

Biodiesel is a legally registered fuel and fuel additive with the U.S. Environmental Protection Agency. Biodiesel fuel has chemical properties that are very similar to conventional diesel fuel, and does not require any engine modifications or new equipment to enable its use as a blend stock or substitute for conventional diesel.

Unlike conventional diesel fuel, biodiesel is a 100% renewable fuel, and significantly reduces levels of harmful pollutants and global warming gases. Biodiesel has also proved to be much more efficient than conventional diesel in its total lifecycle or 'well-to-wheels' total fossil fuel consumption. According to a recent study by the U.S. Department of Energy, when petroleum consumption for production, transportation and distribution is accounted for, "The energy yield of biodiesel is 280% greater than petroleum diesel fuel." Biodiesel can also make a meaningful contribution to national energy security by displacing up to 10% of current U.S. diesel consumption by 2020.

With these important benefits in mind, biodiesel distributors and users should also be aware of the specifications that govern biodiesel quality, and understand the differences in key performance parameters versus conventional diesel.

Engine Performance

Biodiesel has a higher cetane number, which means that biodiesel fuel will ignite more easily in a diesel engine while also reducing engine noise. Biodiesel's higher cetane number offsets its lower BTU content, thus resulting in a negligible difference in overall fuel economy. With over 16 million miles of testing by various groups and agencies, it has been demonstrated that biodiesel usage produces a similar level of torque, horsepower and fuel economy as that achieved by using conventional diesel fuels.

Lubricity of diesel fuel depends on specific components in the fuel to prevent wear on contacting metal surfaces in critical engine parts such as the fuel injection pump or fuel injector. Low lubricity diesel fuel may cause high wear and scarring whereas high lubricity fuel may provide reduced wear and longer component life. Biodiesel fuel blends offer significantly higher lubricity than conventional diesel; a B2 biodiesel blend (conventional diesel with 2% biodiesel) can provide up to a 65% improvement in lubricity.

Cold Weather Performance

Conventional diesel can start to cloud or even gel in cold weather. Biodiesel fuels have similar cold weather limitations but have higher cloud and pour points. However, these limitations are largely mitigated when using B20 biodiesel fuel. During sustained below-freezing temperatures, cold weather performance can be managed via the use of cold flow additives or using a winter grade diesel in the biodiesel blend. Please refer to our "introduction to Biodiesel and Guidelines for Usage" for more information about using biodiesel.

Biodiesel Specifications

B100 biodiesel fuel quality is governed by the ASTM D6751 specification. ASTM is a standards group comprised of engine and fuel injection equipment manufacturers, fuel producers, and fuel users whose standards are recognized in the U.S by governmental entities, including state agencies responsible for ensuring fuel quality. So called "biofuels" or "biodiesel fuels" that do not meet the ASTM standard outlined below are not legally biodiesel fuels and should not be used in diesel engines.



Fuel Specifications

Table 1. ASTM D6751 Biodiesel (B100) Specifications

	Test Method	Limits	Units
Flash Point, Closed Cup	ASTM D93	93 min	° C
Water and Sediment	ASTM D2709	0.05 max	% volume
Kinematic Viscosity @ 40° C	ASTM D445	1.9 - 6.0	mm ² /s
Sulfated Ash	ASTM D874	0.02 max	% mass
Sulfur			
S 15 Grade	ASTM D5453	0.0015 max	% mass
S 500 Grade	ASTM D5453	0.05 max	% mass
Copper Strip Corrosion	ASTM D130	No 3 max	
Alcohol Content (One of the following must be met)			
Methanol Content	EN 14110	0.20 max	% volume
Flash Point, Closed Cup	D93	130 min	° C
Cetane Number	ASTM D613	47 min.	
Cloud Point	ASTM D2500	Report to Customer	° C
Carbon Residue	ASTM D4530	0.05 max	% mass
Acid Number	ASTM D664	0.50 max	mg KOH/g
Free Glycerin	ASTM D6584	0.02	% mass
Total Glycerin	ASTM D6584	0.24	% mass
Phosphorus	ASTM D4951	10 max	ppm
Vacuum Distillation End Point	ASTM D1160	360 ° C max	° C
Oxidation Stability	EN 14112	3 min	hours
Calcium & Magnesium (combined)	EN 14538	5 max	ppm

Table 1 provides detailed information about the ASTM D6751 specification for B100 biodiesel fuel.

Source: American Society for Testing and Materials, Standard Specification for Biodiesel Fuel (B100) Blend Stock for Distillate Fuels, Designation D6751-07 (2007)

Table 2. Selected Properties of Typical No. 2 Diesel and Biodiesel

Fuel Property	Diesel	Biodiesel	Units
Fuel Standard	ASTM D975	ASTM D6751	
Lower Heating Value	~129,050	~118,170	Btu/gal
Kinematic Viscosity @ 40° C	1.3 - 4.1	1.9 - 6.0	mm ² /s
Specific Gravity @ 60° C	0.85	0.88	kg/l
Density	7.079	7.328	lb/gal
Water and Sediment	0.05 max	0.05 max	% volume
Carbon	87	77	wt. %
Hydrogen	13	12	wt. %
Oxygen	0	11	
Sulfur	0.0015	0.0 to 0.0024	wt. %
Boiling Point	180 to 340	315 to 350	° C
Flash Point	60 to 80	130 to 170	° C
Cloud Point	-15 to 5	-3 to 12	° C
Pour Point	-35 to -15	-15 to 10	° C
Cetane Number	40 to 55	47 to 65	
Lubricity SLBOCLE	2,000 to 5,000	>7,000	grams
Lubricity HFRR	300 to 600	<300	microns

Table 2 compares certain key parameters for B100 biodiesel fuel versus conventional petroleum-based diesel fuel.

Source: U.S. Department of Energy, Biodiesel Handling and Use Guidelines (2nd Edition, March 2006)



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