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STUDY OF BIO CHILLERS FOR INDIAN VILLAGES: A REVIEW

Shri Ram Pathak[1],Sohail Bux[2]

1. M. Tech student of AGNOS College of Technology in RKDF University Bhopal (M.P.) Email: shreeram2013@gmail.com Mob. No 9893898928.

2 HOD in department of Mechanical Engineering AGNOS College of Technology in RKDF University Bhopal (M.P.).

ABSTRACT

Bio chiller is a best option in village area of Indian continent. Scientists, academicians and research scholars are done work in this area in different region of the world. In this review paper we develop a pilot research project in mechanical engineering department in AGNOS College of Technology in RKDF University Bhopal Madhya Pradesh India. We read different research papers in the field of bio chillers in last 15 to 20 years and some critical review papers in India or abroad are given step by step.

1. INTRODUCTION

Biogas is a clean and efficient fuel; it is a mixture of methane (CH_4), carbon dioxide (CO_2), hydrogen (H_2) and hydrogen sulphide (H_2S). The chief constituent of biogas is methane (65%). The biogas plants there are two types of biogas plants in usage for the production of biogas.

- The fixed- dome type of biogas plant.
- The floating gas holder type of biogas plant.

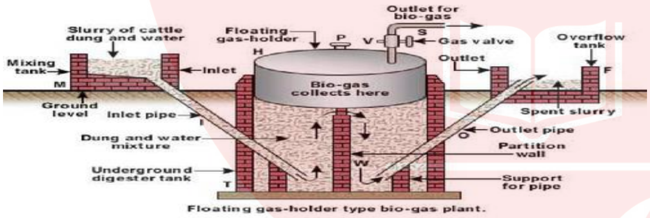

Fig. 1 (a)

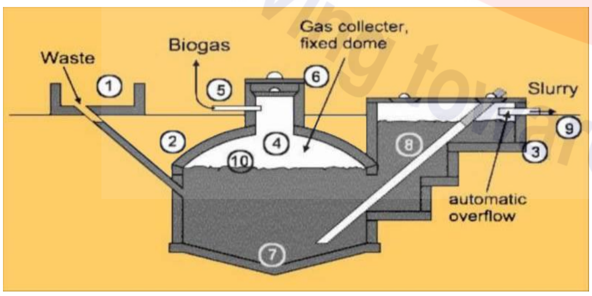

Fig.1 (b)

Fig. 1(a), (b) Simple Floating and fixed type bio gas plant in India

1.1 WORKING OF FIXED DOME BIO GAS PLANT

The various forms of biomass are mixed with an equal quantity of water in the mixing tank. This forms the slurry. The slurry is fed into the digester through the inlet chamber. When the digester is partially filled with the slurry, the inlet of slurry is stopped and the plant is left unused for about two months. During these two months, anaerobic bacteria present in the slurry decompose or ferments the biomass in the presence of water. As a result of anaerobic fermentation, biogas is formed, which starts collecting in the dome of the digester. As more and more biogas starts collecting, the pressure exerted by the biogas forces the spent slurry into the outlet chamber. From the outlet chamber, the spent slurry overflows into the overflow tank. The spent slurry is manually removed from the overflow tank and used as manure for plants. The gas valve connected to a system of pipelines is opened when a supply of biogas is required. To obtain a continuous supply of biogas, a functioning plant can be fed continuously with the prepared slurry. Slurry is prepared in the mixing tank. The prepared slurry is fed into the inlet chamber of the digester through the inlet pipe. The plant is left unused for about two months and introduction of more slurry is stopped. During this period, anaerobic fermentation of biomass takes place in the presence of water and produces biogas in the digester. Biogas being lighter rises up and starts collecting in the gas holder. The gas holder now starts moving up. The gas holder cannot rise up beyond a certain level. As more and more gas starts collecting, more pressure begins to be exerted on the slurry. The spent slurry is now forced into the outlet chamber from the top of the inlet chamber. When the outlet chamber gets filled with the spent slurry, the excess is forced out through the outlet pipe into the overflow tank. This is later used as manure for plants. The gas valve of the gas outlet is opened to get a supply of biogas. Once the production of biogas begins, a continuous supply of gas can be ensured by regular removal of spent slurry and feeding of fresh slurry.

1.1.1 ADVANTAGES OF FIXED DOME TYPE OF BIOGAS PLANT

- Locally and easily available materials for construction.
- Inexpensive
- Easy to construct.
- High calorific value.
- Clean fuel No residue produced.
- No smoke produced none polluting.
- Economical can be supplied through pipe lines.
- Burns readily has a convenient ignition temperature.

1.1.2 DISADVANTAGES OF FIXED DOME TYPE BIOGAS PLANT

- Expensive Steel drum may rust requires regular maintenance

1.1.3 USES OF BIOGAS GENERATED FROM FIXED DOME TYPE PLANT

- Domestic fuel for street lighting Generation of electricity.
- Reduces burden on forests and fossil fuels Produces.
- A clean fuel helps in controlling air pollution, Provides nutrient rich manure for plants.
- Controls water pollution by decomposing sewage, animal dung and human excreta.

2. METHODOLOY

Methane Gas (Bio Gas)

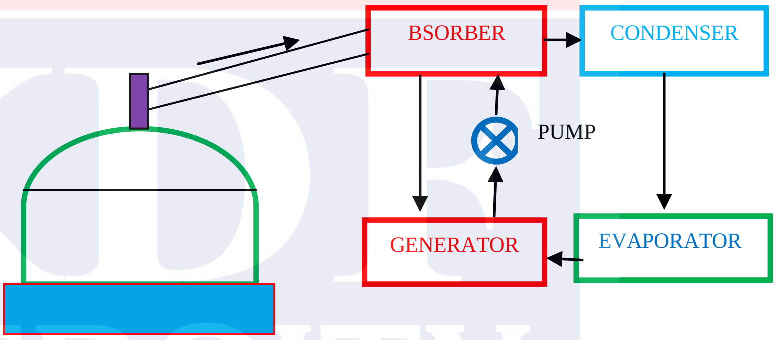

Fig No Fixed Dom Type Bio Gas Plant Connected with Aqua ammonia Bio Chiller absorption plant

In this project we take fixed dome type bio gas plant are taken and connected with aqua ammonia vapour absorption refrigeration system. After development of methane gas is used for heating the liquid ammonia water solution for generating pure ammonia gas for delivering to the condenser of refrigeration system. The condense liquid is flow to the evaporator for extracting the heat form the refrigeration space and back to the absorber for mixing the ammonia liquid and water absorbent this high dense solution is forced to the generator, this cycle is repeated. A pilot project is made at Agnos college of Technology in RKDF University and installed at mechanical engineering lab. The literature of this subject is given below.

3 . LITERATURE REVIEW.

We read different research papers on this topic and some most important review papers are given below.

Ladanai, S.; Vinterbäck [1] shows the energy consumption annually about 4500 energy joule and about total energy contribution about 10%of total consumption of bio mass.

Caillat, S.; Vakkilainen [2] biomass is identified to be useful on a large scale with biomass boilers of more than 500 MW.

Bridgwater, A.V. [3] present the 50% energy is useful for total energy production by agriculture crop.

Treado, S.[4] shows the mainly renewable energy is useful for battery backup power at the main energy is not available in rainy season or in night.

Long, H.; Li, X.; Wang, H.; Jia, J. [5] Biomass is one renewable source that can be used in many applications such as power generation and lighting purpose.

Sopegno, A.; et.al.[6] present the bio gas used in storing and transportation purposes of vehicles.

Ghimire, P.C et,al. [7]-[10] shows the bio gas production in domestic and industrial purposes by human excrement, manure and kitchen waste at household level. Different verities of bio gas production are given in different research papers.

Martinov, M [11] shows exclusive of additional energy input and Domestic biogas systems are broad in Africa and Asian country. The comparison of domestic biogas production systems are more complex simple biogas plants such as big size plants.

Cao, Y. et.al. [12],[13] waste-water treatment plants or biogas plants treating used by organic municipal waste for production of electricity and heat used for pumping, stirring, heating purpose etc. By different bio gas plants.

Terradas-Ill et al. [14] present a household-scale biogas plant and developed a heat transfer purpose that can estimation digester temperature and biogas production in a small, unheated, fixed-dome digester in the ground level.

Perrigault et al. [15] investigated the thermal performance of an experimental on tubular type digester and developed and heat transfer purpose.

Hreiz et al. [16] developed a model to examine heat transfer in a farm-scale semi model type agricultural digester.

Pöschl et al. [17] found result by experiment that the impact of different feedstock and process chains of biogas systems. They complete there could be significant variation in energy efficiency depending on the feedstock and process adopted, conversion technology applied, and digestive management method.

Lübken et al. [18] calculated the digestion of cattle manure and crops in a mesospheric biogas plant.

Banks et al. [19] studied the digestion of domestic food waste in a mesospheric biogas plant.

Havukainen et al. [20] shows dissimilar methods for estimating the energy performance of biogas production. Scientist reviewed three main methods and used data from an existing biogas plant in Finland to estimate the different methods. Their reviewed different studies using methods for evaluating efficiency of biogas production. The reviewed studies used different approaches and different system boundaries, which makes their results hard to compare.

3. CONCLUSION

In this project we conclude following point which are given below.

1. The bio gas generation form fixed dome plant is sufficient to run aqua ammonia refrigeration system for cooling purpose.

2. This coupled plant very useful in developing or poor state of country.

3. This set up is fit for now a days for energy crises is occur in new century .

4. This plant is totally eco friendly in nature.

4. ACKNOWLEDGEMENT

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