

Welcome to Biodiesel 101.

- What is Biodiesel?
- How can I use it?
- Why would I use it instead?
- What do I need to know about using it?
- Where do I buy it? Or, can I make it?
- Where can I learn more?

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www.nwbiodiesel.org

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What is Biodiesel?

- Biodiesel is a fuel that runs in Diesel ('compression ignition) engines, and is made from vegetable oil (or animal fat) that has been reacted with Methanol and a catalyst to cleave off the Glycerine backbone, and oxygenate the fuel.

The term "biodiesel" means the mono-alkyl esters of long chain fatty acids derived from plant or animal matter. In most cases, Biodiesel is made with Methyl Alcohol, so the technical term for it in this case is "Soy Methyl-Ester", or "Rape Methyl-Ester" depending on the vegetable oil feedstock used in its' production.

Biodiesel takes on the qualities of the original oil feedstock. Therefore, biodiesel made from vegetable oils that have higher viscosities at room temperature will exhibit higher gel points (meaning that they will flow less well when cooled, as in winter). So, RME (Rape seed oil based BD) will perform better in cold weather than Palm based Biodiesel, in northern climates.

All biodiesels (regardless of oil feedstock) are more highly oxygenated than regular D2, which contributes to their cleaner burning characteristics.

Biodiesel also contains only about 4 or 5 major chemical components, where D2 contains over 200! All these other components and their respective combustion characteristics contribute to nastier emissions...

Biodiesel is NOT just a mixture of veg oil and alcohol. The trans-esterification process (biodiesel production reaction) transforms it into a completely different compound than just plain veg oil. Burning straight vegetable oil in a CI engine is possible, but results in increased emissions, possible damage to the engine due to nasty combustion build up, and also requires the operator to start and stop the engine on D2 or Biodiesel (more complicated vehicle operation...)

How can I use it?

- Biodiesel can be used in any compression-ignition engine (aka 'diesel').
- It can also be used as a heating fuel if you have oil heat.
- It is also a safe and excellent solvent!

Biodiesel is completely compatible with any compression-ignition (diesel) engine. It is run in commercial fleets, school buses, city transit buses, even the Washington State Ferries!

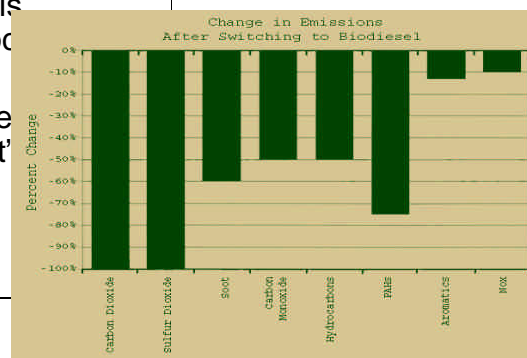
Biodiesel is also used by some for home heating. No modification is really needed. Just get your furnace "tuned up" by your service man, and fill up with BioD. Dan at Alternative Fuelwerks has not seen any problems with pumps or seals.

Biodiesel can soften rubber hoses over time. Also, if it is not good quality fuel, the residual salts and methanol can damage fuel system components. Like with any fuel, you should only purchase it from a reputable supplier!

Since Biodiesel does have good solvent qualities, it tends to clean the petrochemical "gunk" out of existing fuel systems. This just means you need to monitor and change your fuel filters 2 or 3 times in the first 6 months of use in an existing diesel car or truck. New cars or trucks should not have this problem.

Why would I use it, instead?

- Biodiesel burns cleaner – has higher lubricity factor
- Biodiesel is renewable, and can be domestically produced from oilseed crops and waste oil/fats
- Biodiesel is ‘carbon neutral’
- Diesel vehicles get 20-30% better fuel economy than petrol-gas vehicles
- Biodiesel provides over 3 times more energy than is required to grow, harvest, and process the feedstock to transport the fuel; it is Energy Positive!
- Biodiesel is less toxic than table salt - Biodiesel breaks down completely in the environment in 28 days – it’s



Biodiesel can be made from rape, mustard, canola, cotton, sunflower, soybean seeds. Also palm oil, olive oil – virtually any oilseed. As well as used fryer oil, rendered fats, tallow, and “trap grease”

The higher lubricity factor makes your engine run smoother and quieter. 2007 clean air standards call for practically eliminating sulphur from diesel fuel (which acts as a ‘lubricant’), therefore biodiesel may actually be introduced as an additive to regular diesel to replace the lost lubrication properties that are needed for fuel system pumps, injectors, cylinders and valves.

Biodiesel is the first and only alternative fuel to have a complete evaluation of emission results and potential health effects submitted to the U.S. Environmental Protection Agency (EPA) under the Clean Air Act Section 211 (b). These programs include the most stringent **emissions** testing protocols ever required by EPA for certification of fuels or fuel additives in the US. The data gathered through these tests complete the most thorough inventory of the environmental and human health effects attributes that current technology will allow. A survey of the results is provided in the table below.

BIODIESEL EMISSIONS COMPARED TO CONVENTIONAL DIESEL

<u>Emission Type</u>	<u>B100</u>	<u>B20</u>
<i>Total Unburned Hydrocarbons</i>	-67%	-20%
<i>Carbon Monoxide</i>	-48%	-12%
<i>Particulate Matter (soot)</i>	-47%	-12%
<i>Nox</i>	+10%	+2%

(source: National Biodiesel Board)

Biodiesel is actually used to CLEAN UP oil spills because of its non-toxicity, as well as its solvent properties. And any that is left behind breaks down and is eco-friendly.

What do I need to know about using it?

- Pre-1986 diesel cars and trucks may have rubber fuel lines to change out.
- Biodiesel cleans out fuel tanks of gunk (and plugs up fuel filters)
- Biodiesel has a higher 'gel point' than regular diesel and may need to be blended with D2 in the winter to 50% or so...
- People might think you smell funny... (or, rather, that your car does!)

Biggest issues with any fuel are quality and purity. Water is a major culprit in any fuel, as well as suspended particulates (junk). With Biodiesel, production quality is very important to assure that you are receiving fully reacted product (ie: with no methanol or catalyst still present) as well as a 'washed' fuel that does not contain any free, unreacted fats (FFA's). FFA's or residual glycerine will plug fuel filters, and cause the gel temperature to go up (ie: cooking up your fuel system at a higher temperature than it should...)

Biodiesel will gel at a higher point (get thick and not flow well) than regular diesel. Diesel gel inhibitors (additives) don't work on biodiesel as well as they do for petro-diesel (D2). So it is standard accepted practice to blend regular petro-diesel into your B100 to dilute it to 80 or even 50% Biodiesel to avoid gelling problems when the temperatures get down into the 30's.

Biodiesel also has slightly less energy content than D2: between 5-7% less. This may slightly affect your fuel economy; though many users of Biodiesel report increased mileage after switching to Biodiesel.

Biodiesel's excellent solvent properties do clean out gunked up fuel tanks if you have an older vehicle. You may need to change fuel filters 2 or 3 times in the first 6 months of use depending on the condition of your tanks...

Biodiesel has a distinctive smell when combusted and you can tell the difference between 'feedstocks', whether it be french fry oil, tortilla oil, or soybean oil. Unlike regular petrol diesel which just smells bad... ☺

Where do I get it?
(Or, can I make it myself? 😊)

- Biodiesel is available at over a dozen retailers in the Seattle area. Right now it costs less than regular gasoline, as well as diesel (June 2006)
- Yes Virginia, you can make it yourself. It is quite an investment in time, though. But the ingredients run you about 90 cents/gal to produce it if you get your waste fryer oil for free.

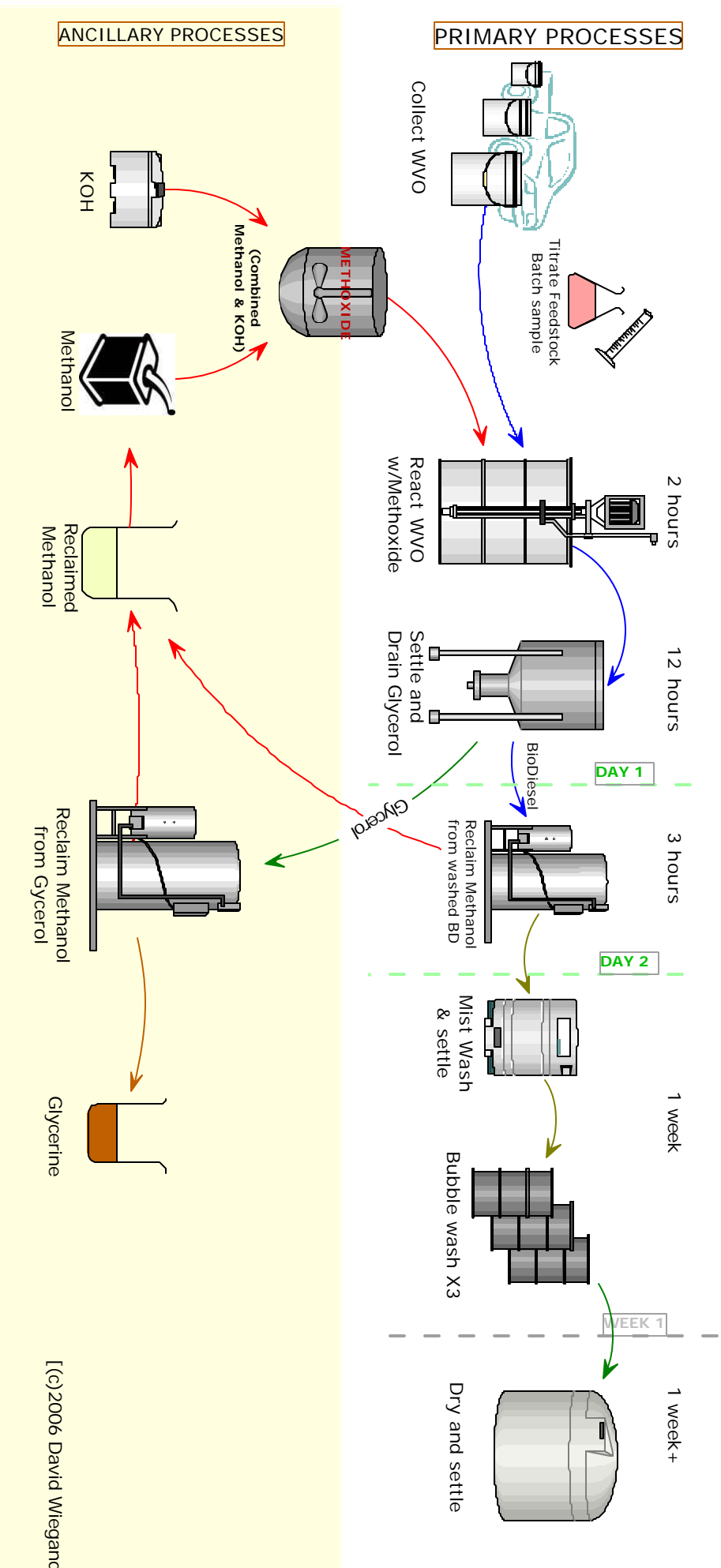
Biodiesel is currently sold at over a dozen outlets in the Seattle area:

- Dr. Dan's Alternative Fuelwerks (just down the hill – in Ballard)
- The Green Car Co – Kirkland, by Totem Lake Mall
- Laurelhurst Fuel – public pumps behind University Village
- Frybrid – located up on Capitol Hill
- Pacific Pride – located on Harbor Island
- Pettit Oil Co – located on Airport way, south
- Seaport Biofuels – in West Seattle
- Bellevue Chevron – By BCC – about a mile north of I-90
- Grange Supply – in Issaquah
- Pacific Pride – in Kent
- Associated Petroleum – in Fife
- Fast Fuel (Acme) – in Olympia
- Also available at Shilshole, Elliot Bay Marinas

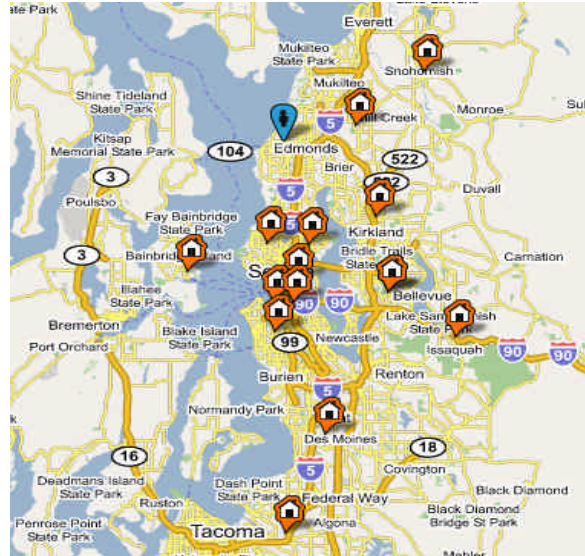
(See the map at <http://www.frapp.com/seattleareabiodieseloutlets> for phone numbers and directions to these locations).

Biodiesel currently costs less than D2, and in most cases less than regular gasoline in this area!

Biodiesel Processing Steps



Frappr Map of BD outlets: www.frappr.com/seattleareabiodieseloutlets



You can also get a listing of outlets for the complete state at:

www.biodiesel.org/buyingbiodiesel/retailfuelingsites/showstate.asp?st=WA

Resources:

• Books:

- From the Fryer to the Fuel Tank – Josh Tickell (a seminal book on Biodiesel)
- Biodiesel America: - Josh Tickell (updated version)
- Biodiesel Power: Lyle Estill (very interesting compilation of Lyle's blogs on BD)
- Biodiesel, Growing a new Energy Economy: Greg Pahl
- Biodiesel Homebrew Guide: (Girl Mark's how-to book <http://www.localb100.com/book.html>)
- How to make Biodiesel: Dan Carter

WWW:

en.wikipedia.org/wiki/Biodiesel (Wikipedia entry)

groups.yahoo.com/group/biodieselbasics/ (Yahoo! Group on making and using BD)

www.biodiesel.org (National Biodiesel Board)

www.biodieselcommunity.org (Collaborative Tutorial)

www.uidaho.edu/bae/biodiesel/ (U of Idaho program)

www.biofuels.coop (Piedmont Biofuels)

www.veggievan.org (Josh Tickell's site)

<http://energy.biofuels.coop/> (Lyle Estell's interesting blog)

www.biodieselnow.com/forums (very interesting forums - worldwide, but mostly U.S.)

www.localb100.com/ (Girl Mark's website)

www.biodieselcommunity.org/onlineresources (a listing of other websites and resources for homebrewing and SVO information)