

Solid Waste Management and Landfill Design

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Abstract:- Solid waste management has been one of the neglected areas of urban management activities in India, in cities and towns hardly 50 per cent of the solid wastes generated are collected, transported and disposed off, giving rise to insanitary conditions and diseases. Efficient garbage collection, transportation and disposal are among the vital functions of Urban Local Bodies. Despite the fact that a large number of staff is employed by them to discharge this function and a substantial portion of their annual budget is spent only on garbage collection, transportation and disposal, the situation in towns and cities remains far from satisfactory, the issue of recycling of solid waste has not received due attention. With the solid waste generation with time, the importance of recycling needs to be recognized and given due importance.

Waste landfills can cause both immediate environmental impacts through geotechnical-related failures as well as long term damage from leakage of unacceptable levels of contamination. Landfill design and operational practices can be used, sometimes in combination with Municipal Solid Waste(MSW) pre-treatment techniques, to control effectively landfill behaviour.

I. INTRODUCTION

Management of municipal solid waste involves (a) development of an insight into the impact of waste generation, collection, transportation and disposal methods adopted by a society on the environment and (b) adoption of new methods to reduce this impact.

A landfill site (also known as a tip, dump, rubbish dump, garbage dump or dumping ground and historically as a midden) is a site for the disposal of waste materials by burial and is the oldest form of waste treatment. Historically, landfills have been the most common method of organized waste disposal and remain so in many places around the world.

- ❖ The stench emanating from the landfill is unbearable and it becomes worse when the climate is windy and in the rainy season.
- ❖ The groundwater which is the source of drinking water and irrigation has been contaminated by toxic sludge, which not only causes health risks but also ruins the crops.

The measurements of the Mandur landfill area are as follows:

PERMIMETER	1518 m
AREA	102550 m ²
VOLUME	11581844.51 m ³

II. MANDUR LANDFILL

The plant located in Mandur Garbage Dump Yard, is a part of the city of Bangalore. Mandur is a place situated in Bengaluru East Tehsil. It is one of the Villages in Bengaluru East surrounded by villages like Kodigehalli, Nimbekaipura, Raghuvanahalli etc., about 25 kilometers from downtown Bangalore.

The landfill in Mandur has the following problems:

III. INTEGRATED MUNICIPAL SOLID WASTE MANAGEMENT

The Integrated Solid Waste Management (ISWM) system is based on the 'waste management hierarchy', with an aim to reduce the amount of waste being disposed, while maximizing resource recovery and efficiency.

- ❖ **At Source Reduction And Reuse At Source**

The most preferred option for waste management is to prevent the generation of waste at various stages including at product

design stage, production, packaging, use and reuse stages of a product.

❖ **Waste Re-cycling**

Recovery of recyclable material resources through a process of segregation, collection and re-processing to create new products is the next preferred alternative.

❖ **Waste To Composting**

The organic fraction of waste can be composted to improve soil health and agricultural production adhering to FCO norms.

❖ **Waste-To-Energy**

Where material recovery from waste is not possible, energy recovery from waste through production of heat, electricity, or fuel is preferred.

❖ **Waste Disposal**

Remaining residual wastes at the end of the hierarchy, which are ideally comprised of inserts, are to be disposed in sanitary, lined landfills, which are constructed in accordance with stipulations of the MSW Management and Handling Rules.

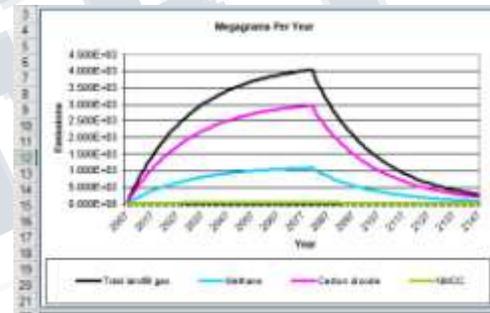
simple hydrocarbons.

Landfill gases are the result of three processes:

- ❖ Evaporation of volatile organic compounds (e.g., solvents)
- ❖ Chemical reactions between waste components
- ❖ Chemical reactions between waste components

MANDUR Gas Emission

The gas collected in Mandur is calculated using the software Land Gem and is computed as follows:



From the graph the gas emitted is approximated to be 1000 mega grams/year. Therefore, the emission per day=10000/365=27.39 mega grams/day=27390 kg/day. Since the landfill gas has been escaping over the years a PASSIVE GAS COLLECTION SYSTEM is recommended.

The passive gas system has the following specifications:

- ❖ Well should be constructed of PVC or HDPE.
- ❖ Well should be a minimum of 100 mm in diameter.
- ❖ The pipe should be placed in the centre of a 300 - 600 mm diameter borehole.
- ❖ The pipe should be backfilled with gravel to a level of 3 foot (.3 to 1 m) above the perforated

IV. COMPOST FLOWSHEET

Weight	Windrow	Transfer by	Removal of	Size	Packing
bridge	Yard	Tractor trailer	Contraries	Reduction	Sale

Landfill Gas

Landfill gas is a complex mix of different gasses created by the action of microorganisms within a landfill gas is approximately forty to sixty percent methane, with the remainder being mostly carbon dioxide. Trace amount of other volatile organic compounds comprise the remainder (<1%). These trace gases include a large array of species, mainly

or slotted section.

Flares

Since the volume of gas is less, we can go for a Candlestick flare since it is more economical and also has a gas destruction percentage of 98%.

The specifications of the Candlestick flare are:

- ❖ The candlestick flare system must be capable of achieving the following performance requirements:
- ❖ The flare must be capable of sustaining stable combustion with 30% - 50% CH₄ at the maximum required flow rate.
- ❖ The flare must be capable of a minimum 40:1 turndown.
- ❖ Flame length shall be determined and be based on the maximum design heat release with allowances for the molecular weight.
- ❖ The pressure loss through the flare must be less than 120 mm from the inlet flange through the outlet of the flare.

V. LANDFILL LEACHATE

Mandur Leach ate Management

The leach ate formed in Mandur has the following characteristics:

Parameter	Initial Results
pH	9.75
Electric conductivity in mhos/cm	87000
TDS mg/L	56000
BOD mg/L	6700
COD mg/L	21500
Sulphates as SO ₄ mg/l	316
chloride as Cl mg/l	8942.35
Calcium as Ca, mg/L	92.18
Total alkalinity as CaCO ₃ mg/L	13200
Iron as Fe mg/l	11.16
Zinc as Zn, mg/L	1.67
Nickel as Ni, mg/l.	6
Sodium as Na, mg/L	15062.5
Potassium as K, mg/L	18427.5
Nitrate as NO ₃ mg/L	3068

VI. CONCLUSION

Barring a few progressive municipal corporations in the country, all other local bodies suffer due to non-availability of adequate expertise and experience; thereby the solid waste is not properly handled resulting into creation of environmental pollution and health hazards. As mentioned earlier, these local bodies lack technical, managerial, administrative, financial resources, adequate institutional arrangements.

The term 'landfill' can be treated as synonymous to 'sanitary landfill' of Municipal Solid Waste, only if the latter is designed on the principle of waste containment and is characterised by the presence of a liner and leachate collection system to prevent ground water contamination. The term 'sanitary' landfill has been extensively used in the past to describe MSW disposal units constructed on the basis of 'dump and cover' but with no protection against ground water pollution.

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