Biodiesel

Biodiesel is a clean burning alternative fuel, produced from domestically grown, renewable resources. Biodiesel contains no petroleum products, but can be blended at any concentration with diesel from fossil sources to create a biodiesel blend. It can be used in compression-ignition (diesel) engines with little or no modification. Biodiesel is simple to use, biodegradable, non-toxic, and basically free of sulphur compounds and aromatics.

Composition

Biodiesel is made in a chemical process called transesterification, where the glycerine is separated from the fat or vegetable oil. The process results in two products -- methyl esters (the chemical name for biodiesel) and glycerine (a valuable by-product usually sold for use in the production of soap).

Biodiesel should not be confused with straight vegetable oil! Fuel-grade biodiesel is produced to strict industry specifications (ASTM D6751 in the US) in order to ensure proper combustion and engine performance. Biodiesel is the only alternative fuel for motor vehicles up to now (2004) to have fully completed the health effects testing requirements of the 1990 Clean Air Act Amendments. Biodiesel that meets ASTM D6751 and is registered with the Environmental Protection Agency is a legal motor fuel for sale and distribution as such. Raw vegetable oil cannot meet biodiesel fuel specifications, it is not registered with the EPA, and it is not a legal motor fuel, despite widespread use in many areas. To express it more exactly: Biodiesel is defined as mono-alkyl esters of long-chain fatty acids derived from vegetable oils or animal fats, conforming to ASTM D6751 specifications for use in diesel engines. Biodiesel refers to the pure fuel before blending with diesel fuel.

Biodiesel is less damaging to the environment because it is made from renewable resources and has lower emissions compared to fossil diesel. The toxic effects are even less than from table salt and it biodegrades as fast as sugar when spilled. Since it is made from renewable resources such as rape seeds or similar oil plants, its use decreases dependence on imported oil, whilst contributing to the local rural economy.

Comparison

With agricultural commodity prices approaching record lows, and petroleum prices reaching ever new record highs, it is clear that more can be done to utilize domestic surpluses of vegetable oils while enhancing energy security. Oil plants will grow in many areas where other agriculture is possible. Because biodiesel can be manufactured using existing industrial production capacity, and is used with conventional equipment, it provides a very good way of securing energy supplies in the short term.

Increased utilization of renewable biofuels can result in measurable microeconomic benefits for both the industrial and agricultural sectors as well as positively affecting the balance of trade. A study completed in 2001 by the U.S. Department of Agriculture states that an annual increase by the equivalent of 760 million litres of soy-based biodiesel demand would boost the total cash receipts from crops by USD5.2 billion cumulatively by 2010, leading to an average farm income increase of USD300 million per year net over this period. In addition to being a domestically produced, renewable alternative fuel for diesel engines, biodiesel has positive performance attributes such as increased cetane number, high fuel lubricating value and high oxygen content.

Biodiesel is one of the most rigorously tested alternative fuels on the market. A number of independent studies have been completed with the results showing biodiesel performs as well as fossil diesel whilst causing much less damage to the environment and human health compared to diesel. That research includes studies performed by the U.S. Department of Agriculture, U.S. Department of Energy, Stanadyne Automotive Corp., Lovelace
Respiratory Research Institute, and Southwest Research Institute. Biodiesel is the first and, up to now, the only alternative fuel to have completed the rigorous Health Effects testing requirements of the Clean Air Act. Biodiesel has been shown to perform similarly to diesel in more than 80 million successful road kilometres, using virtually all types of diesel engines, a great deal of off-road distance and countless marine hours. There are now more than 300 major fleets use the fuel in the US alone.

Pure biodiesel (B100) has a solvent effect, which may well release deposits accumulated on tank walls and in pipes from operation. It will also attack paint and similar surfaces, given the chance. Using high blends of biodiesel, the release of deposits may clog filters initially and care should be taken to replace fuel filters until the build-up of deposits is eliminated. This issue is less of a problem with B20 blends, and there is no evidence that lower-blend levels such as B2 have caused filters to plug.

B20 and B2 refer to the American system of designating the percentage of biodiesel in a blend. B20 contains 20 % biodiesel and B2 contains 2 % biodiesel by volume. The rest will consist of standard fossil diesel fuel.

The recent switch to low-sulphur diesel fuel has caused most OEMs to switch to components that are also suitable for use with biodiesel. In general, biodiesel used in pure form can soften and degrade certain types of elastomers and natural rubber compounds relatively quickly. These were commonly used in engines up to a few years ago, so there may be a compatibility issue with older vehicles. Using high percentage blends can impact fuel system components (primarily fuel hoses and fuel pump seals) that contain elastomer compounds incompatible with biodiesel, although the effect is lessened as the biodiesel blend level is decreased. Experience has shown that no changes to gaskets or hoses are necessary when using B20, even in older engines.

The final issue to be covered is that of shelf life. Most fuel today is used up long before six months, and many petroleum companies do not recommend storing hydrocarbon diesel for more than six months. The current industry recommendation is that biodiesel be used within six months, or reanalysed after six months to ensure the fuel meets ASTM specifications (D-6751).

On the negative side, biodiesel does not supply the same energy yield per area that energy plants for use in a biodigester would. The methane produced there would give about twice the energy that the same area devoted to oil plants for biodiesel production would recover. Biodiesel has the great advantage of being useable in existing engines with very little being needed in the way of adaptation. In cold climates it will probably prove impossible to use pure biodiesel (B100), but mixtures up to 20 % biodiesel (B20) should cope with most climates. Preheating of the fuel is also a possibility, which is unavoidable in many areas, even using standard diesel from fossil sources. This advantage means that the technology can be applied generally without any preparation stage. Converting fleets of vehicles to gas propulsion is a very costly and time-consuming business, to say nothing of the down-time caused.