

Project Hanford Lessons Learned

Title: Potential for Hydrogen Accumulation in Ion Exchange Columns Not Identified in Safety Basis Document

Date: December, 28, 2005

Identifier: 2005-RL-HNF-0046

Lessons Learned Summary:

Deactivation and Decommissioning (D&D) operations have the potential to encounter legacy hazards that have not been previously identified. Decay of isotopes causes radiolysis reactions in solutions which produce hydrogen and oxygen gases as major products. Buildup of this flammable gas mixture in vessel void spaces poses possible ignition and explosion hazards. However, the potential for radiolytic generation and accumulation of hydrogen in a previously used, disconnected, and capped Ion Exchange Column (IXC) was not identified in the previous hazards identification activity. Diligence is required to ensure that work planning includes comprehensive hazard identification and analysis that does not rely exclusively on prior analysis.

Discussion of Activities:

During work planning for the removal and disposition of two used IXCs stored in the 327 Building wet storage basin, it was determined the configuration could potentially allow hydrogen to accumulate in the IXCs. The IXCs were removed from service over decade ago, and blank flanges were installed at the inlet at the top of the IXCs and the outlets extending from the bottom of the IXCs. If the outlet flanges leak and the inlet flanges are sealed, the IXCs will accumulate hydrogen over time as a result of radiolysis. The identification of this hazard had not previously been identified in the Safety Basis document. As a result of this discovery, and the source term involved, the project declared an Unreviewed Safety Question in regard to this activity.

Analysis:

Personnel who performed the Preliminary Hazard Analysis (PHA) in 1999 identified numerous potential hazards associated with the IXCs but failed to identify the potential for hydrogen generation and accumulation in the IXCs during storage. The causes for this oversight may have been the result of: (1) a knowledge based error regarding the configuration of the column; (2) an incorrect assumption that there could be less rigor when analyzing a lower level hazard (inventory barely at category 3 threshold); (3) simple oversight of a hazard; or (4) an analytical error in the performance of the PHA process

In 1999, HNF-4604, *327 Building Hazard Baseline Document* was developed based on the Fluor Hanford procedure HNF-PRO-704, *Hazard and Accident Analysis Process*. The hazard identification and analysis methodology contained in HNF-PRO-704 was later replaced by a 10 CFR 830 Subpart B implementing document HNF-8739 Rev. 0 Safety and Risk Analysis Handbook (SARAH), which was approved by DOE in a Safety Evaluation Report transmitted to FH by DOE letter 02-ABD-0145 August 26, 2002. When effectively applied, the increased impetus provided by 10 CFR 830 Subpart B, and the resulting additional rigor as evidenced by the three fold increase in the hazard identification checklists in SARAH, reduces the potential for

performance errors identified in the report.

Recommended Actions:

D&D operations have the potential to encounter legacy hazards that have not been previously identified due to unknown configurations systems and equipment, hazardous conditions that may develop over time, or errors or omissions in prior hazard identification. Effective implementation of Integrated Safety Management principles requires thorough identification hazards during the planning of D&D activities to ensure safety analysis and controls are in place prior to initiation of work.

Estimated Savings/Cost Avoidance: Not evaluated

Priority Descriptor: BLUE/Information

Work / Function: Authorization Basis, Decontamination & Decommissioning, Operations-Facility

Hanford Functional Categories: Associated Causal Factors - A3B3C05 - Incorrect assumption that a correlation exists between two or more facts, A4B3C08 - Job scoping did not identify special circumstances and/or conditions

Hazard: Personal Exposure-Radiation/Contamination, Radiological Release

ISM Core Function: Analyze Hazards, Develop and Implement Controls

Originator: Fluor Hanford, Inc., Submitted by Alan Horner

Contact: Project Hanford Lessons Learned Coordinator; (509) 372-2166; e-mail: PHMC_Lessons_Learned@rl.gov

Authorized Derivative Classifier: N/A

Reviewing Official: Gerald Whitney

Keywords: Fire, Explosion, Hydrogen, Safety Analysis Report, Safety Basis

References: Occurrence Reports: RL--PHMC-327FAC-2005-0001