SRTC Input to DOE-HQ R&D Database for FY99

by

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FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Enhanced Surveillance Program (ESP) / Ultrasonic Testing of Bonds

Project ID:

P/SRTC-9902103001

Project Description (4000 characters or less):

Subsequent to the end of the cold war, international treaties were put into place that effectively eliminated the ability to test nuclear weapons as a means to verify the effectiveness of the enduring stockpile. Since annual certification of the weapons stockpile is a requirement that the Department of Energy (DOE) must meet, a new capability had to be developed that would enable the DOE to meet their commitment. The Enhanced Surveillance Program (ESP) was initiated in FY96 by the DOE. The goal of the ESP was to develop a thorough understanding of the aging mechanisms that were taking place in the materials, components and systems found in a weapon; develop basic equations of state (EOS) that would describe those aging mechanisms and their effects on the performance of a weapon; and then to develop new nondestructive examination (NDE) tools and methods that could measure the essential parameters that were identified by the equations of state so that models of the performance of the weapon could be produced that would show how the weapon would perform if needed.

One of the NDE tasks identified by the ESP program was to develop an ultrasonic testing (UT) capability that could quantify the quality of a bond. UT methods had already been demonstrated to show that a totally bonded material (100% bond) could be detected or a very poor bond (< 20% bonded) could be detected. However, if two similar materials were in very intimate contact (known as a "kissing" bond), then the bond may be evaluated as an acceptable bond when, in fact, it's possible that no bonding may be present.

The Savannah River Technology Center (SRTC) worked in collaboration with the Lawrence Livermore National Laboratory (LLNL) to investigate UT techniques and methods that had the potential to quantify the quality of bonds. SRTC chose to investigate high current resistance welded bonds in stainless steel as their bond of choice. Resistance welding produces a solid state bond along the interface of the two parent pieces with no melting of the material when the process is applied correctly. Although this process normally produces bonds of good quality, quantification of the bond quality has not been previously possible.

In FY99, SRTC prepared 12 bonded stainless steel resistance welded test pieces. Each test piece was machined to remove excess surface material and to bring the dimensions of each test piece into a configuration that was most favorable to UT principles. Subsequent to machining, all 12 pieces were thoroughly characterized using ultrasonic testing. The 12 samples were then subdivided into two ultrasonically similar sets of six pieces each, i.e. sample #1 in set A was ultrasonically similar to sample #7 in set B; #2 in set A was similar to #8 in set B, etc. One sample set was put into storage while the other sample set was investigated.

A formal methodology was prepared to guide the investigation program. Each sample was fully characterized using a variety of nondestructive examination (NDE) methods. Once the characterization was complete, a sectioning plan was prepared for each sample that would produce a tensile specimen from the selected area of interest. The selection of UT transducers and equipment was based on the type of flaws to be detected and the characteristics of the parent material. Once the UT results were acquired and documented, each sample was metallurgically sectioned in accordance with its individual plan and the tensile results evaluated to see if a correlation could be established.

While the UT results could be roughly correlated to the tensile results, the effects of grain structure on the UT and tensile results vs the effects of planar defects or voids on the results could not be discerned. Additional specimens have been prepared to help discern those effects, however, ESP funding for FY00 was not forthcoming. Therefore, the investigation has been suspended until additional funding can be acquired.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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5	<input type="text"/>	<input type="text"/>

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Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

Plutonium Immobilization

Project ID:

P/SRTC-9902107003

Project Description (4000 characters or less):

The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company provided equipment development, equipment evaluation, and conceptual designs for several facets of a process to be used for the immobilization of Plutonium. Plutonium is to be processed into ceramic forms, and the resulting forms are to be placed within a Defense Waste Processing Facility (DWPF) canister and surrounded by high activity waste glass for the purposes of nonproliferation. Design and development work was performed in the areas of: movement/material handling of the ceramified form within a series of gloveboxes; loading of the forms within a stainless steel can for removal from the gloveboxes; placement of the resulting can into a transportation "magazine"; and placement of several magazines within a DWPF canister in preparation for high activity waste glass pouring. Deliverables included technical reports and equipment mockups. Technical reports were issued documenting conceptual facility layouts, equipment evaluations, and conceptual equipment designs. Mockups were produced for the purposes of testing design concepts.

FY99 Savannah River Site R&D Database

Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date: Compl. Date:

Project Title:

Digital Radiography (DR) Imaging System for CEUSP Containers

Project ID:

P/SRTC-9902108001

Project Description (4000 characters or less):

Oak Ridge National Laboratory (ORNL) had a need to develop a nonintrusive capability to examine their Consolidated Edison Uranium Solidification Program (CEUSP) storage containers. ORNL needed to be able to assure that the containers have sufficient integrity to withstand handling and that no detectable internal pressure has built up during the storage life of the containers. Conventional NonDestructive Examination (NDE) methods were not practical due to the radioactive nature of the material being stored in the CEUSP containers. Some of the containers had internal radiation fields of up to 500 Rads/Hour, and all would have to be examined remotely. The ability to examine these containers was a 97-1 issue of the Defense Nuclear Facilities Safety Board (DNFSB), therefore, ORNL was actively seeking a solution to this problem.

An inquiry was made by ORNL personnel to the Savannah River Technology Center (SRTC) asking if SRTC could provide assistance. The NDE Systems Group (NDES) was put in contact with ORNL and within two weeks, a conceptual solution was suggested. NDES engineers formally presented the concept of a DR system to ORNL which, in turn, resulted in an invitation by ORNL to accompany them to a DNFSB meeting to review and discuss the concept. As a result of that meeting, ORNL provided funding to SRTC/NDES to stage a proof of principle (PoP) demonstration that would show the viability of the conceptual solution.

In an eight week period, NDES assembled a PoP demonstration using mock-up containers and DR components that were on-hand. The internal fields were simulated using a Cobalt 60 industrial radiography sealed source. The digital images were acquired using an Iridium 192 industrial sealed source as the imaging isotope. The PoP showed that the effects of the internal gamma field could be negated by appropriate signal processing and that sufficient resolution and sensitivity could be obtained. SRTC also pressurized the mock-up can and demonstrated that internal pressurization could be detected at a threshold substantially below the level of concern.

Subsequent to the successful completion of the PoP, funding was put in place to design, procure, assemble, and test the DR system. Approximately six months passed from the start of design to the performance demonstration of the DR system. Once the assembled system was successfully demonstrated, the third phase of funding was put into place to enable SRTC to deliver, install, and start-up the system at ORNL. Personnel training was also provided as well as support to prepare procedures. A final phase of funding was placed to enable SRTC to provide follow-up technical support and to provide improvements or modifications to the system and software as operators became more familiar with the system.

The CEUSP imaging system is now installed at ORNL and has been in operation to train personnel and to develop applicable procedures. Production imaging is scheduled to start in 2000.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

Material Technology Program (R&D)

Project ID:

P/SRTC-9901103001

Project Description (4000 characters or less):

This Material Technology Program (R&D) is long-term research in the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company (WSRC) directed toward the understanding of phenomena related to tritium effects on nuclear materials or nuclear components. WSRC efforts involve the study of tritium materials and processes for which WSRC has unique expertise, facilities and responsibilities.

In FY '99 SRTC supported fundamental research on the effect of hydrogen isotopes on containment materials in order to better understand the role of these species on deformation and fracture processes. This involved measuring the crack growth rates and fracture toughness of various alloys as a function of helium content and investigating the roles of microstructure and strength on tritium and helium embrittlement of alloys, particularly in weldments. Work this year focused on conventional forgings and weldments, both fusion and solid-state.

Research also included examining the effects of tritium and its decay product helium-3 on metal tritides used to store, pump and separate hydrogen in tritium handling processes. This involved determining the useful lifetime of metal hydride materials used in current and future tritium handling applications and examining any problems that arose and how SRTC might deal with these problems before they actually occurred in plant processes.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

Process Development

Project ID:

P/SRTC-9901103002

Project Description (4000 characters or less):

The Process Development Program (PDP) is the ADAPT Campaign Program responsible for implementing DOE requirements to maintain a viable technology base that is responsive to weapon component production requirements. PDP assures the development of processes expected to be used for future production and ensuring these processes are fully production capable, and the improvement of current weapon production processes for regulatory compliance or efficiency, including feasibility demonstration studies for selected manufacturing processes.

In FY '99 the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company :

- 1) continued efforts to implement an improved method for fabrication of reservoirs,
- 2) provided field testing of the automatic fill stem inspection system,
- 3) continued development of techniques for metallographic examination of reservoirs in an inert atmosphere,
- 4) supported installation and startup of a real-time gas analysis system in the Savannah River Site (SRS) Tritium Function Test Facility,
- 5) continued the evaluation of plasma cleaning as a means of decontaminating tritium-exposed reservoirs,
- 6) continued development of an alternate process that can reproducibly reclaim reservoirs in the SRS Tritium Facility,
- 7) conducted experiments to develop the cleaning and loading requirements for reservoir units which will enable their deployment into the stockpile,
- 8) conducted tests to qualify newly manufactured hardware,
- 9) continued development of improved tritium storage, tritium stripping, isotope separation and tritiated water processing in support of the ongoing tritium recycle mission at SRS and
- 10) continued development on manufacturing processes for hydride materials to be used in process beds in SRS tritium loading facilities.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

Stockpile Evaluation

Project ID:

P/SRTC-9901103003

Project Description (4000 characters or less):

The Reservoir Surveillance Operations (RSO) Program entails environmental conditioning, function testing, hydraulic burst testing, destructive and non-destructive examination of tritium reservoirs returned from the stockpile in order to obtain safety and reliability data. In FY '99 the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company focused on the operation of environmental conditioning equipment.

The Life Storage Program conducts research to determine the effects of long-term tritium exposure on reservoir designs and materials in order to improve personnel protection and increase the reliability of weapons components. Production and developmental reservoirs are loaded with tritium and stored. Tritium permeation measurements and pressure checks are made periodically on the reservoir's secondary container to determine whether units have leaked. Based on these data and consultation with the design agencies, reservoirs are unloaded and either reclaimed, reloaded with tritium and returned to shelf storage or burst tested for metallagraphic examination. In FY '99 SRTC focused on placing new fabricated reservoirs into life storage.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

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- ☐ CS = Computer Software
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

Enhanced Development

Project ID:

P/SRTC-9901103004

Project Description (4000 characters or less):

The Enhanced Surveillance Program (ESP) provides collaboration with the three design agencies, (Los Alamos National Lab(LANL), Sandia National Lab and Lawrence Livermore National Lab(LLNL)) on development of new technologies for the increased surveillance of various weapons components.

In FY '99 the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company :

- 1) provided consultation on high resolution x-ray tomography based upon experience gained through other high resolution radiography programs,
- 2) provided support for enhanced ultrasonic characterization of bonded assemblies through consultation and loan of appropriate advanced ultrasonic testing hardware and software used in development of the ultrasonic inspection system for weld acceptance of Pu238 heat source encapsulations,
- 3) continued work with LLNL to define sensor needs and develop sensors for the specific applications identified,
- 4) continued development of advanced diagnostics for flight test scoring through consultation to LANL on applicable sensor technology capabilities and utilization,
- 5) continued development of in situ vibrational spectroscopy by deploying sensors in field environments,
- 6) supported efforts of LANL & LLNL to update and expand the existing engineering material property database(s) used to design and analyze the enduring stockpile,
- 7) supported development of high energy neutron radiography for component assessment,
- 8) supported enhanced inspection of reservoir girth welds by developing and applying ultrasonic inspection methods for inspection of reservoirs,
- 9) evaluated the capability of the laser based interferometry technique to measure residual stresses in reservoir fabrication welds in order to fully explain hydrogen assisted stress cracking,
- 10) continued development of a SQUID microscope field deployable system, and
- 11) continued support for gamma resonance absorption (GRA) by conducting a feasibility study which determined the applicability of GRA for imaging the distribution of light elements .

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

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- ☐ CS = Computer Software
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Project Title:

DAS Upgrade- Reclamation Welding

Project ID:

P/SRTC-9908103001

Project Description (4000 characters or less):

This task was required to characterize and qualify the technical standard limits for reclamation welding given a significant equipment upgrade to the Savannah River Site reclamation welders. As a result of the studies, outer limits and inner limits of force, current, and welding time for the reclamation welders were developed. A number of technical reports covering each reservoir type were issued.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes		FY Costs: (in thousands)
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Start Date: Compl. Date:

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Project Title:

Process Development Materials Task

Project ID:

P/SRTC-9908103002

Project Description (4000 characters or less):

This multifaceted work was performed to bring some of the latest materials technologies to bear on the Savannah River Site's (SRS) tritium processing and packaging activities. Five separate tasks were worked on: Alternative Reclamation, Implementation of Solid-State Welding of Reservoirs, Automated Image Analysis of Reservoir Fillstems, Metallography Under Inert Atmospheres, and Plasma Decontamination of Tritiated Stainless Steel.

The Alternative Reclamation task demonstrated a means to reclaim reservoirs without new hardware by using a laser to pierce the fill stem, evacuate the gas, refill the reservoir, defocus the laser to weld the hole closed, and cover the stem with a welded cap. The Solid-State welding task developed a technique to upset resistance weld reservoirs bodies together at the girth. The Image Analysis task developed hardware and software to progress toward machine inspections of fill stems prior to reservoir filling and pinch welding. Specific steps and equipment have been specified to perform metallography in an inert glove box. Use of a commercial plasma cleaning system, typically used for electronic parts, has been shown to be effective to reduce surface contamination by tritium.

These results were presented at the Annual Process Development Review (10/99) and were documented in numerous reports and memos.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Start Date: Compl. Date:

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Project Title:

Materials Technology R&D Tasks

Project ID:

P/SRTC-9908103003

Project Description (4000 characters or less):

This work was performed to characterize the behavior of metals and polymers for hydrogen isotope service. The two specific tasks were "Effects of Hydrogen Isotopes on Containment Alloys" and "Tritium Effects on Polymers".

Fracture toughness tests were performed on conventionally forged and hydrogen exposed stainless steel, unexposed and hydrogen exposed fusion and solid-state welds. The new polymers task was initiated by specifying test equipment and samples to be tested, and equipment was purchased.

Results for fracture toughness testing were presented at the annual Process Development Review (10/99) and documented by memos and external presentations.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Start Date: Compl. Date:

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Project Title:

Solvent Extraction of Plutonium from High Fluoride Solutions

Project ID:

P/SRTC-9908104001

Project Description (4000 characters or less):

Processing of Sand, Slag, and Crucible (SS&C) materials from the DOE Rocky Flats Site requires the use of fluoride ion concentrations above what had been used in the past. Special processing conditions were developed for extracting plutonium from these high fluoride solutions to prevent high losses to waste or other waste problems. The research produced acceptable results and processing conditions.

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Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Project Title:

Hydrogen Generation from SS&C Residues

Project ID:

P/SRTC-9908104002

Project Description (4000 characters or less):

Shipment of Sand, Slag, and Crucible (SS&C) from Rocky Flats was planned using the 9975 shipping container. In order to certify this container for shipping SS&C, gas generation rates from radiolysis of moisture present had to be determined.

The research showed that while some hydrogen was generated, oxygen was depleted and the material could be shipped without fear of explosive gas mixtures.

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(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes		FY Costs: (in thousands)
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Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Plutonium Polymer Formation

Project ID:

P/SRTC-9908104003

Project Description (4000 characters or less):

Plutonium polymer formation in stored solutions present a potential criticality problem. This polymer is known to form under certain conditions, but the limits for the parameters resulting in Pu polymers had not been documented.

A series of experiments were performed based on known information from literature studies. The results were documented in and provide a basis for revision of site safety documentation.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
1	<input type="text" value="EW04"/>	<input type="text" value="100"/>
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3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

HEU/LEU Impurity Studies

Project ID:

P/SRTC-9908104004

Project Description (4000 characters or less):

The Highly Enriched Uranium (HEU) solutions stored in the Savannah River Site's H area needed to be diluted to Low Enriched Uranium (LEU) and sold to the TVA for use in reactors. The purity requirement is very stringent in commercial reactors which required characterization and purification flowsheets. Solvent extraction is acceptable for most impurities, but a problem with phosphorus residues required additional steps.

It was shown that the impurity could be reduced to acceptable levels by using the evaporator to strip the organic phosphorus from the uranium solutions safely.

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
1	<input type="text" value="EW04"/>	<input type="text" value="25"/>
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5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Autofocusing Lenses- Site Acceptance for Welding

Project ID:

P/SRTC-9908104005

Project Description (4000 characters or less):

The Separations Department of the Savannah River Site requested the Savannah River Technology Center to facilitate and coordinate a site-wide activity to obtain site approval in utilizing an autofocusing lense which is built into a light weight welding hood. Health Physics and a number of other organizations were required to endorse/approve this welding hood implementation. Acceptance was obtained and documented and the purchase of these hoods has commenced.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Repair of Bent Flange Canister for DWPF

Project ID:

P/SRTC-9908105001

Project Description (4000 characters or less):

A canister filled with radioactive glass existed in the Savannah River Site's Defense Waste Processing Facility (DWPF) that has a bent flange as the result of an accident. Since the damaged canister could not be welded with a resistance welding process, an alternate welding mechanism was required. As a result of this task, final welding parameters were established .

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☒ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

High Temperature Materials Development for Melter Pour Spout Bellows Liner

Project ID:

P/SRTC-9908105002

Project Description (4000 characters or less):

The purpose of this task was to develop and test various materials for use in the Savannah River Site's Defense Waste Processing Facility (DWPF) melter pour spout bellows region to prevent sticking of glass in the bellows liner during upset conditions. High temperature molten glass testing was performed on candidate materials and selection was made for Nickel 201. A new bellows liner with Nickel 201 has been fabricated and placed into service and has exceeded criteria for performance.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☒ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

High Temperature Materials Development for Melter Borescope Outer Housing

Project ID:

P/SRTC-9908105003

Project Description (4000 characters or less):

The purpose of this task was to develop and test various materials for use for the Savannah River Site's Defense Waste Processing Facility (DWPF) Melter Borescope outer housing to eliminate breakaway corrosion of the housing which results in damage to the borescope optics. High temperature melter vapor corrosion tests were performed on candidate and alternative materials and modified alloy 690 was selected. A borescope outer housing has been fabricated with the replacement material and design changes have been made to allow remote replacement.

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
☐ CS = Computer Software
☐ HW = Hardware
☐ OT = Other Technical Deliverables
☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Spent Nuclear Fuel: Melt Dilute Technology Development Program

Project ID:

P/SRTC-9908122001

Project Description (4000 characters or less):

The Melt-Dilute alternative for treatment of aluminum-based spent nuclear fuel was one of the highest-ranked technology options by the Research Reactor Spent Nuclear Fuel Task Team appointed by the Office of Spent Fuel Management of DOE. Treatment technologies were further evaluated using decision models and the melt-dilute technology ultimately emerged as the preferred technology option in the Savannah River Site's Environmental Impact Statement for the management of the aluminum-based fuel. The Melt-Dilute treatment technology has been developed by the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company to stabilize and reduce the isotopic enrichment of uranium in aluminum-based fuels to provide a superior disposal form. This treatment technology minimizes proliferation risks and criticality issues with highly-enriched research reactor fuels. The process of melt-dilute is flexible and can be extended to treat other nuclear materials for safe, permanent repository disposal.

In FY99, the basic technology for the Melt-Dilute form of aluminum-based spent nuclear fuel was completed and a furnace/off-gas integrated small-scale system demonstration of the melt-dilute treatment was achieved using a full-scale Materials Test Reactor design fuel surrogate.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Spent Nuclear Fuel: Melt Dilute Form Qualification Program

Project ID:

P/SRTC-9908122002

Project Description (4000 characters or less):

The ultimate goal of the DOE Melt-Dilute Qualification Program is to ensure that the Melt-Dilute (M-D) form is in compliance with requirements for interim storage, transportation, and ultimate disposal in the geologic repository. The program objectives are to:

- 1) Demonstrate that M-D Form in the Codisposal Waste Package Complies with Repository Requirements
 - Waste Acceptance- System Requirements Document .
 - Repository Performance for Performance Assessment (Release Rate), Design-Basis Events, and Criticality.
 - Technical Database for License Application.
- 2) Demonstrate Safe Interim Dry Storage of Aluminum-Spent Nuclear Fuel (AI-SNF) Forms.
- 3) Provide Direct Link to Final Specifications for M-D Form and for Interim Storage and Repository Disposal Configurations.

The technical approach is to:

- Focus on AI-SNF Form Performance Characterization.
- Perform Analysis and Testing with Inputs (Preliminary & Confirmed) for AI-SNF Forms.
- Technical Interfaces with other involved technical organizations.

The Melt-Dilute form can meet the requirements . The technical information is being developed to show compliance.

Deliverables in FY99 included: American Society for Testing and Materials Guide for Corrosion Testing of Aluminum-based Spent Nuclear Fuel in Support of Repository Disposal (ASTM C1431-99); Criticality Analyses ; Thermal Analyses ; and neutron absorber evaluation and initial testing.

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☒ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Accelerator Production of Tritium Materials Corrosion Test Program

Project ID:

P/SRTC-9908140001

Project Description (4000 characters or less):

The purpose of this task was to develop an electrochemical corrosion probe to perform corrosion measurements in a proton radiation field. Probes were developed and electrochemical measurements were made in on corrosion probes in the A6 target station at the Los Alamos Neutron Science Center (LANSCE) to determine the effect of proton radiation, neutron radiation, and water spallation and radiolysis products on the corrosion rates of candidate and alternate Accelerator Production of Tritium (APT) engineering materials

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>

Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☒ HW = Hardware
- ☐ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Project Title:

Accelerator Production of Tritium Materials Characterization Program

Project ID:

P/SRTC-9908140002

Project Description (4000 characters or less):

The purpose of this task was to investigate the behavior of various materials in an neutron irradiation environment. As part of this task, the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company fabricated and inserted several aluminum tubes filled with ^3He in accelerator target assemblies as part of the tritium target blanket study. The tubes are currently being unloaded and characterized.

FY99 Savannah River Site R&D Database
Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

Hydrogen Research Program

Project ID:

P/SRTC-9901107001

Project Description (4000 characters or less):

Hydrogen Separation Membrane Development(HSMD)

The ability to recover and recycle hydrogen gas from process gas streams could provide important economic and environmental benefits to US industries, such as refinery operations. The savings worldwide has been estimated to be \$1 billion/year. As hydrogen becomes an important part of worldwide energy systems, highly efficient separation technology will be required to produce low cost, high purity hydrogen. Membrane separation has been identified as an economical separation technology in the gas industry. Current metal membranes have coking problems when they are exposed to hydrocarbon, and they are also sensitive to poisonous gases. It is essential to develop a membrane which is more efficient and inert to the poisonous gases.

This project has three phases of development:

- (1) Development of the sol-gel process,
- (2) Development of a composite membrane for hydrogen filtering, and
- (3) Development of a composite membrane reactor for hydrogen production.

HSMD activities included the development and characterization of sol-gel films on suitable filter substrates.

FY99 Savannah River Site R&D Database

Laboratory-Directed R&D (LDRD) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name -

First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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4	<input type="text"/>
5	<input type="text"/>

Start Date:

Project Title:

High Level Waste Disposition

Project ID:

P/SRTC-9906107001

Project Description (4000 characters or less):

Potential Savannah River Site (SRS) Defense Waste Process Facility (DWPF) glass formulations will be combined with existing information on the High Level Waste (HLW) system material balance requirements to evaluate the impact of replacing In Tank Precipitation Process with crystalline silicotitanate ion exchange process. This will provide the basis for better understanding of the process chemistry, identifying show-stoppers, and evaluating costs. This task involved the following subtasks:

- 1) Developed Parallel Computing Acceleration of HLW Integrated Flowsheet Model (HLWIFM) methods. Previously, HLWIFM run times were so long that precluded its use as a routine analysis tool. Application of parallel computing technology significantly reduced HLWIFM run times, thus making the tool more useful.
- 2) Significant material and labor cost savings for SRS and DOE tank closure efforts are possible by stabilizing or encapsulating the residual waste. The feasibility of improved fill and grout materials using SRS fly ash and contaminated soil, and other improvements, were evaluated.
- 3) Increased the waste loading in DWPF HLW glasses to decrease the total number of canisters produced thus dramatically reducing life tank cleanup costs. Improved Liquidus Temperature Modeling to optimize the glass formulation to increase waste loading.
- 4) Glass foaming is a major concern in the melting of several types of radioactive waste glasses. Non radioactive glass batch materials representative of DWPF and Americium/Curium systems were used to evaluate two types of sensors, 1) zirconia oxygen sensors, and 2) an electrochemical method (square wave voltammetry) to control foaming by evaluating glass batch material as it is heated.
- 5) Closure of HLW tanks requires removal of remaining residues, comprised of hardened sludge, zeolite, and silica (clinkers). Sound Lasers, using large amplitude directed acoustic waves may be able to break up the clinkers. Developed and demonstrated a small prototype system.
- 6) Improved the service life of the Defense Waste Process Facility (DWPF) melter borescope by using improved high temperature materials.
- 7) Developed data reduction techniques to interpret complex emission spectra for material analysis.
- 8) Developed instrumentation for deformation and strain measurement using machine vision technology.
- 9) Developed on-line elemental analysis of process materials using laser spark source emission analysis.

FY99 Savannah River Site R&D Database

Laboratory-Directed R&D (LDRD) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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5	<input type="text"/>

Start Date:

[Redacted]

Project Title:

Material Stabilization and Environmental Restoration

Project ID:

P/SRTC-9906107002

Project Description (4000 characters or less):

This task involved evaluating the use of Hybrid Microwave Technology for destruction of organic constituents and treatment of other components found in Savannah River Site Transuranic wastes. The following subtasks were studied:

- 1) Developed "getter" materials to remove Hydrogen gas generated during storage and transportation of nuclear materials.
- 2) Found and demonstrated faster and cheaper ways to characterize tritium in concrete.
- 3) Developed optimal processing conditions for fusion of refractory plutonium oxide using sodium peroxide as a pre-treatment to dissolution.
- 4) Studied the viability of using ozone to regenerate silver-2 from silver-1 in nitric acid as a means of oxidizing intractable plutonium-4 to soluble plutonium-6.
- 5) Applied cost effective analytical techniques to determine the production of Benzo(a)pyrene with prescribed burning and evaluate natural attenuation.
- 6) Developed a Cone Penetrometer off surface tool allowing deployment of sensors 1" to 3" off the surface of the penetrometer.

FY99 Savannah River Site R&D Database

Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

Nuclear Regulatory Commission (NRC) Technical Support

Project ID:

P/SRTC-99061080004

Project Description (4000 characters or less):

Provided technical evaluation services to the Nuclear Regulatory Commission (NRC) for sealed radioactive sources and devices. The NRC requested an evaluation of existing regulations governing the design and construction of portable gamma radiography systems. Subsequently, the Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company ran a series of performance tests on three commercially available gamma radiography systems. Each system consisted of a portable, shielded box that housed a gamma source, and associated equipment to safely move the source to the radiography site.

FY99 Savannah River Site R&D Database

Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

Nuclear Regulatory Commission (NRC) Technical Support

Project ID:

P/SRTC-9906108001

Project Description (4000 characters or less):

Nuclear power plants (NPPs) must ensure that their emergency core cooling system (ECCS) or safety-related containment spray system (CSS) remains capable of performing its safety function. That function may be impaired by the accumulation of foreign materials, including failed protective coatings in the flow path of the ECCS or CSS. The U.S. Nuclear Regulatory Commission, which is ultimately responsible for the licensing of commercial nuclear reactor operations in the U.S., has concerns related to the degradation and failure of the coatings in NPPs. The protective coatings of concern are the Service Level 1 coatings used on the exposed surfaces within the NPP primary containment. Coatings identified as either "qualified" and "unqualified" are used at Service Level 1. Qualified coatings have demonstrated adhesion to substrates during testing in the environmental conditions surrounding a design-basis loss-of-coolant accident (DB LOCA). Coatings that are termed unqualified are assumed to fail and disbond from their substrates during a DB LOCA. However, failure of qualified coatings has been observed even in normal service in NPPs.

The Savannah River Technology Center at the Savannah River Site is conducting a two-phase program to develop a coatings failure model and to implement an experimental plan to evaluate and validate the model. The program is focused on meeting the following objectives:

1. Propose a coatings degradation and failure model integrating the key elements, namely:
(a) interfacial/reliability models, (b) coatings structural models, and (c) substrate models.
2. Develop an experimental program leading to characterization of coatings debris.
3. Review the industry NPP coatings activities.
4. Implement an experimental program to validate the model and failed coatings characteristics.

The two-phase program will be conducted over a 24-month period. The six-month Phase I effort is complete and focused on objectives 1, 2 and 3. Phase I evaluated the underlying coatings failure mechanisms to guide the development of a failure model. It also used the model as the basis for a logic diagram leading to the development of an experimental program to validate the model and to define coatings characteristics. Phase I work included a review of current and past Service Level 1 coating systems and their failures to support the development of the model. It also included some preliminary environmental testing, the results of which guided the experimental plan. Phase II, to be conducted over 18 months, is implementing the detailed experimental plan to test the assumptions and variables in the model.

FY99 Savannah River Site R&D Database

Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

High Precision, Controlled Potential Coulometer Development

Project ID:

P/SRTC-9906108002

Project Description (4000 characters or less):

The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company designed, fabricated, tested, installed, and provided training on a controlled-potential high-precision coulometer for non-proliferation verification to the Power Reactor and Nuclear Fuel Development Corporation of Japan (PNC). Westinghouse Savannah River Company's Savannah River Technology Center is recognized by the as the one of the organizations in the world that has the expertise and capability to build high-precision coulometers to the ultra low level detection limits required by non-proliferation requirements. The coulometers are based on development work performed at the Savannah River Site (SRS) for plutonium monitoring purposes at SRS and updated with state-of-the-art electronics.

FY99 Savannah River Site R&D Database (*All data is required*)
Work for Others (WFO) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

Technical Support

Project ID:

P/SRTC-9906108003

Project Description (4000 characters or less):

Provided technical support services for private companies performing work on the Savannah River Site. Services included waste glass analysis, material analysis of failed equipment, and analysis of effectiveness of radionuclide collection systems.

FY99 Savannah River Site R&D Database

Work for Others (WFO) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

FY Costs: (in thousands)

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Proprietary ☐ Yes

Sponsoring Program (if not proprietary)

Perf Location Zip:

Start Date:

Compl. Date:

Project Title:

BNFL Support

Project ID:

P/SRTC-9906108005

Project Description (4000 characters or less):

BNFL, Inc. is providing Low Activity and High Level Waste processing services to DOE for the Hanford Tank Waste Remediation program. The Savannah River Technology Center performed process testing and demonstration for BNFL, Inc. in this program. SRTC's scope included:

- Pretreatment of 5 samples taken from Hanford's tank waste. Each was analyzed for chemical and radionuclide composition and physical properties by DOE/Richland prior to shipment. DOE/Richland provided preliminary analytical reports at time of sample shipment. SRTC analyzed each received sample for key chemical and radionuclide components and physical properties
- Pretreatment of samples included sludge washing, filtration, precipitation and ion exchange processes to remove entrained solids, cesium, transuranics, technetium, strontium and sulfates. Testing was performed with actual waste (bench scale tests) and simulants (pilot scale inactive tests). Special tests was performed to address adverse reactions and mixing of process heels, and process and recycle streams.
- Vitrification of low activity waste solutions, high level waste sludge, and pretreatment radionuclide products combined with the high level waste sludge. Activities included testing of systems with simulants and actual waste on bench scale, and simulants on pilot scale. Testing was related to the actual vitrification process as well as other associated systems such as evaporation, glass former feeds and mixing, off gas systems and waste form qualification. Vitrified products were evaluated.
- Analytical methods development and on-line technetium measurement development.

FY99 Savannah River Site R&D Database (*All data is required*)
Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
☐ CS = Computer Software
☐ HW = Hardware
☒ OT = Other Technical Deliverables
☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: **LARGE SCALE DEACTIVATION DEMONSTRATION PROJECT : DEACTIVATION OF 321-M FUEL FABRICATION FACILITY AT SAVANNAH RIVER SITE**

Project ID: **P/SRTC-9909114001**

Problem

The 321-M Fuel Fabrication Facility was used to manufacture fuel and target assemblies for irradiation in the site's production reactors. The manufacturing of these fuel and target assemblies has left 15 percent of the 60,000 ft² facility as a contaminated area (CA). The radiological contaminant is highly enriched uranium (HEU). A radiological buffer area surrounds the CA.

Based on an HEU holdup assessment conducted in 1995, approximately 1200 grams of U-235 remain in the building. Although not a large enough quantity to provide an attractive target for special nuclear material diversion, the residual HEU forces monthly material control & accountability reports and periodic audits and is the impetus for operating the facility's forced air ventilation system. The HEU holdup is located in the ventilation ducts, the process equipment, on the floor of the contaminated area spaces, and in the overheads. By removing HEU, the project team will eliminate many of the existing surveillance & maintenance requirements. A reduction in the facility's CA will facilitate survey and maintenance (S&M) during the safe storage period by making inspections easier and less costly. A reduction in the facility's CA will also make eventual decommissioning easier and less expensive. Removing HEU will also decrease the probabilistic risk of a criticality event.

The optimum technical approach to deactivate the 321-M Facility will be determined. The innovative technologies shall be deployable, and must have the potential of being faster, cheaper, safer, and/or better than the baseline technologies. In addition, the innovative technologies shall not have been demonstrated or used at a U.S. Department of Energy (DOE) facility (bench-scale experiments excepted).

To the extent practical, baseline technologies were performed and innovative technologies demonstrated. Collected data from the baseline and innovative cases will be compared. The LSDDP provides opportunities for the transfer of successful technologies to future projects at SRS, across the DOE complex, and in the commercial sector.

Accomplishments:

Five technologies were demonstrated and five Innovative Technology Summary Reports (ITSR) issued. These were:

- Long Range Alpha Detection (LRAD).
- X-Ray K Edge Heavy Metal Detection System.
- Strippable Coatings.
- Electret Ionization Chamber (E-PERM).
- Size Reduction.

FY99 Savannah River Site R&D Database (*All data is required*)
Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
☐ CS = Computer Software
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: DEVELOPMENT OF IMPROVED REMEDIATION AND FIELD SAMPLING

Project ID: P/SRTC-9909114002

Problem:

The U.S. Department of Energy (DOE) is embarked on an aggressive program to environmentally remediate contaminated sites previously used to support the production of special nuclear materials during the Cold War. In this effort, the DOE will rely extensively on efficient chemical separation technologies to treat radionuclide-containing waste. There also exists a need for field characterization at remediation sites containing stored waste or to decontaminate facilities. One obstacle limiting testing today is that an estimated 80% of tests are lab-based processes. That is, a sample is collected in the field and tediously transferred and stored in a laboratory until the proper analytical procedures can be conducted. The turn around time for lab-based results can be days, or even months. As a result, on site decisions may instead be made based upon instant, but limited results from real-time instrumentation. Although some progress has been made through the use of mobile labs or Field Analytical Methods (FAMs) to shorten this cycle to hours, such methods suffer from relatively low sample handling capacities.

The 3M Co. has developed state-of-the art solid phase extraction (SPE) techniques and markets a line of products under the trade designation "EMPORE" for laboratory sample separations plus chemical storage and process separations. Such products provide the capability of removing dissolved contaminants down to detection levels at high flow rates in the presence of high levels of radiation, and concentrating the contaminants, while generating a minimum of secondary waste. For example, 3M environmental sample preparation disks have become the standard of the SPE Industry in responding to U. S. Environmental Protection Agency (EPA) methods for water analysis. The technology depends on the ability to make effective separations using very small (10-40 um) particles.

Accomplishments

The 3M prepared remediation skid is at the Savannah River Site and will be deployed in FY2000 at the R-basin to remove Strontium-90 (Sr-90) and Cesium-137 (Cs-137).

A field demonstration of the disks was completed. Samples were processed for Sr-90, Cs-137 and radium. The Sr and Cs disks were counted using field portable counting equipment (the Radium disks were screened and then sealed to allow ingrowth of the radium daughters prior to final activity determination).

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: SCAPS LOGISTICS

Project ID: P/SRTC-9909114003

Problem:

Task A: DNAPL Characterization at the Cape Canaveral Air Station (CCAS) in Support of the Interagency Dense Non-aqueous Phase Liquids (DNAPL) Consortium:

CCAS has single DNAPL source area located east of the Engineering Support Building (ESB) and another site at Hangar K. High concentrations of Trichloroethylene (TCE) have been measured in groundwater samples taken near Hangar K. Innovative characterization technologies were used as much as possible in a dynamic characterization mode to characterize these plumes.

The primary scope of the task was to identify additional DNAPL sources at Hangar K. Initially, the Raman sensor was used for direct detection of DNAPL and the traditional EIC, Inc. cone penetrometer (CPT) probe for lithology determination. The performance of the innovative tools will first be validated at the known source area at LC-34. The GeoVis Video Microscope will be used during the characterization to determine its usefulness in determining the nature and location of critical stratigraphic units and the ability to visually detect contamination (DNAPL globules).

Two additional technologies designed for direct detection of DNAPL, under development at Savannah River Technology Center (SRTC), were evaluated at the site. The Precision Injection/Extraction (PIX) probe for a micro alcohol injection/extraction test for DNAPL detection was evaluated to determine its usefulness and costs. The FLUTe™ Hydrophobic Membrane was evaluated for its ability to determine the location of depth discrete DNAPL.

The Cone Sipper, CPT deployed water sampler, was used as a backup sampling device to obtain depth discrete water samples and if possible to try to recover DNAPL samples.

Task B: Evaluation and Deployment of New Technologies:

The CPT is becoming the tool of choice for environmental site characterization in unconsolidated and semi-consolidated formations because it can provide access to the subsurface in a rapid and cost-effective manner. Many sensors and probes for use with the CPT are currently under development for environmental characterization. The purpose of this activity was to evaluate and deploy new sensors designed for environmental characterization using the CPT truck. The sensors selected address high priority Department of Energy environmental restoration needs and were evaluated and deployed at environmental restoration waste sites.

Task C: Field Evaluation of CPT Sensors

The purpose of this activity was to provide for independent evaluation, including cost and performance data, of new sensors developed for use with the CPT truck. A membrane sampler commercially available from GeoProbe demonstrated the potential to yield semiquantitative results on Volatile Organic Compounds (VOC's) at Savannah River Site. This tool is effective for a wide range of VOC concentrations and will complement the existing DNAPL sensors used in a dynamic characterization mode.

Accomplishments

Deployed the following innovative technologies:

Raman Spectroscopy.
GeoVis Soil Video Imaging System.
SEA Cone Permeameter System.

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FY99 Savannah River Site R&D Database

Project Description

Cone Penetrometer Precision System/Extraction Probe (PIX).

Cone Penetrometer Cone Sipper Sampling System.

FLUTe Hydrophobic Flexible Membrane.

Internal Reflection Sensor by EIC Laboratories, Inc.

ARA Geophysical Tomograph.

Bladon Lysimeter

SEA Cone Permeameter

Enhanced Spectral Gamma Probe

FLUTe™ Hydrophobic Sorbent Membrane

FY99 Savannah River Site R&D Database (*All data is required*)
Managing & Operations (M&O) Data

Research Organization:
Project Title:
Funding Mechanism:
Project ID:
POC Last Name - First Name -
Point of Contact Phone:

B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
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Start Date: Compl. Date:
* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: ADVANCED CHEMICAL SEPARATIONS AT SAVANNAH RIVER SITE

Project ID: P/SRTC-9909114004

Problem

Demonstrate cesium (Cs), strontium (Sr), transuranium, and other radioisotope decontamination on simulated and actual tank waste with Efficient Separations and Processing CrossCut Program (ESP-CP) developed technologies and evaluate compatibility with Savannah River Site (SRS) and other site's waste disposal flowsheets. ESP-CP technologies were also demonstrated for removal of Resource Conservation and Recovery Act (RCRA) metals from these wastes.

SRS tank wastes and recycle wastes from the Defense Waste Processing Facility (DWPF) contain radioisotopes plus Resource Conservation and Recovery Act (RCRA) or Toxic Substance and Control Act (TSCA) regulated substances, especially Mercury (Hg). These materials must be removed prior to further processing or vitrification.

During the vitrification of tank waste sludges at SRS, various liquid waste streams are generated including offgas scrubbing solutions, excess solution from sampling operations and other miscellaneous solutions. These solutions are currently being returned to the waste tanks for evaporation and retreatment. These solutions are being stored in Waste Tank 22 until a method of processing is developed that removes Cesium (Cs) and Hg, which will allow the decontaminated solution to be treated further in the Effluent Treatment Facility. Treating this stream separately will save money by not requiring evaporation and retreatment.

Several ESP-CP developed technologies could potentially meet the requirements: crystalline silicotitanate, a non-elutable ion exchange material, SuperLig™644, an elutable ion exchange material, and solvent extraction from alkaline solution with an extractant consisting of a crown ether attached to a calixarene. These materials have potential for improving waste processing at the Savannah River Site as well as Hanford, Oak Ridge and the Idaho National Engineering and Environmental Laboratory.

Accomplishments

Issued final report on Materials Testing with DWPF Recycle Solutions.

Completed initial test of a remotely operated ion exchange system within a shielded cell.

Issued final report on testing for removal of heavy metals Lead (Pb), Mercury (Hg) and Copper (Cu).

FY99 Savannah River Site R&D Database (*All data is required*)
Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
☐ CS = Computer Software
☐ HW = Hardware
☒ OT = Other Technical Deliverables
☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
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FY99 Savannah River Site R&D Database

Project Description

Project Title: SAVANNAH RIVER SITE PLUMES FOCUS AREA ORGANICS PRODUCT LINE

Project ID: P/SRTC-9909114005

Target Problem

The conditions at the Czechowice Oil Refinery in Poland have remained somewhat constant for its entire 100 year existence and thus provided a stable environment for microorganisms to adapt to the unique environment of low pH, high Polynuclear Aromatic Hydrocarbons (PAHs) and cold climate conditions. Previous preliminary microbial work has identified 36 isolates that may exhibit properties and capabilities heretofore unknown. Microorganisms surviving in the Czechowice Oil Refinery waste lagoon environment provide the potential for developing improved biodegradation techniques for recalcitrant and weathered soils as well as other harsh environmental processes.

Many technologies exist for the disposal of petroleum contaminated soil (PCS) and material. The amount of material, its distance from the treatment facility and the possibility of continued risk to the generator even after disposal, support the use of in-situ bioremediation as a preferred technology approach. Some of the drawbacks of bioremediation are the length of treatment, the variability of biodegradation with temperature and the reduced rate of degradation of recalcitrant and weathered material.

General microbiological laboratory techniques can isolate and culture pure strains of microorganisms. Once isolated, the properties of each microorganism is identified and a literature/patent search is conducted to determine if the organism has been isolated before. Numerous microorganisms have been identified and patented for uses from production of goods to the remediation of contaminants.

Accomplishments

More than twenty morphologically unique microbial isolates have been recovered on various carbon sources (recovered petroleum crude oil, naphthalene, and salicylic acid) by the Environmental Biotechnology Section. These isolates have been purified and maintained on gelrite plates at both 15 C and room temperature.

A Petroleum Contaminated Soils (PCS) Bioreactor has been developed using the technologies and lessons learned during the biopile project. Preliminary discussions have begun with the Westinghouse Savannah River Company (WSRC) High Level Waste (HLW) Environmental Compliance group for the possible use of the Bioreactor to remove the petroleum fraction from co-contaminated soils. In addition, a patent disclosure has been submitted to the WSRC Patent Committee for the PCS Bioreactor.

FY99 Savannah River Site R&D Database

(*All data is required*)

Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
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- ☒ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
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FY99 Savannah River Site R&D Database

Project Description

Project Title: WESTINGHOUSE SAVANNAH RIVER COMPANY IMMOBILIZATION

Project ID: P/SRTC-9909114006

The purpose is to develop data and understanding of composition effects on glass properties, that limit waste loading in current glass formulations. The objective is to increase the waste loading in the US Department of Energy's (DOE) high-level waste (HLW) glasses.

Problem

HLW glass formulation work done in the past in the DOE complex was focused on achieving a safe and reliable vitrification process that produced an acceptable product. The present Savannah River Site (SRS) Defense Waste Processing Facility (DWPF), Hanford, and Idaho National Engineering and Environmental Laboratory (INEEL) composition databases and predictive models are not adequate to optimize glass formulations for increased waste loading. The current data does not cover a broad enough range of waste compositions. The present situation calls for expanding the databases and developing tools to optimize waste loading, thereby minimizing production and disposal costs.

Accomplishments

SRS Savannah River Technology Center (SRTC) and Pacific Northwest National Laboratory (PNNL) developed two additional glass compositions to demonstrate direct vitrification of INEEL's Zr-calcine. Both glasses target a 38 wt% Zr-calcine loading (on a non-volatile oxide basis) and were experimentally shown to meet all processing and product performance constraints.

The first pilot scale vitrification demonstration run in the EV-16 melter using INEEL pilot plant calcine was completed. After cooling, removal of the solidified glass from the melter revealed no change in electrode length and little, if any corrosion or erosion on the electrodes, drain tube, or refractory.

A Peer Review Committee (PRC) was established to assess the long-term performance strategy for Hanford low activity waste glass.

FY99 Savannah River Site R&D Database

(*All data is required*)

Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☒ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: WESTINGHOUSE SAVANNAH RIVER COMPANY RETRIEVAL AND CLOSURE

Project ID: P/SRTC-9909114007

Problem

Task A:

Methods must be explored and developed to successfully remove residual heels of sludge and debris that remain on the bottoms of some of the waste tanks after bulk waste removal is complete. The tanks are one (1) million gallon nominal capacity with a diameter of 75 to 85 feet, depending on the type of tank. The types of debris and residual waste can include the following:

- Hardened sludge
- Zeolite
- Silica
- Reel tapes.

As much as 40,000 gallons of residue can remain after a conventional waste removal campaign.

Task B:

Saltcake is formed through successive evaporation cycles of alkali waste. Total waste volume is reduced during storage of waste in a less mobile form. Conventional waste removal techniques utilizing slurry pumps and transfer jets/pumps do not suspend and remove this type of waste very effectively. However, the Saltcake must be redissolved and transferred for further processing. Traditional salt removal involves installing large 150 HP slurry pumps into the tank to vigorously mix the contents into solution.

The objective is to design and demonstrate a small system that can be installed in the waste tanks along with the mixers when needed to mobilize the remaining sludge. Hanford also requires, as part of mixer pump retrieval process, a means of transferring waste from a tank that is being actively mixed.

Task C:

Tank 16 is a Savannah River Site Type II waste tank. It has a 2-1/2 foot wide annulus surrounding the primary tank and is lined with a five foot high steel pan to provide secondary waste containment. Tank 16 is underground and enclosed in a concrete vault. The annulus currently contains about 22,000 lbs of water insoluble solids containing 30,000 curies of activity. These demonstrations will evaluate commercially available equipment which can be inserted in to the waste tank to aid in dissolving salt as well as provide an alternate method for removal of waste that has resulted from past production campaigns. Test data indicates there are more cost effective processes for removing salt from High Level Waste (HLW) Tanks than the current use of three mixer pumps.

Task D:

Transfer lines can become blocked, preventing or restricting related waste management functions. The purpose is to identify and test industrial methods to locate and remove waste transfer line blockages and to inspect and certify the condition of the waste transfer lines. In order to determine the factors and their relative importance, it is necessary to create and understand blockage phenomena under laboratory conditions.

Task E:

In-situ grouting has been applied to stabilization of buried waste sites and to previously emptied underground tanks. However, the intention with the Old Solvent Tanks and the tanks is to avoid the issues associated with material retrieval and disposal and grout the tanks with their contents in-situ. There are a number of difficulties that have to be overcome before this technology can be considered field deployable in this application, namely total entrainment of the solid and liquid contents in the grout mixture and grout formulation. Multi-Point Injection (MPI) is a new technology that potentially has the capability of achieving the objective of total entrainment.

Task F:

Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Residual wasteheels have accumulated within the Evaporator and Concentrate Transfer System (CTS) over nearly 30 years of operation, which included leakage into the containment cells. Having identified representative sample locations, one or more specialized sample tools are being developed. These sample tools will have the capability to retrieve approximately 50 ml sample volumes from each location. Analytical methods will be employed for determination of specific species. The results of the sample analysis will support fate and transport modeling as part of the closure program.

Accomplishments

Issued final report on Savannah River Site Tank 16 modeling effort.

FY99 Savannah River Site R&D Database (*All data is required*)
Managing & Operations (M&O) Data

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
☐ CS = Computer Software
☐ HW = Hardware
☒ OT = Other Technical Deliverables
☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
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FY99 Savannah River Site R&D Database

Project Description

Project Title: INNOVATIVE DNAPL CHARACTERIZATION AND MONITORING TECHNOLOGIES

Project ID: P/SRTC-9909114008

Problem

Task A: DNAPL Characterization Workshops

Dense Non-Aqueous Phase Liquid (DNAPL) characterization using barometric pumping and multiphase modeling. The second task is a field implementation of an innovative technique developed at SRS. This technique is designed for vadose zone DNAPL contamination and is potentially inexpensive enough to be accessible to any site. The technology will be transferred to a U. S. Department of Defense (DOD) site in collaboration with researchers at Lawrence Berkeley National Laboratory (LBNL).

To advance the experiential and theoretical DNAPL characterization knowledge acquired throughout the U. S. Department of Energy (DOE) and DOD complex by conducting two workshops in two regions of the country.

Task B: DNAPL Characterization using Barometric Pumping and Multiphase Modeling

Work performed at Savannah River Site (SRS) has demonstrated the use of long term (approximately 100 days), continuous gas phase monitoring of vadose zone wells under two barometrically pumped flow regimes for DNAPL location. The method involves the deployment of a remote monitoring/data logging system with flow meters, pressure transducers, and a Volatile Organic Compounds (VOC) zone well in a DNAPL suspect area.

Accomplishments

Issued a paper on Raman Spectroscopy to Groundwater, titled "Field Tests of a DNAPL Characterization System Using Cone Penetrometer-based Raman Spectroscopy". This paper describes the technology and results obtained from several field trials at SRS waste sites. The method and results shown in the paper represent the first in situ direct measurement of DNAPL in the subsurface.

The Ribbon NAPL Sampler for FLUTE was successfully deployed at the McCormick Baxter Wood Treatment Site in Stockton, California. The work was conducted collaboratively with the Army Corps of Engineers - Tulsa, the Army Corps of Engineers - Seattle and the California Environmental Protection Agency (CEPA).

Successfully deployed the Non-aqueous Phase Liquids (NAPL) FLUTE membrane to a depth of 60 feet at the Paducah, Kentucky C-400 site. The membrane clearly showed red spots from contact with Trichloroethylene (TCE) DNAPL at several depths through the vadose zone and into the water table (approximately 45 feet bgs). This site was contaminated with TCE from leaking pipes and pump seals. Due to equipment problems, the NAPL FLUTE membrane was the only DNAPL characterization technology demonstrated at the site.

Excitation and emissions spectra of twenty common lubricating oil samples and DNAPL samples from SRS have been recorded. The results from this laboratory work are included in the final DNAPL characterization handbook. Details from the spectral analyses will be used to fine tune future DNAPL characterization studies at SRS and other sites. Personnel from the chemistry department of the University of South Carolina at Columbia performed the laboratory analyses under contract to the Savannah River Technology Center.

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
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FY99 Savannah River Site R&D Database

Project Description

Project Title: REMOTE MODULAR WASTE CONDITIONING SYSTEM

Project ID: P/SRTC-9909114010

The Hanford Reservation's Handling and Segregating System for 55-gallon drums (HANDSS-55) uses robotics and automation technologies to prepare waste for final disposal. HANDSS-55 allows operators to remotely open a 55-gallon drum; inspect, sort and repackage the waste for shipment to a disposal facility. The result is improved safety and treatment efficiencies.

HANDSS-55 is a modular system designed to satisfy the various and unique needs of each waste generator. Each piece of equipment can be used separately or integrated with some or all of the others. Five main subsystems comprise HANDSS-55:

- Drum and liner opener
- Inspection and segregation station
- Drum and liner volume-reduction station
- WIPP-approved container repackaging port
- System integration and control station.

HANDSS-55 is being developed through a collaboration between the Mixed Waste Focus Area (MWFA), the Robotics Crosscut Program, and EM-30 at the Savannah River Site. Two reports are available that assess the existing technologies, identify technology development needs and make recommendations for a path forward: *Evaluation of Technologies for Sorting, Sizing-Reduction, and Handling of Mixed Wastes* and *Mixed Waste Focus Area Remote and Automation Technology Needs Investigation*. Deployment of the integrated system is currently scheduled for Fall 2001 at the Savannah River Site. The system will be used to process 10,000 drums of transuranic (TRU) waste at SRS. Future efforts include adapting the system to meet the remote-handling needs of the Hanford site.

Accomplishments

Issued a technical report entitled "Development of an Infrared Welder for Sealing Polyethylene TRU-Waste Containers."

See record P/SRTC-9909114020, "HANDSS-55."

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: DEVELOPMENT OF CONSOLIDATED INCINERATOR FACILITY STABILIZATION TECHNOLOGIES

Project ID: P/SRTC-9909114011

Problem

Task A:

The current equipment available at the Savannah River Site (SRS) Consolidated Incinerator Facility (CIF) for removal and handling of ash is proving to be unreliable and manpower intensive. Equipment failures are extremely time consuming due to the limited access available to internal components. Identification and evaluation of alternative processes for ash removal, handling and stabilization are needed to enable the CIF to improve facility throughput and reduce downtime.

Existing technologies, available through commercial industry for handling, containing, and stabilizing ash were identified and evaluated for ease of operation, reliability and maintainability.

Task B:

With the addition of a evaporator, a new stabilizing material is required to treat the CIF liquid blowdown wastes. Portland cement is currently in use. Portland cement is less effective in stabilizing the highly concentrated salt wastes resulting from operation of the evaporator.

Salt waste stabilization technologies are being evaluated for use in CIF. A stabilizing agent suitable for future wastes with higher salt concentration and enhanced leaching properties was identified.

Accomplishments

Task A:

It was discovered that additives improve the stabilization suitability of Portland cement. A final report was issued. This report addresses permeability, compressive strength, bleed water, and leaching test results of Portland cement and Super cement. The findings indicate that both cements are acceptable for solidifying ash from SRS M-Area filter waste and Purex canyon job control waste. Scrubber solutions from these incinerated wastes failed permeability requirements but passed all other acceptance criteria.

Task B:

Evaluation activities will continue into the next Fiscal Year. FY 2000 deliverables include a system design requirements document and a conceptual design.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☒ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

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FY99 Savannah River Site R&D Database

Project Description

Project Title: ENVIRONMENTAL MANAGEMENT SCIENCE PROGRAM FY 1998 AWARDS: SAVANNAH RIVER TECHNOLOGY CENTER

Project ID: P/SRTC-9909114012

Project #1

Title: Decontamination and Decommissioning of Polychlorinated biphenyl (PCB) Sites at the U. S. Department of Energy (DOE): Extraction, Electrokinetics, and Hydrothermal Oxidation

Large quantities of mixed low level waste (MLLW) that fall under the Toxic Substances Control Act (TSCA) exist and continue to be generated at DOE sites across the country. Currently, the volume of these wastes is 23,500 m³, and the majority of these wastes (i.e., almost 19,000 m³) consists of PCBs and PCB-contaminated materials. Although a number of processes have been proposed for the recovery and/or destruction of these persistent pollutants, none has yet to emerge as the preferred choice for DOE cleanup. This is a collaboration between researchers at the University of South Carolina, Clemson University, and the Savannah River Site.

Project #2

Title: Physical, Chemical, and Structural Evolution of Zeolite-Containing Waste Forms Produced from Metakaolinite and Calcined HLW

Natural and synthetic zeolites are extreme versatile materials. They can adsorb a variety of liquids and gasses, and also take part in cation exchange reactions. Zeolites are easy to make, they can be synthesized from a wide variety of natural and man made materials. One such combination is metakaolinite and sodium hydroxide solution. The objective is to adapt this well known reaction for use in site remediation and clean-up of caustic waste solutions now in storage in high level waste tanks.

Project #3

Title: Precipitation and Deposition of Aluminum-Containing Phases in Tank Wastes

Aluminum-containing phases represent the most prevalent solids that can appear or disappear during the processing of radioactive tank wastes. Of all tank waste constituents Al-species have the greatest potential for clogging pipes and transfer lines, fouling components such as ion exchangers, and completely shutting down processing operations.

The primary focus of this proposal is to understand the major factors controlling precipitation, scale formation, and cementation of existing insoluble particles by Al-containing phases. Results will be used to predict and control precipitation, scale formation, and cementation under tank waste processing conditions.

Project #4

Title: Millimeter-Wave Measurements of High Level and Low Level Activity Glass Melts

The objectives of the proposed multi-organizational research are to develop new real-time sensors for characterizing glass melts in high level waste (HLW) and low activity waste (LAW) melter, and to understand the scientific basis and bridge the gap between glass melt model data and melter performance. Millimeter-wave technology was developed and applied to the simultaneous measure of temperature, conductivity, and viscosity for the first time. This research will be a collaboration between the Massachusetts Institute of Technology (MIT) Plasma Science and Fusion Center (PSFC), the Pacific Northwest National Laboratory (PNNL), and the Savannah River Technology Center (SRTC).

Accomplishments

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Project Description

Project #1

None referenced.

Project #2

A source of decontaminated low level and high level salt supernate has been identified for this task.

Project #3

Provided periodic technical consultation to PNNL researchers concerning SRS waste characterization, storage, retrieval and processing operations.

Closely coordinating with PNNL on the plan for the next phase of research to ensure there is no duplication between these activities and related areas being funded by SRS operations and Tanks Focus Area.

Project #4

Developed a Defense Waste Processing Facility (DWPF) Batch 3 glass test matrix to serve as input to the overall test matrix being developed by PNNL.

Submitted an expanded annual report that summarizes the specifics of the SRTC research efforts in the development of "Millimeter-Wave Measurements of High Level and Low Activity Glass Melts."

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Deliverables:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: DEMONSTRATION OF APPLIED DNAPL CHARACTERIZATION METHODS

Project ID: P/SRTC-9909114013

Currently, there are no broadly applicable technologies that can successfully and consistently detect Dense Non-aqueous Phase Liquids (DNAPLs) in the subsurface either directly or by inferred measurements. Because of the lack of acceptable, individual DNAPL detection technologies, a combination of several complementary data sets from different technologies is recommended.

This work will include the development and testing of innovative field characterization tools. FY99 scope will include deployment of three DNAPL detection tools at SRS and another DNAPL site with different geology and contaminant matrices. The result will be field ready DNAPL characterization tools and a compendium of DNAPL characterization techniques which will include the appropriate application of each technology, field case studies, comparison to baseline technologies and a cost analysis.

Task A: Characterization of DNAPL using Fluorescence Techniques

The objective was to address the field application and testing of the Laser Induced Fluorescence (LIF) to develop a field usable tool and procedure. The results prove the effectiveness of in-situ fluorescence spectroscopy as a method to characterize subsurface DNAPL contamination.

Task B: Alcohol Micro Injection/Extraction using CPT

The objective was to test a new in situ method of DNAPL detection using the injection and extraction of small amounts of DNAPL solubilizing fluids (e.g., alcohols) as delivered by a cone penetrometer Precision Injection/eXtraction Probe (PIX).

Task C: Characterization of DNAPL using Hydrophobic Flexible Membranes

The objective was to develop and prove the effectiveness of rapid, in-situ direct sampling of DNAPL using a temporary flexible membrane inverted into a cone penetrometer or sonic borehole.

Task D: Compendium of DNAPL Characterization Techniques

A report was issued which documents the development, field results and procedures from the 3 technologies in Tasks A-C. This report provides a description of and comparison to baseline DNAPL characterization technologies and the appropriate application of the technologies based on contaminant matrices and geologic settings. The report also includes a cost analysis.

Accomplishments

Task A:

Final results verified that the CPT Laser Induced Fluorescence (LIF) method for DNAPL detection is a useful tool at certain DNAPL sites.

The following list provides the technology deployment information for the LIF technique:

- SRS M-Basin - saturated and vadose zone (2 deployments)
- Cape Canaveral Air Station - saturated zone (2 deployments)
- Florida Dry Cleaner site - saturated zone (2 deployments)

Task B:

The one demonstration of the Micro Alcohol Precision Injection/Extraction Probe (PIX) at a DNAPL site proved the technique works for DNAPL characterization. The time

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Project Description

required to perform the two injection/extraction steps and the costs of sample analysis were greater than expected.

The following list provides the deployment information for the PIX technique:

- Cape Canaveral Air Station - saturated zone (2 deployments)

Task C:

The Ribbon NAPL Sampler has proven to be the most robust DNAPL characterization tool under this TTP and is the first field tool that consistently identifies depth discrete DNAPL location both above and below the water table.

The following list provides the deployment information for the Ribbon NAPL Sampler technique:

- Solvent storage tanks at SRS - Vadose zone to 50 ft
- Cape Canaveral Air Station - Saturated zone to 50 ft
- SRS A-014 Outfall - Vadose Zone (to approximately 50 ft)
- SRS C-Area Burning Rubble Pits - Vadose Zone to 30 ft
- Paducah Gaseous Diffusion Plant - Saturated and Vadose Zone (one CPT boring to 60 ft)
- Wood Preserving Plant (EPA Superfund Site), creosote and coal tar DNAPL, Stockton, Ca - Saturated and Vadose Zone to 50 feet

Task D:

Issued the DNAPL Characterization Compendium.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

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Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: SAVANNAH RIVER SITE D AREA GEOFLOW TREATMENT SYSTEM

Project ID: P/SRTC-9909114014

The Savannah River Site (SRS) Environmental Restoration Department (ERD) is seeking low maintenance and low operating cost remediation alternatives to utilize in place of pump and treat for both the D-Area Coal Pile Runoff Basin (CPRB) and the Ash Basin. The GeoSiphon treatment system is a low maintenance and low operating cost alternative to pump and treat.

GeoSiphon Cells are passive groundwater treatment systems which utilize siphon flow between two points of natural head differential to induce greater than natural contaminated groundwater flow through a treatment train without the requirement for external energy input. The treatment train utilized in GeoSiphon Cells can include permeable treatment materials, aeration, chemical addition, etc.

Accomplishments

Based upon media evaluation, a two stage process was determined as the best approach for the precipitation of aluminum, chromium, iron and nickel. Limestone was selected as the media of choice based on its ability to precipitate aluminum and chromium and because it continues to be effective even after a precipitative coating has developed on the media.

Conceptual design of the secondary treatment system was issued.

Issued a final report with GeoSiphon System testing results.

Issued Deployment Fact Sheets on:

- GeoSiphon/GeoFlow Technology
- GeoFix Technologies.

FY99 Savannah River Site R&D Database Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: WESTINGHOUSE SAVANNAH RIVER COMPANY CHARACTERIZATION AND SAFETY

Project ID: P/SRTC-9909114015

Task A: Savannah River EN Corrosion Probe Validation and Deployment

The purpose is to develop and demonstrate electrochemical noise (EN) measurements as usable technique for real-time, on-line corrosion monitoring of high level waste (HLW) tanks.

The primary degradation mode of the waste tanks is corrosion, which limit the tank's lifetime and safety. Chemical control through analysis of grab samples is currently the only corrosion monitoring tool, so the actual state of corrosion in the tanks is unknown.

Corrosion monitoring of underground storage tanks has typically been achieved by chemical analysis of grab samples of the supernate and examination of corrosion coupons that were immersed in the supernate. These techniques provide only historical information.

Task B: Savannah River Chemistry Species Monitor Development

The purpose is to develop and demonstrate a chemistry species probe as a viable technique for real-time, on-line monitoring of high level waste (HLW) chemistry. The chemical species probe uses both Raman spectroscopy and conductivity measurements to measure and determine the concentrations of chemical species pertinent to HLW.

Processing of the waste for cleanup will require better and more timely knowledge about the waste chemistry. Variations in waste composition occur at different locations within the tank and are not easily characterized under the present chemical control program.

Chemical control of underground storage tanks has typically been achieved by chemical analysis of grab samples of the supernate. The dynamic conditions of the waste tank during processing cannot be followed. Efficient waste processing requires that the appropriate chemical composition be obtained prior to process continuation. On-line monitoring techniques are needed to follow the dynamic conditions encountered in the tank during removal and waste processing.

Commercial in-situ probes for chemistry measurements are not available for application in the waste tank environment. A robust in-situ probe which uses Raman spectroscopy as the analysis technique, however, is capable of measuring the nitrite/nitrite concentration and the hydroxide concentration to 0.05 M. This probe needs to be demonstrated in an actual waste tank.

Task C: Metal Filters for Waste Tank Ventilation

The SRS HLW tanks are currently equipped with a ventilation system to maintain the tank contents at negative pressure (-1.0"WC). This system contains conventional disposable glass-fiber High Efficiency Particulate Air (HEPA) filter cartridges. Cleanable HEAP filters that could replace the conventional disposable filters are desired. These filters should be designed such that the cleaning could be accomplished in the process (i.e., insitu) which would eliminate personnel radiation exposure associated with removal of plugged filters.

This effort was to identify and conduct performance testing on different types of cleanable HEPA filters. Filter performance data will be used to aid in selection of an insitu cleanable HEPA filtration system.

Accomplishments

Task A:

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Project Description

Data analysis has focused on developing a self-organizing map with artificial neural network (SOM/ANN). The vectors which are generated from the data have been found to correspond to particular real-time noise signals. The analysis has involved evaluating if pre-selected vectors can be used to interpret the noise data. The vectors from a given set of data are being used to compare different data sets for identical corrosion environments.

Task B:

Raman Probe was tested and no unusual peaks were detected in the spectra of any waste sample. Excellent to good agreement was found between the Raman results and the standard analytical results for nitrate, nitrite and hydroxide.

Task C:

The final testing using a simulated HLW salt solution to challenge the metal filters was completed. Results will be issued in FY 2000.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Deliverables:

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Perf Location Zip:

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* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: TRANSURANIC OPTIMIZED MEASUREMENT SYSTEM

Project ID: P/SRTC-9909114016

Target Problem

The Savannah River Site (SRS) has a large volume of legacy Pu²³⁸ contaminated transuranic (TRU) waste. A significant portion of this Pu²³⁸ contaminated waste is suspect TRU. This waste is alpha contaminated waste that is currently being managed as TRU waste. This waste is primarily contained in drums stored in concrete culverts. This type of waste can be assayed with the type of system such as the Transuranic Optimized Measurement System (TOMS) and could potentially be reclassified as Low Level Waste (LLW) or Mixed Low Level Waste (MLLW).

Currently, this waste cannot be reclassified as LLW because there is no technology available to accurately characterize the Pu²³⁸ contaminated wastes. There is a need at Savannah River Site (SRS) for radionuclide quantification.

The TOMS is a portable assay system designed to analyze fifty five (55) gallon waste drums in acceptably short time (15-45 minutes) with the results used to segregate TRU from non-TRU waste at the regulatory limit of 100 nCi/g TRU. The system consists of six (6) subsystems or components. The major subsystems are:

- the electronic enclosure,
- the detector assembly,
- the data acquisition system,
- lift rotate assembly,
- operations and analysis software, and
- environmental control system.

Accomplishments

Physical assembly and electrical integration of the system are complete. System specific software was upgraded to make it compatible with the new system hardware and software.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Deliverables:

- ☒ SI = Scientific Information (reports)
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Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: DIAGNOSTIC TESTING AT THE CONSOLIDATED INCINERATION FACILITY

Project ID: P/SRTC-9909114017

Problem

Testing is being done to determine the operational elements that influence dioxin and furan formation in the Consolidated Incinerator Facility (CIF) stack emissions. If the dioxin and furan emissions, when measured at normal operating parameters, can be controlled by operations, such as more frequent blowdown, then CIF may be able to meet the proposed U. S. Environmental Protection Agency (EPA) maximum achievable control technology (MACT) standards without a need to add a carbon bed to the existing CIF pollution control equipment. Carbon beds are expensive to operate and it may be very difficult to dispose of spent carbon in a radioactive environment.

CIF needs to understand the operational conditions that may lead to high dioxin and furan emissions when operating at typical conditions on normative waste feeds. Also, CIF needs to determine if mercury in a solid matrix in expected daily concentrations will meet MACT mercury emission limits.

Accomplishments

Completed analytical testing and sampling analysis.

Completed all field testing under radiological conditions.

Issued final report on stack tests that includes analytical and field verification data.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: PRESSURE REDUCTION TECHNOLOGY FOR TRUPACT-II

Project ID: P/SRTC-9909114018

Problem

The purpose is to develop an hydrogen getter technology that will prevent formation of flammable gas mixtures in the TRUPACT-II shipping cask. Initially, design criteria for the use of hydrogen getters were documented, and major categories of hydrogen getter technology were reviewed to determine the best technology available that supported the design criteria. Interaction of radiation from transuranic uranium (TRU) elements with the waste matrix being transported in the TRUPACT-II results in decomposition of the waste and production of non-radioactive gaseous by-products. The radiolysis products may include gases and vapors.

The most promising technologies identified were composite getter materials that provide a means to prevent poisoning of the getter by other gases and vapors present in the TRUPACT-II.

The amount of hydrogen generated is a function of both the waste type and the decay energy; therefore, operating limits for allowable radioactive decay energy in the TRUPACT-II have been established for different waste types.

The term "metal hydride" is commonly used to refer to a metal or metal alloy that reacts reversibly with hydrogen, whether or not it is in the hydride form. Metal hydrides have been studied and used for purposes of hydrogen separation and storage for some time. In general, metal hydrides absorb hydrogen at lower temperatures and desorb hydrogen at higher temperatures, although the functional temperature range varies widely for different metal hydrides. The fact that the reaction is reversible suggests metal hydrides used as hydrogen getters in the TRUPACT-II could be recycled and reused, resulting in significant cost savings.

Accomplishments

Initially, sol-gel metal hydride (SGMH) was the focus of this effort. SGMH has been patented and tested for use in an oil refinery as a means of recovering hydrogen in the presence of significant concentrations of getter poisons. Additional research and consultation lead to the testing of two other metal hydride materials, neodymium cobalt (NdCo) and zirconium cobalt (ZrCo). ZrCo shows more promise than NdCo. As a result, SGMH samples are being made and tested using ZrCo. The experiments are focusing on 1) conditions for activation of the metal, 2) absorption performance at room temperature, and 3) absorption performance at both -20 degrees C and 70 degrees C.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: HANDSS-55

Project ID: P/SRTC-9909114019

The Hanford Reservation's Handling and Segregating System for 55-gallon drums (HANDSS-55) uses robotics and automation technologies to prepare waste for final disposal. HANDSS-55 allows operators to remotely open a 55-gallon drum containing waste; inspect, sort and repackage the waste for shipment to a disposal facility. The result is improved safety and treatment efficiencies.

HANDSS-55 is a modular system that is designed to satisfy the various and unique needs of each waste generator. Each piece of equipment can be used separately or integrated with some or all of the others. Five main subsystems comprise HANDSS-55:

- Drum and liner opener
- Inspection and segregation station
- Drum and liner volume-reduction station
- WIPP-approved container repackaging port
- System integration and control station.

HANDSS-55 is being developed through a collaboration of the Mixed Waste Focus Area, the Robotics Crosscut Program, and EM-30 at Savannah River. Two reports are available that assess the existing technologies, identify technology development needs and make recommendations for a path forward: *Evaluation of Technologies for Sorting, Sizing-Reduction, and Handling of Mixed Wastes* and *Mixed Waste Focus Area Remote and Automation Technology Needs Investigation*. Deployment of the integrated system is scheduled for Fall 2001 at the Savannah River Site where it will be used to process 10,000 drums of transuranic waste. Future efforts include adapting the system to meet remote-handling needs at the Hanford site.

Accomplishments

Issued a technical report entitled "HANDSS-55 System Integration Module Linking Components Conceptual Design Report Revision 1." The document describes a collection of equipment components known as the TRU-Waste Transfer System (TWTS) that perform the following tasks:

- 1) Remove the unopened 55-gallon TRU-waste drum from the load-in port into the glove box.
- 2) Assist in the removal of the drum lid and plastic liner top.
- 3) Empty the drum of its inventory by picking the drum up and rotating it.
- 4) Move the empty drum from the dumping area to the Process Waste Reduction (PWR) module.
- 5) Move the bucket containing the size-reduced waste from underneath the PWR module to the TRU-Waste Repackaging Module.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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FY99 Savannah River Site R&D Database

Project Description

Project Title: VADOSE ZONE RESEARCH AND DEVELOPMENT

Project ID: P/SRTC-9909114020

Problem

The purpose is to determine the state of scientific knowledge related to the vadose zone and how that knowledge can be applied to understanding the transport mechanisms that effect remediation efforts. Working with experts on vadose zone technologies from other DOE Departments, other Federal Agencies, universities and private industries, a reference book on the state of Vadose Zone remediation knowledge has been developed and will be published in Spring FY 2000.

Assemble, develop and document the technical content for the Vadose Zone Book. Compile the chapters, issue for internal and external review, assess and incorporate comments and prepare the manuscript for publishing.

Accomplishments

Completed research, collection and editing of case studies.

Completed peer review of final manuscript.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Deliverables:

- ☒ SI = Scientific Information (reports)
- ☐ CS = Computer Software
- ☐ HW = Hardware
- ☒ OT = Other Technical Deliverables
- ☐ IN = Inventions

Perf Location Zip:

Start Date: Compl. Date:

* Sponsoring Program

* (asterisk) indicates that a field may contain multiple values separated by a semicolon (;)

Date 12/8/99
Time 4:29:57 PM

FY99 Savannah River Site R&D Database

Project Description

Project Title: SALT DISPOSITION SAVANNAH RIVER SITE

Project ID: P/SRTC-9909114021

Problem

Task A - Precipitation and dissolution behavior of mixed alkali salts of tetraphenylborate.

Measured the studies measured the solubility of the tetraphenylborate ion as a function of time given different ratios of total NaTPB added to the solutions with constant potassium content.

Task B - Examine the continuous precipitation of cesium from simulated SRS waste using tetraphenylborate.

Examine the removal of Strontium (Sr), Plutonium (Pu), Uranium (U), and Neptunium (Np) from simulated wastes in varying ionic strength at two defined concentrations of monosodium titanate (MST). Confirm the rates of sorption for these radionuclides from a single mixture of radioactive waste.

Task C -

Using sodium tetraphenylborate to remove Cs from a sample of SRS radioactive waste in a continuous, two-stage process. Design, fabricate and initiate non radioactive testing of a unit completed meeting target requirements for the process.

Task D -

Completed a series of non radioactive experiments examining the performance of crystalline silicotitanate in its engineered form, IONSIV(TM) IE-911, with simulated SRS waste.

Task E -

Examined the kinetics of monosodium titanate for removal of Pu, U, Sr, and Np from a sample of SRS radioactive waste.

Task F -

Completed two workshops with external personnel to review the crystallization and precipitation chemistry of sodium tetraphenylborate as well as to examine mixing behavior.

Accomplishments

Task A -

Examined the precipitation and dissolution behavior of mixed alkali salts of tetraphenylborate. Showed that a fraction of the precipitated NaTPB in these mixed salt systems remains effectively unavailable for recovery during the earlier stages of dilution with water.

Task B -

Established the physical and operating design parameters for a larger (20 L scale) demonstration conducted at Oak Ridge National Lab (ORNL). Defined the type of agitator, mixing speed, amount of excess reagent, and residence time for the tests at ORNL. Demonstrated successful decontamination of the simulated waste.

Task C -

The initial test with radioactive samples resulted in excessive foaming. Equipment was redesigned and installed. Successful testing showed decontamination of the solution for both cesium and strontium. Foaming still plagued operation but did not stop the test.

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FY99 Savannah River Site R&D Database

Project Description

Task D -

Examined the influence of variable flow rate, the presence of organic compounds, the variation between various manufacture lots of material, and the influence of column aspect ratios. Demonstrated reasonably good agreement of measured results with predictions based upon the VERSE model (Purdue), incorporating the thermodynamic predictions from the Texas A&M model.

Task E -

Comparing the rate of removal with similar data from other experiments using simulated wastes provided confirmation of process cycle times. Completed testing with initial analyses available for Pu and Sr. In both cases, the data agree well with results of previous simulated waste studies.

Task F -

Completed workshops, records exist in two internal reports: SRT-WHM-99-006 and SRT-WPT-99-007. The reports include peer review of the experimental programs conducted at Savannah River Technology Center and ORNL as well as guidance on future testing.

FY99 Savannah River Site R&D Database

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Project Title:

Defense Waste Processing Facility (DWPF) Technology Support - Process and Chemistry

Project ID:

P/SRTC-9903105001

Project Description (4000 characters or less):

The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company continued to provide key technical and operational support to Defense Waste Process Facility (DWPF) at the Savannah River Site in FY99. Due to continued funding limitations, the technical support to increase DWPF production was constrained. DWPF and SRTC developed a prioritized list of technical needs to address the most critical technical and operational issues.

The objectives are to support operation, improved waste loading, and improved processing times of the Defense Waste Processing Facility (DWPF); to demonstrate that the DWPF waste form will meet repository requirements; and to provide optimum performance parameters for DWPF. Direct technical support is provided for chemical and melter cell technical issues, analytical methods development, preparation of radioactive process requirements, process control, and chemical flowsheet and material balance evaluations.

The following major DWPF technical needs were addressed: chemical flowsheet modeling support for long term planning for immobilization of tank farm high level waste; chemical flowsheet support for several sludge batch blending scenarios; radionuclide analysis of tank farm waste and preparations for bench scale processing of actual high level radioactive tank farm waste to demonstrate that the next Batch will meet waste acceptance requirements; developed analytical methods for removal of strontium-90 and cesium-137 from high level radioactive waste; provided statistical and analytical support for evaluation of data on new aliquoting sampling and analytical method; demonstrated anti-foaming agents in 1/240th Glass SRAT (engineering scale pilot); developed a flowsheet that allows for a SRAT product with a greater solids content to improve melter pour rate, and another flowsheet for sludge waste only (from Tank 42) that produces a chemically more reducing melter feed, which improves melter operations; supported DWPF process control methods and glass property models to provide assurance that the melter feed is processable and will produce an acceptable product; evaluated glass viscosity data for macrobatch 2 and provided recommendations to improve DWPF operations; evaluated other operational constraints (frit and glass liquidus correlation) to improve DWPF operations and increase waste loading in the final glass wasteform; supported DWPF melter pour spout insert and knife edge testing at the Clemson Environmental Test Laboratory (CETL) and Florida International University (FIU); analyzed DWPF glass pour stream sample and performed glass variability studies in support of sludge batch waste qualification and acceptance.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

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Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Project Title:

Defense Waste Processing Facility (DWPF) Technology Support - Equipment and Materials

Project ID:

P/SRTC-9903105002

Project Description (4000 characters or less):

The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company (SRTC) continued to provide key technical and operational support to the Defense Waste Process Facility (DWPF) at the Savannah River Site in FY99. Due to continued funding limitations, the technical support to increase DWPF production was constrained. DWPF and SRTC developed a prioritized list of technical needs to address the most critical technical and operational issues.

The objectives were to support operation and improved processing times of the Defense Waste Processing Facility (DWPF). Equipment engineering, materials engineering, and welding support includes equipment development, testing, and general assistance.

The following major DWPF technical needs were addressed: melter pour spout insert work in collaboration with Florida International University (FIU) and Clemson Environmental Test Laboratory (CETL) to improve melter pour rate; developed and delivered tools for melter pour evaluation, high temperature inspection system, developed tele-robotic manipulator for DWPF melt cell; supported DWPF in investigation and repair techniques; provided improved design for equipment in DWPF analytical laboratory; evaluated high temperature materials for use in DWPF melter; provided corrosion evaluations and material testing to verify material compatibility for specific application and improve DWPF operations; DWPF welding processes; designed and installed Year 2000 (Y2K) compliant process monitoring systems; and evaluated gas chromatographs for Y2K compliance.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

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Project Title:

Materials Disposition - Plutonium Immobilization Program

Project ID:

P/SRTC-9903107002

Project Description (4000 characters or less):

The Plutonium Immobilization Project is developing the technology to disposition excess weapons grade plutonium. In the two part Can-in-Canister (CIC) approach, plutonium would be immobilized within a ceramic formed in "pucks". The pucks would then be placed inside Defense Waste Processing Facility (DWPF) canisters for filling with radioactive High Level Waste glass at the DWPF.

The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company successfully tested variations of the CIC design in August 1999 during the Phase 1 scoping test at the Clemson Environmental Technologies Laboratory. Three canisters were filled with surrogate DWPF glass under various DWPF pour conditions. No radioactive materials were used in these tests. Comparisons of predicted glass pour weights with measured glass weights in the canisters, visual examination of the inside of one canister during glass filling, and subsequent cross sectioning and inspections of the canisters showed no observable glass voiding or hardware deformation.

The Phase 1 test indicated that the CIC system is a viable option for the disposition of excess weapons grade plutonium. The results of this Phase 1 test will be used to determine the "final" CIC hardware design to be tested in the Phase 2 test in FY00. This Phase 2 test will be used to demonstrate compliance with the filling requirements in the Plutonium Immobilization Product Specifications.

FY99 Savannah River Site R&D Database

Managing & Operations (M&O) Data

(*All data is required*)

Research Organization:

Project Title:

Funding Mechanism:

Project ID:

POC Last Name - First Name -

Point of Contact Phone:

	B&R Codes	FY Costs: (in thousands)
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Project Title:

Digital Imaging & Measurement System

Project ID:

P/SRTC-9902103002

Project Description (4000 characters or less):

Development of the Tritium Digital Imaging & Measurement System (DIMS) was a FY99 continuation of a task that was initiated in FY98. The Savannah River Technology Center (SRTC) of the Westinghouse Savannah River Company (WSRC) was funded by WSRC Tritium to design, procure, assemble, test and qualify a Digital Radiography (DR) system that could acquire filmless images of pinchwelded tubes and then automatically evaluate the features of interest. The resolution of the system was specified at the high end of the technology's capability and the system had to be user-friendly to personnel that had minimal training in nondestructive examination techniques, specifically radiography.

At the beginning of FY99, the components of the DIMS had been assembled and integrated into a stand-alone X-ray cabinet and the software development was underway. The system was in its testing phase to demonstrate that the selected scintillating medium, the CCD camera, and the spatial configuration of the components was adequate to produce filmless images with a 0.001" resolution. The operation of the system was controlled by the software, however, only the software development engineer could run the programs and routines. The Graphical User Interfaces (GUIs) and screens were still under development along with several of the subroutines that would perform specific functions.

In early FY99, SRTC and Tritium Engineering Department (TED) worked to develop the formal methodology that would be used to qualify the DIMS. The methodology specified the features of interest that would be evaluated by the DIMS as well as the number of measurements to be taken, how they would be taken, the accuracy of the results, and how the qualification would be evaluated in order to determine the acceptability of the system. The methodology also specified that a dimensional standard would be prepared and would be used as a calibrated guage to evaluate the resolution and accuracy of the system. An equipment baselining procedure would be prepared to establish the performance and response of the system's electronic components and the overall performance of the DIMS. The qualification program was reviewed and approved by the SRTC and TED management and input was also acquired from representatives of the national lab design agencies.

The software development program proceeded in parallel with the qualification program. Unexpected problems were encountered such as the presence of "bubbles" in the scintillating glass. Due to the ultrahigh resolution of the system, these manufacturing defects became a problem. A software routine had to be developed to locate the bubbles in the image, identify them as a manufacturing defect, and then to remove them from the digital image. The effects of secondary light produced by the scintillating glass was also a problem due the "fogging" effect of the light. A software routine was produced that would reduce or eliminate those effects. In addition, the software was presented to a broad range of operators in order to get their feedback on the usability of the software. Formal training materials were produced that were based on the completed software and formal classroom and practical training was presented to the operators. Extensive comparisons of the DIMS measurements were made against the traditional film radiography measurements. All of this was combined to produce the finished system and program.