CONCEPT & PRINCIPLE

The digestion of the organic material is done by a range of many different species of different naturally occurring bacteria all doing a different job at a different step in the digestion process. Maintaining suitable conditions in the digester is essential in maintaining a healthy bacterial population.
Four stages of digestion have been recognized.

- The first is hydrolysis, in which complex organic molecules are broken down into simple sugars,amino acids, and fatty acids with the addition of hydroxyl groups.

- The second stage is acidogenesis, where there is further breakdown producing ammonia, carbon dioxide and hydrogen sulfide.

- The third stage is acetogenesis where the products of acidogenesis are further digested to produce products such as carbon dioxide, hydrogen and mainly acetates, although higher molecular- weight organic salts (e.g., propionate, butyrate, valerate) are also produced.

- The fourth stage is methanogenesis where methane, carbon dioxide and water are produced.

FEED STOCK

Feedstock into the biogas power plants must be biodegradable in order to produce methane. Suitable feedstock includes (but not limited to):

- Biodegradable waste
- Sewage
- Slaughterhouse waste
- Food waste
- Farm waste
- Organic component of mixed waste Modify intro-- bav

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COMPOSITION OF BIOGAS

Substances	Symbol	Percentage
Methane	CH4	50 - 70
Carbon Dioxide	CO2	30 - 40
Hydrogen	H2	5 - 10
Nitrogen	N2	1 - 2
Water vapour	H2	0.3
Hydrogen Sulphide	H2S	Traces

SYSTEM DESCRIPTION & WORKING

Biogas power plant is a combination of anaerobic digestion systems with associated electricity generator. The electricity produced is classified as renewable or green energy. A typical biogas power plant consists of the following components:

- Inlet tank
- Digester
- Gas holder (floating dome)
- Outlet tank
- Moisture trap
- Flame arrestor
- Canteen stove
- Gas piping & accessories

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INLET TANK

The inlet tank consists of 12 inch PVC pipe leading straight into the digester at a steep angle. The inlet pipe is positioned in such a way that it is accessible even for a rod to be pushed through to eliminate obstructions, if any. The feed stock is mixed with equal amount of water and fed into the digester.

DIGESTER

The digester is constructed in round shape and designed to meet the following requirement:

- Water tightness –in order to prevent seepage and the resultant threat to soil and groundwater quality
- Gas tightness – in order to ensure proper containment of the entire biogas yield and to prevent air entering into the digester.
- Structural stability – sufficient to withstand all static and dynamic loads, durable and resistant to corrosion

Two relevant forces act on the digester. The external active earth pressure causes compressive forces and the internal hydrostatic and gas pressure causes tensile stress in the masonry. The round shape for the digestive is preferred owing to reason that the external pressure applied by the surrounding earth must be greater at all points than the internal forces

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In order to meet the above requirements the digester tank constitutes of two layers of brick between which two layers Reinforced Cement Concrete (RCC) is filled. The foundation of the digester is prepared as per the following specification:

- Random rubble masonry 1:5, 100mm thick
- Plain Cement Concrete (PCC) 1:4:8, 40mm metal, 100mm thick
- RCC 1:2:4, 20mm metal, 100mm thick

GAS HOLDER (FLOATING DOME)

Gas holder is a hemispherical floating dome constructed out of mild steel coated with fiber reinforced plastic. In a floating dome plant the gas collecting in the upper part of the dome displaces a corresponding volume of digested slurry. Extensive care is taken during the construction of the dome in order to avoid the crack or leak. Inner and outer surface of the dome is coated with fiber reinforced plastic.

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OUTLET TANK

The outlet tank is used to collect the displaced slurry from the digester. The slurry from the digester is pushed to the outlet whenever the gas is formed and also during the feeding of the raw material. In both the cases, gas gets collected in the gas holder. The tank is constructed out of bricks and the foundation consists of rubble packing and PCC layer. The outlet tank is provided with a manhole for maintenance purpose. The manhole is covered by a heavy cement concrete slab to avoid easy entry.

MOISTURE TRAP

The biogas from the digester consists of moisture which has to be removed before allowing it inside the burner. In order to remove the moisture the biogas is passed through the moisture trap. Moisture trap is made out of stainless steel and it contains a baffle plate inside. The biogas when passes through the moisture trap strikes the baffle plate and the moisture in the gas get condensed. The condensed moisture is collected as water droplets in the bottom of the trap and gets removed through a drain valve provided at the bottom of the trap.

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FLAME ARRESTOR

As a safety device flame arrestor is fixed in the gas pipe line . The main purpose of the flame arrestor is to avoid the travel back of the flame from the burner, if any

GAS PIPING & ACCESSORIES

The requirements for biogas piping, valves and accessories are essentially the same as for other gas installations. Since biogas contains water vapour and traces of H2S, PVC pipes are used (pipes containing ferrous materials are avoided). Special attention is paid to gas-tight fittings to avoid leakage of gas. Gas pipes running from the gas holder to the moisture trap are buried under the ground to avoid damage. Also certain angle of slope is maintained to avoid stagnation of water in the pipe line. Control valves are provided at necessary points for easy & safe operation. Emergency shutdown valve is provided at the outlet of the gas holder

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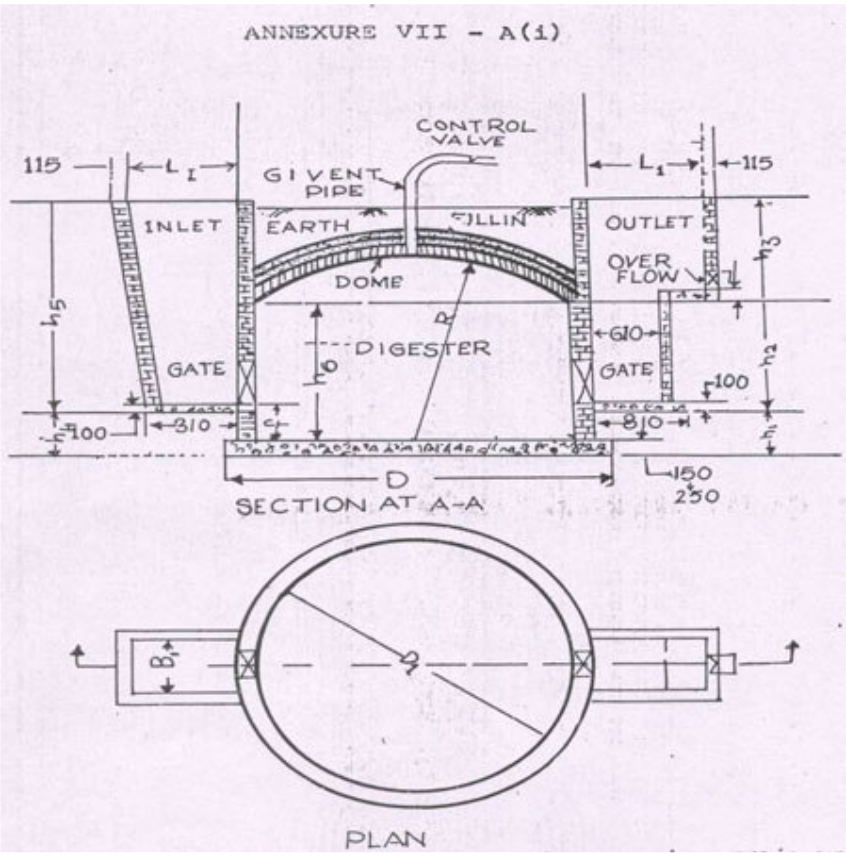

All dimensions are in mm

Plant Size	D		D2	L1	B1	F1	h1	h2	h3	h4	h5	h6	h7	R	GATE
2	2750	2500	2370	850	610	580	680	765	810	680	1575	1345	520	1610	610x610
3	3100	2950	2720	1216	900	746	846	828	880	845	1710	1575	590	1865	610x610
4	3610	3400	3000	1372	950	825	1005	990	854	1005	1845	1715	640	2080	610x760
6	4110	3890	3420	1620	1380	660	840	1290	1025	840	2315	1950	735	2360	610x1000

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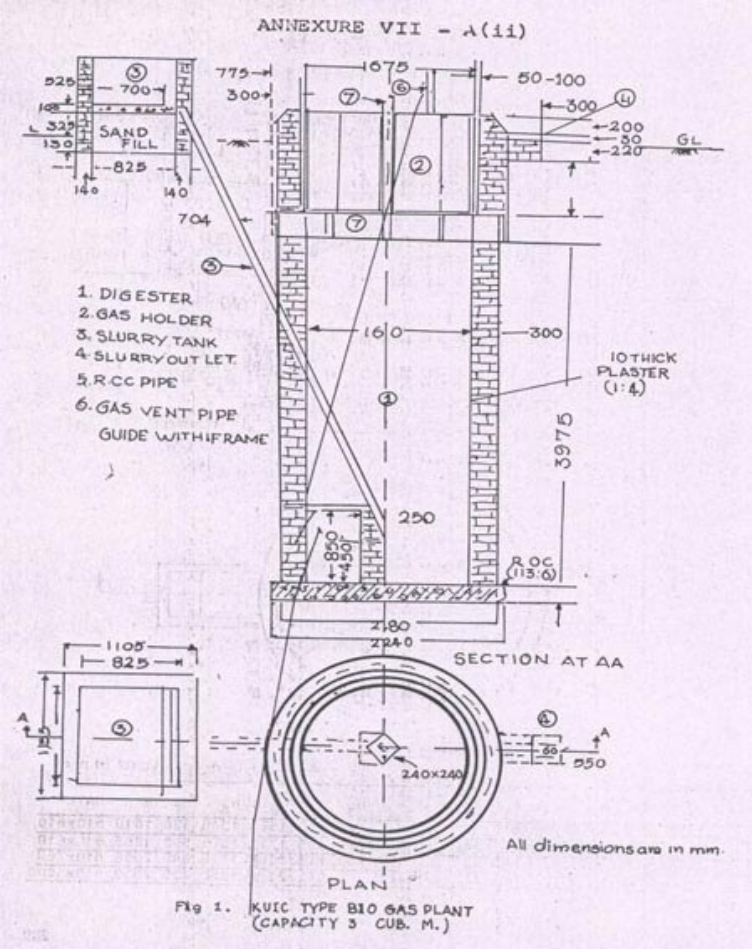

Fig 1. KUIC TYPE BIO GAS PLANT (CAPACITY 3 CUB. M.)

Dmensions of Floating Drum Type Bio-Gas Plants All dimensions in centimeters

Dimensions	Plant capacity , m 3																			
	For 30 Days Retention Period							For 40 Days Retention Period							For 55 Days Retention Period						
	1	2	3	4	6	8	10	1	2	3	4	6	8	10	1	2	3	4	6	8	10
A	120	135	160	181	220	240	275	120	135	160	180	220	240	275	120	135	160	180	220	240	275
B	157	187	202	212	212	242	232	177	257	277	292	292	332	317	227	327	377	427	427	477	477
C	170	95	110	135	135	125	115	170	165	185	200	200	200	200	170	220	270	320	320	345	345
D	112	70	70	70	70	70	70	112	110	100	90	90	90	120	112	175	180	180	210	210	205

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