Test Bed: Treatment and Disposal of Hanford Tank Waste

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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
  o 83 archived sample jars from 6 tanks
  o NaOH to reach sodium molarity
  o Final volume: 11.5 L

• Mixed & settled

• Solids removal
  o Composite filtration
    ▪ Settled solids
    ▪ 186 ppm suspended solids (nanoparticles)
  o Precipitation post-filtration – natrophosphate \([\text{Na}_7\text{F}((\text{PO}_4)_2\cdot19\text{H}_2\text{O})]\)

• Cesium removal
  • Sequential lead/lag sRF ion exchange columns
### Ion-Exchange Results

- 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

#### Table 1. Pre- and Post-Column Contact Analysis

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Pre-Column</th>
<th>Post-Column</th>
<th>Unit</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cs-137</td>
<td>49.6</td>
<td>0.000173</td>
<td>μCi/mL</td>
<td>99.9997%</td>
</tr>
<tr>
<td>Cesium (total)</td>
<td>2.13</td>
<td>0.0234</td>
<td>μg/L</td>
<td>98.901%</td>
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<tr>
<td>Potassium</td>
<td>869</td>
<td>745</td>
<td>μg/L</td>
<td>14%</td>
</tr>
</tbody>
</table>
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