

# Biodiesel Tipsheet 50p



Centre for  
Alternative  
Technology  
Publications

As the impacts of global climate change become increasingly visible, interest in alternatives to fossil fuels is growing. Learn which biofuels are suitable for you, where to buy them, and how to make your own.

Machynlleth, Powys SY20 9AZ / Tel. 01654 705950 / Fax. 01654 702782 / email. [info@cat.org.uk](mailto:info@cat.org.uk) / website. [www.cat.org.uk](http://www.cat.org.uk)

Interest in alternative transport fuels grows as the impacts of global climate change become increasingly visible, and as the international situation makes fuel security a vital issue. As oil prices increase and reserves become exhausted, investment in the alternatives to fossil fuels will become widespread. In the meantime, a number of adventurous and environmentally conscious individuals and entrepreneurs have begun to seek out change for themselves. A swift browse through the dozens of internet sites available on the subject proves that there is much you can do, even in the rather backward UK, to cut your CO<sub>2</sub> emissions and your chances of running out of gas!

So, what can you do? You can buy biodiesel (new or used vegetable oil that has gone through a process of transesterification), or a modified vehicle that will run on straight vegetable oil (SVO) – (using one of a number of methods intended to heat the SVO and reduce its viscosity). Or you can do it yourself: make your own biodiesel at home, or install an engine conversion kit. If doing it yourself, or using SVO, then don't forget that you will still be liable for fuel duty – HM Revenue and Customs require payment of duty on every litre of fuel used for transport on public roads (but not for boats, farm vehicles or generators). If producing fuel yourself you will need to register as a producer and for tax – you'll need to register for tax as an SVO user too. (Contact HM Revenue and Customs for form EX103A and notice 179E, [www.hmrc.gov.uk](http://www.hmrc.gov.uk))

## What's best for me?

It depends on your level of commitment and technical know how. Experience shows that using biodiesel is quick, convenient and suitable for almost all diesel vehicles without any modification, whereas using 100% SVO requires a conversion kit, plus a certain amount of dexterity and skill to fit the kit (depending on your vehicle and the method of conversion you choose). Making your own biodiesel, however, is a potentially dangerous activity that requires proper preparation facilities and extreme care and attention to detail (though the process itself is relatively straightforward once you understand the organic chemistry involved). Both forms of 'vegetable' fuel attract a reduced rate of duty – this will be reflected in the price you pay your supplier of biodiesel or the tax you have to pay as a producer – the tax is currently 20p per litre less than that for fossil diesel. *From the Fryer to the Fuel Tank* by Joshua Tickell explains in detail how to turn used vegetable oil into a fuel – either by creating biodiesel or by modifying your engine to run on SVO.

## Buy

There are a number of organisations that are now producing biodiesel in the UK – from collectives to commercial companies. You can have fuel delivered to your garage in quantities from 20 to 200 litres, buy a tank for 1000 litres or even in some places pick it up from a refuelling station (see [www.biodieselfillingstations.co.uk](http://www.biodieselfillingstations.co.uk), which at the time of



## How biodiesel is made

The process of converting vegetable oil into biodiesel, whether used waste product or from crops such as oilseed rape (*above*), relies on an organic chemical reaction known as transesterification, a chemical process in which the vegetable oil molecule is broken up, glycerol is removed and replaced by the much lighter compound methanol. The basic chemical process remains the same whether 1 litre or 1 million litres is being produced, though the quality of the feedstock oil will dictate the intensity and length of the process.

Note: Biodiesel can technically be produced from ethically unsound crops, such as palm oil grown on clearcut rainforest land. Similarly, source crops which require high energy input to be produced provide no net environmental benefit if using them to produce biofuels. Check what you're buying!

writing lists over 200 outlets, though the majority are currently listing 5% biodiesel blends; only 23 suppliers are listed for 95-100% biodiesel). In France most diesel sold at the pump contains a small proportion of biodiesel, and in the UK a lot of Tesco service stations are also selling 5% biodiesel.

## DIY

**Biodiesel:** as mentioned above, doing-it-yourself is perfectly possible, but isn't simple and needs strict care and attention. You can buy the necessary chemicals and hardware from suppliers varying from your local pharmacy to dealers in secondhand laboratory equipment, or you can build your own 'reactor' following guidelines devised by organisations such as the Low Impact Living Initiative (LILI). You will need to set aside a safe working area with sufficient room to store volatile chemicals, oil feedstock and finished fuel and to house your reactor – its size will be dependent on the scale at which you intend to produce biodiesel i.e. tens, hundreds or thousands of litres at a time. CAT would advise all those considering producing their own fuel to first attend a training course: either at CAT or elsewhere (see Further information).

**SVO:** straight vegetable oil is very thick (viscous), and using 100% SVO will require some changes to your vehicle's engine, but these are comparatively simple and completely safe. To make the oil thin enough it needs to be heated and there are various systems that can be installed either by the car owner or a professional. Oil can be heated either electrically or by starting the engine with fossil diesel and when it is warm using this heat to warm the oil. In the former case it is important to heat the entire fuel system, right down to the combustion chambers. Care has to be taken not to place excessive demands on the vehicle's electrical system (resulting in a flat battery). In the latter case two fuel tanks and fuel supply systems are installed and the engine is started from cold, with a small amount of fossil diesel or biodiesel. When the engine has warmed up and heated the vegetable oil sufficiently, a switch is flicked to change over to the SVO fuel system. The switch should be turned back to the alternative diesel supply before stopping the engine so that no SVO remains in the fuel system when the engine has cooled. Systems also exist that continuously gauge fuel viscosity and automatically blend fossil diesel and SVO from different tanks to feed an ideal fuel blend to the engine.

By far the simplest method, if you have an older or more robust diesel engine, is to use a blend of SVO and fossil diesel. Depending on your engine, this can be up to 35% SVO without the need to carry out any engine modifications. You only have to record how much fossil diesel you add to the tank and add the appropriate amount of SVO – thus reducing both your dependence on fossil diesel and your emissions.

#### What to watch out for when using your biodiesel

- Check your warranty – it may outlaw use of any alternative fuel – though most manufacturers permit a blend of 5% biodiesel to be used.
- Check your insurance policy – the NFU Mutual will insure vehicles run on vegetable oil.
- Check fuel filters during the first few weeks of use – they may clog to begin with due to paint, linings or fuel deposits being removed from the fuel tank (biodiesel is a strong solvent). Filters may need changing, but this will only occur when you initially make the change to biodiesel.
- Rubber engine parts found in older diesel engines (~1994), may degrade and should be replaced with synthetic lines.
- Biodiesel and fossil diesel form wax crystals in very cold weather, which will clog filters etc. In these circumstances, use a winterising agent.
- Extra care must be taken when using waste vegetable oil as it is thicker than new oil and contains contaminants such as dissolved fats and food particles.

**Beware:** there are lots of products coming on to the market branded 'biodiesel', but they won't, necessarily, all be the same thing. This tipsheet focuses on transesterified biodiesel (or FAME – fatty acid methyl esters). You may also find modified waste vegetable oil and 5% biodiesel 95% fossil diesel blends labelled as 'biodiesel'.

#### Case studies

Based in Ammanford, south Wales, **Sundance Renewables**, a non-profit making company, makes fuel from locally sourced used vegetable oil. Sundance are keen to see sustainable community based groups making their own renewable fuel countrywide. They run training courses and offer a complete turnkey package from feasibility studies, business plans and VPPC permit applications to design and installation, operator training and ongoing support services. Their fuel has been awarded the European biodiesel specification EN14214.



Leyland LDV engine conversion

#### Further information

##### Courses

- **Centre for Alternative Technology:**  
*Make Your Own Biodiesel*  
tel. 01654 705981  
web. [www.cat.org.uk/courses/](http://www.cat.org.uk/courses/)
- **Low Impact Living Initiative**  
*How to Make Biodiesel*  
*Veg Oil Engine Conversion: Low Impact Living Initiative*  
tel. 01296 714184  
web. [www.lowimpact.org/courses.htm](http://www.lowimpact.org/courses.htm)

##### Books

- *From the Fryer to the Fuel Tank: The Complete Guide to Using Vegetable Oil as an Alternative Fuel*, Joshua Tickell, Eco-Logic Books / Worldly Goods
- *How to Make Biodiesel*, Dave Derby, Jon Halle, Low-Impact Living Initiative

##### Websites

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| <a href="http://www.biofuels.fsnet.co.uk">www.biofuels.fsnet.co.uk</a> | <a href="http://www.vegburner.co.uk">www.vegburner.co.uk</a>                         |
| <a href="http://www.ecotrip.co.uk">www.ecotrip.co.uk</a>               | <a href="http://www.vegetableoilbiodiesel.co.uk">www.vegetableoilbiodiesel.co.uk</a> |
| <a href="http://www.veggiepower.org.uk">www.veggiepower.org.uk</a>     | <a href="http://www.biodiesellamerica.org">www.biodiesellamerica.org</a>             |
| <a href="http://www.biofuels.ca">www.biofuels.ca</a>                   | <a href="http://www.hmrc.gov.uk">www.hmrc.gov.uk</a>                                 |

**Golden Fuels** is a workers' co-operative venture in Oxfordshire which achieved full recognition as a commercial producer and supplier of biodiesel in early 2005. They run training courses for groups and individuals – contributing to courses at LILI and CAT. In response to requests from course participants and others, they are working on a design for a community scale biodiesel reactors. The design will give small scale producers all the kit they need to make small batches of biodiesel. These reactors are intended to utilise waste oil collected directly from catering outlets or unused oil. They have paid special attention to minimising waste products and possible emissions.

**Please note that using and producing alternative fuels can be dangerous – proper precautions must be taken at all times. Take care not to damage yourself or others, not to mention your vehicle! Don't try it yourself without undergoing proper training via an established course (see resources).**