

Abstract

The system currently in place for managing municipal solid waste is a significant improvement over the outdated “dumping” scheme. Today’s MSW sanitary landfills are a product of incredible advances in waste management engineering in the second half of the 20th century. However, modifications must be made in order to bring the process into the 21st century.

The current system of MSW management was analyzed thoroughly, from the initial planning stage, through site selection, to excavation and lining, to filling, compacting, and isolating the waste, through closure and decommissioning. An analysis was made on the formation, composition, and treatment of landfill gas, and on the composition and formation of leachate. A detailed case study of the Fresh Kills Landfill, the largest MSW sanitary landfill in the world, was detailed, and served as a springboard for further work, as it highlighted several flaws in the existing system.

The current system called for landfill gas to be burned upon reaching the surface, with collection and processing not occurring until AFTER the landfill was decommissioned. A method was proposed for collecting the gas and processing on site DURING the operating years of the landfill. This proposal was found to double the revenue due to landfill gas collection to over one billion dollars over the course of the operation. Aside from this, processing the landfill gas was found to eliminate over 30 years of fossil fuel emissions from entering the atmosphere through the flaring process.

Additionally, the shape of the excavated cells in the current system was found to be a potential place for improvement. The landfills of the last century had cells with a rectangular base profile. A design was proposed to change this to a conical profile, to simplify leachate collection in the final landfill. This led to a savings in the leachate collection pipework that is placed in the initial construction phase.