Hazardous Waste Management

TSDF Dobbasapete - Bangalore Case Study

Background

Hazardous Waste (HW) and its disposal is increasingly becoming a problem globally for various reasons. India is no exception. While all Industries generate considerable amount of waste, certain industries generate waste that are hazardous in nature. Such wastes, because of its characteristic quality of being corrosive or flammable, reactive, toxic or persistent in nature, are termed as Hazardous Wastes. Now, India has several common "Treatment, Storage and Disposal Facilities (TSDF)" according to legal requirement where HW is treated and disposed in a controlled and scientific way. Out of this, the TSDF at Karnataka has been developed in a systematic way following all the international norms from inception to commissioning.

Introduction

This TSDF of Karnataka is called TSDF-Dobbasapete as it is located in Bangalore Rural District on the Bangalore Tumkur Highway, about 48 Kms from the Bangalore City. This project was technically assisted by GTZ (The German Agency for Technical Co-operation in India), through its project HAWA. The project began in 2001 with the partner agency – Karnataka State Pollution Control Board (KSPCB). The project not only involved in assisting the Karnataka Government to set up a TSDF, but also in the holistic management of HW in the state. This paper is however dealing with only the case study of setting up the TSDF.

Preparatory and planning phase:

Initially all the likely HW generating industries in Karnataka were surveyed to determine the quantity of HW existing in Karnataka, as this was the basis for determining the capacity and other technical aspects of the TSDF. About 1600 industries were surveyed and the inventory study recommended the quantity of 40,000 tonnes per annum. This study also determined the types and characteristics of HW generated in Karnataka from various industries.

The GTZ-HAWA project then carried out a thorough study which helped in short-listing - Dobbasapete site. The suitability of the site was assessed in the year 2002 with respect to geological, hydro-geological and morphological conditions and operational aspects.

The HAWA project then prepared a Detailed Project Report (DPR), which detailed the technical concept, financial proposal, and legal requirements. This

was followed by an Environment Impact Assessment (EIA) study which resulted in a REIA and EMP report.

Public consultation:

An intensive public awareness campaign was conducted in the Dobbasapete site surroundings (5 km radius of the site) for a period of seven months (June 2003 untill January 2004) where all the stakeholders were appraised about the project. Door to door campaigns, meetings with political leaders, religious leaders, school teachers, technical university experts, NGOs and local well wishers were briefed about the project. A public hearing was conducted and Environmental Clearance obtained for the project and the site as per a Government Order, in April 2004 in accordance to the Hazardous Waste (Management & Handling) Rules, 1989. Consultations with industries, industrial associations, Government agencies and NGOs were carried out to arrive at the operator model for the TSDF.

Operator Model:

The operator model chosen for TSDF Dobbasapete was of DBOOT (Design, Build, Own, Operate and Transfer). In the initial years, the facility will be monitored and managed by a Contracting Authority (CA) which is the Karnataka Industrial Areas Development Board (KIADB) and later a Special Purpose Vehicle (SPV) will take over. The SPV will have members of Industrial Association and Government representatives. The TSDF will be constructed in 1 year and will be in operation for 20 years and will have a post closure monitoring period of 30 years.

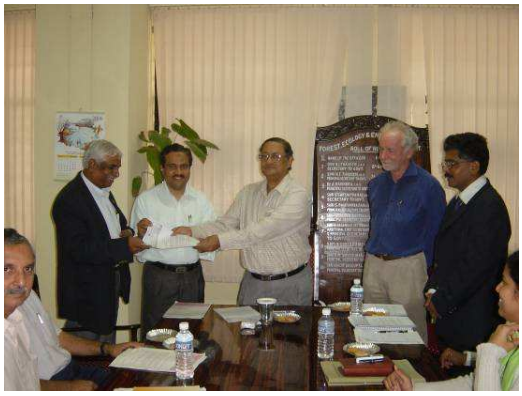
Tendering Procedure:

A Tender Document with the technical specifications was also prepared. An Expert Committee was formed with technical experts with experience in dealing with tendering of similar projects under the framework of the Steering Committee constituted for the project. The Principle Secretary, Department of Ecology, Environment and Forests heads the Steering Committee. The Expert Committee scrutinised the bidding documents and evaluated the tender as per the norms laid down in "The Karnataka Transparency in Public Procurements Act, 1999".

Tendering for the selection of private operator was undertaken as a two stage process – Pre-qualification and Final tendering. Pre-qualification was carried out between December 2004 to February 2004 and four companies were short-listed. The final tendering activity was undertaken between June 2006 to July 2006. M/s. Ramky Consortium was awarded the contract to be the Private Operator for TSDF Dobbasapete.

Land Acquisition:

Cabinet clearance was obtained for the project in the month of June 2005. Clearance for land acquisition was obtained from the industries minister in the month of December 2005. Clearance for setting up the project at Dobbasapete was obtained from the Government in June 2006. About 93.18 acres of land was notified by KIADB for TSDF Dobbasapete. Final notification was given to the private owners of the land and compensation to the land losers was also given. DFEE, KSPCB and Department of Industries and Commerce contributed jointly towards land acquisition cost which amounts to approximately Rs. 8.5 crores. The Land for the facility was given by DFEE to the Private Operator on a nominal lease for a period of 51 years. The land lease document was signed between DFEE and the Private Operator M/s.Ramky Consortium on 1st December 2006. On the same day the TSDF contract between KIADB, who is the CA and the Private Operator was signed.



Signing of contract and Land Lease Agreement 1st December 06

Technical details of the project:

Landfill (Engineered Landfill):

The Dobbasapete landfill has a the following base liner system: The excavated land is overlaid with the base liner system comprising of a 1.0 m thick compacted clay (mineral sealing layer) overlaid by an HDPE geomembrane 2.5 mm thick, protected with a non-woven needle punched HDPE Geotextile of 2000g/m². A thick clay liner system gives the advantage of higher residence time of the leachate in case of liner failure. The geotextile is covered with a drainage layer of 300 mm thickness. Perforated HDPE leachate collection pipes are embedded in the drainage layer. These lateral pipes are then connected to the header pipe which is led to the leachate treatment pond.

A surface sealing system is provided on the top of the waste fill at the end of each construction phase, to control the leachate production by reducing the ingress of rain into the fill. The surface sealing system comprises a compensation layer, mineral sealing layer, geomembrane, geotextile, drainage and recultivation layer.

Each cell is designed for one year at the rate of 40000 tons / year. Ten cells are planned in the landfill which will be sufficient for 20 years. A daily cover of the HW and covering during monsoon period is undertaken to avoid any rainfall or moisture entering the landfills. This also minimizes leachate quantity. The landfill is bounded by dykes on all four sides which prevents storm water from entering the waste.

Pre-treatment of waste by dewatering, stabilization, shredding etc., is undertaken in this TSDF. This helps in rendering the waste as inert as possible.

The design permits the inspection of the leachate collection system and coupled with a stringent operation and maintenance program provides the TSDF with the early warning in case of failures or other abnormalities. This system also has an advantage in that it can also use this facility to clear the clogging and to detect the problem area, so that remediation at the right spot for replacement of liner is possible.

Leachate management system

The leachate pond is expected to evaporate the moisture during its one year cycle and the resulting sludge after evaporation will be returned to the landfill. The solar evaporation pond has pre-treatment like neutralisation and coagulation of leachate at an initial stage, using lime and allowing the water component to be evaporated naturally using the solar radiation.

Storm water management system

The TSDF area is divided into dark zone (contaminated area like roads where the trucks with waste moves, near treatment and storage building, near drying yard, near Solar Evaporation Ponds, etc.,) and white zone (where there is no contamination of waste like the green belt area, garden, other open spaces away from the movement of waste). The storm water collected from the dark zones are stored in a separate tank, tested for contamination and if found contaminated it is sent to the solar evaporation ponds. If the water is not contaminated, then it is sent to the rain water harvesting pond and utilized for gardening.

Rainwater harvesting

The runoff water in the TSDF will be collected and reused for gardening. This ensures that the TSDF maintains a zero discharge. The advantage of this system is that the TSDF can save the amount of water required for landscaping and green belt.

Greenbelt

Maintaining more than 30% of total area of landfill with green cover from the second year of operation itself and increasing it every phase to reach up to 90% at the end of twenty years is a unique system in this TSDF.

Sewage water treatment system

The TSDF has an improved technology for sewage treatment know as the Decentralised wastewater System (DTS) as against the conventional septic tanks.

Safety Control systems adopted

The TSDF besides having in-built safety and environmental checks in the primary technology, has specific monitoring and quarantine systems which acts as secondary and tertiary control systems making the TSDF highly safe.

Monitoring wells

Monitoring wells are dug in the periphery of landfills to detect contamination of groundwater due to accidental seepage of leachate. The water from these monitoring wells are monitored once in two months for any contamination.

Sampling Area

A sampling area is provided to collect samples of waste from the vehicles. Vehicles will not be given clearance to unload the waste until the laboratory confirms acptability of the waste sample. In case of non-conformity of waste, KSPCB and the waste generator will be notified immediately. The waste will be stored in the intractable waste shed until a decision is made after further analysis, negotiation or decision by KSPCB.

After wastes have been sampled and fingerprinted, if the load is acceptable, then the vehicles will move to the Delivery, Treatment and Storage Area to unload the waste in the appropriate storage shed.

Analytical Laboratory

A full-fledged state of the art analytical laboratory is installed at the TSDF which undertakes waste acceptance tests, regular environmental monitoring at the TSDF like ambient air, stack air from DG sets, ground water and treated waste water tests.

Delivery, Treatment and Storage Buildings

A treatment, storage and mixing area is provided which will enable wastes to be offloaded into segregated bays, mixed in mixing bays and subjected to simple treatment and stabilization to make the waste as inert as possible. This area will also provide undercover storage of wastes awaiting transfer to the landfill area during monsoon periods.

Pre-treatment area for rendering the hazardous waste inert before being landfilled

Storage of waste at the TSDF
Fire safety measures adopted also seen)

Other buildings

This building serves as a shelter for all mechanical equipment to be used at the land-fill (except dozer) and transportation vehicles. Furthermore, a storage room, a restroom, sanitary facilities and separate office space will be included in the building.

Conclusion:

The construction of the TSDF Dobbasapete began in July 2007. The KSPCB issued the Consent for Operation of the TSDF for collection and storage of Hazardous waste in June 2008 and for the complete operation in January 2009. The TSDF is thus commissioned and has land-filled 4000 MT of HW and has collected and stored 8032 MT of HW from 42 industries from Karnataka as on 6th March 2009. Over the 51-years lifetime of the site total project cost is Rupees Fifty Four Crores. The lessons learnt from this project can now be replicated in other states.