Test Bed: Treatment and Disposal of Hanford Tank Waste

Stephanie Doll, Ph.D

Objectives

Demonstrate pretreating HLW tank waste to the maximum extent practicable, classifying as LLW using the Waste Incidental to Reprocessing (WIR) process, and treating for disposal at an off-site commercial facility

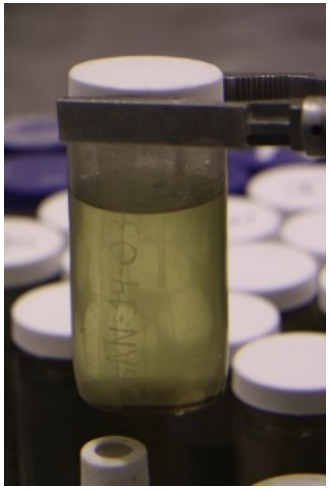
- Meet regulatory requirements
- Obtain tank waste
- Pretreat for solids and cesium removal
- Ship off-site to Perma-Fix Northwest (PFNW)
- Stabilize LLW for disposal
- Meet Waste Acceptance Criteria of off-site facility
- Ship and dispose of at Waste Control Specialists (WCS)

Regulatory Requirements

- Categorical exclusion for National Environmental Policy Act (NEPA)
- Treatability study performed under Washington Administrative Code, 173-303-071 and Resource Conservation and Recovery Act (RCRA)
- Waste Incidental to Reprocessing supplied by DOE HQ, based on pre- and post-column analytical results, DOE Manual 435.1-1, Section II.B(2)(a)
- Waste Acceptance Criteria for PFNW and WCS

Pretreatment

- Reconstruct tank waste supernate
  - 83 archived sample jars from 6 tanks
  - NaOH to reach sodium molarity
  - Final volume: 11.5 L
- Mixed & settled
- Solids removal
  - Composite filtration
    - Settled solids
    - 186 ppm suspended solids (nanoparticles)
  - Precipitation post-filtration – natrophosphate [$Na_7F(PO_4)_2 \cdot 19H_2O$]
- Cesium removal
  - Sequential lead/lag sRF ion exchange columns



Ion-Exchange Results

Table 1. Pre- and Post-Column Contact Analysis				
Constituent	**Pre-Column**	**Post-Column**	**Unit**	**Change**
Cs-137	49.6	0.000173	µCi/mL	99.9997%
Cesium (total)	2.13	0.0234	µg/L	98.901%
Potassium	869	745	µg/L	14%

- 110 constituents reported; 9 showed >10% reduction in concentration
- Radioanalytical results supported WIR
- Remaining analytical results supported waste designation and acceptance
- Shipped pretreated waste to PFNW

LLW Stabilization

- Perform the following in small batches:
  - Mix 2 L of treated supernate with reductant
  - Add dry stabilization agent
- Combine aliquots from each batch to make 2 samples
- Transferred remaining mixture to a lined, 10 gal drum
- Allowed solidified waste to cure
- Sent samples out for TCLP analysis
- Shipped to WCS for disposal