Biomass :

The term biomass is used for the waste material of living organisms and the dead plant parts. It includes cattle dung, wood, sewage agricultural waste or crop residue.

These compounds contain carbon and are used as source of energy for domestic work. There are following two ways of using biomass as fuel.

(i) Generally biomass like wood, cattle dung and agricultaral waste is used directly in ~~chuulah~~ chulhas.

(ii) Biomass is converted into a fuel by a certain process for example wood is converted into charcol, cattle dung is converted into Biogas. Paddy husk is converted into smokeless solid fuel.

~~Bio~~ s a

Biogas :

This is also known as Gobar-gas.

Biogas is obtained by anaerobic fermentation of animal dung, Plant wastes in presence of water and in absense of oxygen. Microorganisms like anaerobic bacteria is used in formation of wastes. On decomposition methane CO_2, N_2, H_2 etc. are obtained.

Composition : $CH_4 \rightarrow 55\%$. $H_2 \rightarrow 7.4\%$.

$CO_2 \rightarrow 35\%$ $N_2 \rightarrow 2.6\%$ $H_2S <$ 0.1%.

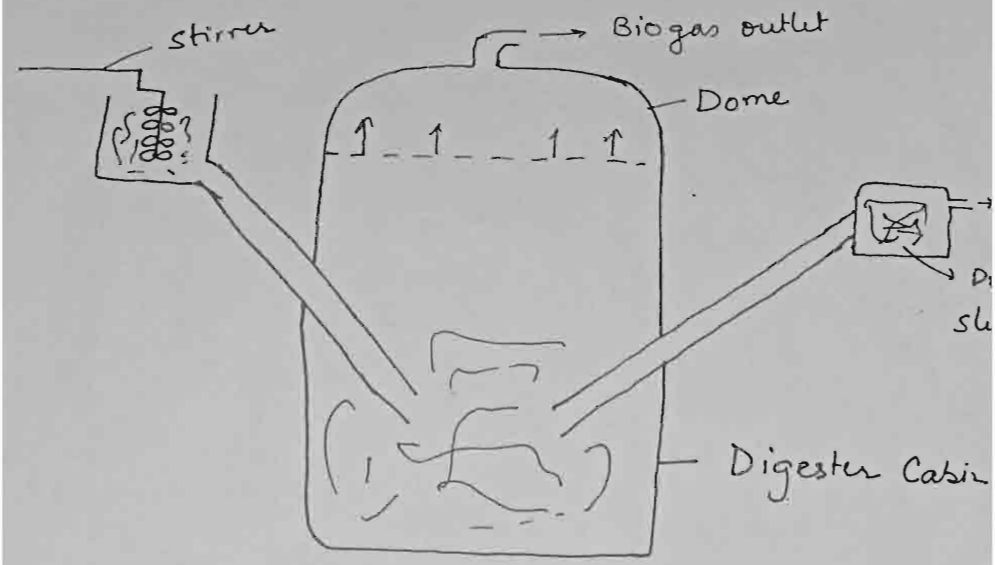
Flow chart

Complex organic substrate —(Fermentative hydrolytic bacteria: E-coli, Bacillus)→ Butyric acid, Propionic acid, Lactic acid

↓ Acetogenic bacteria

Acetic Acid ($H_2 + CO_2$ etc.) —(Methanogenic bacteria)→ Methane (CH_4)

roduction :



Bio gas Plant.

pH → 6 – 8 , Temp → 30 - 40°C

Digestion period — 2-3 weeks for cow du

Lime requirement =

$$= \frac{74}{100} \left[\text{Temp. Hard.} + \text{Perm. Hard.} \right] \times \text{Vol. of water}$$

Mg

Soda requirement =

$$= \frac{106}{100} \left[\text{Perm. hard.} \right] \times \text{Vol. of water}$$

Calculate the amount of lime & soda required for softening of 15,000 L of water which was analysed as -

temp. hard. = 20 ppm, Perm. hard. = 15 ppm.
Mg hard. = 10 ppm

→ Lime requirement.

$= \frac{74}{100}$ [Temp. hard. + Perm. hard.] × vol. of water in mg

$= \frac{74}{100}$ [(20 + 10)] × 15,000

$= 22.2 \times 15000 = 333,000$ mg

$= 333$ g.

Soda requirement -

$= \frac{106}{100}$ [Perm. hard.] × Vol. of water

$= \frac{106}{100}$ (15) × 15,000

$= 15.9 \times 15,000$

$= 238.500$ mg

$= 238.5$ gm.

Numerical:

3.25 gms of coal was kjeldahlised and NH_3 gas thus evolved was absorbed in 45 mL of 0.1N H_2SO_4. To neutralise excess acid, 11.5 mL of 0.1N NaOH was required. Determine the percentage of N in the coal sample.

$$NCV = GCV - (0.09H \times 587)$$
$$= 6251.88 - 0.09 \times 6.5 \times 587$$
$$= 6251.88 - 343.395$$
$$= 5908.485 \text{ cal/gm}$$

Following data is obtained in B.C. expt.

wt. of crucible = 3.649 gm
" " + fuel = 4.678 gm
water eq. of calorimeter = 570 gm
" taken in " = 2200 gm
Observed rise in temp = 2.3°C
C_t = 0.047°C
C_A = 62.6 cal.
C_F = 3.8 cal
C_{CT} = 1.6 cal.

Calculate GCV of fuel sample. If the fuel contain 6.5% H.

wt. of fuel = 4.678 - 3.649 = 1.029 gm

$$GCV = \frac{(2200 + 570)(2.3 + 0.047) - (62.6 + 3.8 + 1}{1.029}$$
$$= 6251.$$