ACCELERATING HANFORD TRANSURANIC WASTE CERTIFICATION AND SHIPMENTS FROM TWO-PER-YEAR TO TWELVE-PER-MONTH

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ABSTRACT

The Department of Energy's site at Hanford has significantly accelerated the characterization of transuranic (TRU) waste and its subsequent shipment to the Waste Isolation Pilot Plant (WIPP) — from a total of two shipments in fiscal year 2002 to twelve shipments per month. The challenges encountered and experience gained in achieving this acceleration provide valuable lessons that can be used by others in the waste industry. Lessons learned as well as estimates of cost savings and schedule benefits are described.

At the start of the acceleration effort, three separate facilities managed by multiple organizations characterized and handled the drums. To consolidate the majority of these activities under one organization and in one facility required RCRA permit and safety basis modifications, and a myriad of construction activities— but all with very visible benefit. Transferring drums between the separate facilities involved multiple organizations, and required meeting a complex set of transportation and safety basis requirements. Consolidating characterization activities into a single facility greatly simplified this process, realizing very significant operational efficiencies.

Drums stockpiled in buildings for future processing previously were stored with recognition of physical, chemical, and radiological hazards, but without consideration for future processing. Drums are now stored using a modular approach so that feed for characterization processing takes drums from the accessible module face rather than randomly throughout the storage building. This approach makes drum handling more efficient, minimizes the potential for worker injuries, and supports the principles of "as low as reasonably achievable" (ALARA) exposure from the waste.

Sampling the headspace gas of the TRU waste packages was a major bottleneck in the characterization process, and hence an obstacle to acceleration. Sampling rates were improved by a combination of insulating and heating a waste storage building to provide sufficient space for the required temperature residence time; installing filter and sample ports in the drums using

a pneumatic dart method; improving gas analysis time using cryofocusing technology; and using both onsite and offsite labs for redundancy of analysis capability.

The need for real-time radiography was reduced by implementing a visual examination technique as the waste was being packaged. Key to implementing the visual examination technique was the use of a "portable procedure" that can be used anywhere on the Hanford Site. This approach has been used successfully for packaging newly generated waste from various decontamination and decommissioning projects.

Using a glovebox for repackaging drums has also been a rate-limiting step in accelerating the characterization of TRU waste at Hanford. The impacts of this requirement, however, have been minimized in two ways: first, by venting certain heat-sealed bags, and second, by implementing hydrogen and methane testing of headspace gas for high gram drums with multiple layers of confinement. The details of these specific efforts are included in a separate paper.

Payload assembly and loading efficiencies of the TRUPACT-II, and certification and shipment efficiencies were instrumental to Hanford's successfully accelerating shipments. Loading time of TRUPACT II's for a shipment (three TRUPACTS per shipment) went from four days to two days.

Future acceleration plans include certification of a box radioassay unit to assay TRU standard waste boxes (SWB) for shipment to WIPP and adding additional payload building/loadout stations to increase the shipping capabilities.

INTRODUCTION

When Hanford began certifying TRU waste for disposal at WIPP, the processing rates for the various unit processes were very low, allowing only a few shipments a year. This low shipping rate was partly due to funding limitations, but also significantly due to physical limitations in processing capacity and geographically and organizationally separated unit processes. Characterization and drum-handling activities occurred at three separate facilities managed by multiple organizations. By consolidating characterization activities under one organization and in a single facility, Hanford has been able to significantly increase the amount of waste shipped to WIPP for disposal. Figure 1 illustrates this increase by showing the waste volume shipped for each fiscal year from 2000 through 2004.

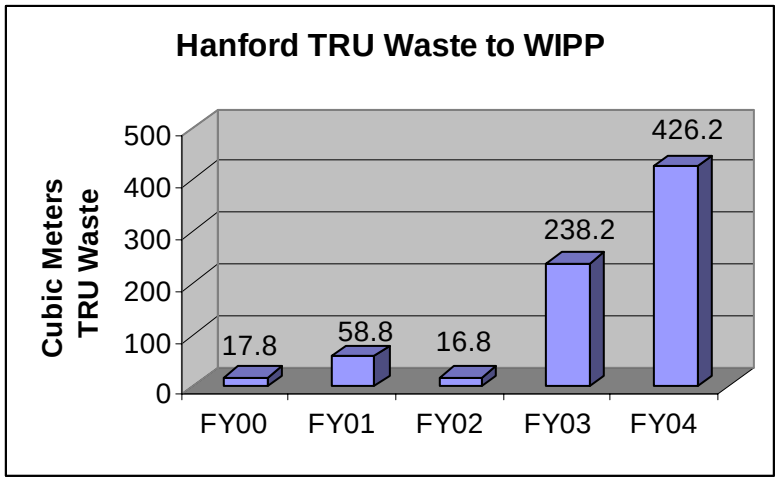

Fig. 1. The amount of TRU shipped waste to WIPP dramatically increased between FY00 and FY04.

Consolidation of Characterization Activities

At the beginning of the acceleration effort in 2003, drums were stored in the Central Waste Complex (CWC); headspace gas sampling was performed at the T Plant; and non-destructive assay (NDA), non-destructive examination (NDE), and glovebox reprocessing were done at the Waste Receiving and Processing (WRAP) facility as illustrated in Figure 2. Each of these facilities is a separate RCRA treatment, storage, and/or disposal (TSD) unit, with distinctions in waste-acceptance criteria and safety-basis requirements. Each is managed by a different organization within the same Hanford sub-project.

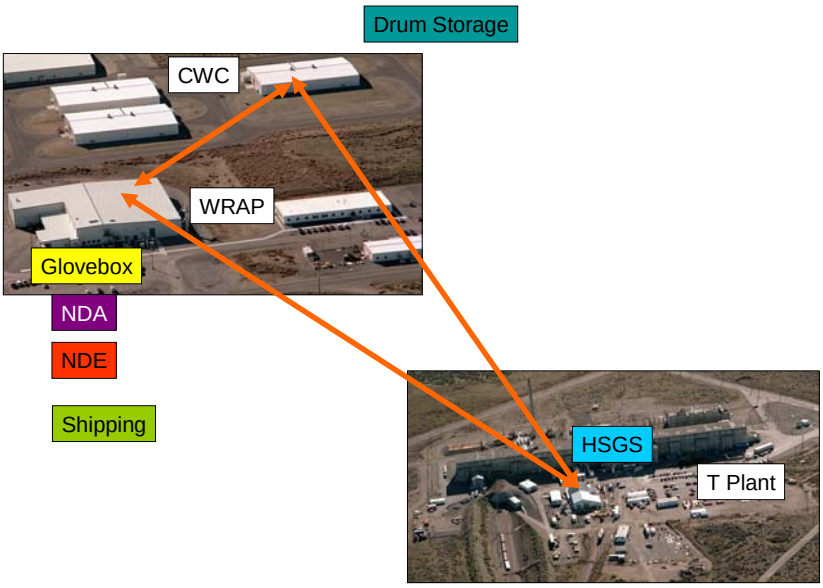

Fig. 2. In 2003, three separate facilities were involved in processing TRU waste.

After a drum was retrieved, it would typically go to the Central Waste Complex for storage, to the WRAP facility for processing, and then back to storage. It would then go from storage to the T Plant for head gas sampling, and then back to storage. When the package was ready to be shipped to WIPP, it would again be moved from storage to WRAP to be loaded into a TRUPACT-II. This process not only resulted in multiple handling of the waste, but also reviews of acceptance paperwork for each transfer. The first step in improving efficiency was to consolidate drum handling into one location managed by one organization as illustrated in Figure 3. WRAP was chosen as the location, and WRAP management as the organization. Two storage buildings in the CWC were annexed into the WRAP permit, requiring a RCRA permit modification. This allowed shipment of retrieved waste directly to WRAP, avoiding an extra Department of Transportation manifesting step.

A common safety basis was implemented across the waste-management complex, including WRAP, the Central Waste Complex, and T Plant, providing consistent requirements among the facilities. One of the new WRAP storage buildings was equipped to provide a location that meets the requirements for headspace gas sampling. This reduced the need for drums to travel to T Plant except as a backup resource.

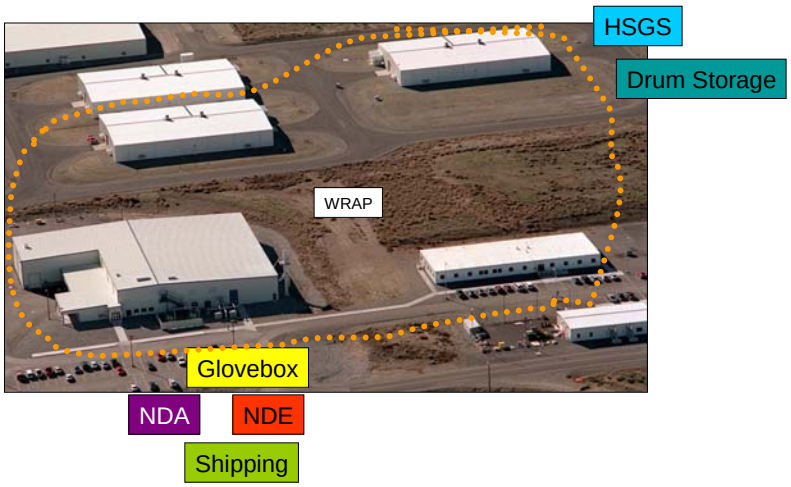

Fig. 3. The new approach consolidated activities to improve efficiency.

Storage/Sorting of Drums

With TRU drums destined for WIPP consolidated under the WRAP organization, further efficiencies could be obtained by planning storage based on future processing of the drums.

Drums are now stored using a modular approach so that drums from approved waste streams are stored together, and feed for characterization processing takes drums from the accessible module face rather than randomly throughout the storage building. As drums are received from generators or from the Hanford waste-retrieval effort, they are placed in the appropriate module based on processing plans for the respective waste stream. Periodically, large lots of drums are transferred from the Central Waste Complex modules into the WRAP complex for processing and shipment. These drums move together as a block as they progress through the characterization steps, e.g., from NDE to NDA to headspace gas sampling. This approach makes drum handling more efficient, minimizes the potential for worker injuries, and supports the principles of "as low as reasonably achievable" (ALARA) exposure from the waste.

Headspace Gas Sampling Efficiencies

Before headspace gas samples are taken, drums must be maintained at a temperature of at least 65°F for a minimum of 72 hours. Before accelerating the TRU waste process, the T Plant was used for this sampling because it had available heated space for the temperature equilibration. While T Plant was very well suited to the activity and performed admirably, the limited storage area and the effort of moving drums from the Central Waste Complex to T Plant and then back to storage proved to be a bottleneck in the characterization process. A project was begun in 2003 to provide a thermal equilibration area within the consolidated WRAP space. One of the storage buildings, 2404-WC, a 12- ft by 180-ft uninsulated steel building on a RCRA floor was insulated and provided with heating and air conditioning. As part of the upgrade, additional area lighting was provided to convert the space from a storage area to an operational area.

These modifications have been highly successful. The building provides a significant area for drum storage. Headspace gas sampling can be conducted on the drums, in many cases without even moving them from their storage module. As a result of the larger area available and the efficiencies of reducing interfacility drum transfers, the headspace gas sampling capacity has increased from 40 drums per week to 80 drums per week, with plans to nearly double the capacity again in 2005. In addition, the development of a portable headspace gas-sampling procedure has allowed sampling of waste drums in some waste generating facilities; again increasing the overall processing efficiency.

Visual Examination Technique

WIPP requires that 100% of the waste be examined visually or by real-time radiography (RTR) to confirm that its characteristics are consistent with established acceptable knowledge before it can be qualified for shipment. For waste that is already packaged, this examination is typically done using RTR. However, for newly generated waste, WIPP allows the option of using the two person visual examination technique, during which each waste item is carefully documented before it is placed in the waste container. The need for RTR was reduced by implementing the visual examination technique at the Hanford site for newly generated waste. Key to using visual examination was adopting a "portable procedure" that can be used anywhere on the Hanford Site. Thus, instead of each waste-generating facility using a separate procedure for performing

the visual examination technique, a common procedure can be used. This approach has been used successfully for packaging newly generated waste from various decontamination and decommissioning projects.

Shipment Preparations

The time required for certifying shipments was reduced significantly at Hanford in August 2003. Before WIPP implemented e-TRAMPAC (the electronic shipment preparation database), the certification paperwork was entered manually by filling out several time-consuming "shipment forms." Hanford implemented the use of e-TRAMPAC as the primary means of configuring, verifying acceptance criteria, and approving payloads and shipments for the TRU program in August 2003. This process replaced the requirement to manually generate Payload Container Transportation Certification Documents, manually enter data into an Excel spreadsheet, perform RadCalc functions, and review data for keystroke errors, as these functions are now completed by e-TRAMPAC. This change resulted in a significant reduction of the time necessary to complete review and data entry for the transportation certification officials (TCOs) from an average of approximately 45 hours per shipment to just over 15 hours. This process improvement allowed Hanford to handle additional shipments as evidenced by the accelerated schedule (Figure 1) and realize a cost savings of nearly $2,000 per shipment. This translates into a savings of just under $41,000 in a four-month period from August 2003 to November 2003. Expanded for calendar year 2004, an additional cost avoidance of $234,000 is anticipated in FY04.

A careful evaluation of the processes for WIPP shipments was conducted to identify areas for improvement. The loading efficiencies of the TRUPACT II were key to achieving four shipments per week and twelve per month. TRUPACT lid stands were redesigned to better utilize available floor space, which made it possible to stage six lids stands rather than four, — providing a stand for each lid (inner and outer) on a three-TRUPACT shipment. A shipment is now loaded in an assembly-line fashion where the vacuum checks can be done on one TRUPACT while another is being loaded.

Additional resources have been added to accelerate the process even more. Multiple vacuum pumps have been provided so that lid removal and leak tests can be performed simultaneously. Personnel who perform NDE at WRAP have been cross-trained to perform TRUPACT leak testing, providing dedicated resources and additional ability to perform this critical step. Radiological controls have also been streamlined. Process history allows the transfer of TRUPACT lids based on a large-area wipe counted with a field instrument. This eliminated a delay while waiting for results from a technical smear and laboratory counting. Pre-shipment surveys of trailers are conducted so that when the tractor arrives, only surveys of dose rates to the driver are required, minimizing the delay time for fully loaded trailers. Through these various procedural, equipment, and configuration changes, the time required to process a WIPP shipment has been decreased by approximately 16 hours, resulting in an improvement of 44 percent.

CONCLUSIONS AND FUTURE PLANS

The Hanford site has been able to accelerate waste shipments to WIPP from a handful of shipments per year to 12 shipments a month. This acceleration has been achieved through innovations from consolidating operations, standardizing safety basis requirements, providing additional facilities, and applying additional techniques. The volume of TRU waste yet to be processed is large, and the current pace of processing and shipping TRU waste is not yet sufficient. Future plans to accelerate the schedule include certification of a box assay unit to assay TRU standard waste boxes. Much of the waste to be generated in the next few years consists of large items from the decommissioning of gloveboxes. This waste will be packaged in standard waste boxes. The waste processing input will be further enhanced by adding additional payload building/loadout stations.