

## **Los Alamos National Laboratory Develops “Quick to WIPP” Strategy**

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### **ABSTRACT (#438)**

The Cerro Grande forest fire in May of 2000 and the terrorist events of September 11, 2001 precipitated concerns of the vulnerability of legacy contact-handled (CH), high-wattage transuranic (TRU) waste stored at Los Alamos National Laboratory (LANL).

An analysis of the 9,100 cubic meters of stored CH-TRU waste revealed that 400 cubic meters or 4.5% of the inventory represented 61% of the risk. The analysis further showed that this 400 cubic meters was contained in only 2,000 drums.

These facts and the question “How can the disposition of this waste to the Waste Isolation Pilot Plant (WIPP) be accelerated?” formed the genesis of LANL’s Quick to WIPP initiative.

The majority of the drums are currently not shippable in the Transuranic Package Transporter-II (TRUPACT-II) due to the potential for hydrogen gas generation associated with the high-wattage waste. A key technical cornerstone of the Quick to WIPP project is the addressing of the problem of shipping these 2,000 drums to WIPP without the need of repackaging to meet the

Nuclear Regulatory Commission (NRC) requirement of limiting hydrogen concentration to below 5% by volume during transportation. Repackaging is the most time consuming and costly step in the waste characterization, certification, and shipping process.

The solution was found in the form of a change in methodology for compliance with the hydrogen concentration requirement. This new method includes:

- loading the drums into the TRUPACT-II inner containment vessel (ICV) and purging through the use of vacuum the ICV and drums (drum lids have a filter vent) of any hydrogen that may have accumulated during storage,
- backfilling the ICV with an inert gas as a margin of safety, and
- imposing a 5-day shipping period versus the 60 days currently allowed.

Approval of this methodology was sought from the NRC in the form of an application for Revision 19a to the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC). NRC approval was granted in July 2002. The projected benefit is a reduction of the number of shipments from 739 to 55.

## **INTRODUCTION**

LANL has approximately 9,100 cubic meters of CH-TRU waste in storage. The waste is stored above ground in domes and on pads and stored below ground in trenches, and shafts. Over half of this waste is stored above ground in predominantly 55-gallon drums in fabric-covered domes. The Cerro Grande forest fire came precipitously close to these domes. The terrorist attacks of September 11, 2001 showed how susceptible our nation is to such actions.

Both of these events precipitated concerns by our stakeholder community of the vulnerability of this waste. The stakeholder community consists of the United States Department of Energy (DOE), the University of California (the management and operations contractor for LANL), the State of New Mexico Environment Department (NMED), and the public.

The emphasis of the Quick to WIPP initiative is to expedite the shipment to WIPP of that fraction of the inventory that could present the greatest risk to the environment and the public if the waste drums were disrupted by a disaster, e.g., a fire, an accidental plane crash, or a terrorist attack. The goal is to move away from simply managing the risk to eliminating or significantly reducing it as quickly as possible.

## **THE WASTE**

The CH-TRU waste is comprised of different waste forms, some of which are more dispersible than others. The candidate drums for the Quick to WIPP effort were those drums that contained high-wattage debris waste, predominantly contaminated with Pu-238. This waste represents the highest risk to the environment and the public if the waste becomes airborne and subsequently

dispersed. An analysis of the 9,100 cubic meters of stored CH-TRU waste revealed that the amount of dispersible waste stored above ground is 4,700 cubic meters. It was further found that of that amount 400 cubic meters or 4.5% of the inventory represented 61% of the risk. Finally, the analysis further showed that this 400 cubic meters was contained in only 2,000 drums. These 2,000 drums became the target of Quick to WIPP.

## **THE QUESTION**

The majority of this 2,000-drum population cannot be shipped in the TRUPACT-II due to the high potential for hydrogen gas generation associated with the high-wattage CH-TRU waste. The U.S. Nuclear Regulatory Commission requires hydrogen concentration not to exceed 5% by volume during transportation. Thus this limitation dictates that these high-wattage drums to be repackaged to comply. A parent drum has the potential of requiring repackaging into as many as 80 daughter drums. Repackaging is the most time consuming and costly step in the waste characterization, certification, and shipping process, a formidable barrier.

How can this barrier be removed while meeting all regulatory requirements? The DOE, the Albuquerque Operations Office, the Office of Los Alamos Site Operations, and the Carlsbad Field Office; the NRC; the University of California; Institute for Regulatory Science, Westinghouse TRU Solutions; and Shaw Environmental and Infrastructure formed a partnership to address the question. The DOE commissioned a feasibility study.

## **THE STUDY**

The purpose of the study was to investigate the feasibility of shipping high-wattage CH-TRU waste, specifically the 2,000-drum Quick to WIPP population, from LANL to WIPP in the near future in compliance with the 5% hydrogen concentration limitation.

Three scenarios were visited:

- 1) Compliance with Revision 19 of the TRAMPAC. This revision includes several initiatives addressing flammable gas generation limits. Unfortunately only two of the 2,000-drum population were found compliant with the allowable decay heat limits, the rest would have to be repackaged or a revision to the TRAMPAC would be need.
- 2) Use of bag breaching technology. Breaching of the bag layers in the CH-TRU waste drums reduces the resistance to hydrogen release and increases decay heat limits. Applying this technology, 82% of the 2,000-drum population would meet the decay heat limits. Unfortunately the practical application of this technology does not presently exist. Its successful development, proof of operability, and implementation is not a short-term solution. The remaining 18% of the drums would require repackaging.

3) Hydrogen evacuation, inert gas backfill, and a 5-day shipping period. It was found that a) if most of the hydrogen that may have accumulated during storage was purged by application of a vacuum upon loading into the TRUPACT-II, b) the containers are subsequently backfilled with an inert gas, and c) the total time from purging to venting at unloading of the TRUPACT-II was limited to 5 days over 91% of the 2,000-drum population could be shipped under current regulations, hydrogen concentration to below 5% by volume during transit. This would require the development and approval of a revision to the TRAMPAC.

The Scenario 3 was chosen as the path forward.

## THE SOLUTION

The solution is found in a change in the methodology used to meet the NRC 5% limitation. Specifically it includes the following.

- 1) Once the drums are loaded into the inner confinement vessel (ICV) of the TRUPACT-II and the ICV is sealed a vacuum is applied. Since each drum is vented the vacuum is in turn applied to the drums themselves. This purges the drums of most of the hydrogen that have accumulated during storage and air allowing an initial flammable gas concentration approaching zero.
- 2) The ICV and accordingly the drums themselves are then backfilled with nitrogen, an inert gas. This is an added safety measure for which formal credit is not taken.
- 3) The 5-day clock starts upon completion of the vacuum process. Twenty-four hours are allowed for the backfilling of the ICV, leak testing, and handling of the loaded TRUPACT-IIs. Two days are then allowed for transit from LANL to WIPP and finally twenty-four hours are allowed for venting of the ICV and accordingly the drums upon arrival at WIPP. An extra twenty-four hours are included as a margin of safety. This allows only five days for flammable gas accumulation versus the 60 days currently allowed.

To facilitate implementation of the path forward the following activities were accomplished.

- 1) The feasibility study was completed and a final report issued in February 2002. (1)
- 2) Also in February 2002 a briefing of the proposed path forward was presented to the NRC in Washington, D.C. successfully soliciting their support of an expedited review of a revision to the TRAMPAC. (2)
- 3) A revision, Revision 19a, to the TRAMPAC was developed. It is important to note two factors a) that the revision was a change to the methodology used to meet the 5% limitation, not a request of a change to the regulatory requirement itself and b) the

application of the new methodology would be limited to only the 2,000-drum Quick to WIPP population. Revision 19a provided the theoretical evidence that the methodology would indeed work. Revision 19a was forwarded to the NRC for their review and approval in March 2002. (3)

4) A successful demonstration test of the methodology was performed in June 2002 with a final report issued in September 2002 thus providing the empirical evidence that the methodology would indeed work. (4)

5) In the June 2002 a public interactive information workshop was held, leadership bodies of the Indian Pueblos adjacent to LANL were briefed, and the DOE's New Mexico Citizens Advisory Board was also briefed. (5)

6) NRC approved Revision 19a in July 2002. (6)

7) Implementation required revision of appropriate procedures at WIPP and LANL. These were completed in October 2002.

8) The first of the 2,000 Quick to WIPP drums were successfully shipped from LANL to WIPP in December 2002. Plans call for all 2,000 drums to have been shipped by the end of fiscal year 2004.

## **THE BENEFITS**

Repackaging will still be required of a few extremely high-wattage drums, but with the application of Revision 19a the number of daughter drums produced will be significantly less than would have been required without its application. It is estimated that the number of shipments will be reduced from approximately 739 to about 55.

The costs and risks associated with repackaging are also significantly reduced by approximately two-thirds.

The 2,000 Quick to WIPP drums represent only 4.5% of LANL's CH-TRU waste inventory. Although Revision 19a only applies to these drums, the next logical step would be to apply this methodology to the remaining inventory that exceeds Revision 19 wattage limits.

Previous plans estimate the entire inventory would require 4,500 shipments with completion by 2032 at a cost of \$1.2B. An accelerated plan, assuming approval by the NRC to apply this methodology to the entire inventory, would reduce the total number of shipments to 1,500 with completion by 2010 at a cost of \$412M, significant savings.

## REFERENCES

- 1) Feasibility Analysis for the Immediate Shipment of High-Wattage Plutonium Wastes from the Los Alamos National Laboratory, Final Report, February 2002
- 2) Proposed Shipment of High-Activity CH-TRU waste from Los Alamos National Laboratory, briefing presentation by James Orban, et. al., February 12, 2002
- 3) Revision 19a of the TRUPACT-II Shipping Package Application, Docket No. 71-9218, M. L. Caviness to D. H. Tikinsky letter, March 15, 2002
- 4) Test Report for Evaluating TRAMPAC Revision 19a Implementation, Revision 0, September 2002
- 5) Accelerated TRU Waste Disposal, briefing presentation by Jim Orban, June 27, 2002
- 6) Model No. TRUPACT-II Package, E. William Brach to Mike Caviness letter, July 5, 2002