3.3 Hydrological consideration in land fill design

Need for hydrological considerations

Objectives of landfill hydrology

Surface hydrology and drainage

3.3 Hydrological consideration in land fill design

Need for hydrological considerations

Hydrological considerations play a major role in the selection of landfill sites and in the design and performance of landfills for hazardous waste management. A landfill is a form of a biochemical reactor where the municipal solid waste (MSW) comes into contact with moisture, a catalyst, and gets decomposed into solid waste, gases and liquid contaminants (leachate) resulting in the release of heat. The design of the control and recovery systems requires the estimation of amount and composition of gas and leachate accurately, as also the changes in these with time. Lysimeters are used to simulate the landfill performance.

Besides, hydrological parameters like weather, topography, surface storage, snowmelt runoff, infiltration, evapotranspiration, soil storage, lateral drainage, leakage through linear and geo-membrane may possibly be monitored in the selected sites. These parameters could also be employed in the water balance method to estimate the percolation of the exact quantity of leachate. Hydro-geological investigations could be carried out, by fixing and monitoring of observation wells. Resistivity surveys could be used for collecting the necessary lithological information.

Objectives of landfill hydrology

The main objective in landfill hydrology is usually to predict leachate generation, but the presence and movement of water in a landfill also affect the degradation of the waste, the leaching of pollutants and the geotechnical stability of the fill. Understanding landfill hydrology is important for handling of the generated leachate from the landfill. Many of the old landfills were located in places less suitable and their design was not always made with concern of the generation of leachate.

The main environmental problem is the potential risk of groundwater pollution and subsequent influence on surface water quality. The concentration and the composition of a contaminant in water are dependent on the composition of the waste contained in the landfill and the degradation of the waste. The total pollutant load to the environment is dependent

on the quantity and the quality of the leachate.

The insight of the problem with leachate has implicated a better and safer construction of landfills. In recent years' landfills have commonly been provided with more or less water-tight materials in the bottom and a cover at the top when the deposition has been completed. Such measures aim at preventing water to reach the disposed waste and dissolve compounds contained in the waste or generated as a result of the degradation of the waste. As a complement to this insulation, dikes are often dug around the disposal either to control the groundwater surface in order prevent the groundwater to come into contact with the waste, or to collect and convey eventually contaminated water originating from the disposal. In many cases, a system of drainage conduits is installed at the bottom of the landfill in order to collect generated leachate. Collecting the contaminated water, the leachate, makes a treatment possible in order to avoid undesired impact on the environment and on the human health.

Surface hydrology and drainage

The principle behind the drainage network is to separate unpolluted water and polluted water. Therefore, upslope cut off drains will be constructed which divert the fresh storm water around the waste landfill site into the ordinary drainage network. Water that has been in contact with waste is, theoretically, contaminated and should be collected via toe drains into a pond. Contaminated water will evaporate from the pond. In times of high rainfall, the pond could overflow, and in this case the potentially polluted water would be sufficiently diluted to be acceptable in the environment.

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY
PALKULAM, KANYAKUMARI
OBSERVE OPTIMIZE OUTSPREAD