

WHAT IS BIODIESEL?

Technical Definition:

Biodiesel is a fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated as B100 that meets the requirements of the American Society for Testing and Materials (ASTM) D 6751.²

How Is It Made?

Domestically produced plant-derived oil, microalgae, fish oil, animal fat, or recycled cooking oil (from restaurants) is mixed with the catalyst lye (sodium or potassium hydroxide) and methanol, which forms methoxide.

The methoxide breaks down the transfatty acids into two products, methyl esters and glycerin (a valuable by-product), through a process called *transesterification*.

The methyl esters are separated from the glycerin. Excess alcohol is recycled and the esters are purified through water washing, vacuum drying, and filtration.

The final product is Biodiesel.¹

See "How is Biodiesel Made?" at the Alternative Fuels Data Center website listed on the back.



Who's Using Biodiesel in Hawai'i?

- ◆ City & County of Honolulu, Maui County
- ◆ Bio-Beetle Rental Cars (Maui and Oahu)
- ◆ Haleakala National Park (Maui)
- ◆ Pacific Whale Foundation & Aqua Adventure Charters (Maui)³
- ◆ Hawaiian Electric Co., Rock Star Masonry, Shamrock Tree Service (Big Island)
- ◆ Neil Young (Big Island) & Willie Nelson & Woody Harrelson (Maui)
- ◆ Many other businesses & residents

Interested in More Information?

- National Biodiesel Board — www.biodiesel.org
- Alternative Fuels Data Center — www.eere.energy.gov/afdc/altfuel/biodiesel.html
- DBEDT Strategic Industries Division — www.state.hi.us/dbedt/ert/
- Pacific Biodiesel, Inc. — www.biodiesel.com
- Bio Beetle Rental Cars — www.bio-beetle.com



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This document was prepared with the support of the U.S. Department of Energy, Grant DE-FG51-02R021318. Any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of, nor constitute an endorsement by, the U.S. Department of Energy, the State of Hawaii, nor any agency or employee thereof.

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www.BID-BEETLE.com

Economic Benefits

- Used cooking oil is collected and processed into biodiesel at the local level, so fuel costs can be lower than petrodiesel.⁵
- Creation of new jobs in the manufacturing industry.
- A decrease in the dependency on foreign oil allows all fuel-related monies to be spent locally and increases our national security.²
- Biodiesel can be the least cost alternative to comply with State and Federal air quality regulations.²



Health and Safety Benefits²

- Biodiesel is non-toxic (ten times less than table salt) and is safe enough to drink (but not recommended due to the fat content).
- It's the only fuel to meet the standards of the EPA's Energy Policy Act and complete all Health Effects Testing under the Clean Air Act.
- Cancer risks are reduced by 90%, leading to reduced health care costs, to improved air quality and the alleviation of greenhouse gases and air pollution.
- Biodiesel biodegrades at the same rate as sugar, which is four times faster than petrodiesel. Therefore, spills and leaks do not pose as much of an environmental threat that occurs with petrodiesel use.
- Biodiesel doesn't produce explosive fuel vapors due to its high flashpoint (the temperature at which the fuel ignites). Thus, there are fewer risks in handling, transporting, and storing biodiesel.

Environmental Benefits

- Biodiesel is derived from renewable and/or recycled sources which help divert waste from landfills.
- Biodiesel is ideal for use in marine areas, national parks, forests, and other ecologically



sensitive environments. It can also be used to clean up petroleum spills and the wildlife affected.^{6 & 9}

- Biodiesel use over petrodiesel would result in the following emission reductions¹:
 - 80% less carbon dioxide
 - Almost 100% less sulphur dioxide
 - 50% less carbon monoxide
 - 95% reduction in hydrocarbons
 - 30% less particulate matter (soot)
 - 30% less overall smog potential
 - Almost no emissions contributing to global warming
 - No sulfur oxides, sulfates, or carcinogenic benzene (components of acid rain)

What Else Should I Know?

- Biodiesel can be used in pure form or as an additive to regular diesel.
- It's the fastest growing alternative fuel in the United States and has been in use in Europe for over 20 years.²
- Hawai'i produces most of its Biodiesel from used cooking oil, but it can also be made from plant crops, beef tallow, fish oil, and microalgae.⁴

Automotive Benefits^{1 & 7}

- More complete fuel combustion due to increased oxygen levels.
- Can be distributed through existing diesel fuel pumps and used in existing, unmodified diesel engines (at most, older rubber hosing may need to be replaced).
- Engine wear is reduced due to 50% increased lubrication, leading to extended and improved engine life.
- Provides smoother vehicle operation without affecting fuel consumption, auto ignition, power output, and engine torque.

- Biodiesel is an excellent solvent and can be used to clean the engine, injectors, fuel pumps, fuel lines, and other automotive parts.
- Biodiesel can be used as an additive to petrodiesel in any ratio. The most common proportion sold commercially is B20 (20% Biodiesel, 80% petrodiesel).



Disadvantages⁷

- Rubber hosing in cars built before mid '90s may be damaged when using B-100.
- Dirt cleaned from engine will clog fuel filters. When first using biodiesel, change filters frequently until all petrodiesel deposits are dissolved.
- A slight increase of nitrogen oxides (NOx) may occur, but the lack of sulphur in the fuel allows for NOx emissions control technology.
- Biodiesel does not work in gasoline engines and is not yet readily available in large supply.

Sources

- 1 – "Biodiesel Fact Sheet". Biodiesel Association of Australia. <http://www.biodiesel.org.au/biodieselfacts.htm>
- 2 – "Environmental & Safety Information" & "Biodiesel and Energy Security". & "Commonly Asked Questions". National Biodiesel Board. http://www.biodiesel.org/pdf_files/Environment_Safety.pdf & http://www.biodiesel.org/pdf_files/fuelsheets/Energy_Security0604.pdf & <http://www.biodiesel.org/resources/faqs/default.shtm>
- 3 – "Uses of Biodiesel Fuels". Yokayo Biofuels. www.ybiofuels.org/bio_fuels/uses.html
- 4 – "Oil Yields and Characteristics". Journey to Forever. http://journeytoforever.org/biodiesel_yield.html
- 5 – "Pacific Biodiesel Winning Price Wars". The Maui News. <http://www.mauinews.com/story.aspx?id=11931>
- 6 – "Technical Handbook for Marine Biodiesel". CytoCulture Environmental Biotechnology. www.cytoCulture.com/biodiesel%20handbook.htm
- 7 – "Biofuels". Earth Science Australia. <http://www.earthsci.org/energy/biofuels/biofuels.html>
- 8 – "A Look Back at the US Dept. of Energy's Aquatic Species Program: Biodiesel from Algae".
- 9 – "Why Biodiesel?" Pacific Biodiesel. http://www.biodiesel.com/why_biodiesel.htm