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Case Study On Bio CNG Production Plant

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Abstract - *This article presents a case study to find out CNG performance in Ranebennur taluk Haveri District of Karnataka. India's economy is based on agriculture and animal husbandry, which is 80% dependent on 1 billion people. Waste management is a major environmental issue in most developed countries. The world's rapidly evolving problem and waste problem is growing every day. The article also discusses development opportunities to optimize the device to maximize energy and environmental benefits and also this study shows that the amount of methane produced, which means that the gas generated can be further increased by optimizing the operation of the plant.*

Key Words: Biogas, bio-cng, anaerobic digestion (AD), press mud, energy performance ,etc

1.INTRODUCTION

Biogas is the most well-established sustainable source and the most popular source of energy worldwide based on waste-cattle manure. Biogas replaces both fuel and fertilizer, plants produce gas, and, at the same time, the growing fertilizing value of dung. It is estimated that 69% of the total amount of garbage is used as fertilizer, 29% as fuel, and the remaining 2% is used for any other purpose (Nesmith, 1991).

In India, there is a growing shortage of non-renewable resources, as 65% of India's electricity production is generated using oil, coal, etc. Power is available for use with any small job like power, heating, and water supply. As a result of using a biogas plant in India to produce approximately 17000MW of products. In Ranebennur, the use of biogas is limited only for fuel. If the biogas plant does not work properly, it should be considered as national damage.

Animal waste and other agricultural waste used for biogas with anaerobic digestion. With the help of this energy, both the current and future energy needs of the village can be satisfied. Press mud, sugar cane waste that can be used for biogas production. The sugar industry produces a huge amount of waste, organic and nutrient-rich in nature. Sugar cane press mud has a high potential for renewable energy production using the anaerobic digestion process.

2. ANAEROBIC DIGESTION

Anaerobic digestion is a series of biological processes that microorganisms destroy biodegradable material in the absence of oxygen. One such product is biogas, The process of anaerobic digestion already exists in nature, landfills and in some manure systems, but it can be controlled, and this is accessible by using an anaerobic digester. Anaerobic digestion of bio waste combines the energy production with environmental benefits. Biogas contains 50 to 70 percent methane and 30 to 40 percent carbon dioxide and a small amount of other gases, but Bio-CNG, which is 92 to 98 percent methane and 2 to 8 percent carbon dioxide, is the ideal fuel.

Anaerobic bacteria transforms, in three stages of biogas production. During the liquefaction stage, the bacteria content is converted into insoluble fibrous substances like carbohydrates, fats and proteins. In the second stage of digestion, acid-forming bacteria convert the remove solution from organic substances, volatile fatty acids, organic acids, which can be the main reason for the formation of an odor from stored manure. Finally, methane-forming bacteria convert these volatile fatty acids into biogas.

Some of the organic waste that is difficult to break down in an anaerobic digester is larger than others. Food waste, fats, oils and fats are the simplest organic waste by breaking them down, and animal husbandry is usually the most complex. After this biogas is captured, it can create, heat and electricity, for use in engines and microturbine engines and fuel cells. Biogas can be and is converted to biomethane, which is also known as natural gas or CNG, and is then injected into natural gas pipelines or used as fuel for vehicles.

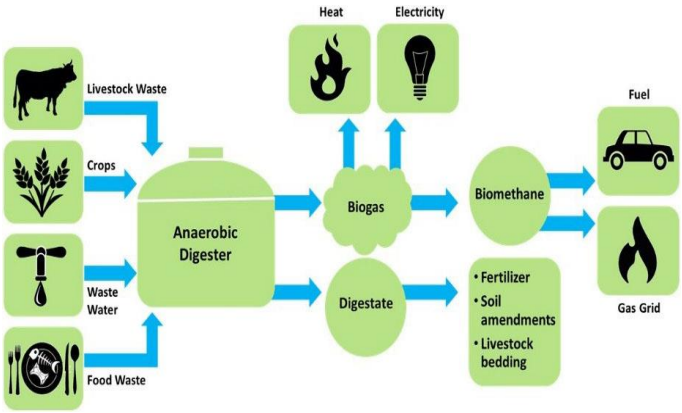

Fig -1: Anaerobic digestion process

3. MATERIAL AND METHODS

The Study was conducted at Ranebennur. The main objectives of this bio cng plant are to achieve the highest efficiency of gas production and to conserve inputs to increase plant productivity. This was learned by doing internship there.

Types of substrates (Feedstock)

- Animal waste
- Slaughter house waste
- Press Mud etc

3.1 PLANT SPECIFICATION

The plant considered in this study is KYATHI GREEN ENERGY PRIVATE Ltd. located Near Makanur 16KM from the Ranebennur Taluk. Ranebennur, A town in the Haveri region of Karnataka. It has a seed multiplication industry .In the city where several seed companies operate.Geographically located in the center of Karnataka.

The current project is a bio-gas plant of 2,000 m3 / day based on anaerobic digestion of cattle manure,press mud any other appropriate contaminants that may be found

The project is considering establishing a state-of-the-art cattle breeding technology facility manure / compress mud in the following products. 750 Kg (1000 M3) / Day Bio-CNG, which will be sold instead of commercial LPG. 7500Kg / day of organic fertilizer and 15000 L / day of Liquid Fertilizer, to be sold as added value for products. Plant processing: 80% mechanical and 20% manual. These are CSTR type reactors and operate at extremely dark temperatures. HRT is 28 to 30 days.

FIGURE 2 : KYATHI GREEN ENERGY PRIVATE Ltd.

3.2 FEED MATERIALS

Every day 25 tons of published mud will be added along with the possible addition of cow manure and poultry waste. This will ensure a stable bacterial response and a smooth operation of the digester. Additional value will be adjusted such as availability, TS content and storage requirements

S.NO	FEED MATERIALS	AVAILABILY (TONS PER DAY)
1.	Press mud	24
2.	Fruit&vegetable waste(optional)	1
3.	Cattle-dung(optional)	3
	Total	24

Table -1: Details of the average feed-materials available for the plant.

3.2 PRESS MUD AS SUBSTRATE

The Press Mud, the sugar-cane residue in the purification of the juice of the sugar cane. The precision of this process, to divide the juice and clear juice, as it rises to the surface, and is made out of mud builds up on the bottom. It is then to be filtered in order to separate the suspended substance that is not soluble salts, and the fine bagasse. For every 100 tons of crushed sugarcane, we get about 3 tons of press mud. It is estimated that 2.7 million tons of mud is produced in our country every year,and it is that economic soil most reclaims the red loamy soil. India annually produces about 10-12 million tons of press mud.Press mud traditionally is used as manure through bio-compost process by spraying spent wash on press mud.Existing ways to dispose of mud are unsuitable for the economy and pollute the environment. As it carry a reasonable amount of easily digestible organisms,has excellent potential for biogas production. In excess, the crushed slurry can be utilized as superior quality Fertilizer. Eventhough there are some biogas plants, which are active but their effectiveness is unsatisfactory due to the exist of wax and the issue of brisk acidification.

4. RESULT AND DISCUSSIONS

Press mud was collected from a Bio CNG Production plant, Ranebennur and sent to Ashoka Consultancy, Pune for analyzing the Composition & Characteristic of Press Mud.

Press mud was suspended, air, soil and filtered by particle size less than 2 mm, and the press mud was characterized by standard methods. COD, total solids (TS), volatile solids (VS), ash, and pH were determined according to standard methods (APHA 2005). COD reviews were performed in accordance with the closed reflux standard, colorimetric method, 5220 D) (APHA 2005). Elemental analysis (C, H, and N) is quantified using the Perkin Elmer 2400 Series II CHNS/O Elemental Analyzer. In fact, the oxygen content was calculated by subtracting the percentages (C, H, and N) of dry ingredients measured for weighing. A rapid analysis of a fine-grained sample with an average particle size of 200-500 lm was carried out after drying in a press furnace at a temperature of 105 °C for 2 hours. Calorific value is determined by a bomb calorimeter. Particle size analysis was performed using a particle size analyzer. Sugar, determined by gas-liquid chromatography, and lignin analysis by NREL method.

Sl No.	Compound and Parameter	Value
1	pH	6.38
2	COD g/kg	277.3
3	C %	39.31
4	H %	4.96
5	N %	2.03
6	Ash %	14.34
7	TS %	18.40
8	VS %	82.15
9	Protein %	13.5
10	Sugars %	6.4
11	Cellulose %	12.90
12	Hemicellulose %	20.86
13	Lignin %	11.28
14	Wax %	8.2
15	Moisture %	73.87
16	SiO %	7
17	Mgo %	1.1
18	Phosphorus %	2.02
19	Calorific value Joules/gm	14730.39
20	C:N ratio	14

Table-2: Composition & Characteristic of Press Mud

Table 2 Shows that Sugar cane press mud(SPM), which was declared at high moisture, which is 73.87%. Dry weight of mud, which is 18.40% and 82.15 % - on TS and VS respectively. The breakdown of components of lignocellulosic biomass is 12.90%, 20.86%, 11.28%, dry based on cellulose, hemicellulose and lignin, respectively. This observation is possibly due to bagasse particles, which is used to enhance the filtration process of clarified lil-SPM. The average pressure values of organic matter and clay expressed in terms of COD were about 277.3 g / kg). At the same time, an average pH value of 6.38 was reachedDifferent pH values can be found in the literature due to differences in the process of the study of mud and collection methods, conservation of ideas and concepts. In fact, the chemical composition of the affected clay depends on the type of sugarcane, the soil, the conditions, the nutrients in the field, specifies the process of acquisition, filtration information, and other factors.

It contains many trace elements, which is very important for the process of anaerobic digestion. These are phosphorus (2.02%), Mgo (1.1%) and Sio (7%), in slightly small concentrations. C, N, and H content values are consistent with the values reported at 39.31%, 4.96% , and 2.03%. It was found that the carbon-nitrogen ratio of 14 is in the optimal range (10-30). As a rule, it is expected that it will have better digestive indicators. The results on the press mud quality characteristics of the press mud test were considered, and it is very, very well suited for the production of Bio-CNG.

5. CONCLUSION

The results of the Bio CNG operation can be used to determine the points from time to time the output occurs, problems and further research of these issues can be undertaken to increase the production of biogas.

In order to increase the productivity of the Ranebennur Bio-CNG plant, follow the following recommendations:

- It has been observed that the pressmud is untreated in present scenario, 72% more methane yield can be obtained, if pretreated
- Bio-methanation can be improved by liquid hot water pre-treatment
- The co-digestion of press mud with vinasse will also enhance the methane yield up to 64%
- A novel high rate bio-methanation digester can be designed and operated
- The dry absorbent based biogas purification system can be developed to improve the efficiency of purification

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