

Biofuels Technical Terms

- **Batch Processing:** Since the 1940s, batch processing (one quantity of raw material at a time) has been used, with separation of biodiesel from glycerol being the final part of the process. The advantages of batch operation are given as cheap cost and flexibility to accommodate changes in raw materials quality and quantity. The disadvantages are difficulty in attaining consistency of product quality and safety.
- **Cellulosic biomass:** Cellulosic biomass is the fibrous, woody, and generally inedible portions of plants that make up 75 percent or more of all plant material. Bioethanol and biobutanol are produced from cellulosic biomass. Typically, cellulosic biomass is derived from readily available sources such as perennial grasses like switchgrass, plant wastes and even sawdust. Cellulosic biomass is cheap, it doesn't compete with food crops and estimates have put the level of production from cellulosic biomass as high as **2,000 gallons of renewable petroleum per acre**. There are two ways of producing alcohol from **cellulose** : Cellulolysis processes which consist of **hydrolysis** on pretreated lignocellulosic materials, using **enzymes** to break complex cellulose into simple **sugars** such as **glucose** and followed by **fermentation** and **distillation**. **Gasification** that transforms the **lignocellulosic** raw material into gaseous **carbon monoxide** and hydrogen. These gases can be converted to ethanol by fermentation or chemical **catalysis**. They both include distillation as the final step to isolate the pure ethanol.
- **Cetane number:** Biodiesel from tallow has a higher cetane number than plant oil biodiesel. This means cleaner and more efficient burning in diesel engines.
- **Chemical transesterification:** Biodiesel can be produced from any non mineral oil or fat through transesterification, a reaction with alcohol and a catalyst. The products of the reaction are an ester (biodiesel) and glycerol. A variation of the transesterification reaction has been used for centuries to produce soap but modern biodiesel production plants use a very fast, high pressure and temperature continuous process.
- **Cloud point:** Due to the high levels of saturates, biodiesel from tallow tends to crystallise out at much higher temperatures than biodiesel from plant oils. In Northern Europe this makes tallow biodiesel unsuitable for winter use apart from blending at low rates into conventional diesel. Tallow diesel cannot meet the required DIN standard for 100% biodiesel, but as a 5% mix with conventional diesel it meets the required standards. Cloud point defines the temperature at which a clear diesel fuel becomes hazy or cloudy due to the formation of wax crystals.
- **Cold Filter Plugging Point (CFPP):** An indicator of the temperature at which the precipitation of wax crystals in distillate fuel may lead to blocking or plugging of equipment filters and fuel lines.
- **Cold-flow standards:** Biodiesel specifications in New Zealand are controlled by a voluntary Standard NZS 7500:2005 Automotive Biodiesel - Specification for manufacturing and blending. While biodiesel is generally considered to be similar to mineral diesel there are some key differences which need to be considered as part of a diesel / biodiesel blend. These properties are density, viscosity and cold flow (cloud point and cold filter plugging point or CFPP). Biodiesel, particularly when made from tallow, is known to have poor cold flow properties. While cold flow properties are specified in the PPSR all oil companies in New Zealand choose to provide diesel with more stringent cold flow properties. See **here** for more details on cold flow.
- **Continuous Flow:** The advantages of continuous reactors include product consistency, safety, and more efficient design options for the reactor and ancillary processes such as glycerol separation. The key feature of the process is its ability to operate continuously with a high reaction rate, potentially requiring less post reaction cleaning and product/reactant separation than currently established processes.

- **Denaturant:** A substance added to ethanol to make it undrinkable, or unsuitable for human consumption, e.g. petrol.
- **EN 14214:** Automotive fuels - Fatty acid methyl esters (FAME) for diesel engines – Requirements and test methods.
- **FAEE:** Fatty acid ethyl ester, biodiesel produced by ethanol esterification of natural product fatty acids.
- **FAME:** Fatty acid methyl ester, biodiesel produced by methanol esterification of natural product fatty acids.
- **Fermentation:** Ethanol is currently produced from starch and sugar based products which are fermented to form a dilute alcohol. Various grades of industrial, beverage and fuel grade ethanol are then distilled from the initial dilute solution.
- **Fuel Quality Monitoring Programme (FQMP):** Responsibility of the Measurement and Product Safety Service, a group within the Ministry of Economic Development. It routinely tests petrol and diesel samples from around the country to monitor that the fuel available to consumers complies with the regulations.
- **FVI:** Flexible Volatility Index is a function of VP and E70. It is an indicator of hot running performance, or the tendency for fuel to vaporise in the fuel lines when the engine is hot (known as vapour lock) and impede fuel flow.
- **Gasification:** Interest is currently growing in the use of biomass gasification products to produce Fischer-Tropsch liquids (FTLs). These liquids may eventually be produced at similar prices to petroleum-based diesel. FTL formulations tend to be cleaner burning than petroleum-based diesel.
- **Glycerides:** Esters formed from glycerol and fatty acids. Glycerol can be esterified with one, two or three fatty acids to form monoglycerides, diglycerides and triglycerides.
- **Glycerol (or glycerine):** An alcohol that is the main by-product of the transesterification process. Biodiesel may contain free glycerol and/or bound glycerol (i.e. contained in the mono-, di- and triglycerides).
- **Hydrous ethanol:** Neat ethanol that has a higher water content than "anhydrous" ethanol, and is therefore generally unsuitable for blending with petrol.
- **Hydrolysis/Fermentation** - Advances in the hydrolysis/fermentation of ligno-cellulose to produce ethanol/methanol and lignin are promising, with future cost reductions claimed. The alcohol fuels can be used in present designs of internal combustion engines, new micro-turbines, or as a source of hydrogen for fuel cells.
- **Minimum ester content:** Conventional processing methods require a much higher quality tallow in order to meet the Engine Fuels Specifications Regulations minimum ester content and cold-flow standards.
- **NZS 7500:** The New Zealand Standard on Automotive Biodiesel – Specification for Manufacturing and Blending.
- **Polymerise:** The chemical reaction in which a compound is made into a polymer, which is a natural or synthetic compound that consists of large molecules made of many chemically bonded smaller identical molecules.
- **Pr EN 15376:** Automotive fuels - Ethanol as a blending component for petrol.
- **Pyrolysis:** Pyrolysis processes provide greater flexibility and higher conversion efficiencies compared to combustion, but capital costs are also currently excessive and technology is in the early stages of development. The product, pyrolysis oil, which can be used in turbines and other heat plant, can be easily transported and thus allows separation of the resource location from the site of use.
- **Reactive Distillation:** Reactive Distillation is a continuous process in which the chemical reactions and product separations occur simultaneously in the one unit.

- **Rendering:** Rendering is the boiling down of waste scraps of meat, fat, bone and other animal tissues at meat processing plants to produce meat meal and tallow.
- **Saturated fatty acids:** All carbons contain as many hydrogens as possible (hence a saturated fat is 'saturated' with hydrogen atoms). The fatty acids do not contain any double bonds or other functional groups along the chain.
- **Tallow:** Tallow is the fat fraction from the rendering process. It is produced in two main grades – edible grade for human consumption as cooking fat or in baked products, and inedible grade that is made into soap, candles and waxes. New Zealand rendering systems are generally advanced and well managed, and consequently NZ tallows command a premium on world markets. See guide to buying tallow here.
- **Tallow methyl esters manufacture:** Biodiesel is formed when tallow (triglycerides) is heated in the presence of methanol and an alkaline catalyst to produce methyl esters (biodiesel) and glycerol.
- **Unsaturated fatty acids:** A fat or fatty acid in which there are one or more double bonds in the fatty acid chain (hence eliminating hydrogen atoms). A fat molecule is monosaturated if it contains one double bond and polyunsaturated if it contains more than one double bond. The greater the degree of unsaturation in a fatty acid (i.e. the more double bonds in the fatty acid), the more vulnerable it is to oxidative degradation.
- **Vapour pressure (VP):** This is a measure of the pressure exerted by the vapours delivered from a liquid at a given temperature and pressure.

Something missing here?

Contact us with your suggestions to make this list of technical terms more helpful.