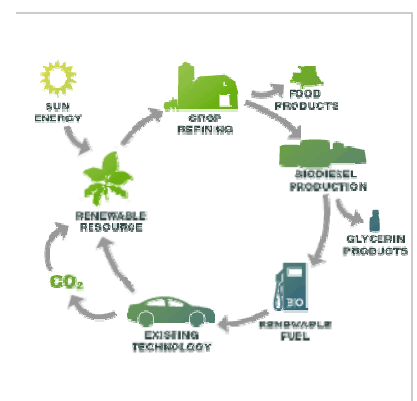


Micro Bio Diesel Production Line Abstract

The consumption and demand for the petroleum products are increasing every year due to increase in population, standard of living and urbanization. Today's diesel engines require a clean burning, stable fuel that performs well under the variety of operating conditions. Biodiesel is the only alternative fuel that can be used directly in any existing unmodified diesel engine. Because it has similar properties to diesel fuel, biodiesel can be blended at any ratio with diesel fuel. In most of the developed countries, biodiesel is produced from soybean, rapeseed, sunflower, peanut, etc., which are essentially edible. Among the various vegetable oil sources, non-edible oils are suitable for biodiesel production. Because edible oils are already in demand and too expensive than diesel fuel. Biodiesel is a variety of ester-based oxygenated fuels derived from natural, renewable biological sources such as vegetable oils. It's name indicates, use of this fuel in diesel engine alternate to diesel fuel. Biodiesel operates in compression ignition engines like petroleum diesel thereby requiring no essential engine modifications. Moreover it can maintain the payload capacity and range of conventional diesel. Biodiesel fuel can be made from new or used vegetable oils and animal fats. Unlike fossil diesel, pure biodiesel is biodegradable, nontoxic and essentially free of sulphur and aromatics. Below you can see an illustrated value chain of the Bio Diesel Operation.

Advantages of biodiesel

1. Produced from sustainable / renewable biological sources
2. Ecofriendly and oxygenated fuel
3. Sulphur free, less CO, HC, particulate matter and aromatic compounds emissions
4. Income to rural community
5. Fuel properties similar to the conventional fuel
6. Used in existing unmodified diesel engines
7. Reduce expenditure on oil imports



Biodiesel facts

- Fuel created from vegetable oil or animal fat
 - Small-scale producers generally use vegetable oil
- Can be used in traditional diesel engines
- Biodiesel can be blended with diesel fuel
- Biodiesel be produced in small or large quantities

Major Oilseed Crops

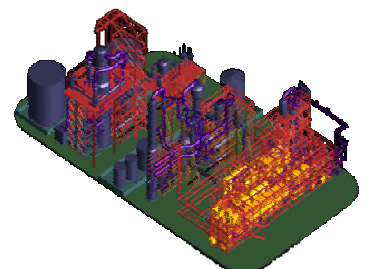
- Soybean
- Cottonseed
- Sunflower
- Canola/Rapeseed
- Flaxseed
- Safflower

Other oil producing crops

- Corn
- Peanut
- Camelina
- Palm
- Olive
- Coconut
-

Process Technology-Two General Methods

- Solvent Extraction
 - Standard technology for facilities with daily capacities of greater than 300 tons per day
 - Commonly used in conjunction with some form of mechanical extraction
- Mechanical Extraction
 - Typically used for facilities with daily capacities of less than 150 tons per day



Process equipment

- Pre-Reaction Equipment
 - Oil Storage Tank
 - Alcohol Storage Tank
 - Catalyst Storage
 - Biodiesel “Reactor”
 - Pumps, Filters, Plumbing
- Post-Reaction Equipment
 - Settling tanks and/or Separating Equipment
 - Washing Equipment
 - Drying Equipment
 - Biodiesel Storage Tank
 - Glycerin Storage Tank
 - Pumps, Filters, Plumbing



1Micro Bio Diesel Reactor

Bio Diesel Equipment

- Small-Scale Processors
 - 75 to 300 gallons per batch
 - Fewer Manufacturers
 - Usually not sold as “kits”
 - Typically higher quality materials

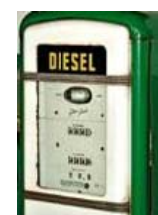


Bio Diesel Production Units: As Micro Diesel Production Lines become more and more popular, ensymm offers these units for different capacities and with different features. These kind of Bio Diesel Production Units can be operated very simple and close to the raw material sources –also in rural regions. In the table below ensymm introduces two different price efficient production units. Further ensymm also offers sophisticated production lines with much higher capacities (please ask in case of interest).

Model	Capacity /Batch (90min)	Feature
e-250-A	250 l	Without Electronic controller
e-250-B	250 l	Electronic controller
e-250-Plus	250 l	Electronic controller; internet remote control
e-1000	1000 l	Electronic controller; internet remote control



The pictures aside show how simple the Bio Diesel operation basically is. The first picture shows a pressing unit where oil gets won out of a natural source like e.g. peanuts or Olives. The second picture illustrates the Reactor where the oil (also cooking fat or pig fat could be used) gets refined within 90 minutes per batch by adding chemicals and heat. The third picture shows also a reaction boiler. On the last picture the control unit can be seen.



In case you are interested in our micro biodiesel production lines please don't hesitate to contact us for further information's. therefore please contact: info@ensymm.com