Historical Overview of the Leaching Performance of Cementitious Waste Forms used in Performance and Risk Assessments at the Hanford Site.

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At the U.S. Department of Energy (DOE) Hanford Site, 56 million gallons of chemical and radioactive legacy wastes from weapons production efforts are stored in 177 underground steel tanks. Leaks from the tanks and intentional discharges of waste to shallow beds and cribs have contributed to contamination of the subsurface. Over the last five decades, technologies have been developed for retrieving the wastes from the tanks and immobilizating them into stable waste forms for long-term disposal. Candidate technologies have included vitrification, cementation and steam reforming. The viability of these waste forms is judged partially by performance assessment (PA) modeling of the waste forms ability to retain their contaminant/radionuclide inventories upon disposal. The PAs model release from the waste form, interactions with the near field environment, and transport through the subsurface to predict the environmental impact of an inventory of immobilized waste.

Since 1993, vitrification has been identified as the baseline process for the immobilization of high-level (HLW) and low-activity wastes (LAW) at the Hanford Site. Cementitious waste forms (CWFs) are the baseline technology for immobilization of many of the secondary waste streams generated as a by-product of vitrification. As well, CWFs have been a possible candidate for supplemental immobilization of LAW. Advancements in cementitious technologies have occurred; however, the intermittent inclusion of CWFs in PA efforts has, in some cases, prevented contemporary assessments of CWFs.

This presentation will provide an overview of the history of CWFs at the Hanford site, the evolution of modelling efforts to predict the performance of CWFs, and a chronological review of the performance metrics of CWFs used as input data for PA calculations. The performance of the CWFs in simulated disposal conditions vs. standard test methods will also be discussed. A summary will be provided of the overall improvements of modern CWF technology relative to initial technologies investigated.