U.S. DEPARTMENT OF ENERGY
Savannah River Site

Presentation to Savannah River Site Citizens Advisory Board

DWPF Process Improvements & Tank 13 Modifications

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PURPOSE and AGENDA

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Purpose: to respond to the WMC request and to meet the FY 11 Workplan

Agenda:

- Defense Waste Processing Facility (DWPF) Process Improvements
  - Bubblers
  - Alternate Reductant
  - Dry Frit
  - Strip Effluent Feed Tank to Slurry Mix Evaporator Tank
  - Water Separation from Decontamination Frit
- Tank 13 Modifications

ACRONYMS

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- Decon – Decontamination
- DWPF – Defense Waste Processing Facility
- MFT – Melter Feed Tank
- SEFT – Strip Effluent Feed Tank
- SME – Slurry Mix Evaporator Tank
- SRAT – Sludge Receipt and Adjustment Tank
- SWPF – Salt Waste Processing Facility

DEFINITIONS

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- ARRA- American Recovery and Reinvestment Act
- Frit – a silica based product (glass) used to vitrify high level waste
- Reductant – a chemical reducing agent
- Strip Effluent – the waste stream produced from the removal of cesium from sludge or salt waste
- Sludge – the by-product waste of chemical separations activities at the Savannah River Site
- Slurry – mixture of a liquid with a solid to allow the solution to be transferred between tanks

LIQUID WASTE ARRA

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- Workscope - 41 activities
  - reduced the operational risk of the liquid waste program
  - provided needed infrastructure modifications and equipment
  - activities support Salt Waste Processing Facility, tank closure and operations, Saltstone and the Defense Waste Processing Facility
- $200M
- 99% of all physical work completed
- 1% - late delivery of four pumps, financial closeout

DWPF PROCESS IMPROVEMENTS

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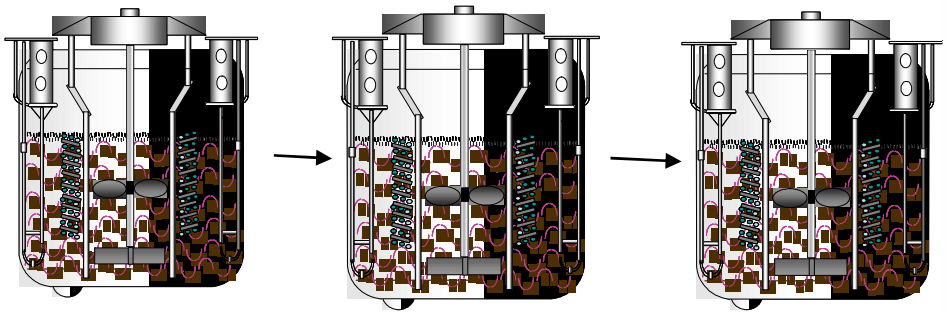
DWPF Chemical Process Cell

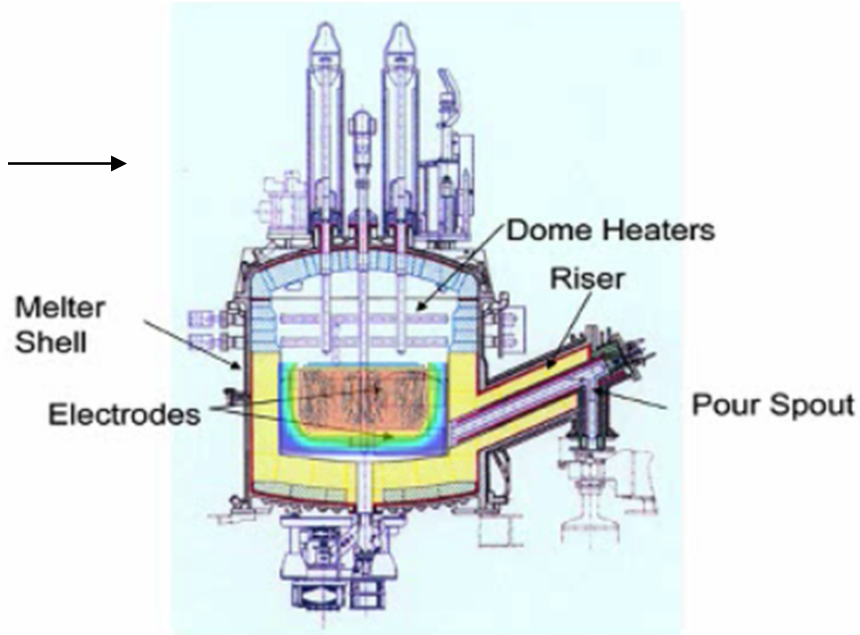


SRAT – Sludge Receipt And Adjustment Tank

SME – Slurry Mix Evaporator

MFT- Melter Feed Tank

DWPF Melt Cell



Joule Heated Melter

Melter Feed Prep

- Alternate reductant
- Dry process frit addition
- Strip Effluent Tank options
- Water separation from decon frit

Vitrification

- Melter Bubblers

DWPF PROCESS IMPROVEMENTS

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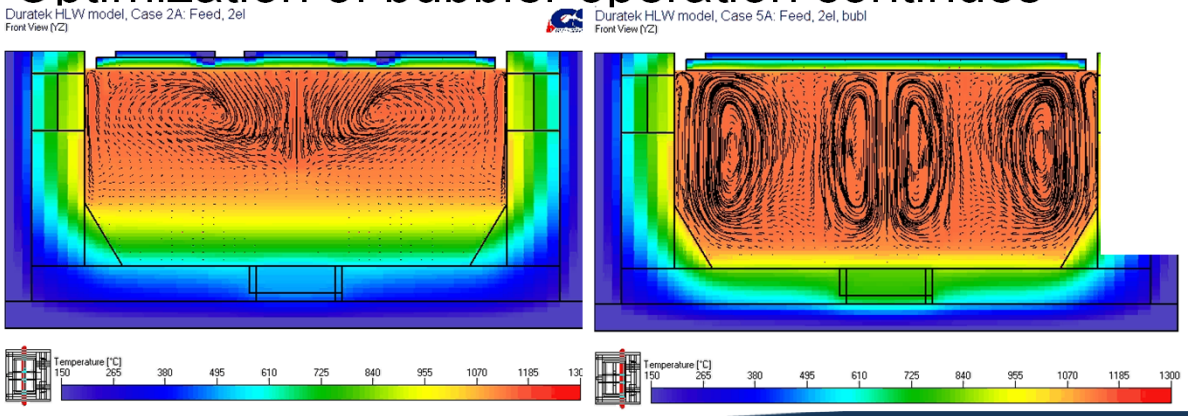
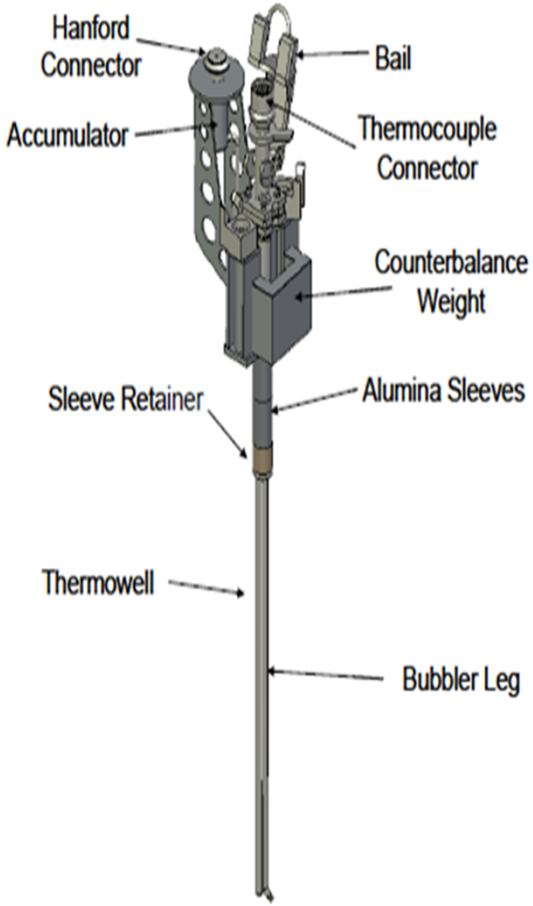
- Melter Bubblers
  - Four Bubblers installed in September 2010
  - Melt rate has increased from approximately 130 lb/hr to 200 lb/hr
  - Increased canister production from ~200 cans/year to 300+ cans/year
  - First set of bubblers replaced upon reaching design life of 6 months
  - Second set remains in service
  - Optimization of bubbler operation continues





Bubbler

DWPF PROCESS IMPROVEMENTS

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- Alternate Reductant in the Sludge Receipt and Adjustment Tank (SRAT)
  - Formic acid (CH_2O_2)(reductant) currently used in the SRAT - chemically reduce mercury (Hg^{+2}) to elemental mercury (Hg) and manganese (Mn^{+4}) to manganese (Mn^{+2}) – allows removal of Hg and reduces foaming
  - Minimize the use of formic acid by an alternate reductant
    - expected to increase the evaporation rate
    - reduce processing time up to 20%
  - Multiple combinations of reductant evaluated
  - A glycolic acid ($C_2H_4O_3$) selected for further process development
  - 18 – 24 months from deployment

DWPF PROCESS IMPROVEMENTS

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- Dry Frit Addition to the Slurry Mix Evaporator (SME) Tank
  - Replace the current slurry-fed transfer design with a dry conveying system
  - Cycle time reduction of up to 7% due to less evaporation time
  - Contract in place with the selected dry frit conveying system vendor
  - Project under evaluation due to forecasted limited funding in FY12.

DWPF PROCESS IMPROVEMENTS

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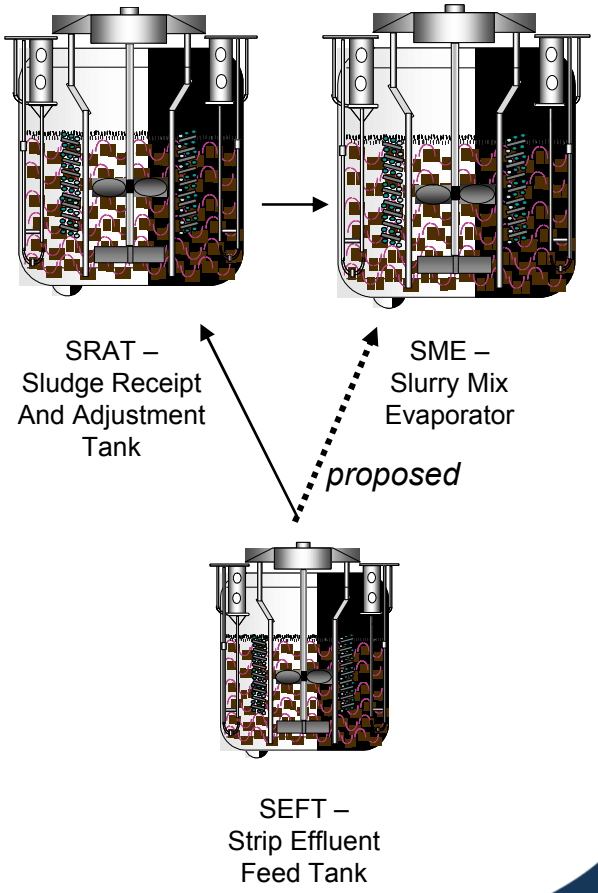
- Strip Effluent Feed Tank (SEFT) to Slurry Mix Evaporator (SME) Tank
  - Install the capability to transfer strip effluent to either the Sludge Receipt and Adjustment Tank and/or Slurry Mix Evaporator Tank
    - Strip Effluent comes from the cesium removal from sludge or salt waste – stored in the Strip Effluent Feed Tank
  - Provide flexibility to balance evaporation loads
  - Piping (jumpers) inside the process cell have been fabricated but not installed
  - Work outside the process cell in the connecting corridor continues
  - Ready by March 2012

DWPF Chemical Process Cell



DWPF PROCESS IMPROVEMENTS

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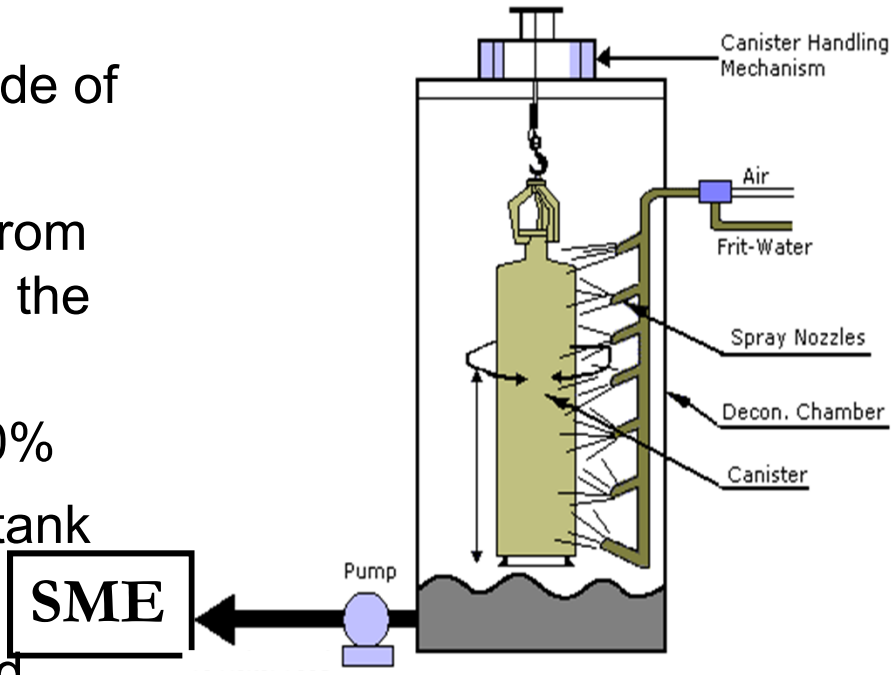
- Water Separation from Decontaminated Frit
  - Currently a frit slurry is used to decontaminate (wash) the outside of a waste canister
  - Improvement to remove water from the slurry before it goes back to the slurry mix evaporator tank
  - Cycle time reduction of up to 20%
  - Reduces water returned to the tank farms
  - Performed testing and assessed water separations technology
  - Hydro-cyclone design selected
  - Future development dependent on funding



TANK 13 – BACKGROUND

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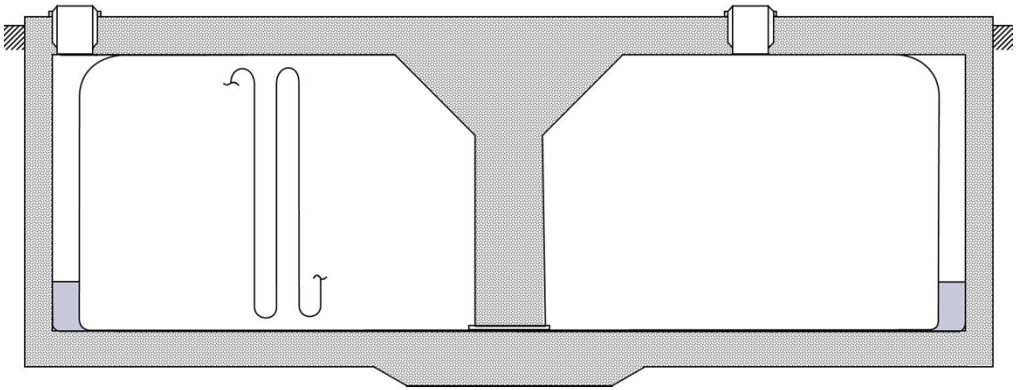
- Tank 13 is a Type II waste tank located in H Tank Farm
- Currently, Tank 13 contains 277K gallons of sludge
- Upgrades are required to:
  - Initially perform bulk waste removal for sludge transfers to support sludge batch 8
  - Ultimately provide transfer capability for tanks 14 and 15 to tank 51



Type II (1.03 Million gallon capacity)

TANK 13 – SCOPE

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- Disassembling and removing existing equipment
- Riser probing to identify potential interferences in the tank
- Procuring and installing three submersible mixer pumps, a submersible transfer pump, electrical substation, and electrical equipment skid
- Tying the transfer pump into an existing transfer line
- Procuring and installing flow instruments, hydrogen level monitors and alarms, and purge and ventilation alarms

TANK 13 – HIGHLIGHTS

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- Three submersible mixer pumps were procured and tested:

Installing the pump into the test stand

Testing at the TNX Facility

TANK 13 – HIGHLIGHTS

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- Three submersible mixer pumps were installed into the tank:

Disassembling and removing existing equipment

Installing the pump into the tank

TANK 13 – HIGHLIGHTS

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- **An electrical substation skid and an electrical equipment skid were fabricated and installed to provide power for the pumps and other tank top equipment:**

Electrical substation

Inside Electrical Equipment Skid

Connecting the tank pumps to Electrical Equipment Skid

Installing the Electrical Equipment Skid on pad

TANK 13 – HIGHLIGHTS

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- Other infrastructure improvements:

Hydrogen analyzer

Infrastructure mods

Purge exhaust stack

Inlet HEPA filter housing

Transfer line excavation and installation

TANK 13 – THE BIG PICTURE

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Electrical substation and equipment skids

Tank 13 Aerial View

CONCLUSION

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- Liquid Waste ARRA work is physically complete
- Defense Waste Processing Improvements well underway
- Tank 13 infrastructure modifications completed