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STUDY ON ENGINEERING LANDFILL IN HYDERABAD WASTE MANAGEMENT PROJECT AT DUNDIGAL, HYDERABAD

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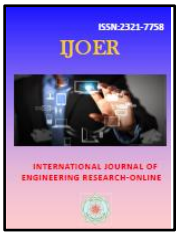

ABSTRACT
Hyderabad Waste Management Project certified in Environmental Management Systems as per ISO:14001:2004. And laboratory accredited by NABL (as per ISO/IEC 17025:2005) ISO 9001 – Quality systems. The Project Cost was 45 Crores. The available facilities are Landfill & Incineration. The concession period is 99 years. The project promoter is REEL. The firstly started operations are Landfill from Sep'2001 and Incineration from Aug'2006.The Infrastructure was Secure Landfill, Waste Storages, Waste Treatment Facilities, Comprehensive Analytical Laboratory, Earth Moving Equipment, Incinerator, Leachate Management & other infrastructure. HWMP manages its activities of Collection, Transportation, Treatment, Storage and Disposal of hazardous waste, in such a manner to ensure the Health. Safety and others (including visitors, contractors, and the public) who may be affected by its activities in conformance with OHSAS – 18001. HWMP shall ensure that this will be achieved by the following mater, that is by providing a safe premises, plant, equipment and safety system that ate safe and do not involve any risk to health. By providing sufficient instructions, information, training to all employees. By consulting workmen on measures for ensuring health and safety at work place. By carrying out a comprehensive risk assessment to develop safe systems and procedures. By confirming to the relevant legislation and codes of practices of India.

KEYWORDS: Landfill, Hazardous waste, Liners

Introduction

The hazardous waste management (HWM) is a very important issue and is assuming significantly globally. There is no proper secured landfill facility available in India to dispose of hazardous waste (HW) till 1997. Very few industries in India, mostly in large scale and a few in medium scale, own proper treatment and disposal facilities. A common waste treatment and disposal facility such as Treatment, Storage and Disposal Facility (TSDF) for management of HWS generated from industries , is one of the useful options under such conditions. The planning for HWM comprises of several aspects ranging from identification and quantification of HW to development and monitoring of TSDF.

Engineered landfills play a vital role in waste management by providing a repository for suitable solid industrial wastes and residues. some wastes are suitable for direct disposal to landfill, others must be pre treated to modify their physical or chemical characteristics. Landfill of industrial liquid wastes and sludge's is not a desirable practice and has been prohibited in many countries throughout the world. This has encouraged better methods of these materials; however such treatments often produce a solid or semi- solid residue which is not acceptable for direct disposal in a landfill.

Hazardous waste is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes encompass a wide variety of materials. In 1987, the US EPA estimated that approximately 238 million tons could be classified as hazardous. This number is probably generous but suffice it to say that a great deal of material of a hazardous and dangerous nature is generated and disposed of every year. The Resource Conservation and Recovery Act defines a hazardous waste as a solid waste that may cause or significantly contribute to serious health or death, or that poses a substantial threat to human health or the environment when improperly managed.

MATERIALS AND METHODS:

Landfill may be defined as a method of disposing of refuse on land without creating a nuisance or hazards to public health. Employing an engineered method of disposing of wastes on land.

Landfill may refer to ground that has been filled in with and rocks instead of waste materials; so that it can be used for a specific purpose such as for building houses. Unless they are stabilized.

LANDFILL TECHNOLOGY:

This technology minimizes environmental hazards by spreading the wastes to the smallest practical volume and applying and compacting cover material. Depending upon the type of waste the landfill may be divided into Sanitary landfill (disposal of the domestic municipal waste) Secured landfill (hazardous waste)

SECURED LANDFILL:

This type of landfill is similar to that of sanitary landfill with some exceptions.

BASIC ASPECTS IN LANDFILL IMPLEMENTATION:

SITE SELECTION:

Hazardous waste landfills should preferably be located in areas of low population density, low alternative land use value, low ground water contamination potential and at sites having high clay content in the subsoil.

SITE INVESTIGATION CRITERIA: The data collected during site selection is not sufficient for landfill design. To be able to undertake detailed design of a landfill at a selected site, it is essential to characterize the landfill site and evaluate the parameters required for design. It is necessary that all data listed in Section 3.0 (iii) on "preliminary data" be collected for site characterization. If some data has not been collected, the same should be obtained before site investigations are undertaken for characterization

Subsoil Investigation:

A detailed investigation plan may be drawn up in consultation with a geotechnical engineer. The output from such an investigation should yield the following:

- Stratification for subsoil – type of soil and depth.
- Depth to ground water table and bedrock (if located within 15m of base of landfill).
- Permeability of various strata beneath the landfill.
- Strength and compressibility properties of subsoil.
- Extent of availability of liner material, drainage material, top soil and protective soil in adjacent borrow areas.

Subsoil properties along approach road.

A minimum of 3 boreholes per hectare of landfill area up to 15m beneath the base of the landfill shall be drilled and in situ tests as well as laboratory tests shall be performed for permeability, strength, compressibility and classification of soils.

SITE PLANNING & DESIGN CRITERIA:

Essential Components:

- A HW landfill shall have the following seven essential components.
- A liner system at the base and sides of the landfill, which prevents migration of leachate or gas to the surrounding soil.
- A leachate collection and treatment facility, which collects and extracts leachate from within and from the base of the landfill and then treats the leachate to meet standards, notified under E (P) Act 1986.
- A gas collection and treatment facility (optional), which collects and extracts gas from within and from the top of the landfill and then treats it or uses it for energy recovery.
- A final cover system at the top of the landfill, which enhances surface drainage, prevents infiltration of water and supports surface vegetation.

- A surface water drainage system, which collects and removes all surface runoff from the landfill site.
- Design Life:
- A landfill design life will comprise of an 'active' period and an 'closure and post-closure' period. The 'active' period shall be comprise of the period for which waste filling is in progress at the landfill and typically range from 10 to 25 years depending on the availability of land area. The 'closure and post-closure' period for which a landfill will be monitored and maintained shall be 30 years after the 'active period' is completed.

There is no standard method for classifying landfills by their capacity. However, the following nomenclature is often observed in literature:
Small size landfill : less than 5 hectare area .
Medium size landfill :5 to 20 hectare areas
Large size landfill :greater than 20 hectare area

Waste Volume, Waste Compatibility and Landfill Capacity:

The volume of waste to be placed in a landfill will be computed for the active period of the landfill taking into account (a) the current generation of waste per annum and (b) the anticipated increase in rate of waste generation on the basis on the basis of past records.

A landfill comprise of separate 'units'. In each unit, only compatible waste will be disposed.
Basic components of landfill:
Impermeable Liner System on the base and side.
Top cover.
Leachate collection, removal and treatment scheme.
Surface Water Control Systems .
Other site infrastructure.

Gaseous Emissions Management:

Landfill gas is generated as a product of waste biodegradation or on account of presence of VOCs in the waste. Gas generation can be reduced or eliminated by avoiding disposal of organic wastes/biodegradable

Final Cover System:

A final landfill cover, comprising of several layers, each with a specific function shall be installed after each landfill phase reaches the full height. The final cover system shall enhance surface drainage, minimize infiltration, support vegetation to prevent erosion and control the release of landfill gases.

Surface Water Drainage System:

Surface water management is required to ensure that rainwater run-off does not drain into the waste from surrounding areas and that there is no waterlogged/ ponding on covers of landfills.
Bottom Liner
Prevent migration of wastes or 'by-products' out of the landfill into subsoil, ground or surface water.
Should have chemical properties, sufficient strength and thickness to prevent failure due to :
Pressure gradients
Physical contact with the waste or leachate
Climatic conditions
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CONSTRUCTION AND OPERATION CRITERIA:

The construction and operation of a landfill shall consist of the following steps:
Site Development
Phase Development
Phase Operation
Phase Closure
Landfill Closure
Post-closure vegetative stabilization

Site Development:

The following construction activities shall be undertaken during site development.

Construction of perimeter fence, entrance gate and green belt.

Construction of main access road near the entrance gate with parking area.

Construction of road along the perimeter of the site and well as constructed of arterial road to tipping area of the first phase.

Acquisition and installation of weigh bridges.

Phase Development:

Development of each phase shall be done in stages. These stages are;

a.Clearing the area of al shrubs and vegetation, b.Excavation (if required), c.Stockpiling of excavated material and material imported from borrow area, d.Leveling of base and side slopes of landfill and achieving desirable grades at the base of the landfill, e.Construction of embankment and temporary beams along the perimeter of the phase, f.Construction of temporary surface water drains, g.Installation of monitoring instruments, h.Liner Construction, i.Leachate collection and removal system.

Phase Operation:

At the design stage, the phases of a landfill are clearly demarcated. Operation of a phase requires planning and execution of daily activities - daily waste filling plan and demarcation, waste discharge and inspection, waste placement, waste compaction, daily covering of waste, prevention of Pollution and fires.

Pollution Prevention and Safety during Operation:

The following measures are needed to ensure that the landfill operation shall not adversely affect local environment within and outside the landfill.

Traffic, Noise, Dust, Mud on the Road, LandfillFire Management, Odour, Landfill Safety Aspects.

Phase Closure:

After the last set of cells of a phase are placed (on the highest lift), an intermediate or final cover shall be constructed. If another phase is to be placed over the just completed phase, an intermediate cover is provided. However, if the just completed phase has reached the final height of the landfill, the final cover system and surface water drainage system is provided.

An intermediate cover shall be made of locally available soil (preferably low permeability) and is 45 to 60 cm thick. It is compacted with smooth steel drum rollers and provided a suitable gradient (3 to 5 %) to encourage surface water to run-off from the cover and thus minimize infiltration. The side slopes of the intermediate cover are compacted by the tracked dozer moving up and down the slope.

Landfill Closure:

As each phase is completed and as the final cover level is reached in successive phases, the following interconnectivities are established.

The Leachate collection system of each phase is sequentially connected (if so designed)

The surface water drainage system at the cover of each phase is sequentially connected (if so designed)

The temporary surface water drainage system constructed at the base of each completed phase is dismantled.

The gas collection system (if provided) of each phase is sequentially connected.

Upon completing of all phases a final check is made of the proper functioning of all inter connected systems.

Slopes of the intermediate cover are compacted by the tracked dozer moving up and down the slope.

Estimation of Leachate Quantity:

Leachate is generated on account of the infiltration of water into landfills and it's prelocation through waste as well as by the squeezing of the waste due to self weigh. The quantity of Leachate generated in a landfill is strongly dependent on weather and operational practices. The amount of rain falling on the landfill, to a large extent, controls the Leachate quantity generated. Precipitation depends on geographical location.

METHODOLOGY:

Testing of hazardous waste samples in laboratory with required parameters:

1.PH
2. LOD and LOI
3. CHLORIDES
4. AMMONICAL NITROGEN
5. FLUORIDES
6. CALORIFIC VALUE

RESULTS AND DISCUSSION:

TABLE : 1.1

S.NO :	PARAMETERS	EXPERIMENTAL VALUE	STANDARD VALUE
1.	P^H	9.503	4-11.5
2.	LOD	1.531	No limit
3.	WET LOI	0.136	< 20%
4.	DRY LOI	0.000138	< 20%
5.	CHLORIDES	320.53 mg/l	No limit
6.	AMMONICAL NITROGEN	0.121	< 1%
7.	FLUORIDES	30	30mg/lt-WL
8.	CALORIFIC VALUE	2500^0c	2500^0c

TABLE : 1.1 indicates the sample goes to Direct Landfilling. because of that the sample have a calorific value which is 25000C and the Loss on ignition (LOI) and the Loss on drying (LOD) which both are in their permissible limits. Greater than this value sample goes to incineration. And less than this value it goes for stabilization.

SUMMARY AND CONCLUSION:

Hazardous waste is very harmful to the environment and the people. To overcome this problem some waste treatment methods are needed, those are landfilling and incineration.

The procedure applies for the operation of hazardous waste management at RAMKY ENVIRO ENGINEERING Ltd., which consists of instruments like Ph meter, Bomb Calorimeter, Conductivity Meter, UV spectroscopy, Muffle Furnace, KF-Titrator, COD Digestor.The procedure seemed to be well suited for Ramky Laboratory requirements. By using those instruments they analysed the different types of waste then gave a reports of that wastes and they suggested which operation is suitable for it.

As our understanding of landfill processes has improved, we have been able to improve the level of environmental protection that is engineered into these facilities. Modern landfills - if sited, constructed, and operated appropriately - no longer pose a significant risk to the environment.

As long as we, as a society, continue to produce solid wastes, it appears that we cannot live without landfills. We can, however, improve these facilities and the methods of dealing with the solid waste that we generate. As we explore alternate end uses for existing landfills, it may be possible that closed landfills will add value to our communities.

As the design, operation, and management of landfills have improved, the environmental impact of our waste is reduced. The final issue for a closed landfill is the future of the land. The incorporation of engineering safeguards into landfill design is facilitating the reclamation of closed landfills for community use. Several closed landfills have been successfully converted into community green space, recreational areas, golf courses, and commercial, industrial, and residential uses.

REFERNCES:

[1]. Babu B.V. and Rama Krishna.V (2000) Hazardous Waste Management in India, Journal of the Institution of the Public Health Engineers India, Volume : 2000 (1) : 54-70.

[2]. Dirassouyan. S, Moulin. P, Renous. S, Givaudan J.G., POulain. S (2008) Study on Landfill Leachate Treatment, Journal of Hazardous Materials, Volume : 150 (3) : 468-493.

[3]. Dinesh Kumar and Babu J. Alappat (2008) Evaluating Leachate Contamination Potential of landfill sites using leachate pollution index, Journal of Hazardous Materials, Volume : 150 (3) : 468-493.

[4]. Jang. Y and Townsend. T (2003) Study on Leachate Quality, Journal of Environmental Engineering Science, Volume : 20 (3) : 183-196.

[5]. Leena Sivula, Kai Sormunen, Jukka Rintala (2011) Study On Leachate Formation and Characteristics from Gasification under

Landfill Conditions, Journal of Waste Management, Volume : 32 (4) : 780-788.

[6]. Mohammad Reza Nikoudel, Mashalah Khamehchiyan and Mehdi Boroumandi (2005) Identification of Hazardous Waste Landfill Site: A Case Study From Zanjan Province, Iran, Journal of Clean Technology and Environmental Policy, Volume : 7 (3) : 190-197.

[7]. Roussat (2007) Leaching Behaviour of Hazardous Waste, Journal of Waste Management, volume : 28 (11) : 2032-2040.

[8]. Townsed T, Tolaymat T, Sologabriel H, Dubey B, Stook K., Wadanambi L. (2004) Study on Implications for Waste Disposal, Journal of Hazardous Materials, volume : 114 (3) : 75-91

[9]. Viswanathan. C (1999) Hazardous Waste Disposal, Journal of Pollution Control & Management & Enironmental Technology, Volume : 16 (1-4) : 201-212.

[10]. Viraraghavan. T, Mahendhar .V and Mihial D.J. (2005) Study On Landfill Closure Plant and Post Closure Care, Journal of cover Design. Volume : 22 (1) : 66-71.

[11]. Walker, Jana L and Gover, kevin (1993) Study on Hazardous Waste Disposal, Journal On Regulation, Volume : 10 (1) : 229-262.

[12]. Viraraghavan. T, Mahendhar .V and Mihial D.J. (2005) Study On Landfill Closure Plant and Post Closure Care, Journal of cover Design. Volume : 22 (1) : 66-71.

[13]. Walker, Jana L and Gover, kevin (1993) Study on Hazardous Waste Disposal, Journal On Regulation, Volume : 10 (1) : 229-262.

[14]. Viraraghavan. T, Mahendhar .V and Mihial D.J. (2005) Study On Landfill Closure Plant and Post Closure Care, Journal of cover Design. Volume : 22 (1) : 66-71.

[15]. Walker, Jana L and Gover, kevin (1993) Study on Hazardous Waste Disposal, Journal On Regulation, Volume : 10 (1) : 229-262.

[16]. Viraraghavan. T, Mahendhar .V and Mihial D.J. (2005) Study On Landfill Closure Plant and Post Closure Care, Journal of cover Design. Volume : 22 (1) : 66-71.

[17]. Walker, Jana L and Gover, kevin (1993) Study on Hazardous Waste Disposal, Journal On Regulation, Volume : 10 (1) : 229-262.

[18]. Viraraghavan. T, Mahendhar .V and Mihial D.J. (2005) Study On Landfill Closure Plant and Post Closure Care, Journal of cover Design. Volume : 22 (1) : 66-71.