

Solid Waste Management Plant at Hamirpur, Himachal Pradesh: A case study

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Abstract: - The contemporary world is facing many challenges; one of them is the generation of Solid waste. This waste is generated from the households, commercial area, industrial area and other parts of the city town and villages. Management of this wastage is becoming a challenging task. In this paper, solid waste in Indian scenario, its characteristics, management of solid wastage and best practices are discussed. It also discusses the case study of Hamirpur Solid Waste Management Plant and process of treatment of organic or biodegradable into compost fertilizer.

Keywords: Solid waste; management; treatment; hazard etc.

I. INTRODUCTION

In the last century, different materials developed and became important part of life. This includes things like plastic for packings, paper of daily uses, electronic wastages and many more. Due to fast growth in urbanization, industrialization and population, the generation rate of municipal solid waste in Indian cities and towns is also increased (Gupta, Yadav, & Kumar, 2015). Human actions create waste and these wastes are moved, stockpiled, collected and disposed of, which can pose risks to the environment and to public health. (Saxena, Srivastava, & Samaddar, 2003).

II. SOLID WASTE

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional) according to its contents (organic material, glass, metal, plastic paper etc) or according to hazard potential (toxic, non-toxin, flammable, radioactive, infectious etc). The high organic or biodegradable waste portions in the solid waste can lead to recapture of energy by applying proper processing options, but on the other side, it can create pollution problem if it is disposed of without adopting any control measures (Dhar, Kumar, & Kumar, 2017).

III. CHARACTERISTICS OF INDIAN SOLID WASTE

In India like all other sectors there is a marked distinction between the solid waste from urban & rural areas. However, due to ever-increasing urbanization, fast adoption of 'use & throw concept' and equally fast communication between

urban & rural areas the gap between the two is diminishing. The quantity of solid waste generated ranges from as low as 50 to 100 g per head per day in a tribal area to as high as 500 to 700 g per head per day in urban areas and metro cities of the country.

IV. SOLID WASTE MANAGEMENT

Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effective management of waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal. In India, the per capita waste generation is increasing by 1.3% per annum. The yearly increase in waste generation is around 5 % (Ghatak, 2016). The amount of waste can be reduced from its source regardless of the methods (composting, recycling etc.) (Budiman, 2017).

V. NEED OF SOLID WASTE MANAGEMENT

The key instruction and guiding manual for Municipal Solid Wastes (MSW) management in India is the Municipal Solid Wastes (Management and Handling) Rules, 2000 under the Environment Protection Act, 1986. Under this regulation, every municipal authority is responsible for collection, segregation, storage, transportation, processing, and disposal of MSW. State and local legislation, that govern municipal authorities also include special provisions for collection, transport, and disposal of waste (Potdar et al., 2015). Disposing solid waste out of site does not solve the problem but indirectly increases the problem manifold and at a certain point it goes beyond the control. The consequences of this practice can be listed as:

1) Health hazards,

- 2) Pollution of soil, water, air & food,
- 3) Unpleasant surroundings,
- 4) Loss of precious resources that could be obtained from the solid waste.

For SWM a community-based approach is needed, so that the waste can be treated before it creates problems at larger levels.

VI. BASIC PRINCIPLES OF SOLID WASTE MANAGEMENT

6.1 3R: Reduce, Reuse & Recycle

Reduce – First ‘R’ of ‘3R’ stands for the suggestion to all human being that alter your lifestyle so that minimum garbage is generated. Which result in better management and disposal?

Reuse – Second ‘R’ of ‘3R’ stands for another step towards making secondary use of different articles. Like reuse of plastic and glass bottles.

Recycle – Last ‘R’ of ‘3R’ stands for remediation of mistake which is done. In this context it means convert the recyclable garbage into manures or other useful products.

6.2. Segregation at source

Segregation of solid waste reduces the amount of waste and the treatment intricacies. Storing organic or biodegradable and inorganic or nonbiodegradable solid waste in different bins separately helps in treating them efficiently and recycling of all the components with minimum labour and cost.

6.3. Different treatments for different types of solid wastes

The treatment techniques of wastes must be as per its suitability of the given type of garbage. For example, the technique suitable for general market waste may not be suitable for slaughter house waste.

6.4. Treatment at nearest possible point

The solid waste should be treated in as isolated way as possible. The garbage generated should be treated preferably at the site of generation i.e. every house or at community level or very small-town level.



Figure 1 Solid waste management hierarchy

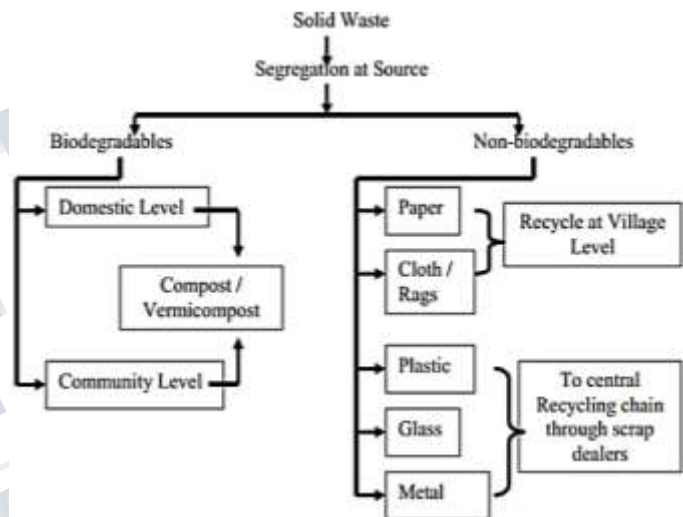


Figure 2 An ideal Solid Waste Management at a glance

VII. SOLID WASTE MANAGEMENT PLANT HAMIRPUR, HIMACHAL PRADESH

Hamirpur is a town with 17700 populations, in state of Himachal Pradesh in India (Census of India, 2011). Hamirpur is on an elevation of 700mt to 1250M from sea level. The temperature varies from 01 OC in winter to 39 OC in summer and the humidity varies from 18% to 67%. This range of temperature and humidity classifies it into temperate climatic Zone (Bansal & Minke, 1995). As per Action Plan for Municipal Solid Waste Management Himachal Pradesh total collection of wastage in Hamirpur is 15 TPD (Tones Per Day) (Urban Development, 2017).



Figure 3 Solid Waste Management Plant Hamirpur, Himachal Pradesh, India

7.1 Location of Solid Waste Management Plant

Solid Waste Management Plant is located in the vicinity of Hamirpur. It is having capacity of 114 Tons at a time. So, in cycle it always has space for new waste of the city.



Figure 4 Location of Solid Waste Management Plant at Hamirpur

Source: Google maps

7.2 Solid waste management plant for organic or biodegradable

This plant was made for the management of the organic or biodegradable waste of the city which is collected from municipal garbage bins on daily basis (Municipal Council, 2017).



Figure 5 Plan of Solid Waste Management Plant

7.3 Process of solid waste treatment

Collected wastage from the market and door to door is stored in an area after that recyclable waste is transported to the vendors for sale. Organic or biodegradable waste is again separated into the different parts:

- a type- Early degradable (3-10 days)
- b type- Medial degradable (within 3-4months) and
- c type- Long-time degradable (4-6 months).



Figure 6 Cells for Solid Waste

After segregation of the wastage it is kept into different cells. Cell is about 1.5M wide and 3.00M long with height of 2.1M, covered with G.I. Sheets. The entire process that takes place in a cell is described hereunder.

Step 1

In first month 'c type' waste is kept on first level and then above this 'b type' waste is placed in the cell. Watering is done with water sprinklers for every 3 hours to make the decompose process fast.

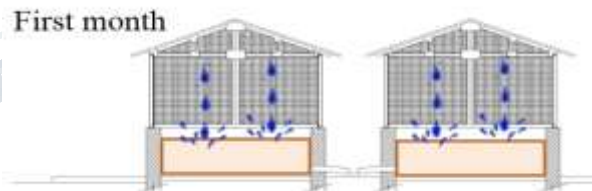


Figure 7 step one collection and placed in cells

Step 2

After one-month step 2 take places in which same waste is somewhat decomposed and top layer is ready so second layer brings up at top with water sprinkling done on it at gape of 4-6 days depends upon the situation. This time waste turned bit darker in colour and less in volume.

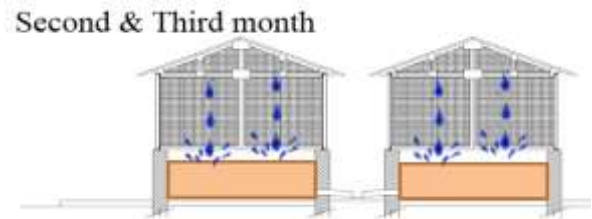


Figure 8 step two change in the layers within the cells

Step 3

At this level most of the waste turns into compost and the colour turns into brown. Only few part of waste remains to be decomposed. Now, in this step water sprinkling is reduced and generally carried in 15 days.

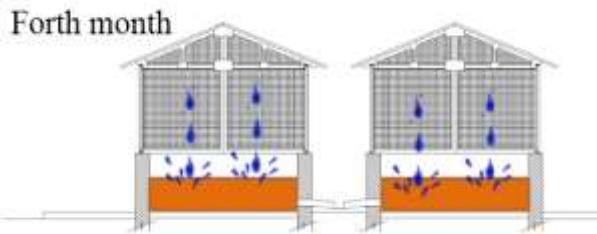


Figure 9 step three change in the layers within the cells and reduction in quantity and water.

Step 4

Step 4 is the last step of entire process. At this level color of waste turns into blackish brown and it is left for getting dry. Now it is taken out and processed for sale in the market as compost fertilizer.

Fifth & Sixth month



Figure 10 step four water sprinkling has been stopped and wastage is left to get dry.

VIII. CONCLUSION

This study shows that a well-designed Solid Waste Management Plant in towns like Hamirpur can solve the issue of waste management to a great extent. For large cities such Solid Waste Management Plants can be installed at different parts of the city. These plants can also have some added area like recycling and decomposing training facilities to aware local people. It is very important to treat waste before it outgrows in size and put challenging problems, difficult to solve.

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