Biodiesel Technical Update for Purdue Road School

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ASTM Specifications and Biodiesel Fuel Quality
ASTM Biodiesel Standards

• 1993: ASTM Biodiesel Task Force began
  – Initial Focus: On/Off road diesel applications

• 2001: ASTM D6751, B100 Blend Stock
2008

- ASTM D975: On/Off Road up to B5

- ASTM 7467: On/Off Road B6-B20
Significant Changes With Diesel Fuel and Diesel Engines

- Ultra Low Sulfur Diesel
- High Pressure Common Rail Fuel Systems
- Engine Exhaust After-Treatment Systems:
  - Diesel Oxidation Catalysts
  - Particulate Matter Traps
  - SCR systems for NOx
Continuous Updates to D6751: Feb 2013

Originally published in 2002: ASTM D6751-02
-03:  Added 15 ppm sulfur grade
-03a: Modified ‘middle distillate’ term, lubricity note
-06:  Reduced AV from 0.8 to 0.5; added limit on Na+K.
-06a: Added limit on Ca+Mg
-06b: Addition of oxidation stability
-07:  Modified language and added test methods
-07a: Added alcohol control and modified flashpoint
-07b: Added DCN and sulfur test methods
-08:  Addition of cold soak filterability

Introduction of B5 into D975 and publication of D7467 (B6 to B20 Standard)
-09:  Added cloud point test methods
-09a: Added cloud point test methods
-10:  Added EN15751 as referee method for stability
-11:  Added test methods and appendix on low temperature operability
-11a: Replaced cold soak filterability annex with D7501
-11b: Added new test methods
-12:  Addition of 1B Grade, updated scope, new test methods

Continuous evolution to address OEM and end-user concerns
Biodiesel Industry’s equivalent to an ISO 9000 program

NBB implemented BQ-9000 as a means to help instill confidence with users and equipment companies

There are now four BQ-9000 designations:
- Producer (make it to spec)
- Marketer (buy spec, keep in spec, blend it well)
- Certified Laboratories (test fuel accurately)
- Retailer (fuel quality management practices)
U.S. Biodiesel & Renewable Diesel Market
(millions of gallons)
Source: EPA EMTS*

*Volumes reported under the RFS in the D4, D5, and D6 categories.
**EMTS through November. Estimate for December based on 11-month average.
Key ASTM Standards Changes are Working, Quality Increasing

- Oxidative Reserve Standard
- Cold Soak Filtration Test
- Number 1 Grade of B100
- 90+% US Volume in BQ-9000 Program
- 6751 Legal Standard in 49 States
- Most OEMs now support B20
Higher Blends Available Nationwide, Often Blended by Major Retailers

- Retailers nationwide sell B10 - B20 blends
- Especially on main truck routes

U.S. Retailers Selling Biodiesel Blends of B10 to B20

Source: NBB; Company websites
S.K. DAVISON, INC.

**B20 Facts on S. K. Davison**

- **183,018 gallons of B20 used annually**
- **7,558 trees planted**
- **28 fleet vehicles running on biodiesel**
- **Annual reduction of 120 pounds in particulate matter**

Funded by the Illinois soybean checkoff.
Key Factors with Biodiesel Success

• Improved biodiesel standards and fuel quality
  – Getting in-spec B100 to use for blending (i.e. BQ-9000)
  – Implementation of CSFT in 2008/9 was huge improvement

• Knowing (and managing) the cold flow properties of your diesel and biodiesel and finished blends
  – Cold flow is impacted by both biodiesel and petrodiesel
  – Cold flow additives work with B20 (some optimized for B20)
  – In cold weather, most folks use the No. 1 grade of B100 for blending

• Good housekeeping (which should be done w/ diesel!)
  – Monitor/drain water bottoms, especially in fall
  – Periodic sampling for water/haze, acid number
    • Especially if un-used for more than a year
Biodiesel Driving Forces
Biodiesel Improves Diesel Properties

- Blends with petrodiesel in any percentage
  - Once it is blended it does not separate back out
- Higher Cetane
  - Over 50 vs. average petrodiesel around 44
  - Smoother, more complete burn
- Higher Lubricity
  - 2% biodiesel ‘fixes’ even bad diesel
- Virtually Zero Sulfur
  - Meets ULSD limits of 15 ppm or less
- Zero Aromatics Reduces Toxicity and Burns Cleaner
- 11% Oxygen Provides Superior Lubricity and Reduces Black Smoke (Particulates)
- High Flash Point Makes it Safer
  - Non hazardous shipping (over 200 F)
Biodiesel’s Low Carbon Footprint

Biodiesel Reduces Global Warming

- 80% Overall Reduction in Carbon Emissions
  - Meets EPA RFS ‘Advanced Fuel’ Definition
  - B20 Provides 16% Carbon Reduction

- Biodiesel Generates RFS2 RINs
  - Biomass Based Diesel Category
  - Advanced Category
Biodiesel is Making a Difference

2015 US Biodiesel Marketplace

2.1 BILLION GALLONS OF BIODIESEL USED

3.8 MILLION CARS

REDUCED BY 18.2 MILLION METRIC TONS

PLANTING 466 MILLION TREES

ANNUAL GREENHOUSE GAS EMISSIONS OF

PROTECTING 14.9 MILLION ACRES

MATURE FORESTS
A gallon of biodiesel cannot be produced without co-producing 30 lbs. of protein and 22 lbs. of carbs and dietary fiber.
Iowa

- Consumption Incentives
  - Retailer Tax Credit:
    - 3.5 cents per gallon on B5;
    - 5.5 cents per gallon on B11.
  - Fuel Tax Differential:
    - 3 cents per gallon fuel tax differential on blends above B10.
Iowa Diesel Market 2015

- Straight Diesel
- B11-B19
- B5-B10
- >B20
- B1-B4
Minnesota

• B10 required statewide currently*.
• B20 required statewide beginning May 1, 2018.

*Note: B5 required Oct 1st through March 30th.
New York City

• Citywide Bioheat® Standard:
  – B5 in 2017.
  – B10 in 2025.
  – B15 in 2030.
  – B20 in 2034.
Illinois

• 6.25% Sales Tax on Diesel
  – In addition to state and federal road tax

• Entire 6.25% is waived if more B11 or higher is used

• B11 – B20 blends are approximately 70% of the market in Illinois
Conclusions

• State policies have induced blends in many states into the B11-B20 range.

• Customers are using B11-B20 without issue

• State policies are beginning to induce blends above B20.
B20 FACTS ON G&D INTEGRATED

1,764,701 gallons of B20 used annually

72,893 trees planted

411 fleet vehicles running on biodiesel

1,524 pounds in particulate matter reduced annually

Funded by the Illinois soybean checkoff.
OEM Support for Biodiesel
Biodiesel Ranks First Among Fleets for Alternative Fuel Use in 2016!

• According to the 2016 Fleet Purchasing Outlook study conducted by the NTEA – The Association for the Work Truck Industry – biodiesel is now the most commonly used alternative fuel option on the market.

• **Survey data shows 18 percent of fleets use biodiesel now – up from 15 percent in 2015.**

• In terms of future alternative fuel interest, biodiesel also takes top honors, with more fleets planning to acquire or continue using biodiesel than any other alternative fuel option.

• **Biodiesel represents an easy and cost-effective way for fleets to improve their performance and environmental profile**
OEM Biodiesel Support

• All major OEMs producing diesel vehicles for the U.S. market support at least B5 biodiesel blends

• Over 90% now support B20 in all the production coming off production lines

– Note: OEMs still cover their parts and workmanship warranty for higher blends than recommended, fuel related problems are not covered with biodiesel or petrodiesel
OEMs Supporting B20
OEMs Supporting B20

*Models equipped with Cummins engines are B20 approved. See NBB website for details.
New in 2016:

• **Full B20 approval in new and legacy model** PACCAR MX-11 and MX-13 engines for Heavy Duty trucks, as well as in PX-7 and PX-9 Engines for Medium Duty trucks.

• Now the entire diesel fleet of Peterbilt and Kenworth Medium and Heavy Duty trucks are approved for use with B20 Biodiesel Blends
General Motors has announced it will have 20 different diesel vehicle model options available in the U.S. market in 2017-2018 – all of which are approved for use with B20:

- **Chevrolet Express** full-size vans (Cargo, Passenger, Cutaway)
- **Chevrolet Low Cab Forward** commercial truck
- **Chevrolet Colorado** mid-size pickup
- **Chevrolet Silverado** (2500HD, 3500HD, Chassis Cab) full-size pickups
- **Chevrolet Equinox** CUV
- **Chevrolet Cruze** (Sedan, Hatchback)
- **GMC Savana** (Cargo, Passenger, Cutaway) full-size vans
- **GMC Sierra** (2500HD, 3500HD, Chassis Cab) full-size pickups
- **GMC Canyon** mid-size pickup
- **GMC Terrain** CUV
- **Class 4/5 conventional cab truck** being developed jointly with Navistar.
Ford approves B20 in all its 2011 MY and beyond

Class 2 - 5 Super Duty

&

Class 6,7 Medium Duty Trucks

And in the Ford Transit Van

New Ford F-150 Diesel coming in 2018!
(Biodiesel position TBA)
Ford B20 Mike Rowe
Biodiesel Production Goal:
4 Billion Gallons by 2022
Thank You!

Questions?