

MANAGEMENT OF A VERY LARGE TYPE B PACKAGING FLEET

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ABSTRACT

The US Department of Energy (USDOE) has begun a 35-year process to dispose of transuranic (TRU) waste generated during the development of the national nuclear defense system. Central to this process is the development and opening of the Waste Isolation Pilot Plant (WIPP) located in southeastern New Mexico. Stable salt formations lying 2,150 feet below the surface will be excavated where the TRU waste will be permanently encased and isolated from the environment. The safe disposal of the TRU waste can only be achieved if the material is delivered to the facility in a safe and effective manner. To ensure the safe transport of TRU waste, the USDOE has developed and deployed a wide array of US Nuclear Regulatory Commission (USNRC) approved Type B packagings. Once fully constructed, the USDOE's WIPP fleet will be one of the largest quantity of Type B packagings assembled in the world. The management of this very large Type B packaging fleet will present both challenges and opportunities for the dedicated professionals of the WIPP project.

INTRODUCTION

The Type B packaging fleet that will be used to transport the TRU waste to the WIPP is split between a Contract-Handled (CH TRU) system and a Remote-Handled (RH TRU) system. Each system is uniquely designed to address the handling, confinement, and shielding of the TRU waste being transported.

The CH TRU packaging fleet, once fully developed, will be comprised of three primary Type B packagings:

- First, the TRUPACT-II, which will be the workhorse of WIPP's fleet, is a double-contained stainless steel packaging approximately 8 feet in diameter and 10 feet tall. Approximately 7,000 pounds of TRU waste can be shipped when packaged in 14 55-gallon drums with an average weight of 300 pounds. For highway transport, 3 of the TRUPACT-II can be transported on a specially designed lightweight trailer using standard tractors.
- Next is the HalfPACT, which is essentially a TRUPACT-II, but is 30 inches shorter in height. The HalfPACT is a double-contained stainless steel packaging approximately 8 feet in diameter and 7 1/2 feet tall. HalfPACT was specifically developed to efficiently transport 7 55-gallon drums weighing as much as 1,000 pounds. Using the HalfPACT to transport heavy drums (greater than 600 pounds) will deliver 21 drums per shipment versus 14 for TRUPACT-II.

- Finally, the TRUPACT-III is currently in the early stages of development. Once deployed, the TRUPACT-III will be used to efficiently ship the majority of TRU waste currently packaged in 4 foot by 4 foot by 7 foot, or larger, rectangular boxes. The TRUPACT-III will be the packaging of choice for many of the decommissioning projects due to a large horizontally loaded internal cavity. The TRUPACT-III is projected for deployment in the 2003 or 2004 time frame.

Many factors will dictate the eventual size of the CH TRU packaging fleet, such as, generator site closure schedules, federal and state agreements, and capital budgets. However, one factor will have the greatest impact on the eventual number of WIPP packagings, that factor is the implementation of rail as a mode of transport. Given recent USDOE studies and a renewed interest from the rail industry, transport by rail is actively being pursued. Rail offers several advantages over truck such as minimal weather impacts during the winter months, greater payload capacities, and limited restrictions on height and width parameters.

Therefore what will the size of the CH TRU fleet be when fully configured? Current projections, if only highway transport is considered, indicate a fleet of Type B packaging consisting of 60 TRUPACT-II(s), 20 HalfPACT(s), and a yet to be determined number of TRUPACT-III(s). Assuming that at least 15 TRUPACT-III(s) would be required, the total number of CH TRU Type B packagings identified to date is 95 units. Should transport by rail be realized, projections show the number of TRUPACT-II packagings could be doubled and the HalfPACT and TRUPACT-III increased but by a smaller margin. If the projections and program develops as planned, the CH TRU Type B packaging fleet could approach 150 or more units.

The RH TRU packaging fleet, once fully developed, will be comprised of one primary packaging with a second supplemental packaging. The RH TRU fleet will consist of:

- The RH 72B Cask is currently certified to transport the gamma and neutron emitting TRU waste that requires the shielding properties of heavy stainless steel and lead lining. The RH 72B is a traditional cylindrical cask utilizing bolted impact limiters and approximately 2 inches of lead shielding. The packaging is approximately 12 feet long and 3 1/2 feet in diameter. When shipped with a payload of 8,000 pounds, the gross weight of the RH 72B is 45,000 pounds.
- Also, the CNS 10-160B cask developed by Chem-Nuclear Systems (now GTS Duratek) will be used to supplement the RH 72B for specific shipments. The CNS 10-160B can transport 10 55-gallon drums bearing less than 20 Ci, due to its single-containment design.

Currently, the RH TRU packaging fleet is projected to consist of 12 RH 72B packagings and 1 CNS 10-160B packaging. As the RH TRU program begins to mature to the level of the CH TRU program, the impact to the number of RH TRU packagings will have to be considered and the appropriate adjustments made. Conceivably, the positive impacts of rail transport could significantly increase the numbers of RH TRU as in the case of the CH TRU packaging fleet.

In addition to the Type B packaging fleet, consideration must also be given to the management

challenges for the transport trailers. Lightweight and efficient trailer designs will require dedicated inspection and maintenance programs to ensure long life, safe operations, and efficient payload capacity. The management of a large trailer fleet are challenges worthy of consideration, but will not be addressed herein, in order to concentrate on the management of the Type B packaging fleet.

MANAGEMENT CHALLENGES

The management challenges presented for any USNRC approved Type B packaging will be the same for 1 packaging or for 160 packagings. The user must ensure the integrity of the initial certification is maintained and documented throughout the life of the packaging. As set forth in Title 10 Code of Federal Regulations Part 71 (10CFR71), the design, fabrication, assembly, testing, procurement, use, maintenance and repair of a Type B packaging must be performed and documented in accordance with an approved quality program. WIPP has established and continues to expand the quality assurance program by implementing their program based on the guidance found in the USNRC's Regulatory Guide 7.10, Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material. Each of these eight elements, identified within the regulatory guide, should be evaluated and a program implemented to ensure the proper management a Type B packaging fleet. WIPP's approach to addressing the quality elements can be summarized as follows:

Design - The USDOE, through its managing and operating contractor, manages the design and certification of the Type B packaging fleet. Since the initial packaging certification, expansion of the payload and implementation of physical configuration revisions has resulted in amendments to the Certificate of Compliance (C of C) and to the Safety Analysis Reports for Packaging (SARP). Revisions to the various SARP(s) include 19 amendments to the TRUPACT-II, 2 amendments to the HalfPACT, and 3 amendments to the RH 72B cask. In addition, special attention must be given to ensure the packagings have their C of C renewed every 5 years as required by the USNRC regulations.

Management of the SARP and C of C amendments present a significant document control and distribution challenge. Controlled copies and amendments must be distributed to stakeholders such as the shipping facilities, packaging fabricators, state agencies, public reading rooms, and to the USNRC. Communication is key to informing the stakeholders of changes, instructions on how to update their respective documents, and seeking input for any future amendments. In order to manage this large volume of paper, plans and procedures are being developed to leverage the benefits of electronic document management, thereby reducing the material and distribution cost associated with paper documents. WIPP has taken a first step in this evolution by posting all approved packaging documents on the Internet for "information only". The next step will be to replace the "information only" status with a "controlled" status.

Fabrication - Production of the Type B packaging fleet for WIPP has presented many challenges for the WIPP team. The USDOE utilizes fabricators that have USNRC approved Subpart H quality assurance programs for all Type B packaging production. Qualified fabricators have been mobilized across the nation, and in Canada, for expediting the production and delivery of the WIPP packaging fleet. As the contracting agency, the USDOE has responsibility for providing technical and quality oversight of the fabricators during the construction phase. This broad oversight requires

a significant investment of manpower and funding to ensure the packaging fabrication is performed in complete compliance with the C of C. Teams of technical engineers, quality assurance engineers, quality control inspectors, and independent review teams are working together to produce a compliant and operable packaging. The coordination and integration of the participating teams present a significant challenge to management in balancing contractual commitments and certification compliance. Central to this issue is the review and approval of the documentation assembled for each individual packaging. Hundreds, if not thousands, of pages of manufacturing planning, material certifications, test and inspection reports, and measurement records make up the extensive quality record. The records are meticulously reviewed before the packaging can be accepted and placed into service. Once accepted the records are entered into a records management system where they will be maintained for the life of the packaging.

Assembly - The assembly of the Type B packagings presents a unique challenge to the USDOE TRU waste program. Assembly is obviously performed during the initial fabrication, but also is a primary element that must be performed on a limited basis at the shipping facilities and at the WIPP. Assembly, and disassembly, includes removal and inspection of internal payload support structures, O-ring replacements, and closure hardware. While most of the post-fabrication assembly is performed during the maintenance and repair operations, users of the Type B packagings must be prepared to address these issues if the need arises. Procedures must be developed, submitted, and approved by the WIPP program prior to their use. Personnel must be trained and qualified to the approved procedures before assembly operations can be performed. The management of the qualification of personnel and procedures at both the shipping facility and WIPP is a significant challenge to the USDOE TRU complex.

Testing - Testing has been an active part of the WIPP packaging system long after the initial certification test program was completed. Testing has been used to seek regulatory approval for new and innovative approaches to shipping TRU waste. As an example, supplementary testing was utilized to demonstrate the ability of a primary waste container to survive the hypothetical test conditions without damage or loss of contents. The success of this test program yielded a significant increase in the fissile material shipped per package, thereby eliminating the need to repackage or increase the number of shipments to WIPP. Testing will continue to play a significant role in the payload expansion and optimization of the Type B packaging fleet. Coordinated management of the test program will be vital to ensure maximum benefits are realized with minimal cost and schedule impacts.

Procurement - WIPP procedures have been established to ensure that suppliers possessing a USNRC approved quality assurance program are used for Type B packaging activities. Potential suppliers are first screened through the USNRC's registry of approved quality assurance programs, and once identified, an extensive audit is performed prior to qualifying the supplier. In addition to ensuring the supplier's quality program is adequate, a business history evaluation is performed to ensure the supplier is capable of meeting any contractual obligations. Suppliers providing services for WIPP's Type B packaging fleet work to support the periodic audits and surveillance activities necessary to ensure complete regulatory compliance. In many cases, the supplier's are required to accommodate a resident inspector if the activities being performed warrant it. As an example, WIPP is utilizing three resident inspectors to oversee the fabrication of the TRUPACT-II, HalfPACT, and RH 72B Cask. Resident inspectors are required due to the quality demands,

complexity of the fabrication, and to support an expedited schedule.

Use - Prior to a shipping facilities utilization of WIPP's Type B packaging fleet, it must pass a stringent qualification process. Based on the packagings C of C, SARP, and operations manual, the shipping facility must prepare a transportation plan that is submitted to the USDOE for approval. Once the plan is approved, implementing procedures must be written which address all requirements of the packagings. After the plan and procedures have been approved, the USDOE sends an audit team to the shipping site for their initial certification. The audit team consists of auditors and subject matter experts that audit the individual elements of the site's transportation plan. Once all elements have been audited, findings closed and verified, the shipping site is authorized to begin shipments to WIPP. During the course of a year, the shipping site is subjected to annual recertification audits and spot surveillances. If any significant findings are found, the site's certification will be suspended until corrective actions have been taken.

Maintenance – Maintenance will present the greatest management challenge to the WIPP team. Every Type B packaging will be subjected to annual maintenance, 5-year maintenance, and unscheduled maintenance. Large inventories of spare parts will have to be procured, distributed, and controlled from both main warehouses and auxiliary warehouses. Hundreds of documents will be generated as a result of the maintenance tasks, and will be subject to record management.

Assuming WIPP will implement rail shipment, and the fleet will reach approximately 150 packagings, consider the implications on a maintenance management system. Approximately 260 working days are available in a calendar year, therefore, without an extended work schedule maintenance would have to service 1.7 packagings per day. Experience has shown that routine annual maintenance, without any off normal events, takes approximately 3 days (single 8-hour shift) to complete, including all documentation. The 5-year maintenance is more extensive and typically takes 5 days to complete, but can be scheduled at a more flexible and convenient time. The obvious conclusion is that scheduling management, multiple suppliers, or extend workdays must be utilized to keep the packagings available for service. Certainly, scheduled maintenance will present a significant management challenge.

Spare parts to support a Type B packaging fleet of 150 units will present unique challenges. Typically, 2-5% of the original packaging costs is used to estimate the cost of spare parts. Using this percentage factor, WIPP will have to procure and manage approximately 3 million dollars in spare part inventory.

Repair - As the fleet matures over the lifetime of the packagings, unscheduled repairs will be required to ensure the continued compliance with the USNRC's C of C. To date, repairs to the TRUPACT-II packaging fleet have include minor repairs and replacement of threaded inserts and fittings. These repairs were anticipated and provisions included in the design for the replacement of high wear components or those subject to operator errors. In many instances, repairs will be the result of normal wear and tear when using the packaging. During payload insertion and removal, the inner vessels are venerable to scratches and impacts. To help reduce the potential damage, several measures have been implemented such as extensive personnel training programs, protective bumpers on the payload assemblies, and automatic leveling lift equipment which are all utilized to reduce repair frequencies. Any repair must be performed using qualified personnel, procedures, and

materials as was used in the original fabrication process. Detail records are kept by the unit serial number and become part of the packagings lifetime and permanent records.

Beyond the fundamental challenges of managing a large Type B packaging fleet, the maintenance and expansion of the payload capabilities of each packaging will be significant. Because this fleet is transporting waste streams, the challenge of ensuring chemical compatibility, flammability limits, and criticality control will keep the WIPP team challenged for the foreseeable future. As the USDOE enters fully into the demolition and decommissioning of facilities across the nation, new payload profiles will become a major challenge in payload control. New technologies such as computer-aided nondestructive examination machines, next generation assay machines, and computer programs designed to help optimize payload management will be implemented.

SUMMARY

The US Department of Energy, Westinghouse TRU Solutions, and various support contractors, will be challenged to manage one of the world's largest fleets of Type B packagings. All of the WIPP team members are dedicated to fulfilling this formidable mission with utmost professionalism and competence. Systems will be implemented and operated for three decades as the nation's nuclear waste legacy is closed in an environmentally sound and responsible manner. WIPP will be a leader in developing and demonstrating new technologies that will assist our nation, and the world, in managing today's and tomorrow's nuclear programs. If nuclear energy is to survive and become the promised energy source of the future, then we must be capable of closing the nuclear cycle with safe and efficient waste management. The foundation of this management challenge, will be the competent execution of a transportation system capable of protecting the public and the industry workforce. WIPP is ready to accept this challenge and will move forward in seeking the best technology, the best commercial practices, and the best men and women our industry has to offer.