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A Review On Solid Waste Management Plant Of Vita.

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Abstract— The management of municipal solid waste under the theme of "Waste Characterization and Treatment." The disposal methods employed by the Vita Municipal Corporation in Sangli District, Maharashtra, highlight the significant concern regarding plastic production in Vita city. Effective waste management is essential for maintaining environmental sustainability.

Solid waste management poses a considerable challenge for authorities in both small and large cities within developing countries. This challenge arises primarily from the increasing generation of solid waste and the financial burden it places on municipal budgets. Beyond the high costs, the management of solid waste is complicated by a lack of understanding of the various factors that influence the entire waste handling system. A review of the literature related to waste management in developing countries reveals that few studies provide quantitative data. The diverse methodologies employed in this study are crucial for engaging stakeholders and assessing the factors that impact the performance of solid waste management in the cities examined. Factors such as population growth, rapid urbanization, economic expansion, and rising living standards in developing countries have significantly accelerated the rate, volume, and quality of municipal solid waste generation.

The extensive use of various plastic products has resulted in a substantial amount of plastic waste. There is an urgent need to raise awareness about the use and management of plastics as part of our daily lives. Plastics are increasingly prevalent in everyday activities, including packaging for food and beverages, cosmetics, pharmaceuticals, and other production sectors, which require safe and efficient packaging for their products.

The conversion of waste into heat and fuel can be achieved through various technologies, including incineration, gasification, pyrolysis, and anaerobic digestion. These methods are often categorized as "Waste to Energy" technologies. Municipal Solid Waste Management encompasses activities related to the generation, storage, collection, transfer, transport, processing, recovery, and disposal of solid waste, all while adhering to environmentally compatible principles of economy, aesthetics, energy, and conservation. This field involves planning, organization, administration, finance, legal considerations, and engineering aspects, necessitating interdisciplinary collaboration.

In Vita city, with a population of approximately 55,000, a significant amount of waste is generated daily. The total solid waste collected in Vita city is around 20254 kg, with a staggering 10% consisting solely of dry plastic. Despite the presence of various treatment facilities for plastic, a comprehensive solution for the substantial generation of plastic waste remains elusive.

I. INTRODUCTION

Solid Waste Overview :

Solid waste refers to unwanted or useless solid materials produced from a mix of residential, industrial, and commercial activities within a specific area. It excludes materials such as solid or dissolved substances found in domestic sewage, as well as source, special nuclear, or by-product materials as defined by federal regulations. The management of solid waste encompasses various activities, including source reduction, recycling, storage, collection, transportation, processing, and disposal. Facilities involved in solid waste management include landfills, composting sites, transfer stations, incinerators, and processing plants, which can be either publicly or privately owned.

In Idaho, solid waste facilities are categorized into two main types: municipal and non-municipal, each subject to distinct state regulations. Municipal facilities are limited to landfills that handle municipal and household waste, or other waste types mixed with these. Currently, there are no municipal landfills in District II. Non-municipal solid waste facilities refer to any solid waste facility that is not a municipal landfill. The

Idaho Solid Waste Management Rules (IDAPA 58.01.06) govern these facilities, which include transfer stations, non-municipal landfills, composting sites, and sites for processing petroleum-contaminated soil. Non-municipal solid waste (NMSW) is defined as solid waste that is not mixed with household waste. Various types of these facilities exist in our region and play a crucial role in the solid waste management systems of our counties.

Solid waste management poses significant challenges for authorities in both small and large cities in developing countries, primarily due to the rising volume of waste generated and the financial strain on municipal budgets. Alongside high costs, there is often a lack of understanding regarding the various factors that influence the entire waste management system. A review of literature related to waste management in developing countries reveals a scarcity of quantitative data. This study employs a combination of methodologies to encourage stakeholder engagement and assess the factors affecting solid waste management performance in the cities analyzed.

II. STATE OF DEVELOPMENT

Prof. P. M. Maske (2023)

This paper provides information of Kagal plant as well as vita plant. This comparative analysis helps to provide certain amount of basic idea for further scope of investigation.

Preliminary survey is useful for comparative study of current and past collection of waste. In 2023 plastic is almost 46% but now this reduced up to almost 10%. It gives idea of waste to energy model as well.

Diego Moya et al. (2017)

This paper indicates that the global generation rate of municipal solid waste is projected to reach 2.2 billion tons annually by 2025. In developing nations, challenges persist in the collection, transportation, and disposal of waste, while developed countries utilize emerging technologies to create various by-products, including heat, electricity, compost, and biofuels. The study categorizes waste management into four areas: biological treatment, thermal treatment, landfill gas utilization, and biorefineries. Additionally, it examines integrated solid waste management systems alongside waste-to-energy technologies, providing global examples.

Aashishdeep Kaur et al. (2017)

This research highlights the rapid migration of rural populations seeking employment
and improved living conditions, contributing to increased waste production and electricity demand worldwide. According to World Bank data, global municipal solid waste generation was 1.3 billion tons in 2012, with projections exceeding 22 billion tons annually by 2025. The scarcity of disposal sites has escalated environmental and health concerns.

E. C. Rada (2014)

The initial section of this paper explores the growing interest in energy recovery from municipal solid waste. The subsequent section addresses energy availability, considering the qualitative and quantitative dynamics of municipal solid waste composition. The final part examines the significance of selective collection in the context of energy recovery.

Tarek A. Hamad et al. (2014)

This study illustrates that solid waste represents a significin Libya. The rapid industrial growth has resulted in increased urbanization and population, leading to a surge in municipal solid waste generation. However, challenges remain regarding environmentally sound management of this waste. The paper provides an overview of solid waste types suitable for bioenergy, including municipal, industrial, and healthcare wastes, emphasizing the importance of understanding their composition and physicochemical properties. It discusses the benefits of waste-to-energy and the challenges of expanding incineration in Libya.

Surajit Bag (2015)

This study aims to evaluate the current landscape of solid waste management practices in India. It delves into the solid waste-to-energy programs currently implemented in the country and discusses relevant policies. Various technologies enable energy recovery in the form of electricity, heat, and fuel through processes such as incineration, gasification, pyrolysis, and anaerobic digestion. These methods are collectively referred to as "waste-to-energy technologies." Municipal solid waste management encompasses generation, storage, collection, transfer, processing, recovery, and disposal, adhering to principles of environmental compatibility, economy, aesthetics, and conservation.

K. M. Nazmul Islam (2016)

This paper emphasizes the alarming increase in methane (CH4) emissions from municipal solid waste, which is 34 times more potent than carbon dioxide (CO2). The study's objective is to assess the potential for renewable electricity generation and carbon reduction through sustainable management of municipal solid waste in Bangladesh using waste-to-energy strategies.

Dr. Maarten Arentsen et al. (2018-19)

The primary goal of this research is to enhance understanding of how Kathmandu
can mitigate the environmental impact of its current municipal solid waste management practices by implementing waste-to-energy technologies. The paper addresses the unsystematic waste management issues in KMC and proposes a systematic, efficient, and sustainable framework for municipal solid waste management that offers long-term benefits and is more environmentally friendly.

Shweta Choudhary (2019)

Adequate health and safety measures for workers involved in waste handling
are essential. Given that the dump site is several kilometers away and smaller trucks are utilized for transportation, establishing a recycling plant would be beneficial in reducing transportation costs. Manual separation of solid waste at village dumping sites is an effective method for recovering and reusing materials such as metal, plastic, glass, and rubber. The framework should adhere to environmental protection regulations.

III. EXPERIMENTAL WORK

a. Waste Separation:

Waste is collected at its source in each area and sorted accordingly. The sorting method must align with the local disposal systems. The following categories are commonly used:

Total of 13 types of waste collected in vita solid waste management plant. Following flowchart shows how the waste is handled.

1. Collection Process

- **Collection from City**
  ↓
- **Collection Area**
  ↓
- **Segregated Material Storage Area**

2. Material-Wise Processing Flow

Material	Process/Next Step
Plastic	Crushing Machine → Densifire Machine → Paving Block Making → Sold OR Crushing Machine → Road Construction → Sold
Packaging Material	Bailing Machine → Sold
Paper	Bailing Machine → Sold
Card Board	Sold / Given Free to Ragpicker / Self Utilised
Cloth	Sold / Given Free to Ragpicker / Self Utilised
Metal	Sold / Given Free to Ragpicker / Self Utilised
Glass	Sold / Given Free to Ragpicker / Self Utilised
Rubber	Sold / Given Free to Ragpicker / Self Utilised
Hair	Sold / Given Free to Ragpicker / Self Utilised
Chappal	Sold / Given Free to Ragpicker / Self Utilised
Leather Bags	Sold / Given Free to Ragpicker / Self Utilised
Plastic Bottles	Sold / Given Free to Ragpicker / Self Utilised
Non-Recyclables	Sent to Landfill

Fig. Waste Separation

b. On Sight Record:

Total waste collected on daily basis 20254 Kg which almost 20 ton.

1] Wet waste = 9 ton

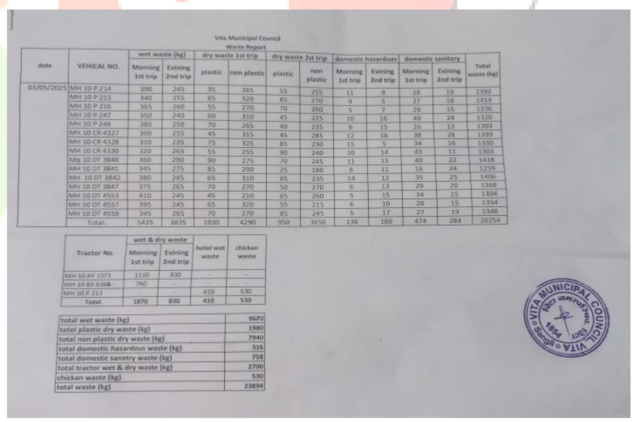
2] Dry waste = 10 ton

i) Plastic waste = 2 ton

ii) Non-Plastic = 8 ton

3] Domestic hazardous waste = 300 Kg approximately

4] Domestic sanitary waste = 750 Kg approximately



Vita Municipal Council
Waste Report

date	VEHICAL NO.	wet waste (kg) Morning 1st trip	wet waste (kg) Evining 2nd trip	dry waste 1st trip plastic	dry waste 1st trip non plastic	dry waste 2st trip plastic	dry waste 2st trip non plastic	domestic hazarduas Morning 1st trip	domestic hazarduas Evining 2nd trip	domestic sanitary Morning 1st trip	domestic sanitary Evining 2nd trip	Total waste (kg)
03/05/2025	MH 10 P 214	390	245	95	285	55	255	11	9	28	19	1392
	MH 10 P 215	340	255	85	320	85	270	9	5	27	18	1414
	MH 10 P 216	365	260	55	270	70	260	5	7	29	15	1336
	MH 10 P 247	350	240	60	310	45	225	10	16	40	24	1320
	MH 10 P 248	380	250	70	265	40	235	9	15	26	13	1303
	MH 10 CR 4327	360	255	45	315	45	285	12	16	38	28	1399
	MH 10 CR 4328	310	235	75	325	85	230	15	5	34	16	1330
	MH 10 CR 4330	320	265	55	255	90	240	10	14	43	11	1303
	MH 10 DT 3840	360	290	90	275	70	245	11	15	40	22	1418
	MH 10 DT 3841	345	275	85	290	25	180	8	11	16	24	1259
	MH 10 DT 3842	380	245	65	310	85	235	14	12	35	25	1406
	MH 10 DT 3847	375	265	70	270	50	270	6	13	29	20	1368
	MH 10 DT 4553	410	245	45	210	65	260	5	15	34	15	1304
	MH 10 DT 4557	395	245	65	320	55	215	6	10	28	15	1354
	MH 10 DT 4559	345	265	70	270	85	245	5	17	27	19	1348
	Total	5425	3835	1030	4290	950	3650	136	180	474	284	20254

Tractor No.	wet & dry waste Morning 1st trip	wet & dry waste Evining 2nd trip	hotel wet waste	chickan waste
MH 10 AY 1373	1110	830	-	-
MH 10 BX 6368	760	-	-	-
MH 10 P 213	-	-	410	530
Total	1870	830	410	530

total wet waste (kg)	9670
tatol plastic dry waste (kg)	1980
total non plastic dry waste (kg)	7940
total domestic hazardous waste (kg)	316
total domestic sanetry waste (kg)	758
total tractor wet & dry waste (kg)	2700
chickan waste (kg)	530
total waste (kg)	23894

c. Faecal sludge treatment plant (FSTP):

A Faecal Sludge Treatment Plant (FSTP) is a facility specifically designed to process faecal sludge, which is the waste gathered from septic tanks, pit latrines, and various on-site sanitation systems. The primary goal of an FSTP is to treat this waste in an environmentally safe and sustainable way.

i. The capacity of this plant in vita SWM = 10 KL Per Day.
ii. This runs on full capacity making 10 KL per day.
iii. The Advance dewatering processed machine is equipped which is yet to be started.

Fig . Faecal sludge treatment plant (FSTP)

d. Manufacturing blocks from plastic:

Plastic waste poses a significant environmental challenge because it is non-biodegradable. An innovative solution to this issue is the conversion of plastic waste into paving blocks or bricks.This approach not only provides a sustainable material for road construction but also offers practical applications in gardening, all while tackling the problem of plastic pollution.

For making blocks this processed follows :

i) First we have to segregate the plastic in white/ plane and other mixed coloured plastic.

ii) Then densifire in the machinery.

iii) Making blocks from it. They create two type of blocks

a) Rectangular shape blocked : This Rectangular shaped block used in road divider as well as in garden for decorative purpose.

b) Hexagonal shape blocked: This hexagonal shaped block used as Paving block for tiling purposes.

Fig. Manufacturing of blocks

e. Organic pit composting:

Organic pit composting is a traditional and straightforward method for converting biodegradable organic waste, such as kitchen scraps, leaves, and agricultural residue, into nutrient-rich compost. This process involves decomposing the waste in a pit dug into the ground.

The machine has capacity to produce compost of 4.5 ton per day. They also have Compost Storage area. Mainly wet waste is utilized and sold to private firm.

f. Biogas Plant:

A biogas plant is a facility designed to generate biogas, which is a mixture of methane, carbon dioxide, and other gases. This process occurs through the anaerobic digestion of organic materials, including animal dung, kitchen waste, agricultural residue, and sewage sludge.

i. In vita SWM plant mainly kitchen waste is utilizing in Biogas plant. The 5 stage procedure generates electricity which useful for plant itself.

ii. The capacity of this plant 5 Metric ton per day

Fig. Biogas Plant

g. PET bottle crusher:

A PET bottle crusher machine is an essential device designed to crush or shred used plastic bottles, primarily those made from Polyethylene Terephthalate (PET). This machine reduces the bottles into small pieces or flakes, facilitating easier storage, recycling, and reuse of the material.

The process begins with the input of whole PET bottles into the machine, where they are fed into a crushing chamber. The blades or shredding mechanisms then break down the bottles into manageable sizes. This not only optimizes space for storage but also enhances the efficiency of the recycling process, as smaller pieces are easier to handle and process in recycling facilities. In addition to promoting recycling efforts, PET bottle crusher machines contribute to environmental sustainability by reducing plastic waste in landfills and oceans. They are commonly used in various settings, including recycling centers, manufacturing plants, and even in households, where individuals can manage their plastic waste more effectively.

Overall, these machines play a crucial role in the circular economy by transforming waste into valuable raw materials for new products.

Currently two machines is placed at vita city:

1) The first machine located nearby Municipal Council vita.

2) Second machine is located at market area locally called Bhaji Mandai.

Fig. Polyethylene Terephthalate (PET)

IV. THE SCOPE OF WORK

Municipal Solid Waste (MSW) energy presents a dual solution to the pressing environmental and energy challenges by reducing the volume of waste generated and harnessing it to produce electricity. MSW is increasingly recognized as a clean and renewable energy source, offering a promising alternative for electricity generation.

The imperative to revamp the existing waste management system and adopt cutting-edge, scientific methods of waste disposal has become more pressing due to the escalating issues with waste management in urban areas. The growing awareness of the detrimental impacts of conventional waste management practices on public health has further underscored the need for innovative solutions.

By leveraging MSW energy, cities can mitigate the environmental and health risks associated with traditional waste disposal methods, such as landfilling and open burning. This approach not only reduces greenhouse gas emissions but also helps to conserve natural resources, decrease reliance on fossil fuels, and promote sustainable development.

As the world grapples with the challenges of urbanization, population growth, and climate change, MSW energy has emerged as a vital component of a comprehensive waste management strategy. By embracing this technology, communities can create a more sustainable, environmentally conscious, and energy-efficient future.

REFRENCES

1. Tomy Muringayil Joseph
"Polyethylene terephthalate (PET) recycling: A review" (2024)
2. Renbi Bai
"The practice and challenges of solid waste management in Singapore" (2002)

3. Choudhary, S. "Solid Waste Management. Department of General Science,Vivekananda Global University, Jaipur." (2019)

4. Arentsen, M. & Clancy, J. "Waste to Energy: Solution for Municipal Solid Waste Management in Kathmandu Metropolitan City (KMC). Master of Environmental and Energy Management, University of Twente. (2018-19)

5. Judge, I. & Patel, A. U. "Solid Waste Management in India: An Assessment of Resource Recovery and Environmental Impact. Division of Materials Science and Renewable Energy". (2018)

6. Kaur, A., Bharti, R., & Sharma, R. "Municipal Solid Waste as a Source of Energy.Department of Chemistry, University Institute of Science, Chandigarh University, Gharuan, Mohali 140413, Punjab".(2017)

7. Moya Clay Aldas, D., Lopez, G., & Kaparaju, P. "Municipal Solid Waste as a Valuable Renewable Energy Resource." Área de Energía, Facultad de Ingeniería Civil Mecánica, Universidad Técnica de Ambato, Avd. Los Chasquis y Río Payamino, 18013 14, Ambato, Ecuador. (2017)

8. Islam, K. M. N. "Municipal Solid Waste to Energy Generation in Bangladesh. Hindawi Publishing Corporation, Journal of Renewable Energy". Volume 2016, Institute of Forestry and Environmental Sciences, University of Chittagong, Chittagong 4331, Bangladesh.(2016)

9. Bag, S. "Solid Waste to Energy Status in India: A Short Review. Université Internationale de Rabat."(2015)

10. Prof. P. M. Maske, Miss. Prashani P. Babar, Mr. Shrinath P. Gurav, Mr. Rohan G. Babar , Mr. Rushikesh J. Suryawanshi, Mr. Bhaskar P. Pawar. "Solid Waste Management for Vita Nagarparishad"(2023)