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EXPERIMENT ON BIOGAS PLANT

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Abstract - Because of its high biodegradability, calorific value, and nutritional value to microorganisms, canteen trash may be used to create biogas, reducing our reliance on fossil fuels.. The research work was conducted to investigate the production ability of biogas Co-digestion of cow manure through anaerobic digestion At Alard College Of Engineering we have hostels and having one mess, where daily a lot of kitchen squander is gotten which can be used for better purposes. Anaerobic digestion is required for biogas generation. Biogas production facility that is more cost-effective, environmentally friendly, produces a high-quality renewable fuel, and reduces carbon dioxide and methane. Kitchen waste is the best alternative for biogas production in a Canteen level Biogas Plant. When bacteria decompose organic materials in the absence of oxygen, it produces methane. Biogas contains around 55-65 percentage of methane, 30-40 percentage carbon dioxide. Biogas has a calorific value of about 4700 Kcal, which is rather high. The biogas yields have been determined using batch anaerobic digestion. The rate of methane generation oscillated in a predictable pattern, which might be attributed to the presence of methylotrophs in the activated sludge, which use methane as a carbon source for their development. The anaerobic digestion of kitchen waste produces biogas, a valuable energy resource anaerobic digestion is a microbial process for production of biogas The Temperature used for biogas production at 37°C in reactor. Overall by creating a biogas reactors on Engineering Canteen. Kitchen (food waste) was collected from mess of Alard College Of Engineering & Management as feeds for our reactor which works as anaerobic digester system to produce biogas energy. It decrease the waste of canteen.

Key Words: Canteen Organic Waste, Batch Anaerobic Digestion, Methane Production, Economic Digester, Lab Tests

1.INTRODUCTION

Anaerobic digestion of biodegradable organic feedstocks such as municipal and industrial wastes, as well as animal and agricultural leftovers, produces biogas. Biogas includes a significant amount of methane, which can be improved to natural gas quality [2] . The enhanced biogas can be used as a transportation fuel or pumped into a natural gas infrastructure. Apart from generating energy and manure, anaerobic digestion of biodegradable organic wastes has a number of social and environmental advantages [7] . Biogas helps to reduce the negative externalities associated with organic wastes, such as groundwater and soil degradation, local air pollution such as dioxins and furans, and methane, a potent greenhouse gas. For cooking, lighting, and electricity generation, replacing fossil fuels and untreated traditional solid biomass with clean fuels like biogas would help reduce emissions and indoor air pollution. When compared to untreated animal dung, the nitrogen concentration of the slurry following anaerobic digestion increases, allowing it to be used as an organic fertiliser.

2. BIOGAS

Biogas is a mixture of gases created by the anaerobic decomposition of organic matter in the absence of oxygen, chiefly methane and carbon dioxide. Agricultural waste, manure, municipal trash, plant material, sewage, green waste, and food waste can all be used to make methane. Biogas is a renewable source of energy.

Anaerobic digestion with methanogen or anaerobic microbes, which digest material inside a closed system, or fermentation of biodegradable materials are two methods for producing biogas. An anaerobic digester, also known as a biodigester or a bioreactor, is a closed system [1] .

3. METHODOLOGY

3.1 MATERIALS FOR BIOGAS DESIGN

1. One PVC tank with a capacity of 100 litres (Digester Tank) [8] .
2. Capacity of one circular rubber tube (Gas Holder)
3. 5 inch diameter Pipe made of plastic to be used for (feedstock waste)
4. 10 mm in diameter As a guide pipe, use PVC flexible pipe (from Digester Tank to Gas holder)
5. M-seal
6. a gas station
7. Paint in the colour of black (prevent from cool)

3.2 THE BIOGAS DIGESTER

Alard College of Engineering and Management is a place where you may learn about engineering and management. The biogas model is being developed in the canteen, and the trash from the canteen will be used as biogas producing waste, making the project both renewable and cost-effective.

- A 100-liter tank will be used for mess waste and water
- The gas will be collected using the circular tube.
- To remove surplus water from the 100L tank, a 1inch outlet pipe will be installed in the centre.
- A 5-inch waste feeder is mounted on the tank's top.
- The flexible circular tube in the upper centre is utilised to transport gas from the tank to the circular tube.
- Every day, 1 litre of water and 1 kg of kitchen trash are poured into the tank. After the seventh day (ratio = 1: 1: 1), the mixer is used to properly mix the water, kitchen waste,cowdung into the container i.e. (1 kilogramme waste = 1 litre of water=1 kilogramme cowdung)
- Accept on the first day, 25% of the water will be added to the tank the next day so that the old waste does not dry out, and the water will be added with new waste. The test will be done in kilogrammes.
- Biogas Test will be done for 20 days [3][4] .

1. Gas Amount
2. pH
3. Temperature
4. Total Solids
5. Volatile Solid
6. Volatile fatty acids

3.3 pH

- Acidogens are at pH 6.0.
- Methanogens thrive at pH 7.0 to 8.0.

3.4 Temperature

- Psychrophilic (25°C)
- (30°C To 45°C) Mesophilic :Mesophiles

4. RESULT

4.1 RATIO OF MANURE

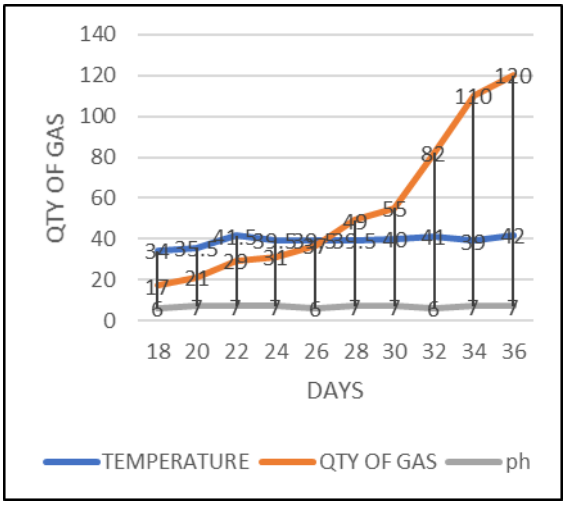
Nos of Days	Ratio Of Waste :Water: Cowdung	Waste+ Water Kg	Average Kg
0	2.5:2.5:1	6	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	Gas Started
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	
2	1:1:1	3	57

Table No 4.1:Ratio Of Manure

4.2 EFFECT OF QUANTITY OF GAS WITH PH,TEMPERATURE

NO OF DAYS	QTY OF GAS (GM)	PH	TEMPERATURE
14	17	6	34°C
2	21	7	35.5°C
2	29	7	41.5°C
2	31	7	39.5°C
2	37	6	39.5°C
2	49	7	39.5°C
2	55	7	40°C
2	82	6	41°C
2	110	7	39°C
2	120	7	42°C

Table No 4.2 : EFFECT OF QUANTITY OF GAS WITH PH,TEMPERATURE



Graph 4.2 : EFFECT OF QUANTITY OF GAS WITH PH,TEMPERATURE

Conclusion For Qty Of Gas With Ph,Temperature

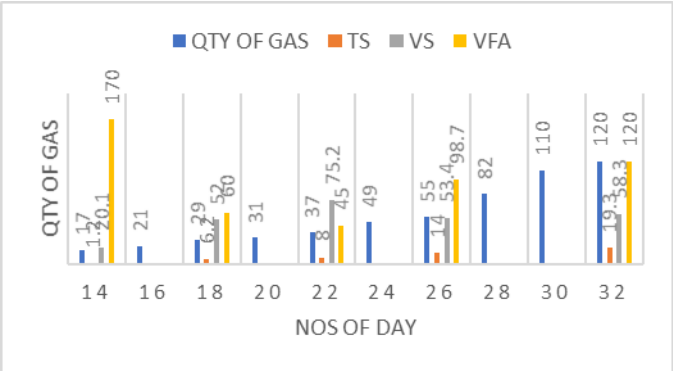
- The Production Of Gas Increases As Time Passes
- If Proper Stirring And Feed Waste Is Done On A Regular Basis For every two Days The Production Of Gas Increases
- As Manure Ages, Bacteria Increases.As the number of bacteria grows, so does the amount of gas generated.
- The pH is used to determine the health of anaerobic microorganisms as well as the effectiveness of the ad system.
- In this test, methanogens bacteria were used, which are beneficial to both the production of methane and human health.
- Only Mesophiles Bacteria Are Present In This Test For Gas Production
- Mesophiles Bacteria Type Is Growing • It Is Good For Methane Production.
- Methanogen bacteria thrive at temperatures between 35 to 43 degrees celsius.
- pH 7 is good for methane bacteria health

4.3 EFFECT OF GAS QUANTITY ON TS,VS,VFA

Nos of Days	QTY OF GAS (GM)	TS %	VS %	VFA %
14	17	1.2	20.1	170
2	21			
2	29	6.2	52	60
2	31			
2	37	8	75.2	45
2	49			
2	55	14	53.4	98.7
2	82			
2	110			
2	120	19.3	58.3	120

TS-Total Solid; VS-Volatile solid; VFA-Total Volatile Fatty Acid

Table No 4.3 : EFFECT OF GAS QUANTITY ON TS,VS,VFA



Graph 4.3: EFFECT OF GAS QUANTITY ON TS,VS,VFA

The graph shows that gas production grows initially until day 14, but then TS, VA, and VFA increase the quantity of gas produced.

5. CONCLUSION

Many factors influence the anaerobic digestion process (for example, the circumstances within and outside the reactor, the reactor's design, and the operational parameter). The plan boundaries of the biogas plant, the key natural circumstances in the reactor, and the accessible observing and regulating improvements of the anaerobic digestion process were all covered in this article. The methane-producing biogas bacteria multiply over time. Gas is produced, and the gas is burnt with a blue flame.

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