

# TECHNOLOGY@ROCKY FLATS

## Demonstration & Deployment Summary

### *Aqueous and Oil/Organic Liquid TRU Waste- Solidification Method Test*

#### Summary

The decontamination and decommissioning of Rocky Flats facilities has presented the TRU Waste Program with a unique challenge with respect to the treatment of liquid waste. Liquid waste is no longer being generated as large volume, homogeneous waste streams that can be treated in dedicated treatment facilities. Liquids are now being generated in small quantities, in many locations (some inaccessible) and are highly variable in composition. In addition, the facilities that were once available for treatment of liquids are being torn down! In response, Rocky Flats had to re-think the way it managed TRU waste liquids. A new solidification process that was flexible and mobile was needed. Rocky Flats successfully developed a “point of generation treatment” approach that meets the needs of the Site and the Project.

#### The Project Need & Goals

Since TRU liquid waste cannot be shipped and disposed at the WIPP, liquid waste must be processed into a WIPP acceptable solidified waste form. Rocky Flats needed a toolbox of technologies and a corresponding technology management approach that would enable us to consistently produce an acceptable waste form from a wide variety of TRU waste liquids and which could be used at the point at which they were encountered. Due to the variability of the TRU waste liquid and the constraints associated with the management of radioactive liquid wastes in D&D facilities, the approach had to be flexible, easy, cost effective, and safe.

#### The Technology Solution

The TRU Waste Orphan Project was given the challenge to identify, demonstrate, and implement the new technical/operational approach. The Project evaluated several novel treatment technologies and approaches and chose to pursue the use of “super-absorbent” solidification agents as the preferred treatment option. In a funding partnership with DOE’s Office of Science and Technology and Technology Solutions Program, a series of super-absorbent polymer agents were tested and NOCHAR Petro Bond and Acid Bond were chosen as the



Nochar Demonstration Of Oil Stabilization After Nochar Was Introduced Into Waste Oil Inside Building 774.

two super-absorbents that best met the Project’s objectives. NOCHAR products and products from other vendors had been developed in recent years with EM50 support. Methods were developed to treat the wastes at the locations on the site where the wastes were and packaged for shipment in such a way that the product was certified without having to go through the site’s central transportation processing a second time.

#### The Project

Once the process solution was identified, the Project then proposed a novel approach to implement the process. The Project worked closely with the D&D Projects to develop the “point of generation” process. The new process allowed the D&D Projects to immediately treat and package TRU liquid waste at the point where they were encountered, thus eliminating the need to accumulate, store, and transfer these liquids to a centralized treatment area (which didn’t exist). The Project provided the D&D Projects with the process conditions that needed to be maintained. The Projects then incorporated the conditions into their operating procedures.

Waste produced by the Solidification Process will be characterized and certified for shipment and disposal in accordance with WIPP-approved site procedures. Therefore, the intent of process testing was to show that the process would consistently produce a waste that can be certified for shipment to WIPP. Since extensive testing involving solidification of oil and organic waste

## TECHNOLOGICAL BONDING AGENTS

with Nochar Petro Bond has been conducted at other DOE sites, the experiments performed at Rocky Flats focused on testing the effectiveness of Nochar Acid Bond for solidification of various aqueous waste streams.

### The Benefits and Results

The original baseline strategy for treatment of the TRU waste liquids at Rocky Flats consisted of developing portable/trailer mounted treatment systems for treatment of aqueous and organic liquids. The projected cost for development and implementation of this alternative was approximately 11 million dollars. In contrast, development and implementation of the NoChar point of generation solidification process for both aqueous and organic waste streams has cost the Site approximately \$700,000, representing a savings of over \$10 million.

An additional benefit, which was not anticipated, has been the applicability of the process for solidification of various TRU tank sludge wastes, as well as, small amounts of incidental liquids found in legacy TRU waste packages.

The following table describes the waste to bonding agent ratios (volume of waste to volume of bonding agent) used for various wastes at Rocky Flats.

Waste to Bonding Agent Volume Ratios

Waste Category <sup>a</sup>	Bonding Agent	Recommended Ratio of Waste to Bonding Agent	Maximum Tested Effective Ratio of Waste to Bonding Agent
<b>Aqueous Waste (less than 1 volume % organic)</b>			
Acidic (pH < 6)	Nochar Acid Bond (A660)	1 : 2	2.4 : 1
Basic (pH > 9) <sup>c</sup>	Nochar Acid Bond (A660)	4 : 1	8.0 : 1
Neutral (pH > 6 and < 9)	Nochar Acid Bond (A660)	4 : 1	8.0 : 1
Spent Cerium Nitrate Solution	Nochar Acid Bond (A660)	1 : 1	3.6 : 1 <sup>d</sup>
Spent Cerium Nitrate Solution Neutralized (pH > 6)	Nochar Acid Bond (A660)	2 : 1	4.6 : 1
<b>Oil/Organic Waste (less than 1 volume % aqueous)</b>			
Oil and/or Organic Waste	Nochar Petro Bond (N990)	1 : 1	1.7 : 1
<b>Mixtures of Aqueous and Oil/Organic Waste</b>			
Mixtures Approximately 50% aqueous	Nochar N962	1 : 1.5	N/A
Unknown Mixtures	Nochar N962	1 : 2	N/A

Table Notes:

- a - The recommended ratios are conservative. Projects may elect to use a less conservative ratio, but should not exceed the highest tested ratio without further testing.
- b - For mixtures of aqueous and oil/organic waste, bench scale testing should be performed to determine the ratio of waste to bonding agent(s). Nochar Petro Bond (N990) and Acid Bond (A660) can be mixed and used together or Nochar N962 can be used to solidify mixtures of aqueous and oil/organic waste.
- c - A strong ammonia smell is generated when basic waste is solidified with Nochar Acid Bond. Appropriate PPE should be worn when solidifying basic waste.
- d - 4.6 grams of Mg(OH)<sub>2</sub> was added to 22.5 grams of Acid Bond before mixing with surrogate cerium nitrate solution



## Technology Supporting Paths to Closure

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