

clean burning alternative fuel



Biodiesel Technology



BioDiesel Fuel - Growing a new energy economy.

A biodegradable and eco-friendly product, biodiesel fuel provides one answer to future fossil fuel shortages.

Devastating long-term ill-effects of limited fossil fuel reserves, industrial & automotive emissions and greenhouse gases have focused the attention of policy makers and others throughout the world to search for alternative energy sources.

Solar radiation, wind and biomass are resources for generation of alternative energy in vast quantities of which biomass is already proven for techno-economic viability for commercial production of a major alternative energy - BIODIESEL. The U.N. framework for climate change [Kyoto Protocol, 2005] mandates member nations to reduce greenhouse gas emission through increasing use of biofuels i.e. bioethanol and biodiesel.

Global production of biofuels is growing steadily and will continue to do so despite financial slowdown. The world biofuel market's value is likely to attain a CAGR of around 14.7% during 2006-2016. The rapid development of the global biodiesel industry has been closely observed by countries interested in stimulating economic growth, improving the environment and reducing dependency on imported oil.

Chemically speaking, biodiesel is the methyl ester of long chain fatty acids derived from vegetable oils animal fats. It can be used in compression ignition engines (diesel engines) directly, the engine needing minor or no modifications.

Raw Material for Biodiesel Production :

Biodiesel can be commercially produced from various sources (Oil seeds – both edible and non-edible, dead wood and leaves, agri-wastes, food processing wastes – both kitchen and industry etc. can be used, oil seeds being the most important, abundant and common raw material).



Different regions of the world do not have the benefit of possessing the same vegetable oil or animal fat in plentiful supply. Thus raw materials for biodiesel production have become geographically region-specific. Palm oil seeds in Malaysia, animal fats in Japan, soybean seeds and animal fats in the US, canola seeds in Canada and rapeseed and animal fats in Europe are examples. India has taken up Jatropha [*Jatropha curcas*] seeds as the major raw material. The plant may yield more than four times as much fuel per hectare as soybean, and more than ten times that of maize (corn). A hectare of jatropha has been claimed to produce 1,892 litres of fuel.



Advantages of Biodiesel Over Petrodiesel :

- Less dependence on limited fossil fuel reserves
- Improved ignition
- Higher engine efficiency
- Better lubricity
- Much lower greenhouse gas emission
- Lower particulate emission
- Not toxic, free of sulphur
- Safest fuel to store and handle
- Much higher flash point
- No aromatics or carcinogens
- Biodegradable

biodegradable

eco friendly

higher engine efficiency

low emission

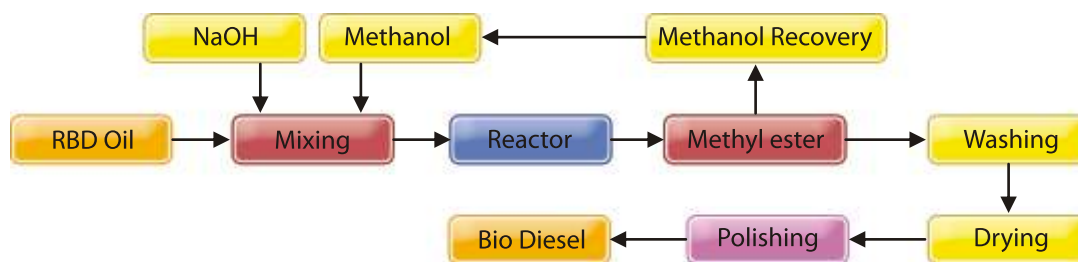
clean fuel

safest fuel

Fenix™ Technology for Biodiesel :

Fenix biodiesel process uses trans-esterification reaction followed by neutralization and washing steps. The two-step trans-esterification converts nearly 100 percent of the triglycerides in the oil or fat to bio diesel (methyl ester). The excess methanol is recovered, and the biodiesel dried in the same step. Finally, the bio diesel is filtered to remove potential impurities formed below the process temperature. In essence, the steps are, trans-esterification, washing, drying and polishing.

FENIX BIODIESEL : PROCESS FLOW DIAGRAM



Glycerine Recovery

Glycerine generated in the two-step trans-esterification reaction is recovered and neutralized. The excess methanol is recovered and the glycerine dried in the same step. The glycerine is considered crude glycerine because it contains greater than the maximum 0.01 percent salts allowed in technical grades and is less than 99 percent pure.

The salts are formed from the reaction of the caustic and acid used in most trans-esterification processes. The salts are removed when the glycerine is distilled or refined to a technical grade or higher quality.

Water Recovery

Water recovered from the water wash decanter, strippers, and methanol distillation is reused for washing the bio diesel and diluting the acid and caustic.

Methanol Recovery

The excess methanol is recovered from the bio diesel, glycerine, and fatty matter, dried and reused in the two-step trans-esterification reaction. Fenix uses its own structured packing columns for effective distillation of methanol.

Fatty Matter Recovery

A small amount of fatty matter, typically mono- and di-glycerides, is generated in the trans-esterification reaction. This fatty matter does not require a separate recovery system due to the small quantity generated, and can be skimmed or decanted from the glycerine storage tank. If the trans-esterification process feedstock has a high amount of free fatty acid (FFA), then a separate fatty matter recovery step may be required.

Energy

Fenix design minimizes the energy required by using gravity both for separation and flow from vessel to vessel. The design incorporates heat economizers to cool one stream while heating the other.

Feedstock Quality

Fenix trans-esterification process is most efficient when the feedstock quality of the phosphorus and fatty acid is at least equivalent to refined and bleached oil (RB oil). Removing the phosphorus and fatty acids is critical to producing the highest quality biodiesel at the lowest cost. Phosphorus and fatty acids are inhibitors to the reaction and decrease conversion and yield, thereby increase the processing cost.

The Fenix - Shutek Process for Biodiesel:

Fenix has **exclusive technology collaboration** with M/s Shutek Oleo S A of Costa Rica for Biodiesel.

Shutek Oleo has developed its unique process which meets all international quality standards parameters at optimal cost of operation. The Shutek process is cost wise very competitive. The process consists of the following steps which guarantee maximum yield and better quality.

- Feed preparation
- Catalyst preparation
- Trans-esterification (Batch/Continuous)
- Separation of Glycerols
- Continuous Countercurrent ester washing
- Vacuum drying
- Filtration
- Methanol recovery and rectification
- Vent scrubbing
- Glycerine purification

Advantages of Shutek process

1. Zero effluent & Zero emission of gases - environment friendly
2. Built in accordance to API standards - increased safety
3. 100% Methanol recovery- lower operating cost
4. Continuous Glycerin separation-increased yield
5. Flexibility for batch and continuous operation
6. More than 98 % conversion
7. Incorporated heat recovery system - lower energy consumption
8. Advance process control with high degree of instrumentation - increased reliability
9. Vertical start of the plant, operator friendly layout - short project duration
10. Cost competitive with best quality product – Comparatively Low capital investment
11. Multi feed stock
12. Can handle any level of FFA



A FENIX-SHUTEK BIODIESEL PLANT RECENTLY COMMISSIONED

Consumption & Yield : Per 1000 kg vegetable neutral oil raw material

Methanol consumed : 120 kg
Catalyst (NaOH/KOH) consumed : 10.115 kg
Glycerine recovered : 110 kg
Biodiesel produced : 1000 kg

[The figures vary slightly depending on which seed oil is used]

www.fenix.in

www.mantra-solutions.com



FENIX™

Fenix Process Technologies Pvt. Ltd.

K 6/1, Malini
Erandwane Co-op. Housing Society
Near Mangeshkar Hospital
Opp. Sevasadan School, Erandwane
Pune - 411004. India.

Tel. No.: +91 20 25458454, 32542601, 64009569
Fax No. +91 20 25458454

Email: info@fenix.in
Url: www.fenix.in

Representative:

