



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2017; 5(3): 89-92
 © 2017 JEZS
 Received: 15-03-2017
 Accepted: 16-04-2017

Aditya Sharma
 Research Scholar, Department of
 Chemical Engineering, UECU,
 Madhya Pradesh, India

Dr. Alka Srivastva
 Research Scholar, Department of
 Chemical Engineering, UECU,
 Madhya Pradesh, India

Dr. Parag Dalal
 Associate Professor, Department
 of Chemical Engineering, UECU,
 Madhya Pradesh, India

Dr. JK Srivastva
 Head and Professor, Department
 of Chemical Engineering, UECU,
 Madhya Pradesh, India

Proposal of on - Site composting of MSW in Ujjain city

Aditya Sharma, Dr. Alka Srivastva, Dr. Parag Dalal and Dr. JK Srivastva

Abstract

Ujjain is the religious capital of Madhya Pradesh with the population density 330 (people/square km). Total solid waste generation in the city required 226 tons/day. Out of which 63% waste collecting from individual households (MSW). Huge amount of money is in the collection and transport of this waste to trenching grounds situated at 20 km apart from the city. Present study is an effort to find a technique for reducing hard some amount of solid waste which is being collected and transported. This purpose green technology is implemented which involve on-site composting of municipal solid waste and paper shredding for reusing. The results of the study demonstrated that 63% of municipal solid waste can be reduced to 33%.which is a substantial reduction. It can be achieved with green cleaning done at base level either colony wise or individual households.

Keywords: Municipal solid waste (MSW), green cleaning, on-site composting, shredding, households

Introduction

Rapid increase in population and change in life style and consumption pattern in India have resulted in a dramatic increase in municipal solid waste (MSW) [1]. Municipal solid waste management (MSW) is non-hazardous substance generated from daily activities of human life. Sources of MSW are household, Industrial, commercial and institutional sectors, market, yards and streets. Generally, solid waste is heterogeneous in nature such as mixture of vegetable, food items, paper, plastics, rags, glass etc [2].

Present Scenario of the City

The solid waste from Ujjain city is rising day by day due to population explosion in Ujjain has led to the migration of people from villages to cities consequence increase in the waste from 340kg/day(2005) [3] to 226 tons/day (2017).

Municipal area of the Ujjain city is 93sq km and Population is 5, 15,215 as per 2011 census. Per capita waste generation ranges from the city between 0.37 to 0.45 kg/day. Ujjain municipal area is been divide into six zone and 54 wards. One deputy commissioner, two health officers and five sanitary inspectors are working in the city as municipal officers for sanitation and waste management of city.

Solid Waste Management in the City

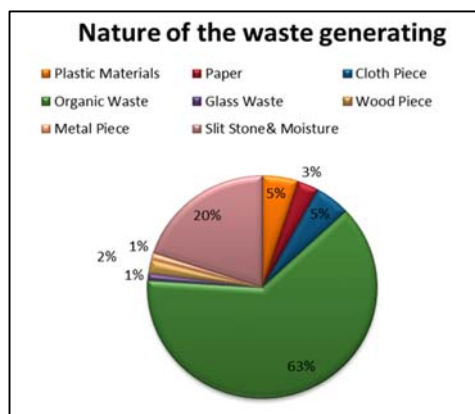


Fig 1: Nature of the Waste Generating

Correspondence
Aditya Sharma
 Research Scholar, Department of
 Chemical Engineering, UECU,
 Madhya Pradesh, India

As depicts from the above table approximately 63% of organic waste is been generated in the city. Our research will pay more focus on the management of this organic waste.

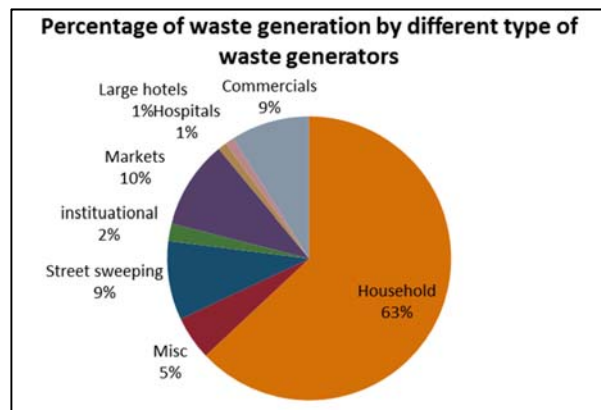


Fig 2: Types of the Waste Generating from the City

Collection and Transportation of MSW

For a proper collection management of solid waste Ujjain Municipal Corporation undertake the primary collection which is done from door to door steps basis of the household/commercial area daily by equipments like mini-tippers, hand-crafts etc, which has been deployed in every area of a single ward distributed equally all over the city depending on mass-density ratio. The secondary transportation is done through by deploying heavy vehicles for bulk transportation. In addition to it two modular transfer stations are situated at MR-5 Maksi road bypass and Gaughat consisting of hook loaders, compactors etc which contracts msw for transportation. The door to door vehicle collection lifting and transportation of MSW from UMC is done for a tenure of 10 years as per MSW rules 2000. Table 1 shows the types of vehicle in the Ujjain city. UMC has 76 mini-tippers with the size of 3cubic meter and 15 compactors with the capacity of 1300kg each.

Table 1: Types of the vehicle running in the Ujjain city are

S. No.	Types of Vehicles	Number of Vehicles	No. of trips per day
1	Mini Tipplers	76	3
2	Hook Loader	05	1
3	Compactors	15	2
4	Dumper Placer.	02	3

Waste Processing and Disposal

All compacted MSW is been transported to Gondia trenching ground about 20 km away from the Ujjain city. Waste are being processed in the four steps, as the waste send to the trommel where 100 mm of organic waste is segregated from the remaining plastic, paper etc. this 100mm of organic waste goes for the window composting and final output which will be turned into organic manure size between 2 to 4mm are being sold in the market while unprocessed waste are being dumped in the 4 meter deep pit which is 140 meter long and 120 meters wide.

At present MSW composting Plant is operational at Gondia (Ujjain) but the cost of collection transportation and processing of MSW is very high. This cost can be reduced by using green technology of MSW. Green cleaning is a new, promising approach to environmental cleaning that aims at reducing harm to human health and the environment while maintaining and improving the hygiene of the healthcare

environment. While a growing number of healthcare facilities are adopting green cleaning practices [4]. Green cleaning also involves providing on site composting pits for bulk organic waste generators at their sources.

Materials and Methods

Composting pits for bulk generators of organic waste

This method involves making compost in pits that have been dug in the ground. The best depth for a pit varies according to local soil conditions and the depth of the water table. A typical pit would measure 1.3 to 2m wide, 1.5m deep and 3m length depending on site area available. The pit can be lined with a thin layer of clay to reduce water loss and lechate. Often, several trenches are dug next to each other, to allow turning from one pit into the next. Material should be placed in the pit in layers as described below.

The layering is as follows

1. 10 cm of material, which is difficult to decompose (twigs, stalks)
2. 10 cm of material which is easy to decompose (green and fresh)
3. 32 cm of animal manure (if available)
4. A thin layer of soil from the surface of arable land to obtain the micro-organisms needed for the composting process
5. Repeat these layers until the heap reaches to top.
6. Cover with grass or leaves (such as banana leaves) to prevent water loss.

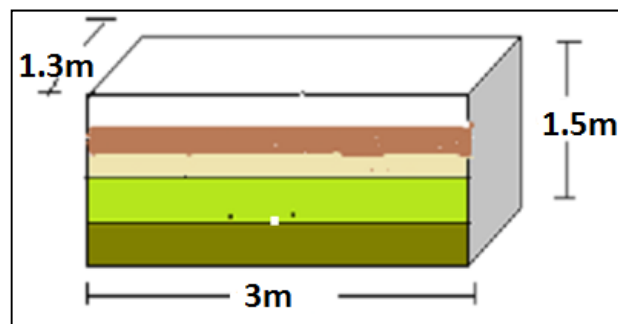


Fig 3: Shows composting pit

Proposed Composting Pots for House Holds

For individual house hold 3ft×3ft×3ft composting pots are ideal size. We can use pots of any materials like ceramic, terracotta and plastic etc. soil even degraded or old soil from our garden can be used. old metal plates can be used as lids as they are waterproof but used cardboard, old thick polythene sheets or old rags of carpet would needed to cover the pots. Dish placed at the bottom of the pot for indoor composting.



1. Take any used flower pot with holes at the bottom for drainage and aeration. Put a layer of coconut husk (or other material like cork) that decomposes more slowly at the bottom to prevent too much moisture coming out of the pot. Cover with a layer of soil about 5 cm thick.



2. Put all your kitchen waste for the day over this soil:



3. Cover the waste well with soil:



4. You can start all over again with another layer of waste the next day:



5. And repeat by completely covering with another layer of soil. This will ensure there are minimal flies and smell. As you keep layering waste and soil alternately, you will have to stir the contents once or twice a week to ensure proper aeration:



6. Always keep the pot covered with a metal lid or thick cardboard or old rags of carpet. I tend to use metal because it's waterproof and so we can control the amount of moisture in the pot better when it's exposed to sun and rain.



We may keep a series of pots and label them Pot 1, Pot 2, Pot 3 and Pot 4. As the first pot fills up, you can move on to the second, third and fourth. By the time the fourth is full, you'll find that it has been 6-8 weeks in a tropical climate and the first pot is properly composted. The compost that is being made in the pots is checked and managed to stir regularly once or twice a week.

Keep a dish under the pot to collect the excess moisture that will be released. This water is precious and can be used as fertiliser for plants. The outdoor pot on the grass, the water will directly go to the soil and fertilise it. Those with larger garden space can dig a hole and do the same process. Keeping the compost pit covered is a good idea to keep away pests and flies.

Conclusion

Materials for on-site composting are easily available so, it can be practiced at commercial area as well as individual homes with very little cost. The practice of on-site composting has three benefits: (a) It reduces the cost on the overall solid waste management system of the government and (b) Introduces on site recycling of the waste (c) Homemade fertilizer is ready for our garden.

We can construct two cemented On- site composting pits of size 5 meter long, 1 meter wide and 1.5 meter deep for every main vegetable markets like Chimanjanj Mandi (agar road), Badi Sabji Mandi (Jama masjid), fool Mandi Dudh Talai (Indore Gate) one pit for storing and the other for producing enriched compost with the use of earthworms. Each pit can store approximately 5 tonnes of solid waste such as disposed vegetables and fruits. It takes 3 to 4 weeks for it to get fully decomposed after that it would be transferred to the next process of producing compost. Apart from these vegetable markets, we have also listed out 5 major hotels which are generating solid waste more than 100 kg/day Municipal Corporation provided on-site composting pits of the same size

for them. Due to this decentralized composting system, solid waste generation has been reduced from 63% to 59%. If we apply this system in whole municipal area of the city for commercial as well as households individually then this waste generation can be reduced from 63% to 33%.

References

1. Ananthkrishnasamy, Sarojini SS, Gunasekaran G, Manimegala G. Flyash - a lignite waste management through vermicomposting by indigenous earthworms *lampito mauritii*, American-urasian journal agriculture & environmental science, 2009; 5(6):720-724.
2. Peter S, Karl W, Jorg C. Concetual framework for municipal solid waste management in low-income countries, 1st ed. St. Gallen: Swiss Centre for development in technology and management. 1996.
3. Dalal Parag. Sustainable development of holy city Ujjain, India by solid waste management, Journal of industrial pollution control, 2005; 21(2):127-132.
4. Quan Xiaobo. Joseph Anjali, Jelen Matthew, Green Cleaning in Healthcare: Current Practices and Questions for Future Research, Health care research collaborative, 2011, 3-51.
5. <http://www.ecowalkthetalk.com/blog/2010/07/21/part-1-how-to-compost-at-home-using-container-pots/>