

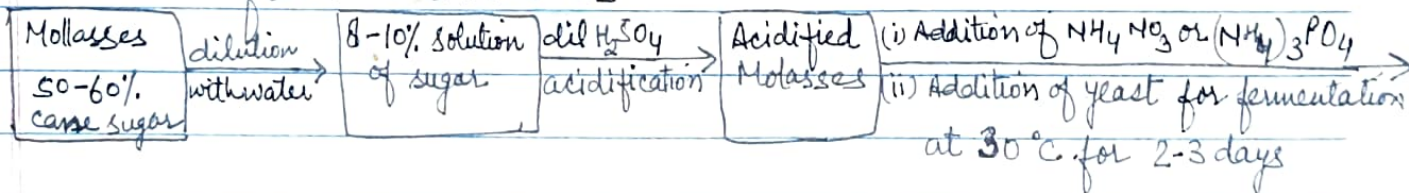
Biomass is the waste organic matter (mostly from the dead plants and animals) which is used either as a source of energy (by burning or biogas production) or as a chemical feed stock.

For e.g. wood, cattle dung, bagasse (remaining part of sugar cane), poultry wastes, vegetable wastes, waste paper, waste cotton clothes, plant wastes (grass, husk leaves, weeds etc.), human excreta, bird excreta, dead animals, sewage etc. Biomass consists of carbon compounds which may be used as a source of energy by using either of the following methods:—

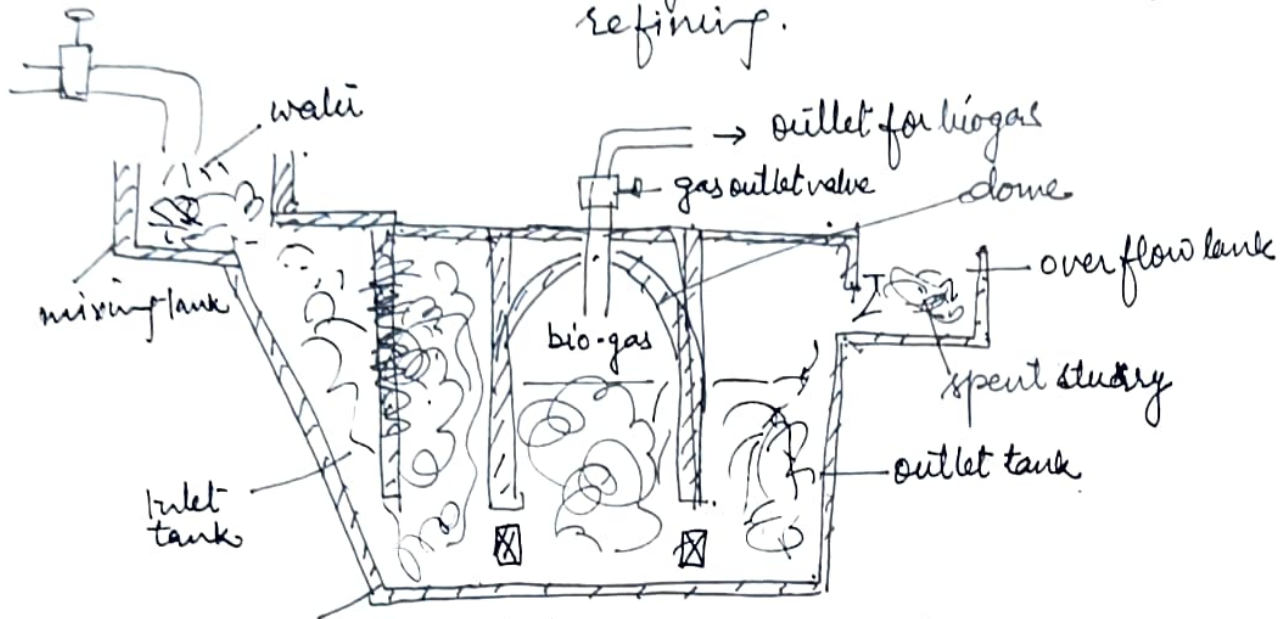
1- Biomass is burnt directly in chulhas for getting energy. However, by doing so, a lot of heat energy is wasted and a lot of smoke is liberated. It also liberates poisonous gas carbon monoxide and leaves ash as residue.

2- Biomass is converted into biogas which liberates much larger amount of heat. For example, 1 kg of dry cattle dung liberates only 100 KJ of effective heat on direct burning but when 1 kg of dry cattle dung is converted into biogas, it can supply about 800 KJ of heat on burning. Moreover, on burning biogas does not produce poisonous gas, CO.

3- Biomass can be converted into liquid fuels like ethanol or methanol which can be used as a fuel. For e.g. - ethanol from biomass as -

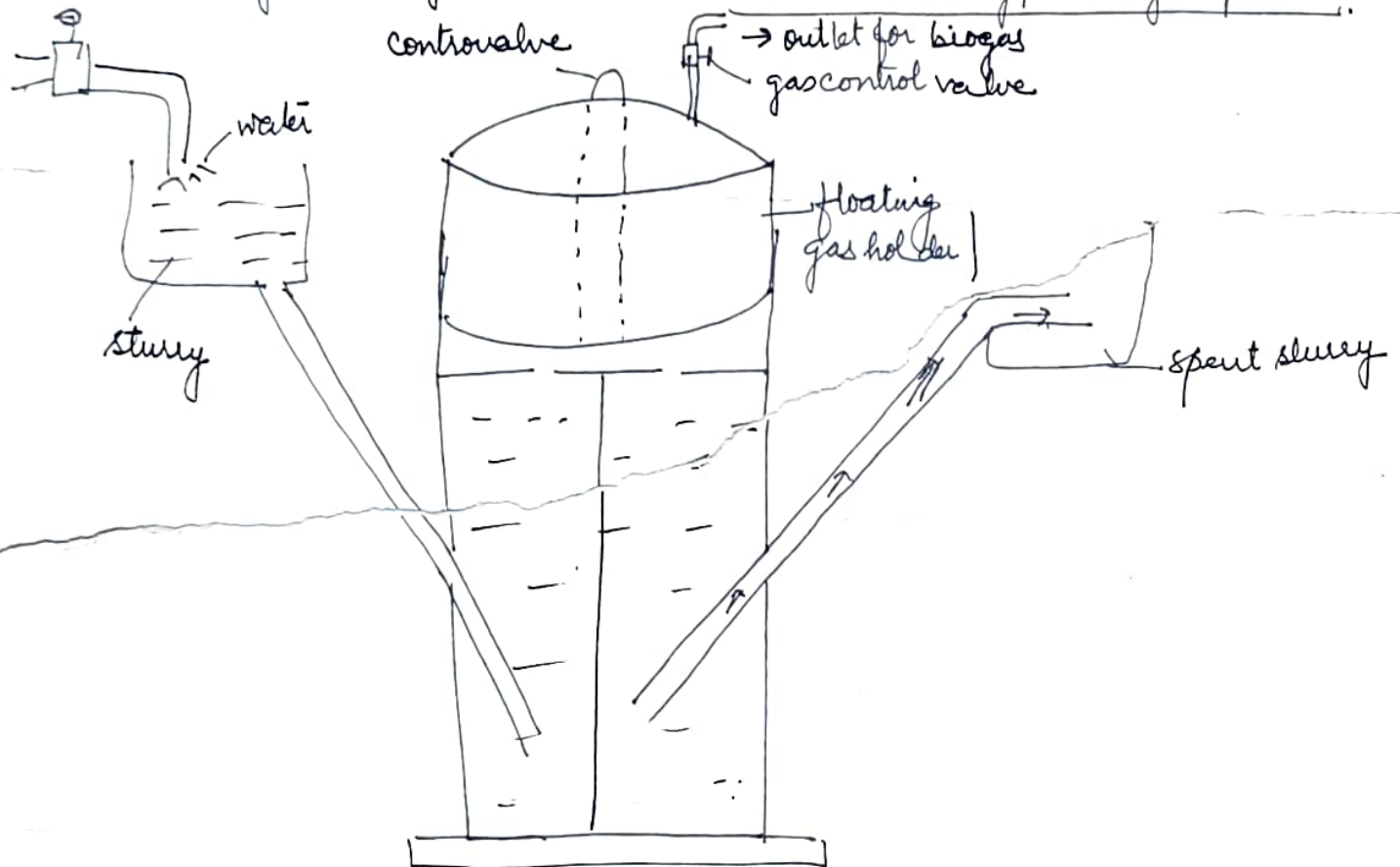


⑧ molasses → dark syrup drained from sugar during refining.



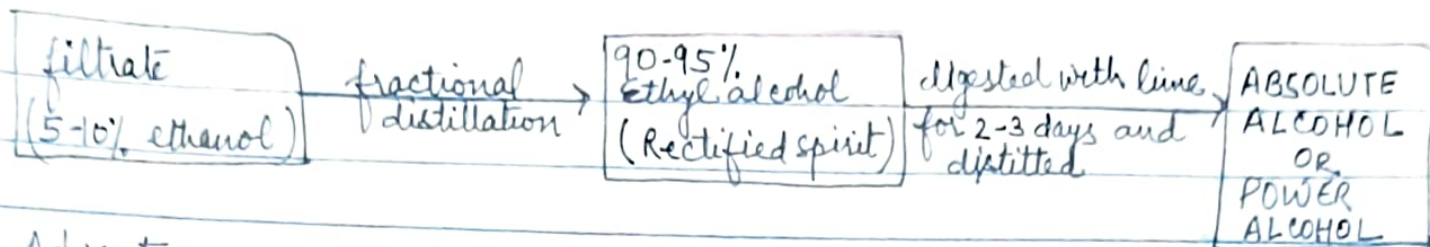
Underground digester tank

Fixed-dome type biogas plant



Floating gas holder type biogas plant





Advantage of converting biomass into biogas -

- (i) Biogas production is very economical.
- (ii) It does not produce CO.
- (iii) Gives excellent yield of good manure.
- (iv) Has all advantages of gaseous fuel like cleanliness, absence of smoke etc.

### BIO GAS

Biogas is produced by the degradation of biological matter by the bacterial action of anaerobic bacteria in the absence of free oxygen.

Examples -

- (i) Natural gas is a biogas (fossil fuel)
- (ii) Gobar gas
- (iii) Biogas can also be produced from the sewage, waste, and other organic wastes.

Constituents - The average composition of biogas is -

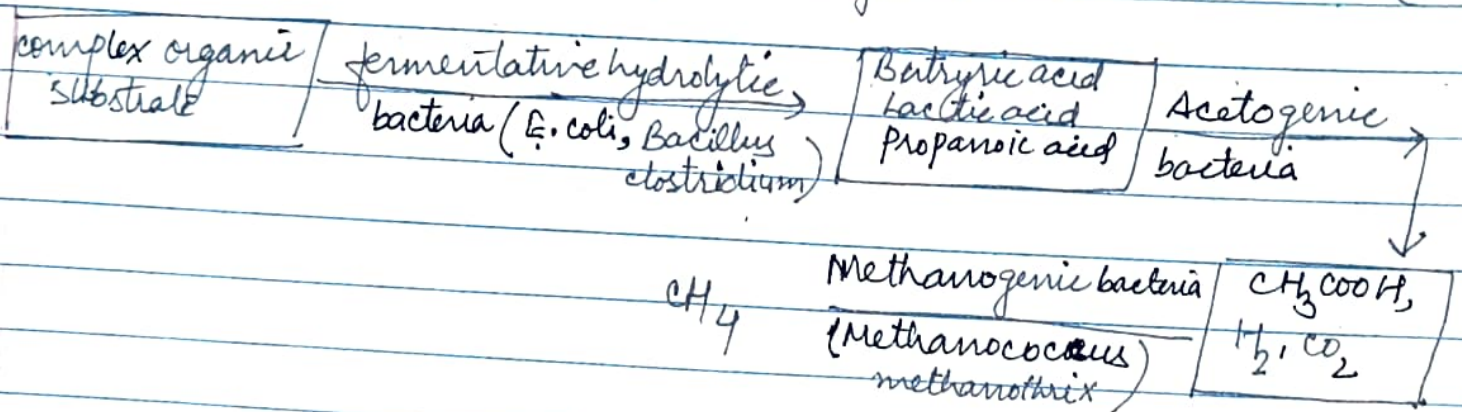
- (i)  $\text{CH}_4$  = 50-60% (a combustible gas)
- (ii)  $\text{CO}_2$  = 30-40% (a non-combustible gas)
- (iii)  $\text{H}_2$  = 5-10% (a combustible gas)
- (iv)  $\text{N}_2$  = 2-6% (a non-combustible gas)
- (v)  $\text{H}_2\text{S}$  = traces (a combustible gas)

Out of these, the constituent methane (an extremely good fuel) makes biogas an excellent fuel.

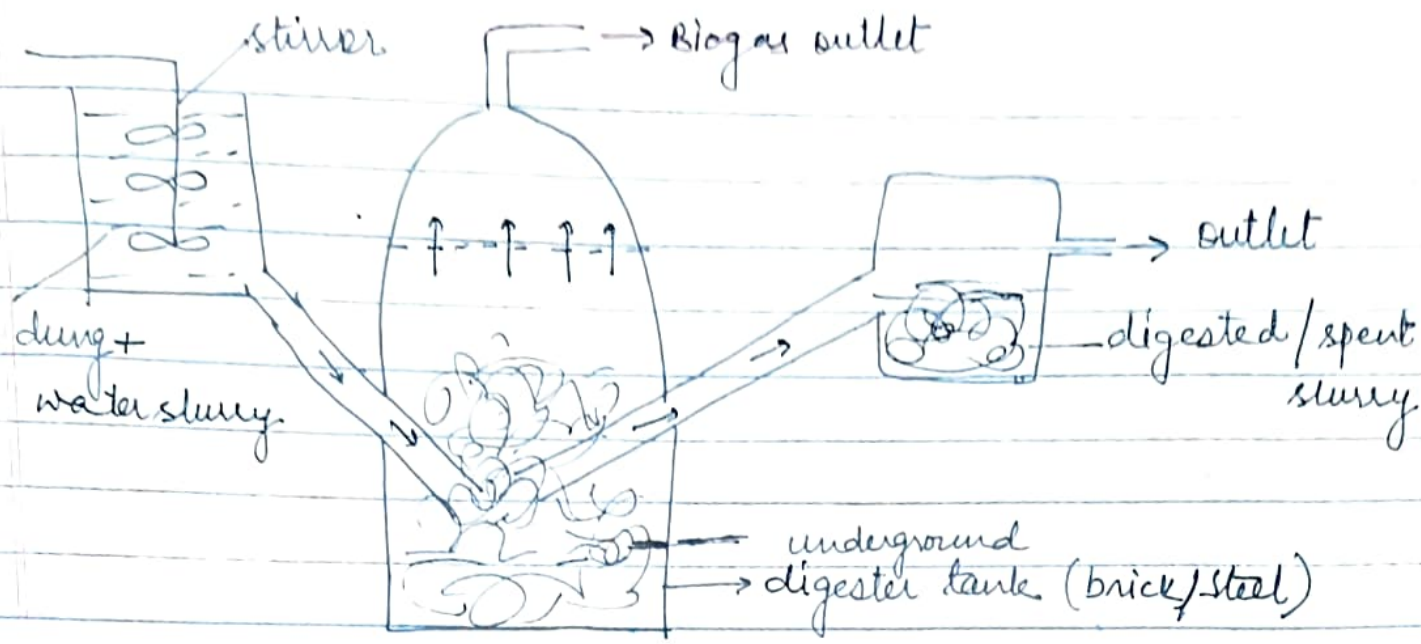
## Manufacturing and Working of Gobar Gas - (Biogas)

It is produced by anaerobic degradation of cattle dung in a gobar gas plant which consists of a well-shaped underground tank, called digester which is covered by a dome-shaped roof, made-up of bricks and cement and it acts as a fixed gas holder for storage of gas. At the top of this dome, gas outlet pipe and a gas valve is present. On the left side of digester, there is a sloping chamber and on the right side an outlet chamber.

Fresh cattle dung and water slurry is fed from inlet chamber. While ~~sp~~ In about 50-60 days, the biogas plant starts functioning and cattle dung In about 50-60 days cattle dung undergoes fermentation in the presence of anaerobic bacteria with gradual evolution of biogas which starts collecting in dome-shaped space. From the overflow tank the spent slurry is withdrawn periodically and used as a manure.







Uses of Biogas → for cooking food

- (ii) As a fuel to run engine
- (iii) As an illuminant (light purpose) in villages.

Advantages →

- (i) No residue like ash, smoke etc. i.e. clean fuel.
- (ii) Large amount of heat is generated as compared to direct burning of cattle dung.
- (iii) Waste can be used as a good manure (contains 2% N)
- (iv) No harmful CO product

Imp (v) calorific value of Biogas is  $\approx 1200 \text{ Kcal/m}^3$

(vi) Flame temp. can reach upto  $540^\circ\text{C}$ .

1 Kg dry cattle dung gives 23 Kcal heat on burning  
but gobar gas of 7 Kg dry cattle dung gives 188 Kcal heat

$$\begin{array}{r} 23 \overline{) 188} \\ \underline{174} \phantom{0} \\ 14 \phantom{0} \end{array}$$

$\approx 8$  times more

or