Challenges and Opportunites Associated With Waste Managment In Nagpur Municipal Corporation(NMC)

Sneha Nagdeve[1],Dr. Arif Khan[2]
[1]P.G Student [2] Principal
[1,2]Department of Environmental Engineering
[1,2]Nuva College of Engineering & Technology, Katol Kalmeshwar Road, Nagpur, India

Abstract

Nagpur Municipal Corporation (NMC) Keeping the city clean has taken on a whole new meaning in the orange city where Nagpur, the second capital of Maharashtra. Being innovative, clean and green has had a significant bearing on the city's future competitiveness and attractiveness as a business and traveling hub. Firm determination and hard administrative measures have contributed towards the success of the efforts of NMC. The innovative steps taken by NMC in MSW handling and disposal have led to visible changes in the city. Nagpur is recognized as one of the cleanest cities in the country. Nagpur bench of Bombay High Court that construction work on waste-to-energy project at Bhandewadi start soon and it had already submitted the proposal to government to allot 10 acres land.
Keywords- *Nagpur Municipal Corporation, NMC, MSW, Waste-to-energy, Bhandewadi.*

I. INTRODUCTION

In Nagpur According to the Swachh Sarvekshan of the integrated waste management system for Nagpur was conducted along with a detailed waste characterization of municipal solid waste. The waste characterization exercise was undertaken by the National Environmental Engineering Research Institute (NEERI), Nagpur. A total of 34 samples were collected from all the 10 zones in the city in April/May 2017 and tested for physical and chemical composition analysis, including bio-methane potential. Results from the waste characterization indicate that the average waste composition for Nagpur includes organics at approximately 60%, along with plastics (16%), paper (11%) and inerts (2%). The balance of 11% constitutes wood, metal, glass, etc. The MSW samples were also tested for chemical parameters, such as pH, moisture content, Total Solids (TS), Total Volatile Solid (TVS) ash, calorific value, Chemical Oxygen Demand (COD), average density and C/N ratio. The waste from Nagpur has COD at 24%; the average waste density is 440 kg/m3, and the C:N ratio of waste is approximately 24. The average moisture content is 56 %, TS is 44 %, TVS is 70 %, ash content is 31 %, and calorific value is 1089 kcal /kg. The collected samples from all the zones in Nagpur city were also analyzed for their bio-methane potential, which indicated a biogas yield of 93 m / tones of organic waste and an average methane yield of 45 m^3/ tone. The methane percentage in the biogas was estimated at around 49%. Currently, the waste collection and transportation service is privatized and is being provided by Kanak Resources Management Limited (KRML). Approximately 255 vehicles of various types are deployed by KRML for the transportation of waste, along with handcarts, small tricycles and tipper trucks for primary collection from the households. Analysis of the vehicle deployment plan shared by NMC for KRML indicates that the total carrying capacity is sufficient. However, operational inefficiencies of KRML result in waste accumulation at the community bins and other secondary storage points. Segregation of waste at source is not practiced by the generators. Segregation of waste (limited to recovery of high value recyclables) is practiced by the workers engaged in door-to-door collection of waste. The city had adopted the concept of “Bin Free City” as far back as 2008, which resulted in a significant reduction in the number of community bins from 700 in the year 2008 to 170 in 2017 (approximately 80% reduction).

II. LITERATURE SURVEY

In our country municipal corporations are primarily responsible for solid waste management. But with the growing population and urbanization municipal bodies are facing financial crunch and can no longer cope with the demands. The limited revenues earmarked for the municipalities make them ill equipped to provide for high cost involved in the collection, storage, treatment and proper disposal of waste[1]. Municipalities are only able to provide secondary collection of waste, means they only collect waste from municipal bins or depots. A substantial part of the municipal solid waste generated remains unattended and grows in the heaps at poorly maintained collection centers. Open dumping of garbage facilitates breeding of disease vectors such as flies, mosquitoes, cockroaches, rats and other pests. At present the standard of solid waste management is far from being satisfactory[2]. The environmental and health hazards caused by the unsanitary conditions in the cities were epitomized by the episode of Plague in Surat in 1994. That triggered public interest litigation in the Supreme Court of India. Based on the recommendations of the committee set up by the apex court in that Public Interest Litigation (PIL), the Government of India has framed Municipal Solid Waste (Management and Handling) Rules 2000, under the Environmental Protection Act, 1986[3]. The Municipal Solid Waste (Management and Handling) Rules 2000. Though doorstep collection of segregated waste is important for municipal solid waste management, it is not carried out by many of the municipal bodies in the country as they are lacking in financial resources or the expertise to comply with those rules and they often make little effort to revise outdated and deficient waste management systems[4]. As the authorities were hardly able to provide cost-efficient service to citizens, one possibility was to outsource solid waste management by putting in charge professional private organizations like Centre for Development Communication (CDC). The key concept is making availability for door-to-door collection of segregated domestic waste, but the model includes all aspects of solid waste management from waste generation to waste processing (e.g. recycling and vermi-composting) and the final disposal [8]. The end consumer is both main contributor and main beneficiary, as he should segregate the waste instead of littering it and, in turn, profits from the cleanliness of the city and creation of a new awareness that CDC work is generating. Presently the Swachta Doot [9] project is being successfully being implemented in several cities of India.

III. DEVELOPMENT OF NEW METHOD

Currently, there is no working waste treatment facility in Nagpur. Waste collected from various parts of the city is dumped at the Bhandewadi dumpsite, which is around. 10 km from the city centre. There was some previous initiative for the processing of waste in the city, which included setting up a waste to RDF/Compost facility with support from a private operator. However, this facility is not operating currently. In addition, a waste bioremediation/ bio-mining project primarily for legacy waste is being practiced by the city on the existing dump site. According to discussions with the city officials, the project has managed to process the legacy waste and reduce the height of the existing waste dump considerably. However, the project and technology is currently under question and is facing challenges because of some recent incidences of huge fire (March 2017) and odors issues. In May 2017, NMC signed a contract for the development of a waste to energy facility of 800 TPD at the Bhandewadi dumpsite. M/s. Essel Infra Projects Ltd. Mumbai and Hitachi Zosen India have been selected as concessionaires for the project. The project is based on mass burn incineration technology and is expected to generate 11.5 MW of electricity. The scheduled commissioning date for the project is June 2019 and the total contract duration is 15 years. The existing dumpsite at Bhandewadi is open and subject to various risks due to fire, leachate percolation and emission and is a health and safety concern for the people working on-site, as well as for people residing along the edge of the dumpsite.

Mechanical Pre-treatment: Waste after reception is transferred to Mechanical pre-treatment. Mechanical pre-treatment breaks the waste down automatically into individually defined fractions, according to the material and to differences in size.

Biological Step: The process involves the addition of process water to ensure appropriate and uniform consistency. After a short retention time in the mixer, presses dewater the solid material which is ideally prepared for biological drying. The new DAMP process leaves microbially convertible organic materials in the solid material for optimized drying. The resulting press water is treated in several steps for energy extraction and cleaning.

Biological Drying This procedure dries the waste in an energy-efficient and economical way with the energy inherent in the waste. In tightly-closed concrete tunnels, air flows through the waste evenly and provides the microorganisms with oxygen. The micro-organisms feed on organic components and produce thermal energy. This thermal energy evaporates the water contained in the solid material. After a short treatment time, a homogenous, dry and free-flowing solid material is produced. The dried solid material can be easily broken down into its components: energy sources, minerals and metals.

Mechanical material separation: Mechanical material separation works fully automatically with a specially configured technology: sieving and classification systems break down the dry, very homogenous and free-flowing material into various sub-fractions. With differentiated materials handling, the energy-rich fuels, minerals and the few remaining metals flow into the loading stations. The composition of the energy-rich fuels is defined as follows: grade size range, chemical composition, heating value and biomass share.

Discharged air treatment: Polluted discharged air and process air streams are captured in a targeted, individual manner and are recycled again. Discharged air with low-level pollution is fed through humidifiers and bio-filters. This biological procedure enables micro-organisms to clean the discharged air most effectively. Air washers and a regenerative thermal oxidation system clean the more severely polluted process air streams. Conduct rapid global market study of the viable technology options for waste treatments that are suitable for Nagpur's cultural, climate and waste type and are economically viable to operate.

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IV. CONCLUSION

The generation of large quantities of MSW in Nagpur city has become a serious environmental issue. NMC, though committed to the services, is finding this issue difficult to manage properly due to the growing magnitude of problems. The major problems in MSWM in Nagpur city are due to the lack of MSW segregation at source, low operational efficiency of MSW transportation system with old vehicles and an inefficient informal recycling system. Nagpur Municipal area generates 905 metric tons of MSW per day, whereas, no data was maintained for receiving it at landfill site, demonstrating the need for augmentation of the present collection and transportation system. To achieve a target of 100% collection, transportation, treatment and disposal, NMC, would first need to prepare a micro plan which would identify the quantity of waste generated in the city and the broad strategy to be adopted to manage the system. The existing handcarts used for collection of solid waste, are to be replaced by tricycle carts. Capacity improvements to the existing MSWM framework need to be stressed. For collection system, emphasis should be on segregation at the household level and 100% door-to-door collection.

REFERENCES

[1]. M. A. Al Mamun, M. A. Hannan, A. Hussain, and H. Basri, "Theoretical model and implementation of a real time intelligent bin status monitoring system using rule based decision algorithms," Expert Syst. Appl., vol. 48, pp. 76–88, 2016.

[2] D. C. Wilson, L. Rodic, A. Scheinberg, C. A. Velis, and G. Alabaster, "Comparative analysis of solid waste management in 20 cities," Waste Manag. Res., vol. 30, no. 3, pp. 237–254, 2012.

[3] S. Balandin, S. Andreev, and Y. Koucheryavy, Internet of Things, Smart Spaces, and Next Generation Networks and Systems, vol. 9247, no. June. Cham: Springer International Publishing, 2015.

[4] S. Kumar, "Ubiquitous Smart Home System Using Android Application," Int. J. Comput. Networks Commun., vol. 6, no. 1, pp. 33–43, 2014.

[5] A. Zanella, N. Bui, A. Castellani, L. Vangelista, and M. Zorzi, "Internet of things for smart cities," IEEE Internet Things J., vol. 1, no. 1, pp. 22–32, 2014.

[6] A. Mesmoudi, M. Feham, and N. Labraoui, "Wireless Sensor Networks Localization Algorithms: A Comprehensive Survey," Int. J. Comput. Networks Commun., vol. 5, no. 6, pp. 45–64, 2013.

[7] K. Potiron, A. El Fallah Seghrouchni, and P. Taillibert, From Fault Classification to Fault Tolerance for Multi-Agent Systems. London: Springer London, 2013.

[8] N. V. Karadimas, G. Rigopoulos, and N. Bardis, "Coupling multiagent simulation and GIS - An application in waste management," in WSEAS Transactions on Systems, 2006, vol. 5, no. 10, pp. 2367–2371.

[9] M. Longo, M. Roscia, and G. C. Lazaroiu, "Innovating Multi-agent Systems Applied to Smart City," Res. J. Appl. Sci. Eng. Technol., vol. 7, no. 20, pp. 4296–4302, 2014.

[10] M. A. Al Mamun, M. A. Hannan, A. Hussain, and H. Basri, "Integrated sensing systems and algorithms for solid waste bin state management automation," IEEE Sens. J., vol. 15, no. 1, pp. 561– 567, 2015.

[11]. Mr. C Srinivasan: Cattle Based SLRM - Project Interlink-1, LWM_duck_concept_2013, SLRM-Project.