



IFDA Fuel Summit

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Biodiesel Myths, Truths, and Updates

Richard Nelson

National Biodiesel Board

Biodiesel—Physical and Chemical Properties and Attributes

- **High Cetane (avg. over 50)**
- **Ultra Low Sulfur (avg ~ 2 ppm)**
- **High Lubricity, even in blends as low as 1-2%**
- **High Energy Balance (3.2 to 1) and 78% Life Cycle CO₂ Reduction**
- **Low Agriculture Inputs: Soybeans**
- **Renewable, Sustainable, and Domestically Produced**
- **Reduces HC, PM, CO in existing diesel engines**
- **And reduces NO_x in boilers and home heating**

FUEL QUALITY

- Fuel quality is of the utmost concern and importance to the biodiesel industry.
- ASTM D 6751 is the specification for biodiesel fuels irrespective of the feedstock source and/or processing method.
 - National Quality Program (BQ-9000) Launched for Biodiesel Marketers and Producers
 - Look for **BQ-9000 Certified Marketers**: Biodiesel's 'Good Housekeeping' Seal of Approval
 - Assures "cradle-to-grave" fuel quality



"cradle"

→ "grave"



NREL Vehicle Testing Summary

- **Average change in NO_x for B20 use is 0%**
 - No statistically significant change (less than +/- 0.1%)
 - Versus +2% in EPA analysis
- Magnitude and direction of NO_x impact is cycle dependent
- **Average change in PM for B20 use is -23%**
 - Versus -12% in EPA analysis

Vehicle	Engine		MY	Cycle	NOx % Change	PM % Change
1	Cummins ISM	Transit Bus	2000	CSHVC	-3.8	-17.4*
2	Cummins ISM	Transit Bus	2000	CSHVC	-6.2	-49.3*
3	Cummins ISM	Transit Bus	2000	CSHVC	-4.1	-22
4	Cummins ISM	Class 8	2005	CILCC	0.0	-27
4	Cummins ISM	Class 8	2005	WVU Interstate	2.0	-35
5	International Green Diesel	School Bus	2005	RUCSBC	1.5	0
5	International Green Diesel	School Bus	2005	CSHVC	-1.0	0
6	Cummins ISB	Motorcoach	2003	CSHVC	2.8	-28.1
6	Cummins ISB	Motorcoach	2003	UDDS	3.4	-30
7	DDC S60	Class 8	2000	CSHVC	2.1	-19.4
7	DDC S60	Class 8	2000	WVU Interstate	3.6	-26.2

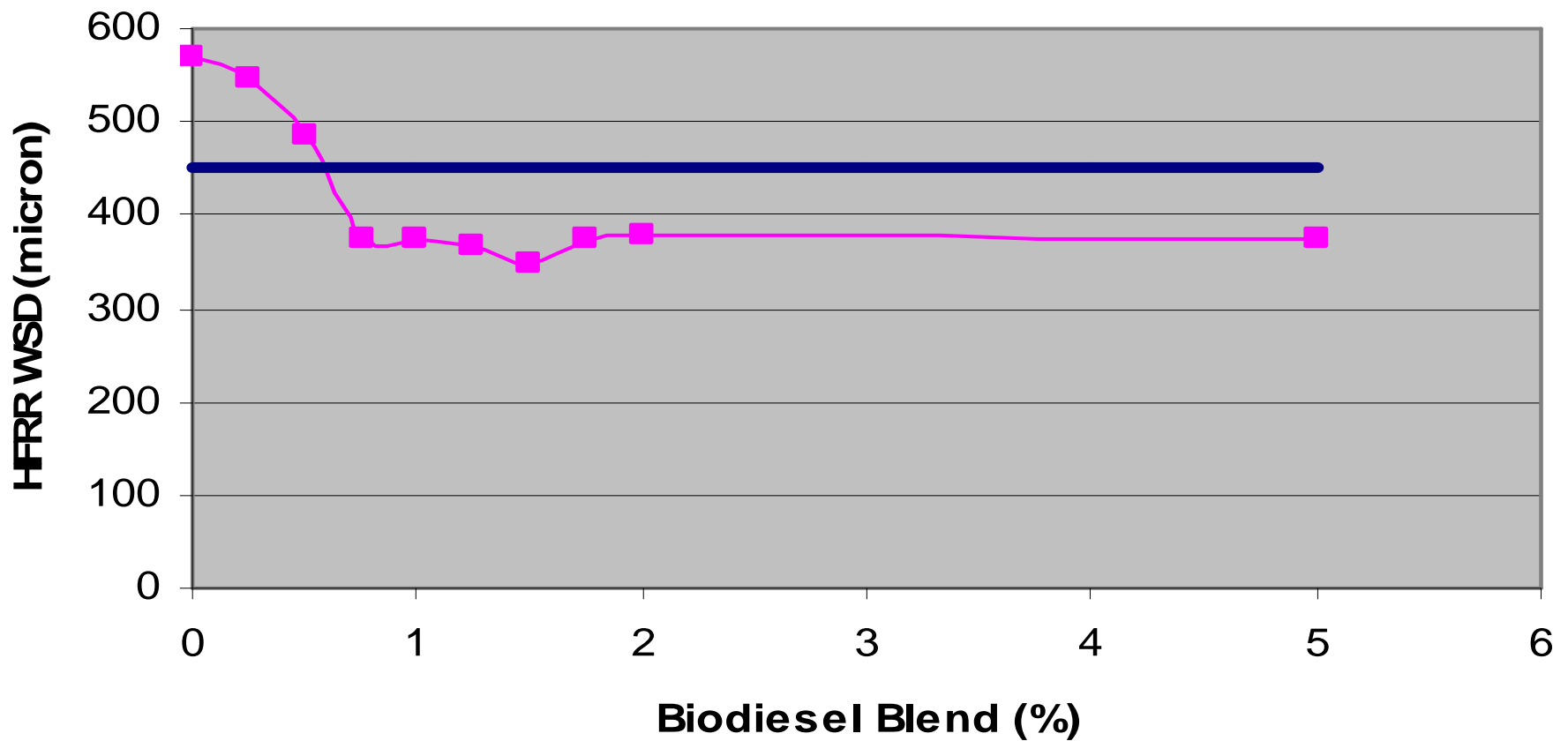
*Vehicle equipped with diesel particle filter

Biodiesel and 2007 Engines

- Biodiesel provides SIGNIFICANT benefits with new ULSD 2007 diesel fuel and technology
- 2% biodiesel restores the lubricity of the poorest lubricity diesel
- Although similar in size/distribution, B20 particles are different than petrodiesel particles
- Break Even Temperature of PM Traps reduced by 30 to 50 degrees F with B20
 - May increase fuel economy w/ PM traps
 - May lengthen PM trap life
- Engine out PM reduced
 - Helps EGR, reduces engine oil soot levels
 - Lower initial burden on trap

Biodiesel, ULSD, and Lubricity

Ultra-low Sulfur Diesel



Biodiesel, ULSD, and Sulfur

- Diesel has two grades:
 - S15, less than 15 ppm sulfur content
 - S500, less than 500 ppm sulfur content
- Most biodiesel from first use oils are less than 1-2 ppm sulfur content
 - Some from used cooking oils can be over 15
- Blending biodiesel usually reduced the sulfur content of the finished blend
 - Possible to use B20 to bring a slightly out of spec petrodiesel back to S15 grade

Biodiesel, ULSD, and BTU's

- Pure biodiesel, B100, has about 7-9 % less BTU's per gallon than today's No. 2
 - About the same, or a little higher, than No. 1
 - Some users see better fuel economy with B20 - this is most likely due to the cleaning effect of B20
- Biodiesel blend BTU's correspond to values of pure biodiesel and the diesel used
- BTU of ULSD is still a question
 - Some reports of higher, some lower
- Bigger ULSD issue will most likely be PM trap use of extra fuel

Biodiesel, ULSD, and Cold Flow

- Biodiesel, B100, freezes faster than most petrodiesel
 - Dependent on the feedstock used
 - Finished biodiesel is similar to feedstock
 - Vegetable oils are the best (25 to 35 F)
 - Animal fats are the worst (40 to 70 F)
 - Used frying oils span the range (25 to 70 F)
- Using blends mitigates this issue
- Jury is out on how things might change with ULSD

Biodiesel, ULSD, and Stability

- After meeting D 6751, stability is the #1 issue of OEM's
- Virtually no stability issues in field with B20 meeting the current version of D 6751
 - Recommended storage life of 6 months
- Stability specifications are being added to the B100 specification D 6751 that address the potential concerns OEM's have
- These specifications eliminate any potential deposits with B20 and lower blends

Sustainable Industry Growth

- Will be dependent upon:
 - Consumer confidence → **FUEL QUALITY!**
 - Maintaining federal legislation
 - State programs and incentives
 - Blend economics (i.e. price relative to petroleum prices)
 - Feedstock availability (i.e. raw material supplies)

