



Biodiesel for Oregon



Biodiesel Basics

Biodiesel is a safer, cleaner-burning alternative to petroleum diesel. Produced from vegetable oil or animal fats, biodiesel is a homegrown, renewable fuel. Pure biodiesel (B100) can be used undiluted in a diesel engine or blended in any proportion with petroleum diesel. Engines built before 1994 running B100 may require the replacement of natural rubber seals and hoses, but biodiesel blends of up to 20% (B20) require no engine modifications. At very low blends of 1-2%, biodiesel adds needed lubrication to ultra-low sulfur diesel.

Rudolph Diesel, the inventor of the diesel engine, designed it to run on vegetable oil. He used peanut oil to power his demonstration engines in Paris in 1904.

Biodiesel is good for Oregon's environment and economy. Using biodiesel improves air and water quality, supports rural economies, curbs global warming, and increases energy security. It is far less toxic than petroleum diesel, safer to store and transport, and biodegrades quickly in water.

Biodiesel for Economic Growth

When Oregonians spend a dollar on diesel or gasoline, we support a finite, non-renewable resource that is imported from elsewhere and that will never be produced in Oregon. If we spend a dollar on biodiesel or ethanol¹ instead, we support a renewable fuel that can be produced in Oregon, providing new markets for Oregon crops and new jobs for Oregon workers. Instead of sending our dollars out of the state, our dollars recirculate in the Oregon economy.

From the Field to the Fuel Tank

Biodiesel can be processed from any type of plant oil or animal fat, including used cooking oils from restaurants. In Oregon, the most applicable crops include canola and mustard. These oilseed crops are good rotational crops, particularly for wheat and grass seed, two of Oregon's main agricultural products.

¹ Ethanol is biodiesel's renewable fuel cousin. It is an alcohol-based fuel made from corn or cellulosic wastes. It burns cleaner than gasoline, and is easily used in gasoline engines when blended with gasoline at levels up to 15%.

Biodiesel vs. Diesel

Here's why biodiesel beats diesel:

Renewable

Diesel comes from petroleum, a non-renewable resource whose supplies are dwindling. Biodiesel is produced from oilseed crops, animal fats and waste cooking oils.

Healthy

Because of its respiratory impacts and carcinogenic properties, diesel exhaust is regulated as a toxic air pollutant by the California Air Resources Board.

Pure biodiesel exhaust is far cleaner (toxic emissions are 60-90% lower), and it smells like French fries or donuts!

Locally Produced

Diesel is refined from petroleum oil, much of which is imported from other countries. Biodiesel can be grown and produced right here in Oregon, supporting local farmers and local economies.

Energy Efficient

It takes energy to produce fuels like diesel and biodiesel. A lifecycle analysis of diesel conducted by the US Dept. of Energy and US Dept. of Agriculture shows that it actually takes more energy to drill, transport and refine diesel than it produces when combusted! Petroleum diesel use results in a net energy loss of 19.5%.

Biodiesel produces 3.2 units of fuel for every unit of energy consumed throughout its lifecycle, creating a net energy gain of 220%.



Biodiesel is made through a relatively simple process of bonding alcohol (usually methanol) to the oils or fats. Manufacturing plants may choose to produce biodiesel alone, or to produce higher-value biolubricants, with biodiesel as a byproduct.

Byproducts of Biodiesel Production

Biodiesel is only one of many products connected to biodiesel production process. By-products and co-products help make biodiesel production profitable for farmers and producers and help lower the cost of biodiesel for everyone.

By-products of Biodiesel Production

Oilseed Crushing:

Products	crop fertilizer, livestock feed, crop pesticides	Markets	farmers, ranchers
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Refinement: Glycerin

Products	food products, lubricants, soaps, alcohols, pharmaceuticals, cosmetics, polymers	Markets	food industry, pharmaceutical industry, cosmetics and soap manufacturers, plastics production
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Co-products of Biodiesel Production

Industrial biolubricants	metalworking industry, engine coolant and lubricant, cleaning solvent
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Erucic acid	plastics production, lubricant
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Prior to processing into biodiesel, the oilseed must be crushed, leaving high-protein meal as a saleable byproduct. Oilseed crushing operations allow a crop like canola to be transformed from a mere agricultural commodity into a value-added product. Oregon farmers growing oilseed crops for biodiesel production will profit the most by being part of the oilseed crushing process.

Renewable fuels have proven their economic worth elsewhere in the country. In the past several years, over a dozen states have launched initiatives in support of biofuels, and many are reaping the benefits. In 1997, Minnesota passed a law requiring all gasoline sold in the state to be blended with ethanol. Since then, Minnesota's ethanol industry has grown to produce over 400 million gallons a year of corn-based ethanol. The Minnesota Department of Agriculture estimates the ethanol industry brings over \$580 million in net annual benefit to the state. Thanks to ethanol, gasoline consumption in Minnesota has been reduced by roughly 10%, and gasoline prices have remained competitive with those in surrounding states.

Encouraged by ethanol's economic benefits, Minnesota's state legislature passed a law requiring a 2% biodiesel blend in all diesel fuels sold in the

state by July 2005. The law is expected to create an annual market for approximately 8 million gallons, and Minnesota's governor has established a Biodiesel Task Force to ensure that the biodiesel is locally grown and produced, keeping dollars in the state.

Biodiesel for Oregon's Environment

Better Air Quality

According to Oregon's Department of Environmental Quality, diesel exhaust is the #1 source of airborne toxins in Oregon, and Oregonians across the state are exposed to diesel particulate matter at levels well above health benchmarks. Using biodiesel helps clean up Oregon's air. Biodiesel has significantly lower tailpipe emissions of such pollutants as carbon monoxide, particulate matter, unburned hydrocarbons and sulfates. It is also less likely to cause cancer than petroleum diesel. Biodiesel's nitrous oxide emissions tend to be higher, but the overall smog-creating potential is reduced by 50% because of lower hydrocarbon emissions.

Researchers are currently seeking ways to reduce biodiesel's nitrous oxide emissions.

Less Global Warming Pollution

According to the National Renewable Energy Laboratory, lifecycle carbon dioxide (CO₂) emissions from biodiesel are 78.45% less than diesel: the crops that are used to produce biodiesel pull CO₂ out of the atmosphere with every planting. Methane, another important greenhouse gas, is reduced by 2.57% and 0.51% for B100 and B20, respectively, compared to petroleum diesel, on a lifecycle basis. Though tailpipe emissions of these gases may be higher, global-level lifecycle CO₂ emissions are of concern in addressing global warming, not tailpipe emissions.

Breathing Easier with Biodiesel

Pollutant (tailpipe emissions)	B100 vs. Diesel (2D)	B20 vs Diesel (2D)
Hydrocarbons	-80% to -90%	-20% to -30%
Carbon Monoxide	-40% to -50%	-10% to -20%
Particulate Matter	-30% to -50%	-5% to -15%
Nitrous Oxides	+ 12%	+4%
Smog forming potential	-50%	-
Sulfur oxides and sulfates	-100%	-
PAH (aromatic compounds)	-75% to -85%	-
NPAH (aromatic compounds)	-90%	-

Particulate Matter:
asthma attacks,
probable carcinogen,
greenhouse contributor

PAHs & NPAHs:
carcinogens

Carbon Monoxide:
harms heart &
respiratory system

**Hydrocarbons, Sulfur
& Nitrous Oxides:**
contributors to smog

US EPA and National Biodiesel Board Health and Environmental Effects Testing, 1998.

Biodiesel for Energy Security

Currently, the United States imports over 3.9 *billion* gallons of crude oil and refined petroleum products annually. This dependence on foreign oil supplies leaves Oregonians vulnerable to price spikes in the global oil market, and sends a steady stream of millions of dollars out of the region -- dollars we could use to fuel Oregon's economy.

It is estimated that the world will soon reach peak production of petroleum. As production decreases and demand increases, prices will rise. Investing in renewable fuels now will help us hedge against price spikes in the near-term and help forestall serious fuel shortages in the long-term.

A Renewable Fuel Standard for Biodiesel in Oregon

Biodiesel's benefits are tremendous, but they won't be realized unless Oregon actively supports the fledgling biodiesel industry. More than anything, would-be biodiesel producers need assurance of a steady market for their product. There is no better way to guarantee this market than to require a minimum biodiesel content in all petroleum diesel sold in the state.

Due to the serious health impacts of diesel exhaust, the federal government is mandating that diesel fuel be refined to dramatically reduce its sulfur content. As of mid-2006, all diesel sold for use by on-road engines (trucks, buses, etc.) must be ultra-low sulfur diesel (ULSD). By 2010, the ULSD mandate will take effect for off-road engines (generators, locomotives, construction equipment, etc.). The refinery process that reduces sulfur also reduces lubricity, which in turn increases wear on fuel-injection equipment and could result in catastrophic engine failure. Therefore, ULSD requires the addition of a lubricity agent. At a blend of just 2%, biodiesel is an excellent lubricity enhancing additive and the only one that can be produced in Oregon.

Biodiesel Use FAQs

Where can I use biodiesel?

You can use biodiesel or a biodiesel/diesel blend in any diesel motor (cars, generators, woodchippers, home oil tanks, etc).

Will biodiesel hurt my engine?

No. Engines built before 1994 may have natural rubber seals or hoses, which will need to be replaced with synthetic materials. When you first burn biodiesel, or switch back from burning regular diesel for thousands of miles, you will probably have to replace your fuel filter a couple of times. Biodiesel's solvent effects will clean out deposits left in the system by petroleum diesel and clog the filter.

Can I switch between biodiesel and regular diesel?

Yes, biodiesel users report that switching back and forth between diesel, B100 and any blend in between causes no ill effects, though filter replacements may be necessary.

Does switching to biodiesel lower my fuel economy?

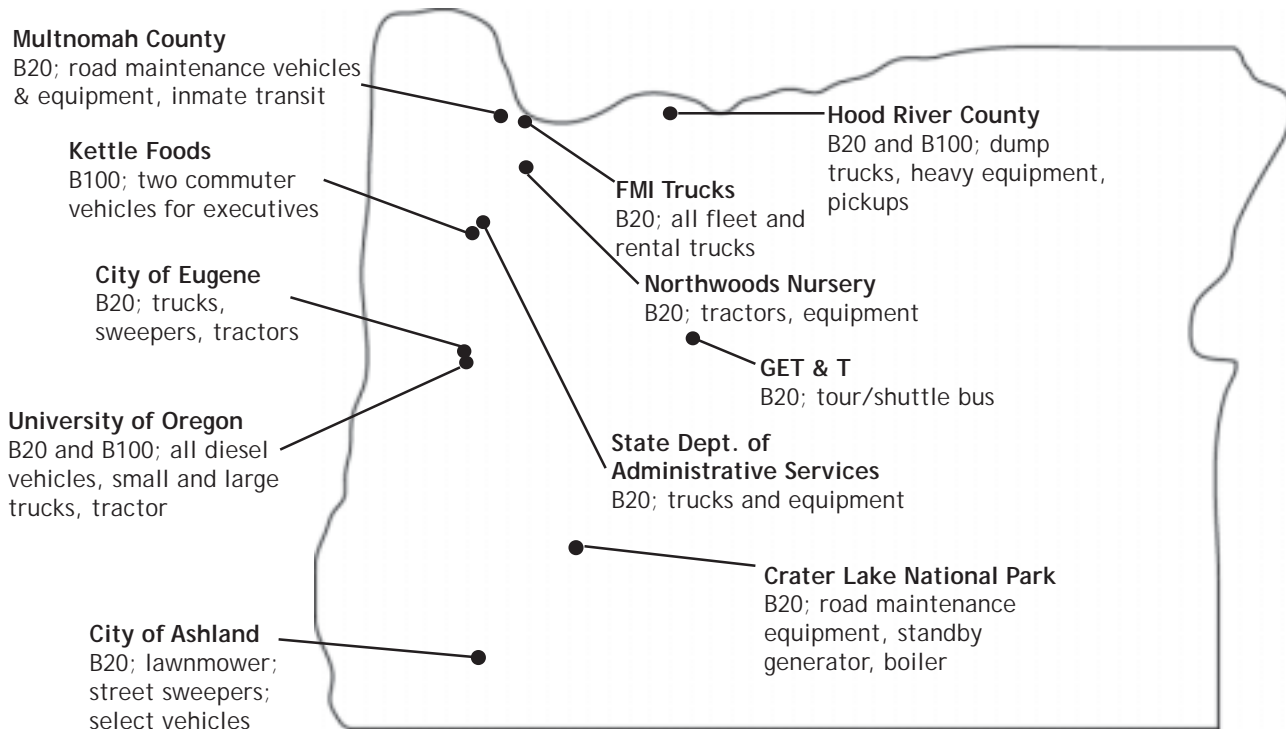
Biodiesel does contain less energy than petroleum diesel, but biodiesel's higher lubricity increases engine efficiency, effectively canceling out the difference. Users of biodiesel have reported no noticeable changes in engine performance.

Will using biodiesel affect my warranty?

If you are buying your biodiesel from the pump or another ASTM-certified source, it shouldn't void your warranty. Fuel from small-scale and home producers is probably not certified. To be safe, please check with the manufacturer before making the switch.

Biodiesel in Oregon

Here are just a few of the hundreds of biodiesel users around the state.



There are a number of retailers selling biodiesel and biodiesel blends in locations around the state, as listed below. For the most recent listing of retailers, or to find biodiesel retailers around the country, visit the National Biodiesel Board's website: www.biodiesel.org/buyingbiodiesel/guide.

Aurora Cardlock Pacific Pride B20; I-5 exit 278 21690 Dolores Way NE; 24/7	Corvallis Co-Op Grease Works! B100 Bulk purchasing co-op 245 SW Cummings Ave.; 9-5 M-F 541-754-1897	Medford Cardlock Hays Oil Co. B100; credit/billing 1890 S. Pacific Hwy.; 24/7	Star Oilco B100; cash/credit/check 232 SE Middlefield Rd. M-F 8:30- 4:30
Bend Retail Pump Red Carpet Express B20; cash/credit 764 N Greenwood Ave; 8-5/7 Co-Op Bend Biofuels Co-Op B100 Bulk purchasing co-op Contact: Michael Hippenhammer 541-322-1910	Eugene Retail Pump Tyree Oil B100; cash/check 1355 West 1st Ave. 10-2 Sat. Cardlock Tyree Oil B20; bi-monthly billing 1355 West 1st Ave.; 24/7	Parkdale (near Hood River) Retail Pump (off-road) Valley Ag Service Inc. B100; cash/check/credit 4995 Van Nuys Dr.; M-F 8-3	Cardlock Star Oilco B20; bi-monthly billing 4505 SE 17th Ave; 24/7 Star Oilco B20; bi-monthly billing 3537 NW St. Helens Rd.; 24/7
		Portland Retail Pumps SeQuential Biofuels B100; cash/credit 11330 NW St. Helens Rd. M-F 6-9, S&S 7-8	Co-Op Go Biodiesel Producer co-op with several meetings/month www.gobiodiesel.org

Bulk purchasing of B100 is available through many of these retailers. Phoenix Organics in Phoenix also offers bulk purchasing; call 541-535-1134 for information. RD Barker Petroleum in McMinnville offers B20 and B100 in bulk; call 503-472-5000. **Cardlocks** are self-service fueling stations which require a specially encoded credit card to gain access to the pumps. Call the biodiesel retailer for details and an application.

www.biofuels4oregon.org

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