Highlight: Oak Ridge Tanks Waste Stabilization for RCRA Constituents

John W. Barton

Chemical Technology Division
Oak Ridge National Laboratory
PO Box 2008
Oak Ridge, Tennessee 37831-6226

*This work was supported by the Office of Environmental Restoration and Waste Management (EM), U.S. Department of Energy at Oak Ridge National Laboratory, managed by UT-Battelle, LLC, for the U.S. Department of Energy under contract DE-AC05-00OR22725.

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On January 9, 2001, TFA representatives met with EM-30 and EM-50 program managers, the ORNL project PI and engineers, Foster Wheeler Environmental Corporation (FWENC) representatives, and representatives from Bechtel Jacobs managing Melton Valley Storage Tank (MVST) operations to discuss recent results from OR00WT31, 3TKH, ORNL Immobilization. This project provides an independent review of a proposed process for stabilizing MVST sludges and supernates (supported by EM-30 under a contract to FWENC). Both surrogate and actual tank sludge data collected suggest that the FWENC process for tank stabilization may not work on all of the various MVST tanks. A test plan was developed based on these initial results and will be implemented during FY01.

The Foster Wheeler process to be applied by FWENC to stabilize MVST sludges involves mixing the sludge with water in a 1:5 volume ratio. After 12 hours, the rinse is separated from the settled sludge and added to existing tank liquids. Both the sludge and supernate portions generated are to be stabilized by addition of two commercially available stabilizing agents to the portions, followed by drying process that reduces the volume of each waste portion. The chemical additives which are used to stabilize RCRA metals in the sludge are commercially available from Etus, Inc. (Sanford, Fl). The first stabilizer added, Thio-Red^{TM}, is a reddish-brown liquid that contains proprietary amounts/species of thiocarbonate. Upon addition of Thio-Red, dark, fluffy, buoyant flocs form. This is suspected to be mercuric sulfide, although ETUS literature indicates that this agent generates stable metal thiocarbonates. The second additive is called 'ET Soil Polymer', and is an alkali silicate. Physically it is a hygroscopic, white powder.

Results from the Foster Wheeler process were described as applied to two different surrogates. The first surrogate, which was prepared by simple mixing of reagent grade chemicals in appropriate proportions to roughly simulate actual tank wastes, was stabilized by the 'Optimum' FWENC process in terms of both the rinsed sludge and the rinse water generated by the process. The second surrogate was designed to be more representative of Bethel Valley Evaporation Storage Tank (BVEST) W23 tank waste, from which we had actual tank samples on hand and immediately available for testing. This surrogate deviated by less than 2% in elemental/complex anion composition of more than 20 of the key species analyzed in W23 actual sludge. Speciation differences between surrogate and actual tanks are likely however. We chose to use the most soluble species as a conservative approach. The 'Optimum' FWENC process failed (in mercury leach only) to stabilize the rinse water in only one of the triplicate runs; the average for the triplicate tests failed to pass as well. The 'Alternative' FWENC process as applied to the rinse did not provide any enhancement; triplicate runs all indicated failure in mercury leach. These tests will be repeated for better accuracy and precision.

All RCRA and process metal species, including thorium and uranium, were analyzed before and after treatment.

Freeze-thaw long-term testing of one surrogate has been completed. Although some hydration occurred, no visible free water accumulated.

Actual W23 tank sludges were subjected to the FWENC 'Optimum' process and were successfully stabilized. It must be noted that earlier work with W23 had shown that this sludge would pass TCLP even without the treatment. The 'Optimum' process did impact the mercury leach concentrations substantially, bringing them below detection limits--without 'Optimum' treatment, levels were measured to

be 0.034 ppm in 'wet' TCLP tests; after treatment and drying, the levels were below 0.008 ppm. The mercury concentration in W23 was measured to be approximately 35 ppm, which is lower than the average measured concentrations of mercury for MVST tank sludges (82 ppm).

Sludge samples from six of the MVST tanks (W24, W25, W26, W27, W28, and W31) were obtained during FY00 and submitted for 'wet' TCLP analysis. Two of these sludges (W26, W27) failed TCLP in mercury without any further treatment. W31 passed by a close margin (0.195 ppm) and should also receive stabilizing additive treatment. Even though some of the tanks passed the 'wet TCLP tests, the FWENC protocols require that 'passing' sludges be dried under the same drying conditions and re-tested for stability. This procedure was completed on W24, W25, and W28 sludge samples with all samples passing TCLP requirement.

In general, the FWENC 'Optimum' process does not appear to stabilize mercury levels in tank sludges. The 'Alternative' process has not been applied and tested. 'Alternative' tests will not be performed until later decision points are reached regarding the rinse waters. Future testing of supernate/rinses from the MVST has been planned and should be completed by late March. Re-testing of some of the surrogate/rinse data will be completed to eliminate uncertainty caused by data scatter. Long term stabilization testing of treated surrogate sludge will continue during FY01.