International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 03 | Mar 2020 www.irjet.net p-ISSN: 2395-0072

PREFEASIBILITY STUDY ON BIOGAS GENERATION FROM VEGETABLE WASTE

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Abstract - *Biogas is an excellent natural source of energy that can severe as an alternative for LPG. In this experiment, biogas is generated by using vegetable waste and cow dung mixed for co-digestion under anaerobic condition in an anaerobic digester at lab scale. Biogas is collected and methane content is identified by syringe method. Proximate analysis and ultimate analysis has been carried out and it is found that the methane content in the biogas generated can be further increased by removal of Sulphur content from the vegetable waste. The biogas consisted mainly of CH_4 and CO_2 along with other gases in lesser amount. Thus, the fuel efficiency can be increased upon successful purification of biogas and effective usage of methane.*

***Key Words*: Vegetable waste, Proximate analysis, Ultimate analysis, Methane, Carbon dioxide, Biogas.**

1. INTRODUCTION

Due to increasing population and scarcity of fuel supplies such as coal and petroleum there rises a need for alternative source of energy for fuel. In order to overcome this scarcity and meet the requirements renewable energy sources such as solar energy, wind energy, thermal energy, hydroelectric power, biogas etc., can be used.

Biogas is distinct among the renewable source of energy as it does not require advanced technology to produce energy. Also it is simple and easy to use and apply.

Vegetable waste is a high calorific value organic material that can be used in producing the biogas effectively. The cost of producing the biogas can be reduced by increasing the efficiency and size of the reactor used. In most cities the vegetable waste are disposed in landfill or discarded which may leads to health hazards and cause epidemic outbreak. The composition of biogas depends on the type of vegetable waste used. Biogas is colourless and almost odourless that burns with 60% efficiency in a conventional biogas stove.

While the gas produced is used a fuel the residual organic sludge is used as a high nutrient neutral fertilizer thus it is an eco-friendly process

2. METHODOLOGY

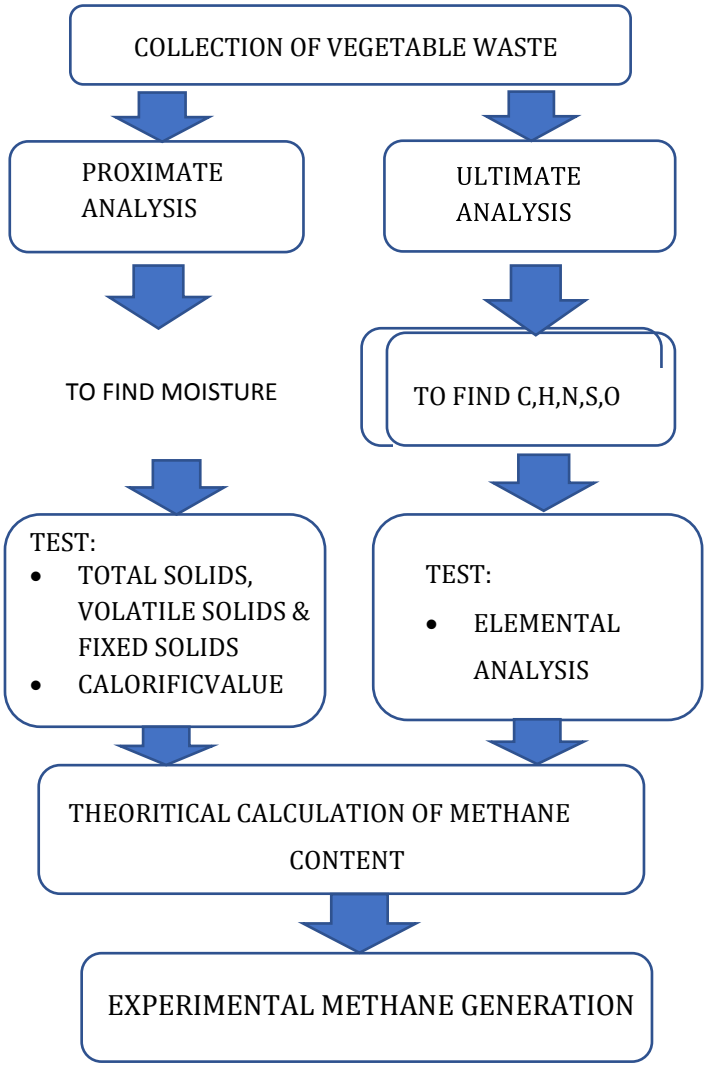

Fig-1 Methodology

3. EXPERIMENTAL BIOGAS GENERATION

A. MATERIALS REQUIRED

Table -1: Materials required

No.	Materials used
1	20 Litre container (used for drinking water storage)
2	Solid tape
3	M–seal
4	PVC pipe 0.5'' (length~1m)
5	Rubber or plastic cape(to seal container)
6	Funnel (for feed input)
7	Pipe (for gas out put, was used level pipe) (3-5m)
8	Bucket(15-20 litre)
9	Tube–for gas collection

B. PROCEDURE

- Fresh cow dung was collected and mixed with water thoroughly by hand .
- 20 litre can is cut open at the top and side in circular shape at 1 inch diameter to install inlet and outlet pipes.
- A small hole is made at the top to insert 2m long tube through which biogas is taken to the collecting tube.
- Collecting tube is connected to the tube using M-seal.
- The well mixed food-dung mixture is allowed into the can through inletpipe,the can in filled and the inlet is closed.
- After two weeks of digestion biogas gets collected in the collecting tube.

4. RESULT AND DISCUSSION

A. Chemical formula without sulphur

I. Without water $C_{28.4} H_{2.2} O_{30.5} N$
Total gas = 0.0463 m^3/kg

II. With water $C_{28.4} H_{8.3} O_{345.5} N$
Total gas = 0.0728 m^3 /kg

B. Chemical formula without sulphur

I. Without water $C_{74.4} H_{5.9} O_{18.1} N_{2.6} S$
Total gas = 0.0861 m^3/kg

II. With water $C_{74.4} H_{109.1} O_{905.8} N_{2.6}$
Total gas = 0.041 m^3/kg

It is found that the methane content in the biogas produced can be increased by removing the Sulphur content from vegetable waste feed.

5. CONCLUSIONS

Thus, it has been concluded that co-digestion of kitchen waste and cow manure yield good amount of biogas with 50% methane content. The research has provided, that after 7-8 days of setting the feed to the digester, a considerable amount of gas is produced, which may be due to the cultivation of the bacteria into the digester chamber. Total biogas produced has been estimated to be around 0.0763m^3/kg. The slurry tends to have neutrality (pH of 6.9-7.1), which provide a good source of natural fertilizer.

From this experiment it is able to produce around 0.067 lit of biogas in a 20 lit reactor from 1 kg of vegetable waste. Hence I can conclude that we can produce 67 lit of biogas from 1000 kg of vegetable waste in under ideal condition 67 lit of biogas is equal to 4.5 cylinders of LPG. Hence from this experiment we found out that 4.5 LPG cylinders can be replaced by biogas produced from the bio digester.

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