
INTERSTATE TECHNOLOGY & REGULATORY COUNCIL

**Warning! This document has not been amended since publication. Some content may be out of date and may no longer apply.**


INTERSTATE TECHNOLOGY & REGULATORY COUNCIL

# Interstate Technology & Regulatory Council

https://ITRCweb.org

**Characterization, Design, Construction, and Monitoring of Bioreactor Landfills (ALT-3)**

## EXECUTIVE SUMMARY

This Bioreactors Landfill Technical/Regulatory Guidance Document is primarily written for decision makers associated with the plan development, review, and implementation of bioreactor landfills. The decision makers include, at a minimum, regulators, owners/operators, and consultants. This document focuses on the decisions and facilitating the decision processes related to design, evaluation, construction, and monitoring associated with bioreactor landfills.

To facilitate the use of this document and understanding of the decision process, a decision tree is provided in Chapter One (1.0). In the electronic version of this document, clicking on any process box or decision diamond in the decision tree accompanied by a section number will take the reader to that place in the document.

Bioreactor landfills are designed and operated by increasing the moisture content of waste to enhance the degradation and stabilization of the waste material. The team believes that available research indicates that municipal solid waste degraded in a bioreactor landfill may reduce the long term threat potential relative to a dry tomb landfill resulting from breakdown of organics and the possible sequestration of inorganics. Specifically, bioreactor landfills may accept non-hazardous liquids and sludges to provide nutrients, enzymes, moisture, and bacteria to accelerate biodegradation of both Municipal Solid Waste (MSW) and biosolids. Also, while recirculating leachate from a landfill is fundamental to bioreactor operation, make-up liquids provide additional moisture when not enough leachate is generated from the landfill to attain optimal waste moisture content.

Leachate and make-up liquids recirculation will be collectively referred to as “liquids recirculation” throughout this document. Liquids recirculation accelerates the decomposition of MSW by distributing moisture, nutrients, enzymes, and bacteria throughout the waste mass more efficiently than natural infiltration alone. In addition, various application systems are used to provide a thorough and more homogeneous distribution of moisture throughout the waste material. Liquids recirculation may be accompanied by pressurized air to enhance the aerobic biodegradation process; however, with or without aeration, the anaerobic bioreactor process accelerates gas generation that can offer a revenue stream and decrease the contaminant load in the leachate.

The team believes that bioreactors can expedite beneficial reuse of landfill capacity, resources, and expedited reuse of the property. Because most landfills have little ability to complete the degradation process while in a dry tomb state, landfills of this design continue to be managed as such ad infinitum unless a demonstration can be made that the waste is not longer able to leach undesirable constituent into the groundwater. Bioreactors, on the other hand, design degradation

into the landfill, thereby accelerating what will eventually occur, but under controlled and predictable conditions. Planning post closure land use into a landfill is now a reality and there are more choices for land use that would never have been considered when using a dry tomb landfill design. Additionally, landfill capacity can be increased since during degradation waste, volume decreases thereby providing additional landfill space in existing landfill sites.

The team does offer caution because bioreactor landfills must be carefully designed and operated. Many smaller county and local landfills should not consider using bioreactors until they have appropriate scientific and engineering staff to design, monitor, and operate the bioreactor appropriately.