



Appendix 13: USA

Innovative technologies for the remediation of transuranic-contaminated landfills

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Given the complexity and heterogeneity of buried waste associated with the United States Department of Energy, identifying appropriate remediation schemes has required considerable effort. Preliminary evaluations indicated that significant technological advancements were required to safely and cost-effectively complete the remediation of Department of Energy buried waste sites, particularly within established timeframes.

The Transuranic-Contaminated Arid Landfill Stabilization Programme, formerly the Buried Waste Integrated Demonstration Programme, was organized by the Department of Energy, Office of Technology Development, to (a) manage the development of emerging technologies that could be successfully applied to remediation and (b) promote the use of these technologies to improve environmental restoration and waste management operations for transuranic-contaminated landfills in arid environments.

Implementing the Transuranic-Contaminated Arid Landfill Stabilization Programme involved three key strategies: 1) A systems engineering approach was used to include an overall perspective of the entire remediation process; 2) State-of-the-art science and technology were sought for improving the remediation system; 3) Integrated product teams which were comprised of end users, regulators, stakeholders, as well as industry partners were formed.

The Transuranic-Contaminated Arid Landfill Stabilization Programme focused its resources on various remediation technology systems. The In Situ Stabilization System and the Selective Retrieval System were two innovative systems that were directly applicable to the CRP.

The In-Situ Stabilization System involves the encapsulation of previously disposed waste. A jet grouting technique operating at 6000 psi was the emplacement technique used for these field experiments. This system showed that improved stability to the waste form was achievable if the waste cell was solidified. This approach reduced the hydraulic conductivity of the disposal cell to 2.8×10^{-14} m/s thereby reducing both surface and groundwater intrusion. Researchers also:

- investigated the spread of contaminants during the injection and removal operation,
- determined the effectiveness, and durability of grouting a soil/waste matrix,
- assessed the retrievability of a grouted soil/waste matrix,
- investigated grout emplacement techniques for high clay-content, low permeability soils, and
- investigated improved waste forms such as vitrified, cementitious and polymer grouts.

Results showed that in situ stabilization can prevent migration of contaminants from the buried waste. In situ stabilization can also provide an additional means of structural support for caps and surface barriers. Both interim and long term stabilization materials were investigated to provide remediation alternatives to satisfy a variety of site characteristics.

The Selective Retrieval System was an example of another type of technology system that can provide an indirect barrier. This system involves the use of remote selective retrieval equipment, including advanced waste handling, retrieval, and conveyance techniques. Using remote operations, operators can safely and efficiently remove buried waste contaminated with radioactive or other hazardous constituents. These techniques remove the workers from the hazardous and radioactive contaminants while permitting segregation of various waste types for conditioning, repackaging and improved management. Results of this research were still ongoing at the end of the CRP. Preliminary studies showed that production rates may be as low as 50% of the baseline manual techniques. However, safety and factors were significantly enhanced through the use of remote systems.

The Transuranic-Contaminated Arid Landfill Stabilization Programme supported environmental remediation efforts by seeking out the best talent to solve technology challenges identified in baseline remediation strategies. Experts from throughout the Department of Energy, universities, private sector, and international community were included in the programme to ensure implementation and commercialisation of innovative technologies.

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