

Biodiesel Fuel Quality Update

Unlocking the Key to Successful Biodiesel Use

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Biodiesel Standard Philosophy

◆ Develop Stand Alone Specification

- Biodiesel producers will be different companies than Petrodiesel producers
- Based on potential markets, a pure biodiesel trading standard is needed
- If fuel meets pure biodiesel spec, it can be blended with diesel in any percentage
- Similar to status of # 2 and kerosene



Biodiesel Standard Philosophy

◆ Base the Specification on Physical and Chemical Attributes

- Not on Feedstock Source
 - Most likely will be mixtures of oils and fats
- Not on Processing Methods
 - Similar to how petrodiesel specs are set
- Base it on the Properties Needed for Satisfactory Operation of the Vehicle and Engine



Biodiesel Standard Philosophy

- ◆ Start with D 975
- ◆ Eliminate Specifications Not Applicable to Biodiesel:
 - Distillation Curve
 - Cetane Index
 - Aromatics



Biodiesel Standard Philosophy

- ◆ Extend to D 975 Tests as it is Updated

Extend to Biodiesel Specific Properties:

- Acid Number
- Total Glycerin
- Free Glycerin
- Phosphorous



Written Definition

- ◆ *biodiesel*, n. -- a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.
- ◆ *biodiesel blend*, n. -- a blend of biodiesel fuel with petroleum-based diesel fuel designated BXX, where XX is the volume percent of biodiesel.

A vintage key with a circular head and a notched bit, resting on a textured, light-colored surface. The key is positioned vertically on the left side of the slide.

Biodiesel (B100) Written Definition

◆ Eliminates:

- Coal Slurries
- Raw Vegetable Oils and Fats
- Non-Esterified Oils
- Partially Esterified Oils
- Blends With Diesel
- Non Ester Renewable Diesel

◆ Needed to secure auto, engine, and fuel injection equipment OEM acceptance



ASTM Current Status

- ◆ ASTM D 6751 is the approved standard for B100 to be used for blending in the US
- ◆ ASTM D 6751 has two grades
 - S500
 - S15 (Almost all biodiesel is already S15)
- ◆ If B100 meets D 6751 and petrodiesel meets D 975, the two can be blended up to 20%
 - Similar to how #1 and #2 diesel are managed
- ◆ The MOST important factor is B100 meeting D 6751 prior to blending

Biodiesel ASTM – D 6751-07a

<u>Property</u>	<u>Test Method</u>	<u>Limits</u>	<u>Units</u>
Calcium & Magnesium	EN 14538	5 max	ppm (ug/g)
Flash Point	D 93	93 min.	degrees C
Alcohol Control, either			
Flash Point	D 93	130 min	degrees C
Methanol	EN 14110	0.2 max	vol %
Water & Sediment	D 2709	0.05 max.	% volume
Kin. Viscosity, 40C	D 445	1.9 - 6.0	mm ² /sec.
Sulfated Ash	D 874	0.02 max.	% mass
Sulfur S500	D 5453	0.05 max (500)	% mass (ppm)
S15	D 5453	0.0015 max (15)	% mass (ppm)
Copper Corrosion	D 130	No. 3 max	
Cetane number	D 613	47 min	
Cloud Point	D 2500	Report	degrees C
Carbon Residue	D 4530	0.05 max.	% mass
Acid Number	D 664	0.50 max.	mg KOH/g
Free Glycerin	D 6854	0.020	% mass
Total Glycerin	D 6854	0.240	% mass
Phosphorous content	D 4951	0.001 max	% mass
Distillation, T90 AET	D 1160	360 max	degrees C
Na/K, combined	EN 14538	5 max	ppm (ug/g)
Oxidation Stability	EN 14112	3 min	hours
Workmanship	Free of un-dissolved water, sediment and suspended matter		

BOLD = BQ-9000 Critical Specification Testing Once Production Process Under Control



ASTM Biodiesel Ballots June 07

- ◆ Improvements and changes to D 6751
- ◆ Incorporation of up to 5% biodiesel into the petrodiesel ASTM standard D 975
- ◆ Incorporation of up to 5% biodiesel into the petrodiesel heating oil ASTM standard D 396
- ◆ A new stand alone specification for a finished B6 to B20 blend
 - This will be a new number
- ◆ Specifications for B6 to B19, B21 to B99, B100 lower priority, no efforts until above is completed

NREL Survey Results

Released: Fall 2006

- ◆ Part of B20 Fleet Evaluation Team Efforts
- ◆ 50% of the samples tested at distribution locations in Spring 2006 did not meet one or more D 6751 parameters
- ◆ Mostly flash point and total glycerine
- ◆ Total glycerin is the SAME issue that caused the Minnesota B2 problems
- ◆ Some flash point problems may not be real issues




Industry Response

- ◆ **The National Biodiesel Board and Petroleum Marketers Association of America released a Joint Biodiesel Winter Weather Advisory**
- ◆ **The industry's response included the following actions:**
 - Stepped up a fuel quality outreach program to federal and state agencies with authority to test biodiesel at the plant / terminal levels to enforce fuel quality (IRS, EPA, USDA, state Departments of Weights & Measures)
 - Developed an online Fuel Quality Enforcement Guide, as well as posted the NBB Fuel Quality Policy at www.biodiesel.org/resources/fuelqualityguide
 - Issued recommendations to users that include buying fuel from BQ-9000 certified marketers and accredited producers



Biodiesel Winter Weather Advisory

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- ◆ **The NBB and PMAA advised its members to take the following actions:**
 - Buy fuel from BQ-9000 accredited producers or certified marketers. Become a certified marketer.
 - Work with a reputable supplier who you have a good relationship with who will stand behind the product.
 - Require an actual certificate of analysis on every load.
 - Know cold flow properties of both the ULSD and biodiesel before blending.
 - Observe all proper handling and storage procedures, and carefully review the materials available online. Those materials include:
 - Fuel Quality and Performance Guide
 - Biodiesel Handling and Use Guidelines
 - Cold Weather Blending Report
 - Fuel Handling Training Video

BQ 9000 Program

- Biodiesel Industry's Good Housekeeping™ seal of approval for biodiesel production and distribution companies
- ASTM Grade Fuel, BQ-9000 Companies





Fuel Quality - Enforcement

- ◆ Encourage Government adoption and enforcement of ASTM D 6751
 - State Divisions of Weights and Measures
 - Internal Revenue Service (IRS), others....





Fuel Quality - Enforcement

- ◆ Emphasis on quality is working!
- ◆ Minnesota operated B2 successfully all winter in 2006/2007
- ◆ 18 BQ-9000 approved producers
- ◆ 7 BQ-9000 approved marketers
- ◆ States need to continue to adopt and enforce D 6751 and encourage BQ-9000