

WM2016 Conference Panel Report

PANEL SESSION 4: **Panel: LANL Recovery - Re-Treatment of Problem Waste Stream Nitrate Salts**

Co-Chairs: **Bruce Robinson**, *Los Alamos National Laboratory*
Doug Hintze, *US DOE-EM, Los Alamos Field Office*

Panel Reporter: **Roger Nelson**, *US DOE-EM*

Panelists:

1. **J. R. Stroble**, *US DOE-EM, Carlsbad Field Office*
2. **Doug Hintze**, *US DOE-EM, Los Alamos Field Office*
3. **Kathryn Roberts**, *New Mexico Environment Department*
4. **David Funk**, *Los Alamos National Laboratory*

About 75 attendees listened to presentations by the panelists, asked questions and made comments during this session. This panel session focused on the management and remediation of the nitrate salt waste stream that was the source of the February 2014 incident at the Waste Isolation Pilot Plant (WIPP). Nitrate salts were incorrectly treated at the Los Alamos National Laboratory (LANL) by mixing them with an organic absorbent, thereby creating an ignitable waste form. In addition to shipments to WIPP, some of this waste was also shipped to the Waste Control Specialists (WCS) facility in Andrews, Texas. The panel primarily focused on the nitrate salt waste containers still stored at LANL, and safe management and plans for eventual re-treatment to make this waste compliant with WIPP waste acceptance criteria. Regulatory implications of the incident were also a dominant element of the panel discussion.

Summary of Presentations

J. R. Stroble reviewed the history of the February 2014 event at WIPP, and described the current status of the nitrate salts that were emplaced in WIPP, and stored at WCS and LANL. He showed how the continuous air monitor for airborne radiation detected a release underground and how the ventilation system shifted to filtration mode, as designed, resulting in a very small release to the surface, but a large area of contamination underground. He went on to describe how early hypotheses of the cause of the radiation release misled DOE into continuing shipments from LANL to WCS for temporary storage, until WIPP was ready for disposal again.

He then described how WIPP, under direction from the DOE Accident Investigation Board (AIB), determined the cause of the underground release to be a single drum of nitrate salt (treated with organic absorbent). This resulted in immediate termination of shipments to WCS and a concerted effort to understand the nature of the runaway exothermic reaction in WIPP.

WM2016 Conference Panel Report

He described the Administrative Order issued by NMED to WIPP to close and seal those disposal rooms where the nitrate salt waste containers had been emplaced. Panel 6 and Room 7 of Panel 7 were eventually closed with steel bulkheads and substantial barriers in early 2015. He went on to describe the changes in ventilation to supplement filtered air flow rates, which will allow resumption of waste emplacement operations planned for late 2016.

Finally, Mr. Stroble described the changes in the National TRU Waste Program taking place across the DOE complex as a result of the February 2014 incident. He described the new paradigm of “trust, but verify” for waste characterization and certification in the future. He explained how a new set of processes would be applied to confirm the pedigree of Acceptable Knowledge, and how DOE will perform pre-waste evaluations at each generator site, upstream of the certification process, to preclude similar events in the future. He also described the many organizational changes (at WIPP, EM Headquarters, and at generator sites) that were made to the TRU waste characterization and certification process.

A question was posed whether this complicated new characterization and certification process would further slow the already tedious flow of TRU waste to WIPP. Mr. Stroble answered that while there might be some small near-term impact, he thought that once the new procedures and programs were in place, the throughput could return to pre-event rates. However, he did caveat his answer that waste emplacement operations may not be able to keep up with waste certification capabilities.

Doug Hintze presented a review of a new Office of Environmental Management field office at LANL on behalf of David Nickless (*DOE, LANL*), who was unable to attend. Mr. Hintze described the efforts he personally led that resulted in setting up the new EM field office in March 2015. The new LANL EM office is only responsible for legacy waste generated before 1998; NNSA is still generating both TRU and low-level waste. EM is also responsible for groundwater cleanup at LANL. Mr. Hintze described how his new office created a bridge contract with the existing laboratory contractor, LANS (Los Alamos National Security), for challenging clean-up work within Los Alamos (the city), and nearby Native American Pueblos. He described several of the clean-up projects LANS is currently executing for EM. This cost-plus award-fee bridge contract will be replaced with completion of a new contract acquisition planned for the summer of 2017. He predicted the contractor community could expect a “Request for Proposals” in the next few months.

Mr. Hintze acknowledged the original consent order issued by NMED to LANL in 2005, and how efforts to meet a looming December 2015 completion date contributed to the February 2014 incident at WIPP. Next, Mr. Hintze described the new EM field office paradigm of 1) Safety, 2) Transparency, and 3) Efficiency. He acknowledged that discussions with NMED to renegotiate the conditions of the unfulfilled consent order have resumed, but that no firm schedules have been decided.

WM2016 Conference Panel Report

When asked the question of “What is EM’s greatest challenge at LANL?” Mr. Hintze answered that there was still a lot of culture at LANL that needed to be changed. He explained that NNSA relies mostly on self-implemented contractor assurance programs, but EM relies on day-to-day hands on oversight. He also pointed out that the NNSA budget at LANL is much, much larger than the EM budget, which poses other challenges.

Kathryn Roberts presented the NMED perspective on the regulatory aspects of the February 2014 incident. She expressed NMED’s view that the LANL actions leading up to the WIPP incident were preventable. NMED has two primary priorities 1) Safety of the Nitrate Salt Waste, and 2) Path Forward for Treatment of the Nitrate Salt Waste. She described the actions NMED took by issuing Administrative Orders to LANL & WIPP. The May 2014 LANL Administrative Order required submittal of an “Isolation Plan” to isolate, secure and/or treat impacted containers, stringent reporting rules, and a schedule for implementation.

Ms. Roberts described the status of those items required within the LANL Administrative Order. LANL is still implementing the Isolation Plan, with containers currently in a Permacon at TA-54. LANL continues headspace gas monitoring and temperature measurements on a routine basis, and monthly reporting. The Settlement Agreement was signed January, 2016, and included five supplemental environmental projects (unrelated to the nitrate salts) and dozens of corrective actions. NMED considers the idea of separate environmental projects in lieu of fines as “state of the regulatory art”.

Ms. Roberts concluded her remarks with a summary that NMED expects LANL will need a hazardous waste facility permit modification for a specific treatment of the nitrate salts. There were no questions asked.

David Funk opened his remarks on behalf of LANL with a sincere apology for the problems caused by the February 2014 incident at WIPP, and the subsequent recovery at all three facilities. Immediately after identification that the nitrate salt waste stream was involved, LANL identified every possible affected container in the waste stream and placed them in a safe condition by over-packing into standard waste boxes, and segregating them in a Permacon dedicated to their storage, equipped with fire detection and extinguishing systems. Headspace gas monitoring and temperature measurements were immediately started to track any similar behavior in containers at LANL. Nitrate salt containers at WCS were also over-packed in standard waste boxes, which were then placed into large concrete casks, which were buried in the Federal Cell at the WCS facility.

A cooling system to keep the Permacon at LANL below 0C was installed, and categorized as safety significant. Wildfire analyses were performed to find a bounding scenario, with subsequent combustible clearing completed outside a large perimeter around the building. Fire

WM2016 Conference Panel Report

blankets are also used as a compensatory measure, and pressure release burst disks are soon to be installed as well.

Dr. Funk described extensive surrogate testing at LANL to explain the source of the runaway exothermic reaction. These tests ranged from small crucible calorimetry to full-scale drum tests that reproduced the runaway exothermic reaction in the WIPP underground. LANL testing found that the primary source was the complex nitrate salt mixture in intimate contact with the organic absorbent. While other conditions may have contributed, such as pH, the use of organic neutralizers, or even possible catalysts coincident in the drum, the primary source of the reaction was the nitrate+fuel combination. LANL tests found eutectic combinations of nitrate salt that would “cook-off” over periods of a few weeks, and eventually reach a condition when the reaction resulted in deflagration. LANL found that pressure within the container had a strong effect on reaction rate and the runaway behavior (thus the plan for pressure relief burst discs in stored nitrate salt containers awaiting remediation).

He concluded his remarks with a description and video of the planned nitrate salt treatment process that LANL recommends. This treatment still needs approval from NMED via permit modification. While keeping them cool, the nitrate salt drums inside standard waste boxes will be removed into a glovebox. A batch operation (few liters at a time) will employ a standard rotary mixer to blend the nitrate salt matrix with water, and then a substantial amount of zeolite will be added, resulting in a putty-like waste form that will be bagged out into new drums.

Question: “Did LANL tests identify any runaway reactions starting at room temperature?”

Answer: “Yes, complex nitrate salt mixtures and organic kitty litter can cook-off” at room temperature, eventually reaching a runaway reaction, strongly affected by gas pressure.”

Question: “Does the risk of the existing nitrate salt drums decrease over time?”

Answer: “Yes, LANL tests indicate that the cook-off period is relatively short – a few weeks. As time goes on after the salts were packaged over two years ago, the risk of another container reaching runaway conditions is decreasing”.