

# Biodiesel

- The process of changing waste vegetable oil into usable fuel for compression ignition engines.



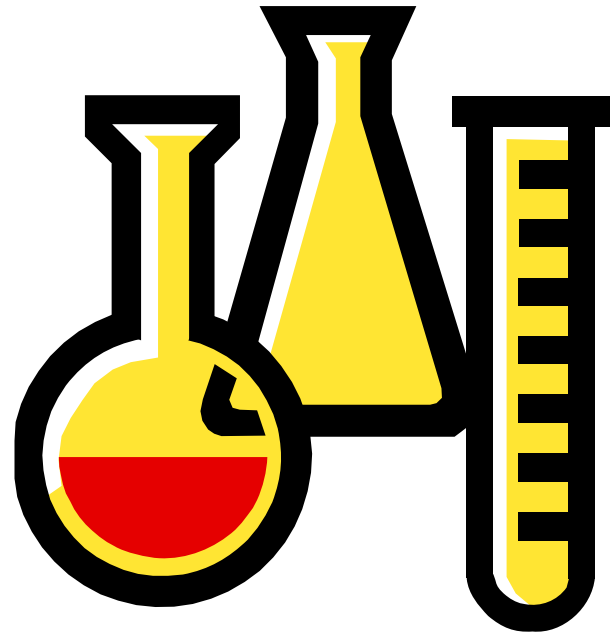
# Biodiesel

- The reaction process is quite simple!
- We are not refining the oil.
- Chemical reaction is done.



# Biodiesel

- Glycerol
- By product and it's uses.



# Biodiesel

- **Environmental and Safety Information.**
- **Biodiesel non-toxic** 17.4g/Kg body weight, by comparison table salt is nearly 10 times more toxic.
- **Skin irritation-Humans** 24 hr. patch test, undiluted BD ,very mild irritation by contrast 4% soap and water irritation was more.
- **Aquatic Toxicity** 96 hr lethal concentration of bluegills of BD was greater than 1000mg/L these concentrations deemed insignificant by NIOSH.
- **Biodegradability**, BD degrades 4 times faster than petrol diesel 28 days pure BD degrades 85 % in water.
- **Flash Point** BD over 260°F, petrol is around 125°F safer to store and handle.

# Biodiesel

- Diesel Engines.
- Performance concerns.
- Low Sulfur Diesel.
- Ultra Low Sulfur Diesel.



# Biodiesel

• Regulated Emissions.	B100	B20
• Total Unburned Hydrocarbons	-67%	-20%
• NO <sub>x</sub> .	+10%	+2% to -2%
• Carbon Monoxide.	-48%	-12%
• Particulate Matter.	-47%	-12%

# Biodiesel

- Helps mitigate “global warming”.
- Reduces net CO<sub>2</sub> 78%.
- Closed loop cycle.

# Biodiesel



- Biodiesel offers similar horsepower to diesel fuel.
- B-100, 7-9% lower energy content (BTU).
- Petrodiesel varies 15% (BTU) from supplier to supplier and from summer to winter.
- B20 decrease BTU 1-2%.
- B2 has negligible BTU decrease.
- Biodiesel offers similar consumption.
- Biodiesel offers similar torque.
- Biodiesel offers similar haulage rates.

# Biodiesel

- Engine oil dilution.
- Blends over 20% may cause larger amount of unburned fuel to get into oil pan, due to higher viscosity.
- Added engine oil sludge.
- Shorter oil change levels.
- B20 or lower more consistent with petrodiesel oil changes.

# Biodiesel

- Lubricity.
- Improvement of up to 65% with as little as 1% Biodiesel added to distillate fuels.
- Other options available also.



# Biodiesel

- **B100 Material Compatibility**, HOSES, GASKETS SEALS, GLUES, AND PLASTICS DEGRADE WITH PROLONGED EXPOSURE . NATURAL OR NITRILE RUBBER COUMPOUNDS, POLYPROPELENE, POLYVINYL, AND TYGON ARE PARTICULARLY VULNERABLE. *MOST ELASTOMERS USED AFTER 1993 ARE COMPATIBLE WITH B100 (VITON, TEFLON).*
- BRASS, BRONZE, COPPER, LEAD, TIN, AND ZINC MAY ACCELERATE OXIDATION PROCESS CREATING FUEL INSOLUABLES OR GELS AND SALTS. *REPLACE WITH STAINLESS STEEL, CARBON STEEL OR ALUMINUM*
- **B20 Material Compatibility**,
- 20% OR LESS HAVE SHOWN A MUCH SMALLER EFFECT ON THESE MATERIALS *MONITOR THESE ITEMS FOR LEAKS IS SUFFICIENT*
- **B2 Material Compatibility**,
- *EFFECTS VIRTUALLY NON-EXISTENT IN LOW LEVEL BLENDS SUCH AS B2*

# Biodiesel

- Compatibility of Engine components with Biodiesel.
- Elastomers.
- Natural or Butyl Rubber. Compounds
- Hoses and Filter Seals.
- B20 Lowers Degradation of Rubbers.

# Biodiesel

- Biodiesel in Cold Weather.
- Cloud Point.
- Pour Point.
- Cold Filter Plugging Point (CFPP).
- B100 Gel Point, Increase 30 to 40° F. Blend.
- B20 Increase 2 to 10° F. Blend

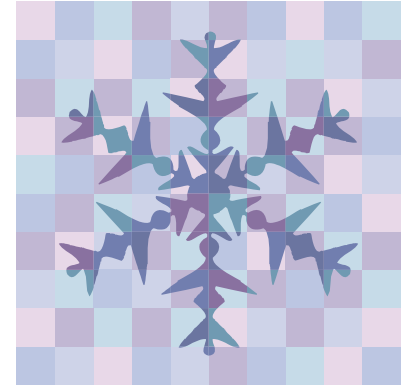


# Biodiesel

- Cold Weather Options.
- Blend with #1 Diesel.
- Additive to Improve Cold Flow.
- Fuel Tank, Fuel Filter, Fuel Line Heaters.
- Storage of Vehicles in Buildings.



# Biodiesel



- Conclusions on Cold Weather
- #2 diesel can experience significant cold flow problems in cold weather.
- The diesel industry has solved the problems with #2 diesel through a variety of means that are in common practice today.
- These same solutions should be used with Biodiesel blends to assure satisfactory cold weather performance.
- B20 has been used successfully in fleets experiencing extremely cold weather without any additional precautions.
- When using blends of B20 or lower, the cold weather performance of the blend is mostly determined by the diesel fuel portion.
- Incorporation of blends less than 20% biodiesel(i.e.B5 or B2) into existing diesel fuel has little or no affect on the cold flow properties of the finished blend.
- SOURCE: National Biodiesel Board [www.nbb.org](http://www.nbb.org)

# Final Conclusions

- Ensure BD meets ASTM specification for pure diesel (ASTM D 6751) before blending with petrodiesel.
- Check fuel filters on vehicle and delivery system frequently, change as necessary.
- Be aware of BD's cold weather properties and take precautions as with #2 petrodiesel use in cold weather.