

## **BIOMASS ENERGY CONVERSION:**

*Biomass is a renewable energy source because we can always grow more trees and crops, and waste will always exist. Some examples of biomass fuels are wood, crops, manure, and some garbage.*

*Typical biomass supply is derived from:*

- 1. Woody forest residue, fuel wood, mill residues, short rotation crops,*
- 2. Non-woody agricultural crops, crop residue, processing residues; and*
- 3. Animal waste such as manure from feed lots and municipal sewage and waste.*

*Biomass energy in the forms of gas can occur spontaneously, as marsh gas, or landfill gas, Agricultural wastes or manures undergo certain processes first.*

*The two main processes are thermal and biological*

*Thermal and biological biomass energy conversion*

*Thermal conversion can happen in three ways:*

- 1. Combustion*
- 2. Pyrolysis*
- 3. Gasification*

*Combustion* of course means that biomass is burned, similar to coal and oil, to make electricity. When mixing biomass with coal, this co-firing process is very efficient. Solid municipal waste is also burned to generate electricity.

*Pyrolysis* is a chemical process of decomposition of biomass materials. It is a heating process without the involvement of oxygen. The recycling of used vehicle tyres uses pyrolysis.

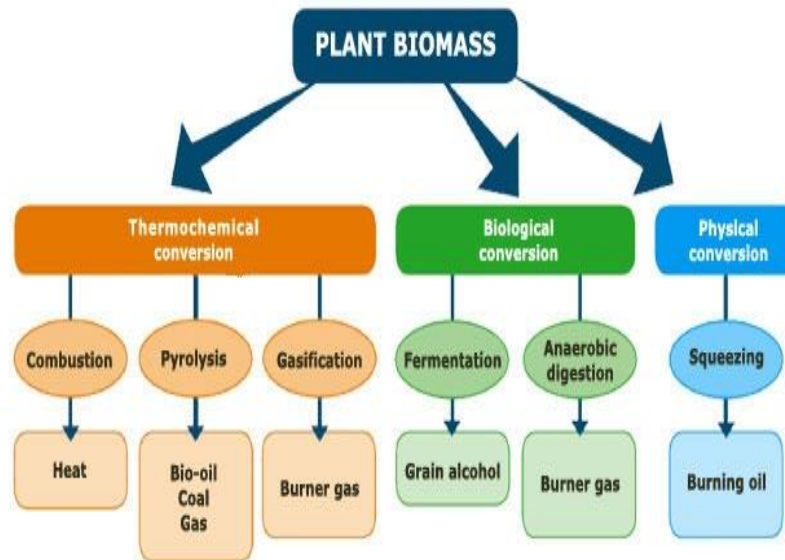
*Gasification* involves processes that turn parts of solid biomass materials into gas.

*Biological conversion can happen through:*

*Digestion and fermentation* of biodegradable wastes occurs in large digester power plants where bacteria convert waste into gas. The produced gas drives turbines that generate electricity from these wastes. The solids that are left behind may be used as fertilizer, depending on the biomass materials used.

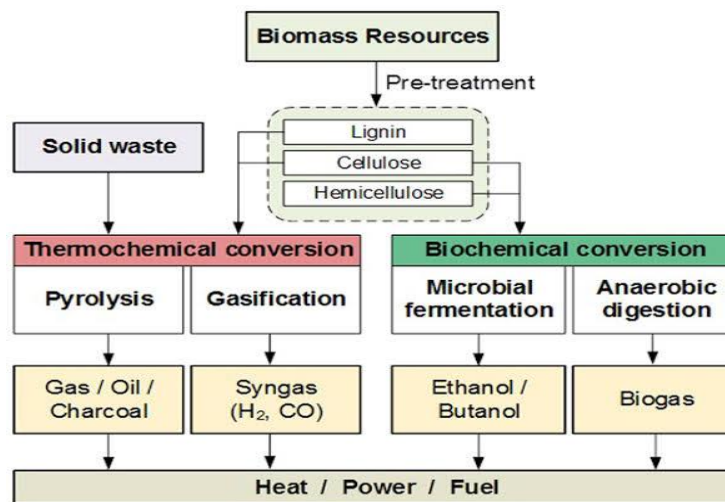
*Physical conversion:* The physical conversion is essentially a process of mechanical pressing of crops with high oil content (sunflower rapeseed, soybean). The end

results are some edible squeezing oil and protein panels containing a higher



percentage of oil (10% max).

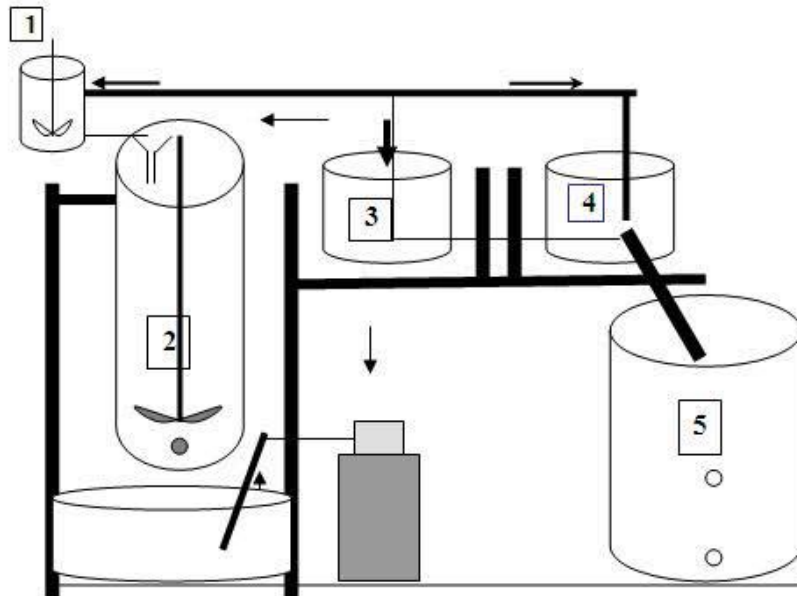
OR



Biofuels that can be made from biomass are:

- 1·Biogas
- 2·Bioethanol
- 3·Biodiesel

**Biodiesel production:**



- 1· Mixing tank for chemical
- 2· Main reactor
- 3 & 4· Settling tanks
- 5· Washing tank

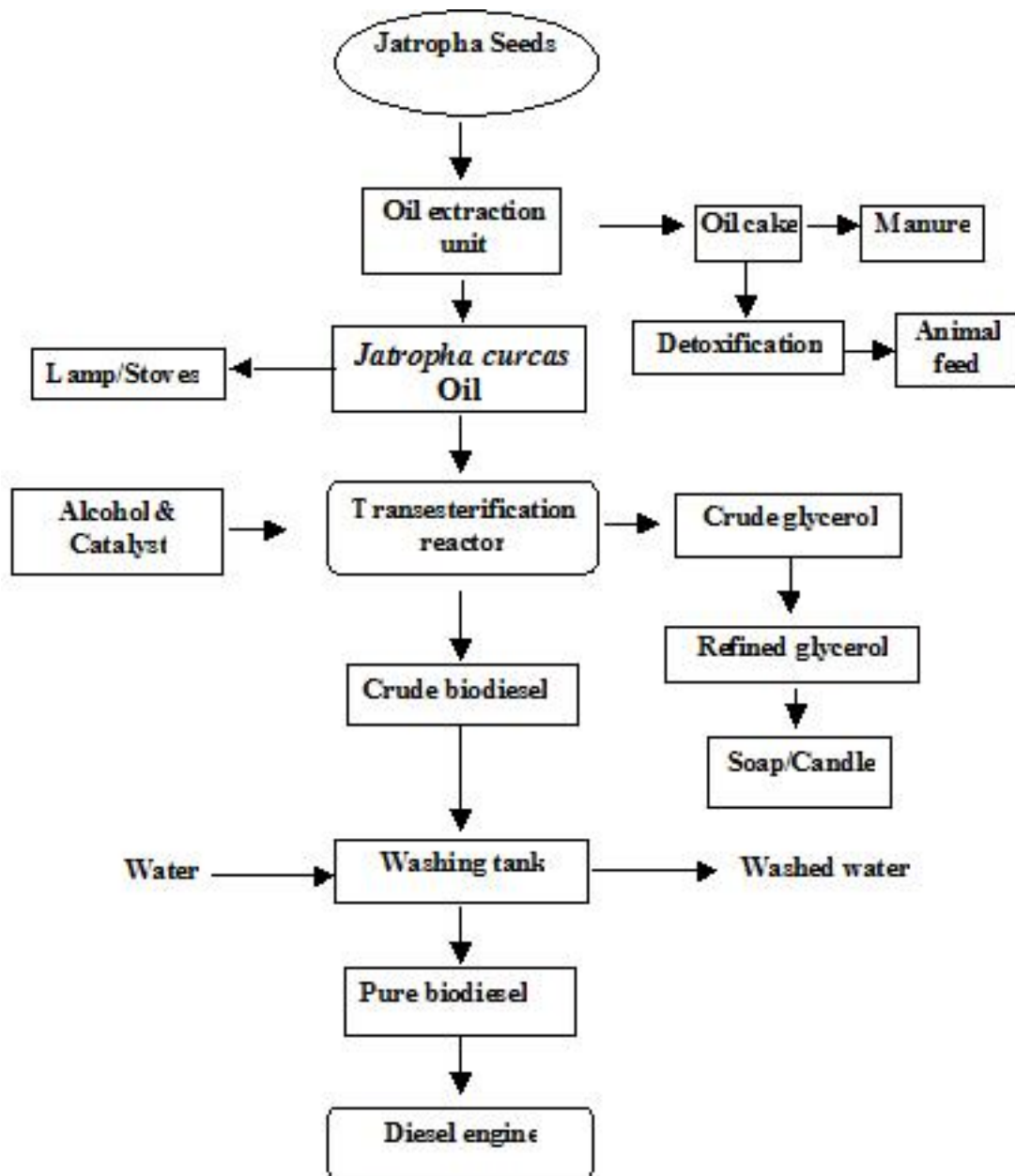
The *Jatropha* oil is blended with alcohol and catalyst mixture. The oil extracted from the seeds of *Jatropha* is mixed with methanol catalyst mixture at a proportion under a particular temperature. This solution is continuously stirred for two hours. During the above process, glycerol present in the solution separate out, which when settled can be separated out. For settling, two separate tanks are provided in the plant. After removing the glycerol, the liquid biodiesel is transferred to washing tank, where the fuel is washed twice and the purified biodiesel is obtained.

**BIODIESEL PRODUCTION PROCESS:**

- 1· Take 50 litres of *Jatropha* oil in the container and pump oil from inlet tank to biodiesel reactor by using inlet pump (10 minutes).
- 2· Switch ON for heater of biodiesel reactor.

3. Take 20 per cent of methanol and 1 per cent of sodium hydroxide (by weight of oil) in the chemical mixing tank. Ensure that gate valve for chemical tank is in closed position before filling of methanol into tank.
4. Switch ON for stirrer of chemical mixing tank (15 minutes) to produce the sodium methoxide solution.
5. After reaching reaction temperature  $60^{\circ}\text{C}$ , the sodium methoxide is sent to biodiesel reactor by opening of gate valve and close the valve.
6. Switch ON for main stirrer of biodiesel reactor and reaction is continued for about 2 Hours.
7. After reaction time is completed, open the gate valve for glycerol settling tank and the biodiesel and glycerol mixer is sent to the glycerol settling tank (by using storage switch).
8. Allow the biodiesel mixture in glycerol settling tanks for 12 hours.
9. Before feeding of raw biodiesel, fill 100 litres of water in the washing tank
10. Remove the glycerol from settling tank and biodiesel is sent to washing tank by opening gate.
11. Switch ON the aerator for 30 minutes. Allow the sample for 3 hours and remove the biodiesel from washing tank.
12. Heat the biodiesel for 20 minutes to remove the moisture.

### **EXAMPLE OF BIODIESEL PRODUCTION FROM JATROPHA SEEDS:**



**TRANSESTERIFICATION :** It is the conversion to simple alkyl esters with various alcohols (alcohols reacts with fatty acids to form the mono alkyl ester i.e. biodiesel ) to reduce the high viscosity of oils and fats.