



Centre for
Alternative
Technology

ALTERNATIVE TRANSPORT FUELS

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Modern modes of transport cause lots of problems. We tend to organise our lives around the idea of everyone having their own car - living miles from work, school or friends, so spending more time in our cars and having an impact on our environment and on local communities. In the last fifty years the number of cars on our roads increased from two million to over 20 million, a figure that is still rising.

The conventional automobile, even after a whole century of engineering from what is now the largest industry on the planet, is incredibly inefficient. Of the fuel energy consumed by a normal car, almost 80% is lost as engine heat and exhaust, so only 20% is transferred to movement of the vehicle. Of that 20%, around 95% is used to move the car itself whilst the remaining 5% (1% of the total fuel energy used) actually moves the driver!

Cars and lorries cause congestion, noise, local pollution, harm to health, destruction of habitats and biodiversity, and global warming - hardly the freedom that we think they offer. These problems can really only be tackled by using cars and lorries less - and instead looking at alternatives such as trains, buses, trams, bicycles and our feet! Many argue that this is difficult because of insufficient public transport - a chicken and egg situation. Whilst we are still so wedded to our cars some of the problems, (e.g. pollution and global warming) would lessen if we used alternative transport fuels.

Conventional fuels such as petrol and diesel emit pollutants including carbon dioxide, nitrogen oxide, carbon monoxide, benzene and particulates. New petrol cars have catalysts to clean up these emissions, and though a diesel car emits less carbon monoxide and carbon dioxide than a petrol car with a catalyst, it emits more particulates and nitrogen oxide. Cleaner fuels like ultra low sulphur diesel (ULSD) may have lower levels of sulphur, nitrogen oxide or benzene but do still contribute to global warming. It is estimated that around one in seven children has asthma - and there are strong links between this and traffic pollution.

Alternative transport fuels

Using renewable energy for transport would cut emissions (so is a technical fix) but would not sort out congestion, traffic jams, unsafe roads etc. Possible transport fuels include biodiesel,

ethanol, methanol, and electricity from renewable sources for electric vehicles or to make hydrogen.

Vegetable based fuels include oilseed crops like rape and recycled waste oils - including vegetable, fish and animal oils. In diesel engines you can use straight vegetable oils, in which case you'll usually need to modify your engine to preheat the oil, or use **biodiesel**, formed by removing the glycerine from the raw product - known as 'esterification'. Biodiesel will work in most modern diesel engines - either on its own or blended with ordinary diesel, and although you won't normally need to modify the engine you may need to modify/check your fuel pipe. Using biodiesel or vegetable oil might make your vehicle's warranty invalid, and their use should be approached carefully, as if used incorrectly, they may damage your engine. With a bit of technical knowledge it is possible to make your own biodiesel but you need to pay duty on it.

However, there are insufficient supplies of used oils to meet existing diesel demand, and if lots of biodiesel were made from new vegetable oils, it would raise issues about land use and the energy used in production.

Ethanol can be produced from starchy or sugary feed stocks, such as sugarcane or maize, by fermentation - much as in the production of alcohol. Ethanol can be used blended with petrol and is widely used around the world - with more than 4 million vehicles in Brazil running on it.

Electric vehicles are ideal for short journeys, and range from bikes and scooters to ordinary-looking cars and vans. They are very quiet, have zero tailpipe emissions (though if you haven't switched to a green electricity supplier there are emissions associated with fossil fuel generation) and are extremely cheap to run - as little as 1p a mile. They have a top speed of around 50mph, but the drawback is that the batteries have a limited range (50 miles is about average but some can have an 80 - 100 mile range) and don't charge instantly. If most of your journeys are local this shouldn't be a problem. It takes around 2 hours to charge a half-full battery, or 6 - 8 hours to charge from empty. Some fleet vehicles have changeable batteries, so one can be charged while the other is being used.

If you park on the street charging may be difficult, although as time goes on there should be more 'recharging stations' appearing both for

public use and at workplaces. Westminster City Council have offered free parking and recharging for electric vehicles in their car parks, and in one London Borough (Lambeth) an electric vehicle user has a recharging post in the street with reserved parking.

Electric vehicles still aren't widely available to the general public – contact us for details of suppliers. Petrol and diesel cars can be converted to run on electricity by removing the engine, radiator, fuel tank and exhaust system and replacing them with an electric motor, batteries and control equipment, Although this is expensive (£5000 upward). There are companies that will convert your car, or you can get a DIY conversion kit for some cars.

Most major car companies are now producing **Hybrid Cars**, combining some elements of electric vehicles with conventional petrol engines to achieve a high fuel performance (up to around 80mpg). The 2 seater Honda Insight has a battery that is charged when the car is decelerating, with the electricity stored used to assist the petrol engine under high load or acceleration. The first mass-produced hybrid car was the Toyota Prius, which uses just the electric motor when travelling at speeds under 20mph, but switches to petrol at higher speeds (again assisted by the batteries under high load). Hybrid cars look set to be popular as they don't need recharging and have a good range. Although more fuel-efficient than a conventional internal combustion engine, they still give off significant carbon dioxide emissions.

Liquid Petroleum Gas (LPG) is a fossil fuel, but has lower carbon dioxide emissions than petrol (it produces more carbon dioxide than diesel but less nitrous oxide and particulates). It is currently cheaper because it has a lower fuel duty. A litre of LPG will take you only 75% as far as a litre of petrol, but you can go one and half times as far for the same money. Many vehicles can be converted to LPG, but it's easier to convert petrol engines than diesel. You can usually convert your car so that it will run off either fuel, at the flick of a switch. The number of petrol stations offering LPG is increasing (1300 at present).

Natural Gas can be used in vehicles, but it is less energy dense than LPG so must be compressed or cooled to become a liquid fuel. The weight and cost of tanks and the limited number of refuelling points makes it more suitable for trucks and buses than for cars. It is much cheaper than LPG.

Hydrogen can be burnt in an internal combustion engine or used in a fuel cell to produce electricity.

Fuel Cells are not a fuel in themselves but a device for converting energy from a fuel (usually hydrogen) directly into electrical energy, which

can then be used to drive a motor. Car manufacturers are looking at either storing compressed hydrogen in a tank in the vehicle or having a tank of petrol or methanol from which hydrogen is generated by an on-board 'reformer'. The hydrogen would then propel the vehicle via an electric drive-train. The first option is more efficient, and cheaper; and the hydrogen could be created with renewable energy. However, it requires an infrastructure for refuelling hydrogen vehicles. Although the second option may use fossil fuels, it would use them more efficiently than internal combustion engines and could use the existing fuel station infrastructure.

Fuel cell vehicles are not yet available, but there are some prototypes in operation - including buses in London and Canada. Iceland has opened the world's first hydrogen fuel station, and major car companies are developing fuel cell cars that may be available in the next couple of years.

Compressed Air cars have been developed in France and are used as taxis in Mexico City and elsewhere. Like electric vehicles, they produce no emissions directly, but energy is needed to compress the air.

CONTACTS

CAT Courses

Tel: 01654 705981; Web: www.cat.org.uk/courses

Run weekend courses in making biodiesel and on converting engines to run on vegetable oil.

CAT Mail order

Tel: 01654 705959; web:

www.cat.org.uk/shopping Sell 'How to Make Biodiesel' and 'From the Fryer to The Fuel Tank' - both guides to making biodiesel.

Campaign for Better Transport

Tel: 020 7613 0743; www.bettertransport.org.uk

Campaigns for environmentally sound and socially responsible transport policies: putting pedestrian, public transport and vulnerable road users first.

Energy Saving Trust: Fleet and Travel Plans

Tel: 0845 602 1425; web: www.est.org.uk/fleet
Grants and advice on cutting emissions and costs for fleet operators, local authorities or employers.

LP Gas Association

Tel: 01425 461612; web: www.boostlpg.com
Information on LPG, including companies offering vehicle conversions and UK refuelling stations.

Environmental Transport Association

Tel: 0800 212 810; web: www.eta.co.uk
Provides insurance and breakdown services, and campaigns for a sustainable transport system.