

Integrated Solid Waste Management System for Small Community

Megha Oza¹, Arti Rai², Gadhesariya Darshak³, Dishant Thakor⁴

^{1,2,3,4}BE Student, Department of Environmental Science & Technology, Shroff S. R. Rotary Institute of Chemical Technology, Vataria, India

Abstract: The present study includes disposal of solid waste in scientific manner for one of the tribal community nearby Ankleshwar. This community is suffering from frequent epidemic & unhygienic condition due to lack of proper Solid Waste Management system. We decided to provide a model for integrated Solid Waste Management system with cost effectiveness. The solid waste collected by the people of this community is in two forms named biodegradable & non-biodegradable. Sending this waste to municipal solid waste site is expensive, a system/model have to be established at a local level to promote R3 (reuse, recycle & reduce) approach & to make system more sustainable. This model consists of segregation, collection & treatment of the collected waste. The community is made up of around 300-450 houses comprising of people from different life styles & food habits. From selected 30 houses around 208.67 kg/day waste has been collected, out of which 116.39 kg/day is biodegradable and 92.28 kg/day is non-biodegradable waste generated. Thus, the Solid Waste Management approach has to be selective as well as generalized to cope up with the need of the entire locality.

Keywords: Non-biodegradable, waste management, sustainable

1. Introduction

MSWM is a challenging problem for the developing countries like India where the trend of urbanization is very high. In India, the municipal bodies render the solid waste management services. Though it is an essential service, it is not attaining proper priority, which it deserves and services are poor. This has caused many problems in urban environment as well as to the public health in most of the Indian cities and towns. Solid Waste Management is a vital, ongoing and large public service system, which needs to be efficiently provided to the community. To maintain aesthetic and public health standards. Municipal agencies will have to plan and execute the system in keeping with increasing urban areas and population. The quantity of waste generated in India has increased considerably during the last three decades and that produces enormous challenges to the municipal bodies for their effective management and disposal. Like other towns and cities of the country in the state of Gujarat, the problem of solid waste becomes a serious one and needs extensive research of effective management of the wastes. Solid waste management is an integral part of the environmental domain of any region. Inefficient waste disposal systems lead to environmental

pollution along with presenting severe health hazards. Municipal solid waste is again classified into different types like biodegradable substances (rotten or waste foodstuffs and general kitchen waste), recyclable materials and domestic hazardous waste (light bulbs, batteries, etc). Hazardous solid waste is industry generated which need special disposal techniques. There are different waste is generated which need to be managed in an economical way, while not compromising the environment and public health, intensive work is being done in searching for means to reduce the growing amount of waste generated and technologies to discard and dispose of it safely and economically. Solid waste management involves activities associated with generation storage, collection, transfer and transport, processing and disposal of solid waste which are environmentally compatible, adopting principles of economy aesthetics, energy and conservation administration, financial, legal and engineering aspects involving interdisciplinary relationships. Consequently, the life standards are also increased with production of more and more solid wastes especially in urban centers. Solid wastes are the direct consequences of what we do in our modern society. Majority of the waste is dumped in open landfill and people are not involved in solid waste decision-making process or the solid waste management system.

2. Problem summary

The domestic waste generated in rural household of India is increasingly becoming an issue of serious concern. Solid waste management has become a practical necessity in rural areas too. Domestic refuse from individual households should not become a cause for unsightly and unhealthy ruler environment. For the healthy ruler environment and quality, living it requires proper solid waste system.

A. Aim of the study

To propose a self- sustainable model for ISWM.

B. Objectives of the study

It includes:

- Awareness
- Waste Segregation
- Waste Quantification and Characterization

- Cost estimation
- Development of the model

3. Methodology

An efficient and promising technique in decentralized composting is the rotary drum composter. The rotary drum provides agitation, aeration and mixing of the compost, to produce a consistent and uniform end product. In warm, moist environments with ample amounts of oxygen and organic material available, aerobic microbes flourish and decompose the waste at a faster pace. The culture of microorganisms is added in the drum with the wooden powder. The waste decomposes in drum for two weeks and provides water and air by the holes of the drum. After two weeks the waste is transfer in pits and covers it and they will be decomposing for the two weeks. After these 4 weeks the compost is ready to use or sell.

4. Calculation

A. Moisture content

% of moisture content = $(W_i - W_d / W_i) * 100$
 Empty weight of crucible = 34.65 gm.
 Weight of sample = 9.467 gm
 Dry weight of sample = 6.305 gm
 % of moisture content = $[(9.467 - 6.305) / 9.467] * 100 = 33.4\%$

B. Volatile Matter

Dry sample Wt. = 6.305 gm
 Wt. of Ash = 1.496 gm = $[(6.305 - 1.496) / 6.305] * 100 = 76.278\%$

C. Ash content

Wt. of Ash = 1.496 gm

D. Fixed Carbon:

= $100 - (\% \text{ of moisture content} + \% \text{ of Ash content} + \% \text{ of volatile matter}) = 100 - (33.400 + 1.496 + 76.278) = \dots\dots$

E. Lower heat value (LHV) = 45V - 6W

V = combustible volatile matter
 W = Moisture content
 = $45 * 76.278 - 6 * 33.400$
 = 3231.84 Kcal/kg

Table 1
Method analysis

Sr.NO	Method of analysis	Obtain by wt%	Standard by wt%
Proximate Analysis			
1	Moisture Content	33.4	30.4
2	Volatile Matter	76.278	39.3
3	Fix Carbon		8.42
	Ash Content	1.496	21.9
4	Lower heat value (LHV)	3231.84	1745
Ultimate Analysis			
1	Total Carbon	6.49	32.3
2	Nitrogen Percentage	3.41	0.526
3	Sulphur Percentage	1.06	0.056
4	Percentage hydrogen	10.9	4.46
5	Percentage oxygen	-	9.49

5. Results and summary

We have selected a small village. Survey that village and taken the permission of the gram panchayat for our project. We have selected 30 houses for our project. We have given them two different colors of plastic beg for the collection of the wet waste and dry waste after that collection of the waste we have segregate the waste in biodegradable and non-biodegradable waste. Then we have done the proximate and ultimate analysis and done the calculations. The waste which having more

Table 2
Analysis data of high class

	1	2	3	4	5	6	7
Moisture content	54.28	50.68	33.400	41.32	45.212	37.12	37.56
Volatile matter	49.44	69.98	94.084	78.59	94.03	49.57	69.42
Lower Heat Value	1899.12	2986.23	4033.38	3374.23	3961.563	2840.35	1788.16

Table 3
Analysis data of middle class

	1	2	3	4	5	6	7
Moisture content	50.158	51.393	45.212	50.365	45.212	52.788	50.467
Volatile matter	48.33	50.444	94.063	49.908	94.063	55.890	97.452
Lower Heat Value	1999.12	2000.54	3961.563	3899.43	3961.565	3487.48	3900.74

Table 4
Analysis data of lower class

	1	2	3	4	5	6	7
Moisture content	47.33	41.419	41.49	42.786	38.62	40.63	42.65
Volatile matter	43.44	86.284	86.28	87.986	78.98	83.2	80.78
Lower Heat Value	1698.12	3933.834	3633.66	3944.76	3268.6	3164.23	3024.86

calorific value that waste is sent for the incineration and the waste which having low calorific value is given to the scrap for recycling and reuse purpose and the municipality for the disposal. And the waste which is biodegradable for that composting method is used.

6. Conclusion

This paper presented integrated solid waste management system for small community.

References

- [1] Yuri Joelsson, Rebecca Lord, "Urban Solid Waste Management in Mumbai Bachelor Thesis in Energy and Environment".
- [2] Swapan Das, Bidyut Kr. Bhattacharyya, "Estimation of Municipal Solid Waste Generation and Future Trends in Greater Metropolitan Regions of Kolkata, India"; Journal of Industrial Engineering and Management Innovation, Vol. 1, No. 1 (October 2014), 31-38.
- [3] Vikash Talyan, R.P. Dahiya, T.R. Sreekrishnan "State of municipal solid waste management in Delhi, the capital of India"; Elsevier.
- [4] Nishi Waseda, Shinjuku Ku; "Solid Waste Management In Chennai"; The Public Sector Innovation Journal; Volume 21(2).
- [5] Rishi Rana, Rajiv Ganguly, Ashok Kumar Gupta; "An Assessment of Solid Waste Management System in Chandigarh City, India"; EJGE
- [6] Mihirkumar D. Patel, Nayankumar P. Sonib and Miss. Dhvani J. Prajapati "Critical Analysis of Solid Waste Management in Bharuch City, Gujarat, India";
- [7] Dipam Saikia, Manash Jyoti Nath. "Integrated Solid Waste Management Model for Developing Country with Special Reference to Tezpur Municipal Area, India";
- [8] Anjali Prajapati, Arti Pamnani. "Municipal Solid Waste Management of Medium Scale Town of South Gujarat Region "
- [9] Abdurrahman Alsulaili, Bazza A. Sager, Hessabanwan, Aisha Almeer and Latifa Essa. "An Integrated Solid Waste Management System in Kuwait";
- [10] Jayashree Sreenivasan, Marthandan Govindan, Malarvizhi Chinnasami and Indrakaran Kadiresu "Solid Waste Management in Malaysia – A Move Towards Sustainability"; TECH
- [11] Floyd hasselriis, William j. huff, Philip m. schuchter, Eugene aleshin. "Integrated waste management in Babylon, new York "13. Floyd hasselriis, william j. huff, philip m. schuchter, eugene aleshin. "Integrated waste management in babylon, new York "
- [12] K. Patel, Sejal S. Bhaga; Kapil, "Wot analysis for improvement of municipal solid waste management planning: a case of amod town, bharuch"; international journal of advanced research in engineering, science and management.
- [13] Regina Dube, Senior Advisor & Head, Sustainable Urban Habitat at all. "Municipal solid waste audit & characterization study for municipal council manali"; IGEP.
- [14] H. N Chanakya, TV Rama chandra and Shwetmala. "Towards a sustainable waste management system for Bangalore".