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EXPERIMENTAL STUDY ON PRODUCTION OF BIOGAS (WASTE WATER SLUDGE AND GREEN WASTE)

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ABSTRACT

Solar energy, Wind energy,different themal, biogas are all renewable energy resourses.But, Biogas is different from other renewable energy by its charecteristics of using, controlling and collecting organic waste. At the same time producting fertilizer and water for using agricultural irigation. No geographical limitations takes place in in Biogas nor it does not requires advanced technology for producing energy, also it is very simply to apply and to use.

Production of gas more difficult now a days and it is uneconomical too. To overcome this problem, production of Biogas is necessary. It is cheap and economical because of using waste as major one. It is easy to produce manually.

1. INTRODUCTION

Biogas is a gas which is produced by the biological breakdown of organic matter in the absence of oxygen. Biogas starts from biogenic material. Biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as green waste, manure or sewage, biomass, municipal waste and energy crops. This type of biogas comprises primarily methane and carbon dioxide .The other principal type of biogas is wood gas which is created by gasification of wood or other biomass. The biogas is the combination of gases like nitrogen ,hydrogen and carbon monoxide , with detection of high amount of methane. Biogas is based on the phenomenon that when organic matter is fermented and form gas in the absence of air, combustible gases are formed mostly. Anaerobic digestion is one of the process which is to be done in absence of air.

2. ANAEROBIC DIGESTION

Anaerobic digestion is a natural process in which bacteria convert organic materials into biogas. In landfill the bacteria is more active where they are the principal of degrading process because of land filled food wastes and other biomass. Biogas can be collected and used as a potential energy resource for heating purpose. The process of anaerobic (oxygen-free) environment through the activities of bacteria that break down the organic material and produce methane (CH_4) and carbon dioxide (CO_2) in a gaseous form which is known as biogas.

Elements of Anaerobic Digestion systems

Anaerobic digester system, decades at waste facilities, and recently, it is also used to process industrial and agricultural wastes. These systems are designed to develop the growth of the methanogenic bacteria that generate CH_4. By using organic wastes as the major source, it produce biogas that contains 55% to 70% CH_4 and 30% to 45% CO_2.

Manure collection and handling:

The amount of water and inorganic solids that mixed with manure during collection and handling is the major key considerations in the system.

Biogas recovery:

In the anaerobic digester bubbles formed to the surface when biogas forms and it form a fixed rigid top, a flexible inflatable top, or a floating cover, depending on the type of digester. The collection system, mostly plastic piping is used to direct the biogas to gas handling subsystems.

Biogas handling:

For a required specific application, the biogas is usually pumped or compressed to the operating pressure and then metered to the gas use equipment. By the advance of this biogas may be processed to remove moisture, H_2S and CO_2, the main contaminants in it.

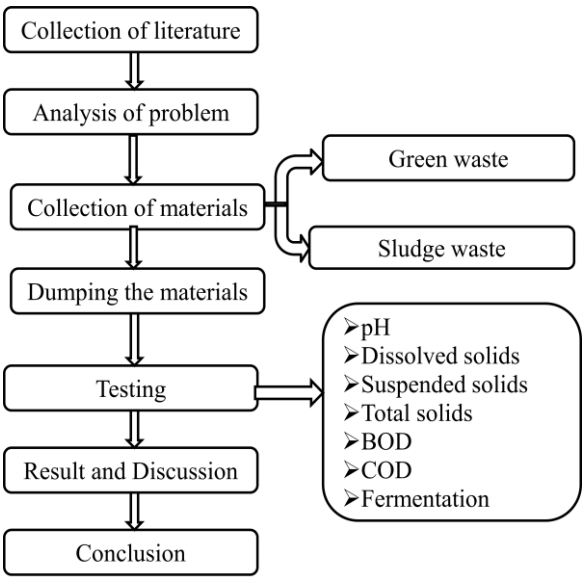
Biogas use:

Anaerobic digestion is a complex process that has two stages. In first stage, decomposition is performed by fast-growing, acidogenic bacteria.

Protein, carbohydrate, cellulose, and hemicelluloses in the manure are hydrolyzed and metabolized into mainly short-chain fatty acids acetic, propionic, and butyric along with CO_2 and hydrogen (H_2)gases.

In the second stage, methanogenic bacteria metabolized most of the organic acids and all of the H_2, from the end result production of a metabolized by methanogenic bacteria, production of a mixture of approximately 55% to 70% CH4 and 30% to 45% CO2, called biogas. The methanogenic bacteria are slower in growing and environmentally more sensitive (pH, air and temperatures) than the acidogenic bacteria. The methanogenic bacteria require adequate time (more than 15 days),pH range (above 6) and temperatures at or above 70degree F, which effectively convert organic acids into biogas. The average amount of time, manure remains in a digester is called the hydraulic retention time, defined as the digester volume divided by daily influent volume and expressed in days.

3. METHODOLOGY



4. OBJECTIVE AND SCOPE OF REVIEW

OBJECTIVE

- Recovery of energy from waste water sludge and solve landfill resource problem.
- production of gas from sludge waste .
- The energy release allows biogas to be used as a gas; it can be used for any heating purpose, such as cooking.

SCOPE

- The development and implementation of renewable energy sources, such as biogas from green waste and sludge waste based on national and regional biomasses, will increase the security of the national energy supply and reduce dependency on others.
- This project has the benefits, such as renewable energy production, cheap and environmentally healthy organic waste recycling, lower green house gas emission, pathogen reduction through sanitation, increased fertilization efficiency and economical advantages for farmers.
- In order to prevent negative environmental impact it is necessary promote the biological treatment of organic waste.

5. MATERIALS USED

Green waste

The green waste is that the waste collected from the garden or market (vegetable waste).

Sludge waste

Sludge waste is collected from the waste drainages or from the waste water treatement plant.

Cow dung

cow dung is used to increase the production of Biogas as earlier.

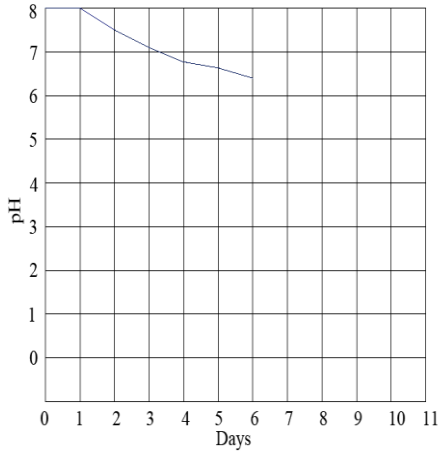
6. EXPERIMENTAL METHODS

Determination of pH

pH is measured by immersing the meter using a glass electrode which generates a potential varying linearly. The principle of electrometric pH is the identifying the acidity of hydrogen electrode of a reference electrode. The pH meter is removed from the cover and turned on by the switch. Then the pH meter is wiped with a tissue paper and it is dipped in the sample solution. After this immersing process wait up to 1 min for steady reading. The reading value is taken when the pH value remains constant about a minute.

DAY	TEMPERATURE	pH
1	25°	8.0
2	25°	7.5
3	25°	7.05
4	25°	6.8
5	25°	6.6
6	25°	6.4

Table.1



Determination of Total solids

Wash and dry the crucible in a hot oven for dryness. Measure the initial weight of the crucible by the electronic balance. Take 20ml of sample in a crucible and kept in the incubator for a certain time limit. Then take it out and cool the container to dryness in desiccators and weight the crucible again and note the increasing weight.

Amount of Total solids present in the sample = mg of residue/20ml sample × 1000

Determination of Total dissolved solids

Wash and dry the crucible in a hot oven for dryness. Measure the initial weight of the crucible by electronic balance. Take 20ml of sample in a crucible and kept in the incubator for a certain time limit. Then take it out and cool the container to dryness in desiccators and weight the crucible again and note the increasing weight.

Amount of dissolved solids present in sample = mg of residue/20ml sample× 1000

Determination of Total suspended solids

Wash and dry the crucible in a hot oven for dryness. Measure the initial weight of the crucible by electronic balance. Filter the sample by using the Whitman filter paper. Transfer the solid particles in the filter the crucible and keep in the over. Then take it out and cool the container to dryness in desiccators and weight the crucible again and note the increasing weight. Otherwise the difference between the total solids and dissolved solids are the suspended solids in the solids

Amount of dissolved solids present in sample = mg of residue/20ml sample× 1000

Determination of BOD

The dissolved oxygen in the sample is determined before and after 5 days incubation. The amount of oxygen presence is calculated as BOD. Sample of oxygen containing less amount of oxygen is diluted several times with special type oxygen diluted water saturated with oxygen, in order to provide sufficient amount of oxidation.

The sample is diluted with dilution water and the diluted sample is taken in two bottles for 5 days. The first sample is used to test the dissolved oxygen test and the second sample is kept in the incubator for 5 days. If the incubator is not available then the sample is covered by the aluminium foil sheet. By titrating the sample at the end of 5 days then the BOD value is determined.

Determination of COD

A known amount of sample of waste water is taken in a pot. A known amount of potassium dichromate and sulphuric acid are added to the sample. The mixture is kept for about three hours. During this period, a chemical reaction takes place to produce carbon dioxide after the reaction the remaining amount of potassium dichromate is determined by titration with ferrous ammonia sulphate solution. The consumption of dichromate indicates the amount of oxygen required for the oxidation of organic matter.

7. TEST RESULT

S.NO	CHARACTERISTICS	TESTED VALUE
1.	pH	8
2.	Solids	
	(i)Total solids	25500mg/lit
	(ii)Suspended solids	20000mg/lit
	(iii)Dissolved solids	5500mg/lit
3.	BOD, 5days at 20°C	120mg/lit
4.	COD	340mg/lit

8. MODEL

The experiment was done in a container, digester. Here, different concentration and combination of wastes are used. The gas is produced in this container and then it is collected or transferred to gas collecting container. The container used for collection of gas, should be checked before the process is carried out. No leakages should be takes place.

9. CONCLUSION

Based on the literature review, following conclusions are obtained:

1. From the result it is seen that the generation of biogas is time dependent and takes few days for its incubation. The generation starts from 10 days onwards and progresses fast with increasing reaction.
2. The changes in temperature and pH are not varied much and remains almost same. It appears that the temperature variation between 24-25ºC are favorable for the reaction to continue.
3. The generation of biogas progresses fast and attains a maximum value of 2200cc on 28nd day and thereafter it slows down progressively. This is evident because of the fact that the generation of methanogenesis bacteria is progressively retarded with the prevalence of acid genesis bacteria because of absence of fresh feed from outside. Therefore to make the process continuous feed supply should be continuous.

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