MIXED WASTE MANAGEMENT OPERATIONS AT THE IDAHO CHEMICAL PROCESSING PLANT

T. F. Pointer, K. R. Krivanek
Idaho National Engineering Laboratory
Westinghouse Idaho Nuclear Company

ABSTRACT

The U. S. Department of Energy's recent clarification of the Atomic Energy Act by-products rule in conjunction with the signing of the Environmental Protection Agency/Department of Energy Consent Order and Compliance Agreement for the Idaho National Engineering Laboratory now requires that mixed waste at the Idaho Chemical Processing Plant (ICPP) be regulated by both the AEA and the Resource Conservation and Recovery Act (RCRA).

This paper describes how Westinghouse Idaho Nuclear Company (WINCO) ensures that its Mixed Waste Program at the ICPP complies with all applicable Federal and State hazardous waste laws and regulations.

- Specific components of the WINCO Waste Management Program include:
- Identification, characterization, and remediation of past waste management sites
- Evaluation of waste generation activities
- Implementation of minimization activities
- Operation of storage activities.

BACKGROUND

The Idaho Chemical Processing Plant (ICPP) is a government owned, contractor-operated facility located at the Idaho National Engineering Laboratory (INEL) in southeastern Idaho. Nuclear reactor fuels are shipped to the ICPP for temporary storage prior to reprocessing to recover the unused uranium in the fuel for reuse. The management of the wastes generated during the uranium dissolution process is a major activity of the ICPP.

On July 10, 1987, DOE-ID, the U. S. Geological Survey (USGS) and EPA, Region 10 entered into a Consent Order and Compliance Agreement (COCA). The COCA was developed to coordinate the activities required to minimize potential harm to human health or the environment from past hazardous waste management activities at the INEL. The COCA contains compliance actions and schedules, to achieve and maintain compliance with applicable hazardous waste requirements for addressing the release and/or potential release of hazardous waste from the ICPP. The COCA also established that DOE-ID will conduct its hazardous waste and mixed waste management programs in compliance with the regulations adopted by EPA for implementing RCRA.

COCA COMPLIANCE ACTIVITIES

The COCA did not require complete abandonment of the existing DOE CERCLA Program but rather built upon the foundation developed by DOE Order 5480.14 "Guidance for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)." The first action required by the COCA was an Initial Assessment (IA) of the Waste Management Units at WINCO. The preparation of this IA was simplified by use of the Installation Assessment prepared under DOE Order 5480.14.

Determining where past waste management sites exist at the ICPP was a laborious task. Significant changes in processes, practices, personnel, regulations, and reporting procedures have occurred over the past thirty years. In general the following procedures were used to identify past waste management sites at the ICPP during preparation of the Installation Assessment:

- outside documentation
- interviews
- analysis of applicable on-site information
- site inspections.

Outside Documentation

Relevant data and other documents relating to hydrogeological, ecological, meteorological, and general environmental data were obtained from outside agencies; ie., National Oceanic and Atmospheric Administration (NOAA) and the USGS.

Interviews

Interviews were conducted with present and former ICPP personnel who had knowledge with respect to operations and conditions at various facilities located at the ICPP.

Analysis of Applicable On-site Information

A determination was made of past management practices regarding the use, storage, treatment, and disposal of hazardous/toxic and/or radioactive substances resulting from development, production, construction, and laboratory operations. This included identification of all neutralization and burial sites and all sites where spills or releases of hazardous/toxic and/or radioactive substances may have occurred. Furthermore, applicable information about the ICPP was collected and reviewed. The type of information analyzed included:

- Site-specific National Environmental Policy Act (NEPA) documentation
- Environmental monitoring program data and designs
- Effluent and emission monitoring program data and designs
- Federal and state permit documentation
- Safety analysis documentation
- Unusual Occurrence Reports (UORs) and investigative reports of accidents and incidents.
- Reports of hazardous waste spills and other releases
- Operational records and documents of hazardous and radioactive mixed waste operations
- Site maps
- Past and present standard operating procedures
- Audit and appraisal documentation
- Contingency and emergency plans
- Special and topical reports relevant to waste disposal and environmental pathways
- Site development or site management plans and documents
- Site history and function
- Process records relevant to hazardous waste generation
- Shipment records
- Process descriptions.

Site Inspections

Physical inspections of the tentative waste management sites were made to validate site specific information. This included inspecting for obvious spills (stained soil) and evidence of environmental stress.

As a result of the identification process, a list of waste management sites which may have been contaminated by hazardous/toxic and/or radioactive substances was prepared.

Ranking the Sites

All contaminated and potentially contaminated sites were ranked subsequent to identification. This was intended to provide an indication of the relative potential for adverse environmental impact of each site.

WINCO used the modified Hazardous Ranking System (mHRS) to rate all known waste management units. Currently 78 units have been identified at the ICPP. These units are classified as either Land Disposal Units (LDU's) or Solid Waste Management Units (SWMU's). LDU's are those units which are known to have received a hazardous or mixed waste after November 19, 1980. SWMU's are those units which are suspected to have received hazardous or mixed waste after November 19, 1980; units which are known to have received hazardous or mixed waste prior to November 19, 1980; units which received radioactive waste only; or units which received solid waste which is not a hazardous waste as defined by RCRA.

All INEL LDU's and SWMU's were ranked separately and classified as either high, medium, or low priority units. The LDU's and SWMU's with the highest rankings are being initially examined from the standpoint of what technology will be most satisfactory in protecting human health and safety and the environment, and how the units should be monitored to ensure that they remain in compliance with RCRA. For those sites exhibiting a significant potential for release of contamination, plans are being developed under the COCA to quantify the extent of the hazardous waste contamination/migration (See Fig. 1). The lower ranked SWMU's will be proposed for administrative closure through issuance of Summary Assessments (SA). The SA must be approved by DOE-ID and EPA Region X.

The universe of INEL waste management units will be reprioritized semiannually. The units which are closed in accordance with RCRA, or in the corrective action or the monitoring, analysis, testing phase of the COCA will be removed from consideration when reprioritizing the units.

Characterization of Past Management Sites

Eventually, all LDU's and SWMU's will be characterized in accordance with the Action Plan of the COCA. A Sampling and Analysis Program will be developed for each of the LDU's. This program will be detailed in the unit's Closure Plan. A Monitoring, Analysis, and Testing Program will be developed for each of the SWMU's. These Plans or Procedures must be reviewed and approved by DOE-ID and EPA Region X prior to implementation.

The exact procedures employed for unit characterization will be unit-specific depending on the type(s) of waste assumed to be present and the physical characteristics of the unit. Unit characterization will be accomplished through the analyses of appropriate environmental samples which will provide an extensive characterization of the unit.

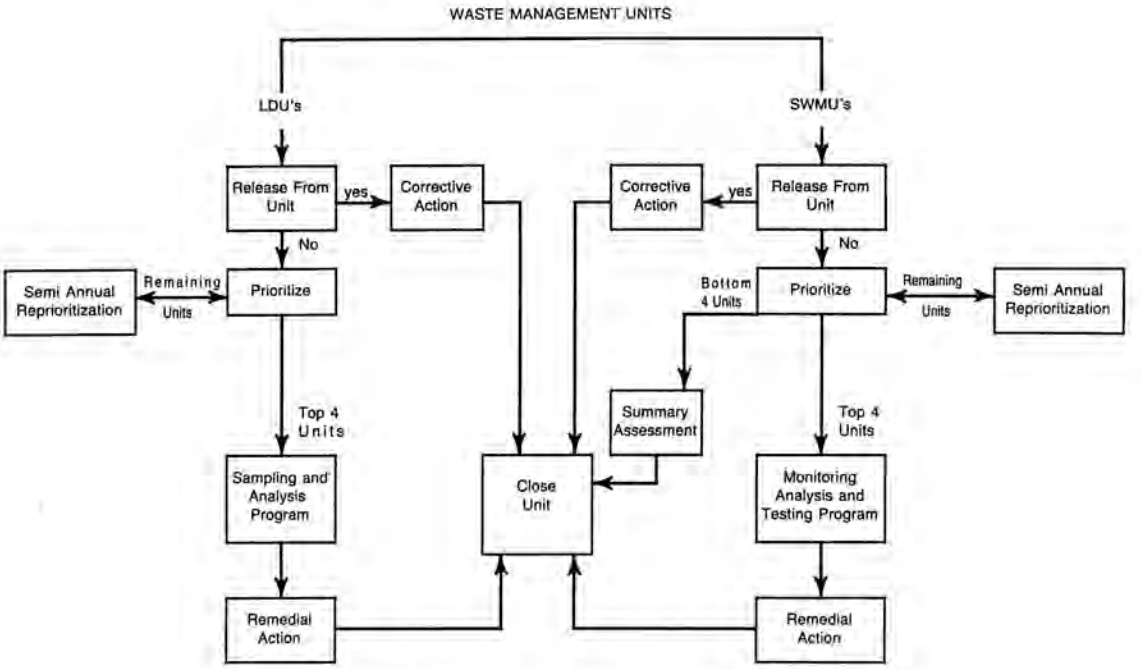

Fig. 1. Waste Management Units.

Modeling procedures may also be implemented for estimating the extent of contaminant migration and for analyzing critical migration pathways.

Remediation of Past Management Sites

Units which are found to be releasing contamination to the environment, and/or are deemed to pose a risk to human health and safety or the environment will be closed in accordance with the procedures outlined in the Corrective Action section of the Action Plan.

Evaluation of the alternative methods for corrective action will include an assessment of the effectiveness of the technology used and an assessment of the probable impact each action would have on human health and safety and the environment. The procedure implemented will depend on such factors as the :

- nature of the contamination;
- impact of the action on the environment;
- effects on the workers carrying out the remedial action;
- proposed post-remedial action land use.

The various methods to be considered in this process may include the no-action option or any one or more of the following:

- The treatment of hazardous wastes insitu to reduce volume and/or toxicity;
- The engineering, design and construction of barriers;
- The engineering, design and construction of active collection systems;
- The excavation of contaminated materials for relocation to a more environmentally acceptable/controlled location.

Unit specific corrective action plans will be approved by DOE-ID and EPA Region X before any work is initiated.

RCRA WASTE MANAGEMENT

Evaluate Waste Generating Processes

RCRA requires all Treatment, Storage and Disposal (TSD) facilities to not only identify and address past hazardous /mixed waste management units but to prevent creation of new units as a result of current management practices.

The first step toward developing and implementing an effective mixed waste management program is a total facility evaluation. WINCO has systematically evaluated its waste generating processes, from the beginning of the dissolution process to the end, and has identified those areas which have a significant bearing on the amount and characteristic of waste generated. Following this review, any procedural changes that could be made without adversely affecting fuel processing and at the same time reduce the amount and toxicity of the waste generated were implemented. Furthermore, all WINCO employees are instructed as to the

significance of waste disposal and the significance of minimizing the excess use of materials in their particular area of responsibility. Preventive and corrective maintenance is routine at the ICPP and ensures optimization of equipment performance, eliminates leaks, etc., and in general achieve waste reductions. Following the process evaluation WINCO was able to determine where waste generation could be minimized.

Waste Minimization

Minimization of the quantity and/or toxicity of a waste may be accomplished through process or procedural modifications which reduce the amount and/or toxicity of the waste generated from the process, or by changing the manner in which the waste is handled after generation in order to further reduce its quantity and/or toxicity. WINCO uses a combination of four basic elements in its Waste Minimization Program. These elements and examples of their application are delineated below:

Process Modification and Raw Material Substitution

WINCO has identified processes where raw materials are used which contribute to the waste's hazardous classification and is presently in the process of determining if substitutes can be used which will enable the waste to be classified as nonhazardous or radioactive only. One such area that is being investigated is the use of Cd as a nuclear poison in the FAST dissolution process.

Recycle/Recovery and Reuse

This element is used for waste streams which are not contaminated with many detrimental constituents making reuse an ideal choice. Examples of this element include:

- The recycling of the sodium carbonate used in the extraction process to reduce the amount of I-129 discharged to the Process Equipment Waste evaporator system.
- The use of spent processing solvents (tributyl phosphate and dodecane) as a fuel supplement for burning in the New Waste Calcining Facility (NWCF).
- The use of an acid fractionator to remove acids and other contaminants from Process Equipment Waste condensates for later use in the NWCF.

Tail-end Treatment

Approximately 4.0 E + 03 liters per year of acidic waste is currently being routed to the ICPP tank farm for temporary storage prior to processing in NWCF. This acidic waste could be routed to service waste if it were neutralized. A neutralizing system is being provided for this waste stream.

Implementation of Waste Processing

Following implementation of the above elimination/minimization processes, the ICPP must then manage the remaining waste streams. These management techniques are discussed below:

- PEW

Liquid wastes generated at the ICPP consist primarily of (a) solutions generated during fuel reprocessing and (b) wastewater from the water treatment facilities, heating/cooling systems, and laboratory and floor drains. High-level mixed liquid wastes generated from solvent extraction of the fuel are sent to interim underground storage for eventual solidification in the New Waste Calcining Facility (NWCF). Intermediate level liquid mixed wastes are collected in holding tanks and processed through one of two Process Equipment Waste (PEW) evaporators. Approximately 6.0 E + 06 liters are processed annually. Concentrated wastes (bottoms) remaining in the PEW evaporators are treated as high-level mixed waste. This constitutes approximately 4.0 E + 05 liters per year. Condensates (5.0 E + 06 liters) from the PEW evaporator overheads are handled as low-level waste. These overhead streams are monitored and upon meeting all appropriate environmental standards are mixed with the nonhazardous service waste (SW) and discharged to percolation ponds.

- LET&D

The purpose of the Liquid Effluent Treatment and Disposal (LET D) Project is to provide disposal of the PEW condensate overheads. The LET & D will treat and dispose of 5.0 E + 06 liters annually of PEW overhead condensate which is currently being discharged to the existing SW system. In addition, the proposed system will also include provisions for removal of both hazardous constituents and radionuclides to the maximum practical extent prior to the discharge of the evaporator condensate to the environment.

NWCF

The NWCF is designed to solidify the high-level mixed liquid wastes generated at the ICPP, which include aqueous raffinate from first-cycle extraction, concentrated aqueous raffinates from subsequent extraction cycles, and wastes from the PEW. The NWCF employs fluidized bed calcination to convert liquid waste to calcined solids. The calcine is pneumatically transferred to underground storage bins where it can be later retrieved for final long-term disposal. This process significantly reduces the volume of waste that must be stored at the ICPP for extended periods.

HEPA Leaching Facility

The operation of ventilation clean-up systems at the ICPP generate transuranic (TRU) and radiologically contaminated high-efficiency particulate air (HEPA) filters. Many of these filters may also be contaminated with hazardous constituents; ie., Cd, Hg. The HEPA Filter Leaching System will be installed to leach the numerous ICPP HEPA

filters to remove TRU, hazardous contamination, and reduce the level of radioactivity associated with these filters.

High-Level Waste Immobilization

R & D studies are underway to evaluate processes to convert calcine to a form more suitable for long term storage. Presently glass-ceramic and ceramic forms are being investigated and verified.

Operation of Storage Activities

Storage activities constitute the final component of WINCO's Waste Management Program. Storage activities at the ICPP are divided into two major categories. These are discussed below:

- High-Level Mixed Waste

High-level mixed liquid waste generated during fuel dissolution processes is temporarily stored in large underground stainless steel tanks which are contained within concrete vaults which utilize various leak detection methods to assure containment. The mixed wastes stored in the tanks are converted to granular solids by calcining.

High-level mixed waste resulting from the calcination of the high-level liquid mixed waste is stored in near-surface stainless steel bins situated within concrete vaults. New bins and vaults are constructed as needed. The bins are designed for a 500-year lifetime; however, routine corrosion measurements indicate that the lifetime could be much longer.

- Hazardous and Mixed Waste

Mixed wastes are produced by related ICPP support activities. Furthermore, mixed waste is generated during cleanup activities associated with the COCA.

Initially, mixed waste is staged at the ICPP Waste Staging Area. This waste is then shipped to the RCRA permitted storage area at the INEL.

All hazardous or toxic waste is accumulated near the point of origin. This waste is then shipped to the RCRA permitted storage facility at the INEL.