



biodiesel



what is it?

Biodiesel is a fuel for diesel engines made from plant (or animal) oils or fats that have been chemically transformed into alkyl esters. Its properties are similar to mineral diesel. Any plant oil can be made into biodiesel, including algae. In fact one of Rudolf Diesel's first engines was exhibited at the Paris exhibition of 1902 running on pure peanut oil. We only support the use of biodiesel made from used oil. It's a bad idea to use land to grow crops for vehicles when so many people go hungry, and there's so much pressure on natural habitats. Corporations are producing it from palm oil grown in huge plantations in West Africa and South-east Asia. We think that biodiesel from these sources is at least as environmentally-damaging as mineral diesel.

This means that we're not advocating a wholesale change to biodiesel for all the world's diesel vehicles, as there's nowhere near enough waste oil. But it's something that can be done on a small scale, using a local waste product. Ultimately, we need to find ways to reduce our fuel use – including driving less, working from home, holidaying without flying and more fuel-efficient transport options.

Plant oil is too viscous to be used directly in a diesel engine, so one of two things needs to happen:

1. vehicle modified to run on straight veg oil, or
2. veg oil modified to be used in a normal diesel engine

No. 2 is biodiesel production. The oil is modified by making the glycerine drop out with a chemical reaction and heat, so it's no longer too viscous, and can be used in any vehicle with a diesel engine, either neat, or mixed with mineral diesel. It can also be used in generators, boats, or as a heating fuel.



Sample of finished home-brew biodiesel.



Biodiesel processor.

what are the benefits?

- Climate change: the most important greenhouse gas is CO₂, emitted by the burning of fossil fuels. Burning biodiesel also emits CO₂, but this is offset by the fact that it's from plants, and plants use CO₂ from the atmosphere to grow
- Emissions: tests have shown that biodiesel is cleaner burning than normal diesel with only a very slight loss in range (how far a vehicle can go on a full tank) of 3-5%. Alkanes, carbon monoxide (CO) and particulates are reduced; only nitrous oxides may stay the same or increase, but can be reduced with a catalytic converter, and / or by altering the engine timing. Sulphur is almost completely eliminated. As well as being good for the atmosphere, this can increase operator safety on vehicles such as waste collection trucks, and the smell is much more pleasant than with conventional diesel vehicles
- Spills: it reduces the risk of spills from oil tankers; small spills and leaks from vehicles are harmless
- Waste reduction: it can reduce waste by recycling used oil. (the UK produces 100-400,000 tonnes of waste cooking each year)
- Energy balance: biodiesel has an energy balance of 3:1, i.e. it provides 3 times the amount of energy used to produce it. (compared to not much more than 1:1 for mineral diesel)
- Biodiesel is more lubricating than mineral diesel, and so can extend engine life
- Being able to drive past a petrol station and knowing that you don't have to give money to giant oil companies



what can I do?

Using biodiesel

You can buy biodiesel (research online to find suppliers from waste oil), or make your own. You can use 100% biodiesel in summer and maybe a 50:50 blend of biodiesel and mineral diesel in winter – biodiesel is more viscous at lower temps, so the fuel pump works harder with a cold start.

As biodiesel is a strong solvent, you need to change your fuel filter after the first 500-1000 miles, as it could remove material from the walls of your fuel tank and deposit it in the fuel filter. This should only happen once though.

Check your vehicle's warranty to see if it covers the use of biodiesel. Many do, but many don't, so you'd be taking a risk. Obviously it's fine after the warranty has run out.

There is a question mark over whether to use it in common-rail diesels and modern, computer-controlled engines. There's a risk that the more precise fuel injectors may become clogged by the slightly more viscous biodiesel, or that the computer may be confused by the oxygen in it into thinking that water is present, and various 'safety' features may kick in. The complexity of modern vehicles seems tailor-made to prevent people from tinkering with their vehicles and their fuel – but plenty still do. On forums many state that they're using 100% biodiesel with modern engines. Maybe a B30 (a blend of 30% biodiesel, 70% mineral diesel) would be better. There's no such risk with older vehicles.

Making biodiesel

Processors: you'll need a processor. You can buy one, or make one with a couple of oil drums, a pump, filter, copper pipe and plumbing fittings. It's cheaper to get together with friends to make or buy a processor. Check forums for reviews of commercial processors. See Lowimpact.org for books or websites on how to build them.

Raw materials: you can buy used cooking oil cheaply (or maybe get it free from local restaurants) as well as the other chemicals that are needed. See our links page.

Method: care must be taken when making biodiesel, as it requires the use of potentially hazardous materials - the area must be well-ventilated, no naked flames, use goggles and gloves. Books or websites will have a list of safety precautions. Here's an overview of the process:



Quite.

- remove excess water from the oil by evaporation or heating & drawing off the bottom when settled
- filter the oil
- 'titrate' a sample of oil to work out the quantity of catalyst to use in the reaction: this involves isopropyl alcohol and a pH indicator
- mix and heat the oil with alcohol (usually methanol) and a catalyst ('lye' - sodium or potassium hydroxide) in a processor
- when settled, draw off glycerine from the bottom (can be used to make soap and other products - after recovering excess methanol from it)
- 'wash' biodiesel with water to remove impurities
- filter again and de-water for finished biodiesel

See lowimpact.org/biodiesel for quantities and detailed instructions.

Testing, regulations & duty: if you buy biodiesel, duty is already paid; if you make it, ask HMRC about current rates of duty (which is constantly changing), and the Environment Agency about permissions (although you probably won't need permits for domestic production). There are companies that can test your biodiesel's quality.

resources

- see lowimpact.org/biodiesel for more detailed info, link and books, including:
- Estill & Armantrout, *Backyard Biodiesel*
- Guy Purcella, *DIY Guide to Biodiesel*
- Bryan Connery, *Biodiesel Handling & Use*
- Joshua Tickell, *From the Fryer to the Fuel Tank*
- graham-laming.com - biodiesel-making resource
- biofuelwatch.org.uk - campaigning against land use for biofuels

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