



Biodiesel

A fuel derived from organic oils, such as vegetable oil, rather than petroleum. Biodiesel's use and production are increasing. It's typically used for aircraft, vehicles and as heating oil.

Vegetable oils comprise of 90 to 95% triglycerides with small amount of diglycerides, free fatty acids, phospholipids, etc. The viscosity of vegetable oils are higher and their molecular weights are in the range of 600 to 900, which are about 3 times higher than those of the diesel fuels.

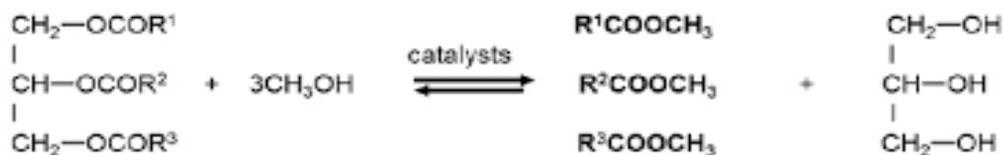
Problems in using Vegetable Oils directly

- (i) As the viscosities of vegetable oils are high, atomization is very poor and hence inefficient mixing of oil with air leads to incomplete combustion.
- (ii) Oxidation and Thermal polymerization of vegetable oils cause deposit formation

Manufacture: Trans-Esterification (or) Alcoholysis

The above problems are overcome by reducing the viscosity of the vegetable oils by the process known as trans-esterification or alcoholysis. Alcoholysis is nothing but displacement of alcohol from an ester by another alcohol.

It involves treatment of vegetable oil (sunflower oil, palm oil, soya bean oil, mustard oil, etc.) with excess of methanol in the presence of catalyst to give mono ethyl esters of long chain fatty acid and glycerin. It is allowed to stand for some time and glycerin is separated.



Plant Oil
(Triglyceride)
(Rapeseed,
Soybean, etc)

Methanol

Biodiesel Fuel (BDF)
(Methyl ester compounds)

Glycerin

R¹, R², R³: Fatty Acid Chain (C11~C17)

Methyl esters of fatty acids, thus formed, are called "**Bio-diesel**". Bio diesel is defined as mono-alkyl esters of long chain fatty acids derived from vegetable oils or fats.



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Advantages

1. It can be produced from renewable, domestic resources.
2. Biodiesel is energy efficient
3. It can be used directly in most diesel engine applications.
4. It can reduce global warming
5. It is nontoxic and biodegradable.

Limitations

1. It generally has a higher cloud and pour point (will freeze at a higher temp) than conventional diesel.
2. It is not compatible with some metals and plastics.
3. It may increase nitrogen oxide emissions