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Innovations

from Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

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Impact

This innovative solution successfully identified new molecular/chemical process, tested, and verified its readiness for deployment in SWPF. This allowed next-generation technology to provide improvement in treatment throughput to meet future needs and to overcome a potential conflict in the cleanup schedule.

- The improved cesium extraction system will increase the processing rate of SWPF from 7 million gallons per year to 8 million gallons per year (14% increase in throughput).
- The increased SWPF production rate will help meet regulatory commitments, avoiding in excess of \$500 million cost for each added year of tank waste processing at SRS.

Contact Information

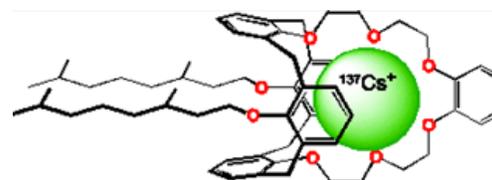
SRNL Office of Communications
803.725.4396



R&D as a hedge against project uncertainties

Standard practice freezes treatment technology at facility design

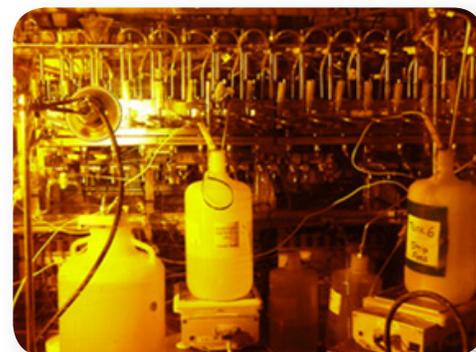
In developing one-of-a-kind waste treatment facilities, the treatment technologies are typically frozen at the time of facility design. Since hardened nuclear facility construction can take many years to complete, the technology at start-up is often significantly out of date relative to currently available technology and may no longer match the cost, schedule or regulatory needs of the current program.



MaxCalix with captured cesium ion

Disposition of Salt Waste at SRS

A rigorous collaborative research program led to the development of a cesium extractant that serves as the baseline technology for alkaline liquid waste treatment in the Salt Waste Processing Facility (SWPF) at the Savannah River Site (SRS), as well as the pilot-scale Modular Caustic Side Solvent Extraction Unit (MCU). The baseline technology has already been used to successfully treat nearly three million gallons of salt waste in the MCU pilot operation. Unfortunately, changes to the expected start-up date for SWPF have created a potential mismatch between the schedule for salt waste processing and the overall SRS tank waste cleanup program completion schedule. The consequence of this schedule mismatch is a possible need to extend the operation life of the tank waste treatment program at SRS for an estimated two to three years, with a cost of more than \$500 million per year.



Test station in SRNL Shielded Cells Facility

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Out-of-the-box thinking: Concurrent research and development to improve baseline technology

The Environmental Management and the Science programs continued to actively support collaborative R&D work aimed at expanding and improving the baseline salt waste processing technology, even after SWPF design was finalized and construction had begun. The Savannah River National Laboratory ensured that the R&D program operated within the process constraints of the SWPF facility design and focused the program on approaches that could achieve a step change in process effectiveness while meeting the development timeline to meet regulatory requirements and facility startup schedule.

Innovation from science to successful deployment

- Established operational parameters and process boundary conditions R&D needed in order to ensure that technological advances could be deployed at facility start-up.
- Built the integrated team of national laboratories, suppliers, and operating contractors to perform concurrent R&D and enhance the development schedule. This allowed the new technology to be integrated prior to facility start-up.
- Used molecular design principles to rapidly sort high potential calixarene solvent structures that could offer step change in extractant performance.
- Improved complexant solubility to treat a more concentrated waste-stream feed and developed an alternate strip acid with enhanced ability to remove cesium from the complexant that was also more compatible with downstream processes.
- Integrated testing of the new solvent and alternate strip acid in the SWPF full-scale testing program to allow early deployment of the next-generation solvent system.



Full-scale contactor apparatus

Partners in Success

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Department of Energy

U.S. DOE Office of Basic Energy Sciences,
U.S. DOE Office of Environmental
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Contractors

Savannah River Remediation, Parsons,
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Other Government Agencies

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