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RCRA Waste Minimization Progress During CY 1985

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RCRA WASTE MINIMIZATION PROGRESS DURING CY 1985

C. M. KENDRICK

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NUCLEAR AND CHEMICAL WASTE PROGRAMS

OAK RIDGE NATIONAL LABORATORY

INTRODUCTION

During 1985, considerable effort was dedicated to reduction of waste volume and toxicity at ORNL. In fact, "significantly reducing" volumes of waste generated during the period from October 1985 to March 1986 was a criterion used to determine the award fee received by Martin Marietta Energy Systems, Inc., for this period. Hazardous, radioactive, and mixed wastes were the focus of these efforts. This report will describe the activities associated with hazardous and mixed wastes.

HAZARDOUS WASTE

The volume of hazardous (as defined by 40 CFR 261), nonradioactive waste generated at ORNL in 1985 was approximately 105,700 kg, compared to approximately 100,000 kg in 1984. Cleanout of various laboratories and changing operations have contributed substantially to the totals for both years. ORNL management is encouraging the cleanout of laboratories to remove unnecessarily stored hazardous materials and avoid increased future costs of waste disposal. Although they increase the volume of waste generated, the cleanouts are good waste management practices and will continue.

Although quantity generation data do not reflect it, significant progress in hazardous waste minimization was made during 1985. The efforts were motivated by both the legal requirements of Section 3002 of the Resource Conservation and Recovery Act (RCRA) and the increasing cost of disposing of hazardous wastes. The waste minimization program developed at ORNL includes eight key elements. These elements are:

(1) policy statements from both corporate and installation management;

(2) control of the procurement of hazardous materials;

(3) tracking system for hazardous materials;

(4) cost incentives that charge waste generators for waste management costs;

(5) review of new and existing facilities, processes, and programs for waste reduction opportunities;

(6) education, training, and communication for waste generators and handlers;

(7) formal, documented, internal auditing to ensure an effective program; and

(8) implementation of disposal alternatives, including recycling, materials exchange, and compaction, where appropriate.

ORNL's hazardous waste minimization program plan underwent a major upgrade in December 1985 and is still evolving.

A Waste Minimization Committee, composed of individuals from environmental and waste management organizations, was formed in mid-1985. On September 13, 1985, the Laboratory Director requested the appointment of a representative from each division to serve as contact point for waste minimization planning and implementation. Waste Minimization Committee members met individually with division representatives to provide training in waste minimization concepts and discuss ideas and special problems. Several subsequent group meetings provided a forum for identifying major waste reduction challenges and formulating schemes for attacking them.

In addition to the training provided to division waste minimization representatives, division Environmental Protection Officers (EPOs) were trained in waste minimization concepts. EPOs are responsible for directing waste generated from their divisions to the appropriate waste management system and serving as contact points for waste generators. Two lectures on the topic of waste minimization were delivered during division meetings. Training material was also distributed by the Laboratory Director to all Division Directors.

For a number of years, monthly waste management costs have been distributed equally among those divisions generating waste that month. During 1985, a revised cost distribution system was developed to backcharge costs according to weight and type of waste disposed. This system provides an economic incentive for each division to reduce volume and toxicity of waste generated.

ORNL had implemented a program designed to provide NEPA documentation and address DOE requirements that environmental and personnel exposure from activities including waste management be kept "as low as reasonably

achievable" (ALARA). The program, tremendously expanded during 1985, includes three levels (Action Description Memoranda, Activities Description Memoranda, and Environmental ALARA Memoranda) of review for projects and activities. The reviews ensure that potential impacts on the environment are considered before action begins and call for measures which are considered necessary to protect human health and the environment. Wastes which will be generated are identified, and proper disposal procedures are outlined. During the review, opportunities for reduction of waste volume or toxicity by process modification, chemical substitution, or other methods are examined. The review program was expanded during 1985 to include existing, as well as new, activities. Efforts to work off the backlog of existing activities requiring review will continue for some time.

Improvements were initiated in the procurement process for hazardous materials. Although unit costs are smaller for larger quantity purchases, purchasing agents were alerted to the need to order chemicals in smaller quantities and smaller containers. This practice helps reduce the quantities of chemicals wasted by researchers who require very small amounts but find only large containers of the chemical are available in stores. Periodic reevaluation of standing orders for commonly used chemicals was requested. Existing procedures for control of the procurement of hazardous materials were discussed individually with division waste minimization representatives. Improvements in the process are being considered.

Unused commercial chemicals have been estimated to constitute 90% of the waste chemicals collected at ORNL. Approximately 30% of these containers are unopened. Development of a program to prevent the waste of these chemicals was initiated during 1985. Options, such as using a data base to advertise the availability of unneeded chemicals to other researchers or returning unopened chemicals to stores, were identified and are being implemented. Individual initiative resulted in the recycle of over 2,000 lb of materials between November 1985 and March 1986. This was accomplished through (1) the distribution of lists of unopened chemicals picked up by the waste operations staff and (2) donation of surplus chemicals to the University of Tennessee and other agencies (see Table 1). These chemicals were "given away" to avoid both the costs of disposal and procurement of new chemicals.

Other recycle or reclamation projects were also conducted. A process to recover silver from photographic wastes was operated during part of 1985. The process precipitates silver-bearing sludge, a marketable byproduct, from nonmarketable waste solutions. A volume reduction of approximately 200:1 results for the hazardous waste stream. In addition, Analytical Chemistry Division operates a laboratory bench-scale process which cleans for reuse approximately 2,200 lb per year of mercury.

In an effort to utilize waste management practices which are protective of human health and the environment, disposal options for hazardous wastes

Table 1. Unused chemicals donated to other agencies during December 1985

Quantity	Material	Recipient
605 gal	Ethanol	University of Tennessee
110 gal	Hydraulic Fluid	Roane State Community College
98 gal	Hydraulic Fluid	Roane State Community College
89 qt	Gulf Motor Oil	Roane State Community College
110 gal	Marcol Oil	Roane State Community College
110 gal	Hydraulic Oil	Roane State Community College
110 gal	Isopropyl Alcohol	Tennessee Dept. of General Services

were ranked in order of preference. Disposal in or on the land was the least preferred option. Therefore, when shipping hazardous wastes off-site to treatment, storage, and disposal facilities, incineration or other treatment is requested whenever possible.

Improved segregation of hazardous from nonhazardous wastes was sought through continued education of EPOs and a comprehensive effort to identify and label all drains. Signs prohibiting the disposal of "oil, petroleum products, hazardous, radioactive, toxic, or carcinogenic materials" were placed above sanitary sewer drains.

Other areas of progress toward waste minimization include expansion of the computer tracking system for wastes, additional waste stream characterization, and the issue of the report, The Spill Control, Countermeasures and Contingency Plans for Oak Ridge National Laboratory (ORNL-5946).

MIXED WASTES

Waste reduction efforts for mixed hazardous and radioactive wastes at ORNL have focused on process waste and liquid low-level waste (LLLW) streams, which are interconnected. Concentrated regenerate solution from the ion exchange columns at the Process Waste Treatment Plant (PWTP) feeds into the LLLW system, and condensate and cooling water from the LLLW Evaporator are returned to the process waste system. The average weekly generation for LLLW dropped from approximately 25,350 gal in 1984 to 21,150 gal in 1985. This reduction and the even greater reduction achieved thus far in 1986 are attributable to (1) a serious commitment to achieve goals established in October 1985; (2) effective implementation of an aggressive plan to attain those goals; and (3) dry weather, which reduces the volume of contaminated groundwater which must be treated.

The major driving force toward reduction of these wastes is the curtailment of hydrofracture for their ultimate disposal. Concentrated liquid wastes must be stored while alternative disposal technologies are studied and demonstrated. Since storage space is limited, volume reduction is essential to allow time for careful selection of the alternative technology.

Several of the concepts discussed in the hazardous waste section of this report were also beneficial to the mixed waste reduction program. Included are (1) training to increase awareness of the need for waste minimization; (2) charge-back of waste management costs for LLLW to the generator; (3) review of new and existing facilities, processes, and programs for waste reduction opportunities; and (4) waste tracking to establish generator accountability.

Process and LLLW drains, in addition to the sanitary drains already mentioned, were labeled to forbid the introduction of hazardous wastes. A survey of process and LLLW system users, conducted in August 1985, pinpointed the few generators discharging hazardous wastes. Efforts to provide alternative treatment and thus reduce the waste toxicity are continuing.

Commercial products are used widely throughout the Laboratory for cleaning glassware. By administrative order, different products ("Micro-Solution" or "Lime-Away") were substituted for a commercial glass cleaner containing chromic acid, thereby decreasing the toxicity of both process and LLLW streams.

An aggressive LLLW volume reduction plan was developed in October 1985. The plan established goals in terms of remaining volumes in LLLW concentrate tanks. Despite several operational upsets, the actual volumes of concentrate have generally tracked the plan, as shown in Fig. 1.

The decrease in concentrate volumes is largely due to the reinstallation of the clarifier at the PWTP. This unit operation precipitates out calcium and magnesium ions ("hardness") prior to treatment of the wastewater by ion exchange. These ions compete with strontium and cesium for positions on the ion-exchange medium and cause much more frequent need for column regeneration. Less frequent regeneration results in a smaller regenerate stream, a major contributor to LLLW. Before the clarifier was reinstalled, columns treated an average of 150,000 gal of wastewater and operated for an average of 20 h between regenerations, compared to averages of 1,500,000 gal and 300 h after reinstallation. (One column treated over 4,000,000 gal and operated for over 800 h!)

Development of the LLLW volume reduction plan involved an intensive effort to identify potential improvements in both the process waste and LLLW systems. Table 2 lists projects which are included in the October 1985 plan. Several projects call for equipment replacement or upgrade to eliminate groundwater inleakage and properly segregate waste streams.

Other projects involve process modification. Examples are (1) the decoupling of the PWTP from the LLLW system to increase the volume reduction capabilities of the LLLW Evaporator and (2) the replacement of decontamination sprayers with higher pressure models which generate less wastewater to achieve the same result.

Waste volume reduction achieved during 1985 has been followed by even greater reductions in 1986. This trend is expected to continue as more progress is made in the implementation of the October 1985 plan.

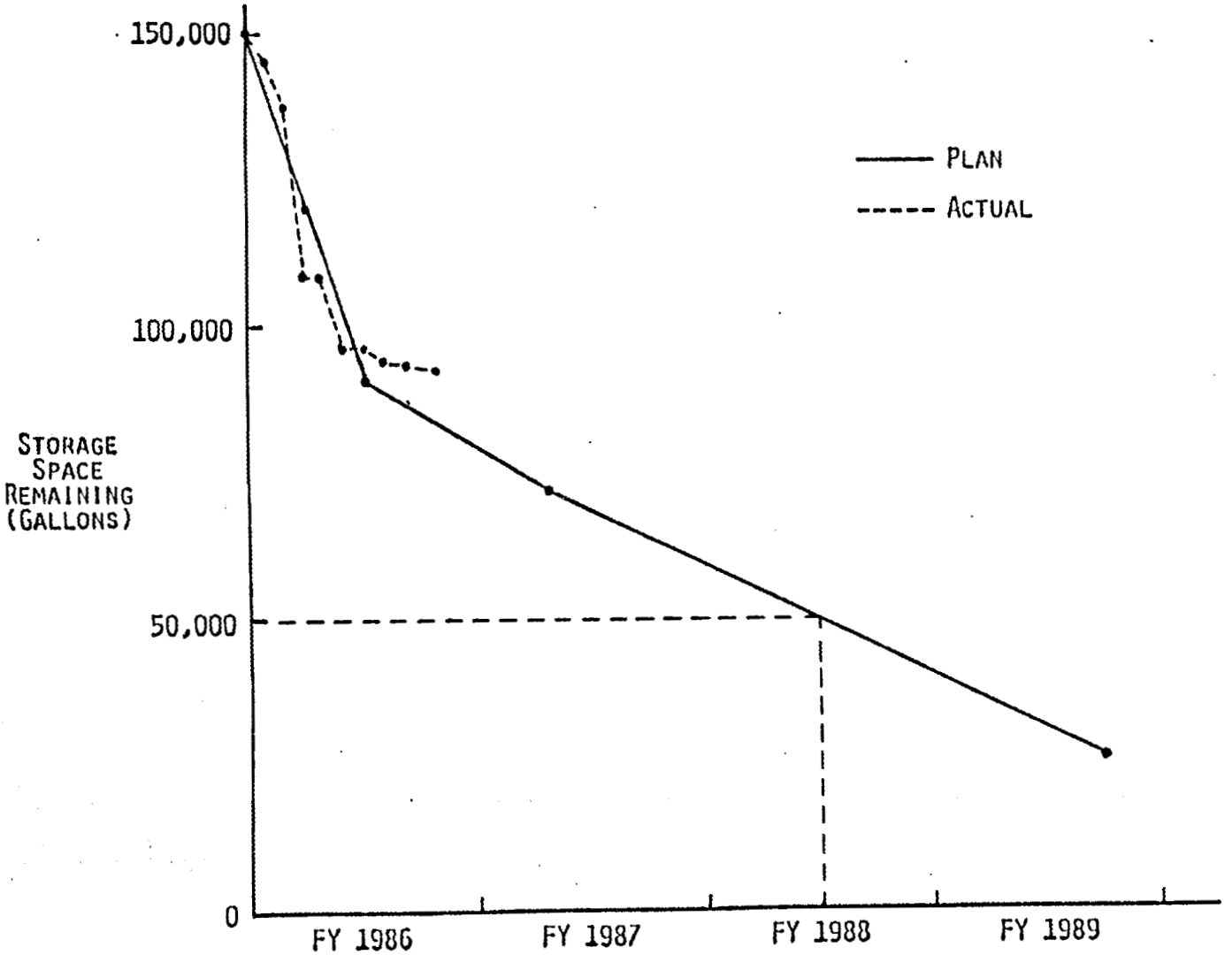

Fig. 1. At this time, the curve of storage space left versus time is tracking the plan presented to DOE-ORO in October 1985.

Table 2. Status of projects in October 1985 Plan

Project	System	Scheduled completion	Status
Decouple PWTP from LLLW (4,000 gal/week)	LLLW	Sept. 1990	85% Complete Volume reduced from 6,900 gal/wk in 1984 to 830 gal/wk in 1986
Repair pump seal leak, 3525 (minimal reduction)	PW	March 1986	Complete
Eliminate groundwater in-leakage to ORR (5gpm)	PW	Aug. 1986	Complete
Route head tank overflow back to HFIR pool (rather than LLLW) (250 gal/wk)	LLLW	Oct. 1986	Complete
Operator training and additional instrumentation at 2026 (100 gal/wk)	LLLW	May 1986	Complete
Train operators, replace ventilation system, upgrade piping in Isotope Area (100 gal/wk)	LLLW	May 1986	Complete
Potable water leak repair	PW	Feb. 1986	Complete
Steam valve repair on LLLW jet (100 gal/wk)	LLLW	March 1986	Complete
Install new make-up water demineralizers for reactors	Watershed	Aug. 1986	Complete
Replace in-cell transfer equipment at 2026 (approx. 50 gal/wk)	LLLW	Jan. 1987	Pumps Received
Replace decontamination sprayers with higher pressure sprayers in Isotope Area (approx. 100 gal/wk)	LLLW	Jan. 1987	Sprayers Received
Increase carbonate concentration in neutralized offgas solution at TRU (reduce solids)	LLLW	Jan. 1987	Planned
Upgrade process waste piping (GPP) 30gpm)	PW	June 1987	Planned
Volume reduction to PWTP (GPP) (18gpm)	PW	Sept. 1988	Planned
Europium solidification during isotope production	LLLW	Nov. 1986	Planned
Divert steam condensate (3039 stack) from PW to storm sewer (5gpm)	PW	March 1987	Being Reevaluated
Replace filter pit at FPDL (1,000 gal/wk)	LLLW	March 1989	Delayed

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