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Monthly Progress Report Summary

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September 1994

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Monthly Progress Report Summary

TTP: OR-1212-02
B&R Code: EW4020000

National Environment and Technology Institute
(A Non-Profit Organization)
Boulder, Colorado 80304

September 1994

Prepared for the
MIXED WASTE INTEGRATED PROGRAM
U.S. DEPARTMENT OF ENERGY
OFFICE OF TECHNOLOGY DEVELOPMENT
Washington, D.C. 20585

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U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

TECHNICAL AREA SUMMARY

1.0

MWIP Program Support

The mission of the Mixed Waste Integrated Program (MWIP) is to identify, develop, demonstrate, and transfer technologies and systems to characterize, treat and dispose of DOE mixed low-level waste. Selected technologies will meet any or all of the following criteria: 1) improve a current technology's performance, 2) reduce risk, 3) lower life cycle costs, 4) be accepted by stakeholders/regulators, 5) meet schedule requirements, and 6) treat waste for which no technology exists. Mixed low-level waste is contained in the following various waste matrices and corresponding percentage of the total waste volume: aqueous liquids at 39%, inorganic sludges and particulates at 33%, debris at 13%, organic liquids at 3%, soils at 2%, and miscellaneous others at 10%. Therefore, the challenge is to apply research and development to improve on current technologies: 1) process monitoring/control and materials handling, which will include pretreatment for aqueous wastes and robust treatment for extremely heterogeneous wastes, 2) advanced air pollution controls, 3) vitrification of inorganic sludges and particulates, and 4) enhanced waste forms since disposal criteria are uncertain. Finally, success of MWIP is based on implementation of technologies that achieve the above cited criteria.

MWIP Program Support

TTP Number OR121202

Technical Area No. 1.0

Sub Technical Area No. 1.1

Contact Person J. B. Berry, Oak Ridge National Laboratory

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Fax No. 615/576-7865

OBJECTIVES

This activity's purpose is to coordinate and implement the Mixed Waste Integrated Program (MWIP) by managing MWIP's administrative structure that includes: program interface with Department of Energy (DOE)-Headquarters, Mixed Waste Focus Area (MWFA) management team and the Federal Facility Compliance Act (FFCA) Policy Coordination group, customers and principal investigators, strategic and program planning and implementation, and quality assurance. Coordination with other technology development efforts, especially within the MWFA, is an integral part of this task. Collaboration with private industry will be sought through individual TTPs. The implementation of the FFCA is supported by continuing a national technology development effort. Emerging technologies that meet the needs of DOE sites are developed and demonstrated. The program's coordination objectives are to ensure that 1) technology is developed, demonstrated, and evaluated to treat mixed waste in order that the final waste form can be disposed, 2) cost-effective solutions to the mixed waste problem are developed, 3) the program is developed in collaboration with EM-30/40 and meets waste treatment needs, 4) project tracking and record management requirements are met, and 5) technologies will be acceptable to regulators and stakeholders.

SIGNIFICANT ISSUES

The Budgeted Cost of Work Scheduled for September 1994, increased to \$3,242K from \$42K because four Technical Task Plans (TTPs) in FY 1994 will not be continued in FY 1995. The majority of these funds are committed through subcontracts. These continuing obligations will be covered under the Mixed Waste Program Support TTP for FY95. In order to facilitate the transfer of these obligations the funds for those tasks have been transferred to the Mixed Waste Program Support TTP in September 1994, for carry-over to FY95.

MAJOR ACCOMPLISHMENTS

The Headquarter's milestone of a Program Management Plan was drafted for the Mixed Waste Integrated Program. This plan incorporates the Department of Energy's action plan for a New Approach to Environmental Research and Technology Development for the Mixed Waste Focus Area. Also, the final draft of the Systems Analysis Report was submitted to Department of Energy Headquarter's.

UPCOMING EVENTS

ASTM D34, Mixed Wastes, committee meeting is scheduled for October 19-21, 1994, in Phoenix, Arizona. A workshop on November 2 & 3, 1994, in Gaithersburg, MD., is scheduled to build consensus within the Mixed Waste Focus Area on a desired approach to integrated systems assessment and evaluation.

PROJECT PUBLICATIONS

John Mayberry presented a paper at the American Chemical Society meeting in Atlanta, Georgia, on Final Waste Form Comparisons. Additionally, John Mayberry co-authored with Argonne National Laboratory a paper on phosphate bonded ceramics.

MWIP Program Support

TTP Number OR121202

TECHNICAL AREA SUMMARY

2.0

Systems Analysis

The mission of the Mixed Waste Integration Program's "Systems Analysis" technical area is to "identify, evaluate, develop, demonstrate, and transfer technologies and systems to characterize, treat and dispose of DOE mixed low-level waste." The selected technologies will 1) improve DOE's ability to treat and dispose of low-level mixed waste, 2) reduce risk to human health and the environment, 3) lower life cycle costs, 4) be acceptable to stakeholders and regulators, 5) meet schedule requirements for treatment and disposal of wastes, and 6) be able to treat wastes for which no current technology exists.

Systems Analysis Mixed Waste Integrated Program

TTP Number OR132002

Technical Area No. 2.0

Sub Technical Area No. 2.1

Contact Person C. H. Brown

Telephone No. 303/966-3667

Fax No. 303/966-2256

OBJECTIVES

A system approach to management of the assessment of enhanced waste form(s) has been and will be employed, including coordination and configuration management of activities in specific technology development tasks. Baseline technologies (i.e., commercially available technologies) and waste management strategies will be evaluated systematically using an ASPEN PLUS program developed by the Mixed Waste Treatment Project (MWTP). Alternatives to the baseline technologies (i.e., OTD-developed technologies) will be analyzed by FLOW, a user-friendly program developed by MWIP. Alternatives will be developed as technology subsystems and analyzed with respect to factors such as performance, risk, and life-cycle cost. There will be close collaboration with the MWTP. Results of this collaborative effort will determine the full extent of the baseline process and the modeling assumptions made to date. This information is crucial as the starting point for the system's analysis effort.

SIGNIFICANT ISSUES

The close of the FY94 fiscal year budget shows that the budgeted cost of work performed is significantly less than the budgeted cost of work scheduled while the actual cost of work performed was greater than the budgeted cost of work performed. However, all scheduled work has been completed and there are no schedule variances. The discrepancy between cost of work scheduled, and work performed indicates a miscalculation in the preparation of performance measurement indicators. Training in development of such indicators has been received by the staff.

MAJOR ACCOMPLISHMENTS

A global system analysis effort is starting to support the mixed waste treatment facility at the Oak Ridge Reservation. A visit to the Molten Metal Company was conducted to obtain information to validate the FLOW model of the molten metal process.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Systems Analysis Mixed Waste Integrated Program

TTP Number OR132002

Risk Assessment for MWIP

TTP Number SF221211

Technical Area No. 2.0

Sub Technical Area No. 2.2

Contact Person Richard C. Ragaini, LLNL or James E. Russell, SAIC

Telephone No. 510/423-8877

Fax No. 510/423-9987

OBJECTIVES

The primary purpose of this task is to perform risk assessments for the proposed MWIP alternative mixed waste treatment technologies. This process includes performing Safety analysis at various levels in accordance with the requirements of U.S. DOE Order 5480.23 and several other standards that are listed in the Related Baseline Documents section of this TTP. The purpose of performing the analysis is to establish an initial hazard categorization for a DOE nuclear facility and to identify those processes and structures which may have an impact on or be important to safety. The initial step in performing the analysis consists of performing a Preliminary Hazards Analysis (PHA) for each alternative mixed waste technology selected for funding through the MWIP technical evaluation process. The PHA then is followed by a Preliminary Safety Analysis Report (PSAR) performed during Title I and II design. This PSAR then leads to performance of the Final Safety Analysis Report performed during construction, testing, and acceptance, and is completed before routine operation. This TTP covers the performance of the PHA phase of the safety analysis for each of the selected technologies.

SIGNIFICANT ISSUES

Due to incremental start and stop funding of this project a number of milestones have been canceled and will not be completed in FY95 due to a lack of funding. Therefore, this project will be deleted from the Project Tracking System.

MAJOR ACCOMPLISHMENTS

The project has been completed, however, a number of milestones were canceled due to funding issues. The Final Plasma Hearth Process and Vitrification Preliminary Hazards Analyses have been completed.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Risk Assessment for MWIP

TTP Number SF221211

Cost Savings Support to MWIP

TTP Number AL121219

Technical Area No. 2.0

Sub Technical Area No. 2.4

Contact Person Steven Booth, LANL

Telephone No. 505/667-9422

Fax No. 505/665-5125

OBJECTIVES

Support an assessment of the cost savings of incorporating technologies developed by the MWIP into the baseline Mixed Waste Treatment Project (MWTP) prototype plant. Conduct a comparison of technology subsystems [i. e., plasma arc furnace, steam reforming (synthetica), and polymer solidification and vitrification] with the MWTP baseline flow sheet to determine the cost savings associated with incorporating improved technology into the plant design. Collaborate with MWIP staff, as well as staff from the MWTP, to obtain information regarding the life-cycle cost of systems that include MWIP-developed technologies. Provide data to the MWIP overall systems analysis so that the improved subsystem can be evaluated against criteria specified in TTP OR-1320-02.

SIGNIFICANT ISSUES

This project has been discontinued and delayed milestones will not be met.

MAJOR ACCOMPLISHMENTS

The vitrification study has been reviewed and is being revised and formatted for publication.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

The vitrification study report is being prepared for publication.

Cost Savings Support to MWIP

TTP Number AL121219

Waste Stream Diagnostic and Control for Treatment of Mixed Waste

TTP Number OR132015

Technical Area No. 2.0

Sub Technical Area No. 2.5

Contact Person D.P. Hoffman, MMES/OR K-25 Site

Telephone No. 615/574-3896

Fax No. 615/576-2820

OBJECTIVES

This project is a continuation of work performed in FY 93 (funded 3/93) in response to the call for proposals from the MWIP. In specific, this proposal addresses issues and needs identified in the Waste Destruction/Stabilization section (needs 1, 2, and 3), the Off-gas treatment technology section (needs 1, 2, 4, 5, 6, and 7) and the Final Waste Forms processing and analysis (need 1) of the FY 93 call for FY 94 proposals. This project will use a synergistic combination of various technical skills to provide technical support for the near- and long-term advancement, optimization, and acceptance of low-level mixed waste (LLMW) treatment technologies. The overall program will address various front-to-back issues of the LLMW treatment process. The issues to be addressed in the FY 94 program include: surrogate waste stream selection criteria and definition for non-thermal treatment processes; rationale and experimental design criteria for the benchmarking and evaluation of LLMW treatment technologies; sampling and analysis of LLMW treatment technologies in support of process modeling and systems analysis; data quality objectives (DQO) of regulatory, development, and design measurements in support of systems operations for LLMW treatment processes; and to define process monitoring and control capabilities and technology development needs in support of process monitoring and control capabilities and technology development needs in support of process monitoring of LLMW treatment technologies. This program will work with the DOE, EPA, and the private sector to ensure utilization of experience and lessons learned.

SIGNIFICANT ISSUES

The project has been completed on time and within budget. The final closeout project issues are now being addressed by the sub-contractors.

MAJOR ACCOMPLISHMENTS

The final report has been completed on schedule — September 30, 1994.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Waste Stream Diagnostic and Control for Treatment of Mixed Waste

TTP Number OR132015

Process Monitoring and Control

TTP Number CH242003

Technical Area No. 2.0

Sub Technical Area No. 2.6

Contact Person Kevin Carney, Argonne National Laboratory — West

Telephone No. 208/533-7263

Fax No. 208/533-7755

OBJECTIVES

The objective of this task is to identify a LLMW treatment process in need of process monitors to improve process control and provide real time monitoring of hazardous materials for industrial hygiene purposes. Argonne National Laboratory - West has been solicited by EM-542 to identify, acquire, or develop versatile on-line process control and environmental monitors to assist in the thermal and non-thermal treatment of low level mixed waste. The primary objective of these monitors is to provide waste treatment operators with information in real-time for regulatory, process control, and industrial hygiene use. The monitors are expected to be highly selective, sensitive, and robust; yet non-intrusive and designed with a high degree of flexibility such that they can be applied to many LLMW treatment processes.

SIGNIFICANT ISSUES

Spending for the reporting period of September was 125 percent greater than planned. However, spending year-to-date is 1.2 percent less than planned.

MAJOR ACCOMPLISHMENTS

The FY95 Technical Task Plan was completed and submitted to EM-50 for approval. Work is continuing with Diagnostic Instrumentation and Analysis Laboratory to develop a real-time calibration method for Laser Induced Breakdown Spectrometry. Additionally, the Laboratory evaluated pulsed valve for the atmospheric sampling of air into the glow discharge sampling cell. The cell will increase the sensitivity to volatile metals.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

A poster was presented at Spectrum '94 entitled "Development of Real-Time Monitors for the Elemental Characterization of Slag and Process Off-Gasses for the Plasma Hearth Treatment Program."

Process Monitoring and Control

TTP Number CH242003

MWIP Support of FFCA Compliance

TTP Number OR142004

Technical Area No. 2.0
Sub Technical Area No. 2.7
Contact Person Les Dole, ORNL
Telephone No. 615/576-4319
Fax No. 615/576-7865

OBJECTIVES

The purpose of this program is to support the Federal Facilities Compliance Act (FFCA) of 1992 through the application of emerging technologies to specific waste treatment problems at specific sites. Assistance will be given in the areas of public and regulatory acceptance, identification of technology gaps, and technology evaluations. The Technology areas to be covered include (1) front end handling, (2) chemical/physical treatment, (3) waste destruction, (4) off-gas treatment, and (5) stabilization/final waste form production.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

The following milestone reports were issued "MWIP Site Agreements for the Applications of Emerging Technologies to the Site Treatment Plans under the FFCA," and the "Final Year Summary Report" on the Applications of Emerging Technologies." The Joint EM-30/50 Action Plan for the Technology Resource Team was Drafted and circulated for comment. Also, the FFCA Task Force Leaders were briefed on the Technology Resource Team.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

MWIP Support of FFCA Compliance

TTP Number OR142004

Pulsed Fast Neutron Analysis of MLLW Containers

TTP Number ID142025

Technical Area No. 2.0

Sub Technical Area No. 2.8

Contact Person K. P. Lange, EG&G Idaho

Telephone No. 208/526-0970

Fax No. 208/526-6802

OBJECTIVES

Pulsed Fast Neutron Analysis (PFNA) is a nonintrusive inspection system developed specifically for detecting contraband and hazardous materials in closed containers filled with very heterogeneous materials for which no knowledge of composition is available. PFNA has been developed to industrial scale over the past few years with government and commercial funding, and is at an advanced level of technology for applications very similar to may DOE waste characterization needs. The objective of this project is to demonstrate the existing state of the PFNA technology and its applicability to DOE's containerized waste characterization needs.

A demonstration of the PFNA will be performed on mock/simulated waste drums utilizing a system which has been designed and built for the Advance Research Program Agency for the detection of narcotics and other contraband. Functional Capabilities are to be demonstrated for mapping elemental distributions and estimating total content of specific elements. Constituents that are to be identified and quantified are: elemental carbon, oxygen, nitrogen, mercury, and total hydrogen. Chlorine is to be identified and limits of detection calculated with corresponding engineering basis. British Thermal Units for test drums are to be calculated from data acquired during the demonstration.

SIGNIFICANT ISSUES

Phase I of the PFNA project was authorized to start in the third quarter of FY94. Therefore, no cost or budget data is provided prior to this period. The project cost at year end show a cost variance of 36% underspent, however, due to outstanding cost commitments due to subcontractor delayed billings the variance is only 2% underrun.

MAJOR ACCOMPLISHMENTS

The final test plan was completed, significantly expanding the scope of work to be performed under the demonstration effort. The other accomplishments include implementing the test drum procurement and issuing the FY94 summary report.

UPCOMING EVENTS

In October, the Californium-based measurements will be performed. A meeting is planned for October 28, 1994, at Santa Clara during which time DOE will tour the PFNA cargo inspection facility and discuss the waste characterization demonstration.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Pulsed Fast Neutron Analysis of MLLW Containers

TTP Number ID142025

TECHNICAL AREA SUMMARY

3.0

Materials Handling

Technical area number 3.0 in MWIP is “materials handling” which is broken down into 1) remote materials handling process, and 2) diagnostics and control. The remote materials handling process area may be further divided into feed systems and “product” removal systems for specific processes. The diagnostic and control subsystems are key components to fully integrated materials handling technology and are integrated into technical area 2.0, Systems Analysis.

Front End Handling Technical Area

TTP Number SR121202

Technical Area No. 3.0

Sub Technical Area No. 3.1

Contact Person Clyde Ward, SRS

Telephone No. 803/725-5891

Fax No. 803/725-7369

OBJECTIVES

The Mixed Waste Integrated Program (MWIP) Technical Support Groups (TSGs) are responsible for technology development systems planning for the National Mixed Waste Program. Specifically, TSG's: establish system requirements, perform selected technology evaluations and rank alternative technologies, assist in monitoring RDDT&E activities, and recommend to the Integrated Program Coordinator and DOE-HQ Program managers priorities for technologies to be developed to treat mixed waste. Included in the TSG responsibilities is control of technical quality for activities funded under their purview, thorough identification of program needs and solicitation of proposals, review and approval of test plans, and providing independent project technical review and monitoring of progress. There are five TSG's linked and aligned with the Office of Waste Management (OWM) EM-30 modular treatment concept: Front End Handling, Chemical/Physical Treatment, Waste Destruction and Stabilization, Off Gas Treatment, and Final Waste Forms. TSGs also provide the major mechanism for technical coordination between MWIP and EM-30 and other mixed waste related EM50 activities.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

This Technical Task Plan has been completed and there is no carryover to FY95. The plasma arc and vitrification processes at the WSRC/Clemson University and at ORNL are under investigation to determine future material handling needs.

UPCOMING EVENTS

No projects events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Front End Handling Technical Area

TTP Number SR121202

TECHNICAL AREA SUMMARY

4.0

Chemical/Physical Treatment

The mission of the Chemical/Physical Treatment technical area is to develop and implement innovative technologies that prepare low-level waste for downstream processing and/or discharge. Specifically, this technical area will 1) identify the requirements for treatment, 2) identify and assess opportunities for innovative treatment technologies, and 3) establish the links between technology developers and customers. Conduct RDDT&E of those identified technologies to develop low-level mixed waste treatment systems.

Chemical/Physical Technical Area Leader

TTP Number OR132016

Technical Area No. 4.0

Sub Technical Area No. 4.1

Contact Person Cliff Brown, ORNL

Telephone No. (303) 966-3667

Fax No. (303) 966-2256

OBJECTIVES

The primary responsibility of the technical leader is to interact with the MWIP staff to ensure the continuation of a coordinated approach to Mixed Waste Treatment R&D. The leader is also responsible for programmatic oversight of technical work being conducted within the given technical area and is responsible for defining technical needs and working with the field to review and focus new programs. In addition, the leader will function as the focal point for such activities within the MWIP relevant to the given technical area.

SIGNIFICANT ISSUES

This project has been incorporated into the MWIP Program Support project for FY95. Because of this incorporation the remaining commitments and funding for this project will be rolled into the September ORNL Technical Task Plan OR-1212-02, for carryover into FY95. For further details please refer to ORNL's Technical Task Plan OR-1212-02.

MAJOR ACCOMPLISHMENTS

The Integrated Systems Assessment and Evaluation portion of the Mixed Waste Focus Area Technology Team Program Plan has been redrafted and submitted for collation with the other sections of the plan.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

Westinghouse Hanford Company and John Wong submitted a report entitled "Go/No Go Recommendation for TTP RL442001, Freeze Crystallization Technology."

Chemical/Physical Technical Area Leader

TTP Number OR132016

MWIP Mercury Control

TTP Number OR132010

Technical Area No. 4.0

Sub Technical Area No. 4.2

Contact Person Thomas Klasson, ORNL

Telephone No. 615/574-8813

Fax No. 615/576-4195

OBJECTIVES

This Technical Task Plan will focus on the development of General Electric's (GE) KI/I2 leaching process for specific U. S. Department of Energy (DOE) solid mixed waste. The goal is to prepare for a full-scale demonstration of the process on actual mercury-contaminated mixed waste. The demonstration may or may not be coupled with a Mixed Waste Integrated Program (MWIP) thermal treatment demonstration. This work will address needs statement listed in the "Call for Technical Task Proposal FY 95" distributed by the Office for Research and Development (R&D) and the Office of Demonstration, Testing, and Evaluation. In specific, the needs statements ES-1 (Radionuclide and/or Toxic Component Removal) and ES-S (Aqueous Processing) under the Efficient Separations and Processing Integrated Program (ESPIP) will be addressed by the proposed work. The program directly addresses MWIP's need for 'mercury processing' as outlined in MWIP's "Technical Area Status Report for Chemical/Physical Treatment. "

SIGNIFICANT ISSUES

EM-50 reduced FY94 funding for the project by \$50,000. A carryover of \$66K into FY95 will cover committed subcontract charges not costed in FY94.

MAJOR ACCOMPLISHMENTS

The bench scale laboratory studies on mercury removal from aqueous waste and solid waste are complete and show that mercury from aqueous waste can be removed to below current EPA toxic characteristic level of 0.2 ppm. Mercury from solid waste forms can also be removed in excess of 98 percent. Additionally, all FY94 milestones have been completed and the Technical Task Plan for FY95 has been completed and submitted to DOE's program office.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

MWIP Mercury Control

TTP Number OR132010

Biocatalyst Destruction of Nitrite and Nitrate

TTP Number CH242001

Technical Area No. 4.0

Sub Technical Area No. 4.3

Contact Person D.J. Chaiko, W. Mego, and T. Krause

Telephone No. 708/252-4399

Fax No. 708/252-5912

OBJECTIVES

The objective of this task is to provide a proof-of-concept for enzyme-based reactor systems that can be used to reduce nitrate and nitrite to N₂ and H₂O. During the first year, we will concentrate on the immobilization of nitrate reduction and nitrate/nitrite partitioning. Enzyme reaction rates will be measured and used to estimate final reactor size and throughput. We will also assess enzyme resistance toward inactivation in an aqueous biphasic system. This is a one-year program with a major decision milestone. If the first year's efforts are successful, we would proceed to immobilize the remaining enzyme systems necessary to reduce nitrate directly to N₂ and H₂O. At that time, the program would become a joint effort with J. Dordick at the University of Iowa. Work at ANL will focus on the development of a biphasic extraction system and process integration. Researchers at the University of Iowa will provide support in developing enzyme immobilization techniques and assays of activities.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

A bipyridinium charge transfer agent has been coimmobilized with the nitrate reductase enzymes into the surface of the gold electrode. Preliminary results show the nitrate is being reduced to nitrite. Work is continuing on an alternate system using safarin functionalized into thiophene-malonic acid.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Biocatalyst Destruction of Nitrite and Nitrate

TTP Number CH242001

Freeze Crystallization Technology

TTP Number RL442001

Technical Area No. 4.0

Sub Technical Area No. 4.4

Contact Person John J. Wong, Tim P. Moberg

Telephone No. 509/372-2464

Fax No. 509/372-2454

OBJECTIVES

This TTP describes the development, design, procurement, testing, and demonstration of pilot-scale, direct-contact freeze crystallization systems. This system will be used to demonstrate that freeze crystallization technology is capable of concentrating liquid effluents, and separating inorganic and organic contaminants in these liquid streams by removing the bulk of the water. A freeze crystallization process separates water from solutions by cooling the solution until ice crystals begin to form. Ice, with a few exceptions, crystallizes as a pure material. The ice is separated from the remaining liquid and impurities, washed, and melted to produce a purified stream. The dissolved components of the stream are concentrated into a reduced volume. Hazardous components of liquid wastes are concentrated into a small volume, which can be more economically destroyed by thermal oxidation or solidified. Freeze crystallization is a flexible process that can adjust to the needs of the application, and thus always operate at a high efficiency.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

A milestone report was submitted to DOE-Richland with a recommendation to proceed with pilot-scale development, including selection of freeze crystallization technology. The laboratory bench scale testing of the indirect-contact freeze crystallization is completed and a report issued. Also, the engineering studies are completed and report to be issued in October 1995.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

Project reports on the bench scale testing and engineering studies have been completed and issued to DOE-Richland Field Office.

Freeze Crystallization Technology

TTP Number RL442001

TECHNICAL AREA SUMMARY

5.0 Waste Destruction and Stabilization

The primary purpose of the Waste Destruction/Stabilization technical area of the Mixed Waste Integrated Program is to identify and evaluate robust innovative technologies for application to DOE waste streams. A robust technology is one that can be applied to a wide variety of DOE wastes, requires minimal characterization of the waste, requires minimal feed preparation, and produces a stable waste form.

Waste Destruction and Stabilization Technical Area Leader

TTP Number OR142002

Technical Area No. 5.0

Sub Technical Area No. 5.1

Contact Person John McFee, IT Corporation

Telephone No. 505/262-8800

Fax No. 505/262-8855

OBJECTIVES

The primary responsibility of the technical leader is to interact with the MWIP staff to ensure the continuation of a coordinated approach to Mixed Waste Treatment R&D. The leader is also responsible for programmatic oversight of technical work being conducted within the given technical area and is responsible for defining technical needs and working with the field to review and focus new programs. In addition, the leader will function as the focal point for activities within the MWIP relevant to the given technical area.

SIGNIFICANT ISSUES

Costs are under budget due to subcontract billing. The carryover is committed to a subcontract currently in place.

MAJOR ACCOMPLISHMENTS

Two MWIP abstracts for Waste Management '95 were finalized and submitted. A paper was presented at the American Chemical Society conference in Atlanta, Georgia on September 19, 1994, on alternative for thermal treatment. Also, personnel participated in the DOE-Albuquerque Packed Bed Reactor/Silent Discharge Plasma review which lead to modifications to the conceptual design.

UPCOMING EVENTS

October activities include 1) attending a meeting in Butte, MO., on closed offgas technology development, 2) participating in FY '95 program planning meeting for task leader activities, 3) attending a workshop on innovative technology evaluations and establishing an EM-50 methodology, and 4) initiating a meeting on permitting transportable systems and BDATs.

PROJECT PUBLICATIONS

Two papers are being prepared for Waste Management '95, and one paper has been presented to the ACS on alternatives for thermal treatment.

Waste Destruction and Stabilization Technical Area Leader

TTP Number OR142002

Plasma Hearth Process

TTP Number OR132020

Technical Area No. 5.0

Sub Technical Area No. 5.2

Contact Person Ray Geimer, SAIC

Telephone No. 208/528-2144

Fax No. 208/528-2194

OBJECTIVES

This project involves evaluating the Plasma Hearth Process (PHP) for a variety of mixed waste treatment applications. The goal of this project is to demonstrate a potentially robust process for the treatment of mixed waste. The project is structured to ensure that the plasma technology can be employed in waste treatment, and will meet or exceed regulatory requirements governing thermal treatment processes. Regulators and waste management personnel will be involved closely in the project throughout the various phases and subtasks to ensure that all requirements will be met. This goal includes demonstration that this technology can treat a wide range of DOE mixed waste with better performance, lower cost, and reduced risk than baseline thermal treatment technologies. Data collected during tests will be evaluated by the MWIP systems analysis team with regard to performance, risk, and life-cycle costs. Data quality objectives, process characterization protocol, and quality assurance for data collection will have MWIP oversight and guidance. This work will be accomplished by Science Applications International Corporation (SAIC), the technology developer, through contracts with Retech, Ukiah, California. This work will be conducted under the direction of the MWIP Waste Destruction/Stabilization Technical Support Group, responsible for technical oversight of the plasma hearth technology demonstration and the system upgrades, and the MWIP Off-gas Treatment Technical Support Group, responsible for developing and demonstrating off-gas treatment and monitoring technologies. The project will be administered and tracked by MMES.

SIGNIFICANT ISSUES

The design, purchase, installation and setup of the off gas system for the plasma primary system cannot proceed until the primary system has been contracted. The primary system contract is being delayed until the validity of the sole source justification can be reviewed. The off gas system work will continue as soon as possible after the award of the primary system contract.

MAJOR ACCOMPLISHMENTS

The installation of the upgraded off gas system on the 2nd generation system has not been accomplished on schedule, nor has the checkout and startup of the 2nd system occurred on schedule. However, work on this milestone will be completed as soon as the primary system contract is awarded.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Plasma Hearth Process

TTP Number OR132020

Plasma Hearth Process - Radioactive Waste Tests

TTP Number CH232007

Technical Area No. 5.0

Sub Technical Area No. 5.4

Contact Person Robert Gillins, SAIC

Telephone No. 208/528-2114

Fax No. 208/528-2194

OBJECTIVES

This project involves the design, construction, testing, and evaluation of a bench-scale Plasma Hearth Process (PHP) unit in the treatment of surrogate and actual mixed radioactive waste in a radioactive facility located at ANL-W at the INEL. Fixed hearth arc plasma technology has been used for many years in the processing of specialty and other metals, and has many potential benefits as a waste treatment process. This work will be conducted under the cognizance of the Waste Destruction and Stabilization TSG of the Mixed Waste Integrated Program (MWIP). The MWIP is evaluating treatment technologies for a wide range of mixed waste types and forms. The Plasma Hearth Process is a very robust process, potentially applicable for treatment of a large portion of the defined DOE waste categories. The Technology Need section will discuss specific applications in greater detail. Development of the PHP will serve MWIP goals in providing a treatment process applicable to a range of waste types.

SIGNIFICANT ISSUES

The baseline schedule for bench scale testing is being slipped several months because of procurement issues with the primary Plasma Hearth Process system components. A revised baseline schedule is being prepared for spiked radioactive testing and alternatives to the current testing plan and hardware configurations are being developed for presentation to DOE.

The layouts for the bench scale plasma system and the field scale system are larger than anticipated (because of the waste handling features) which indicates that both system may not fit into TREAT at the same time. Alternative layouts are now being evaluated.

MAJOR ACCOMPLISHMENTS

The NEPA categorical exclusion for the bench scale tests at TREAT has been approved by DOE-CH. A draft FY95 Technical Task Plan was developed for ANL-W Plasma Hearth Process activities. Also, a final layout for the bench scale plasma system and an updated layout for the field scale system was received from SAIC/Retech.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Plasma Hearth Process - Radioactive Waste Tests

TTP Number CH232007

Fixed Hearth Plasma Arc for Mixed Waste Treatment (RETECH)

TTP Number PE021202

Technical Area No. 5.0

Sub Technical Area No. 5.6

Contact Person Robert Gillins, SAIC

Telephone No. 208/528-2114

Fax No. 208/528-2194

OBJECTIVES

This project will develop a plasma treatment process that will be highly effective in treating a variety of DOE wastes. The project has been divided into three phases. Phase 1 is a Proof-of-Principle phase that will evaluate the ability of the Plasma Hearth process to treat several simulated waste matrices. Phase 2 will consist of the prototypical unit design. The objective of Phase 3 is the construction and demonstration of a prototype field scale plasma treatment process.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

The contract has been issued for design funds for the prototype unit that is to be built at the Retech facility in Ukiah, CA.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Fixed Hearth Plasma Arc for Mixed Waste Treatment (RETECH)

TTP Number PE021202

PHP Slag Chemistry and Slag/Metal Processing

TTP Number CH242005

Technical Area No. 5.0

Sub Technical Area No. 5.7

Contact Person Ankur Purohit, Argonne National Laboratory - West

Telephone No. 708/252-6670

Fax No. 708/252-4007

OBJECTIVES

The objectives of the plasma hearth process (PHP) slag/metal removal validation project are to independently validate the current PHP slag and metal removal design activities. These activities include, vitrification of LLW and TRU with plasma torch, separations of slag and metallic phases, and batch, semi-continuous, or continuous process. Also, an evaluation of radiological considerations will be conducted. These considerations include the following, meeting all safety criteria — both radiological and industrial, environmental control and monitoring, and disposition of slag and metal phases according to their hazards, either radioactive or RCRA.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

No accomplishments were reported for September 1994.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

PHP Slag Chemistry and Slag/Metal Processing

TTP Number CH242005

Steam Reforming of Mixed Wastes

TTP Number AL242001

Technical Area No. 5.0

Sub Technical Area No. 5.8

Contact Person Jim Miller/ Sandia National Laboratories

Telephone No. 505/845-8661

Fax No. 505/844-8170

OBJECTIVES

This task will use the commercial steam reforming system of Synthetica Technologies to demonstrate the destruction of organic and inorganic salts that decompose thermally (e.g., nitrates, nitrites, and carbonates) present in the following: an adsorbed aqueous organic liquid waste simulant; a high organic content sludge simulant; a cemented sludge/ash/solids simulant; a heterogeneous debris simulant; a lab packs simulant; and a Trimsol coated machining waste. In addition, scavenging of mercury vapor by molten sulfur coated on ceramic spheres will be studied to determine whether Synthetica's ceramic sphere packed Moving Bed Evaporator liquid feed system can be used to scavenge mercury vaporized by steam gasification of mixed wastes.

SIGNIFICANT ISSUES

The pullback and reduction of a funding has delayed the project milestones. A revised modified scope was submitted to MWIP to correspond to projected funding. Discussions have been held with both Synthetica and ThermoChem/MTCI on scope of work and preliminary cost estimates. The test plan for all tests has been completed and contract have been awarded, however, the scope of testing has been reduce due to funding reductions. Performance of chlorocarbon kinetics test have been delayed until WED-ID funding becomes available in FY95.

MAJOR ACCOMPLISHMENTS

The contract for simulant tests at ThermoChem/MTCI has been placed and the associated test plan provided.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Steam Reforming of Mixed Wastes

TTP Number AL242001

PHP Radioactive Waste Test - Idaho

TTP Number ID032001

Technical Area No. 5.0

Sub Technical Area No. 5.9

Contact Person Robert Gillins, SAIC

Telephone No. 208/528-2114

Fax No. 208/528-2194

OBJECTIVES

The primary objectives of the plasma hearth radioactive waste tests is to (1) define the regulatory requirements for operation and testing, (2) develop, design, and fabricate a field scale system from the data obtained in the non-radioactive pilot-scale tests, (3) design, procure, and fabricate a bench-scale system, and (4) design and fabricate from the information obtained in the bench-scale test a pilot-scale system that can treat low-level radioactive mixed waste.

The objectives of the bench-scale system is to validate the surrogate testing on non-radioactive pilot-scale sample testing, provide accurate measurements of radionuclide partitioning and metal volatilization, demonstrate treatment of actual mixed wastes, demonstrate the stability of the actual final waste forms, and generate data for radiological environmental and safety issues for the field-scale demonstration unit.

The objectives of the field-scale project are to demonstrate versatility of the process for a variety of actual waste types, full scale verification of the process, demonstrate permitting and operation of such a facility and process, determine the life cycle costs, and demonstrate readiness for complex-wide implementation.

SIGNIFICANT ISSUES

The contract has not been finalized or awarded. Funds will be dispersed at the time of contract award.

MAJOR ACCOMPLISHMENTS

None.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

PHP Radioactive Waste Test - Idaho

TTP Number ID032001

BUDGET/MILESTONES SUMMARY				1993			1994								
				O	N	D	J	F	M	A	M	J	J	A	S
Milestones/Schedules															
Reports — Quarterly and Final						◆			◆			◆			◆
<div><div>400-</div><div>350-</div><div>300-</div><div>250-</div><div>200-</div><div>150-</div><div>100-</div><div>50-</div><div>0-</div></div> <div><div>Total Available \$2.1M</div><div>Total Budgeted \$299K</div><div>Cum. BCWP \$K</div><div>Cum. ACWP \$K</div><div>Cum. Cost Variance \$K</div></div>															
Financial Data (\$K)															
Budgeted Cost of Work Scheduled (BCWS)				1	0	0	197	0	92	0	0	0	9	0	0
Budgeted Cost of Work Performed (BCWP)				1	0	0	197	0	92	0	0	0	9	0	0
Actual Cost of Work Performed (ACWP)				1	0	0	197	0	92	0	0	0	9	0	0
Cost Variance				0	0	0	0	0	0	0	0	0	0	0	0
Cum. Cost Variance				0	0	0	0	0	0	0	0	0	0	0	0

TECHNICAL AREA SUMMARY

7.0

Off Gas Treatment

Off gas treatment is probably the most critical subsystem to any thermal or incineration treatment process. The primary objection to incineration is the release of potentially toxic substances in the effluent waste gas stream. Treatment of off gasses from thermal processes is not unique but the addition of radionuclides into the off gas stream presents a whole new set of issues that require resolution before any thermal treatment process is put on line. DOE/EM is funding six new air pollution control and monitoring technologies in MWIP. While off gas treatment technologies are well understood and have been in use for decades continuous emission monitors are not as fully advanced and, therefore, are ripe for technology development.

Off Gas Technical Area Leader

TTP Number AL221207

Technical Area No. 7.0

Sub Technical Area No. 7.1.

Contact Person Nina Bergen French, Sandia National Laboratories

Telephone No. 510/294-3185

Fax No. 510/294-2999

OBJECTIVES

The primary responsibility of the technical leader is to interact with the MWIP staff to ensure the continuation of a coordinated approach to mixed waste treatment R&D. The leader is also responsible for programmatic oversight of technical work being conducted within the given technical area and is responsible for defining technical needs and working with the field to review and focus new programs. In addition, the leader will function as the focal point for activities within the MWIP relevant to the given technical area.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

Personnel provided technical support to the MWIP Transportable Vitrification System Expedited Demonstration and coordinated the MWIP off gas project demonstrations. Nina French participated in a new project at MSE, Inc. in Butte, MO., to design and demonstrate a "Closed-Loop" off gas system for a plasma hearth furnace. Dr. French also participated in the kick-off meeting for the Savannah River Advanced CEM project.

UPCOMING EVENTS

No projects events have been scheduled.

PROJECT PUBLICATIONS

Dave Dalton reviewed three vendor bids for the air pollution control system for the transportable vitrification system and supplied a written evaluation of the proposed designs to Savannah River. Savannah River then forwarded the report on to EnVitCo., the joule melter manufacturer.

Off Gas Technical Area Leader

TTP Number AL221207

Continuous Monitoring for Hg in Gas and on Solids

TTP Number AL342004

Technical Area No. 7.0

Sub Technical Area No. 7.3.

Contact Person J. Wang, Sandi National Laboratories

Telephone No. 510/294-2786

Fax No. 510/294-3410

OBJECTIVES

This project will develop and demonstrate an instrument system to continuously measure total, elemental, and speciated mercury in effluent from DOE waste treatment units. The principal objectives of the program are to use a commercially-available elemental mercury analyzer in conjunction with a technique to convert speciated mercury into elemental mercury, and then use difference measurements to determine total, elemental, and speciated mercury. Also, a mercury analyzer is to be designed to improve sensitivity to less than 0.1 ppb and achieve the desired goal of 0.1 ppb. This goal was selected because of published data on state-of-the-art mercury control technology have demonstrated that these levels can be achieved. Therefore, it is anticipated that this will establish a Maximum Available Control Technology (MACT) standard that the MWIP processes must meet. Throughout this project, personnel will continue to work with ADA Technologies, an environmental science and engineering company with expertise in instrumentation systems and field implementation.

SIGNIFICANT ISSUES

September spending is at a -\$6K because of the reclassification of a computer. Subsequently, this will allow a carryover of \$4K into FY95. Additionally, \$31K in capital money was committed in September to purchase the sampling and calibration system for the planned FY95 field test.

MAJOR ACCOMPLISHMENTS

Work is continuing on the design and fabrication of the mercury detector, and on the design and fabrication of the sampling interface. Work is continuing on the procurement and assembling of specific components to be used in the field prototype analyzer. The TTP for FY95 was completed and submitted.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Continuous Monitoring for Hg in Gas and on Solids

TTP Number AL342004

Hg Vapor Removal and Control

TTP Number AL342007

Technical Area No. 7.0

Sub Technical Area No. 7.4.

Contact Person D. Sparger, SNL/CA

Telephone No. 510/294-2537

Fax No. 510/294-1015

OBJECTIVES

The overall objective of this work is the control and recovery of vapor-phase mercury and particulates using a regenerable gold-plated porous substrate immobilized in a ceramic filter for application to effluents from mixed waste treatment units. Currently, the state-of-the-art for mercury control is either (1) wet scrubbing, or (2) carbon injection. Wet scrubbing is effective for scrubbing out mercury chloride from effluent streams; however, it is ineffective for removing elemental mercury from effluent streams. Carbon injection requires a different sorbent for each mercury species — this is not highly practical if there are a number of different species present or if characterization is not complete. The high efficiency ceramic filter is designed for particulate removal while the gold plated proprietary sorbent is designed for total mercury removal. The system is designed to be totally regenerable (1) particulates are removed by a pulse blowback, and (2) the mercury is removed by thermal treatment.

SIGNIFICANT ISSUES

The sorbent beds for the "Small Scale Field Demonstration" have been installed at the IT Corp. in Oak Ridge, TN., however, testing was halted because of a facility ventilation problem. The tests are expected to resume in November 1994, following the correction of the ventilation problem.

MAJOR ACCOMPLISHMENTS

The packed sorbent bed was installed in the process train at the IT Corp. Oak Ridge facility in September 1994, and testing began on the process. However, the mercury concentration (7 wt.%) was higher than expected and the mercury concentration in the pilot plant test room began to build up causing a stoppage of the test for health and safety concerns. A more robust ventilation system is being installed and testing is expected to begin again in November 1994.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Hg Vapor Removal and Control

TTP Number AL342007

Real Time Monitoring of Alpha Emissions

TTP Number AL142003

Technical Area No. 7.0

Sub Technical Area No. 7.5.

Contact Person Russ Gritz/LANL

Telephone No. 505/667-0481

Fax No. 505/665-4955

OBJECTIVES

The purpose of this project is to provide an instrument able to monitor stack emissions in real-time, continuous, on-line manner for low levels of alpha emitting radionuclides. This instrument will provide an order of magnitude or more improvement in sensitivity over current best available technology.

SIGNIFICANT ISSUES

The preparation of the final report is delayed because of the re-analysis of data. Several inconsistencies were noticed in the experimental data and corrective actions were taken to correct the problem. Also, the milestone to determine the test site has slipped to allow several other tasks to complete or progress further.

MAJOR ACCOMPLISHMENTS

A new analysis procedure that reduces the overall analysis time was developed for the project because of the work conducted on the data inconsistencies associated with the LeCroy2249w ADC in its ability to handle overflow events that exceeded the maximum range of the ADC.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Real Time Monitoring of Alpha Emissions

TTP Number AL142003

Demonstration of Off Gas Treatment Using Steel HEPA Filter

TTP Number SF242001

Technical Area No. 7.0

Sub Technical Area No. 7.6.

Contact Person Werner Bergman, LLNL

Telephone No. 510/422-5227

Fax No. 510/422-5485

OBJECTIVES

This project is primarily concerned with demonstrating that the steel HEPA filter made with 0.5 micron steel fibers will meet both the efficiency and the pressure drop requirements for HEPA filters. This project will use the 0.5 micron steel fibers developed in the previous project, SF-2012-02. The subtasks for this project include fabricating a filter test sample from 0.5 micron steel fibers, measuring the efficiency and pressure drop of the test filter, and writing a report establishing a proof-of-principle for the steel HEPA filter. The steel HEPA filter is intended to be used in the off-gas from mixed waste treatment systems in the Mixed Waste Integrated Program (MWIP).

SIGNIFICANT ISSUES

The budget for this project has a total overrun of \$3.3K in FY94. A request has been made in writing to Paul Hart requesting headquarters to cover this overrun.

MAJOR ACCOMPLISHMENTS

The project successfully demonstrated that the steel HEPA cartridge can meet HEPA requirements and that the Oak Ridge filter meets the required efficiency, but has 35 inches of water pressure drop which fails the water pressure drop requirement (the requirement is 1 inch of water pressure drop). The steel HEPA cartridge has an efficiency of 99.998%, only 99.97% efficiency is required in HEPA filters.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

The final report on the project is now in publication and will be distributed after printing.

Demonstration of Off Gas Treatment Using Steel HEPA Filter

TTP Number SF242001

Cleanable HEPA
TTP Number OR142001

Technical Area No. 7.0
Sub Technical Area No. 7.7.
Contact Person D. E. Fain, Oak Ridge
Telephone No. 615/574-9932
Fax No. 615/576-2930

OBJECTIVES

The objective of this proposed work is to develop and demonstrate a cleanable HEPA filter for use in off-gas treatment systems such as that planned for the MWIP. The task will utilize inorganic membrane technology available at the Oak Ridge K-25 Site to fabricate long-life metal filter elements that will meet HEPA requirements. The porous filter element will have pores of about 0.25 micron diameter in order to provide surface filtration, and complete surface capture of particles having diameters of 0.3 micron or larger. Using filter elements having 0.25 micron diameter pores, particulates with a diameter of 0.3 micron or larger can not penetrate into the interior of the filter. The particles will collect on the outer surface of the filter. As the particles collect on the filter, a filter cake of these particles will be formed on the outer surface of the filter element. Since the velocity of the particles approaching the filter surface is small, the particles will form a very low density filter cake at the outer surface of the filter. This low density filter cake can be more easily removed or cleaned than if the particles are collected within the interior of the filter as occurs with a depth filter.

SIGNIFICANT ISSUES

Funding for this project has been expended and all work relating to this project has been stopped.

MAJOR ACCOMPLISHMENTS

The testing of cleanable HEPA filter was successfully demonstrated by LLNL using NaCl particles. The inorganic surface filter module captured 99.99997% of the particles of size 0.3 microns or greater. Cleaning of the filter module was easily accomplished by using water/alcohol or ammonia solutions.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Cleanable HEPA

TTP Number OR142001

TECHNICAL AREA SUMMARY

8.0

Final Waste Form

The final waste form technical area is being assessed because of the pressing need to develop a functional final waste forms for low-level mixed waste. This technical area is divided into three primary sections (1) develop final waste forms for glass vitrification, (2) develop alternative final waste forms for waste streams not suitable for vitrification or plasma processing, and (3) determine and develop performance criteria for the final waste form(s) for LLMW. A number of accomplishments have already occurred which include the development of a TASR for the final waste form, development of performance criteria, define performance testing methodology, development of glass vitrification and alternative final waste forms, e.g., sulfur polymer cement and chemical-bonding cements.

FWF Technical Support & Technology Specification

TTP Number OR132017

Technical Area No. 8.0

Sub Technical Area No. 8.1

Contact Person John Mayberry, SAIC

Telephone No. 208/528-2116

Fax No. 208/528-2197

OBJECTIVES

The Final Waste Form technical leader is responsible for the development of final waste form standards and final waste form technology guidance and coordination. With guidance from the HQ program manager and the IPC, specific duties include: TASR update; technology selection chart and flowsheet development; implementation of process alternatives analysis; interaction with DOE-site Waste Management staff; and the establishment of data quality objectives. In addition, the leader will function as the focal point for activities within the MWIP relevant to the given technical area.

SIGNIFICANT ISSUES

The subcontractor invoices are behind schedule for this project. The corrective action for this issue is to extend the period of performance prior to the end of FY94. The late invoices are resulting in the costs being under budget and it is anticipated that the carryover will be committed to the subcontracts currently in place. The schedule variance is due to the late placement of a subcontract in FY94. The work under this contract is scheduled to continue through the first quarter of FY95.

MAJOR ACCOMPLISHMENTS

Completion of the final status report for FY94.

UPCOMING EVENTS

Project personnel will attend the Polyethylene Encapsulation Technology Demonstration at BNL on September 13, 1994, and present a paper at the ACS, I&EC Division, Emerging Technologies in Hazardous Waste Management VI, in Atlanta, Georgia, on September 19-21, 1994.

PROJECT PUBLICATIONS

Paper presented at the American Chemical Society conference in September 19-21, 1994.

FWF Technical Support & Technology Specification

TTP Number OR132017

Low-Level Mixed Waste Vitrification Process Limits

TTP Number SR132004

Technical Area No. 8.0

Sub Technical Area No. 8.2

Contact Person D. F. Bickford, Westinghouse Savannah River Co.

Telephone No. 803/725-3737

Fax No. 803/725-4553

OBJECTIVES

The plan will be developed in collaboration with the Mixed Waste Integrated Program (PNL, LANL, ORNL, and RFP). Use of commercial and university partners to obtain data will be emphasized. Key technical requirements to establish vitrification technology as viable for low-level mixed waste will be established. The effort consists of three primary objectives: 1) glass waste form development; 2) establishment of melter technology and hazardous destruction capabilities; and 3) engineering and pilot scale testing of surrogate wastes. Test cases will consist of three sludges representative of Rocky Flats, ORNL, and LANL sludges. Limited work will be conducted on other waste types in the LLMW program.

SIGNIFICANT ISSUES

No outstanding issues reported for September 1994.

MAJOR ACCOMPLISHMENTS

The final summary report is being written for all work performed under this Technical Task Plan and will be issued upon completion of the report. The second phase of the contract with Clemson University has been placed and the contract subsequently has been extended through July 31, 1995. Summer interns working on the crucible studies have issued their test reports. The reports will be used as a baseline for additional glass formulation development.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

The reports on crucible studies by summer interns has been released. It is expected that the reports will baseline additional glass formulation development.

Low-Level Mixed Waste Vitrification Process Limits

TTP Number SR132004

Vitrification Process Testing and Development

TTP Number RL332009

Technical Area No. 8.0

Sub Technical Area No. 8.3

Contact Person Richard Peters, PNL

Telephone No. 509/376-4579

Fax No. 509/376-1867

OBJECTIVES

This task will define the vitrification process envelope for mixed wastes. This is necessary to develop flowsheet specifications for the process. Effluent stream data and material balances will be established. Process stream information such as this will be necessary to apply for Part B thermal treatment permits from the Environmental Protection Agency or its "agreement states." The permits will require a definition of wastes entering the melter, exhaust gases, gaseous stack effluents, waste glass, and aqueous effluents from off-gas system scrubbers. These process stream specifications will also expedite development of the technology since they allow for design and selection of process equipment to be used in the treatment of mixed waste. The task will simultaneously train technology graduates/undergraduates and private industry personnel from a radioactive waste service company.

SIGNIFICANT ISSUES

The funding level for FY95 is inadequate to complete scope unless carryover and \$50K that has been withheld is provided to the task. The funding short fall will result in the pilot scale melter test being aborted, the contract with Washington State University will be terminated and the project will be unable to pay for a QA engineer to meet the new MWIP QA requirements. The \$50K that is withheld will result in reducing the radioactive bench scale vitrification tests from two to one.

MAJOR ACCOMPLISHMENTS

The task contributed to the overall knowledge of vitrification technology by supporting a novel method of treating combustible material in a melter. A bench scale unit was fabricated and installed by Washington State University in collaboration with PNL discretionary research. The bench scale unit was tested and proved the concept of making glass from combustible bearing feed material.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Vitrification Process Testing and Development

TTP Number RL332009

Phosphate-Bonded Ceramics Waste Forms

TTP Number CH242004

Technical Area No. 8.0

Sub Technical Area No. 8.4

Contact Person Arun S. Wagh, Argonne National Laboratory

Telephone No. 708/252-4295

Fax No. 708/252-3604

OBJECTIVES

The goal of the proposed research is to develop chemically bonded ceramics (CBSs) for low-temperature treatment and stabilization of U.S. Department of Energy (DOE) "problem" low-level mixed waste streams as identified by the EM-30 Mixed Waste Treatment Project. Effort will be directed towards developing phosphate bonded ceramics for treatment of solid and sludge low-level mixed wastes. Final waste forms incorporating wide range of simulated and actual wastes will be fabricated with optimal properties. Various factors involved in the design and scale-up of the waste forms will be identified and established to assess the long-term performance of CBS final waste forms under field conditions.

SIGNIFICANT ISSUES

No issues reported in September 1994.

MAJOR ACCOMPLISHMENTS

No accomplishment reported in September 1994.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

No project publications were prepared or issued during September 1994.

Phosphate-Bonded Ceramics Waste Forms

TTP Number CH242004

Waste Form Performance Criteria

TTP Number CH332001

Technical Area No. 8.0

Sub Technical Area No. 8.7

Contact Person Mark Fuhrmann, Brookhaven National Laboratory

Telephone No. 516/282-2224

Fax No. 516/282-4486

OBJECTIVES

The purpose is to respond to a need expressed by the MWIP. Through its charter, the MWIP has established the need for improved final waste forms. In many cases, current technologies have resulted in poor quality waste form products that have failed prematurely and/or have been out of compliance with environmental regulations. Several solidification technologies have shown promise for improved performance and are under consideration. The TSG on Final Waste Forms has identified the need to establish waste form testing and evaluation criteria for mixed waste that will allow proper selection of solidification technologies for acceptable disposal of DOE mixed wastes.

SIGNIFICANT ISSUES

The carryover of approximately \$35K from FY94 to FY95 was necessary in order to complete tasks in test development. Carryover of the requested amount from FY94 funds to FY95 funds has been approved. The year end letter report cannot be complete until October 31, 1994, because of analytical equipment failure and a medical emergency of a staff member.

MAJOR ACCOMPLISHMENTS

The leaching tests of LLW glasses have been completed and the leachate is being analyzed. The final version of the waste form performance criteria document has been published.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

The final version of the Waste Form Performance Criteria document has been published.

Waste Form Performance Criteria

TTP Number CH332001

Mixed Waste Treatability - Thermoplastic Final Forms

TTP Number CH342001

Technical Area No. 8.0

Sub Technical Area No. 8.8

Contact Person Paul D. Kalb, Brookhaven National Laboratory

Telephone No. 516/282-7644

Fax No. 516/282-4486

OBJECTIVES

The Mixed Waste Integrated Program (MWIP) and the EM-30 Mixed Waste Treatment Project (MWTP) have identified a number of DOE waste streams that are not amenable to treatment by vitrification. These include volatile metal components (e.g., mercury), chloride salts, and tritiated wastes. In addition, glass processes generate secondary waste streams that result from the cleanup of off-gas treatment and require further solidification/stabilization. The effort described in this TTP will examine the suitability of these processes for effective treatment of chloride salts (concentrates and de-watered salt cake), secondary chloride streams (that result from thermal destruction of halogenated organics), mercury wastes (liquid and mercury contaminated solids), and tritium wastes (liquid and tritium contaminated solids).

SIGNIFICANT ISSUES

The final report for this TTP will be completed in October 1994. The FY94 carryover will be used to close out remaining activities. The Mercury leachability from LDPE and SP waste forms are the only remaining issues to be addressed before completing the final report.

MAJOR ACCOMPLISHMENTS

A test matrix for TCLP leachability of thermoplastic encapsulated chloride, sulfate, and nitrate mixed salts surrogate was completed. Polymer concrete processing was successful at reaching full intrusion of lab-scale samples. Currently, leach testing of the aqueous tritium waste from these forms is in being conducted.

UPCOMING EVENTS

No project events have been scheduled.

PROJECT PUBLICATIONS

A paper on "Thermoplastic Stabilization of a Chloride, Sulfate, and Nitrate Salts Mixed Waste Surrogate" was presented at the American Chemical Society, I&EC Symposium, in Atlanta, GA., on September 19, 1994. The paper is now being prepared for peer review and publication.

Mixed Waste Treatability - Thermoplastic Final Forms

TTP Number CH342001

APPENDIX A — SUMMARY OF MWIP PUBLICATIONS

MWIP Publications	Report No.
An Assessment of Offgas Treatment Technologies for Application to Thermal Treatment of Department of Energy Wastes (Available from NTIS 703/487-4650)	DOE/MWIP-1
Thermal Treatment Technology Development Program – Interim Technology Evaluation Report (Available from NTIS 703/487-4650)	DOE/MWIP-2
Final Waste Form Technical Area Status Report (Available from NTIS 703/487-4650)	DOE/MWIP-3
Waste Destruction and Stabilization Technical Area Status Report (Available from NTIS 703/487-4650)	DOE/MWIP-4
Secondary Destruction and Offgas Treatment Technical Area Status Report (Available from NTIS 703/487-4650)	DOE/MWIP-5
Chemical/Physical Treatment System Technology Area Status Report (Available from NTIS 703/487-4650)	DOE/MWIP-8
Mixed Waste Integrated Program — A Technology Assessment for Mercury Containing Mixed Waste (Available from NTIS 703/487-4650)	DOE/MWIP-9
Evaluation of Nitrate Destruction Methods (Available from NTIS 703/487-4650)	DOE/MWIP-10
Vitrification Development Plan for DOE Mixed Waste (Available from NTIS 703/487-4650)	DOE/MWIP-11
Vitrification Treatability Study and Process Demonstration Capabilities Assessment (Available from NTIS 703/487-4650)	DOE/MWIP-12
Preliminary Hazards Analysis Plasma Hearth Process (Available from NTIS 703/487-4650)	DOE/MWIP-13
Multicriteria Decision Methodology for Selecting Technical Alternatives in the Mixed Waste Integrated Program (Available from NTIS 703/487-4650)	DOE/MWIP-14
Surrogate Formulations for Thermal Treatment of Low-level mixed Waste, Part I: Radiological Surrogates (Available from NTIS 703/487-4650)	DOE/MWIP-15
Surrogate Formulation for Thermal Treatment of Low Level Mixed Waste: PartII — Selected Mixed Waste Treatment Project Waste Stream (Available from NTIS)	DOE/MWIP-16
Surrogate Formulations for Thermal Treatment of Low-level mixed Waste, Part III: Plasma Hearth Testing (Available from NTIS 703/487-4650)	DOE/MWIP-17
Surrogate Formulations for Thermal Treatment of Low-level mixed Waste, Part IV: Waste Water Treatment Sludges (Available from NTIS 703/487-4650)	DOE/MWIP-18
Guideline for Benchmarking Thermal Treatment Systems for Low Level Waste (Available from NTIS 703/487-4650)	DOE/MWIP-19

APPENDIX A — SUMMARY OF MWIP PUBLICATIONS

MWIP Publications	Report No.
Treatment Technology Analysis for Mixed Waste Containers and Debris (Available from NTIS 703/487-4650)	DOE/MWIP-20
Front End Waste Handling Technical Area Status Report (draft)	DOE/MWIP-21
Data Quality Objectives: Evaluation of Thermal Treatment Processes (Available from NTIS 703/487-4650)	DOE/MWIP-22
Mixed Waste Integrated Program Performance Systems Analysis (Available from NTIS 703/487-4650)	DOE/MWIP-23
FY94 Program Summary Book (Available from NTIS 703/487-4650)	DOE/MWIP-24
Mixed Waste Integrated Program Life Cycle Cost Analysis of Plasma Arc Furnace (draft)	DOE/MWIP-25
Alternatives to Incineration TASR (draft)	DOE/MWIP-26
Preliminary Hazards Analysis — Vitrification Process (Available from NTIS 703/487-4650)	DOE/MWIP-27
Glass Compositions for 183-H Solar Evaporation Basin Waste (draft)	DOE/MWIP-28
Quality Assurance Requirements Plan (Available from NTIS 703/487-4650)	DOE/MWIP-29
Waste Form Performance Criteria (Available from NTIS 703/487-4650)	DOE/MWIP-30
Records Management Plan for MWIP (draft)	DOE/MWIP-31
Supplementary Data for Surrogate Formulations for Thermal Treatment of Low Level Mixed Waste (draft)	DOE/MWIP-32
Separations Processes for Concentration of Aqueous Low Level Mixed Wastes (draft)	DOE/MWIP-33
Monthly Progress Report Summary, September 1994 (draft)	DOE/MWIP-34

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