

Performance Characteristics of Waste Immobilization Technologies

FIU's Applied Research Center (ARC) reviewed and analyzed a variety of technologies to effectively immobilize chemical and radioactive waste and minimize the potential for environmental contamination due to interactions between the diverse range of metals present in the leachate of on-site disposal facilities at Oak Ridge Reservation (ORR). This supports the goal of the U.S. DOE's current Environmental Management (EM) program to reduce or maintain contaminant levels below EPA-mandated maximum contaminant levels (MCLs), and will aid in the decision-making process for selection of appropriate locations for new on-site waste disposal facilities at ORR.



Figure 1. Aerial photo of EMWMF disposal cells.

The leachate and run-off from the Environmental Management Waste Management Facility (EMWMF) contains a diverse range of chemical and radioactive elements (e.g. uranium, iron, copper, potassium, boron, and others) that can have deleterious environmental effects upon interaction. The potential risk of contamination can be predicted with adequate knowledge of site-specific environmental parameters and a thorough understanding of the chemical reactions these parameters might influence, such as adsorption/desorption, oxidation/reduction, surface complexation and formation of insoluble precipitates. Contaminant concentrations in the EMWMF leachate must be maintained or reduced to below the MCLs specified by the EPA. As such, the U.S. DOE has proposed a long-term project to immobilize radioactive and other heavy metals from the disposal cell collection systems, by converting them to chemically stable forms which will reduce or eliminate their concentration in the leachate. ARC-FIU will provide information that specifically addresses questions related to some of the potentially viable technology options to immobilize uranium

and other metals that could be applicable in the EMWMF and other ORR disposal sites, in an effort to aid in optimization of the current design and disposal methods and make improvements for future development.

Project Objectives

- Identify chemical composition of EMWMF disposal cell leachate and potential chemical interactions.
- Specify EPA-mandated MCLs for leachate chemicals.
- Identify environmental parameters for short- and/or long-term chemical equilibrium or stability.
- Investigate COD impact of disposing iron and copper.
- Provide performance characteristics of the waste immobilization technologies as shown in Figure 2.
- Provide a comprehensive review on soil and debris treatment technologies and methods.

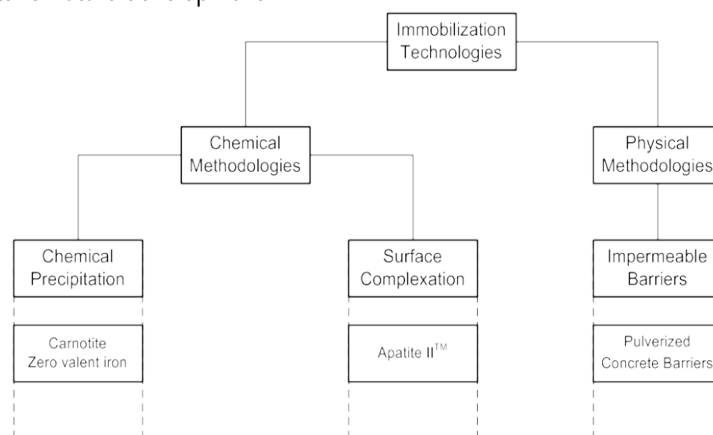


Figure 2. Waste immobilization technologies

Project Benefits

- Provides potentially viable technology options to immobilize uranium and other metals that could be applicable in the EMWMF.
- Can aid in optimization of the current design and disposal methods and make improvements for future development.
- Supports goal of U.S. DOE's EM program to comply with EPA regulations by reducing or maintaining contaminant levels below MCLs.

Project Accomplishments

- A presentation on the performance characteristics of waste immobilization technologies.
- A report on the geochemical behavior of many chemical and radioactive elements found in ORR waste disposal facilities and the performance characteristics of waste immobilization technologies.