Biodiesel

The Good, the Bad and the Funny





What's wrong with this picture?





First step is admitting the problem...



Themes to Abandon:

- ✓ Climate change isn't man-made so we don't need to stop it
- ✓ There is a silver bullet on the horizon so I'll wait
- ✓ "Drill Baby Drill" is our energy solution



en ea

What is Biodiesel?

"Fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100." (ASTM/EPA)

Biodiesel is usually blended with petroleum diesel at various blend levels...most common B5 and B20



What isn't Biodiesel?

 Raw Vegetable Oils and Fats or "SVO"

This non-biodiesel has caused serious problems in diesel engines in past testing....



Beware of the Backyard Brewer!



en ea

How is Biodiesel Made?



iew eat

Average Retail Fuel Prices in the U.S.



http://www.afdc.energy.gov/data/tab/fuels-infrastructure/data_set/10326

Biodiesel Production History

U.S. monthly biodiesel production 2011 - 2013





U.S. Energy Information Administration, Forms EIA-22M and EIA-22S Biodiesel Monthly Surveys.

Top 10 Reasons Why Smart Customers Are Using Biodiesel

Vew eat



#1 – America's Advanced Biofuel

- Biodiesel is America's first domestically produced, commercially available Advanced Biofuel and meets EPA requirements for inclusion and use under the new Renewable Fuels Standard (RFS-2).
- RFS-2 mandates 36 billion gallons of renewable fuel be used by obligated parties (i.e. refiners) by 2022
- 2012 Volume Requirement = 1 Billion Gallons
- 2013 = 1.28 Billion Gallons

#2 – Lower Emissions

- U.S. biodiesel reduces lifecycle carbon emissions by over 50% compared to petrodiesel, qualifying it as an Advanced Biofuel under RFS-2
- It is the single best carbon reduction tool of any liquid fuel commercially available.



#3 – High Energy Balance

- Biodiesel has the highest energy balance (5.54
 - : 1) of any commercially available fuel, returning 5.54 units of renewable energy for every 1 unit of fossil energy needed to produce it.
- Compression Ignition Platform (i.e. diesel engine system) is 30% More Fuel Efficient Than Spark Ignition (i.e. gasoline, CNG, propane)

#4 – Sustainability

- Biodiesel is produced from a variety of renewable resources, such as plant oils, animal fats, recycled grease, and even algae, making it one of the most sustainable fuels on the planet.
- With biodiesel, you don't sacrifice food for fuel.
 Oils and fats for biodiesel are a minor by-product of producing food for humans and animals.
 - Soybeans are 80% protein, 20% oil
 - No one grows livestock for its fat content
 - No one cooks more fried food to get used oil for biodiesel



One of the most bio-diverse fuels in the world!



Canola Oil



Used Cooking Oil



Vew ea

Animal Fats



Soybean Oil



Cottonseed/Camelina



Corn Oil from Ethanol Plants

Future Feedstocks

Frenleat



Algae



Jatropha



Halophytes



Pennycress



Brown Grease Photo by: Joel Rose



Low Ricin Castor

#5 – Energy Security

- Biodiesel production reduces our dependence on foreign oil from unstable parts of the world, while expanding and diversifying our domestic refinery capacity.
- Biodiesel is a low cost option for turning oils and fats into usable fuel diesel applications.
- Biodiesel produced in the U.S. in 2008 displaced 38.1 million barrels of crude oil.







Solar-powered camel! Runs on sunlight during the day and recycled flatulence at night. A hybrid vehicle that brings solar power into the realm of the practical. *Invention & Technology,* Summer

#6 – Better For Your Health

- Biodiesel is:
 - Biodegradable
 - Nontoxic:
 - LD50 =17.4 g/Kg less toxic than table salt
 - Skin irritation less than that of 4% soap and water solution
 - Safer to handle: Flash point above 200 Degrees F, Non-Reactive, Non-Corrosive
- Compared to petrodiesel, biodiesel reduces black smoke (particulates), Carbon Monoxide, and harmful unburned hydrocarbons that cause smog.

#7 – Economic Benefits

- Biodiesel helps our U.S. economy and improves our balance of trade.
- Using biodiesel creates added outlets for farm based products and high paid manufacturing jobs in rural parts of our country.
- The 1 billion gallons of biodiesel produced in the U.S. in 2012 supported about 80,000 U.S. jobs.

#8 – Ease of Use & Performance

- Using Biodiesel is easy!
- B20 and lower blends are a drop-in replacement for diesel fuel
- Can be used in any diesel engine / vehicle without modification, according to OEM's recommendations
 - Visit <u>www.biodiesel.org/resources/oems</u> for OEM positions
 - Similar in terms of engine performance, fuel economy, horsepower, torque same as diesel
- Dispensed through existing fueling stations

Distribution Infrastructure

- Biodiesel and biodiesel blends are now available nationwide from more than:
 - 1,495 Distributors
 - 1,330 Retailers
 - 775 Truck Stops
 - 3,600 Public Locations Total
- Visit the NBB website at: <u>www.biodiesel.org/buyingbiodiesel/</u> or <u>www.biotrucker.com</u> to view biodiesel retailers near you, by state, or along a route



Frewleaf

Human Powered Bus in Netherlands



Propulsion: 32 pedal devices, 80 meters of chain. *Traveling speed:* 20 km/h.

9 – ASTM Specifications & Technical Credibility

- Biodiesel production is guided by stringent ASTM fuel specifications, developed through years of testing.
- The biodiesel industry works closely with OEMs and Petroleum companies to identify needed technical information
- **ASTM D6751** is the approved standard for B100 for blending up to B20, in effect since 2001
 - Performance-based standard: Feedstock & Process Neutral
 - 48 states have now legislatively adopted the ASTM D6751 specifications for biodiesel
- D975 Covers petrodiesel and blends up to 5% biodiesel maximum for on/off road engines

10 – Marketing Advantage

- Companies using biodiesel feel good about flaunting their reduced carbon footprint.
- Using biodiesel differentiates your organization with a "green" competitive advantage
- Examples: Restaurant services providers, municipalities, trash/recycling
- Employment recruiting

Federal Biodiesel Support

Renewable Fuel Standard (RFS2)

- RFS-2 mandates 36 billion gallons of renewable fuel be used by obligated parties (i.e. refiners) by 2022
- 1 billion gallons biomass based diesel,
- 4 billion gallons un-differentiated advanced biofuel
- 2012 Volume Requirement = 1 Billion Gallons

EPACT Credits -

• Incentive for Fleets for B20+ use; most economical option for EPACT Compliance.

CAFÉ Credits -

• Incentive for Automakers for B20+ approval

California LCFS

- Requires a reduction of at least 10% in the carbon intensity for all transportation fuels sold in California by 2020.
- Biodiesel poised to make a major contribution to the carbon reduction goals.
- **There are many a couple of pending lawsuits against the LCFS...so we shall see!

California LCFS:

Freneat

Implementation Schedule

Year	% Reduction Required	Biodiesel Blend Required (UCO)
2011	.25	B.3
2012	.50	B.6
2013	1.0	B1.2
2014	1.5	B1.8
2015	2.5	B3.0
2016	3.5	B4.2
2017	5.0	B6.0
2018	6.5	B7.8
2019	8.0	B9.6
2020	10.0	B12

Biodiesel Feedstocks and Production Forecasts

Global Insight:

- "By using demonstrated yield technologies available to farmers today in combination with consistent biofuels policies and the DOE/EIA crude oil price forecast, biodiesel production can reach 2.5 billion gallons by 2017. This can be reached with growing global food demand for vegetable oils without dramatic increases in vegetable oil prices."
- This represents B6.5 in all on-road fuel in the US
- Note: This work only evaluated feedstocks that have approved pathways or were under review by EPA; over next 5 years, additional feedstocks may contribute to the overall supply, potentially reaching 3.3 BGPY by 2022.



That's a LOT of French Fries!





Biodiesel Use & OEM Acceptance



OEM Warranty Statements & Biodiesel

- All major OEMs selling diesel equipment in the U.S. support at least B5 and lower blends, provided they are made with biodiesel meeting ASTM D 6751
- More than 79% of U.S. manufacturers now support B20 or higher blends in at least some of their equipment;
- More than 90% of medium-duty and heavy-duty truck market supports B20
- Several more OEMs are completing testing and progressing toward support for B20
- For a complete listing of OEM position statements on biodiesel, as well as the current U.S. Diesel Vehicles List, visit: www.biodiesel.org/using-biodiesel/oem-information







Isuzu Commercial Truck approves B20

for all of its 2011+ MY diesel engines, including N-Series truck models and new Isuzu Reach commercial van.

•Isuzu holds 75% market share of low cab-forward medium duty truck market in U.S.

•First Asian manufacturer to announce B20 support in U.S.





Hino Trucks approves B20 for its complete product line of 2011+ MY class 4 and 5 cab-over and class 6 and 7 conventional trucks.

B20 is also approved for Hino's new 2012 diesel-electric hybrid truck entering the market in early 2012.

• Hino Trucks is the world's 3rd largest mfr. of light and medium duty trucks, and now the fastest growing truck mfr. in the U.S.



B20 Approved





Ford approves B20 in all its 2011 MY and beyond



Class 2 - 5 Super Duty &

Class 6,7 Medium Duty Trucks





B20 Approved



Ro





All 2011 MY and beyond GM Heavy Duty Products are approved for B20:

Chevrolet Silverado, GMC Sierra, Chevrolet Express, GMC Savana





B20 Approved for Fleets

Chrysler supports the use of B20 in the Dodge Ram for government, military and commercial fleets, and is considering full B20 support for all customers.





1st B20 Approved Passenger Sedan!

sew ea

General Motors became the first automaker in the US to approve the use of 20 percent) in a light-duty diesel passenger sedan, the new 2014 Chevrolet Cruze Clean Turbo Diesel.



OEMs Supporting B20+























cummin



Vew eat











A NAVISTAR COMPANY



A Toyota Group Company



B5 Approvals

Approve B5:

Audi BMW Mercedes Mitsubishi ** Volkswagen **







Approve B5*:

Sew eat

Daimler / Detroit Diesel ** Freightliner Thomas Built Buses Kubota PACCAR – Peterbilt/Kenworth * Exceptions have been made for B20 use by fleets ** Actively researching B20



Biodiesel Use in Today's New Clean Diesel Engines & Aftertreatment Systems



Biodiesel & Aftertreatment Systems

Biodiesel is compatible with Diesel Particulate Filters in today's new clean diesel technology, and has some distinct advantages:

- Lowers regeneration temperatures
- Less engine out particulate matter
- May provide increased performance and decreased maintenance vs. ULSD alone
- May provide increased fuel economy

B20 vs. Diesel: In the shop

Pew ea

- With in-spec B20 and lower blends, the issues you can expect to see in your shop are the same as you will see with petrodiesel
- Except:
 - Expect to see fewer lubricity related issues
 - Expect to see fewer problems with after-treatment
 - Filter related issues may be related to cleaning effect upon first use, or are likely normal diesel issues or out of spec or imposter biodiesel
 - Less black smoke from exhaust!

USTs: The Need for **Approvals** NEW CENTURY Flow limiter (AI, steel) Breakaway valve (nylon, HDPE, fluorocarbon, NBR, Flexible connector fluorosilicone) (SS, fluorocarbon, NBR) Nozzle (Nylon, Al, fluorocarbon, Silicone rubber, NBR, fluorosilicone, HDPE) Emergency Shear Valve Swivel (SS, fluorocarbon, Protector (Iron, steel, brass, SS, NBR) Teflon, polyurethane)

Pump

Vapor

Liquid

Hose (NBR)

Vew eat

Vapor Line Shear Valve (Iron, fluorocarbon, polyurethane)

Piping (nylon, PVDF, PPS, PK)

Extractor fitting (iron, polyurethane, Zn alloy)

Ball float vent valve (steel, SS)





Thank you!

Questions?



Jennifer Case (619) 236-8500 jennifer@newleafbiofuel.com