

PROJECT FACT SHEET

Optimization of the Retrieval of Waste from Hanford Tank S-109 through Numerical Modeling

FIU's Applied Research Center (ARC) is supporting the U.S. Department of Energy's Office of River Protection in its mission to facilitate the retrieval and treatment of high-level radioactive waste stored in underground, tanks at the Hanford site. Florida International University is assisting the Department of Energy (DOE) and Savannah River Site (SRS) in evaluating the potential of selective saltcake retrieval for schedule acceleration and significant cost savings by analyzing the performance of different retrieval scenarios with the prediction of Cesium breakthrough curves in the resulting saltcake brine and to determine the displacement patterns of Cesium. This predictive information is critical for scheduling and operational purposes.

ARC has developed a 2-D axisymmetric numerical model to determine the effect of washing fluid addition at the top of the tank, combined with drainage, and the displacement of the interstitial fluid and the resulting dilution of Cs, with emphasis on the volumes drained and the concentrations of Cs within the tank. The numerical model implements flow through porous media using Darcy's Law coupled with transport (Advection/Dispersion equations) through saturated and/or variably saturated porous media (Richard's Equation). By solving the coupled models of transport phenomena and the flow through porous media (saturated and/or unsaturated flow) the tank was analyzed to determine the concentration distribution as a function of time and location within the tank.

Project Objectives

The overall objectives of this project are to

- Gain a better understanding of the dissolution process that will occur in Tank 241-S-109 as it is retrieved to provide waste for Vitrification at the Demonstration Bulk Vitrification System Facility (DBVS).
- Determine the effect of washing fluid addition at the top & side of the tank, combined with drainage, and the displacement of the interstitial fluid and the resulting dilution of Cs, with emphasis on the volumes drained and the concentrations of Cs within.

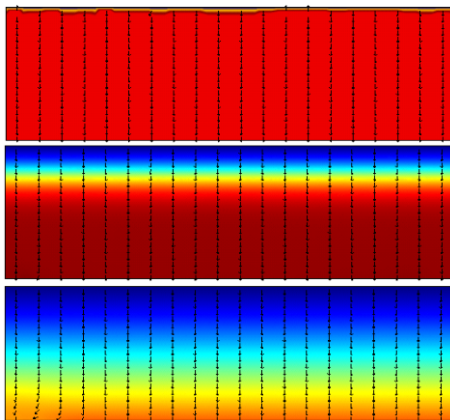
Project Benefits

Benefits of the simulation and optimization study are:

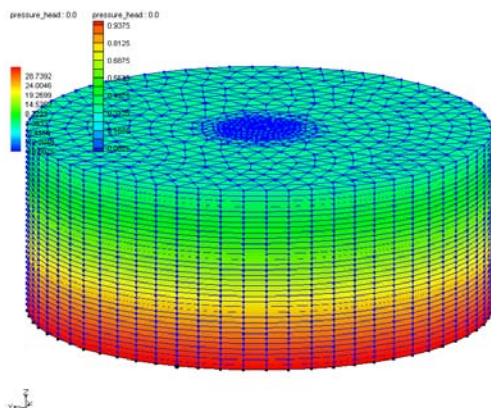
- Improved HLW retrieval efficiency.
- Significant cost savings by analyzing the performance of different retrieval scenarios with the prediction of Cs breakthrough curves.

Project Accomplishments

- Data analysis verified significant cost savings using incremental retrieval vs. continuous retrieval.
- Developed computational model for a total of 10 different retrieval scenarios which provides a better understanding of retrieval efficiency.
- Released topical report on the S-109 Numerical Modeling.



2-D Axisymmetric Numerical Model



3-D view of the model showing Cs Concentration