Lesson Learned Statement:

When analyzing hazards, consideration should be given to potential failure mechanisms that could introduce hazards. The hazards created by residual pressures should be addressed and mitigation controls should be established for the hazards. This could include methods to measure the pressure, valve isolations to protect workers from the pressure, and protective equipment for the workers.

Discussion:

During sludge treatment, the sludge is pumped from storage tanks to the treatment unit. All hoses and pumps are contained in a dike surrounding the storage tanks. At various times, the hoses carrying sludge from the storage tanks to the treatment units have to be relocated. Air and water pressure is utilized to remove the sludge from the sludge hoses when these moves need to be made. During the air flush of the hose, the air flush operation was completed, valves isolated, and the 1" airline was removed. When the 1" airline was removed, pressurized sludge sprayed out of the hose connection where the airline had been attached, onto the chemical operator. Contamination on operator clothing was measured at 13,500 DPM Beta/Gamma per 100 sq. cm. No contamination was found on the chemical operator's skin.

Analysis:

Due to a blockage of sludge in the hose, there was residual air pressure in the sludge hose. When the airline was removed from the system convenience connection, the residual pressure caused sludge to discharge at the connection. This sprayed the operator and nearby area with sludge. Had the isolation valve between the pump and the convenience connection been shut, as was done by a second operator performing a similar operation on another hose, the residual pressure and entrapped sludge would not have escaped.

A procedure was in place for the activity being performed. However, the procedure did not contain detail regarding the valve positions required for the air flushing operation. The usual operator practice was to shut the isolation valve, but there was not procedural direction to so.

Part of the procedure writing process is to prepare an Activity Hazard Analysis (AHA) to identify the hazards associated with the work and define mitigation controls for the hazard. The AHA requirements are then translated into the governing procedures and administrative controls.

In this case, the AHA did not identify a potential hazard of residual pressure due to a
plugged line and pressurized sludge. Since no pressure relief hazards were identified, it was determined that a Radiation Work Permit (RWP) and protective clothing for radioactive contamination was not needed. The importance of shutting the valve near the pump discharge to isolate any residual sludge line pressure prior to disconnecting the air hose was also not identified. This represents a deficiency in identifying all of the potential hazards as required by Integrated Safety Management System (ISMS) principles.

**Recommended Actions:**

A Special Instruction and AHA were issued for unclogging the sludge lines.

Pressure indicating devices have been installed on all pumps that are in use. These ports allow operations personnel to check the pressure on the hoses prior to disconnection.

The procedure governing the activity has been revised to specifically require the isolation valve near the pump discharge to be shut before connecting or disconnecting process air or water hoses used for flushing the sludge lines.

The AHA for the sludge hose flushing and movement activities has been revised by a team of involved workers and subject matter experts to address the hazards of residual pressure caused by plugged sludge lines.

The procedure governing the activity has been revised to address the hazards and controls identified in the AHA and specifically require the isolation valve near the pump discharge to be shut before connecting or disconnecting air or water hoses used for flushing the sludge lines.

The facility Radiation Work Permits for activities that require connecting or disconnecting process air or process water lines to systems are being revised to identify protective equipment for the workers.

A standing order has been issued to operations personnel requiring the use of an RWP when connecting and disconnecting process air or water lines to the sludge hoses.

Operations personnel will be given indoctrination to ensure awareness of the changes to the procedure governing the sludge line flushing and the related AHA.

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Yellow / Caution

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**DOE Function / Work Categories:**
Conduct of Operations - Work Control
Environmental Protection - General
Waste Management
Waste Remediation

**ISM Category:**
Develop / Implement Controls

**Hazard:**
Personal Injury / Exposure - Hazardous Material (General)
Pressurized Systems
Radiological Release

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**End of Lesson!**