

Biogas as A Fuel

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Abstract: There is huge problem of energy resources in India. Energy in India is generated by fossil fuels. Energy used in the houses are in the form of electricity and heat or fire. Heat energy used for cooking is generally produced from LPG (Liquid Petroleum Gas), which is a non-renewable source of energy. So, to fulfill the needs of fuel for production of heat energy various alternatives are provided. One of the most economical alternative is using biogas. Production of biogas using the organic waste digester is one of the most common ways. Biogas is a combination of various combustible hydrocarbon gases which when burnt produces heat. Biogas generally consists of methane, carbon dioxide and traces of various other gases. Biogas plants are used to generate these gases. Biogas plants uses anaerobic decomposition to generate methane and other gases.

Keywords: Biogas, LPG, Energy Resources, Fossil Fuels

I. INTRODUCTION

Biogas consists of various gaseous mixture which are produced in the absence of oxygen from the breakdown of the organic matter. It can be generated from various types of waste materials which includes agricultural waste, municipal waste, green waste, etc. Biogas is an energy source which leaves very small traces of carbon footprint [1]. The production of biogas is carried in a closed system in which anaerobic and aerobic digestion takes place. The main components of biogas are methane (CH₄) and carbon dioxide (CO₂). In this small amount of hydrogen sulphide are also present which is toxic in nature [2-4]. This energy which is released makes it suitable to be used as a fuel. It can be used for many purposes like cooking and heating. I can be used an engine fuel to generate heat and electricity. Table 1 shows the biogas production from different types of wastes. Table 2 shows the biogas requirement for household use. Thermal efficiency of biogas is 60% [3-6].

Table I: Biogas Production from Different Types of Wastes

Sr. No.	Feed Stock	Litre /kg of dry matter	% Methane content
1.	Dung	40	60
2.	Night-soil	40	65
3.	Poultry manure	44	65
4.	Dry leaf	45	44
5.	Sugar cane Trash	75	45
6.	Maize straw	80	46
7.	Straw Powder	93	46

Table II: Daily use requirement of biogas

Sr. No.	Uses	Requirement of gases
1.	Cooking	336-430 l/day/person
2.	Gas stove	330 l/hr /5 cm burner
		470 l/ hr/ 10 cm burner
		640 l/ hr / 15 cm burner

II. BIOGAS PLANT DESIGN

There are many types of biogas plants used, but the most common type of plant used is fixed dome type. Fixed dome type biogas plant consists of following sections.

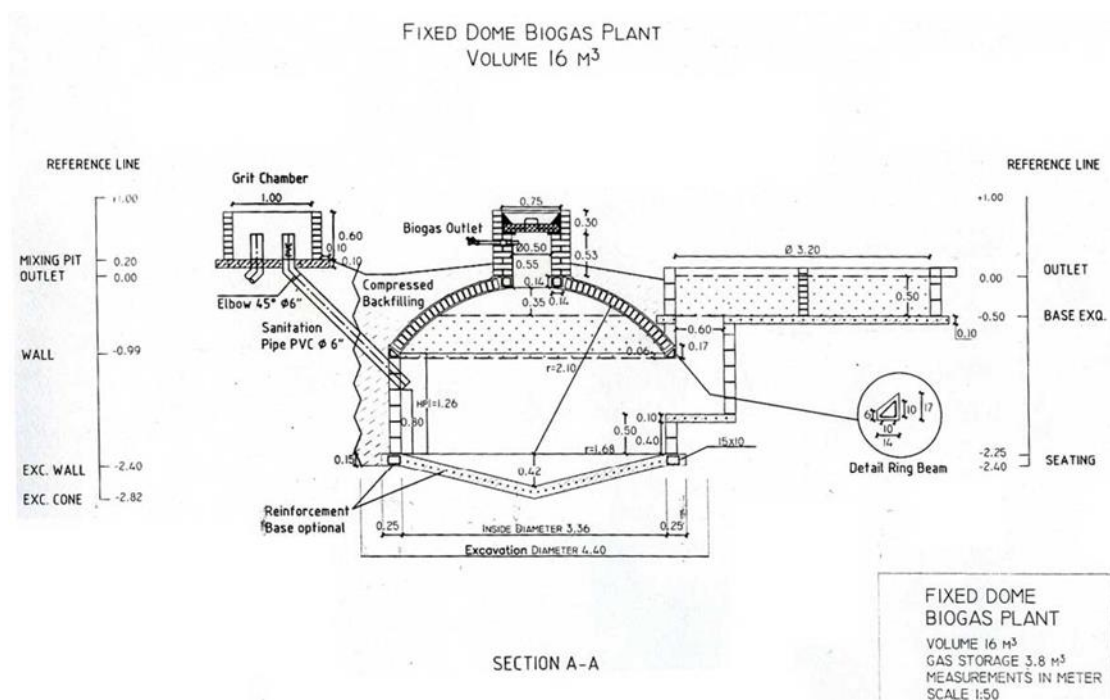
1. Input
2. Digester
3. Output



Figure I: Fixed dome type biogas plant construction

Input consists of mixing tank with inlet pipe [1, 6], digester consists of digesting tank in which all anaerobic decomposition takes place, and output section consists of mainly gas chamber and gas outlet.

- a. Mixing tank with inlet pipe
- b. Digester
- c. Compensating and removal tank
- d. Gasholder
- e. Gaspipe [1]



Virtual village of Haryana with 1000 houses consisting animals (Rural)

Let's consider a village 'A'

Number of houses in the village – 1000

Number of cattle in 1000 houses- 497

Number of buffaloes in 1000 houses- 1778

Number of lambs in 1000 houses- 109

Number of goats in 1000 houses- 106

Number of pigs in 1000 houses- 70

Net quantity of dung or night soil produced by all these animals

Is 32, 934.5(kg/day).

Liters of gas produced $350 \times 32,934.5 = 1,15,27,075$ litres/ day

Consumption of fuel in a day is 1000 liters per person (approx.).

For a village with around 5000 people consumption of fuel is 50,00,000 litres/day.

If the efficiency of gas is 60% then completely useful gas is 69,16,245 litres/day.

The consumption of fuel (Biogas) is less than the production making it totally consumptive and efficient fuel. If proper biogas plants are made by gram panchayat or government. Then it is very effective.

III. COST OF CONSTRUCTION OF BIOGAS PLANT

According to IIT Delhi survey reports cost for construction of community level or village level biogas plant is as follows.

•Cost of plant:–Rs 4, 50,000/-

•Cost of Pipe Line:–Rs 1,50,000/-

•Appliances cost:– $50 \times 400 =$ Rs 20,000/-

•Pressurizing System:–Rs 2, 00,000/-

•Human power (Mechanic –5000, Helper -3000) – Rs 96,000/-

Total cost of plant is Rs 8,50,000/-

IV. CONCLUSION

Biogas is one of the best energy source that can fulfill the energy requirements. One of the most economical alternative is using biogas. Production of biogas using the organic waste digester is one of the most common ways. This can create boom in the society.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities.

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