

Savannah River National Laboratory Support to Liquid Waste

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Savannah River National Laboratory

Support to Liquid Waste

SRNL Background



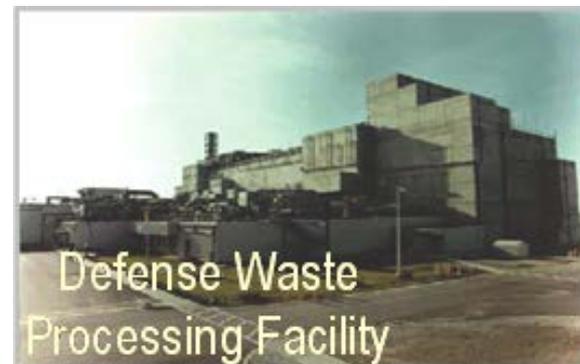
- 1951 – Savannah River Lab (SRL) established to conduct research and development to support Savannah River Plant’s nuclear materials production mission for the national defense
- 1991 - Savannah River Technology Center (SRTC), focused on providing more diverse technological applications as the Cold War ended
- 2004 – Savannah River National Lab (SRNL) designated as a DOE National Laboratory supporting SRS, DOE and other federal agencies nationally and internationally
- 2006 - Named the Environmental Management (EM) Corporate Lab to provide solutions for safe cleanup from legacy nuclear weapons production

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Support to Liquid Waste

SRNL Overview

- ~810 Staff
- ~\$200M (FY15 work performed)
- ~350 Discrete Work Activities
- Multi-Program National Laboratory
- >60% of funding from non-SRS customers



Core Nuclear Capabilities

- Chemical Processing, Separations
- Materials Science
- Tritium/Hydrogen
- Environmental Science



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Multi-Program National Laboratory

Environmental Stewardship

- Environmental and Chemical Process Technology
- Environmental Restoration Technologies
- Hanford Mission Programs
- EM Technical Integration Office

National Security

- Nuclear Deterrence/Tritium Mission
- Nonproliferation
- Support to Intelligence Community
- Global and National Security

Clean Energy

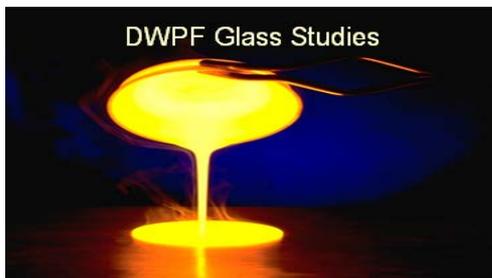
- Renewable Energy
- Nuclear Programs
- Strategic Development & Innovation

Science and Technology

- Analytical Development
- Materials Science & Technology
- R&D Engineering
- Analytical Laboratories

Nuclear Materials Management

- Life Cycle Program Management and Integration



Facilities



Shielded Cells



Engineering Development
Lab



Glass Apparatus Lab
(specialized glass fabrication)



Radiochemistry and
Analytical Labs



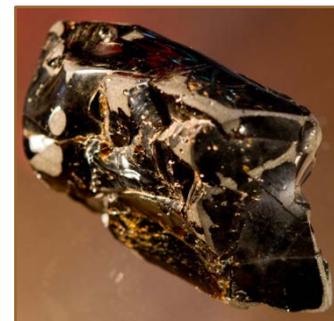
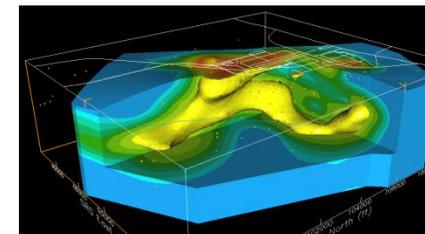
Non-radioactive Labs
(ACTL)

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Core Technical Competencies

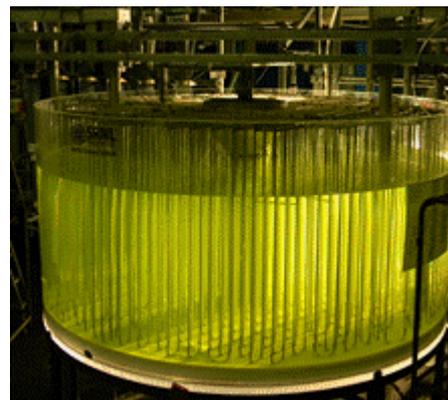
- Integrated chemical process development
 - Laboratory-scale to pilot-scale demonstrations
 - Separations science and engineering
 - Actinide chemistry and processing
- High-level radioactive waste characterization and treatment technologies
- Materials development and analysis
 - Metallurgy, ceramics and corrosion analyses
 - Glass and grout formulation and development
- Modeling
 - Chemical processes
- Mechanical and electrical engineering, remote systems and robotics



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Key Tank Waste Challenges

- Waste Retrieval
 - Bulk waste retrieval
 - Residual waste removal
- Waste treatment
 - Removal of Cs and actinides
 - Separation in LAW & HLW
- Waste form development and production
 - Glass waste forms
 - Grout waste form
- Tank closure
 - Characterization
 - Closure process
 - Performance Assessment support and modeling



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Improved Cesium Removal from Salt Waste

Innovation

- Technology development for “next-generation” cesium removal and actinide removal systems to improve overall process performance
- Conducting R&D concurrent with facility construction
- Ensuring compatibility of process improvements with key aspects of facility design
- Integrating testing into current Salt Waste Processing Facility (SWPF) full-scale testing program to allow deployment early in radioactive operation

Impact

- Expected 15% increase to SWPF throughput will accelerate salt waste processing to help meet regulatory commitments
- Deployed at Modular Caustic Side Solvent Extraction Unit (MCU) for 2 years



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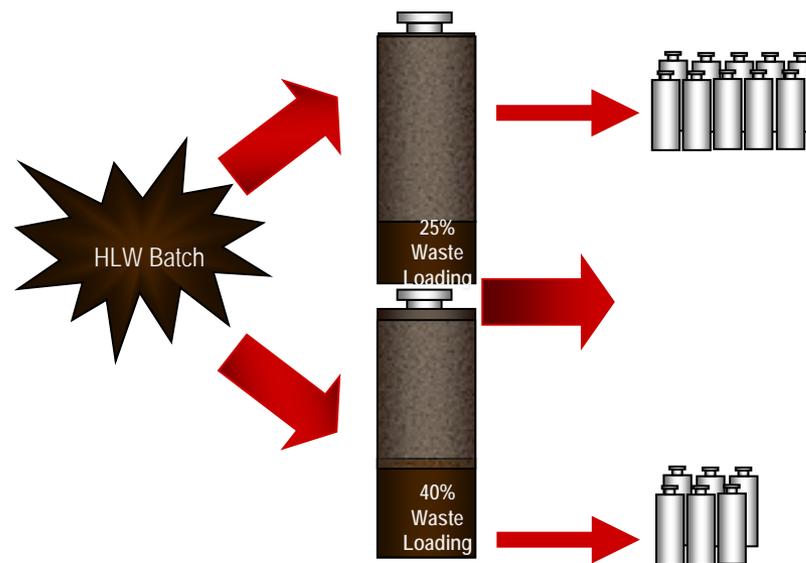
Development of DWPF Frit Strategy

Innovation

- Tailor frit to each sludge batch by developing a frit process that:
 - Provided relatively large operating windows
 - Accommodated variations in sludge composition
 - Provided a glass system that meets processing expectations

Impact

- Improved waste loading up to 40%, commensurately reducing the number of canister produced



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Grout Formulation for Waste Tank Closure

Innovation

- Incorporated experience from closure of 4 waste tanks into grout performance requirements to close remaining waste tanks
 - Developed requirements based on tank configuration and waste properties
 - Developed and tested selected mix compositions
 - Measured fill properties for input into the Tank Farm Performance Assessment model

Impact

- Cured tank fill materials control leaching of various contaminants from diverse environments
- Single formulation for grouting waste tanks rather than 3 formulations used at various points in the grouting process
- Tanks 18, 19, 5, 6, 12 and 16 closed



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Partnership and Support

- Establishment of a ***strategic partnership*** relationship rather than a ***customer-supplier*** relationship enables quick response to emerging issues:
 - Characterized solids causing plugging in the 2H Evaporator and related the increased solids to changes in feed chemistry.
 - Characterized solids found to plug the Mercury Removal Tank in the 3H Evaporator.
 - Performed modeling and characterization to understand precipitation of oxalate solids in MCU feed tanks that led to contactor issues.
 - Knowledge of the physical and chemical changes in Tank 48 when solids were found floating.
 - Performed mock up testing during MCU Next Generation Solvent deployment to remedy contactor issues during start up.

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Summary

SRNL provides a high level of expertise in:

- Flowsheet development and implementation
- Deployment of R&D
- New technologies (Next Generation solvent)
- Quick response to problems
- Modeling, characterization and corrosive evaluation
- Hot cell support