BIODIESEL PRODUCTION

Biodiesel is mainly produced from soybeans, canola, cotton seed and mustard seed.

However, also other oilseed crops, recycled cooking oils, animal fats and other vegetable and recycled oils offer good potential for biodiesel production.

Biodiesel can operate in diesel engines with little or no engine modification. It has superior lubricity, higher flash point, and similar calorific value compared with petro-diesel.

It has no sulphur and substantially reduced unburned hydrocarbons, carbon monoxide, and particulate matter.

It is essentially free of harmful aromatics such as benzene toluene and xylene, which can be as high as 40% in petrodiesel.

If waste vegetable oil is used for biodiesel production, it is filtered to remove dirt, charred food, and other non-oil material often found in it.

Water is removed because its presence causes the triglycerides to hydrolyze to give salts of the fatty acids instead of undergoing transesterification to give biodiesel.

To remove the water, the crude oil is hated to approximately 120°C or the crude oil may be stirred with a drying agent such as magnesium sulfate to remove the water in the form of water crystalization.

The drying agent can be separated by decanting or by filtration. However, the viscosity of the oil may not allow the drying agent to mix thoroughly.

The production processes for biodiesel are well known.

There are three basic routes to biodiesel production from oils and fats:

- Base catalyzed transesterification of the oil
- Direct acid catalyzed transesterification of the oil
- Conversion of the oil to its fatty acids and then to biodiesel.

Most of the biodiesel produced today is done with the base catalyzed reaction for several reasons:

- It occurs at low temperature (<55°C) and pressure (<1.5bar);
- It yields high conversion (98%) with minimal side reactions and reaction time;
- It is a direct conversion to biodiesel with no intermediate compounds;
- Far simpler and efficient compared to production of other biofuels such as ethanol;

- No exotic materials of construction are needed.

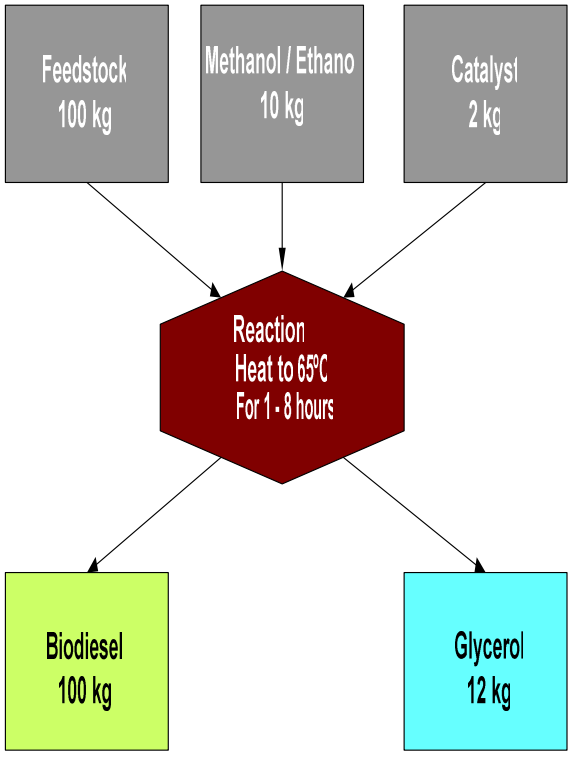
One hundred kilograms (100kg) of fat or oil (such as soybean oil or other) are reacted with ten kilograms (10kg) of a short chain alcohol in the presence of a catalyst to produce ten kilograms (10kg) of glycerol and hundred kilograms (100kg) of biodiesel.

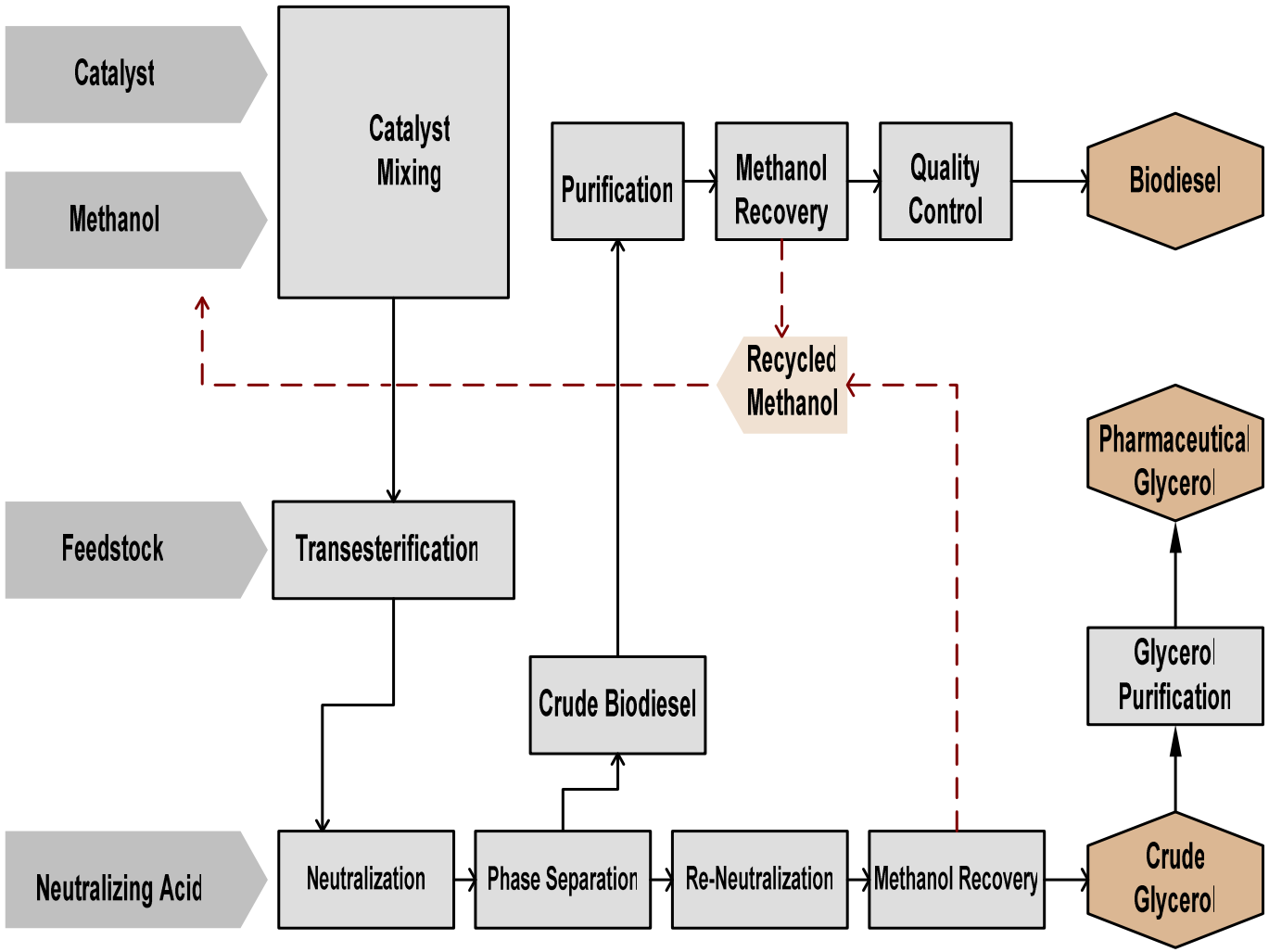
The short chain alcohol, signified by ROH (usually methanol, but sometimes ethanol) is charged in excess to assist in quick conversion. The catalyst is usually sodium or potassium hydroxide that has already been mixed with the methanol.

In this process, the fat or oil is first purified and then reacted with an alcohol, usually methanol (CH_3OH) or ethanol (CH_3CH_2OH) in the presence of a catalyst such as potassium hydroxide (KOH) or sodium hydroxide (NaOH). When this happens, the triacylglycerol is transformed to form esters and glycerol.

The esters that remain are what we then call biodiesel. In comparison with ethanol, 1.34 kJ of energy are produced per 1.0 kJ of fossil fuel used in the ethanol production process, whereas 3.20 kJ are produced for biodiesel.

Simplified diagram showing biodiesel production process is attached here to.




Catalyst
Methanol
Catalyst Mixing
Purification
Methanol Recovery
Quality Control
Biodiesel
Recycled Methanol
Feedstock
Transesterification
Crude Biodiesel
Pharmaceutical Glycerol
Glycerol Purification
Neutralizing Acid
Neutralization
Phase Separation
Re-Neutralization
Methanol Recovery
Crude Glycerol