



LAND RESEARCH PROGRAM

BIOREACTOR LANDFILL RESEARCH SUPPORTS SUSTAINABLE WASTE MANAGEMENT INITIATIVES

Issue

In 2006, U.S. residents, businesses, and institutions produced more than 251 million tons of municipal solid waste, otherwise known as garbage. This is approximately 4.6 pounds of waste per person per day.

Most of this waste is currently managed by disposal at municipal solid waste landfills. EPA is committed to making solid waste management at municipal landfills more sustainable so that less landfill space is needed and waste products such as methane, a greenhouse gas emitted by landfills, can be collected and converted to renewable sources of energy.

To support sustainable practices at municipal landfills, research is needed to evaluate new and innovative technologies and develop new solutions to waste

management. One of these technologies is bioreactor landfills. These types of landfills use moisture as a method to enhance the waste degradation process.

Studies carried out by EPA have suggested that by operating a landfill as a bioreactor there is an increase in settlement of the solid waste as well as an enhancement in the methane generation rate of approximately five times that of conventional landfills. Overall, technologies developed under this program can extend the utility of municipal solid waste landfill space and the increased amounts of methane produced can be captured for use as a viable source of renewable energy.

However, there are some operational and regulatory concerns over bioreactor landfills. The introduction of liquids into

the landfill may result in pressure buildup, which would lead to slope instability. With the introduction of bulk liquids the performance of the liner system and the leachate collection system also need to be examined. Finally parameters need to be set for the safe design, construction, and operation of full scale bioreactor landfills.

Science Objective

The Land Research Program in EPA's Office of Research and Development is conducting research on bioreactor landfills in the laboratory and on location at research sites to assess their capabilities.

In the laboratory, scientists and engineers are examining the effects of the introduction of various industrial liquid waste into solid waste landfills on the methane generation rate, leachate

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quality and solid waste settlement. They are examining various options and controls to enhance the efficiency of collection and utilization of landfill gas.

On location, EPA has two demonstration projects under way through cooperative research and development agreements to examine the performance of full-scale bioreactor landfills. The agreements are with Waste Management Inc. and Polk County, Florida. They involve the construction or conversion of Subtitle-D MSW landfill cells to bioreactor landfill cells. Liquids and/or air are introduced through a series of vertical or horizontal liquid injection pipes to enhance the degradation process. Engineers are also investigating various controls that would enhance the ability to collect and use the methane generated by the degradation process

Research goals:

- Provide a source of renewable energy
 - Reduce the potential for greenhouse gas emissions from solid waste landfills
 - Provide an economical and sustainable disposal option
 - Provide an overall reduction in long-term risk associated with landfills.
- Provided a certification course, through the Solid Waste Association of North America, for operators of bioreactor landfills
 - Developed bioreactor landfill monitoring approaches
 - Provided technical review of proposed bioreactor landfill permits.

Application and Impact

Scientists and engineers have provided technical expertise and support to advance the development of bioreactor landfills. They have received international recognition in the area of solid waste management and have provided assistance to other countries at the request of the U.S. Department of State.

As a result of this research effort, the Land Research Program has:

- Conducted workshops on safe bioreactor landfill design

REFERENCES

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January 2008