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Managing Municipal Solid Waste: The Surat Municipal Corporation Way

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INTRODUCTION

THE GROWING world's population, increasing urbanisation, rising standards of living, and rapid developments in technology is increasing the amount and the variety of solid wastes generated by industrial, domestic and other activities (UNEP, 1991)[1].

At global level, during 2006, total amount of Municipal Solid Waste (MSW) reached 2.02 billion tonnes, representing a seven per cent annual increase since 2003 (Global Waste Management Market Report 2007). It was also estimated that between 2007 and 2011, global generation of municipal waste will rise by 37.3 per cent, equivalent to roughly an increase of eight per cent per year.[2] About 48 million tonne is generated in India. By the year 2047, MSW generation in India is expected to reach 300 million tonne. Per capita waste generation in cities varies from 0.2 kg to 0.6 kg per day depending upon the size of population. Per capita waste generation is increasing by about 1.3 per cent per year. With growth of urban population ranging between three to 3.5 per cent per annum, the annual increase in overall quantity of solid waste is at about five per cent.[3]

In India, solid waste management services are provided by the Civic Bodies as per the provisions of the respective Corporation/ Municipal/Panchayat Acts. The expense towards SWM is usually met from the Property tax collected from the residents[4]. Solid waste management includes the process of generation, collection, storage, transport and disposal or reuse and re-circulation or incineration or any relevant method of disposal (WHO, 1971).[5] In India for managing solid waste Municipal Solid Waste Management and Handling rules are to be adhered to by the Civic authorities. This article attempts to study the efforts being made by Surat Municipal Corporation (SMC) in dealing with MSW. The focus will be to study SMC's approach towards MSW and in finding out how far SMC has been able to achieve the objectives set by it for innovative and modern SWM.

Surat is one of the fastest growing city in the world. Surat Municipal Corporation (SMC) has witnessed a huge 56 per cent rise

in population between 2001 to 2011 which rose from 28.42 lakh to 44.01 lakh.[6] There are three main Governing bodies within Surat, namely, Surat Municipal Corporation (SMC), Surat Urban Development Authority (SUDA) and Hazira Development Authority (HDA) governing the industrial hub of Hazira. Approximately 326 square kilometres of the city comes under the jurisdiction of SMC.[7] The rapid growth of the city has put lot of pressure on the SMC to provide basic civic services to match with the increasing demand of the citizens. One of the challenges it is facing is to keep the city clean and to manage the MSW is a gigantic task. Apart from this for environmental protection and for health purposes managing solid waste is the responsibility of the municipality. About 1,200 to 1,300 tonne per day (TPD) of MSW is generated. About 300 gram of municipal solid waste is generated per person each day. Approx. 60 per cent of this waste is collected through door to door collection system, 30 per cent through containers placed in zones and 10 per cent by street sweeping. SMC has adopted a new and modern approach to SWM which is as under:

The New and Modern approach to the Solid Waste Management

- Integration of SWM with other activities *viz.* sewerage, water supply, health care, engineering departments, etc.
- Emphasis laid on Complaint redressal system, Grievance redressal system, Litter prevention system, Slum Upgradation & Rehabilitation, Field work, Daily meeting in this regard, etc.
- Financial commitment: Equipment, Vehicles, Communication.
- Involving citizens: Positive involvement, penalising truants, creating public awareness.[8]

SMC has put before it certain objectives to be achieved by it for innovative and modern SWM. These are:

Objectives for an Innovative and Modern Solid Waste Management

To devise a system of storage of waste and segregation of recyclable waste at source; improve primary collection of waste; devise more efficient system of day to day cleaning, conventional and mechanical; eliminate practices of throwing garbage on the road causing nuisance and health threat; modernise the system of community waste storage and synchronise the system of primary collection as well as transportation of waste; eliminate manual handling of waste and open transportation vehicles; improve the system of transportation of waste by ensuring "handling waste only once";

construct semi close body transfer station; reduce quantity of waste going to landfill site by adopting suitable technology; develop landfill site at Khajod; derive income from the processing of waste and help agricultural production.; ensure safe disposal of waste including bio-medical wastes; institutional strengthening; encourage public participation and to recover cost.[9]

For the efficient functioning, SMC has been divided into seven administrative zones. All the zonal offices have been equipped with necessary institutional arrangements as well as other infrastructure facilities to cope up with the technical and the sanitation demands of the city. There is a well placed system for collecting and transporting solid waste. Collection and transportation of solid waste takes place at two stages: *Primary* and *Secondary*.[10]

Modus Operandi Adopted by SMC for Municipal SWM.

1. Primary Collection and Transportation

Solid waste generated is collected through the following ways:

a. Sweeping during day time ;

b. Night scrapping and brushing activity;

c. Door-to-door garbage collection system (fully-privatised);

d. Container lifting;

e. Littering bins emptied into wheel barrows which are further emptied into containers;

f. Mechanical sweeping

Sweeping during day time

Sweeping during day time is carried out by SMC. About 5,242 employees are engaged in this activity. This activity is undertaken on all days of the week in two shifts. For commercial areas sweeping is done by contractors during night hours using their own resources. Waste is collected in wheel barrows and transported to containers. There are about 1,125 containers (each of 4.50 Cu.m.) located at different places in the seven zones and the distance between two container is not more than 700 m. so as to reduce the distance travelled by pulling the wheel barrows. There are about 3,000 wheel barrows for collecting the waste. The MSW in containers is transported through hydraulic dumper placers to refuse transfer stations in the respective zones.

Night Scrapping

Major city roads which cannot be sweeped during day hours, those located in business areas and bridges are cleaned during night. There are about 297 routes in all zones which are being cleaned through night scrapping, brushing everyday or on alternate days. This activity is completely outsourced at the rate of 29 paise per sq m. Night scrapping takes place between 11 p.m. to 3 a.m.

Mechanical Sweepers

Two mechanical, sweepers have been purchased by SMC under JNNRUM to clean areas heavily crowded during day time. Operation of these machines have been outsourced.

Littering Bins

To prevent littering on the road side cradle type dustbins (littering bins) have been placed on both sides of the roads on footpath on major roads.

Door-to-Door Garbage Collection System

This system was introduced in 2004 and since October 2005 is in operation in all the zones. It is fully privatised and 60 per cent of MSW is being collected through this system. The contract was awarded to seven private agencies for functioning in different zones for a period of seven years. Contractors were paid at the rate of Rs. 500 to 600 per tonne. Total number of vehicles used for this purpose was 242 (57 three wheeler, 185 four wheeler). The contract has expired in 2011. New contractors have been appointed recently for a period of five years. Door-to-door garbage is collected in closed vans and collection takes place till 2 p.m. In commercial areas collection takes place between 6 p.m. to 8 p.m.

2. Secondary Transportation

Solid Waste collected through primary collection is taken to transfer stations which are located at six places in six zones of SMC.

In the central zone as there is paucity of open land solid waste collected is taken to the other nearby transfer stations as shown in the above table.

At present, excepting Pal, the waste collected through primary collection is dumped in open space at different transfer stations. The waste collected at transfer station is then loaded into HGVS using

DETAILS OF TRANSFER STATIONS

Name of Transfer	Station Zone
Bhatar	South west
Katargam	North & Central (Part)
Varachha	East & Central (Part)
Anjana	South east & Central (Part)
Pal	West
Bhestan	South

SOURCE: Surat Municipal Corporation

loaders and it is there after covered with tarpaulin so as to prevent littering of waste during transportation of waste from transfer station to final disposal site at Khajod.

For secondary transportation in three (Pal, Varachha and Bhestan) zones private contractors have been appointed. The private contractors are paid Rs. 140-150 per tonne based on distance travelled from the respective transfer stations to the final disposal site at Khajod. A total of 59 vehicles are used. Secondary transportation was undertaken by both private agencies as well as by SMC.

Modern transfer stations are being constructed at these six transfer stations. At Pal elevated semi closed transfer station is already in operation. At Varachha and Bhestan though elevated station has been constructed execution from that station is still to take place. For other three transfer stations tenders have been invited and it is expected that by December 2011 elevated platforms will be constructed. Contract for the work of installation of compact system along with purchase of hook lifter, container and other ancillary machineries and to operate and maintain functioning of transfer stations at three places namely Varchha, Bhestan and Pal has been awarded to private agency on BOO basis. An aggregate quantity of MSW 450 TPD has to be handled by the private agency. The tenure is for 10 years and the aggregate cost is of Rs. 45 crore.

With the introduction of the modern transfer station the methodology adopted for the disposal of the solid waste is as under:

Modern Transfer Station functions in the following manner

To begin with primary collecting vehicles are sent to elevated platform through ramp. Chutes are provided at elevated platform to receive the MSW. Secondary transport vehicle is kept underneath the chutes, MSW unloaded from primary collection vehicles will be transferred into the closed container provided with compactor system. The chute portion of transfer station is covered on the top with FRP sheet and whole structure is kept closed with concrete louvered blocks. Transportation of container will be carried out through Hook lifting vehicles. Containers are fully closed with leak proof door opening system. This method helps to carry more quantity of waste per trip to the final disposal site and prevents multiple and manual handling of waste.

3. Final Disposal Site

The Final disposal site is at Khajod and is spread over a land measuring 200 hectare. At this disposal site there are: Two Scientific Landfill Sites, Hanjar Biotech Plant, Vertical Dumping System, Structure for Disposing Treated Bio-Medical Waste and an upcoming plant to be set up by Rochem India for converting garbage into electricity.

To take care of inert, one Sanitary Land Fill (SLF) cell of capacity 1, 25,000 cu. Mt. is in use which was built at a cost of Rs. 131 lakh One more SLF with the capacity of 6,25,000 Cu. Mt. capacity is under construction following the guidelines provided by MSW (M & H) rules 2000. The civil work of the same was to be completed in January 2011. The landfill site is developed in a trapezoidal cell with side slope 1:2 with 450 mm thick clay layer and leachate collection system with perforated HDPE pipe. 1.5 mm thick HDPE linear is used to prevent leachate percolation.

Vertical Dumping System

Solid Waste brought through secondary transportation is dumped at Khajod site. From there the proclaim machines pick up the waste and take it to vertical dumping site. Thereafter it is leveled by dumpers and loaders. The waste is dumped and pressed till it reaches the height of 40 to 50 ft. and assumes vertical shape.

Hanjar Biotech Eng. Pvt. Ltd.

SMC has awarded the treatment of 400 metric tonnes of MSW to Mumbai based Hanjar Biotech Eng. Pvt. Ltd for a period of 30 years at

concessional rate. SMC has allotted land at a token rent of Rs. one per sqm per annum. MSW is provided free. The treatment plant of capacity 400 TPD is in operation from September 2008. The plant generates compost, RDF (refused derived fuel) and pallets which are sold in open market. The capital and recurring expenditure are borne by the agency.

Rochem India - Waste to Energy

For 600 TPD of municipal solid waste treatment (converting garbage waste into electricity) SMC invited tenders. The tender was awarded to Pune based Rochem India. It has agreed to buy 600 TPD MSW at a rate of Rs. 30 per metric tonne. SMC will be providing eight acres of land to them. The residue and inert generated from MSW will be pegged down to 10 per cent. This will reduce the cost of transporting of inert by SMC. The agency will be using the most modern technology and will not separate any kind of waste and use everything to produce electricity. SMC will earn Rs.65 lakh per year by selling MSW to this company. This rate will not remain static. There will be an increase of 5.4 per cent in selling solid waste on compound basis per MT for 25 years.

Disposal of E-Waste

SMC is planning to sell e-waste to a Japanese firm with the help of a local firm. The project is in the planning stage. The local firm will collect the e-waste and sell off part of it in the local market and sell some components of computers, cell phones, digital cameras to Japan. These components will be recycled by the Japanese firm.

Reuse of electric components will reduce the demand for new products, lesser use of natural resources, larger quantities of pure water and electricity for associated manufacturing; less packaging per unit; availability of technology to wider swaths of society due to greater affordability of products; and diminished use of landfills.[11]

Society Anudan*f* Scheme

For internal cleaning of societies and to involve societies in cleaning process the SMC has come with a PPP scheme know as Anudan scheme. The benefit of this scheme is available to every society which is registered, unregistered or service society. Twentyfive per cent of overall layout area of society is to be paid under this scheme. Here the society has to arrange for sweepers. These sweepers are paid out of the contribution made by SMC at the rate of 60 paise to 65 paise per sq.m. If this amount is less than Rs.1,200 per month then minimum of Rs 1,200 per month and maximum up to Rs 4,200 per month is paid

to the society. At present 600 societies have taken benefit of this scheme. Certificate has to be submitted to the ward office every month that the work is completed to avail the amount.

SMC has been to a large extent successful in implementing the new and modern approach to managing MSW. The solid waste manger who is an executive engineer is responsible for the Engineering department as well as the health department under which fall the functions of drainage and storm drain, water supply, slum upgradation, SWM. One of the goals of SMC is to be a city without slums. It has set up a Slum Upgradation Cell to carry out the functions of Slum Upgradation and Slum Rehabilitation. There is a well placed system of grievance redressal where different methods have been provided to lodge complaints at zonal or ward offices and a time frame fixed for disposal of different types of complaints. People littering here and there are also fined. Recently the work of penalising people who litter the city in one of the zones – Central Zone has been given to a private agency. If it proves successful it will be replicated in other zones also. Citizens are being actively involved through PPP mode also. IEC material is being used to create awareness amongst the citizens to keep their city clean. The awareness amongst citizens has reached to a point that if the waste is not collected they bring the waste and dump it before the municipal authorities.

Primary collection of waste has also improved especially through the system of door-to-door collection. Though SMC has plans to segregate waste- wet and dry waste at source by selecting one ward in each zone till date it has has not been able to segregate waste at source. The segregation is undertaken by people who collect waste through door to door collection. Rag-pickers also to some extent help in segregating the waste. Segregation is also being done by Hanjar Biotech Eng Pvt. Ltd. with respect to 400MT waste being provided to it. Manual handling of waste has been more or less eliminated. Vehicles transporting waste are closed which prevents the emission of foul smell and spillage of garbage on road. The modern transfer station will also prevent multiple and manual handling of waste and there will be no storage of MSW at transfer stations. A separate leachate collection system has also been provided for. SMC has been able to develop scientific landfill site and reduce the quantity of inert by the use of modern technology to convert waste to pellets, compost and RDF. Waste to energy project will also be started very soon.

To sum up, managing solid waste is a Herculean task. SMC is making all efforts to manage its waste by adopting a modern approach. It is trying to strengthen primary collection of municipal solid waste

and setting up modern transportation system to eliminate manual handling and open transportation vehicles. It has also set up scientific landfill site and through PPP mode is attempting to reduce the inert by treatment of waste and through its upcoming waste to energy project. But still lots need to be done in the area of segregation of solid waste, reduction, reuse and recycling from solid waste, for which cooperation and support of all stakeholders is required.

Footnotes

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