

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

June 8, 2001

TO: K. Fortenberry, Technical Director
FROM: D. Grover and M. Sautman, Hanford Site Representatives
SUBJ: Activity Report for the Week Ending June 8, 2001

Plutonium Finishing Plant (PFP): Hanford hosted a meeting to discuss problems with various moisture measurement techniques for plutonium oxides. The initial moisture measurement concerns were limited to 1) supercritical fluid extraction's (SFE) ability to detect water that had reacted with MgO to form Mg(OH)₂ and 2) loss-on-ignition's (LOI) problems with water that reabsorbed on the sample as it cooled and biased the weight loss. It now also appears that both LOI and SFE will not detect moisture that forms the single hydroxyl layer on plutonium oxide. This layer will usually form, even in a "dry" glovebox, however, it was thought that a correction factor might be developed to bound it (probably on the order of 0.1 w/o for typical calcined oxide). However, recent PFP data strongly suggests that SFE does not detect or only detects a portion of the additional layers of adsorbed or physisorbed water. If this is true, it would likely eliminate the use of SFE for any type of material under any condition. Los Alamos National Laboratory (LANL) believes that their SFE is seeing some or all of the physisorbed water and that there could be something wrong with PFP's SFE unit. However, the SFE data that LANL presented appeared to show little or no correlation with what was believed to be the actual moisture content and it appears that there might be sample handling issues at LANL that may bias some of their results. Furthermore, PFP discussed why gypsum, which was used to qualify SFE, might have been a questionable surrogate for the hydroxyl layer and physisorbed water on plutonium oxide. Although LANL plans to perform additional testing, the group's consensus was that SFE is not suitable for any application based on current data. This may have major implications for the complex since PFP and Rocky Flats (and Savannah River later on) were planning to use SFE as their primary moisture measurement process. The group's consensus was that the use of thermogravimetric analysis (TGA), possibly combined with other techniques, will provide accurate measurements and can be quickly qualified since it is similar to LOI (without LOI's limitations). The impacts at PFP may be minimal since they already own a "production" TGA (which should fit inside the SFE glovebox) and a laboratory TGA-mass spectrometer. Rocky Flats, on the other hand, does not have a TGA, runs out of LOI-suitable oxides early this Fall, and could have to wait a year or more before they could procure, install, and run a TGA. LANL continues to promote neutron moderation, but the need to develop matrix bias corrections is worrisome. (3-A)

F-Reactor Basin: Mr. Grover attended the entrance and exit briefings for the contractor readiness assessment (RA) for removal of the remaining fill material from the F-Reactor Basin. The RA consisted only of document reviews and interviews of project personnel. The ability of the operators to perform the work was determined by a review of training records as the majority of work is similar to that frequently performed by the project. However, this is not the case for the contingency actions to clean and package any spent fuel pieces identified during the final excavations. The project may want to consider performing another appropriately graded RA for spent fuel handling including demonstrations of the work instruction if fuel is found. (III-B)