IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANAEROBIC DIGESTOR- A STUDY OF SUSTAINABLE MANAGEMENT AND NUTRIENT RECYCLING FROM FOOD WASTE

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Abstract: All wastes produced by human and animal activities that are typically solid and are discarded as worthless or unwanted are considered solid wastes. The word, as employed in this work, is all-inclusive and includes both the more homogeneous accumulations of agricultural, industrial, and mineral wastes as well as the heterogeneous mass of throwaways from the urban community. In an urban environment, the buildup of solid waste is a natural byproduct of life. This result led to the development of the $3 billion to $4 billion per year industry involved with trash management that exists today (1976) in the United States. Biodegradable waste that can decompose and will be broken down into carbon dioxide, water, methane, or simple organic molecules by the action of microorganisms in a reasonable amount of time is referred to as biodegradable trash. Residential locations, business areas, and industrial regions may all serve as sources for the wastes produced by human and industrial economic activity. Depending on where these wastes are produced, they have different characteristics. Due to differences in socioeconomic, cultural, and living conditions, the composition of garbage differs from urban to rural areas and also from community to community.

Index Terms **- agricultural, industrial, and mineral wastes, microorganisms, garbage**

I.INTRODUCTION

At present more than 32% of country's population is living urban areas and wastes generated in 366 Indian cities contribute 70% of solid waste from India's urban population. Estimations made by different agencies and institutions reported that the total MSW generated in urban India at 68.8 million tons per year (TPY) or 188,500 tons per day (TPD). Since 2001, data obtained show a 50% rise in MSW created within a decade. Under the "business as usual" scenario, urban India will generate 160.5 million TPY (440,000 TPD) of municipal solid garbage by 2041. To prevent further deterioration of the public health, the standard of living in Indian cities, and the land, water, and air resources, this volume of rubbish must be carefully managed[2]. Studies and analyses of solid waste samples taken from various cities across India reveal that urban Municipal Solid Waste (MSW) is composed of 51% organics, 17.5% recyclables (including paper, plastic, metal, and glass), and 31% inert elements. Urban MSW has a 47% moisture content and a calorific value of 7.3 MJ/kg (1745 kcal/kg).

II. LITERATURE REVIEW

Dr. Anand Karve (President Appropriate Rural Technology of India, pune ARTI[3],[4] devised a small-scale biogas plant that employs starchy or sweet feedstock, and data reveals that it is 800 times more effective than traditional biogas plants. **Hilkiah Igoni [5] (2008)** investigated how municipal solid waste's total solids concentration affected the biogas that an anaerobic continuous digester produced. The total solids (TS) concentration of the waste has an effect on the pH, temperature, and effectiveness of the microorganisms in the decomposition process. They examined several TS of MSW concentrations and the surrounding in an anaerobic continuously stirred tank reactor (CSTR). **Shalini sing, sushilkumar, M.C. Jain, Dinesh kumar (2000), [6]** conducted research on the insemination of kitchen garbage and their residues with cattle manure and discovered that microbial stimulants improved biogas output. **Ranjeet Singh, S. K. et.al [7]** In order to undertake waste-creation studies, inocula was acquired from four different locations, including the batch reactor, the Jajmau tannery waste treatment facility, the Jajmau municipal waste treatment, and the Unnao distillery. **Jong Won Kang et al (2010) [8]** examined the on-site removal of H2S from biogas produced by food waste using an aerobic sludge bio filter for steam reforming processing. They demonstrate how a biofilter made of immobilised

aerobic sludge was effectively modified to remove CO2 and H2S from the biogas created by food waste. **Abhishek et.al (2015)[9**] conducted research on the creation of biogas from degradable trash and food. **Leta Deressaetal (2015)[10]** examined the anaerobic digester's production of biogas from fruit and vegetable waste combined with cow dung. **Sudha.G.et.al, 2012[11]** "Production of biogas from various fruit pulp" is the title of a paper that was published. Anaerobic digestion was used to convert the biodegradable fruit pulp and produce biogas. Fruit pulp's COD has been found to be correlated with higher biogas production. The COD value and the production of biogas are closely connected. **Govt. of Indians report(2002) on** —Evaluation Study On National Project on Biogas Development, presents a preliminary study of two highly successful rural biogas models wherein biogas is produced and utilized as a cooking fuel by the villagers. **Reinhard Madlenera, et al. (2006)** contrasts data envelopment analysis (DEA) and multi-criteria decision aiding (MCDA) methods for evaluating renewable energy facilities to ascertain how well they perform in terms of economic, environmental, and social indicators and criteria. **Sagagi, et al. (2009)** showed the findings of a study on the production of biogas from fruit and vegetable waste materials and how using digested and undigested sludge as fertiliser affected plants.

III. METHODOLOGY:

1. Overall structure of the project

The structure for the portable biogas plant is of the dimension 6 by 4 feet. It is movable because it has 4 caster wheels joined to it. Because it is portable, the biogas plant may be placed anywhere there is sunshine. Table 1 shows the structure's dimensions. Figure 1 illustrates the structure.

Table 1. Structure's dimension

S.NO	Parameter	Size
01	Length	6 feet
02	Breadth	4 feet
03	Height	3 feet

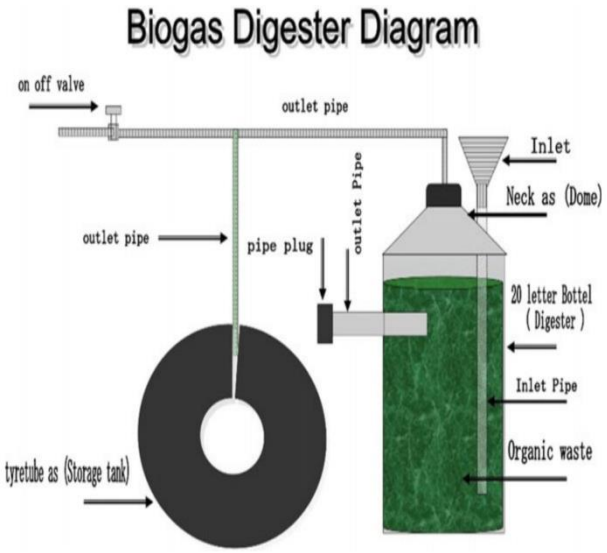

Figure 1: Biogas digestor structure

2. Digester dimension

It is a thick plastic drum used as a digester chamber where garbage is added for anaerobic digestion. Table 2 shows the digester dimensions. Figure 2 depicts the digester.

Table 2. Digester dimension

S.NO	Parameter	Size
01	Length	feet
02	Breadth	feet
03	Height	feet

Figure 2 : Digestor

3. Biogas storage tube

A tyre tube is utilised as a storage tank. Figure 3 shows the storage tube, and the table shows the tube dimensions.

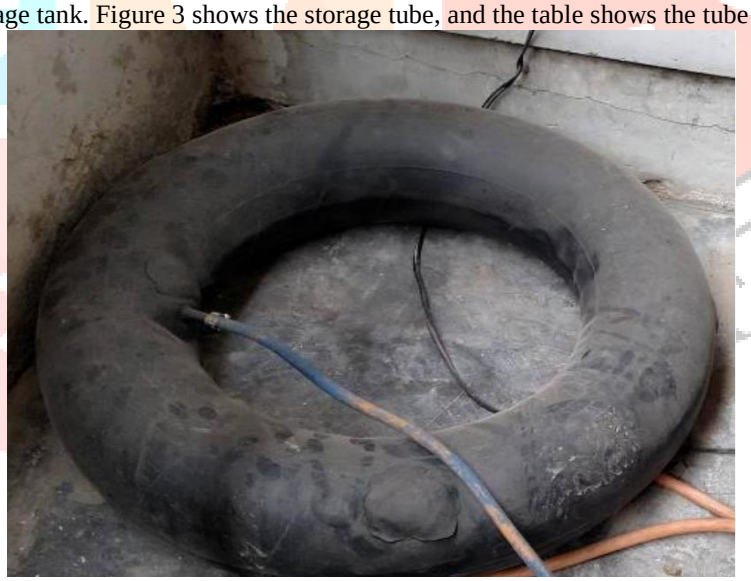

Figure 3 : Biogas storage tube

4. Working principle

Organic matter predominates in the form of biological stuff, which can be either dead or alive creatures. These organic components are typically composed of carbon and oxygen, sulphur, hydrogen, and nitrogen, which combine to produce a variety of compounds such as proteins, lipids, and carbohydrates.

Nature breaks down these microbes into less complicated carbon compounds through digestion. The anaerobic process is a digesting mechanism that occurs without the presence of oxygen, resulting in the production of various gases. Anaerobic digestion produces primarily methane, which burns easily at room temperature and is therefore environmentally benign, reducing reliance on fossil fuels.

IV. CONCLUSION

The adoption of a biogas portable plant for the production of biogas from decomposing kitchen trash provides a solution for a proper stringent waste management system. Its low price, independence, and suitably considered characteristics demonstrate that it is economical. It is a technology that may be used to process kitchen trash with the help of a biogas digester.It has recently acquired prominence and is a strong contender to become the next renewable energy source. This plant is more useful in urban settings since urban regions generate more organic waste due to higher human density. Whereas it is valuable in rural areas due to a lack of gas supply. In the future, it may reduce reliance on CNG and LPG, allowing future generations to be less reliant on imported fossil fuels..

V. ACKNOWLEDGEMENTS:

I would like to express my sincere thanks to our guide Prof. PoojaBhokarefor his complete support, cooperation and valuable suggestion. I would like to thank her for trusting me and for giving me as well as the whole group the opportunity to work on this paper work. I express my deepest gratitude to our principal for giving us this opportunity to present ourselves. Also I am grateful to all the teaching and non-teaching staff of civil engineering department of B.V.C.O.E.K.

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