

WM2017 Conference Panel Report

PANEL SESSION 17: LANL Recovery - Re-Treatment of Problem Waste Stream Nitrate Salts

Co-Chairs: **Bruce Robinson**, *Environmental Remediation Program Director, Los Alamos National Security, LLC*
Randall Erickson, *Associate Director for Environmental Management, Los Alamos National Security, LLC*

Panel Reporters: **Robert Jubin**, *Oak Ridge National Laboratory*
Sharon Robinson, *Oak Ridge National Laboratory*

Panelists

1. **Randall Erickson**, *Associate Director for Environmental Management, Los Alamos National Security, LLC*
2. **J.R. Stroble**, *Director, National TRU Program Compliance Division, US DOE*
3. **Kathryn Roberts**, *Public Outreach Liaison, Longenecker & Associates*
4. **Douglas Hintze**, *Manager, Environmental Management Los Alamos Office, U.S. DOE*

About 70 people attended the panel session on Los Alamos National Laboratory (LANL) treatment of waste streams containing nitrate salts, including those in which a thermally sensitive mixture was created from the use of an organic absorbent during previous remediation operations. Technical, regulatory, and programmatic aspects of this challenging campaign were described. The session provided a high-level discussion of activities of the recently constituted U.S. Department of Energy (DOE) Environmental Management (EM) Los Alamos office responsible for managing legacy environmental cleanup at LANL. This session was an update of the 2016 panel discussion highlighting the significant progress made on all fronts. The session opened with four panelists presenting an up to date position on the nitrate salts topic from their perspectives, including that of the contractor (LANS), WIPP, regulatory, and DOE EM. This was followed by a question and answer session which included questions on startup and operations of the treatment facilities.

Summary of Presentations

Randall Erickson reviewed the cause of the February 2014 accident at the Waste Isolation Pilot Plant (WIPP) and key experimental work that established the safe storage and handling of the waste drums containing nitrate salt material at LANL. Chemical incompatibility between the waste materials and an organic absorbent led to thermal runaway through low temperature reaction and pressurization of waste container after it was placed in storage at WIPP. Key activities included establishing temperature and pressure controls on the drums to manage the chemical reactivity of the waste material. Necessary facility upgrades have been completed for safe storage and treatment these materials for disposal. Readiness activities are underway, and treatment activities are expected to begin in April 2017.

Immediately after identification that their nitrate salt waste stream was involved, LANL placed containers containing this waste stream in a safe condition by over-packing them in standard

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waste boxes, and placing the overpacked containers in a contamination-control Permacon. The Permacon was dedicated to their storage, equipped with fire suppression systems, a HEPA filtered ventilation system, and a climate control system to maintain temperatures <75°F. Wildfire analyses were performed to find a bounding scenario, with subsequent combustible clearing conducted outside a large perimeter around the building. Pressure relief devices were installed on the drums to prevent pressure from building up inside the drums.

As reported last year LANL conducted extensive testing with surrogates to determine the origin of the runaway exothermic reaction at scales ranging from small crucible calorimetry to full-scale drum tests. It was determined that the complex nitrate salt mixture in intimate contact with the organic absorbent was the primary source of the reactants and that certain combinations of nitrate salt would “cook-off” over periods of a few weeks. These mixtures could eventually reach a point at which the reaction resulted in deflagration. These tests also determined that the reaction rate and the runaway behavior were strongly impacted by both temperature and pressure within the container. Based on these findings, steps were undertaken to control the temperature and pressure for the nitrate salt containers stored and awaiting remediation.

Plans are being implemented to treat the nitrate salt waste stored at LANL. An expert panel determined that drums should be stabilized through zeolite addition. 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. A facility to implement zeolite remediation/repackaging systems has been selected, full-scale cold testing of the process has been completed, and the permit modification has been approved by the New Mexico Environment Department (NMED). Treatment is expected to begin in spring 2017.

Concluding remarks included:

- Full-scale mock-up glove box testing was very useful.
- A strong technical basis has been established for treatment of the waste.
- Implementation is through process engineering principles (including change control).
- Appropriate procedures, training, and qualifications have been established.
- Strong use of Contractor Assurance Systems oversight has been implemented.

J. R. Stroble introduced the enhancements required by the new Documented Safety Analysis (DSA) for WIPP, which were further expanded on in Panel Session 18. The good news is that WIPP has reopened, but will only be processing contact-handled packages initially. The receipt rates will also be limited because the partially-contaminated repository is running the ventilation system at a reduced rate. This restricts the number of workers that can be in the mine at any time, and the workers now have to operate in PPE which reduces their efficiency. WIPP should start receiving shipments in April.

Several corrective actions were taken in 2016 in response to Accident Investigation Board Report from 2014. Enhancements are required for new DSA. These drove the new WIPP WAC to include enhanced acceptable knowledge, oxidizer limitations to prevent making an accidental

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fire worse, more reviews of generator site programs, and additional DOE and contractor oversight. The WIPP WAC now requires certification of the individual container rather than the previous waste stream certification. Many new requirements are in place if there is a potential for oxidizing chemicals being present in the waste stream. There is a new focus on risks associated with energetic events in waste containers, not only related to radiological parameters but also chemical parameters. The new DSA requirements emphasize the importance of WIPP WAC compliance assurance as a key initial condition for acceptance of waste at WIPP. The new WIPP WAC may be significantly different than DSA requirements for generator treatment/packaging facilities.

Kathryn Roberts discussed the LANL recovery efforts from the regulatory perspective and highlighted the importance of communication at all levels to resolve the issues that became apparent as a result of the WIPP accident. She was speaking based on her experiences as a previous NMED official, not as a current representative of NMED. The priorities of NMED after the accident were to assure public health and safety, establish regulatory permit modifications to re-treat existing and treat new waste with nitrate salts safely at LANL, and to assure that LANL complete corrective actions as soon as possible to meet the settlement agreements. The settlement agreements were signed in January 2106, and all alleged permit and RCRA violations have been settled. DOE is required to fund supplemental environmental projects (SEP) (road improvements, surface water sampling, Triennial Review, potable water line replacement, and adding engineered structures in canyons) totaling \$34.5M. Most will be completed by the end of FY18. WIPP is required to fund SEP (road improvements, an emergency operations center, emergency response training, and Triennial Review) totaling \$39.5M. Most will be completed by end of FY17.

NMED issues/enforces RCRA permits for both LANL and WIPP. LANL studies/experiments were critical in identifying the risk factors for recovery. LANL & WIPP worked closely with NMED in recovery from the 2014 accident. They are working together at both a staff level and management level now. Communicates at the staff and management levels have improved and streamlined regulatory approvals and recovery efforts.

Douglas Hintze discussed the establishment of the DOE EM Los Alamos office responsible for managing legacy environmental cleanup at LANL. He highlighted a number of FY17 accomplishments and also noted critical factors for success.

LANL is a NNSA site. Prior to the establishment of the DOE EM Los Alamos field office, NNSA had total site oversight. NNSA now manages R&D and operations via an M&O contract. The DOE EM field office manages waste disposition, soil and water cleanup, and D&D legacy waste (pre-1999). **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. This cost-plus-award-fee bridge contract will be replaced with completion of a new contract acquisition. The DOE EM field office doesn't have startup authority or safety basis approval. These reside at DOE headquarters level. LANL and WIPP will have annual enforceable milestones based on funding availability.

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Several projects are underway that the DOE EM field office oversees:

- Nitrate waste has been stored safely and is ready to start treatment
- Soil & groundwater remediation is underway and continues to make substantial progress
- D&D is a lower priority, but some buildings have been demolished
- Completed a programmatic lifecycle cost estimate which was required by the consent order

In summary, **Mr. Hintze** concluded by noting that a critical factor for success was frequent and transparent communications with all stakeholders, partnering and the value of physical co-location of federal and contractor personnel. This success requires mutual respect, aligning safety and efficiency strategies, having clear expectations, having good communications (requires physical co-location of federal and contractor personnel), doing critical self-assessments with a willingness to improve, and relationships (and understanding expectations) are critical to success, including internal and interagency, contractor, Pueblo, state regulators, local governments, and other stakeholders.

Questions and Answer

- How long will it take to process nitrate drums? 2 – 2.5 months
- What is being done with drums of waste that were sent to commercial waste site in Texas? An evaluation is under way. The results are due in September 2017.
- What is the DOE EM Field Office budget? \$160M/yr. The portion of the budget going toward nitrate salt remediation is \$30 – 40M/yr.
- What are the requirements for startup of nitrate waste treatment? An approximate two weeks readiness review and then addressing findings before startup.
- When you get pushback on co-location of contractor and feds, how do you deal with it? It is the right thing to do. We are going to do it and deal with it.