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Cost feasibility Analysis of Organic Waste Converter and Bio Methanation Plant for Township Project

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ABSTRACT: Mumbai is one of India's densely populated cities having population around 22.5 million (according to 2017). City with such a huge population needs a high efficient solid waste management system to treat the waste produced by such a huge population. Therefore according to new BMC rules it is mandatory to have a solid waste management system in high rise buildings, township projects and other residential projects. This paper deals cost feasibility Analysis of Organic Waste Converter and Bio Methanation Plant for township project. Also paper gives a cost analysis report and conditions based applications of OWC & BIO METHANATION PLANT to have a sustainable development in construction sector.

KEYWORDS: Solid waste management, Organic Waste Converter, Bio Methanation Plant, cost analysis report.

I. INTRODUCTION

World population is increasing at the rate of 1.09% that is around 82 million people per year. In world nearly 15000 thousand per hour new babies are born and 6316 people die each hour which results in increase in world population by 8,614 new born babies. Thus the increase in solid waste per day goes up to 49498.8 kg per day in world (by considering the upper limit of 5.7 kg per person per day). Thus huge amount of waste is generated per day which needs a proper treatment for decomposing and reusing it. In ancient days the waste treatment was carried out by primary techniques of open dumping or landfills or in water. In 1874 England develop incinerators technique to dispose the solid waste in high temperature converting it into ash, flume & heat. As the population rate will be increased these technology will be resulted in high outputs of ash which is a serious concern in today's scenario.

India is one of the most populated country in world has to encountered several problems like traffic management, water management, waste management etc. According to the report of 2018 India generates nearly about 5.29 crore Metric tons per year of which nearly 46% waste is treated. Waste management is one of the biggest problems for many growing cities in India one of them is the financial capital Mumbai. Mumbai generates nearly about 27.37 lakh metric tons in a year. These solid wastes need proper treatment to decompose and reusing facility. There are several techniques available for treating solid waste like Bio-methanation, Organic Waste Converter systems, Bio-digesters etc. Thus this paper is based on the cost feasibility of these techniques application with an example of township project consisting 3917 flats. The paper will deal with the factors like cost feasibility, space management and subsidy for applying these techniques.

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II. OBJECTIVES OF PAPER

The objectives of this research paper are to analyse in what conditions which solid waste management can give optimum results. The objectives stated are as follows

1. Cost feasibility Analysis for Installation of Organic Waste Converter.
2. Cost feasibility Analysis for Installation of Bio Methanation Plant.

III. LITERATURE REVIEW

- Apte¹, V. Cheernam², M. Kamat³, S. Kamat⁴, P. Kashikar⁵, and H. Jeswani⁶ (2013), “Potential of Using Kitchen Waste in a Biogas Plant”, International Journal of Environmental Science and Development.

India's Economic development is adding to a gigantic increment in the age of strong waste. Roughly 55 million tons of Municipal Solid Waste is produced yearly by urban territories in India. Over 59% of homes in urban India utilize Liquefied Petroleum Gas (LPG) provided in compact chambers for their cooking needs. Be that as it may, because of our nation's diminishing oil saves and expanded expensive imports of oil, non-customary vitality assets are gradually picking up significance. The utilization of biogas utilizing kitchen squander as feedstock can help take care of the issue of vitality shortage and simultaneously, permit the sheltered transfer of kitchen squander which is regularly informally dumped or disposed of. Our organization grounds (Bhavans' grounds) have various grounds kitchens that use a few LPG chambers and furthermore produce a lot of kitchen squander. The kitchen waste produced has high calorific worth and dampness content; thus it very well may be anaerobically processed. The biogas delivered can be utilized to enhance the fuel prerequisites of the grounds kitchens that produce the kitchen squander. This examination comprises of doing review, portrayal of kitchen squander from a few kitchens and investigating its capability to be utilized for biogas generation.

- Aeslina Abdul Kadir¹, Nur Wahidah Azhari² and Siti Noratifah Jamaludin³ (2016), ‘An Overview of Organic Waste in Composting’, EDP Sciences.

This paper concentrates on the treating the composing of organic waste. Organic wastes will be wastes that effectively biodegradable. These wastes are created from numerous sources, for example, agricultural waste, market waste, kitchen waste, urban solid sustenance wastes and metropolitan solid waste. Without legitimate administration, this waste could make a few situation issue. Along these lines, fertilizing the soil is the best minimal effort elective answers for defeat this issue. Fertilizing the soil strategy can debase a wide range of organic wastes like natural products, vegetables, plants, yard wastes and others. The creation from organic waste that could be utilized as supplements for yields, soil added substance and for ecological administration. Be that as it may, numerous components can add to the nature of the manure items as various kinds of organic wastes have various convergences of supplements, nitrogen, phosphorous and potassium (N, P, K) which are the regular large scale supplements present in composts. The existences of substantial metals show how fertilizers can be connected to soils without contributing any evil impact. In term of the factor influencing the treating the soil procedure, temperature, pH, dampness substance and carbon nitrogen proportion (C:N) are the primary parameters that add to the productivity of the fertilizing the soil procedure.

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- **Neeraj kumar¹, Gourav Dureja², Sandeep Kamboj³ (2014), “To make a biogas energy from different sources & creating awareness between human beings – case study”, International Journal of Modern Engineering Research.**

Biogas from biomass appears as an opportunity source of strength that is doubtlessly enriched in biomass sources. This article offers an overview of present and future use of biomass as a commercial feedstock for production of fuels, chemical substances and other substances. However, to be definitely aggressive in an open market scenario, better price products are required. Results propose that biogas technology must be recommended, promoted, invested, implemented, and demonstrated, but in particular in far off rural regions. Different forms of wastes are used for manufacturing of biogas. These wastes are located very clean and an every palace. This article enables to make biogas shape distinctive wastes. From this examine, it may be concluded that this method not most effective contributed to renewable biogas manufacturing but additionally advanced the effluent nice.

- **Om Prakasha*, Anil Kumar^b, Anukul Pandey^c, Arbind Kumara, Vinod Laguria (2015), ‘A Review on Biogas Plant’, International Journal of New Technologies in Science and Engineering.**

The key environmental trouble of society is the continuously increasing production of municipal strong waste or organic wastes. In many countries and metropolis, sustainable waste management has become a main political problem, to lessen pollutants and greenhouse gas emissions. Dumping of waste is or even controlled landfill disposal, and incineration of natural wastes is not applicable these days. As environmental requirements here of include increasingly stricter and energy recuperation and recycling of nutrients and natural count is aimed. Biogas is a gas, constructed from by using breakdown of organic waste in a close chamber and the absence of oxygen. Biogas is the good supply of clean power.

- **Vivek Saini¹, Sankalp Gupta², Roopendra kr.Verma³, Balvindra Singh⁴ (2017), “A Review Study on Municipal Organic Waste Composting”, International Research Journal of Engineering and Technology.**

This paper states the utilization of municipal organic waste for composting. Production of municipal waste keeps to upward thrust, which reasons lack of assets and multiplied environmental risks. By open dumping and land filling will reason environmental degradation and dangerous disorder. Composting is the maximum appropriate competitively priced answer to conquer the trouble due to municipal waste. The overall waste generated in India is 1.54 lakh metric tons per day in which 50% of overall waste is organic wastes, composting has emerged as one of the exceptional strategies for treatment of wastes. Composting lessen the quantity of waste generated in addition to provide vitamins for plant life, additionally allows in segregation of waste at source. In time period of the element affecting the composting manner, temperature, pH, moisture contents and carbon nitrogen ratio are the main elements that contribute to the performance of the composting procedure. This paper suggests information at the composting for treating waste as a method of pointing the environmental pollutants concerns. Adding components to the compost have also received lots interest in latest years as they enhance the rate of decay.

- **Saleh Ali Tweib , Rakmi Abd Rahman and Mohd Sahaid Kalil (2011), “A Literature Review on the Composting”, International Conference on Environment and Industrial Innovation.**

Composting has been utilized as a method for reusing natural issue again into the dirt to improve soil structure and ripeness. The composting procedure has gotten a lot of consideration as of late in light of contamination concerns and the quest for earth sound techniques for treating waste. Squander volumes keep on rising, which prompts loss of assets and expanded ecological dangers. Open dumping and sterile landfill is a significant technique for squander transfer, the Land filling of biodegradable waste is demonstrated to add to natural debasement, principally through the creation of exceptionally contaminating leachate and methane gas. Composting expects to adjustment of waste for land filling , volume and mass decrease of strong waste and return of natural substances to

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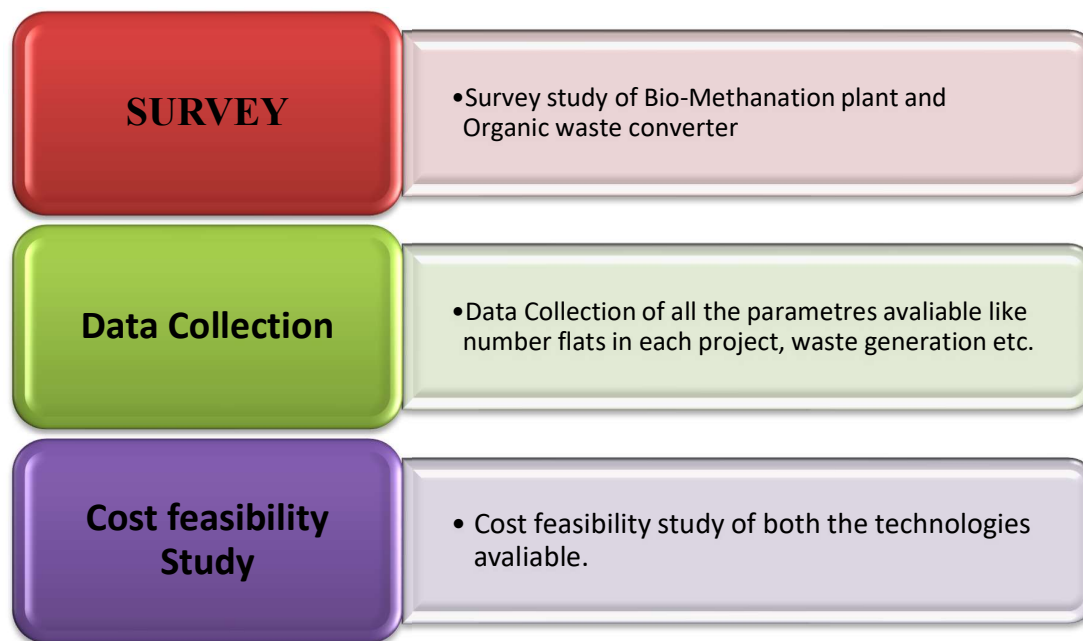
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the common cycle. This paper surveys data on the composting for regarding waste as a methods for tending to the ecological contamination concerns. Composting is a naturally neighbourly technique as opposed to straightforwardly dumped into earth and its strategy is helpful to change over natural waste to valuable items and that would somehow have been land filled. Fertilizer has a great deal of advantages like: decrease landfill space, diminish surface and groundwater sully, lessen methane emanations, diminish transportation costs, diminish air contamination from consuming waste, give increasingly adaptable by and large waste administration, upgrade reusing of materials and can be completed with minimal capital and working costs. (Home Composting).

IV. METHODOLOGY



V. EXPERIMENTAL RESEARCH

The study involves calculation of waste generation from each flat with a thumb rule of considering 4 people living in each flat would generate nearly about 1.12kg wet waste per day therefore the cost feasibility study is being conducted for both the techniques for township project consisting 8 sub projects named as T1,T2,T3,T4,T5,T6,T7,T8. The cost feasibility analysis is based on the parameters like space management, cost analysis of both techniques and subsidy available

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Cost analysis of Organic Waste Converter

Sr No	Project name	Number of Flats	Required capacity of OWC	Required space	Setup cost (Approx. 2000/kg)	Operating & maintenance cost (per month)
1	T1	320	150 kg	250 sq.ft.	3.55 lac	9,000
2	T2	349	150 kg	250 sq.ft.	3.55 lac	9,000
3	T3	530	300 kg	300 sq.ft.	5.20 lac	18,000
4	T4	660	350 kg	320 sq.ft.	7 lac	21,000
5	T5	866	460 kg	480 sq.ft.	9.2 lac	27,600
6	T6	264	150 kg	250 sq.ft.	3 lac	9,000
7	T7	227 (east tower)	150 kg	250 sq. ft.	3 lac	9,000
		203 (west tower)	150 kg	250 sq.ft.	3 lac	9,000
8	T8	552	300 kg	300 sq.ft.	6 lac	18,000
9	TOTAL	3971	2160 Kg	2650 sq.ft.	43.5lac	1,29,600

Cost analysis of Bio-Methanation Plant

Sr No	Required capacity of plant	Required space	Setup cost	Bio-gas Produced in m	Electricity Produced	Operating & Maintenance	Subsidy from Govt MEDA & MNRE
1	1.5 tone	1500 sq.ft	40 lac	100	120 units	35k-40k/ month	8 lakhs
2	2 tone	2000 sq.ft	50 lacs	150	200 units	50-55k/ month	11 lakhs
3	3 tone	3000 sq.ft	65 lacs	250	300 units	70-75k/ month	13 lakhs

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COMPARITIVE ANALYSIS

Sr.No	PARAMETRES	OWC PLANT	BIO-METHANATION PLANT
1	Unit	Separate System for Each Building	Single System required for whole TOWNSHIP
2	Electricity	30 units/day for 1.5 tones	Zero Electricity Consumption
3	Required Space	1 Sq.ft /kg	1 Sq.ft /kg
4	Green Credit	Not Eligible	Eligible for Green Credit
5	By-Products	Composed Manure Only	<ul style="list-style-type: none"> ➤ . Biogas for Cooking ➤ Electricity ➤ Composed Manure
6	Government Subsidy	Not Eligible	<ul style="list-style-type: none"> ➤ Rs 30,000/kw- MEDA ➤ Rs 40,000/kw –MNRE ➤ 80% Tax Depreciation Project cost for first year.
7	Sustainability	Dependent	Self-Sustainable

VI.CONCLUSION

aFrom the above statistics we can conclude that the Bio-Methanation Plant is more sustainable, profitable and accountable for long run in the project than the organic waste converter. As it is clearly defined from the comparative analysis that the OWC has certain drawbacks which can be overcome in the application of Bio-methanation Plant Process for example factors like electricity consumption, water consumption etc. Therefore according to cost feasibility study Bio-Methanation Plant is the best suitable option for treating solid waste for township projects where as the Organic waste converter is feasible for single or double tower projects only.

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