TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

CHLORIDE WASH PROCESS TO PRETREAT FEED TO THERMAL STABILIZATION

Identification No.: RL-01-014-NM
Date: September 2000

Program: Nuclear Materials Stabilization
OPS Office/Site: Richland Operations Office/Hanford Site
PBS No.: RL-CP03
Waste Stream: N/A
TSD Title: N/A
Operable Unit (if applicable): N/A
Waste Management Unit (if applicable): N/A
Facility: Plutonium Finishing Plant

Priority Rating:

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority:

_X_ 1. Critical to the success of the ACPC
____ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Chloride Wash Process to Pretreat Feed to Thermal Stabilization

Need/Opportunity Category: *Technology Opportunity*

Need Description:

- Description: Substantial portions of the impure oxides that are to be thermally stabilized have chloride compounds as a significant impurity. These chloride compounds need to be removed or rendered non volatile at the high temperatures that will be encountered during thermal stabilization.

- Background: Recent laboratory tests have indicated that the chloride containing impure oxide material result in widespread and immediate furnace failure, and plugging/corrosion in the offgas lines. Other processing problems include the formation of "clinkers" or solid bricks in the furnace boat after the high temperature stabilization cycle. This type of material

cannot be easily removed from the boat and is not amenable to sampling techniques to verify the moisture removal.

In addition, since about 1/2 to 1/3 of the chloride is expected to remain in the stabilized product, the resulting 3013 containers will be of concern for corrosion failure and the subject of increased surveillance efforts during storage. Past processing of other materials with halide salts has shown the salt volatility can cause problems in meeting the LOI requirements for product from the Thermal Stabilization process.

Rocky Flats Environmental Technology Site has similar material and is concerned about these problems as well, since they plan on a comparable disposition path.

Schedule Requirements: This technology is needed within the next year for application to the thermal stabilization process. The bulk of the oxides are scheduled for processing between February 2002 and August 2003.

Earliest Date Required: 09/2000
Latest Date Required: FY 2002

Problem Description: A significant number of stored impure oxide SNM items at the PFP are scrap originated from offsite processes that employed chloride salts in one form or another. This resulted in plutonium contaminated scrap items that contain chloride compounds as a major impurity. These chloride compounds have been shown to cause significant processing problems, including equipment failures, the formation of difficult to handle solid chunks during thermal stabilization, and adversely affect quality determination using the Loss on Ignition method (note the newly installed Supercritical Fluid Extraction instrumentation may avoid similar problems).

Chlorides are also a significant threat to process equipment from a corrosion standpoint. Volatile gases can have detrimental effects on offgas lines and filters, as well as the muffle furnaces used in the thermal stabilization process. The Fissile Materials Disposition program, which will receive the final stabilized product, with a washing process, but a better solution would be to remove the impurity from the material that will be placed into the standard 3013 containers.

The presence of chloride in the stabilized product will require additional surveillance to protect against the failure of containers in storage. This is the principal element of concern in development of the integrated surveillance program by the Los Alamos National Laboratory Materials Identification and Surveillance team.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation: At present there is no baseline technology for chloride washing to compare for cost savings. If chloride removal cannot be accomplished, there could be large costs associated with excessive rework of thermal stabilization product, difficulties handling the solidified furnace charges, and questions on the adequacy of the sampling performed for 3013 container product. Costs incurred due to these issues could easily run into the millions of dollars ($5 million ROM) as both

operational and technical resources would be required for a period of some months to resolve them.

Benefit to the Project Baseline of Filling Need: The thermal processing of the chloride bearing impure oxides at temperatures required by the DOE-STD-3013-99 may not be possible without a solution to allow for chloride removal. The concerns with corrosion of equipment and piping, and difficulties in handling solid chunks of product material in the furnace boats, do not appear to be acceptable for a working process. This issue is seen as a critical technology need to allow the stabilization activity to be completed.

Relevant PBS Milestone: TRP-05-500, Complete stabilization and packaging of oxides >30wt%, 5/31/04

***Functional Performance Requirements*:** The chloride removal method must be capable of removing up to 20wt% of chloride salts, with a small residual left in the original material. The separated chloride bearing waste fraction should not contain significant amounts of plutonium, and should be suitable for solidification, absorption or other straightforward method leading to a waste disposal path. Other requirements include:

- Glovebox scale operation
- Capable of washing 1000 kg of feed in 200 days
- Ease of installation into an existing glovebox
- Batch or semi-continuous operation

Work Breakdown Structure (WBS) No.:	***TIP No.:***
1.04.05.01.13	N/A

Justification For Need:

Technical: Removal of chloride compounds from these SNM items is needed to allow the thermal stabilization process to be successful.

Regulatory: The 3013 standard requires that stabilized product processed at greater than 950C (above the melting point of the chloride salts) be sampled and meet a specific moisture content limit.

Environmental Safety & Health: Supports ALARA goals and waste minimization efforts, increased equipment reliability, less maintenance and reduced surveillance.

Cultural/Stakeholder Concerns: Wet processing activities have negative connotations and must be technically justified.

Other: N/A

Current Baseline Technology: Stabilization of the material without removing the chloride impurities, until a LOI sample (or when available Supercritical Fluid Extraction) passes the maximum moisture requirement, and equipment and furnace repair and replacement as needed.

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