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Life-changing Research and Development

ASTM BIODIESEL SPECIFICATION D 6751-07a

JOHN MORRISON

john.morrison@matricresearch.com

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**Chemical and Environmental
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Health and Life Sciences



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Keith Pauley

Keith.Pauley@matric.cc

800-611-2296

www.matric.cc

What Is ASTM?

- **ASTM – International
(American Standard for Testing Materials)**
- **In the beginning, a group of scientists and engineers established standards for steel to prevent rail breakage in the burgeoning railroad industry**
- **ASTM was established in 1898**
- **Volunteer organization of **producers** and **users** with over 30,000 members in over 100 countries – More than 12,000 Standards are maintained**



What Is ASTM?

- **Specification and Method Standards are generated and approved by work groups, sub-committees, committees and finally by the entire ASTM Membership**

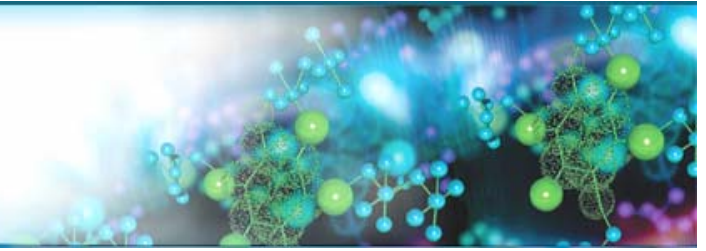
- **At all levels, standards are approved by vote and members may vote Affirmative, Affirmative with Comment, Negative, or they may Abstain**

“NEGATIVE!”

- **Thus, Standards are largely formed By Consensus**



Why Do WE Care About ASTM Standards?

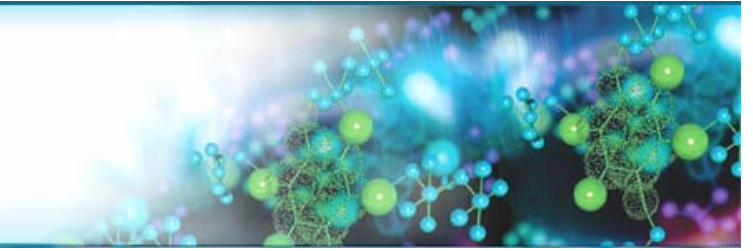


- **ASTM Standards ensure that products are manufactured to an industry and user defined and accepted quality**
- **The quality of many products we use every day are defined by ASTM Standards**



- **There are 29 different ASTM Committees and Sub-Committees that work to define the quality of various sports equipment such as bicycles, camping softgoods, fitness equipment, headgear and helmets**

Why Do WE Care About ASTM Standards?



- When we are flying at 30,000 feet, aren't we glad ASTM Standard D 6227-04a defines the quality of aviation fuel
- When we refuel our automobile, aren't we glad ASTM Standard D 4814-07 defines the quality of that gasoline
- If we are going to use Biodiesel, it is essential that it be as reliable as our aviation and automobile fuels



Why Do We Want ASTM to Define Biodiesel Quality?

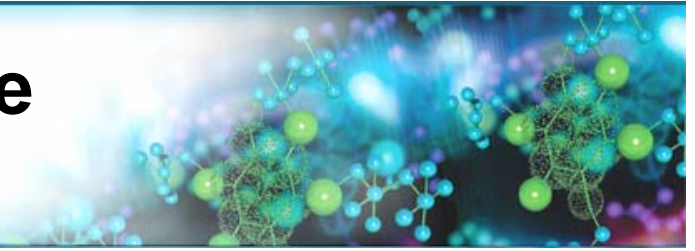


- Biodiesel can be produced from many different renewable sources which can reduce the dependence on oil
- Biodiesel contains no aromatics, almost no sulfur, ~10% more oxygen than oil, and almost half again more energy than ethanol
- Biodiesel is environmentally friendly

Average B100 and B20 emissions compared to normal diesel

<i>Emission</i>	<i>B100</i>	<i>B20</i>
Carbon monoxide	-48%	-12%
Total unburned hydrocarbons	-67%	-20%
Particulate matter	-47%	-12%
Nitrogen oxides	+10%	+2%
Sulfates	-100%	-20%
Air toxics	-60% to -90%	-12% to -20%
Mutagenicity	-80% to -90%	-20.0%

Why Do WE Want ASTM to Define Biodiesel Quality?



- There are also Government Incentives to Produce Biodiesel



- But, when the quality of Biodiesel is not well controlled, there have been numerous problems, such as clogged engine filters
- There are Profit and Environmental Incentives for Biodiesel, but Sacrificing Quality can lead to Problems which may Destroy the Biodiesel Market

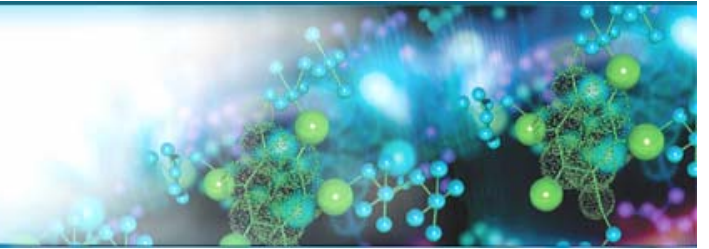


An ASTM Specification was Needed

- Biodiesel was a perfect case for users and producers with a vested interest in Buying and Selling Biodiesel to develop an ASTM Specification for Biodiesel



ASTM Structure



- **Biodiesel is under the Jurisdiction of ASTM Committee D02, Petroleum Products and Lubricants and**
- **Sub-Committee D02.E0, Burner, Diesel, Marine and Industrial Gas Turbine Fuels**
- **ASTM has developed ASTM Specification 6751.07a for refined Biodiesel**



ASTM Biodiesel Specification D 6751

TABLE 1 Detailed Requirements for Biodiesel (B100) (All Sulfur Levels)

Property	Test Method ^A	Grade S15 Limits	Grade S500 Limits	Units
Calcium and Magnesium, combined	EN 14538	5 max	5 max	ppm (µg/g)
Flash point (closed cup)	D 93	93 min	93 min	°C
Alcohol Control				
One of the following must be met:				
1. Methanol content	EN 14110	0.2 max	0.2 max	% volume
2. Flash point	D 93	130 min	130 min	°C
Water and sediment	D 2709	0.050 max	0.050 max	% volume
Kinematic viscosity, 40°C	D 445	1.9–6.0 ^B	1.9–6.0 ^B	mm ² /s
Sulfated ash	D 874	0.020 max	0.020 max	% mass
Sulfur ^C	D 5453	0.0015 max (15)	0.05 max (500)	% mass (ppm)
Copper strip corrosion	D 130	No. 3 max	No. 3 max	
Cetane number	D 613	47 min	47 min	
Cloud point	D 2500	Report ^D	Report ^D	°C
Carbon residue ^E	D 4530	0.050 max	0.050 max	% mass
Acid number	D 664	0.50 max	0.50 max	mg KOH/g
Free glycerin	D 6584	0.020	0.020	% mass
Total glycerin	D 6584	0.240	0.240	% mass
Phosphorus content	D 4951	0.001 max	0.001 max	% mass
Distillation temperature, Atmospheric equivalent temperature, 90 % recovered	D 1160	360 max	360 max	°C
Sodium and Potassium, combined	EN 14538	5 max	5 max	ppm (µg/g)
Oxidation Stability	EN 14112	3 minimum	3 minimum	hours

^A The test methods indicated are the approved referee methods. Other acceptable methods are indicated in 5.1.

^B See X1.3.1. The 6.0 mm²/s upper viscosity limit is higher than petroleum based diesel fuel and should be taken into consideration when blending.

^C Other sulfur limits can apply in selected areas in the United States and in other countries.

^D The cloud point of biodiesel is generally higher than petroleum based diesel fuel and should be taken into consideration when blending.

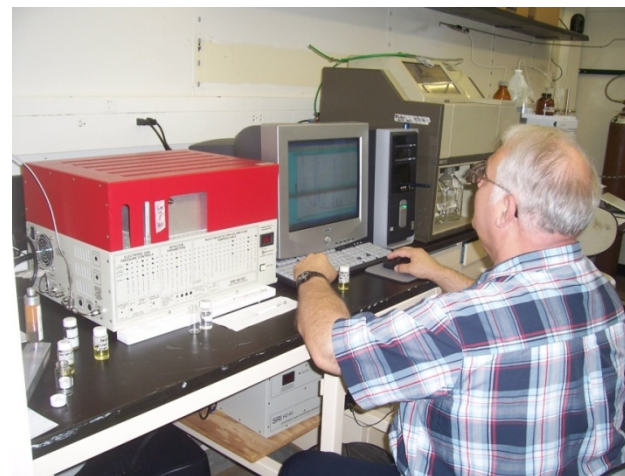
^E Carbon residue shall be run on the 100 % sample (see 5.1.11).

ASTM Biodiesel Specification D 6751

National Biodiesel Board BQ-9000 Critical Specification Testing

ASTM D 93 Flash Point	93° C, min
ASTM D 2500 Cloud Point	Report, °C
ASTM D 5453 Sulfur, Max	15 ppm, 500 ppm
EN 14112 Oxidative Stability	3 Hours, min
ASTM D 6584 Free Glycerin	0.02 % mass, max
ASTM D 6584 Total Glycerin	0.24 % mass, max
ASTM D 2709 Water & Sediment	0.050 % vol , max
ASTM D 664 Acid Number	50 mg KOH/g max

Workmanship Free of undissolved water, sediment & suspended matter



ASTM Biodiesel Specification D 6751

Other ASTM D 6751 Requirements

EN 14538 Calcium & Magnesium combined

5 ppm, max

Alcohol Control (one of the following must be met)

EN 14110 Methanol Content
ASTM D 93 Flash Point

0.2 % vol , max
130°C, Min

ASTM D 445 Kinematic Viscosity, 40°C

1.9 – 6.0 mm²/sec

ASTM D 874 Sulfated Ash

0.02 % mass, max

ASTM D 130 Copper Strip Corrosion

No. 3 max.



ASTM Biodiesel Specification D 6751

Other ASTM D 6751 Requirements

ASTM D 4951 Phosphorus Content	0.001 % mass, max
ASTM D 1160 Distillation temperature Atmospheric equivalent temperature, 90% recovered	360°C, max
EN 14538 Sodium & Potassium, combined	5 ppm, max
ASTM D 4530 Carbon Residue	0.05 % mass, max
ASTM D 613 Cetane	47 min

ASTM Biodiesel Specification D 6751

Strict Adherence to Specification D 6751 is essential for BOTH producers and users to maintain a growing market for Biodiesel

To establish ASTM Specification D 6751 testing is expensive

Execution of Specification D 6751 requires skilled and trained personnel

ASTM Specification D 6751 is located on the Internet at <http://astm.org>