DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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SUBJ: RFETS Activity Report for Week Ending February 27, 1998

Solutions. Draining was completed on tank 292A in B371. The only anomaly was that the total volume drained was 1720 liters, approximately 500 liters less than expected. At this time, all plutonium and uranium tanks at RFETS are operationally empty except those used for CWTS.

SSOC and K-H have been busy trying to address the hydrogen issue for the B771 oxalic acid system as well as for the remaining 37 systems to be tapped and drained. Attachment 1 describes the status of their efforts. In addition, there have been two leaks of high concentration plutonium solution in B771 in the last three weeks. These have required significant decontamination efforts.

Residues. The Site Reps and technical staff reviewed SSOC's draft justification for reclassifying graphite fines as a low risk residue. Characterization did not find any exotherms below 350°C (highest temperature tested). The maximum concentration of reactive metals present was less than 1% and averaged less than 0.2%. Although the staff asked for some additional information and clarification, the staff generally agreed with the report's conclusions.

Plutonium Stabilization and Packaging System (PuSPS). RFFO, BNFL, and Raytheon have agreed how a $920k cost overrun will be funded. The PuSPS prototype handover to DOE has been delayed till March 20. Raytheon has reduced the cycle times to 10.5 hours for the stabilization furnaces and 5.75 hours for the loss-on-ignition furnaces. However, RFFO is very concerned that the furnace design makes replacing failed parts very difficult, if not physically impossible. In addition, BNFL and RFFO still disagree over the significance of porosity in the can welds. This could cause problems with SRS accepting packaged plutonium from RFETS.

Meanwhile, the PuSPS crew has been transferred to salt pyro-oxidation and all non-critical PuSPS work at RFETS (e.g., Module J construction work) has been suspended. K-H has recommended to RFFO a strategy change for plutonium metal and oxide in order to accelerate the closure of B707 and minimize the impacts of further PuSPS delays. This is described in Attachment 2.

Emergency Preparedness. The Site Reps observed an emergency preparedness drill for a simulated drum overpressurization at the B771 dock. The performance in the Emergency Operations Center (EOC), especially in the Hazards Assessment Center, was much better than the January 29 drill because personnel had access to new building-specific emergency response manuals. The manuals list a series of accident scenarios and potential material releases based on each building's activities and inventory. For each accident, the dose consequences for the 50 and 95% meteorological conditions were listed along with the appropriate emergency action level and sheltering requirements. This information provided EOC personnel with conservative guidance until models could be run with the actual data.

Attachment 1
Status of B771 Tap and Drain Hydrogen Issues

Building Authorization Basis. A positive Unreviewed Safety Question has been declared for the discovery of hydrogen in the B771 oxalic acid system. The Basis for Operations will be modified so that the radiolytically-generated hydrogen controls also apply to systems that may contain hydrogen generated by acid corrosion.

Oxalic Acid System Controls/Hazards Analysis. SSOC has proposed purging the oxalic acid system to remove hydrogen by hooking up a pump at one end of the system and an argon or nitrogen cylinder at the other end. A "What-If" hazards evaluation has been performed for this purging activity. They are also evaluating the safety of the pumps in a hydrogen environment and reviewing relevant petroleum industry standards.

A root cause analysis was conducted to determine why the Job Hazards Analysis did not identify the hydrogen and NO_X hazards. The root cause was that the individuals involved with the development of the B771 authorization basis did not consider that hydrogen gas and nitric oxide could be generated from acid dissolution of stainless steel piping, irrespective of fissionable content. Contributing causes were relying too much on process knowledge and no analysis of confirmatory data with regard to chemical constituents.

Controls/Hazards Analysis for Future Systems. For the remaining systems, SSOC has proposed a two-step process. All systems would be vented using glovebox differential pressure to depressurize the system. Then a vacuum source (e.g., peristaltic pump or Portable Vacuum Liquid Transfer System) would be hooked up to most systems and a vent path established so that air would be pulled through the system and remove any hydrogen. The preference is to purge with a vacuum rather than with pressurized gas. This venting and purging may move some solution within the system. Therefore, SSOC is recommending that purging not be performed for those systems where actinide solutions could be transferred to a raschig ring tank. Fissile solutions are not allowed in any of the raschig ring tanks since the raschig rings have not been inspected since the 1980's.

SSOC is also planning to address the root and contributing causes of the incident. The sampling plan is being revised to include more samples and more analysis of the samples. A chemical compatibility study is being performed to determine what chemicals could be formed inside the pipes both during storage and by subsequent mixing of solution during draining activities.

Alternative Strategy. The current strategy is to drain all the solution systems and then tear down the systems. SSOC is evaluating whether it would make more sense to disassemble each system right after it is drained. They are comparing the tradeoffs between delaying the draining of all systems with the earlier removal of the solutions, any residual material in the pipe, and the piping for some systems. This would require a change to the Recommendation 94-1 Implementation Plan.

Attachment 2
K-H Recommendations for Plutonium Metal and Oxide

K-H Preferred Recommendation for Plutonium Metal and Oxide

- Do not install PuSPS at RFETS
- Exit B707 as soon as possible
- Consolidate B777 oxides to B371 to reduce risk
- Stabilize oxides in B371 to meet DOT loss-on-ignition requirements for shipping containers
- Ship metal and oxide to SRS between 2000 and 2002
- Store metal and oxide at K-Reactor in produce cans inside shipping containers
- RFETS plutonium would be stabilized and packaged to meet 3013 at SRS, but will likely miss the May 2002 milestone
- Install PuSPS at another site (e.g., SRS, Pantex)

K-H Alternate Recommendation for Plutonium Metal and Oxide

- Install Packaging System in B371
- Install manual furnaces in B371
- Package all metal and oxide to 3013 to meet 94-1 milestone
- Ship metal and oxide to SRS between 2000 and 2002
- Interim storage of metal and oxide at K-Reactor