements should be confirmed by fuel supplier; always monitor the Certificate of Analysis from each batch of fuel.

<sup>2</sup> 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.

**BIODIESEL FUEL QUALITY REQUIREMENTS:**

- Biodiesel blends up to 5% (B5) must meet ASTM D975, or CAN/GCSB- 3.520 at a minimum, and DETROIT™ requirements detailed in Table 1.
- <sup>3</sup>Biodiesel blends from 6% to 20% (B6- B20) must meet ASTM D7467 or CAN/GCSB-3.522 at a minimum and DETROIT™ requirements detailed in Table 1.
- Biodiesel blendstocks (B100) must meet ASTM D6751, CAN/CGSB-3.524, or EN 14214 at a minimum, and DETROIT™ requirements detailed in Table 1.

Detroit Diesel recommends the use of Top Tier™ Diesel Fuel for use in DETROIT™ Engines. This standard is a voluntary retailer program that has supplemental requirements that exceed ASTM standards, and also has provisions for quality control of the fuel distribution. Look for the Top Tier™ logo at retailers as this diesel fuel will generally meet all Detroit Diesel recommendations.



**Table 1: Supplemental Fuel Property Requirements for DETROIT™ Engines:**

Fuel Property		Test Method	#1 or #2 Diesel Fuel & B5	<sup>3</sup> B6-B20 Blends	B100	
Base Specification for fuel		-	ASTM D975 or CAN CGSB 3.520	ASTM D7467 or CAN CGSB 3.522	ASTM D6751 or CAN CGSB 3.524 or EN14214	
Supplemental Requirements	Biodiesel Content, % (V/V)	ASTM D7371 / EN 14103	≤5	6-20	100	
	Total Water Content, ppm	ASTM D6304 / EN 12937	200	200	200	
	Sediment, ppm	ASTM D2276	24	24	24	
	Copper strip corrosion rating, max (3 h at a minimum control temperature of 50°C)	ASTM D 130	No. 1	No. 1	No. 1	
	Lubricity, HFRR @ 60°C, micron, max	ASTM D6079 / EN 12156-1	460	460	-	
	Conductivity, pS/m or Conductivity Units (C.U.), min	ASTM D2624 OR D4308	25	-	-	
	Acid Number, mg KOH/g, max	ASTM D664 OR D974 / EN 14104	0.08	0.1	0.3	
	Oxidation Stability, hours, min	EN 15751	>24	>20	>8	
	Oxidation Stability, PetroOxy Test, min	ASTM D7545	>60	-	-	
	Calcium & Magnesium Combined, ppm	EN 14538	<1	<1	2	
	Sodium & Potassium Combined, ppm	EN 14538	<1	<1	2	
	Free Glycerin, % mass	ASTM D6584 / EN14105	-	-	0.02	
	Total Glycerin, % mass	ASTM D6584 / EN14105	-	-	0.24	
	Glyceride Content	Mono Di Tri	EN14105	-	-	0.80% 0.20% 0.20%

<sup>3</sup> Requirements listed for Series 60 engines manufactured after 2004 only.

**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 of the engine or aftertreatment device that is determined to be caused by biodiesel blends not meeting the requirements documented in this publication will not be covered by Detroit Diesel warranty.

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**ADDITIONAL CAUTIONS:**

**Fuel Filter Plugging:**

- Due to biodiesel's solvency, it can clean fuel systems and deposit debris on filters and lead to premature plugging immediately after switching to biodiesel.
- If running with biodiesel blends higher than 5%, fuel filters should be changed at ½ the recommended service intervals published in the engine owner's manual. This is due to accelerated filter plugging from glycerides.
- Fuel filter replacement is not to be covered under Detroit Diesel warranty. Detroit Diesel recommends the use genuine Detroit Diesel fuel filters.
- Secondary fuel system hardware failure attributable to premature fuel filter plugging with biodiesel blends is not covered under Detroit Diesel warranty.

**Storage & Oxidative Stability:**

- Biodiesel blends are less stable than diesel fuel and should not be stored for more than 1 month.
- 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.

**Compatibility with Aftertreatment Systems:**

- 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.
- Biodiesel blends will reduce the performance of the diesel oxidation catalyst and may result in the use of more parked particulate filter regeneration.

Cold Weather Performance:

- Use of biodiesel blends above 5% is 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 use.
- Cold flow or anti-gel additives may respond differently to biodiesel blends; consult with the fuel supplier to determine actual performance.

Water Contamination:

- Water is more difficult to separate from biodiesel as compared to diesel fuel. This significantly reduces water separator efficiency. More frequent changes of fuel coalescers may offset the reduced water separation efficiency.
- 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:

- Using biodiesel blends may require reduced engine oil drain intervals. Strictly follow the oil change intervals published [Lube Oil / Fuel / Filter Requirements](#) manual (DDC-SVC-BRO-0001).
- 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 biodiesel blends to check for fuel dilution and to confirm the proper oil drain interval. Detroit Genuine Oil Analysis Program is recommended.