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by

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Savannah River Technology Center

Monthly Report

November 1993

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 19808

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Savannah River Technology Center

Monthly Report

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Executive Summary

Tritium

- Tests of the single stage hydride bed filled with LaNi4.89Al0.11 D (~6), which is planned for tritium service, show that adequate D_2 is absorbed on the bed at an equilibrium pressure of 25 psia (22°C (~72°F)), to achieve a loading pressure up to 1700 psia at a desorption temperature of 170°C. (page 5)

- C&HTS is tracking Replacement Tritium Facility (RTF) requests for technical assistance. Benefits to RTF and C&HTS personnel include definition of the problem, scope, timing, resources required, and less duplication of efforts for problems previously addressed. (page 5)

- C&HTS is providing technical support for the Thermal Cycling Absorption Process (TCAP) Cold Sequence Integrated System Test (SOP-AP-233-00396). The TCAP control sequence was fully demonstrated by this test and should be completed about one week ahead of schedule. (page 5)

- Several process modifications to the LANA-curium matrix flowsheet should provide for increased loading of the LANA. Binder/lubricants were effective in improving the flow characteristics of the copper and sealing metal hydrides in the composites. A low-temperature heat treatment prior to sintering is necessary to remove the binder. (page6)

- In support of the Research and Development program, Effects of Hydrogen Isotopes on Materials, welded tensile samples of type 304L stainless steel, were fabricated using the Gleeble Thermal Mechanical Testing System. (page 6)

Separations

- DOE requested a study of the process changes, made in F and H Canyons and the B Lines from 1975 to present, which could adversely impact the manageability of the processes. Process changes identified will be re-optimized for improved manageability and safety. The only change identified as possibly reducing the manageability of the process was the uranium scrub in the second plutonium cycle of the PUREX process. The effect of this change on potential accident frequency is under investigation. (page 7)

- Results from evaporation experiments established monitoring conditions during interim storage of the plutonium solution in Tank 9.6. F-Canyon Tank 9.6 is normally used to store plutonium product solution (2BP) from the second plutonium cycle before transfer to FB Line. (page 7)

- The Safety Analysis Report (SAR) Addendum for F-Canyon and the Basis for Interim Operation (BIO) for F Canyon and FB Line were transmitted last month and are awaiting DOE approval. (page 7)

- Alpha particle emitting materials produce hydrogen in nitric acid solutions through radiolysis. The production rate depends on the dose rate from the emitted alpha particles and the nitric acid concentration of the solution. Calculations show that radiolysis can potentially cause hydrogen buildup in un-sparged hold tanks. The hold tanks in question contain nitric acid and other chemicals. The reaction of these chemicals generates nitrogen and nitrous oxide gases, which could reduce, by dilution, the maximum hydrogen concentration in the gas phase of the hold tanks. Radioactive experiments are progressing to determine the rates and concentrations under the hold tank conditions. (page 7)

- WSRC approved and delivered the FB-Line BIO on October 29, 1993, three days ahead of schedule. Informal DOE comments were received and incorporated. (page 8)

Environmental

- A sitewide groundwater flow model is being developed to aid in water resource management and to provide accurate boundary conditions to facility specific local models. A Quality Assurance procedure was prepared to implement configuration management. (page 9)

- Analyses was completed for the Inhibited Water Bearing Tank samples. The data indicates that bacteria are present sufficient amounts to cause a biofouling of the system. Because of this, the filters have a real possibility of clogging. (page 9)

- Analysis of vegetation and small mammal samples from the Old F-Area Seepage Basin indicate that all metallic elements, except those that are essentially normal elements, are below the detection level. (page 9)

- The Old TNX Seepage Basin Electrokinetic Demonstration Project is set to begin. Two one-dimensional electrokinetic cells have begun operation. (page 9)

- A list of ten Constituents of Concern (COC) in the Met Lab seepage basin wells was compiled. These COCs exceeded the 99th percentile for the background wells in each of three aquifers. The average constituent concentrations for the point of compliance wells were compared with the maximum concentration limits (MCL) for 20 constituents previously listed in the Part-B application permit. Only two exceeded the MCLs at the 99% confidence limit. (page 10)

- A final version of the Interim Action Proposed Plan for TNX Groundwater was prepared and submitted to DOE-SR for subsequent submittal to the Environmental Protection Agency. (page 10)

- Five sets of silver saddles were reacted with HBr gas to form insoluble AgBr. All five samples passed the TCLP. Three of the five sets were below detectable limits

(page 10).

- SRTC received notice that the CRADA, with JND Sterling Inc. for development of solar collector technology for use in environmental remediation was approved by DOE-SR. (page 10)

- A conceptual model of the Mag-Sep system was developed and reviewed with the Environmental Protection Department (EPD). EPD indicated that permitting the Mag-Sep demonstration should be straight forward, based on the conceptual model. (page 10)

- The heating stage of the six-phase ohmic heating demonstration was successfully completed. Initial analysis of the change in air flow from the extraction well and changes in piezometer readings measured within and outside the heated pattern indicate a significant change in the permeability of the clayey sediments. (page11)

- The draft of a report on the use of the Ion Trap Mass Spectrometer (ITMS) for analysis of groundwater from well characterized wells was issued for review and comment. The goal of this task is to validate the use of ITMS as a screening device for groundwater samples from well characterized wells. This activity should result in a significant reduction in the number of samples sent offsite to commercial labs for analysis. (page 11)

- A construction permit for the new Mobile Bioreactor System at TNX was obtained from the South Carolina Department of Health and Environmental Control. (page 11)

Waste Management

- An initial screening of site solid waste for suitability for vitrification was completed. Filter paper takeup rolls from M Area appear to be excellent candidates for a demonstration. (page 13)

- SRTC hosted a meeting of the Westinghouse GOCO vitrification committee at the Clemson University Center for Vitrification Research. (page 12)

- The Consolidated Incineration Facility Offgas Components Test Facility (OCTF) was turned over from construction and the facility safety inspection was completed on October 13, 1993. Equipment component checkouts are in progress and system checkouts will follow. OCTF checkout is scheduled for completion by January 31, 1994. (page 13)

- WSRC and the Westinghouse Hanford Company are participating in a joint slurry pump development program. The goal of the program is to develop an advanced design slurry pump for use at SRS and Hanford. (page12)

- An integrated dynamic model of the High-Level Waste System is being devel-

oped. The model will forecast tank space versus time by performing a material balance on 20 key chemical compounds across the system. The task is scheduled for completion by September 1994. (page 12)

General

- WSRC approved the SRTC BIO and submitted it to DOE for approval, thus, meeting a DOE "Award Fee" milestone. The SRTC BIO provides an interim safety basis for SRTC and allows continued operation until an updated SAR and Technical Safety Requirements, meeting the latest DOE order requirements, are approved. The BIO concludes that safety to workers and the public is not threatened as a result of continued operation of the SRTC Technical Area. (page14)

- Financial concerns with the Work Authorization System, Change Control, Annual Operating Plan (AOP) financial baseline variance analysis capability, Outyear Budget development process, and the Management Control System process emphasized the urgency to implement Project Management Integration and Costing System applications within SRTC. (page 14)

- Drop testing and evaluation of two 9975 shipping container packages were successfully completed. These packages were the first of fourteen 9973, 9974, and 9975 shipping packages that will be tested for the shipping package recertification program. (page 16)

- The Materials Consultation Group Operating Procedure was reviewed for consistency with the E7 Manual and applicable Quality Assurance procedures. A revised procedure was drafted to ensure compliance with these procedure requirements. (page 17)

- Power Maintenance Engineering requested that the Materials Technology Section perform material evaluation on 484-D boiler components to look for degradation mechanisms that would require component replacement during the refurbishment of these 40- year-old units. Power Maintenance Engineering decided to refurbish the boilers in lieu of building new units. (page 17)

- Results from the SRTC program to develop welding methods for repairing stainless steel containing helium are applicable to several important programs. The fusion reactor community has shown interest in the impact the work may have on the International Thermonuclear Experimental Reactor (ITER). To support the SRS ITER mission, SRS has made the technology available to the ITER community and is preparing a *Fact Sheet* on the capabilities for future support. (page 17)

Tritium

Single Bed Loading Status

W. N. Posey, E. F. Dyer, and T. J. Warren

Absorption/desorption tests of the single state hydride bed filled with LaNi4.89Al0.11 D (~6), which is planned for tritium service, show that adequate D_2 is absorbed at an equilibrium pressure of 25 psia, at 22°C (~72°F), to achieve loading pressures up to 1700 psia at a desorption temperature of 170°C. The volumes of gas delivered to the 1.08 liter calibrated volume and manifold at several desorption temperatures and pressures are shown in Table 1.

Table 1. Gas Delivered to the 1.08 Liter Calibrated Volume and Manifold

Temp (°C)	Pressure, (psia)	Std. (liters)	g. Equil. (T_2)
140	1000	73	19.5
160	1450	106	28.4
170	1700	125	33.5

One objective of the tests is to determine if single bed loading can be achieved with the bed loaded to an equilibrium D_2 pressure of ~10 psia at room temperature (20 - 25°C). If adequate hydrogen isotopes can be absorbed at less than atmospheric pressure at room temperature, the need for low-temperature absorption would be eliminated, thus lowering the operating cost of such a facility in production. The capital cost for establishing this type of loading line would also be reduced. The next desorption tests will be conducted after D_2 absorption at ~10 psia at 20 - 25°C.

Replacement Tritium Facility Technical Issues Tracking

A. S. Horen, T. Motyka, L. K. Heung, J. E. Klein, R. A. Malstrom, G. S. Nichols, J. H. Scogin, and J. R. Wermer

C&HTS is tracking Replacement Tritium Facility (RTF) requests for technical assistance. They provide technical consultation and assistance for RTF Startup activities. Benefits to RTF and C&HTS personnel include definition of the problem, scope, timing, and resources required, and less duplication of efforts for problems previously addressed. Specific RTF issues, typically requested by RTF personnel, are tracked in this manner; general RTF issues and technology topics are not included. The status of RTF issues generated and completed, as well as total manhours spent addressing RTF issues, is reported in the *RTF Monthly Project Status Report*.

Key RTF Technical Issues for October 1993 include:

- maintaining active support of the *TCAP Cold Sequence Test Procedure* (SOP-AP-233-00396)
- participating in TCAP/IBA testing and scheduling issues discussions
- planning for PR revision process
- providing technical information for the LCO revision

Replacement Tritium Facility Thermal Cycling Absorption Process Support

A. S. Horen, L. K. Heung, and J. H. Scogin

C&HTS personnel are providing support for the Replacement Tritium Facility (RTF) Thermal Cycling Absorption Process (TCAP) Cold Sequence Integrated System Test (SOP-AP-233-00396). A working group was formed with members from C&HTS, RTF Technical, RTF DCS, and RTF Test Conductors participating in bi-weekly

meetings (or more often, as required). This group has been able to identify potential "trouble spots" in the procedure before it is performed, analyze data as the test is taking place, and evaluate TCAP performance.

The TCAP Sequence Test fully demonstrates one and two column operation in REFLUX and ONLINE modes. A range of process conditions are evaluated for TCAP and storage bed operation using "pure" deuterium that provides information for establishing process parameters. This test fully demonstrates the TCAP control program, but does not demonstrate tritium-deuterium isotope separation.

The TCAP units have performed as expected throughout this test. The system response for various process conditions is excellent. In addition, this test has provided the opportunity for Operations personnel to gain experience in TCAP operation. The test is expected to be completed by mid-November 1993, about one week ahead of schedule.

Further TCAP testing required for project closure includes: 1 - 2% tritium leak test of the TCAP system (that follows the completion of this test); the In-Bed Accountability "cold" test; and the TCAP Isotope Separation demonstration test (approximately January 1994).

The teamwork and proactive participation by all TCAP testing stakeholders has been a total quality effort, which provided a nearly flawless test.

Metal Hydride Composites

J. W. Congdon and B. K. Sides

Experimental results indicate that several modifications to the LANA-curium matrix flowsheet should provide for increased loading of the LANA. The use of lubricants during compaction has been demonstrated to reduce the amount of metal hydrides exposed on the surface of the composites. This sealing of the surface reduces the loss of hydrides from the surface during hydriding.

Testing indicates that the decomposition of the binder decreases the storage capacity of the hydrides if the normal vacuum sintering procedure is used. The heating cycle can be modified to decompose the lubricants at lower temperatures. This reduces the negative effects of the binder on the metal hydride.

Several different binders are being evaluated. Sol-gel coated metal hydrides were used in an attempt to minimize the lubricant-hydride reactions.

Effects of H_2 Isotopes on Welded Steels

M. J. Morgan

Experiments to measure the effects of hydrogen and tritium on the fracture toughness properties of welded steels are in preparation. Welded tensile samples of type 304L stainless steel were fabricated using the Gleeble Thermal Mechanical Testing System. The weld bond planes in these samples are solid-state welds, much like reservoir pinch or reclamation welds. Smooth and notched bar tensile tests will be conducted to determine the weld-bond strength as a function of weld temperature and heating rate.

The next phase of the program will be to measure the effects of hydrogen on weld bond strength. In preparation for those experiments, our high pressure hydrogen charging facility was tested and proved for operation at 10,000 psi and 350°C.

Separations

Optimization Study

M. C. Thompson

DOE requested a study of the process changes made in F and H Canyons and the B Lines from 1975 to present, related to throughput, waste reduction, and cost that could adversely impact the manageability of the processes. Process changes identified will be re-optimized for improved manageability and safety.

The history of the processes in F- and H-Areas were studied to determine the original design bases to compare with existing processes for identifying processes that need re-optimization. The only change identified as possibly reducing the manageability of the process was uranium scrub in the second plutonium cycle of the PUREX process. This change was made to meet new, lower specifications for uranium in plutonium and to reduce waste generation by not requiring recycled plutonium from scrap and scrub alloy to go through the first cycle for uranium decontamination. The process works well, is easily controlled by the distributed control system, and does not compromise safety. Plutonium is stripped from the solution, even without reductant in the process, when uranium scrub is not done. However, a small amount of reflux can occur with the uranium scrub operating if the reductant is not in the strip solution. The reductant is present during normal operating conditions. The effect of this change on the frequency of criticality is under investigation.

Tank 9.6 and 9.8 Solution Evaporation Studies

J. H. Gray, E. A. Kyser, and K. J. Kalbaugh

Results from evaporation experiments established monitoring conditions during interim storage of the plutonium solution in Tank 9.6. F-Canyon Tank 9.6 is normally used to store plutonium product solutions (2BP) from the second plutonium cycle before transfer to FB Line.

Volume reduction will be the primary tank monitoring control to prevent solids from forming in Tank 9.6. The laboratory study showed that after a 30% reduction in liquid volume, neither plutonium nor boron solids had formed. Additional evaporation of the plutonium solution resulted in plutonium and boron coming out of the solution.

Volume adjustments with nitric acid will be made before the 30% volume reduction is reached. The concentration of the additional nitric acid will depend on the existing acid concentration and the concentration to be maintained in the tank.

F-Canyon and FB-Line Restart Issues

P. L. Fisk and M. E. DelGenio

The Safety Analysis Report Addendum for F Canyon, and the Basis for Interim Operation (BIO) for F Canyon and FB-Line, were transmitted last month and are awaiting DOE approval. Current efforts are focused on various restart issues, including:

- examining the impact of hydrogen deflagration on the criticality frequencies for FB-Line
- re-examining the earthquake-induced fire scenarios for F Canyon and FB-Line
- analyzing the effect of Am-241 ingrowth on the FB-Line source-term assumptions in the BIO.

Hydrogen Generation in FB-Line Process Hold Tanks

J. R. Smith and J. B. Schaade

Alpha particle emitting radioactive materials produce hydrogen, oxygen, and traces of other gases in nitric acid solutions through radiolysis. The production rate of these gases depends on the dose rate from the emitted alpha particles and the nitric acid concentration of the solution. Calculations show that radiolysis can potentially cause hydrogen buildup in unvented hold tanks.

The hold tanks in question contain sulfamic acid (HSA), hydroxylamine-nitrate (HAN), and nitric acid. The reaction of HSA and HAN with

radiolytically produced HNO_2 generates nitrogen and nitrous oxide gases, which could reduce, by dilution, the maximum hydrogen concentration in the gas phase of the hold tanks. Radioactive experiments are planned to determine the production rates and concentrations for the radiolytically produced gases under the hold tank conditions.

FB-Line Basis for Interim Operation

H. S. Smiley

WSRC approved the FB-Line Basis for Interim Operation (BIO) and delivered it to DOE for approval on October 29, 1993, three days ahead of schedule. Informal DOE comments were received and incorporated.

Environmental

Groundwater Modeling

G. Flach
L. Hamm and S. Aleman

A sitewide groundwater flow model is being developed to aid in water resource management and to provide accurate boundary conditions to facility specific local models. The flow/transport numerical code referred to as Subsurface Analysis for Flow and Transport in 3-D (SAFT3D) was selected for developing the model. SAFT3D will also be the main saturated flow groundwater code for modeling local areas onsite. Realizing the large number of unknowns a site model must have, the general purpose code SAFT3D was streamlined to meet specific site needs (e.g., only three-dimensional geometric capability, greatly reduced storage, reduced cost of code maintenance). This new streamlined version of SAFT3D is now ready for placement into a code configuration management system. A Quality Assurance procedure was prepared to implement configuration management. Several spatial data items important to site model development were acquired. These include basemaps, topographical data, and stream/lake coordinates in electronic form as well as published site, 7.5 minute quadrangle and 3302 series local maps. New site hydrogeologic stratigraphy data will be acquired when available.

Development of a groundwater code preprocessor is underway. A few of the basic algorithms for automating the transformation of hydrogeologic data into SAFT3D input decks were completed (e.g., a bicubic spline fitting algorithm of two-dimensional surfaces, an algorithm for the generation of stream, drain, and inactive cell boundary conditions). As a means of testing these special purpose algorithms, the GeoTrans F- and H-Area Seepage Basins and the GeoTrans General Separation Area models, based upon the FTWORK code, are being converted into SAFT3D input decks. Builder-X, a commercially available Graphical User Interface (GUI) builder, will be purchased to assist in the GUI aspects of developing the preprocessor. In the interim the commercial packages TECPLOT and EARTHVISION serve as the GUI.

Microbiology Support

C. B. Fliermans

Analyses were completed for the Inhibited Water Bearing Tank samples. The data indicate that bacteria are present in the water samples collected from the Bearing Water Tank (SRT-ESS-93-563, SRT-ESS-93-582, and SRT-ESS-93-763). The density of these bacteria are sufficient to cause a biofouling of the system and are considered a real possibility for clogging filters associated with the in-tank precipitation system.

Analysis of Samples From Old F-Area Seepage Basin

C. E. Murphy, Jr. and G. P. Friday

The Analytical Development Section performed an analysis of vegetation and small mammal samples from the Old F-Area Seepage Basin for metallic elements. The results indicate that all metallic elements, except those that are essentially normal elements, are below the detection level. The samples will be forwarded to EMS for radionuclide analysis.

Electrokinetic Migration

T. F. Meaker and J. P. Bibler

Electrokinetic migration technology is being investigated as a possible method of *in situ* decontamination for several sites at SRS. This technology, if proven to be successful, would reduce radiation exposure of workers and a reduced cost.

The Old TNX Seepage Basin Electrokinetic Demonstration Project is set to begin. Characterization of the ten- to 13-feet section of the fifth borehole is complete and awaiting analysis. Two one-dimensional electrokinetic cells are operating and will continue for three weeks. Separate sections of the dismantled cells will be analyzed for mercury. The mobile trailer has arrived from New Orleans and is awaiting electrical hookup.

The work authorization document for the sample drilling was completed and approved and awaiting final forwarding to Bechtel. The Work Plan, SHERP, and Quality Assurance Plan were reviewed and revised to include the comments of reviewers.

List of Constituents of Concern for Metallurgical Laboratory Seepage Basin

M. Finney, J. H. Weber, and R. C. Tuckfield

A list of ten COCs in the Met Lab seepage basin wells was compiled. These ten COCs exceeded the 99th percentile for the background wells in each of three aquifers. In addition, the average constituent concentrations for the point of compliance wells were compared with the maximum concentration limits (MCLs) for 20 constituents previously listed in the Part B application permit. Of the twenty constituents, only two exceeded the MCLs at the 99% confidence limit. These were tetrachloroethylene and trichloroethylene in the Lower Congaree aquifer and trichloroethylene in the Water Table. A draft of the documentation for the statistical analysis was forwarded to the customer for comments. The COC list is documented in SCS-ASG-93-0072 and the constituents exceeding MCLs are documented in SCS-ASG-93-0070.

TNX Groundwater Treatability Study Support

R. Nichols

A final version of the Interim Action Proposed Plan for TNX Groundwater was prepared and submitted to DOE-SR for subsequent submittal to the EPA. The IAPP proposed conducting treatability studies on the following technologies: permeable treatment wall, air sparging, and recirculation wells. A draft treatability workplan for the testing of a recirculation well at TNX was also prepared.

Silver Saddles

T. F. Meaker and J. P. Bibler

Silver saddles, used to remove radioactive iodine from dissolver offgas, present a waste handling problem for WSRC. The spent saddles are a mixed wasteform due to the radioactive I-129 trapped on them. They are hazardous because unreacted $AgNO_3$ on the surface of the berl matrix can be leached during standard leaching test procedures, yielding Ag+ concentration greater than 5 mg/L in the leachate.

Five sets of silver saddles were reacted with HBr gas to form insoluble AgBr. Three of the five sets were pretreated with nonradioactive iodine gas to assess the effect of HBr gas on AgI. The other two sets were not pretreated. After treatment with HBr, the five samples were sent offsite for TCLP analysis. All five samples passed (had less than 5 ppm silver) the TCLP. Three of the five sets were below detectable limits.

One final set of silver saddles will be run to test and finalize the procedure. A paper documenting this research is forthcoming.

CRADA

J. Rossabi

SRTC received notice that the CRADA, with JND Sterling Inc., for development of solar collector technology for use in environmental remediation was approved by DOE-SR. This is the first CRADA approved by DOE-SR. M. Fiori and A. Schwallie will participate in a formal signing of this CRADA.

Magnetic-Separation Demonstration Support

R. Nichols, C. Eddy-Dilek, and B. Looney, S. McMullin

A conceptual model of the Mag-Sep system was developed and reviewed with the Environmental Protection Department (EPD). EPD indicated that permitting the Mag-Sep demonstration should be straight forward based on the

conceptual model. A meeting with South Carolina Department of Environmental Control was scheduled for January 26, 1993.

Six Phase Heating

T. Jarosch, B. Looney, C. Eddy-Dilek, and S. Burdick

The heating stage of the six-phase ohmic heating demonstration was successfully completed. Continuous heating was concluded on November 30, 1993, after approximately three and one half weeks of power output to the electrodes. The six-phase *in situ* heating technology was developed by Pacific Northwest Laboratory researchers; SRTC provided field support in the areas of characterization, soil and offgas analysis, installation and offgas equipment operations. Subsurface temperatures of the targeted clay within the electrode array pattern were sustained over the final half of the heating stage at levels at or slightly exceeding 100°C. The heating resulted in a total of nearly 14,000 gallons of steam condensate recovery. The steam generation and removal is an important process in *in situ* heating applications, offering a potential for enhanced stripping of residual solvents and an increase in the permeability of the sediments. Initial analysis of the change in air flow from the extraction well and changes in piezometer readings measured within and outside the heated pattern indicate a significant change in the permeability of the clayey sediments. Vacuum extraction was continued through the remainder of the week until steam recovery rates had dropped to approximately 20% of the maximum levels. Current plans call for drilling to begin on December 13, 1993 to obtain "hot" sediment core samples for interim characterization.

Ion Trap Mass Spectrometer Development

C. Eddy-Dilek and J. Rossabi

The draft of a report on the use of the Ion Trap Mass Spectrometer (ITMS) for analysis of groundwater from well characterized wells was issued for review and comment. These results will be compared with results from offsite laboratories when the analysis is available. The goal of this task is to validate the use of ITMS as a screening device for groundwater samples from well characterized wells. When regulatory approval is obtained, the ITMS will be used instead of offsite labs for a selected suite of wells. This activity should result in a significant reduction in the number of samples sent offsite to commercial labs for analysis.

Mobile Bioreactor System

C. J. Berry

A construction permit for the new Mobile Bioreactor System at TNX was obtained from the South Carolina Department of Health and Environmental Control. This allows us to begin operations after developing operating plans, best management practice plan, and insuring several operating criteria are met.

Waste Management

WSRC and Westinghouse Hanford Company Pump Development Program

M. J. Dalmaso

WSRC and the Westinghouse Hanford Company (WHC) are participating in a joint slurry pump development program. The goal of the program is to develop an advanced design slurry pump, for use at SRS and Hanford, that eliminates the limitations associated with the existing technologies, particularly the bottom mechanical seal. By participating in a cooperative program, each site will benefit.

A specification for procurement of one or more prototype pumps was developed. The specification is general and does not dictate a specific design. This will allow the vendors to use their expertise to develop a new and potentially innovative design.

A pre-bid meeting for the program was held in Richland, Washington on November 3, 1993. WHC Procurement organized the meeting with WHC Technical and Interim Waste Technology (IWT) presenting technical information to potential suppliers. The purpose of the meeting was to provide information concerning procurement to potential bidders before the specification is released and the bidding process starts.

The procurement package and specification will be released for bids early in the second quarter FY 94 with delivery of the first pump by the first quarter of FY 96.

High-Level Waste Vitrification Government Owned Company Operated Meeting

D. F. Bickford

SRTC hosted a two-day meeting with the Westinghouse Government Owned Company Operated high-level waste (HLW) vitrification committee at the Center for Vitrification Research at Clemson University. Representatives from Hanford West Valley, and commercial vendors (SEG, EnVitCo, and Stir Melter) attended and made presentations. Participants were briefed on various components of DOE/SRS/industry/university cooperative tests. SRTC made several important presentations, including plans for adaptation of the PCCS to MLLW; vitrification of high-salts waste; a description of the M-Area simulated runs at Clemson; and the status of the stirred melter acquisition for TNX. Clemson hosted a tour of the center. A highlight of the meeting was the presentation on plasma technology by Georgia Tech.

High-Level Waste Simulation Package

M. V. Gregory

The existing SPEEDUP dynamic process model of the 2H Evaporator and Extended Sludge Processing systems was expanded to include all the other significant elements in the high-level waste processing complex, in at least a "blackbox" (i.e., simple transfer function) form. This required the addition of model elements for the H-Area Waste Removal Tanks, the 1H Evaporator System, the F-Area Complex, and the New Waste Transfer Facility in a "skeletal" form so the overall system connectivity would be correctly represented. The resulting model solves a system of 1057 coupled differential and algebraic equations, requiring about 4 CPU sec per simulated day on the VAX cluster's 8810. The milestone version of the model has been frozen and archived under the Scientific Code Management System.

High- level waste material balances may be tracked systematically from receipt of canyon outflows to glass canister production and through the intervening process steps. Much of the modeling is in a preliminary and elementary form, but the general process connectivity has been consistently implemented. Follow-up work during the current fiscal year will take the current blackbox models and incrementally expand them into more detailed unit operation models, per the specifications of the customer. By the end of the fiscal year, we expect to have a complete model that will allow various production scenarios to be simulated in order to show their dynamic, time-dependent impact on available tank space, numbers of glass canisters produced,

amount of saltstone grout produced, and treated effluent outfall.

To support the milestone software, documentation was co-authored with K. L. Shanahan and T. Hang in SRT-ATS-930105. This report describes the specifics of the skeleton model and WSRC-MS-93-556 (a paper for the 1994 San Diego Simulation Multi Conference) details the general design and implementation of the tank farm model in the SPEEDUP environment.

Initial Screening of Site Waste for Vitrification

M. K. Andrews and S. L. Marra

An initial screening of site solid waste for suitability for vitrification has been completed. Filter paper takeup rolls from M-Area appear to be excellent candidates for a demonstration of vitrification technology with actual waste.

Based on information provided by Solid Waste personnel, site wastes were classified into the following categories: those that are easily vitrified, those that have no treatment method identified, but would require development before they can be vitrified, and those for which there is currently an acceptable disposal method in place. The filter paper takeup rolls and the Mark 15 filter paper rolls appear to be good candidates for a demonstration of actual waste vitrification. We are preparing plans that should lead to a demonstration in FY 95.

Offgas Components Test Facility Startup

J. F. McGlynn, D. B. Burns, and C. B. Miller

The Offgas Components Test Facility (OCTF) will evaluate the operating performance of the Consolidated Incineration Facility offgas system and provide a test facility for startup support.

Final construction and the safety inspection were completed on October 13, 1993. Equipment checkouts are in progress. These checkouts will ensure that each individual equipment component is operable before beginning system checkouts. Each separate that operating system of the OCTF (air flow control, scrubber, quench, pH control, reheater, particulate feeder, HCl, mist eliminator, and burner chamber) will be tested to verify that operating setpoints and alarms are functional.

The path forward is to complete equipment and system checkouts by January 31, 1994.

General

SRTC Basis for Interim Operation

R. A. Moyer, S. P. Tinnes, R. C. Edwards, P. K. Baumgarten, W. J. Copeland, C. L. Smith, et al.

WSRC approved the SRTC Basis for Interim Operation (BIO) and submitted it to DOE for approval, thus meeting a DOE "Award Fee" milestone. The BIO provides an interim safety basis for SRTC and allows continued operation until an updated Safety Analysis Report (SAR) and Technical Safety Requirements meeting the latest DOE order requirements are approved. The BIO concludes that safety to workers and the public is not threatened as a result of continued operation of the SRTC Technical Area. The BIO describes the safety management programs, identifies the operating envelope, and presents the analysis to support that conclusion.

Eleven SRTC Hazard Assessment Documents (HADs) required for the SRTC Technical Area in support of the SRTC BIO were approved. The HADs were performed in accordance with DOE-STD-1027-92. The HADs are for buildings 773-A, 774-A, 736-A, 776-1A through 6A, 778-A, 779-A, 735-A, 735-11A, 738-A, 749-A, and 786-A.

The SRTC *Consequence Analysis Technical Report*, which is a key support document for the SRTC BIO, was approved. The report documents the methodology and consequence analysis for the following cases:

- source-terms and consequences due to releases of radionuclides due to a severe (0.2g) seismic event followed by a fire
- source-terms and consequences due to releases of radionuclides due to process-related events
- source-terms and consequences due to releases of chemicals.

A SRTC BIO support document reporting changes in SRTC processes previously described and analyzed in the SRTC SAR (WSRC-SA-2) was approved. Forty-six changes were identified. All changes were determined qualitatively to be bounded by the SAR. Two "Potential Issues" were identified.

Work continues on establishing maximum administrative control radionuclide inventory limits and associated procedures for the present authorization basis. A computer program spreadsheet that will track all SRTC radionuclide inventory changes is being developed.

Project Management Integration and Costing System Implementation Within SRTC

P. W. Doolittle

Financial concerns with the Work Authorization System, Change Control, Annual Operating Plan (AOP) financial baseline variance analysis capability, Outyear Budget development process, and the Management Control System (specifically, integration with ISS) process have emphasized the urgency in implementing Project Management Integration and Costing System (PMICS) applications within SRTC. The following modules are in use and/or being developed/enhanced.

Budget Module

The PMICS Budget Module Application is of primary interest to those responsible for Annual Operating Plan (AOP) generation, maintenance, and monitoring. This application was created for the Five-Year Plan (FYP) and AOP development process within SRTC by the respective budget liaisons and Financial Resources Department. It is an "interim" application until the main PMICS module, which performs programmatic and financial functions, is fully implemented. The PMICS Budget Module allows for online entry/update of financial data to a single source database, which is then electronically transmitted to ISS (system "W"). Prior to transmitting data to ISS, PMICS uploaded directly to system "W" and/or Integrated Budget, Accounting, and Reporting System (IBARS).

The Budget Module will be modified as necessary for the upcoming FYP process scheduled to begin on December 15, 1993. It is intended to use PSR contract assistance in effecting this process.

Annual Operating Plan Baseline Variance Module

Recent changes in cost account control by SRTC customers have nearly eliminated SRTC's ability to effectively access financial data from IBARS and perform meaningful cost variance analyses on its programs at the task level. This is primarily due to SRTC managers not being cost account managers (CAMs) for their scopes of work, as the customers have elected to control the terminal level Work Breakdown Structure (WBS) and corresponding cost account plans. Work Authorization Documents were generated by customers for work performed within SRTC against the terminal level WBS, and although SRTC activity codes were established for the work, the customer remained the responsible organization for SRTC's activity codes. This presents problems in efficiently extracting actual costs from IBARS for SRTC activity codes.

Another problem facing SRTC is the ability to perform an actual cost vs. budget variance analysis at the primary task level, as ISS does not recognize the primary task that is SRTC's main level of performance measurement and control.

The AOP Baseline Variance Module will allow for direct interactive extraction of actual direct costs at the activity code level from IBARS, summarization of this data at the primary task level by element of cost, performance of an actual vs. budget variance analysis, and generation of financial reports for each section. It will also address modifications to the AOP financial baseline, such as change control.

SRTC Integrated Programs Control Management (SIPCM) is converting data from the FY 94 Form 4s into this module to create each section's AOP baseline spendout plan by primary task. Actuals from IBARS will be brought down by activity code, summarized by the element of cost at the primary task level, and the variance reports will be generated. This effort will require close interaction with Financial Resources to ensure data integrity, as many changes due to reorganization have impacted the original AOP submissions by the respective sections.

Project Management Integration and Costing System Module

This application represents the primary charter for SIPCM. The previously mentioned applications represent efforts to enable SRTC to more efficiently and effectively generate, monitor, communicate, and control its FYP/AOP financial data.

PMICS is an all encompassing data integration network application that allows for development of integrated resource loaded schedules at the group level and generation of costing data (estimated, actual, and performance measurement) as a result of programmatic status and/or forecasted work scope. The purpose of PMICS is to enable managers to more effectively monitor their respective programs and to better evaluate "what if" scenarios by having access to formatted data necessary in performing well informed program management decisions. In short, PMICS is a program management "tool". Once fully implemented across SRTC, PMICS will replace the Budget Module and AOP Baseline Variance Module.

Initial implementation was concentrated within the Waste Management and Technology Department's Interim Waste Technology (IWT) and Defense Waste Processing Technology (DWPT) Sections. Most recently, the Environmental Sciences Section also began its implementation process.

SIPCM represents SRTC programmatic concerns at the weekly In-Tank Precipitation (ITP), Defense Waste Processing Technology (DWPT), and the high-level waste Plan of the Week (POW) meetings along with the technical representatives. SIPCM interfaces on a continuous basis with its programmatic counterparts in ITP and Defense Waste Processing Facility.

P. Glover and K. Mears of LSS, approached SIPCM to assist with the development of a programmatic control tool for use in scheduling/controlling LSS operations.

This effort will require intense up-front research, planning, and training once LSS has defined the information required for effective management of its activities.

Also, G. Lunn expressed interest in using PMICS for his program management needs.

To ensure a timely and successful implementation of PMICS across SRTC, a PMICS Task Team was organized and recognized by Senior Staff.

Project Management Integration and Costing System Task Team

An initial "steering" committee consisting of SRTC-PI (M. Ferrell, P. Doolittle, L. Chandler, and J. Campbell) and SRTC-FR (H. Herrmann, S. Ouzts, and G. Kizer) met on November 10,1993 to develop a charter and outline objectives for the PMICS Implementation Task Team. This team will consist of the steering committee representatives and include one representative from each SRTC department:

Cohen	E&MT	Frank Usch
Beranek	NRT&SC	Eric Randall
Wolfe	CPT	Martin Scott
Papouchado	WM&ET	Sam Budenstein

SIPCM will develop an implementation plan for this effort for review by the team.

An initial meeting of the entire team was held on November 17, 1993 and discussions ranged from the ability to generate financial variance reports to various aspects of the Management Control System (MCS), with primary emphasis on the AOP financial baseline and the Change Control Process on the WSRC level and within SRTC. Continuing sessions will focus on mapping out the following primary change types affecting SRTC's financial baseline:

- change to the WSRC AOP Threshold—responsible/support organizations
- change to SRTC's baseline — internal only
- change to SRTC's baseline resulting from MPOs, WFO, CRADAs, WADs, LOIs

SIPCM is developing the AOP Baseline Variance Module and an Implementation Strategy for the team's review.

Processing Subsytem for Interim Waste Technology

W. Tamosaitis defined a requirement he feels will be necessary for the proper management of Interim Waste Technology (IWT's) resources. This requirement will involve the development of a "processing subsystem" independent of PMICS. An initial technical meeting was conducted with a contractor on November 12, 1993 in Orlando, FL to discuss the feasibility of such a subsystem. This effort is not funded, but will continue to be explored.

Shipping Container Recertification

D. R. Leader and E. J. Majzlik, Jr.

Radioactive material is shipped offsite in a shipping package that consists of a primary containment vessel (PCV), a secondary containment vessel (SCV), a lead shielding vessel, and an energy absorbent filler of cane fiberboard, all contained in a stainless steel drum overpack. The overpacks are either 30- or 55-gallon drums depending on the design of the package. The shipping packages must be periodically recertified to federal transportation requirements by subjecting the assembled package to hypothetical accident conditions. Part of the recertification process is a series of tests in which the package is dropped onto an unyielding surface and a steel punch. The physical condition of the package and leak tightness of the PCV and SCV is evaluated before and after the drop tests by dimensional measurements, leak testing, and visual inspections. The Materials Technology Section (MTS) is providing drop testing and evaluation of the 9973, 9974, and 9975 shipping packages to the Packaging and Transportation Group. The Special Processes Section of the Equipment and MTS is also supporting this effort by providing certified leak testing of the PCV and SCVs. Fourteen packages will be tested in this program with 10 or 11 specified drop tests per package.

Drop testing and evaluation of the first two 9975 shipping packages was completed in October 1993. The packages were subjected to a series of eight 1- foot drops followed by a 30-foot bottom-end or bottom-corner drop and a puncture drop test. The effects of the drop test were assessed by high-speed video recordings and still photography, dimensional measurements, visual inspec-

tion, and gas volume and leak tightness measurements. Both packages successfully withstood the drop tests. The PCV and SVCs showed no physical damage and the o-ring seals passed the leak tightness requirements. Measurements of the nitrogen volume remaining in the PCV and SCVs indicated that no significant leakage of the o-ring seals occurred during the drop tests. Deformation of the stainless steel overpack drum was minor with no tearing of the drum as a result of the end drop or puncture drop tests. The condition of the cane fiberboard filler, including minimum remaining thickness in deformed areas, was recorded for use in heat transfer calculations.

Testing of the remaining packages will continue through January 1994. A summary report of test results is being generated concurrently with testing to provide timely input to the Safety Analysis Report for these packages.

Update to Materials Consultation Operating Procedure

W. L. Daugherty

Manual E7 and its SRTC implementing procedure (Procedure 7.10, Manual L1) make provision for the conduct of standard service activities in accordance with operating procedures. The Materials Technology Section (MTS) performs the majority of its technical activity under one such procedure. This operating procedure (SOP L9.3-7000, Category 4) has been reviewed for consistency with current applicable technical and Quality Assurance requirements. The recent implementation of E7 and Procedure 7.10, as well as changes to Manual 1Q and 1Q28, have led to various inconsistencies between these manual requirements and the MTS operating procedure.

A review of the current manual requirements led to the development of a revision to the MTS operating procedure. This revision is in draft form and undergoing review. The changes do not have a technical impact, but deal primarily with the administrative aspects of conducting technical work. In coincidence with this review, several inconsistencies or areas needing clarification were identified in Procedure 7.10 and Manual E7. These items have been called to the attention of the procedure coordinator and appropriate procedure change requests were submitted.

Material Evaluation Support for 484-D Boiler Refurbishment

P. R. Vormelker, C. E. Arbaugh, N. R. Carpenter, T. B. Curtis, T. DeMaere, S. A. Hatcher, T. M. Stefek, and J. R. Wilderman

Power Maintenance Engineering requested that the Material Technology Section (MTS) perform material evaluation on 484-D boiler components to look for degradation mechanisms that would require component replacement during the refurbishment of these 40-year- old units. Two primary methods are being used for this material evaluation. MTS developed a field replication method to look at the microstructure of the boiler external components (headers and high-pressure steam lines) in the field. Over 30 replications have been performed to date and no degradation mechanism has been optically observed. The future intent is to also look at these replications on the scanning electron microscope. The other method of evaluation is by performing metallography on tube samples taken from boiler No. 3. Again, no tube degradation was noted on approximately ten samples, which means components do not need replacement with subsequent cost savings to the refurbishment program. This material evaluation of 484-D boilers will continue through March 1994.

Welding Irradiated Stainless Steel

W. R. Kanne

Results from the SRTC program to develop welding methods for repair of stainless steel containing helium are applicable to important programs in addition to the repair of SRS reactor tank walls for which the technology was developed. Among these programs are repair of irradiated materials in commercial reactors and naval reactors, welding of weapons components, and repair or modification of fusion reactor components. Representatives of each of these communities have expressed an interest in the

results, and report on the work has been provided to these groups.

During the period since the work for reactor repair was discontinued, the fusion reactor community has shown the most interest in the program. This community is aware that significant problems will be encountered during the repair of the inner wall of the International Thermonuclear Experimental Reactor (ITER), which is the next generation fusion reactor being planned by terms from several countries. The fusion reactor inner wall will encounter neutron irradiation, and therefore helium contents, well in excess of that in the SRS reactor tank walls. Welding problems, such as those that caused the SRS C-Reactor repair to be aborted in 1986, will be significant for the ITER community.

To support the SRS ITER mission, SRTC has made the technology available to the ITER community. The results were recently provided to the SRS representative on the United States ITER Home Team. In addition, a *Fact Sheet* is being prepared as a preliminary statement of research and development that SRTC could perform to support the need for welding methods to repair or modify ITER inner wall materials.

R. Voss continued to support Westinghouse Hanford in upgrading the Safety Analysis of the Plutonium Finishing Plant (PFP). C. Jantzen attended the recent ASTM meeting, and chaired a meeting reviewing a Mixed Waste Integrated Program document on performance criteria as a basis for a standard.

C. Jantzen visited Oak Ridge's "Valley of the Drums" to discuss possible vitrification of Y-12's West End Treatment Facility sludge and of K-25 pond wastes.

D. Ferrara attended a meeting at Vanderbilt University to discuss continuing the successful summer intern program.

J. Harbour has been visiting Coors frequently, assisting DWPF in getting a canister that meets their requirements.

R. Schumacher helped SEG perform a design review of the EnVitco melter that they are purchasing. This is part of an effort leading to a CRADA with SEG.

J. Whitehouse attended the Diagnostic Instruments and Analytical Laboratory (DIAL) meeting in Washington. It is desired to include their advances in the Clemson Center for Vitrification Research.

J. Plodinec, M. Hodges, and D. Helton met EPRI personnel to discuss a possible CRADA on vitrification of ion exchange resins.

C. A. Langton attended the American Concrete Institute meeting in Minneapolis, MN on November 8-11, 1993. Work is progressing on the State of the Art report sponsored by Committee 227 for Radioactive and Mixed Waste Treatment and Disposal.

Presentations

M. Geeting presented, "Savannah River Technology Center K-Reactor Standby Plan Development" and co-authored "Safety Analysis for the SRS K-Reactor Loss of Cooling Water Supply Event and Impact of Installing Cooling Tower" at the American Nuclear Society Winter Meeting in San Francisco, CA in November 1993.

K. Barbour presented, "FLOWTRAN Assessment for Predicting Flow Instability" at the American Nuclear Society Winter Meeting in San Francisco, CA, in November 1993.

J. McCormick and three members of DOE-HQ, EM-64 training team delivered the DOE Order 5480.22 and 5480.23 training courses in Annapolis, MD.

T. C. Hazen was invited to the Institute for Gas Technologies Sixth International Symposium on Gas, Oil, and Environmental Biotechnology on November 30, 1993 in Colorado Springs, Colorado where he presented, "*In Situ* Bioremediation Via Horizontal Wells".

T. C. Hazen presented, "Bioremediation of DOE Waste Sites", in conjunction with the Traveling Lecturer Program, at Indiana University on December 1993 in Bloomington, Indiana. He also met with several faculty and discussed research possibilities with DOE.

G. Ramsey presented the results of his work on vitrification of actinides at the Plutonium/Uranium Recovery Conference.

J. Plodinec presented a paper on application of hydration thermodynamics to *in situ* test results.

A research consortia from the University of South Florida and EPA contacted T. Hazen (ESS). The group submitted a SERDP (DP Congress) proposal on bioremediation monitoring using UV-VIS spectrograms. They published the proof-of-principle and will be doing field testing on the proposed research. If funded, they will test their technology concomitantly with our bioreactor and prepared bed field demonstration. They will provide all services for free and provide operations money, as needed.

C. Fliermans (ESS) served on the Creativity Committee meeting that provided innovative microbiological evaluations to the Augusta Sewage Treatment Facility on ways to meet outfall regulations. Fliermans will serve as the point of contact with Augusta on microbiological issues.

Publications

J. Radway, E. Wilde, M. Whittaker, and J. C. Wiesman submitted, "Screening of Algal and Cyanobacterial Strains for Metal Removal Capabilities", to *Environmental Science and Technology.*

C. B. Fliermans, H. W. Bledsoe, and T. C. Hazen submitted, "Characterization and Reclamation Assessment for a Diesel Storage Facility at the Savannah River Site", to the *Journal of Waste Management and Research*

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January 26, 1994