

Florida Bioreactor Landfill Demonstration Project – Startup Experiences

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Introduction

The New River Regional Landfill (NRRL) in north Florida is hosting a Florida Bioreactor demonstration project. The primary goal of the landfill bioreactor demonstration project is to design, construct, operate, and monitor a full-scale landfill bioreactor in Florida in a manner that permits a complete and fair evaluation of this technology as a method of solid waste management in Florida, with appropriate consideration of science, engineering, environmental and economic issues.

Project description

The NRRL serves sources in five surrounding counties, receiving primarily mixed residential, commercial, and industrial waste. Waste receipt presently averages 800 tons/day. The landfill consists of three contiguous lined cells totaling approximately 26 acres. Cell 1 is equipped with a composite bottom liner consisting of a High Density Polyethylene synthetic geomembrane and compacted clay soils overlain by sand. Cell 2 is provided with a double liner system consisting of a primary leachate collection system overlaying a geomembrane with a leak detection system and geomembrane beneath the primary liner. Cell 3 leachate collection system configuration, starting from the bottom, is compacted clay, geomembrane, biplanar geonet, geomembrane, triplanar geonet, geotextile, and finally a granular drainage media. A fourth cell is currently under construction and duplicates the Cell 3 leachate collection and liner system.

Basic components of the NRRL bioreactor demonstration project

- A leachate recirculation system of wells installed in all of Cell 1 and part of Cell 2 (for a total of ten acres),
- Modification of the leachate collection system to allow collection and testing of leachate from distinct areas within the landfill,
- A temporary membrane cap installed on the slopes and the top of the landfill area subjected to treatment,
- A combination air injection and gas extraction system to allow the landfill to be operated both aerobically and anaerobically (all gas emissions will be collected and characterized), and

- In situ instrumentation to permit monitoring of moisture content, temperature, gas composition, and leachate and gas flowrates; landfill surface profiling to evaluate settlement; and parallel studies to investigate head on the liner and pressure at the liner due to overlying wastes.

The traditional method of landfill bioreactor operation involves enhancing waste stabilization by anaerobic microorganisms. Recently, increased interest has been focused on the introduction of oxygen to the landfill to create an aerobic bioreactor. Air is typically injected into the landfill with the same devices used to extract gas or inject leachate (vertical and horizontal wells). Aerobic bioreactors have been promoted as a method to accelerate waste stabilization and to reduce methane content in landfill gas. Concerns that remain which prevent widespread use of this technology include the issue of landfill fires and added power costs. The NRRL demonstration project will employ aerobic and anaerobic bioreactor practices providing an opportunity to compare and contrast technical and economic aspects.

The landfill bioreactor has been instrumented for the purpose of collecting *in-situ* measurements of such parameters as leachate head on the liner, waste moisture content, waste load, gas composition, and temperature of the waste. Baseline parameters have been collected over the past several years. Construction is expected to be completed in October with startup during November 2002.

The startup of the anaerobic zone involves the controlled recirculation of leachate and/or other fluids (groundwater or wastewater treatment plant effluent and biosolids). Aerobic treatment will begin with controlled air injection into a small area of the aerobic zone. During the startup phase, the aerobic zone will be very carefully monitored for temperature, off-gas composition, and moisture content. The purpose of the start-up phase is to assess responses in landfill conditions as a function of limited air or leachate injection.

This presentation will provide a description of project construction and start up operations and a summary of *in-situ* monitoring instrument and leachate/gas quality data obtained to date.

Reference

Reinhart D. R., and Townsend T.G. (1998). *Landfill Bioreactor Design and Operation*. CRC Press, Boca Raton, Florida.