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SRNL Development and Adaptation of Technologies for Nuclear Applications

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DOE-EM Robotics Team Visit to SRNL

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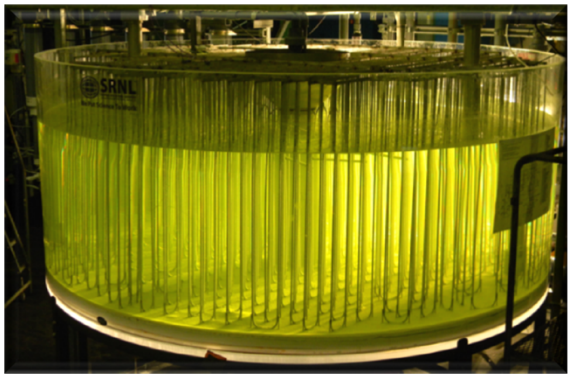
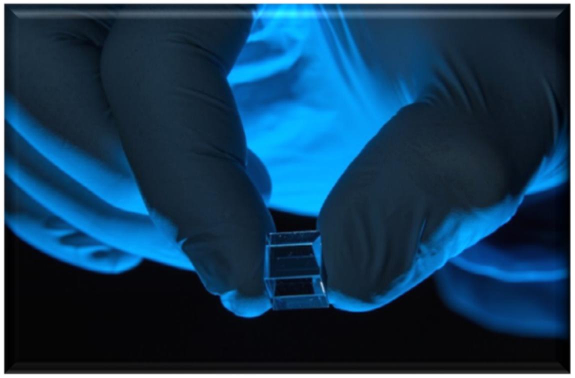
SRNL: Science to Deployment in Nuclear Environments

SRNL – National Laboratory for Environmental Management

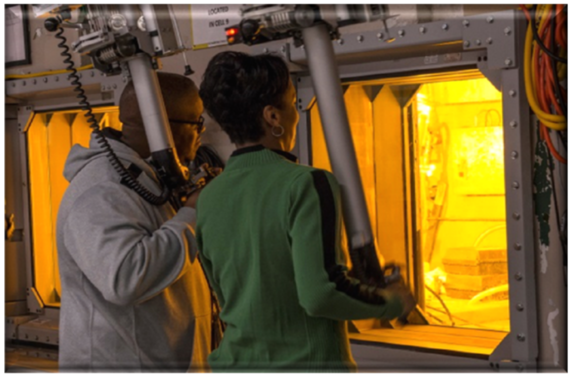


Multi-program national laboratory with broad portfolio



Key role to translate basic science and technology to deployable and operable solutions

- Develop detailed understanding of desired outcomes
- Identify and evaluate potential solutions (commercial or otherwise)
- Down-select most viable options
- Develop, test, and modify (iterate as needed)
- Demonstrate under operational conditions
- Work with contractors to deploy
- Assess and optimize



Example: DWPF Telerobotic Manipulator Arm

Problem: Defense Waste Processing Facility (DWPF) melter pour spout experienced plugging during melter startup

Need: Remote reach tool capable of operating in a high-radiation, high temperature environment over an extended period of time

Innovation for Remote Use in Nuclear Environment

SRNL specification of needed capabilities (cleaning, inspection, gaging, pour spout insertion/removal)

Features specified for the application included:

- All stainless steel
- Remote assembly of In-cell components via DWPF canyon and melt cell crane
- Utilize existing manipulator ports
- Perform preprogrammed and coordinated joint movements (keeps the pour spout tooling aligned with pour spout bore while moving tooling in the z-direction only)

SRNL led procurement and testing

Impact

- 20+ year lifecycle arm allowed rapid recovery from pour spout plugging
- Extended life of melter by avoiding replacement due to pour spout failure

Example: Rotary Microfilter

Problem:

- Solid-liquid separation is rate-limiting step of radioactive liquid waste treatment processes
- Commercial rotary microfilter showed improved filtration rates over baseline crossflow filter, but not suited for radioactive service

Need:

- Adapt commercial unit for radiological service considering longevity and maintenance

Innovation for Remote Use in Nuclear Environment

Developed design improvements to meet requirements

Worked with commercial vendor to incorporate improvements:

- Polyethylene mesh replacement with stainless steel
- Decrease disk volume by use of thinner stainless steel support plate
- Additional disks placed within same housing to increase filter area

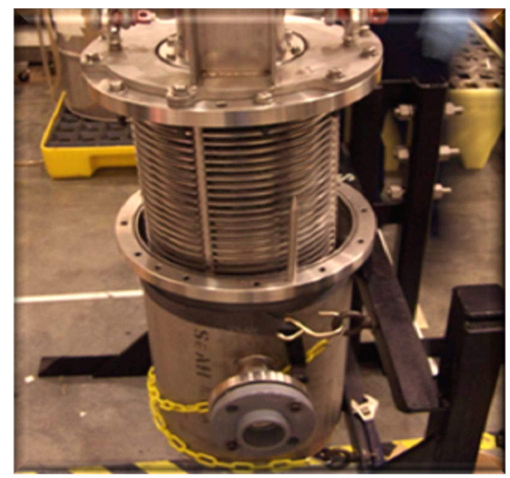
Tested/demonstrated all aspects of design including long-term radiation test

Impact

Developed RMF design concept that met radiological liquid waste needs:

- Radiological service
- Throughput
- Size
- Ease of maintenance and operation

Rotary microfilter is fully deployable and incorporated into system design



Top: RMF (motor at top, disk unit at bottom)
Bottom: Installation of 25-disk stack

Summary

Begin with the outcome in mind and match the solution to the problem

Key steps to practical and successful technology deployments in a nuclear environment include:

- Identifying and understanding distinct characteristics of target problem
- Matching best portfolio of technologies and best application methods
- Testing, demonstrating and refining
- Close collaboration with contractors during deployment

Solution often includes multiple disciplines and combinations of existing and new technologies

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