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**COMPACT BIOGAS PLANT- ENERGY CONSERVATION AND GENERATION THROUGH BIODEGRADABLE SOLID WASTE**

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### Abstract

As there is scarcity of petroleum and coal it is necessary to look for the source of energy i.e renewable energy source like solar energy, hydro energy and nuclear energy source. Biogas is also a renewable energy resource but it is distinct from other renewable energies because of its characteristics of using, controlling and collecting organic waste at the same time producing byproducts like fertilizers and water for use of agricultural irrigation. Generally due to space requirement and unhygienic appearance of biogas plant people in urban areas avoid its use. Compact Biogas Plant which use waste rather than cowdung as a feedstock to supply biogas for cooking. This plant is sufficiently compact and used in urban households. As the most common exercise is to dispose of the waste at random in the streets or in open dumps, this leads to pollution of ground and surface water and contributes to the breeding of insects and rodent vector and the spread of disease. Hence the use of biogas can minimize this problem and can give the perfect solution for it.

**Keywords: Renewable energy, By products, Anaerobic digestion**

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## 1. INTRODUCTION

India use a large amount of fossil fuel such as coal, crude oil etc. The rapid increase in use of Renewable Energies such as fossil fuel, oil, natural gas, has created problems of demand and supply, because of which, the future of non-renewable energies is become uncertain.

Solid waste management in economically developing countries is gaining importance as some of the most important threats to public health and environmental quality are related to inefficient waste. To a great extent, the composition of household waste consist of biodegradable materials.

As the most common way is to dispose of the waste at random in the streets or in open dumps, this leads to pollution of ground and surface water and contributes to the breeding of insects and rodent vector and the spread of disease. When dealing with the organic fraction of municipal solid waste, anaerobic digestion is increasing as an alternative to composting. Biomethanisation at a decentralize level is an option as to minimize transport costs and provide renewable energy in organic fertilizer.

The objective was to study and utilize biogas as an alternative to cooking gas, hence in order to know this technology we

have viewed the history of the conventional biogas plant its production and use.

If this plant is installed and operated it may satisfy the need of cooking gas for a family of five members. It can also be used for generation of electricity. This plant is easy to install and maintain even by the homemaker or a worker in canteen or hotels. It hardly occupies a very little space as it is very compact in size. This plant uses biodegradable waste i.e kitchen waste, rotten fruits, wheat flour, rain affected food grains, oil cakes etc which otherwise would have been created the problem for disposal. The waste from this plant is used as a very high quality fertilizer.

## 2. COMPACT BIOGAS PLANT

It is the advanced form of conventional biogas plant. It is distinct from conventional biogas plant as its reduced size, it do not produce pungent smell and cattle dung is required only once in a life of plant and use solid biodegradable wastes as a feedstock everyday rather than cattle dung. It is a dome shaped compact biogas plant which is feed on any starch material i.e kitchen waste, stale food, pending skin of biodegradable solid waste.

It can be installed in urban as well as rural households. As the size is reduced it can be installed in terrace or backyard of the households. This technology is more efficient than conventional biogas plant. There is no maintenance required so that any homemaker can also handle it easily. Production of methane is faster as compared to conventional biogas plant. require low initial investment.

The plant is self sustainable, as it refund the cost of construction in few months by utilising the biogas instead of LPG. The leftover produced by the plant is use as an effective fertilizer. This fertilizer is purely organic in nature. In this process more amount of methane is produced and less amount of CO<sub>2</sub> is produced.

### 2.1 Materials Used

1. Digester tank
2. Gas holder tank
3. Plumbing material
4. Cow dung for first 45 days
5. After 45 days domestic waste.

### 2.2 Construction of plant

1. It consist of two plastic water tank of having digester as well as gas holder.
2. The digester tank is of 1000lit.Capacity and gas holder tank is of 750 lit capacity.
3. Plumbing materials like PVC pipes, gas cock.
4. The inlet pipe is connected from the inlet section the digester from where the feedstock is feed to the digester.
5. An outlet pipe is also attached to the digester from where the effluent is discharged in the form of slurry.
6. The upper portion is a generally a floating dome type were methane gas is collected and through pipe is supplied to kitchen through gas outlet.
7. There is a provision at the bottom of the digester tank for cleaning purpose. The outlet ball valve is provided.

#### 2.2.1 Step 1

1. Assembling of plant with below material.
2. The gas holder tank is inversely immersed in the digester tank.
3. The PVC plumbing components are assembled in the plant.
4. In the digester tank, initially we feed 250kg of cowdung and same quantity of water, to make slurry.

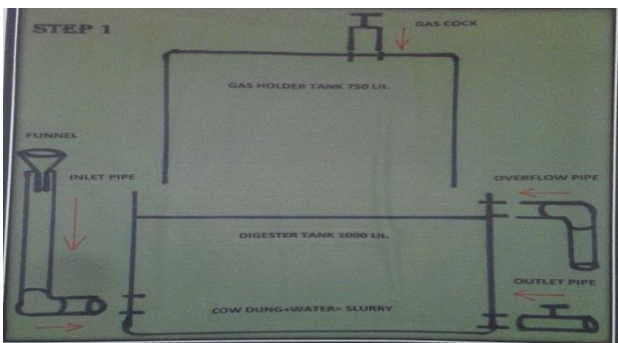


Fig-1

#### 2.2.2 Step 2

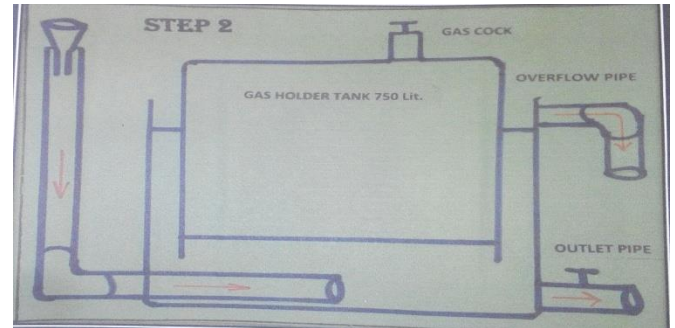


Fig-2

#### 2.2.3 Step 3

1. Mechanization process is occurs in the plant during the tenure of 45 days but the desired result is obtained after 45 days.

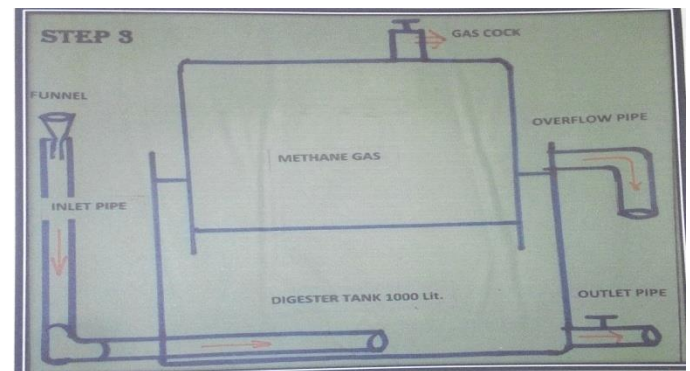


Fig-3

### 2.3 Advantages

1. Require very small space if 1x1 m<sup>2</sup> as it is compact.
2. Provides a clean cooking gas fuels
3. Utilize biodegradable solid waste of domestic urban households.
4. Waste produced from plant is used as good fertilizers.
5. Resolves the problem of garbage disposal and preserve the environment.
6. It is maintenance free.
7. It is user friendly, eco friendly.
8. Safe as it is open to atmosphere and located on terrace.
9. Minimum life is 20 years
10. Comparative cheaper to other fuel.
11. Harmless to nature hence eco friendly.

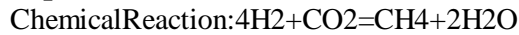
### 2.4 Limitations

1. It is not advisable to transport the biogas plant while in operation.
2. Sudden replacement of starchy feedstock by oily feedstock led to stopping of gas production.
3. Avoid acid and any metal, it lead to reduce the rate of production of methane.

### 2.5 Uses of compact biogas plant

1. It can be used for domestic purpose.
2. It can be used where large amount of domestic waste is available.
3. The waste manure produced by plant is used as fertilizers.
4. For commercial purpose such as hotels, canteens etc the plant can use

## 2.6 Composition



Typical composition of biogas		
Compound	Molecular formula	%
Methane	CH <sub>4</sub>	50–75*
Carbon dioxide	CO <sub>2</sub>	25–50
Nitrogen	N <sub>2</sub>	0–10
Hydrogen	H <sub>2</sub>	0–1
Hydrogen sulphide	H <sub>2</sub> S	0–3
Oxygen	O <sub>2</sub>	0–0

**Fig-4 chemical composition**

## Scope

1. Different raw materials can be used for getting better quality of nature of gas produced.
2. After doing required modifications the electricity can be produced with the help of gas produced by the plant.

## CONCLUSION

This study reveal that there is wider scope in biogas and it has great potential. The plant has proved to be effective in terms of reduction of waste volume and organic load, thus it proves to be alternative to cooking gas as well as it can be used in generation of electricity.

More ever it overcome almost all and residue of this plant can be used as organic fertilizer.

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