

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

November 28, 1997

**TO:** G. W. Cunningham, Technical Director  
**FROM:** R. F. Warther, M. T. Sautman  
**SUBJ:** RFETS Activity Report for Week Ending November 28, 1997

**Solutions.** Tank 550 in B771 is now empty. One high-level solution tank remains to be drained.

**Pu Stabilization & Packaging System (SPS).** Throughput calculations show that the milestone to stabilize and package metal and oxide by May 2002 could be met with a single SPS system despite long furnace cooling cycles. An estimated 1750 cans meeting the 3013 standard will be processed. Two furnaces processing two packages each per day in a single SPS could result in project completion in about two years. Two key issues remain unresolved before this schedule can be accepted as accurate. First, actual SPS throughput will be known better after demonstrations are completed in the next month or so. Second, installation in B707 is still proceeding slowly with several questions outstanding. Three technical issues are currently being investigated:

- The vendor is trying to develop a better seal to prevent nitrogen from leaking into the furnace from the glovebox and diluting the oxygen during stabilization. The significance of the nitrogen inleakage is not clear. Although it may reduce the amount of oxidation, this should only be an issue for oxide which was recently brushed off plutonium metal and has not been previously thermally stabilized.
- Based on data coming from England and the ARIES Project, there is a concern that gallium could cause processing problems. Ga is mostly found at RFETS in the enriched U/Pu oxide mixtures. The concern is that  $Ga_2O_3$  could be reduced to  $Ga_2O$  once the furnace's atmosphere is changed from air to nitrogen during the cool down period.  $Ga_2O$  can sublime at high temperatures and condense on colder spots. The concern is that condensed oxide could plug the furnace vent or that liquid Ga metal could form, which has been found to be very corrosive. Delaying the switch from air to nitrogen until the furnace has cooled to below  $500^\circ C$  may prevent these reactions from occurring.
- The vendor is trying to find an optimum air flow rate for the furnace that maximizes cooling while avoiding suspension of dispersible oxide particles.

**Residues D&T.** The first distillation Demonstration & Test run using actual RFETS electrorefining salt (ER) rather than LANL ER salt was disappointing. The Pu concentrations in the distilled salt and heel were 0.32% and 3.1%, respectively. This does not satisfy the safeguards termination limit requirement of  $< 0.2\%$  and the 3013 standard criteria of  $>50\%$ . Although  $MgCl_2$  in the salt may have contributed to the poor results, there was not enough present to be the sole cause. This salt may have been one of the experimental ones that have been found to also contain  $CaCl_2$ . LANL is hoping that similar problems with Molten Salt Extraction (MSE) salts will disappear now that they have received some RFETS MSE salts. Process knowledge indicates that the RFETS MSE salts contained less  $MgCl_2$  than LANL salts previously tested. The presence of  $MgCl_2$  may prevent complete conversion of  $PuCl_3$  into  $PuO_2$ .

As part of characterization, another bulging produce can containing Molten Salt Packaged for LANL was found. Unlike previous times, the revised procedure ensured proper actions were taken. The can is to be opened with a non-sparking puncture device. The Site Reps will report on the results of opening the can when they become available.

cc: Board Members