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Technology Innovation

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Savannah River Site



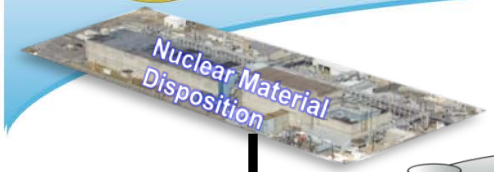



Integration of Innovation

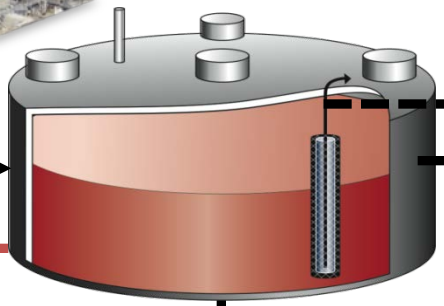
- Outcome based research and development
- Reduce risk
- Production acceleration
- Leverage past successes

Technology Development from Concept to Deployment

Innovation Opportunities



Tank Integrity



Salt waste

Salt Processing Performance

SWPF Integration

SWPF
(under construction)

Tank Closure

DWPF Throughput

Sludge waste

Waste Storage Capacity

Saltstone Throughput and Storage Capacity

Legend:
ARP Actinide Removal Process
DWPF Defense Waste Processing Facility
MCU Modular Caustic Side Solvent Extraction Unit
SWPF Salt Waste Processing Facility

Increasing Waste Throughput in DWPF

- Process faster → Increase melt rate
  - More canisters per year
  - Reduce production time and mission cost

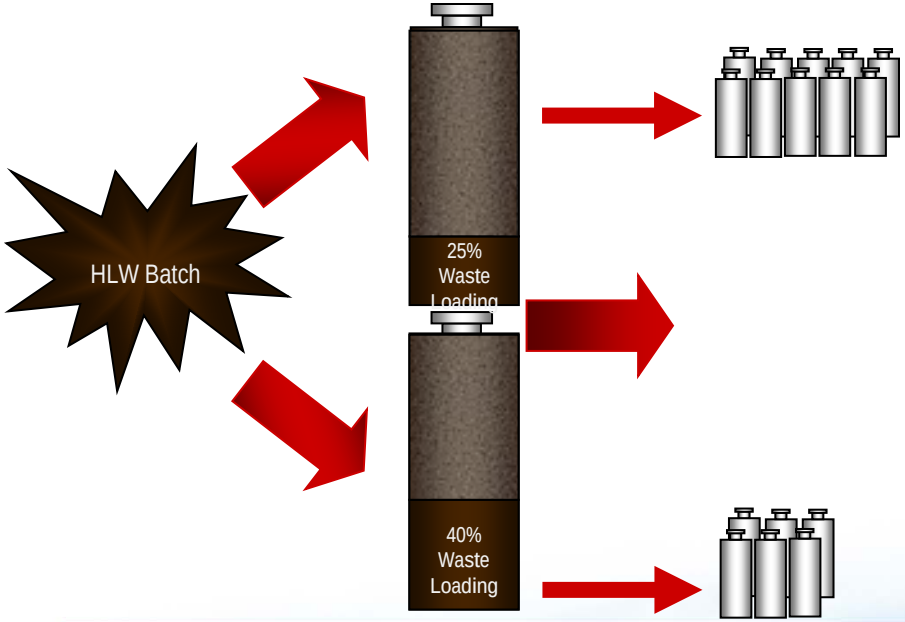
- Make fewer DWPF cans → Increase waste loading
  - Less canisters containing more waste
  - Reduce production time and mission cost
  - Reduce canister storage and disposition cost

Higher waste throughput ultimately reduces the total number of years the HLW system is operated (significant cost avoidance)

DWPF Frit Strategy

Baseline

- Batch operation
- "Global" approach to high-level waste vitrification
  - ➢ Universal frit for all batches



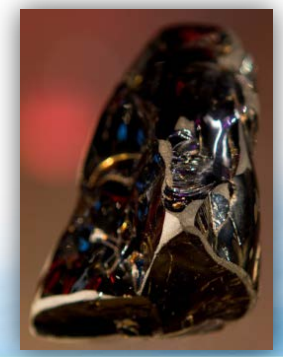
Innovation

Tailor frit to each sludge batch by developing a frit process that will:

- Provide relatively large operating windows
- Accommodate variations in sludge composition
- Provide a glass system that meets processing expectations

Impact

Improved waste loading by 40%, commensurately reducing the number of canisters produced and shortening life cycle



Improving the DWPF Process – *Alternate Reductant*

Baseline

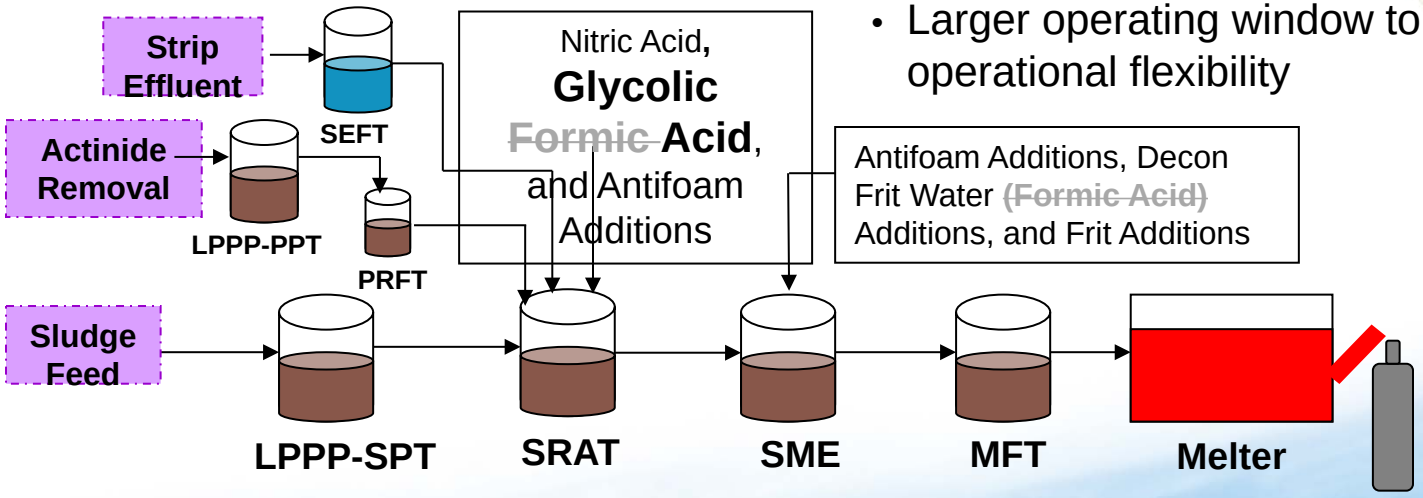
- Formic acid added to process to reduce and steam strip mercury
- Formic acid produces hydrogen requiring safety significant gas chromatographs and large air purges

Innovation

Evaluate an alternate reductant to formic acid that doesn't produce hydrogen and meets processing requirements with no detrimental impacts

Impact

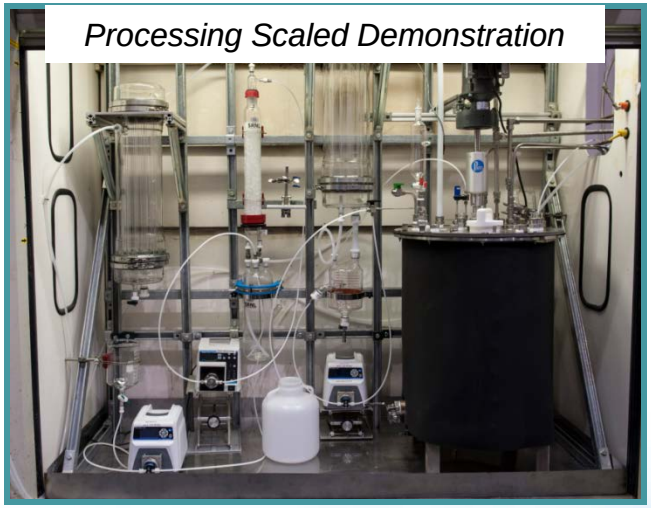
- Decreased air purge
- Gas chromatographs not safety significant
- Improved feed rheology
- Larger operating window to allow increased operational flexibility



DWPF Alternate Reductant – *Developing the Technical Baseline*

- Chemical Processing Cell Simulations
- Melter Offgas Flammability
- Analytical Improvements for Anions
- Glass Reduction/Oxidation
- Material Compatibility and Corrosion
- Downstream Impacts to Salt Processing

Processing Scaled Demonstration



Cold Cap Evaluation Furnace

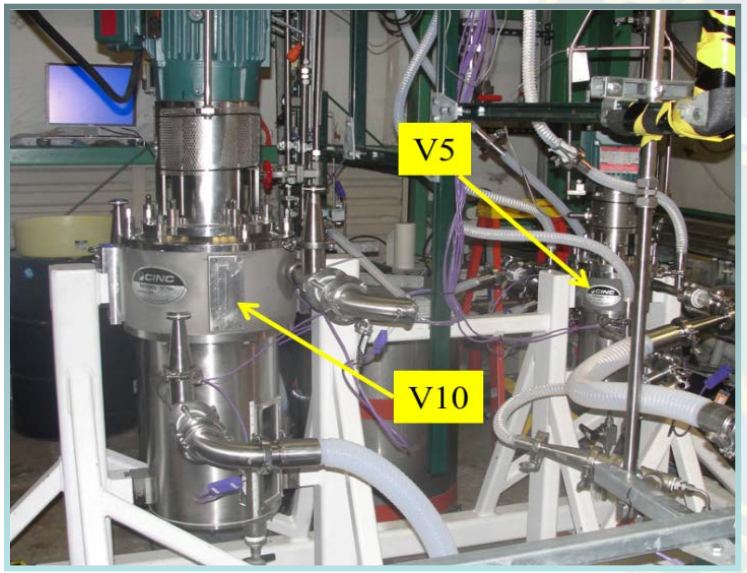
Interim Salt Processing Improvements

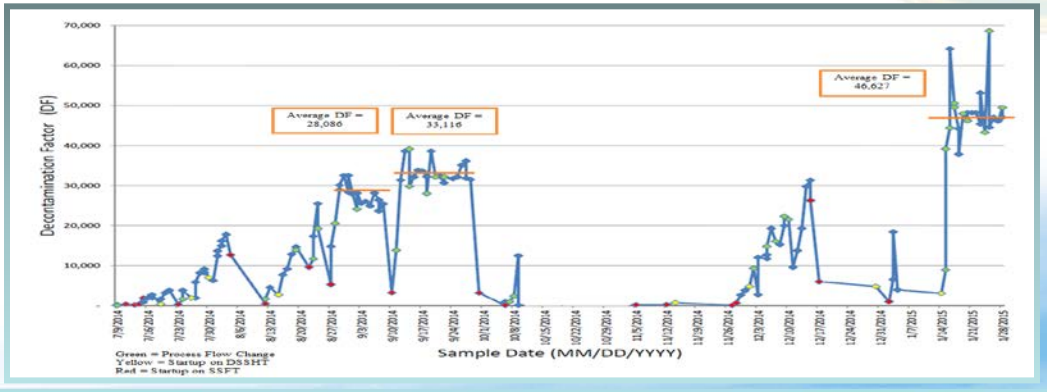
Challenge

Ensure successful deployment of next generation solvent

Integration of Technology

- Full scale demonstrations tested hydraulic performance (contactors, coalescers, etc.)
- Degradation impurities study
- Solvent compatibility/stability with process materials (Coalescer, etc.)
- Real waste performance testing
- Process Integration with DWPF
- Analytical methodology to determine new solvent constituents
- Real time process upsets





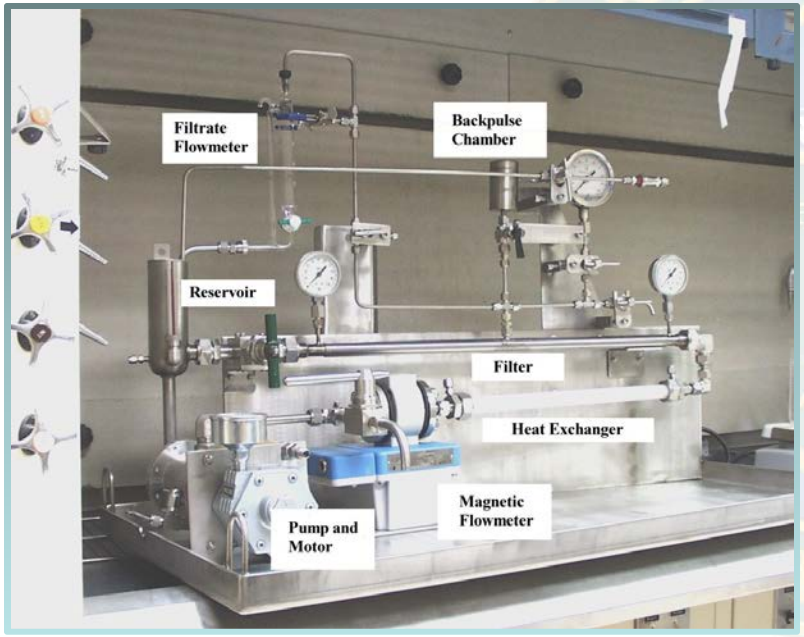
Enabling Interim Salt Processing

Challenge

Filtration limiting processing

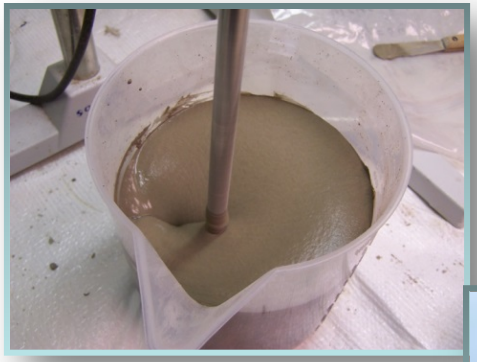
Integration of Technology

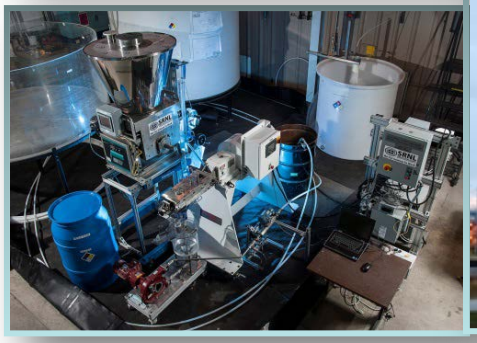
- Lab scale filter testing performed to gain insight into plant performance
  - Comparison testing between filter pore sizes and impact to process
  - Sensitivity testing with expanded salt solution composition to expand the knowledge window



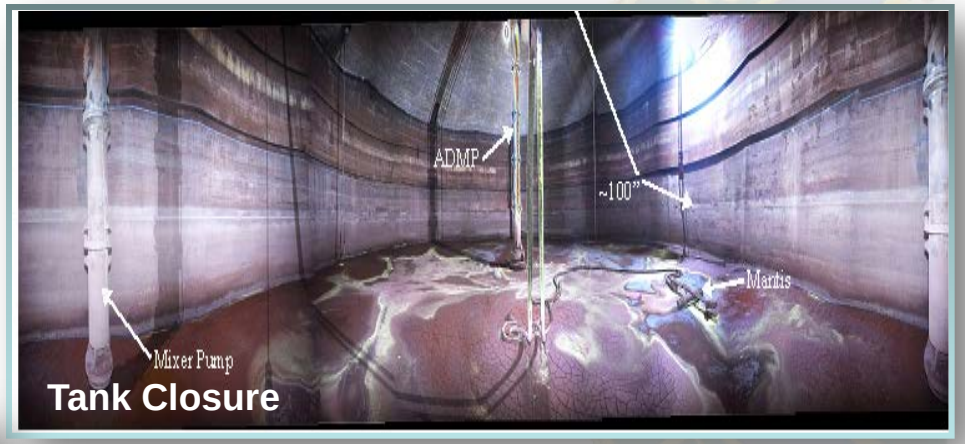
- Characterized process from different locations (feed, post filtration, etc.) to understand changes in salt feed throughout the process
- Modeling of entire process utilized to locate areas of potential precipitation (e.g., oxalate) Evaluation of historical filtration data performed to correlate performance with chemistry (batch analysis)

Cross Program Technology Integration/Transfer – *Cementitious Materials*





Grout Waste Form Development



Tank Closure

In-situ Decommissioning of P and R Reactors3

Continuing the Innovation Beyond SRS

- Transfer to other DOE sites (e.g. Hanford) and internationally (e.g. Fukushima cleanup*)
- Focus on process intensification
  - Increase throughput, smaller footprint
- Identify longer-term strategic challenges, alternate approaches

*Panel 94