Proposal Small Scale Biogas Plant in SLRTCE

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Abstract -This paper evaluates the biogas potential and economic analysis from biowaste produced in an educational institution. This process is a widely used method for processing bio-waste to produce biogas, which will be more cost-effective and environmentally friendly, in addition to reducing waste to landfill, creating high-quality renewable fuel and reducing carbon dioxide and methane emissions in the institution. . In this method, fixed-dome devices are used for a biogas plant. In the methodology, we will get to know the gases and biogas proposal and the waste calculated from the institution. If properly constructed, solid dome plants have a long lifespan. It also saves space and protects the hood from temperature changes. Construction provides opportunities for skilled local employment. From this we conclude that a biogas plant can be much more useful in a college campus.

Keywords*:* Anaerobic digestion, Biogas production, Kitchen waste, Eco-friendly feasibility.

I.INTRODUCTION

This project is based on biogas, which is increasingly used as an alternative energy source in today's world, where there is an energy crisis. Biogas plants bring ecological benefits mainly due to the replacement of conventional fuels with renewable energy sources for energy production. Bio was available in the educational institution including kitchen waste, leave etc. which can be used for better purposes through anaerobic digestion. This process is a widely used method for processing bio-waste to produce biogas, which will be more cost-effective and environmentally friendly, in addition to reducing waste to landfill, creating high-quality renewable fuel and reducing carbon dioxide and methane emissions in the institution. . In general, biogas consists of methane (50-60%), carbon dioxide (~35%), hydrogen sulfide (~4%) and trace amounts of water vapor (<2%)**.** Biogas consists mainly of methane, which is the flammable component of biogas, and large amounts of biogas are needed for cooking purposes due to its moderate methane content. Anaerobic digestion process provides the possibility of handling kitchen waste both in the form of biogas and in the form of slow-release biofertilizers, which can improve the structure of energy consumption and reduce the use of chemical fertilizers in the fields. In an institution, kitchen waste, which is primarily composed of various food particles, is the best alternative for biogas production, where we can save LPG for cooking purposes, reduce cooking fuel costs, and bring new technology to the institution.

Project objectives
Design a functional prototype of a small biogas plant for the slrtce campus.

- Estimate the capacity of the biogas plant and the specific project requirement.
- To study the impact on a biogas plant on a college campus.
- Explore how we can minimize its costs.

The main goal of our project is to design a functional prototype of a small biogas station for the slrtce campus. It is very important to introduce a new modernization that will further help in our institution and the biogas station is one of its solutions. Another goal of this topic was to study the effects of the temperature drop in the winter season. Another goal is to minimize costs by using environmentally friendly materials to protect the environment. In our case, we used a solar panel to increase the temperature.

II.REVIEW OF LITERATURE

Biogas refers to a gas made from anaerobic digestion of kitchen waste. Methane is a clean gas which generates energy and one of the main constituents of cooking gas. Abundant kitchen waste (biomass) in terms vegetable peelings, kitchen waste, food waste is abundantly available from the each and every house of Indian communities. These kitchen waste biomass mass can be a source for Methane production where combination of waste treatment and energy production would be an advantage. In this connection many researches carried studies and investigations for the generation of bio gas the Methane from biodegradable waste. Sarode, A.M., Rahane, M. R (2020) a biogas facility creates an organic processing facility for biogas production that will be more cost-effective, more environmentally friendly, and can be used for

renewable energy sources. In this research, biogas production is done from kitchen food waste. The research study also looks at the amount of biogas production from kitchen food waste and the environmental feasibility of a biogas plant. Effective and clean waste management of collage kitchen waste is implemented by establishing a biogas station in the college campus and the solution is developed by studying economic measures and gas production per day.Andr.J, Christian. H, (2022)The proposed special focus was placed on the rotting of the leaves before they enter the biogas plant. The overall comparison showed that biogas-related scenarios performed better in terms of leaf GHG emissions for biogas. It also shows that the pre-treated leaves resulted in the lowest net emissions and the highest energy production per tonne of feedstock. Measures to reduce leaf rot, such as increasing the load on the biogas plant or ensiling, resulted in lower net emissions and higher energy output. However, further research regarding cost and logistical feasibility is needed for proper implementation. The use of tree leaves for biogas production would represent an alternative source of energy that could reduce the share of fossil fuels and electricity. Om Prankish, Anil. K, ankle P., Rebind k., Vend L. (2021) A study on biogas production has shown that municipal waste, which is available everywhere in large quantities, can be a good source of energy if the government works seriously on it. In this area, a large space is available for entrepreneurs to start operating a biogas plant near the industrial area to meet the energy needs of the industry and residential area and also to maintain the cleanliness and cleanliness of the city.

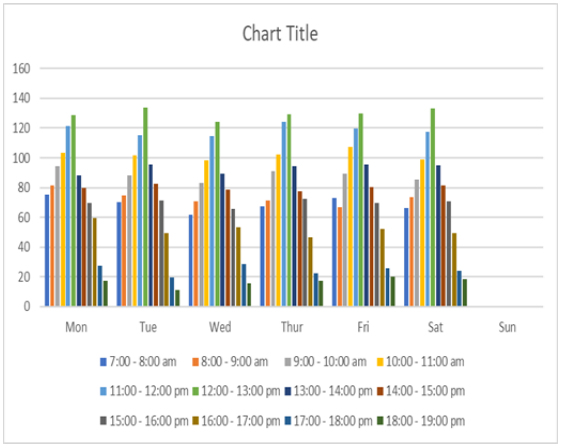
III.BENEFITS OF BIO GAS TECHNOLOGY

- Production of energy.
- Transformation of organic wastes to very high quality fertilizer.
- Improvement of hygienic conditions through reduction of pathogens.
- Environmental advantages through protection of soil, water, air etc.
- Micro-economic benefits by energy and fertilizer substitutes.

IV.RESEARCH METHODOLOGY

The raw material is collected from the canteen and transported to the small prototype plant. The required amount of raw material and water is mixed in the inlet tank and the slurry is discharged into the digester for digestion. The gas produced through methanogenesis by bacteria in the digester and the gas is collected in the dome to obtain biogas generation for the respective feed. The bio degradable waste materials used for the demonstrative study are vegetable peelings, fruit peelings, food waste, Leaves collected from the college Campus. In Shree L.R Tiwari College of Engineering, Mira-Bhayandar there are about 2200 student and staff population. From the Institution survey has been revealed that on an average 1074 kg of exclusive organic waste is collected from the college canteen.

Experimental Work



V.DESIGN BASED CALCULATION

Table no :1 Weekly Wastage

Sizing Factor	0.5% Per Student wastage	0.65% Per Student wastage	0.8% Per Student wastage
Daily Input	1650 l/d	1074 l/d	1320 l/d
Retention Time, RT	40 Day	40 Days	40 Day
Daily Gas Production, G For 1kg waste	$0.24m^3$	$0.24m^3$	$0.24m^3$
Digester Volume, Vd	$66m^3$	$85.912\ m^3$	$105.6m^3$
Gasholder Volume, Vg	$198m^3$/day	$257.712m^3$/day	$316.8m^3$/day
Vd :Vg	1:3	1:3	1:3

VI.DESIGN LAYOUT WITH CALCULATED DIMENSION

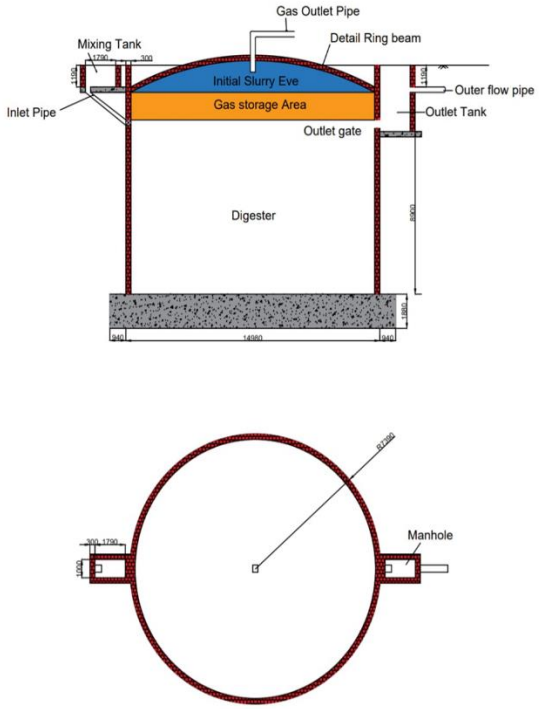


Fig no :1 Layout of Biogas Plant

VII.ECONOMICAL ANALYSIS

Material selection for the proposed fixed dome digester: - The methods of estimation of basic raw materials like cement, sand, brick and steel was made for items like concreting, brickwork and plastering. Concreting is required at the digester bottom and at the base of inlet and outlets tanks. For the construction of the bio-digester the quantity of material varies according to the type and size of the unit. From the information on data in the table, an estimate and cost of a 85.912m3.

Cement : Sand Ratio 1:4

SRNO	ITEM	UNITS	QTY	RATE	AMOUNT	REMARKS
1	SOIL TESTING	NO.	1	5000	5,000.00	
2	EXCAVATION	CUM	909.6307	250	2,27,407.68	
3	PCC BED (RMC)	CUM	534.408	9800	52,37,198.87	M-35 CONCRETE
4	BRICK WORK	SQMT	816.024	1425	11,62,834.20	
5	PLASTER 12MM	SQMT	612.018	750	4,59,013.50	
6	SHUTTERING	SQMT	284.2596	1250	3,55,324.50	
7	SHUTTERING DOME	SQMT	300	1500	4,50,000.00	
8	RMC FOR DOME	CUM	56.85192	9800	5,57,148.82	
9	STEEL	TON	1	120000	1,20,000.00	
TOTAL					85,73,927.57	

VIII.CONCLUSION

We have design fixed dome type biogas plant for Shree L.R Tiwari college of engineering for all college campus waste like, mess, hostel, canteen and garden waste which collect 1074kg of food waste per day. The effective and clean waste management of collage Canteen kitchen waste is done by establishment of biogas plant in college campus area and solution is developing by studying the economical measures and gas production per day

IX.FUTURESCOPE

- To Check the design and testing regarding biogas plant.
- To design a biogas plant for are college.
- To decrease the cost of construction even more and adopt ecofriendly means to do so.

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