

Remediation of Legacy Solid Waste Dump Site Techniques and Strategy.

¹Kailash V Lohar, ²Pratik G Kokate, ³Nagesh M Kumbhar, ⁴Rijwan R Bagwan, ⁵Milind K Pawar
Yuvraj B Khandagale (Asst. Prof. TCOER, Pisoli, Pune, Maharashtra, India)
^{1,2,3,4,5}Final Year Civil Engineering, TCOER, Pisoli, Pune, Maharashtra, India

Abstract : At present, the foremost major problem of pollution is the direct results of the act. Some metropolitan cities like metropolis, Calcutta, Bangalore, and Pune square measure showing typical urban pollution. Among these cities, Pune produces lots of abundance (1000-2000 mt/day) of Municipal Solid Waste (MSW). As there's no effective system to manage this daily mass generated as a waste, it's become a serious downside for Pune Municipal Corporation. Pune Municipal Corporation (PMC) disposes this solid waste at Uruli Devachi Depot that is twenty km far away from Pune town. Open dumps, unremarkably found in Asian countries, square measure land disposal sites at that solid wastes square measure disposed of in such a fashion that poses threat to the setting through its susceptible to open burning, and exposed to illness vectors and scavengers. The analytical knowledge showed that concentration of all water parameters in leachate is objectionable, that is a quite permissible limit of MPCB (Maharashtra Pollution management Board). Leachate may be a contaminated liquid emanating from the bottom of the lowland, that contains countless organic and inorganic compounds generated thanks to that serious spring water contamination was ascertained in wells. gift paper may be a case study of Uruli-Devachi (Open dump site), close to Pune wherever daily 1000–1200 tonnes of solid waste square measure disposed at Uruli-Devachi village, and also the web site was managing issues of frequent fires, smoke, flies, birds and unhealthy odour. PMC was spraying the waste with water to forestall fires, leading to even larger quantities of leachate generated thanks to that Serious spring water contamination was ascertained in wells.

IndexTerms - Biocomposting, Uruli Devachi,

INTRODUCTION

Solid waste contains unwanted and discarded materials from homes, street sweeping, industrial and industrial operations. Uncontrolled momentum of urbanization, industrialization, and modernization result in the generation of solid waste. There has been a big increase in solid waste generation in the Asian nation over the years from a hundred metric weight unit per person per day in little cities to five hundred grams per persons per day in giant cities. These increasing rates of waste generation stress on all infrastructural, natural and fund resources with adverse impacts on human health and setting thanks to the improper and pseudoscientific solid waste marketing. The pseudoscientific lowland website could scale back the bottom water quality, potable purity and causes the illness like nausea, jaundice, bronchial asthma, etc (Bean et al., 1995).

Pune is that the second largest quick developing urban agglomerations in the geographical region and ranks eight at the national level. In Pune Municipal Corporation (PMC) primary sources of waste square measure native households, industrial institutions, vegetable markets, hotels, restaurants, and hospitals. Pune Municipal Corporation generates a Brobdingnagian quantity of solid waste. The number of wastes generated per day is concerning 1400 to 1500 metric tons (approximate generation per capita per day is five hundred grams). This huge quantity is of waste poorly disposed and untreated. Pune town doesn't have scientific lowland and also the capability of Uruli Devachi dump site cannot offer the long run demand of the waste generated. It's a terribly vital issue to spot the appropriate location for the disposal of solid waste. Since the land is restricted resource, there's a shortage of land because the land costs square measure raising. Moreover, the sight of garbage isn't pleasing thus there's a great deal of opposition from the lots and a Hercules task for the municipality to make your mind up an area for marketing the rubbish. If the land is chosen on a scientific basis, there's less possible to own Associate in Nursing opposition to the place of marketing.

The general pattern of Municipal Solid Waste Management followed in the Asian nation is Generation, Collection, Transfer Station, Transportation, and Disposal. The quite common technique used for the disposal of municipal solid waste in the Asian nation is Open marketing. Several railroad cities in the Asian nation still observe the strategy of open marketing (Pune, Mumbai, larger Delhi). Only a few cities in the Asian nation has adopted the construct of the landfill (Bioreactor Landfill) (Surat, Ahmedabad, Vadodara). In several Asian countries, solid waste disposal technique still remains open marketing for reasons like the content of health risks related to marketing of wastes, acceptance of the standing thanks to lack of economic resources to try to something higher and lack of political can to safeguard and improve public health and also the setting. Many aged landfill sand dumpsites existing throughout the developing countries cause a threat to human health. “Leachate “refers to liquids that migrate from the waste carrying dissolved or suspended contaminants. Leachate results from precipitation getting into the lowland and from wetness that exists within the waste once, it's disposed of. Contaminants within the buried refuse could result from the disposal of commercial waste, ash, waste treatment sludge, social unit venturesome wastes, or from traditional waste decomposition.

Study Area

Pune Municipal Corporation lies between latitudes 18°25'N and 18°37'N and longitudes between 73° 44'E and 73°57'E and the geographic region is over 243.84 Sq. km with a population of 3.1 million (according to Census of India, 2011). currently, there

are 34 villages added in Pune Municipal Corporation therefore after state government notification area of Pune Municipal Corporation over five hundred Sq. Km. Pune has had ancient old-economy industries, that still grow. Pune is the cultural capital of Maharashtra since the after independence. the city is currently also well-known for data technology and the academic hub that attract migrants and students from alternative places.

Pune city located at AN altitude of 560 meters higher than mean sea level (MSL) on the western margin of the Deccan tableland. the city is delimited by Thane district to the north-west, Raigad district to the west, Satara district to the south, Solapur district to the south-east and Ahmednagar district to the north and north-east (Fig 1)

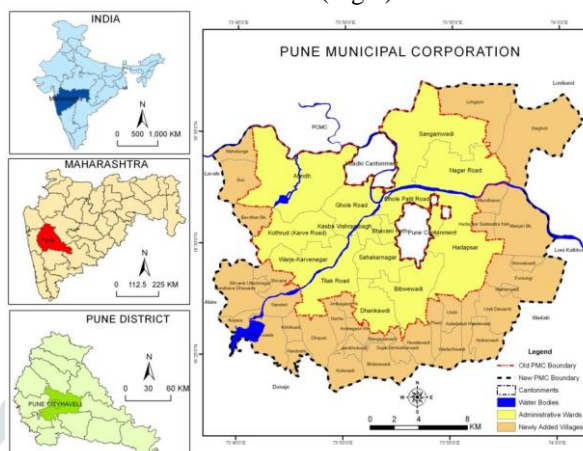


Fig 1: Location Map of Study Area

Percentage of components for Pune city

Sr. No.	Component	Percentage (%)
1	Organic Matter	69.35
2	Plastic	7.1
3	Paper	6.9
4	Cloth	7.8
5	Metal	0.7
6	Glass	7
7	Inert Material	1.2
	Total	100



Fig. 2 : Photograph of Uruli Devachi landfill site for Pune

Leachate

“Leachate “refers to liquids that migrate from the waste carrying dissolved or suspended contaminants. Leachate results from precipitation coming into the landfill and from wetness that exists within the waste once, it's disposed of. Contaminants within the buried refuse could result from the disposal of industrial waste, ash, waste treatment sludge, household dangerous wastes, or from traditional waste decomposition. If uncontrolled, landfill leachate may be liable for contaminating well water and surface water. The composition of leachate varies greatly from vary among a specific site. some factors affecting composition include

- Age of landfill
- Types of waste
- Degree of decomposition that has taken place
- Physical modification of the waste (e.g. shredding).

Once well water is contaminated, it's terribly expensive to wash up. Today’s landfills, therefore, endure rigorous surveying, design, and construction procedures that give several safeguards for the management of leachate migration. Pune city contains several industrial industry hotels, residential buildings moreover as high population that generates zero.12 kilogram of waste per capita/day (Personal communication with PMC workplace Pune). The municipal solid waste is heterogeneous in nature and contains papers, Plastics, rags, metals, glass pieces, ashes, and flammable materials. additionally, to those it conjointly contains alternative substances like scrap materials, dead animals, discarded chemicals, and paints, venturous waste generated

from hospitals, industries, and agricultural residues. The waste generated from biomedical waste, clinics, hospitals, nursing homes, pathological laboratories, blood banks, and veterinary centers has conjointly been disposed of in conjunction with municipal solid waste at the disposal site. This waste is dangerous to the individual and surroundings. Pune Municipal Corporation disposes this waste of Pune city at Mantarwadi (Uruli-Devachi depot) that is 20 km far from Pune city. Approximately 1200-1300 metric a lot of solid city waste from Pune municipal space is disposed per day at Mantarwadi (Uruli-Devachi village). Throughout the first period, MSW was conveniently disposed off at Mantarwadi disposal site in low-lying areas with a giant open land area. The pseudo-scientific disposal of solid waste created several environmental downsides during this space. It resulted in air pollution and well water pollution issues. The ground water near to disposal site in Uruli-Devachi village is no longer safe for domestic use (drinking, outside bathing, propagation of aquatic life, industrial cooling and for irrigation). It's been found that because of waste disposal the individuals living in this area face several environmental and health issues.

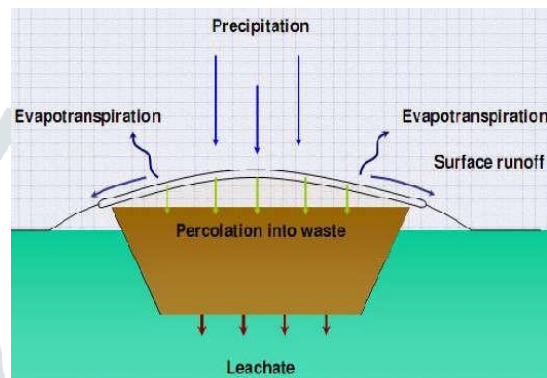


Fig.1 Outline of the process to generate leachate



Fig. 2 Leachate Sample (Source : Self, Uruli Devachi)

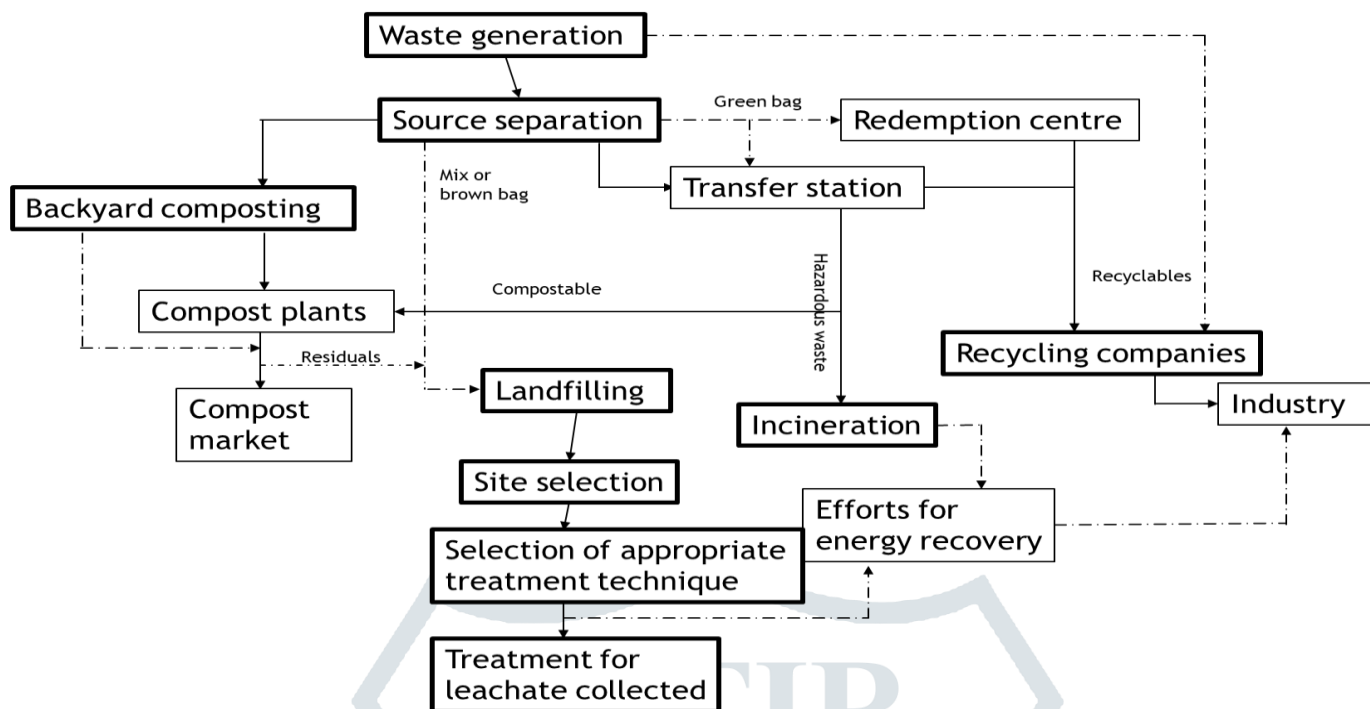


Fig. Outline of Collection to treatment of Waste (Source : Self)

Compost

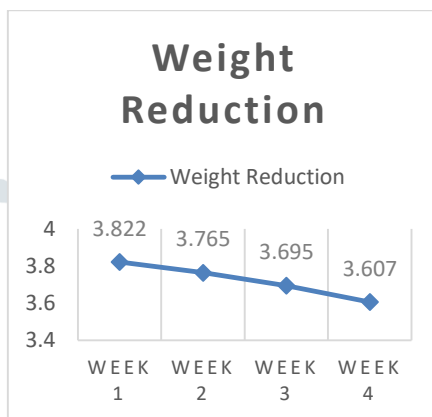
Compost is organic matter that has been decomposed in a process called composting. This process recycles various organic materials otherwise regarded as waste products and produces a soil conditioner.

Compost is rich in nutrients. It is used, for example, in gardens, landscaping, horticulture, urban agriculture and organic farming. The compost itself is beneficial for the land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil. In ecosystems, compost is useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover.

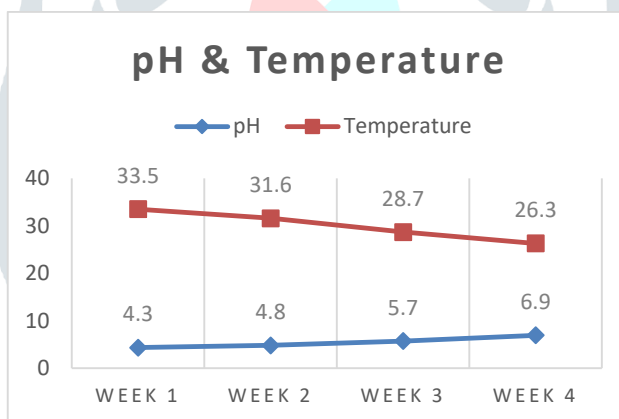
At the simplest level, the process of composting requires making a heap of wet organic matter (also called green waste), such as leaves, grass, and food scraps, and waiting for the materials to break down into humus after a period of months. However, composting also can take place as a multi-step, closely monitored process with measured inputs of water, air, and carbon- and nitrogen-rich materials. The decomposition process is aided by shredding the plant matter, adding water and ensuring proper aeration by regularly turning the mixture when open piles or "windrows" are used. Earthworms and fungi further break up the material. Bacteria requiring oxygen to function (aerobic bacteria) and fungi manage the chemical process by converting the inputs into heat, carbon dioxide, and ammonium.

Description	Bio Composting
Weight of Biocultural Given (Grams)	250
Wt. Of Waste Initial (Kgs)	4
Wt. Of Waste 1 st Week (Kgs)	3.822
Wt. Of Waste 2 nd Week (Kgs)	3.765
Wt. Of Waste 3 rd Week (Kgs)	3.695
Wt. Of Waste 4 th Week (Kgs)	3.607

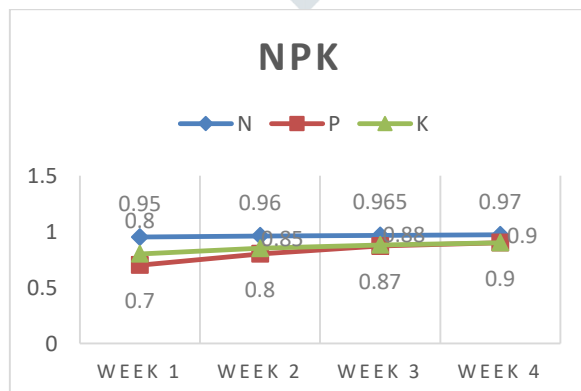
Parameter	4 th Week Composting Bio
Moisture Content	52.30%
C/N Ratio	8.21
pH	6.9
Temperature	26.3
N(%)	0.95-0.97
P(%)	0.7-0.9
K(%)	0.8-0.9
Organic Carbon(%)	7.89



Graph showing variation in Weight Reduction weekly



Graph showing variation in pH & Temperature weekly



Graph showing variation in NPK Values weekly

Conclusion

It is observed that Pune city is generating a substantial amount of low strength organic solid waste and is in necessitate adopting a technology to treat it at source to yield energy. Currently approximately 70-75 Crore rupees per year are spent on solid waste management system which can be reduced by application of better technologies. For collection and conveyance of municipal solid the amount spent on diesel per tones of municipal solid waste is Rs. 90-100. It helps to achieve source reduction of organic waste generated from the different strata of the city. Sustainable solution to the intense problem of solid waste in the city.

Application of this organic manure into the soil, the soil carbon may be return directly to the atmosphere from the soil when the organic material in which it is held is oxidized by decomposition. Soil Carbon has a potential as an atmospheric carbon sink to offset climate change. Soils have the ability to retain carbon that may otherwise exist as atmospheric CO₂ and contributes greenhouse warming.

References

1. Rajkumar Joshi¹ and Sirajuddin Ahmed (17 February 2016) "Status and challenges of municipal solid waste management in India"
2. Abhishek Nandan, Bikarama Prasad Yadav, Soumyadeep Baksi, Debajyoti Bose (18 January 2017) "Recent Scenario of Solid Waste Management in India" (World Scientific News WSN 66 (2017) 56-74 ; EISSN 2392-2192)
3. Abdulkadir Kan (25 February 2009) "General characteristics of waste management: A review" (Energy Education Science and Technology Part A: Energy Science and Research 2009 Volume (issues) 23(1): 55-69)
4. Mufeed Sharholy, Kafeel Ahmad, Gauhar Mahmood , R.C. Trivedi (12 April 2007) "Municipal solid waste management in Indian cities" (Science Direct Waste Management Volume 28, Issue 2, 2008, Pages 459-467)
5. Dr. Sadia Afroz Mukti (November, 2013) "Solid Waste Management In Dhaka City: Problems And Prospects" (Volume 2; Issue 11; ISSN: 2278 – 0211)
6. Tunmise A. Otitoju, Lau Seng "Municipal Solid Waste Management: Household Waste Segregation in Kuching South City, Sarawak, Malaysia" (Volume 3; Issue 6; Page No. 82-91; ISSN: 2320-0847)
7. Subhasish Chattopadhyay, Amit Dutta , Subhabrata Ray (12 December 2008) "Municipal solid waste management in Kolkata, India" (Science Direct; Waste Management Volume 29, Issue 4, April 2009, Pages 1449-1458)
8. K. Naresh Kumar, Sudha Goel (19 November 2008) "Characterization of Municipal Solid Waste (MSW) and a proposed management plan for Kharagpur, West Bengal, India" (Science Direct; Resources, Conservation and Recycling Volume 53, Issue 3, January 2009, Pages 166-174)
9. A Rummyantseva, M Berezyuk, N Savchenko and E Rummyantseva "Modern technologies of processing municipal solid waste: investing in the future" (IOP Conf. Series: Earth and Environmental Science 72 (2017) 012015 doi :10.1088/1755-1315/72/1/012015)
10. Wajeeha Saleem, Ayesha Zulfiqar, Muneeba Tahir, Fatima Asif, Ghazala Yaqub "Latest technologies of municipal solid waste management in developed and developing countries" (Volume 1; Issue 10; Page No. 22-29; ISSN: 2455-4227)