

MIXED WASTE TREATMENT PROJECT - SCOPE AND STATUS

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ABSTRACT

Department of Energy (DOE) facilities currently store and generate significant quantities of mixed wastes - materials containing both radioactive and hazardous chemical contamination. These wastes must be managed in compliance with DOE requirements and EPA Land Disposal Restrictions.

To help meet these requirements for low-level mixed wastes, the DOE Office of Waste Operations has established The Mixed Waste Treatment Project (MWTP). The overall goal of the MWTP is implementation of treatment of low-level mixed wastes .

INTRODUCTION

Department of Energy (DOE) facilities generate significant quantities of mixed wastes. These wastes, mixtures of radioactive materials and hazardous substances, are currently held in inventory at DOE sites across the complex. DOE's mixed wastes are generated by operations with radioactive materials in association with other materials that, when discarded, are designated as hazardous wastes. Because of the diversity of DOE's operations, radioactive wastes may be mixed with almost any regulated hazardous constituent. Over the years, substantial inventories of mixed wastes have accumulated. The DOE supports programs aimed both at reducing to a minimum the amount of mixed wastes produced by ongoing operations and at treating wastes currently in inventory. Although waste reduction measures will eventually decrease the volume of wastes, ongoing operations will continue to generate mixed wastes for the foreseeable future.

DOE facilities must manage their radioactive wastes in compliance with the DOE's requirements for such wastes. These requirements have been established in a series of orders and implementation guides. (1) Hazardous wastes must be managed in compliance with regulations of the U.S. Environmental Protection Agency (EPA). Both DOE orders and EPA regulations specify that mixed wastes must be managed in compliance with both sets of requirements.

The most significant mixed wastes are those containing hazardous materials that are classified as land disposal restricted (LDR) by the EPA. Such wastes are restricted from disposal in waste management units until they have been treated as specified in LDR regulations. The EPA's LDR rules supplement the DOE's already stringent regulations for operations with radioactive materials and for managing and disposing of radioactive wastes. It is, therefore, necessary to comply with both the EPA's requirements for handling LDR wastes and the DOE's requirements for managing radioactive wastes.

Depending on the specific wastes, EPA regulations either prescribe a specific treatment technology or set a permissible concentration level, with the particular treatment technology left optional. The DOE currently does not have the capability

to treat many wastes covered by the May 1990 ruling. Accordingly, the final ruling established a two-year variance from the requirements. At the end of the two-year period May 1992, waste generating facilities either must be employing a treatment or must seek an extension of the variance. A maximum of two additional one year variances may be granted. Including the variances, the final deadline for installation of treatment capability is May 1994. DOE has submitted a case-by-case application for extension of the variance to EPA.

Operational capacity available for treating DOE's mixed waste is very limited. This is primarily incineration at the TSCA incinerator at Oak Ridge. Additional capacity will be available when the incinerators at Los Alamos National Laboratory and Idaho National Engineering Laboratory come back on line. To meet the full treatment required for all its low level mixed wastes, DOE must install additional capacity. Some new treatment technologies need to be developed and demonstrated. New treatment capabilities must be installed throughout the DOE complex.

To implement the regulatory requirements and the many compliance agreements, DOE must have a plans for real progress in this critical area.

A brief analysis of alternative options for deployment of capabilities to treat mixed wastes at DOE facilities nationwide has been conducted. The purpose of this effort is to assist DOE Waste Operations in evaluating the relative costs, schedules, and timing of treatment capacity availability under different scenarios.

To limit the potentially large number of alternative cases that might be generated, all options were based on a single reference case configuration. This reference was established with an assumption of the importance of minimizing waste transportation and waste handling. In the Reference Case configuration a broadly based treatment capability is installed at those sites which already have the majority of the treatment obligation for legacy and newly generated wastes. Because it may be difficult to justify installation of treatment capability for some of the small streams at scattered DOE smaller sites, transportation of these minimized streams to permitted facilities at the baseload sites, is assumed.

Installation of treatment capability for waste streams where a significant inventory exists or will be generated takes advantage of the economy of scale in facility construction while helping to hold net cost and handling risk to a practical minimum. This assumption has not been analyzed and will require further study with facility costs and waste characteristics data in hand.

In addition to the baseload plants assumed in the options analysis, DOE may require single purpose plants at a few locations to treat unique wastes. These wastes are such streams as large quantities of sludges from a settling pond or the low level radioactive fraction of streams from the high level tanks at Hanford and Savannah River sites.

In addition to evaluation of the impact of different siting options DOE is examining alternative approaches to planning and control of projects. The alternatives being examined here consider whether to require centralized planning of uniform technologies for all waste types or whether central control should be applied to common waste types. In the latter case, unique wastes that occur primarily or exclusively at one site would be handled independent of other capability determinations. In either approach the DOE Order requirements for performance assessment of a disposal site must be complied with. Final treatment technology selection must be based on the ability of the technology to produce an acceptable form for disposal.

Normally, the DOE places its low-level radioactive wastes in shallow land disposal facilities at different DOE sites. To dispose of low-level mixed wastes beyond the deadline, the DOE first must treat the wastes to meet the appropriate Land Disposal Restriction (LDR) criteria and to conform to disposal requirements established in the DOE order.

DOE is actively working to improve the mixed waste stream data quality. For some mixed wastes, effective treatment technologies are available. For others, applicable treatments have not yet been identified. As the analyses are refined and waste streams and technology capabilities become better known, lists of technology development needs can be reduced and more sharply defined.

To define the need for appropriate technologies and capacities, the DOE's Office of Waste Operations has established a Mixed Waste Treatment Project (MWTP), which is responsible for

- analyzing the status of DOE's mixed wastes by reviewing and upgrading the current low-level mixed waste database
- examining the pertinent regulatory requirements
- examining requirements for the final waste form
- identifying existing and needed technologies for mixed waste treatment
- evaluating these technology applications in system studies.
- further identifying development and demonstration needed for potentially applicable technologies
- developing the scope of a prototype mixed waste treatment plant.

The first results of these tasks are the subject of two following papers at this conference. (2, 3)

The goal of the DOE's MWTP is to provide support for establishing effective treatment for mixed wastes. The Project

team is made up of B. C. Musgrave from LLNL, L. C. Borduin of LANL, and W. A. Ross from PNL. To provide the broadest feasible input, the project's technology support team was drawn from staff of the Hanford, Idaho, Rocky Flats, Los Alamos, Oak Ridge, and Savannah River facilities. Additional participants include the DOE's Office of Technology Development (OTD), Site Operation waste projects, HAZWRAP, and BDM and SAIC support contractors.

Engineering analysis of a full-scale demonstration plant is being used as a means of bringing together all the waste stream data and treatment operations to ensure that treatment facilities can be operated in compliance with established requirements. Implementation of the EPA-prescribed treatment technologies or treatment levels for DOE's mixed wastes would entail either significant modification of hazardous waste processing equipment as normally employed or a major effort in preparing and pretreating feed wastes.

The MWTP is a part of DOE Waste Operations overall strategy to develop and put in place a capability to treat mixed wastes as required by applicable regulations. This project has been established to ensure that the technologies and facilities developed will be brought into operation in the shortest possible time and without unnecessary expenditures of resources. The Waste Operations organization has committed itself to this route for several reasons:

- to avoid duplication of RDDT&E activities
- to promote standardized construction of treatment facilities
- to ensure acceptable waste forms.

Significant progress has been made on the initial tasks in the project. Waste stream categories have been developed which assist in combining wastes into sets for definition of treatment needs. These are coordinated with the waste streams used in DOE's case-by-case application and have resulted in a common set useful for both purposes. Treatment options were identified for all wastes.

Waste categories have been used to develop a flowsheet from which technology needs are identified to the Office of Technology Development. The waste stream quantities and flowsheet have been combined to develop the prototype mixed waste treatment plant concept.

Using the waste stream characteristics and quantities with the conceptual prototype treatment plant a reference case was established and options for deployment were analyzed as described earlier.

Continuing efforts on this project include further evaluation of identified technologies to clarify development requirements. System engineering efforts are underway to improve the prototype plant concept and develop a cost estimate basis. This systematic approach will be continued with analysis of alternative flowsheets and significant alternatives in treatment technologies. These analyses and alternatives evaluations are developed in close cooperation with the Office of Technology Development to assure the most effective technology improvement efforts that are practical.

REFERENCES

1. DOE 5400.3 Hazardous and Radioactive Mixed Waste Management Program DOE 5820.2A Radioactive Waste Management DOE LLW38T Guideline Document for Implementation of DOE Order 5820.2A

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