



# BIODIESEL FUEL TESTING

## Maxxam Capabilities

## Maxxam Advantage

## ASTM D6751-11b Testing Requirements and Reasons for Each Test

## Explanations of Testing

Biodiesel is the name of a clean burning alternative fuel, produced from domestic, renewable resources. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend. It can be used in compression-ignition (diesel) engines with little or no modifications. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulphur and aromatics.

Biodiesel is one of the fastest growing markets in Canada and the United States, and Maxxam is well positioned to be part of this growth. As Canada's largest testing laboratory, Maxxam is accredited by the Standards Council of Canada (SCC), to ISO 17025 guidelines, with the ability to analyze biodiesel.

## Maxxam Capabilities

Maxxam began preparing for the analysis of biodiesel in 2002 by expanding our current diesel fuel testing scope. We have invested in the latest technology available and we are able to complete all of the tests required by the ASTM D6751-11b specification.

## Maxxam Advantage

- Extensive experience in fuels testing and an industry leader in the testing of biodiesel
- Voting members of the Canadian General Standards Board Mid-Distillate Committee, which oversees the biodiesel specifications in Canada
- Voting members of ASTM D02 Subcommittee E (Diesel Fuels) which drafted and approved D6751-11b
- Ongoing investments to remain current with changing industry issues by attending and participating in various symposiums and workshops in Canada and the USA on biodiesel
- Participation in the testing round robins to further develop the test methods specifically suited to biodiesel
- Participation in the ASTM Inter laboratory Cross Check Program and International Quality Assurance Exchange Program for biodiesel

# BIODIESEL FUEL TESTING



## ASTM D6751-11b Testing Requirements and Reasons for Each Test

Parameters	Test Method	Indicator of	Possible Field Problems
Acid Number	D664	Unreacted acids, oxidized fuel	Corrosion, plugged filters
Calcium & Magnesium	EN 14538	Processing problems	Filter plugging & engine deposits
Carbon Residue	D4530	Carbon deposition, adulteration	Excessive smoking, increased particulates
Cetane Number	D613	Ignition quality	Poor engine performance, engine knock
Cloud Point	D2500	Crystal formation	Fuel filter plugging, lack of cold weather operability
Cold Soak Filterability	D7501	Feedstock type / processing issues	Filter plugging
Copper Strip Corrosion	D130	Unreacted acids	Corrosion of copper, brass & bronze, fuel system parts
Distillation Temperature	D1160	Impurities or adulteration	Poor engine performance
Flash Point	D93	Unreacted alcohol	Fire risk during handling & storage
Free Glycerin / Total Glycerin	D6584	Unreacted or partially reacted oil or fat	Injector deposits, plugged filters
Kinematic Viscosity 40°C	D445	Adulterants, oxidation	Poor engine performance, plugged fuel filters or fuel system
Methanol Content	EN14110	Unrelated alcohol	Fire risk during handling & storage
Oxidation Stability	EN15751	Over all product quality	Fuel system deposits, filter plugging
Phosphorus Content	D4951	Contaminated feedstock	Damaged or mal-functioning catalytic converters
Sodium & Potassium	EN 14538	Processing problems	Filter plugging & engine deposits
Sulfated Ash	D874	Presence of abrasive solids, unremoved catalyst	Injector, fuel pump, piston & ring wear, filter plugging & engine deposits
Sulphur	D5453	High sulphur feedstock, adulterant	Engine wear, increased emissions
Water & Sediment	D2709	Workmanship / over all production quality	Poor engine performance, fuel filter plugging

## Explanations of Testing

**Acid Number** - Measures the amount of unreacted acids remaining in the finished fuel, & is also an indicator of oxidized fuel.

**Alcohol Content** - Is a measurement of the amount of methanol remaining in the finished product. Methanol in the finished product indicates that the reaction did not go to completion. This methanol can cause serious handling risks.

**Calcium & Magnesium** - May be present in biodiesel as abrasive solids or soluble soaps. Abrasive solids may contribute to engine wear & deposits. Soluble soaps may contribute to engine deposits.

**Carbon Residue** - Measures the carbon depositing tendencies of the fuel.

**Cetane Number** - Is a measure of the ignition quality of the fuel & influences white smoke & combustion roughness.

**Cloud Point** - Is an indicator of the fuels ability to flow at cold temperatures.

**Cold Soak Filterability** - Is a measurement of the fuel suitability for use in cold temperatures. Feedstock, degree of saturation of the fatty acid chains & the esterification alcohol all play a role in the cold flow properties of the fuel.

**Copper Strip Corrosion** - Is a measure of possible corrosion problems with copper & brass or bronze parts of the fuel system.

**Distillation** - Is an indicator of the purity of the finished fuel. Adulteration of the fuel with higher boiling components affects engine performance.

**Flash Point** - The flash point for biodiesel is used to determine the level of unreacted alcohol remaining in the finished fuel. Flash point measurement is critical to safe handling & storage of this fuel.

**Oxidation Stability** - Is a measure of the fuels ability to maintain its properties & resist forming various acids & polymers, under a variety of operating & storage conditions. Poor oxidation stability in fuels will cause fuel system deposits & fuel filter plugging.

**Phosphorus** - High levels of phosphorus in the fuel can affect the functionality of the catalytic converters.

**Total Glycerin/Free Glycerin** - Is used to determine the level of glycerin in the fuel & includes the free glycerin & the glycerin portion of any unreacted or partially reacted oil or fat. High levels of free glycerin can cause injector deposits, as well as clogged fuelling systems, & result in a buildup of free glycerin in the bottom of storage & fuelling systems.

**Viscosity** - The viscosity affects the engine's fuel systems ability to move the fuel through the fuel pump & injectors.

**Sodium & Potassium** - May be present in biodiesel as abrasive solids or soluble soaps. Abrasive solids may contribute to engine wear & deposits. Soluble soaps may contribute to engine deposits.

**Sulfated Ash** - Ash forming materials (abrasive solids & unremoved catalysts) can contribute to injector, fuel pump, piston & ring wear, & also to engine deposits. Soluble metallic soaps have little effect on wear but may contribute to filter plugging & engine deposits.

**Sulphur** - The sulphur content of the fuel affects the amount of engine wear & deposits. Fuel sulphur can also affect emissions control systems performance.

**Water & Sediment** - Is a measure of the workmanship of the fuel manufacturer. The biodiesel fuel shall be visually free of undissolved water, sediment, & suspended matter.

Maxxam is the Canadian market leader in analytical services and solutions to the energy, environmental, food and DNA industries and a member of the Bureau Veritas Group of companies – a world leader in testing, inspection and certification services. We support critical decisions made by our customers through the application of rigorous science and the knowledge and expertise of our over 2500 employees.

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