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LOST CREEK ISR, LLC

MEMO

Date: July 28, 2015

Subject: Incident Investigation for Release of Yellowcake through Dryer 1 Packing

A. Description of Incident:

On Saturday July 18, 2015 the dryer operator began unloading dryer 1 into barrels at 18:30. The dryer vacuum system is turned off during packaging. The packaging was completed by 19:20. The dryer operator noticed that the end of dryer 1 was emitting a vertical column of fine particulate uranium, rising from the packing. The dryer operator shut down the system and left the dryer room. The dryer operator discussed the issue with the plant operator, who used to be a dryer operator. The plant operator knew from experience that the packing around the shaft of the dryer needed tightening, but they determined that the task could wait for the airborne uranium to settle. The task would be performed the following day.

The plant operator called the RSO at 19:24 to inform the RSO of the incident and discuss the course of action. Based on prior experience with unplanned releases from the dryers the concentration in the rest of the plant was expected to be minimal. No evacuation of the plant was necessary, and the plan to wait until the next day to tighten the packing was sufficient. The RSO told the plant operator that the RSO would be at the site the following morning to inspect the incident prior to working in the dryer room.

On Sunday July 19, 2015 at approximately 08:00, the RSO visually inspected the side of dryer 1 and determined that the released amount of uranium was relatively small (see residue on side of dryer 1 in Figure 1) compared to other dryer incidents and that performing work in the dryer was safe for standard dryer operations PPE (coveralls, rubber boots, respirator, gloves, and head cover). The breathing zone sample of the dryer operator during the incident had less uranium on it than other routine work such as star valve removals would cause. The plant operator and dryer operator went into the dryer room and tightened the packing and tested the vacuum at approximately 09:30, and the dryer was loaded at approximately 10:15.

On Monday July 20, 2015 the RSO changed the filter on the Central Processing Plant Continuous Air Monitor (CPP CAM) for radon. The filter had a slightly yellow appearance, indicating potential for release of uranium from the dryer room during the incident Saturday

night. The RSO collected swipes of the top of the CPP CAM; there was no visible yellow present on the swipes. If enough airborne uranium is released from the dryer room, then the uranium settles on all surfaces and can be visibly seen on swipes.

B. Immediate Corrective Actions:

The Plant Foreman was given sample bottles to collect bioassays from the plant operator and dryer operator. The plant operator and dryer operator were taking their routine days off at the beginning of the week, starting on Monday. Due to a non-work related injury the Plant Foreman was not able to collect the samples. The bioassay samples were collected on Thursday when the plant operator and dryer operator returned to work.

C. Incident Investigation

In order for uranium to be collected on the CPP CAM filter the airborne uranium would have to leave the dryer room. Based on the airflow of the plant ventilation (see Figure 2) the most likely place for a release from the dryer room detected on the CPP CAM would have to come from the wall shared by the control room/resin water transfer area and the dryer room.

A plant maintenance worker and the RSO inspected the wall above the control room and behind the Resin Transfer Water Vessels. There were two potential holes noted where the insulation meets the I-beam on the ceiling. The holes appear to have some yellow residue settled on the insulation within a few inches of the hole. Due to obstructions and safety considerations the residue was not sampled.

A smoke test was performed to test the holes coming out of the dryer room. The maintenance worker was up in a Man Lift near the holes, and the smoke bomb was ignited under the end of Dryer 1 were the release occurred. The smoke filled the dryer room. The maintenance worker in the Man Lift was able to smell the smoke before personnel on the ground in front of the control room. The smoke was not visible outside of the dryer room.

D. Sampling Results

CPP CAM filter Sample

The flow rate for the CAM is approximately 5.5 L/min, but can range between 5-6 L/min. The most conservative flow rate for determining exposure would be 5 L/min. The filter in this CAM had run for approximately a week until collected. Assuming that all of the alpha emitting radionuclides on the CAM filter were from this incident the activity on the filter would be 689 pCi. At that flow rate, if someone were standing near the CPP CAM during the incident on July 18, 2015 that person would receive an intake of 4 mg of uranium (19 mrem). This is less than the weekly limit of 10 mg/week for soluble uranium.

Breathing Zone Sample

The breathing zone sample of the dryer operator while packaging showed a concentration, without the respirator's Assigned Protection Factor, of 8.21E-10 uCi/mL (270% DAC). This is a typical concentration in the airspace of the dryer operator while packaging.

Bioassay Results

The results of the bioassay were non-detect for both the plant operator and the dryer operator.

E. Causes of the Incident

The direct cause of this incident was a packing that was too loose. The root cause of this incident was that the dryer operator did not know to ensure the packing on the dryer was sufficiently tight.

F. Corrective Actions

To assist in preventing a recurrence of a similar incident the following corrective actions were determined:

1. Ensure that all dryer operators are knowledgeable in how to tighten the packing on the dryer.
2. Review, and amend as necessary, the dryer operations SOPs to ensure they adequately address what to do in this circumstance.
3. Seal any opening in the dryer room wall that could lead to release of material during upset conditions.
4. Sample the air in front of the control room as part of the monthly airborne uranium sampling in the plant. This will continue for the next 6 months to make sure there are no detectable levels of uranium coming through holes in the wall during normal operating conditions.

G. Conclusions

After the release of the uranium was noticed the knife valve was sealed and the dryer rotation was returned to normal, but the vacuum was not turned on. The negative pressure of maintaining a vacuum in the dryer would have minimized the release of uranium from the dryer.

Prior incidents involving unplanned releases of airborne uranium in the dryer room have resulted in large messes to be cleaned up in the dryer room. By comparison, the incident on July 18, 2015 should not have caused detectable uranium outside of the dryer room. The method of release may have created a different average particulate size of airborne uranium. The uranium released when yellowcake is spilled on the ground is caused by large piles of uranium dust similar in size to sand, or road salt. The uranium released on July 18 was passing through the packing, a normally air tight seal, and emitted from the side of the dryer similar to how smoke rises. The smoke-like uranium particulates may have been slower to settle and being smaller in size had a greater

chance of passing through the small holes in the wall of the dryer room. Sealing up the holes in the wall should help contain similar incidents to the dryer room.

Figure 1: Residue from Release through Dryer 1 Packing

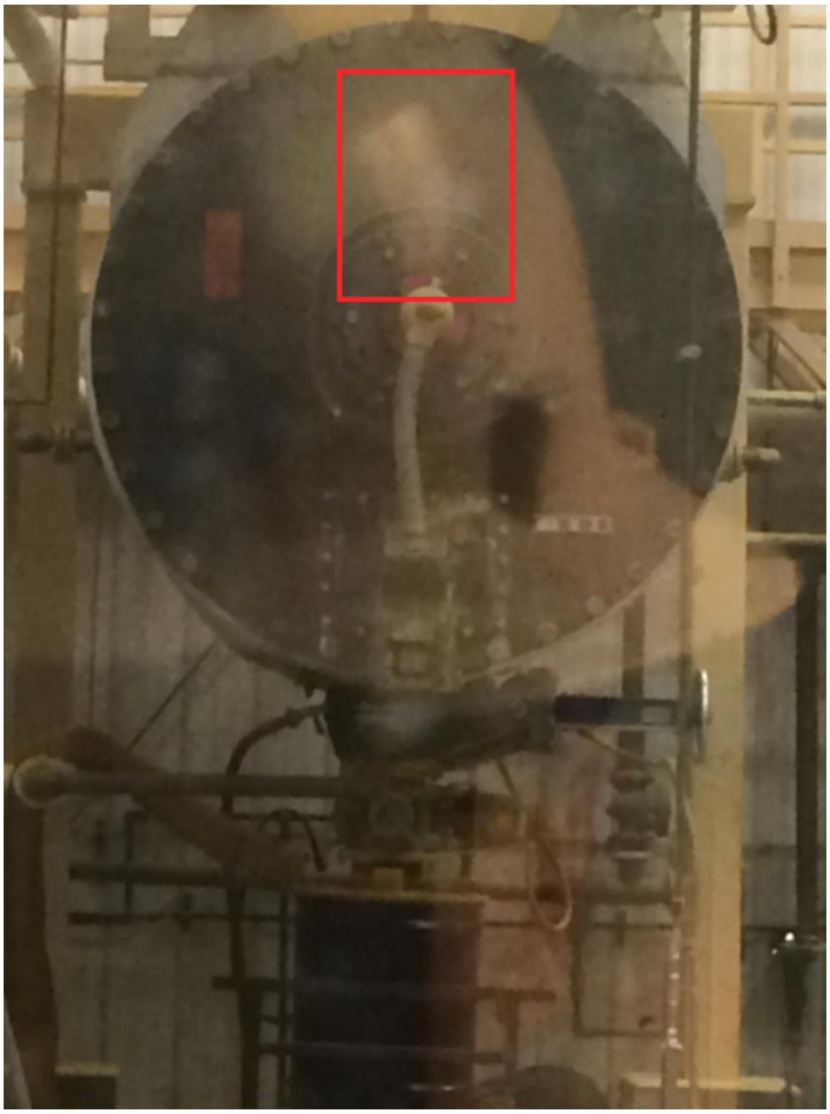

Figure 2: Plant Ventilation Air Flow