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Solid Waste Management for Vita Nagarparishad

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Abstract: This paper represents the municipal solid waste management and disposal methods in Vita Nagarparishad. As we know proper waste management keeps the environmental sustainability. In this study we suggest production of electricity and pure methane from Municipal Solid Waste (MSW). We have presented a brief overview about how solid waste is used for the production of electricity, how much the cost of overall plant, amount of waste required at one time for waste to energy (WTE) and stepwise procedure for WTE. In securing future energy supply and reducing the environmental impact due to the use of fossil fuels, the research on WTE has been studied. This study also represents demo model of WTE plant in Vita Nagarparishad.

Keywords: Waste to Energy, Waste Management, Municipal solid waste, Electricity.

I. INTRODUCTION

The term "solid waste" refers to items that are undesirable or pointless those are produced in a combination of commercial, industrial, and domestic locations. Solid waste does not include wastes such the solid or dissolved materials in household sewage, source, special nuclear, or by-product material as specified by federal law. Solid waste management is the systematic, cost-effective, and hygienic process of gathering, transporting, processing, recycling, and discarding solid waste.

A tremendous amount of MSW and an increase in the world's energy demand are side effects of the current trend of economic growth and fast urbanisation, which is a global concern. WTE is a method of energy recovery that makes use of waste conversion technology to produce heat and electricity from non-recyclable and non-reusable waste materials. Therefore, solid waste is utilised for the production of electricity, with reference to the Kagal Nagarparishad MSW plant.

II. OBJECTIVES

i. To study Methodology for production of waste to energy in Kagal Nagarparishad MSW plant.

ii. To study the waste material in Vita Nagarparishad MSW plant.

iii. To recommend a solid waste management strategy to Vita Nagarparishad in order to produce pure methane and electricity.

iv. To create a waste-to-energy demonstration model for Vita Nagarparishad.

III. EXPERIMENTAL WORK

A. PRELIMINARY SURVEY:

Firstly we visited at Kagal Nagarparishad MSW plant,

i. Population of Kagal Nagarparishad - 46,000.

ii. Waste generation daily - 13-14 ton.

iii. Waste is collected by 7 autorikshwa (ghantagadi).

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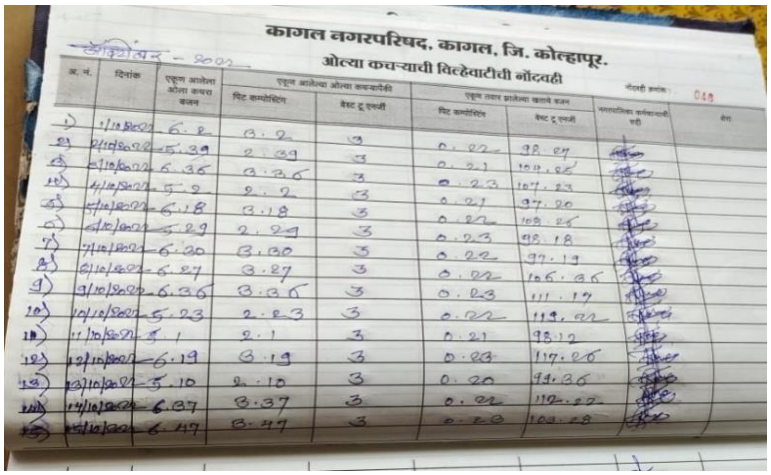

Fig.1: Waste Management in Kagal Nagarparishad MSW plant (On site record)

iv. Above fig. shows the waste management record of Kagal Nagarparishad MSW plant. From the total amount wet waste 3 ton waste is delivered to WTE plant and remaining amount of waste is delivered for pit composting.

B. Present scenario for the production of Waste - to- Energy at the Kagal Nagarparishad MSW plant:

a. Waste Separation:

i. Waste is collected at its source in each area and separated. The way that waste is sorted must reflect local disposal systems. The following categories are common:

1.	Paper	2.	Wood, leather, rubber
3.	Cardboard (including packaging for return to suppliers)	4.	Scrap metal
5.	Glass (clear, tinted–no light bulbs or window panes, which belong with residual waste)	6.	Special/hazardous waste
7.	Plastics	8.	Compost
9.	Textiles	10.	Residual waste

ii. Each waste goes into its category at the point of dumping or collection, but sorting happens after dumping or collection.

Fig. 2: Separated 17 types waste in Kagal MSW plant

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b. Pit Composting:

i. Compost is a mixture of ingredients used as plant fertilizer and to improve soil's physical, chemical, and biological properties. It is commonly prepared by decomposing plant and food waste, recycling organic materials, and manure.

ii. The pit composting tank having length 24ft and width 3ft and depth 3ft.

iii. It is necessary to maintain 20 contain, like zinc, phosphate, hydrogen, oxygen, nitrogen, etc. in pit composting tank for production of earthworm.

iv. The benefits of compost include providing nutrients to crops as fertilizer, acting as a soil conditioner, increasing the humus or humic acid contents of the soil, and introducing beneficial microbes.

v. It helps to suppress pathogens in the soil and reduce soil-borne diseases.

Fig. 3: Pit Composting in Kagal MSW plant (24ft x 3ft)

c. Waste Segregation:

i. Waste can be segregated as,

- **Bio Degradable Waste:**

Bio Degradable wastes include organic waste, e.g. kitchen waste, vegetables, fruits, flowers, leaves from the garden and paper.

- **Non Bio Degradable Waste:**

1. **Recyclable waste**- Plastics, Paper, Glass, Metal Etc.
2. **Toxic Waste**- Old Medicine, paints, chemical, bulbs, spray cans, fertilizer and pesticide container, batteries, shoe polish.
3. **Soiled**- Hospital waste such as cloth soiled with blood and other body fluids. Toxic & soiled waste must be disposed of with utmost care.

ii. Waste segregation means dividing waste into dry and wet. Dry waste includes wood and related products, metals and glass. Wet waste typically refers to organic waste usually generated by eating establishments and is heavy in weight due to dampness. Waste segregation is different from waste sorting.

iii. Segregation of 1 ton wet waste at mixer to make paste with same quantity of water.

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Fig. 4: Dry waste segregation machine in Kagal MSW plant

iv. The whole segregation process in MSW plant is done in below fig.

Fig.5: Mixer

d. Bio digester tank:

i. Bio digester is a system that biologically digests organic material, either anaerobic (without oxygen) or aerobically (with oxygen). Microbes and other bacteria break down organic material in a bio digester. Most food, including fat, greases and even animal manure, can be processed in a bio digester.

ii. The process involves the bacteria which feed upon the faecal matter inside the tank, through anaerobic process which finally degrades the matter and releases methane gas that can be used for cooking, along with the treated water.

iii. In Kagal MSW plant paste is done by injecting methenium bacteria in bio digester.

iv. The capacity of bio digester in Kagal MSW plant is 90,000 lit.

v. By injecting methenium bacteria in bio digester it produces gas.

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Fig.6: Bio digester

e. Gas Fluid Separation Tank:

i. This gas comes at GFS (Gas Fluid Separation) tank.

ii. GFS tank works as separation of gas and fluid.

iii. Then only gas goes at balloon having capacity 60,000 lit.

iv. Remaining Fluid flows down which is used as better quality of composting fertilizer in wet and dry form.

v. For electricity generation we required pure methane.

vi. For that purification system is required.

f. Purification System:

Fig.7: Purification System

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i.Separation of carbon dioxide (Co2) at purification tank (white tank) as shown in fig.

ii.Remaining gas like hydrogen, nitrogen and oxygen is disposed in scrubber (green tank) as shown in fig.

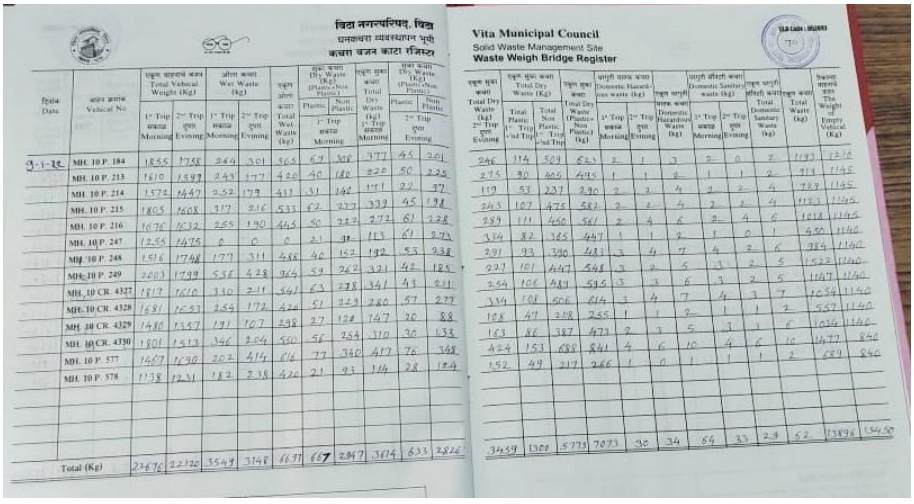
iii.Then pure methane is produced at tank having capacity 12 m3 (yellow tank).

iv.Then it goes at junk set which generate electricity as shown in fig.

Fig.8: Junk set

v.Other remaining waste like plastic, lather, glass, paper, e-waste, clothes, rubber and metals and so on is separated and transported to recycling plant.

C. PRESENT SCENARIO AT THE VITA NAGARPARISHAD MSW PLANT:



विटा नगरपरिषद, विटा
घनकचरा व्यवस्थापन भूमी
कचरा वजन काटा रजिस्टर

Vita Municipal Council
Solid Waste Management Site
Waste Weigh Bridge Register

Fig.9: Record of daily waste collection in Vita Nagarparishad MSW plant

- From this above record, (Almost daily)

i.Total wet waste collected at the Vita Nagarparishad MSW plant = 6697 kg.

ii.Plastic dry waste = 7073kg

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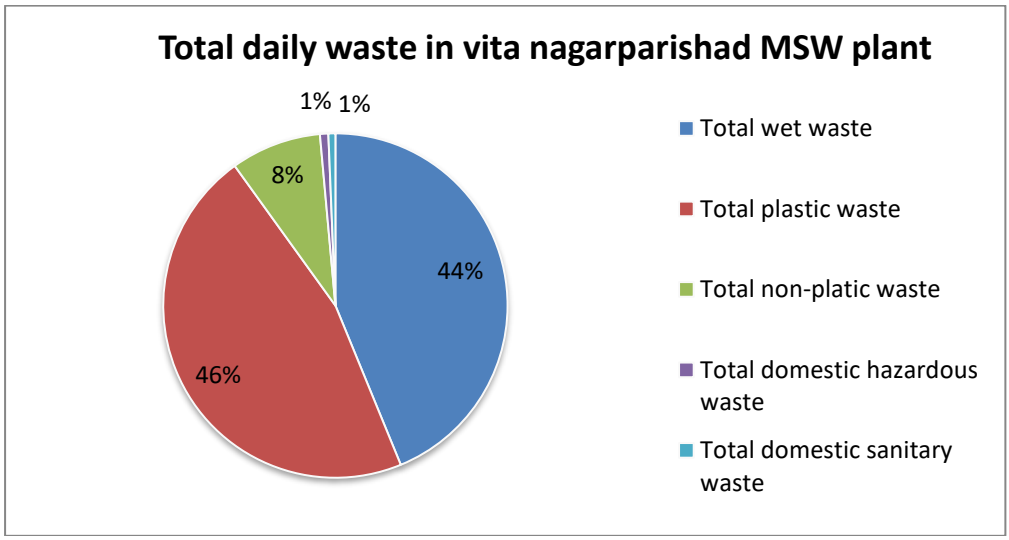
iii. Non plastic dry waste = 1300kg

iv. Total plastic and non-plastic waste = 8373kg

v. Total domestic hazardous waste = 64kg

vi. Total domestic sanitary waste = 62kg

vii. Total waste = 15196kg



- **Our purpose for recommending solid waste-to-energy plant at the Vita Nagarparishad.**

i. Vita Nagarparishad municipal solid waste plant generates 17–18 tons of waste every day, of which 7-8 tones are solid waste. Therefore, 3 to 4 tons of waste we can use for energy production, and the remaining waste is turned into manure.
ii. It ensures the wellbeing, safety, and quality of the environment.
iii. It reduces landfill waste.
iv. A solid waste to energy facility can be built on a nearly 2-2.5 acres site.
v. The cost of solid waste-to-energy plant will be across 4cr.

IV. RESULT

After visiting Kagal Nagarparishad MSW plant we got the results,

i. Overall cost of MSW plant was 3.50cr.
ii. Daily average waste in Kagal Nagarparishad MSW plant is 13-14 ton.
iii. In this plant 5-6 ton waste is used for the WTE.
iv. From 5-6 ton of waste, average 500KW energy per day is produced. This energy is used for lightning of 1700 street lights, office accessories, overall machinery operation in the MSW plant, etc.
v. Kagal Nagarparishad also includes oxygen park, which reduces harmful gaseous produced during various operations involved in waste disposal.
vi. By generating electrical power, WTE avoids carbon dioxide (CO_2) emission from fossil fuel.

CONCLUSION

The Vita Nagarparishad MSW plant's proposed MSWM framework might be the answer to the MSWM issue. In terms of long-term benefits and environmental friendliness, the suggested framework is more systematic, effective, and sustainable MSWM than the current approach. This framework focuses on energy recovery through the use of WTE technology as one of the most effective ways to manage waste and generate energy.

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- Because the proposed framework considers waste segregation at the source to be a crucial component, raising public awareness is a crucial requirement.
- For the establishment of the WTE system, technical human resources are also necessary.
- Since WTE technology is relatively expensive, a cost-benefit analysis and assessment of understanding of how it operates are critical for the decision-making process.

FUTURE SCOPE

MSW energy can solve both the environmental and the energy challenges by lowering the amount of trash produced and converting it into electricity. MSW is viewed as a clean, renewable energy source that can be used to create electricity. The urgent need for improving the overall waste management system and adopting advanced, scientific methods of waste disposal has arisen due to the growing problems with waste management in urban areas and the growing awareness of the negative effects of current waste management practises on public health.

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