SOLID WASTE MANAGEMENT AT INDIVIDUAL LEVEL

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Abstract : One of the main current challenge in many urban areas of the world, both in mega cities and in smaller villages, is considered to be municipal solid waste management . Due to rapid urbanization, economic development and population growth, the waste generation rates are increasing in several cities of the world, leading to diverse challenges. The ways in which solid waste is generated by human activities are handled, stored, collected and disposed off can pose different levels of risks to the environment and to the public health. In early pre-industrial times, waste generation was not an issue as populations were smaller. Waste was disposed off in the ground where it would turn to compost to improve soil fertility. Waste management issues are coming to the forefront of the global environmental agenda at an increasing frequency, as population and consumption growth result in increasing quantities of waste. The production of different constituents of waste varies from season to season and place to place, depending on the lifestyle, food habits, standard of living, extent of industrial and commercial activities in the area, and so on. The amount of waste collected from the regions is way too high than the space available for dumping. In Indian scenario, the mentality of people is different and the waste is mixed (Dry and Wet). The collection vehicles collect all the waste in a single vehicle. Even though after numerous government schemes to separate the waste before collection or proper handling and transportation of waste has not succeeded. The waste which is collected is not segregated at source which creates a lot of problem in treatment of waste. By realising the rising problem of waste, the segregation of waste must be given importance at source. We designed a compacted machine which would further segregate the dry waste such that it will segregate the metals from dry waste and can be send for recycling purpose. For the wet waste, we designed a cylindrical vessel which will compost the wet waste and it will rotate at 10RPM and the rotation of the cylinder will be automatic.

Keywords: solid waste, problems, solution, smart dustbin, invessel composting

Introduction

One of the main current challenge in many urban areas of the world, both in mega cities and in smaller villages, is considered to be municipal solid waste management (MSWM) (UN Habitat, 2010). Due to rapid urbanization, economic development and population growth, the waste generation rates are increasing in several cities of the world, leading to diverse challenges. The ways in which solid wastes generated by human activities are handled, stored, collected and disposed of can pose different levels of risks to the environment and to the public health. (K N Chinchodkar, 2017)

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Levels of municipal waste production are directly proportional to the levels of industrialization and levels of income.

The production of different constituents of waste varies from season to season and place to place, depending on the lifestyle, food habits, standard of living, extent of industrial and commercial activities in the area, and so on.
The Ways in which solid wastes generated by human activities are handled, stored and disposed of can pose different level of risk to the environment and to the public health.
Solid waste is therefore a vital municipal responsibility, yet municipal authorities in rapidly urbanized cities find it hard to manage with the accelerating pace of waste generation.
MSW is a heterogenous mixture of paper, plastic, metal, glass, stones, etc.
A typical composition of Indian Municipal Solid Waste is given below.

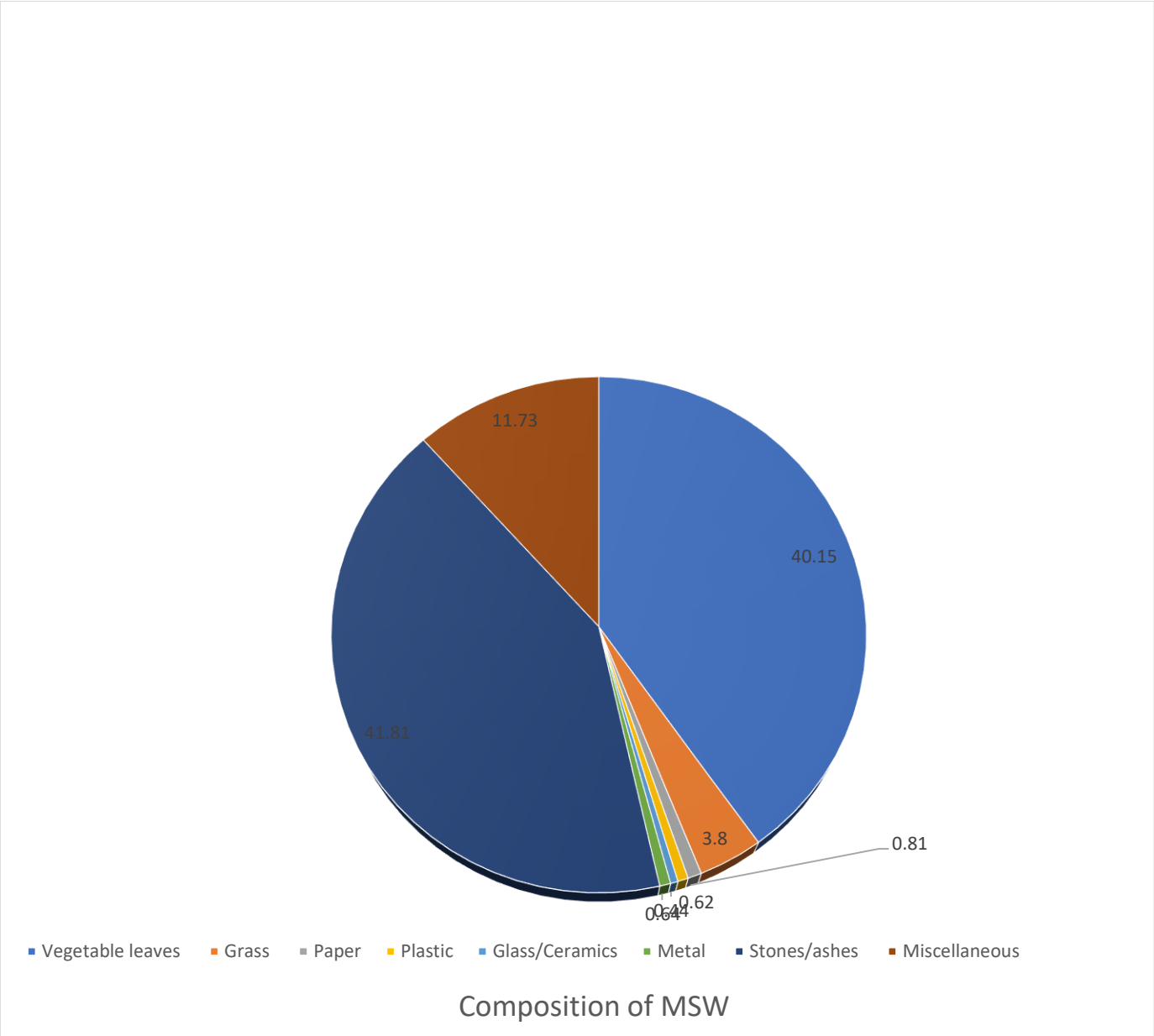


Figure 1(www.devlat.org)

Due to an increasing demographic growth, industrialization urbanization and economic wealth, are up and growing amounts of waste in developed countries. Chemical composition of waste is complex, more and more threatening human health and the environment. (Nebojsa Jovicic, 2009)

Objective:

1. To segregate the solid waste at source & to maintain proper handling and transportation of Municipal Solid Waste at source.
2. To dispose the solid waste in an economical way so as to protect the public health and environment by laws.
3. To reduce the amount of solid waste at source and at community level by reducing, reusing and recycling the MSW.
4. To process the Municipal Solid Waste at community level so as to decrease load on MCGM.

The amount of waste collected from the regions is way too high than the space available for dumping. In Indian scenario the mentality of people is different the waste is mixed (Dry and Wet) the collection vehicles collect all the waste in a single vehicle. Even though after numerous government schemes to separate the waste before collection or proper handling and transportation of waste has not succeeded. To overcome this, rules have to be employed for segregation of waste and a solution is to be given to the consumers for proper segregation of waste.

The waste which is collected is not segregated at source which creates a lot of problem in treatment of waste. Hazardous waste or biomedical waste sometimes get mixed with the municipal solid waste, this affects the whole waste and makes the waste harmful. If the waste is segregated at source it eases the process of treatment and helps to recover the waste which can be recycled or reused or recovery can be done. Certain laws making it compulsory to segregate the waste at source by use of simple dustbins can be done.

If the waste is segregate at source it helps in compacting the waste and large amount of waste can be transported in a single trip. The segregated waste can be collected by the mass producer for the reuse or recycle of the waste.

Once the waste has already been segregated at source the amount left to dispose gradually decreases thus the load on MSW decreases. The Marathon Era at Lower Parel uses this technique and sends only 5% of its waste to the municipality.

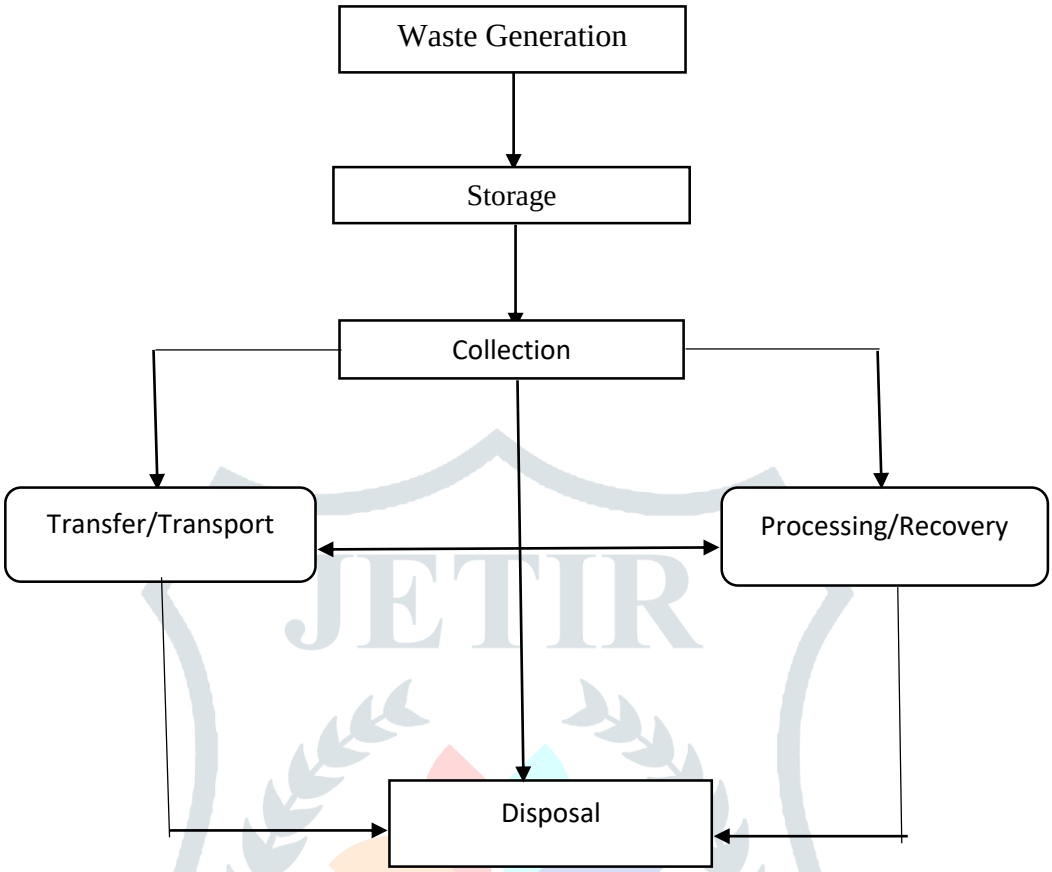
Methodology:

- Visit to Marathon Era to gain the knowledge of processing MSW.
- To decide the different units to be used for treating the MSW at community level.
- To study and design of In-vessel composting for wet waste.
- To finalize the flow chart and to prepare scaled model of MSW process.

VISIT TO MARATHON ERA

A site visit to marathon Era has been investigated, “Perk” is the housekeeping staff company which deals with all the housekeeping process. The housekeeping executive manager manages all the operations related to the treatment and cleaning staff and ensures that the waste generated from the source is disposed off effectively by storing the waste in dry and wet waste separately. Also, the waste which can be recycled can be returned back to the manufacturer thus depleting the amount of waste to be treated. The major significance of the site is that they return the waste that can be recycled or reused which includes tetra-bags, newspapers, glass, e-waste, etc.

Units used for treating MSW at community level



1) Waste Generation: Waste generation encompasses activities in which materials are identified as no longer being of value (in their present form) and are either thrown away or gathered together for disposal. Waste generation is, at present, an activity that is not very controllable. In the future, however, more control is likely to be exercised over the generation of wastes. Reduction of waste at source, although not controlled by solid waste managers, is now included in system evaluations as a method of limiting the quantity of waste generated.

2) Waste Handling, Sorting, Storage, and Processing at the Source: The second of the six functional elements in the solid waste management system is waste handling, sorting, storage, and processing at the source. Waste handling and sorting involves the activities associated with management of wastes until they are placed in storage containers for collection. Handling also encompasses the movement of loaded containers to the point of collection. Sorting of waste components is an important step in the handling and storage of solid waste at the source. For example, the best place to separate waste materials for reuse and recycling is at the source of generation. Households are becoming more aware of the importance of separating newspaper and cardboard, bottles/glass, kitchen wastes and ferrous and non-ferrous materials. On-site storage is of primary importance because of public health concerns and aesthetic consideration. Unsightly makeshift containers and even open ground storage, both of which are undesirable, are often seen at many residential and commercial sites. The cost of providing storage for solid wastes at the source is normally borne by the household in the case of individuals, or by the management of commercial and industrial properties. Processing at the source involves activities such as backyard waste composting.

3) Collection: The functional element of collection includes not only the gathering of solid wastes and recyclable materials, but also the transport of these materials, after collection, to the location where the collection vehicle is emptied. This location may be materials processing facility, a transfer station, or a landfill disposal site.

4) Sorting, Processing and Transformation of Solid Waste: The sorting, processing and transformation of solid waste materials is the fourth of the functional elements. The recovery of sorted materials, processing of solid waste and transformation of solid waste that occurs primarily in locations away from the source of waste generation are encompassed by this functional element. Sorting of commingled (mixed) wastes usually occurs at a materials recovery facility, transfer stations, combustion facilities, and disposal sites. Sorting often includes the separation of bulky items, separation of waste components by size using screens, manual separation of waste components, and separation of ferrous and non-ferrous metals. Waste processing is undertaken to recover conversion products and energy. 8.(Government of India;2003)The organic fraction of Municipal Solid Waste (MSW) can be

transformed by a variety of biological and thermal - 68 - processes. The most commonly used biological transformation process is aerobic composting. The most commonly used thermal transformation process is incineration. Waste transformation is undertaken to reduce the volume, weight, size or Bilaspur City of waste without resource recovery. Transformation may be done by a variety of mechanical (eg shredding), thermal (e.g. incineration without energy recovery) or chemical (e.g. encapsulation) techniques.

5) Transfer and Transport: The functional element of transfer and transport involves two steps: (i) the transfer of wastes from the smaller collection vehicle to the larger transport equipment and (ii) the subsequent transport of the wastes, usually over long distances, to a processing or disposal site. The transfer usually takes place at a transfer station.

6) Disposal: The final functional element in the solid waste management system is disposal. Today the disposal of wastes by landfilling or uncontrolled dumping is the ultimate fate of all solid wastes, whether they are residential wastes collected and transported directly to a landfill site, residual materials from Materials Recovery Facilities (MRFs), residue from the combustion of solid waste, rejects of composting, or other substances from various solid waste-processing facilities. A municipal solid waste landfill plant is an engineered facility used for disposing of solid wastes on land or within the earth's mantle without creating nuisance or hazard to public health or safety, such as breeding of rodents and insects and contamination of groundwater. (Functional elements of solid waste management , n.d.)

In-Vessel composting

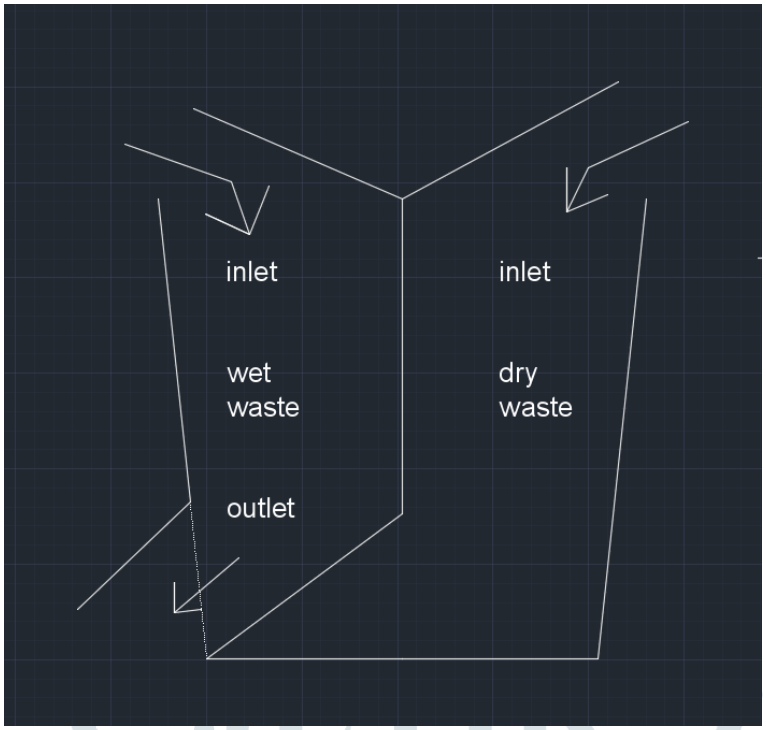
In-vessel composting can be used to treat food and garden waste mixtures. These systems ensure that composting take place in an enclosed environment, with accurate temperature control and monitoring.
There are many different systems these include:

- Containers
- Silos
- Agitated Bays
- Rotating Drums
- Enclosed Halls.

Design of In-vessel composting:
Organic Materials are fed into a drum, silo, concrete-lined trench, or similar equipment where the environmental conditions-including temperature, moisture and aeration are closely controlled.
The apparatus has the mechanism to rotate automatically provided with motor and time for proper aeration. In-vessel composts may vary in size and capacity.
Rotating drums rely on a tumbling action to mix continuously feedstock materials.

Use of smart dustbin

Although the government has made provisions for collection of waste separately (dry, wet, e-waste),
All the waste which is collected is in mixed form from the source. If we used smart dustbin in which dry and wet waste can be collected in same bin but not mixed. It will help a lot in segregating waste at initial level.
Design of dust bin can be in such way that it has 2 containers one for dry and another for wet. The wet waste section have a sloping end at the bottom of bin so that all the fluids and waste can be removed easily. Both the section has openings at the top of waste input, but the wet waste section has an opening at bottom side also so that waste can be removed.



Solid Waste Management in India

India with a population of more than 1.2 billion people, is the second largest in the world. However, India is also facing some great challenges due to poverty and depletion of natural resources. One of the major challenges in many urban areas of the world, both in mega cities and smaller villages is considered to be municipal solid waste management. Due to rapid urbanization, economic development and population growth, the waste generation rates are increasing in several cities of the world, leading to diverse challenges. According to (UNDESA) United Nations Department of Economic and Social Affairs, urban managers in developing countries should focus more upon waste prevention, waste reduction and waste recycling instead of trying to just handle waste through treatment and disposal.

SWM In Mumbai

Mumbai has a coastal stretch of 603 sq. km. Geographically, Mumbai can be divided into 3 sections namely, the island city, the western city and the eastern city. Total population mounts to 13 million that is increasing on a daily basis, such a huge habitat obviously generates a huge amount of waste.

Waste Generation: Total waste of 7,025 tonnes per day out of which 5,025 tonnes consist of biodegradable and recyclable and 2000 tonnes of debris and silt.
The generation of waste by an individual depends upon the socio-economic conditions to which the person belongs.

Waste Management: The MCGM is formerly responsible for management of waste in the city. The prevailing approach has been one of collection and disposal that is, garbage is collected from communities by the municipal authorities and disposed at three main dumping sites that are currently servicing the city

We have in our city, three dumping grounds which are located in the northern part of Mumbai at Kanjurmarg, Mulund, Deonar. Dumping ground at Mulund has been closed recently.

- Deonar dumping ground: Is a waste dumping ground or landfill in the city of Mumbai as the oldest and largest dumping ground. It is managed by India's civic body MCGM. It has a capacity of 1000 tonnes per day. It also has two leachate treatment plant to prevent pollution of creek water and to protect mangroves.
- Kanjurmarg Dumping Ground: As per orders of hon'ble high court and supreme court, the government of Maharashtra handed over a plot measuring hectares excluding forest area at kanjur to MCGM in October 2005 for developing MSW landfill site. Thereafter considering mangroves area and CRZ area the available appraisal committee of Central Pollution Control Board (MCGM, 2005)

Future Plans – ALM

Advance Locality Management (ALM) : The ALM concept envisages great involvement and interaction of MCGM with neighbourhood groups in the wards. These groups form the A.L.M Street Committees, and co-ordinate with the respective ward officer for a better management of civic related issues e.g. garbage, street adoption etc. At present there are about 719 A.L.Ms. .. Under A.L.M. some steps are to be taken as follows:

1) REDUCE the waste generated and what is generated should be reused and recycled. This step is more applicable to dry wastes.
2) STORE the wet and dry waste in containers of choice e.g. bins, bags, drums etc prior to disposal.
3) DISPOSAL off the separately stored wet and dry wastes through separate channels of convenience. Dy waste is disposed through scrap dealer, rag pickers and sweepers. In few A.L.Ms. Composting is done. About 5 tonnes of biodegradable waste is composted per day. (MCGM, 2005)

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