

Biodiesel

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Biodiesel is made from fat or oil. It can be used in nearly any diesel engine, with little or no engine conversion. However, biodiesel is a stronger solvent than regular diesel (petrodiesel^W) - so much so that it will not only "clean out" the fuel tank, sending debris into the fuel filter, but it will also soften and dissolve many rubber and plastic products, including those used in fuel lines, filters and pumps. This deterioration can take years, however, and the replacement of rubber components does not have to happen immediately. Thus for long life, a different grade of components is needed in an engine that uses biodiesel.



Highly simplified
conceptual diagram
of biodiesel
production.

Biodiesel produces less particulates than petrodiesel and is thus much better for the health of the population, particularly those living in urban areas exposed to significant levels of diesel pollution.

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Vegetable oil extraction and conversion

The process of oil extraction is carried out the same way as for extraction of edible oil from plants. There are many crops grown in rural areas of the developing world which are suitable for oil production – sunflower, coconut, cotton seed, palm, rapeseed, soy bean, peanut, hemp and more. Sunflower oil, for example, has an energy content about 85% that of diesel fuel.

There are two well-established technologies for oil extraction:

- The simple screw press, which is a device for physically extracting the oil from the plant - this technology is well suited to small-scale production of oil as fuel or as foodstuff in rural areas. The press can be motorised or hand-operated.
- Solvent extraction is a chemical process which requires large, sophisticated equipment. This method is more efficient - that

is, it extracts a greater percentage of the oil from the plant - but is less suited to rural applications.

The oil, as well as being used for lighting and heating, can be used as a fuel in internal combustion engines.

Biodiesel production is not complex and can be done on a small scale. The vegetable oil is converted to a useable fuel by adding ethanol or methanol alcohol along with a catalyst to improve the reaction. Small amounts of potassium hydroxide or sodium hydroxide (commonly called lye or caustic soda, which is used in soapmaking) are used as the catalyst material. Glycerine separates out as the reaction takes place and sinks to the bottom of the container. This removes the component that gums up the engine so that a standard diesel engine can be used. The glycerine can be used as a degreasing soap or refined to make other products.

This article or section

Straight vegetable oil

While straight vegetable oil^W can be used as fuel (new, or waste frying oil), it has a negative effect on the engine after prolonged use. Thus it is usually better to process the oil into biodiesel, especially for engines which get heavy use.

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Sources

Biodiesel can be made from any fat or oil, such as:

- fish oils (e.g. in Norway[1] (<http://www.upi.com/NewsTrack/Quirks/20061206-073127-3179r/>))
- vegetable oils, which are now often cheaper than regular fuel, if bought in bulk, and we consider that premium cooking oils

are not needed.

- used deep frying fat or oil (which would normally be discarded, at economic and environmental cost) - take-away food shops typically have a regular output of this waste.
- Even fat from liposuction operations should be able to be used.^[1]

Suggested projects

- Search for literature discussing the health impacts of vehicle pollution, and different aspects of the pollution such as particulates vs other pollutants. *suggested project.*)
- Design a relatively simple, reliable way of converting vegetable oil (waste and/or new) into biodiesel, to minimize the technical expertise and resources needed, perhaps making it more practical for production in small or medium-sized remote towns. *suggested project.*

- It is claimed by a guest on an episode of the UK TV show *Top Gear*[2] (<http://www.youtube.com/watch?v=GOFbsaNeZps>) that adding a solvent makes straight vegetable oil runnier (less viscous) and better for use as fuel. The solvent used in the program is non-kerosene-based white spirit (non-kerosene based for tax purposes) added at 3% by volume to filtered used cooking oil. Does this work? Does it reduce the problems of straight vegetable oil, in terms of the long term effect on the car's engine and cold weather operation?^{*suggested project.*}

See also

- Biodiesel Oven
- Biodiesel Tractor Conversion
- Biodiesel Truck Conversion
- Biodiesel auf Deutsch

- Pongamia pinnata, Karanja

Notes

1. ↑ Fortune in fat
(<http://www.aftenposten.no/english/local/article1559489.ece>)
, *Aftenposten*, 6 Dec 2006. Norwegian businessman Lauri Venoy owns a firm in Miami, Florida, was reported to be making an agreement with US hospital giant Jackson Memorial to supply 11,500 liters of human fat per week from liposuction operations.

References and resources

- Tickell, J., Teickell, K., *From the Fryer to the Fuel Tank: The Complete Guide to Using Vegetable Oil as an Alternative Fuel*, Greenteach Publishing, 1999.

External links

- Make your own biodiesel from Journey to Forever (http://journeytoforever.org/biodiesel_make.html)
- biodiesel blog (<http://www.biodieselblog.com/>)
- Footprint Recycling (<http://www.footprintrecycling.com/>)
Providing biodiesel in Humboldt County
- NREL Biodiesel (<http://www.nrel.gov/docs/fy04osti/36244.pdf>) This is an excellent PDF going into some of the technical details of the chemistry and processes behind biodiesel production.
- Guide to Biodiesel (<http://www.self-sufficiency-guide.com/Biodiesel.html>)

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