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Analysis of Cow dung and Goat Dung with Vegetable waste and Rice Husk in various proportions at Thermophilic Condition

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ABSTRACT

In this study a batch type anaerobic digester is used in order to investigate the possibility of utilization of different type of waste in anaerobic digester at thermophilic condition. The cow dung and Goat dung are separately analyzed at thermophilic condition with vegetable waste and rice husk. There are 5 different setups were made and all are kept at thermophilic condition, in the first stage cow dung is analyzed and secondly goat dung is analyzed. The digesters are filled with wastes at various proportions and allowed to produce biogas. The results were shown that where compared to goat dung, cow dung processed biogas with good quality and with lesser retention time. The setup 2 of cow dung produces biogas with 67 % of methane content, and when the percentage of rice husk increases the quality of biogas is decreased which can be observed from setup 4 and 5 of both cow dung and goat dung. The retention time of all the process is low as because all the setups places at thermophilic condition, this can be seen from setups 1, 2 & 3 of cow and goat dung.

Keywords – Cow dung, Goat dung, Anaerobic digester, Thermophilic condition

1. INTRODUCTION

Due to scarcity of petroleum and coal there is a threatening to the supply of fuel throughout the world. Also, the problem of their burning leads to investigate in dissimilar corners of the world to get access to the new sources of energy similar to renewable power possessions. Solar energy, wind power, different thermal and hydro sources of energy, biogas are all renewable force resources. But, biogas is separate from other renewable energies because of its characteristics of by, domineering and collecting unprocessed harsh environment and at the identical time procedure in fertilizer and water for use in agricultural irrigation [1-3]. Biogas does not have any geographical limitations nor does it require advanced knowledge for producing power, also it is very easy to use and concern. Anaerobic digestion is controlled biological deprivation procedure which allows well-organized capturing & exploitation of biogas (approx. 60% methane and 40% carbon dioxide) for energy generation [4, 5]. Anaerobic digestion (AD) is a promising method to treat the organic wastes. While anaerobic digestion for behaviour of mammal compost is ordinary in country parts of just beginning countries, information on technological and functioning feasibilities of the behaviour of crude solid dissipate is incomplete in those parts. There are many factors distressing the recommend and arrangement of anaerobic absorption. Some are related to feedstock characteristics, design of reactors and process circumstances in real occasion [6, 7]. Physical and chemical descriptions of the organic wastes are important for designing and functioning digesters, since they influence the biogas manufacture and process stability during anaerobic digestion. They comprise wetness satisfied, volatile solids, nutrient contents, particle size, & biodegradability [8, 9]. The biodegradability of a feed is indicated by biogas production or methane yield and percentage of solids (total solids or total volatile solids) to be shattered in the anaerobic digestion. The biogas or methane surrender is calculated by the quantity of biogas or methane that can be fashioned per unit of impulsive solids contained in the feedstock behind subjecting it to anaerobic incorporation for an adequate total of instance under given warmth which is taken to be laboratory temperature in our holder.

2. METHODOLOGY

In the phase I of the project work identically five batch type biogas digester are constructed with two litre water bottle and urinary bladder for waste feeding and gas collecting respectively. The cow dung, vegetable waste and fruit waste are added in different proportions in the biogas batch digester. Among the five digester, three of them are kept at mesophilic condition and other two digester are kept at thermophilic condition. The thermophilic condition is maintained by placing the bottles in an empty box and a filament blub is placed in inside to maintain the temperature. Among this the setups placed at thermophilic condition has produces biogas in a less retention time and the percentage of methane in the gas is also high. Therefore in the phase II the project is continued by placing all the digesters in the thermophilic condition.

Also 10 different set of readings were taken by varying the percentage of different types of waste. The project is carried out with cow dung and Goat dung. Cow dung and Goat dung are mainly compared in the thermophilic condition with vegetable waste and rice husk.

3. RESULTS AND DISCUSSIONS

The results of all digesters are compared on basis of retention timing, percentage of methane and carbon di oxide, temperature and pressure.

3.1 Results for Cow dung, Vegetable waste with Rice husk

3.1.1Comparison of methane and carbon dioxide

From the table 1 the percentage of methane a percentage of carbon dioxide is compared for the setups placed in thermophilic condition with cow ding, vegetable waste and Rice husk. The setup 2 produced biogas with high percentage of methane content.

Table 1 Comparison of Methane and Carbon dioxide

Setup No	Percentage of Methane	Percentage of Carbon di oxide
1	65	35
2	67	33
3	61	39
4	58	42
5	51	49

The biogas produces by setup 5 has very lower content of methane as compared with the other setups, because the percentage of rice husk is very high in this setup compared to all. So we can able to see that increases the rice husk percentage lower the methane content in the gas.

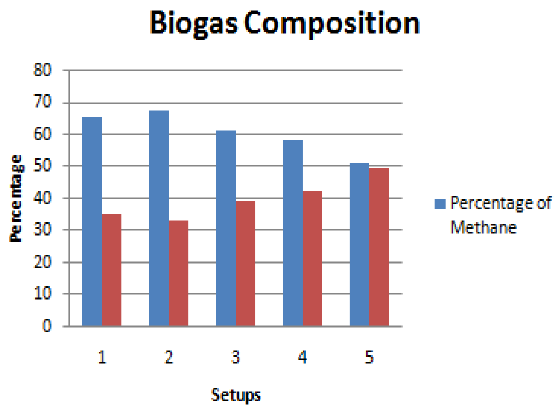

Fig. 1 Biogas Composition

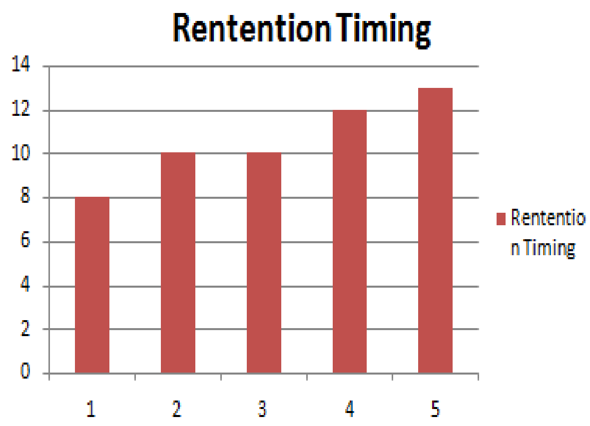

Fig. 2 Retention Timing

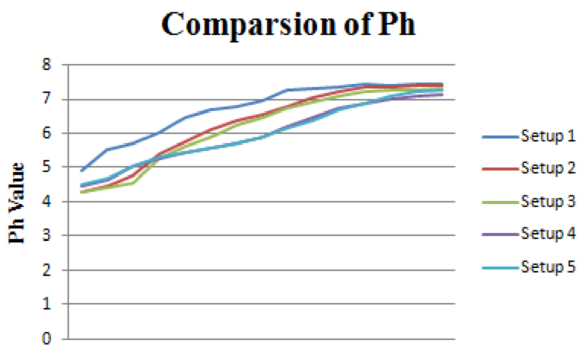

Fig. 3 Comparison of pH

pH of the digester will be very low at the initial stage as the days go on the pH of the digester is also gradually increased, when the digester reached the pH near to 7 the biogas production is starts. The below graphs reflects the pH variation of the setups.

The graph below shows the temperature maintained in the all the setups in the thermophilic condition.

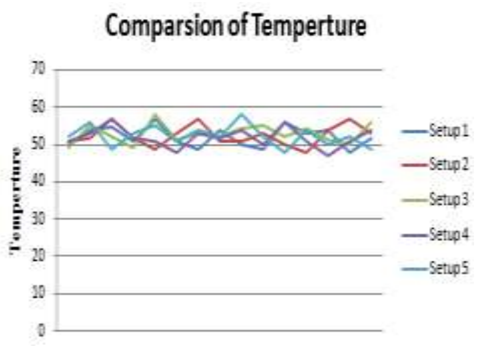

Fig. 4 Comparison of Temperature

3.2 Results for Goat dung, Vegetable waste with Rice husk

3.2.1 Comparison of methane and carbon dioxide

From the table 2 the percentage of methane and percentage of carbon dioxide is compared. The setup 1 has produces biogas with high percentage of methane content. The setup 4 and 5 has higher retention timing as compared to other setups and produces more carbon di oxide because of those two setups were filled with more amount of rice husk which takes more time for digestion.

Table 2 Comparison of methane and Carbon dioxide

Setup No	Percentage of Methane	Percentage of Carbon oxide
1	66	34
2	59	41
3	63	37
4	56	44
5	49	51

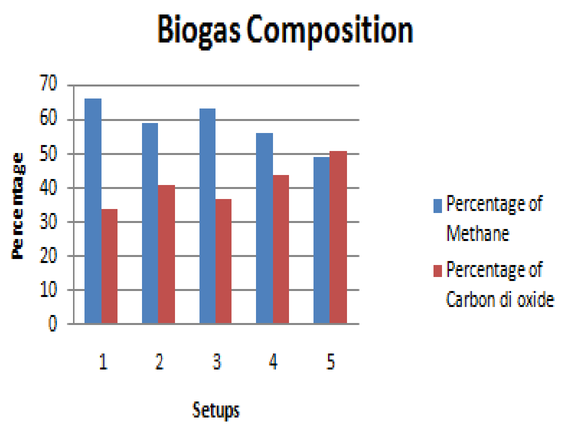

Fig. 5 Biogas composition

The retention time of the digester also varies with the sample. Among the5setups the setup1 produces gas on the 9 day itself. The setup 4 and 5 produces gas on the 14th day because of percentage of rice husk high in both the digesters.

Table 3 Comparison of retention time

Setup No	Retention Timing
1	9
2	10
3	11
4	14
5	14

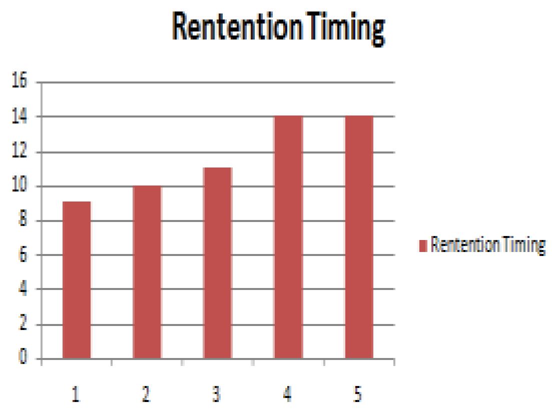

Fig. 6 Retention timing

The variation of pH for setups is shown in the below graph. From the graph it shows that the pH of all the setups rises constantly. Compared to other setups the setup 1 pH has increased faster due the percentage of vegetable waste is higher.

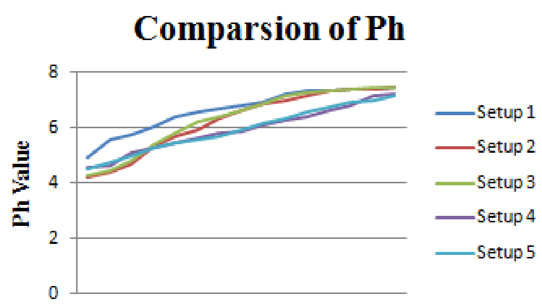

Fig. 7 Comparison of pH

The graph below shows the temperature maintained in the all the setups in the thermophilic condition.

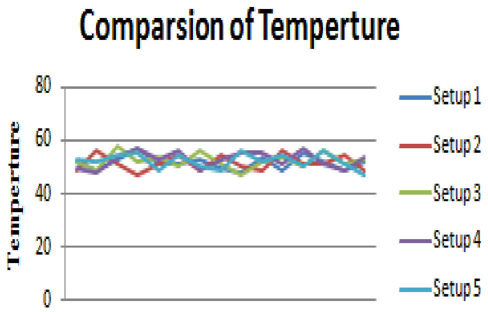

Fig. 8 Comparison of Temperature

5. CONCLUSION

The setups are prepared for testing the effect of rice husk and vegetable waste with cow dung and goat dung. The experiments are carried out successfully and results are tabulated. A brief conclusion of the carried project is given below points.

- From the results of the above experimental work, it is proved that use of cow dung is more effective than goat dung, even though the goat dung can be used by mixing with cow dung.
- The pH of the digesters are increased according the retentiontiming, if the retention timing is high the pH also rises faster and vice versa.
- In the cow dung study the setup 2 has high percentage of methane and in goat dung study setup 1 has high percentage of methane.
- Retention time of the setup 1 is very low compared to all the setups. In the goat dung and setups also setup 1 has very low retention time.
- From this we conclude that, maintain the thermophilic temperature inside the digester improves the retention timing and methane percentage.

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