The Horizontal Band Saw Incident at the B&W NOG-L Facility

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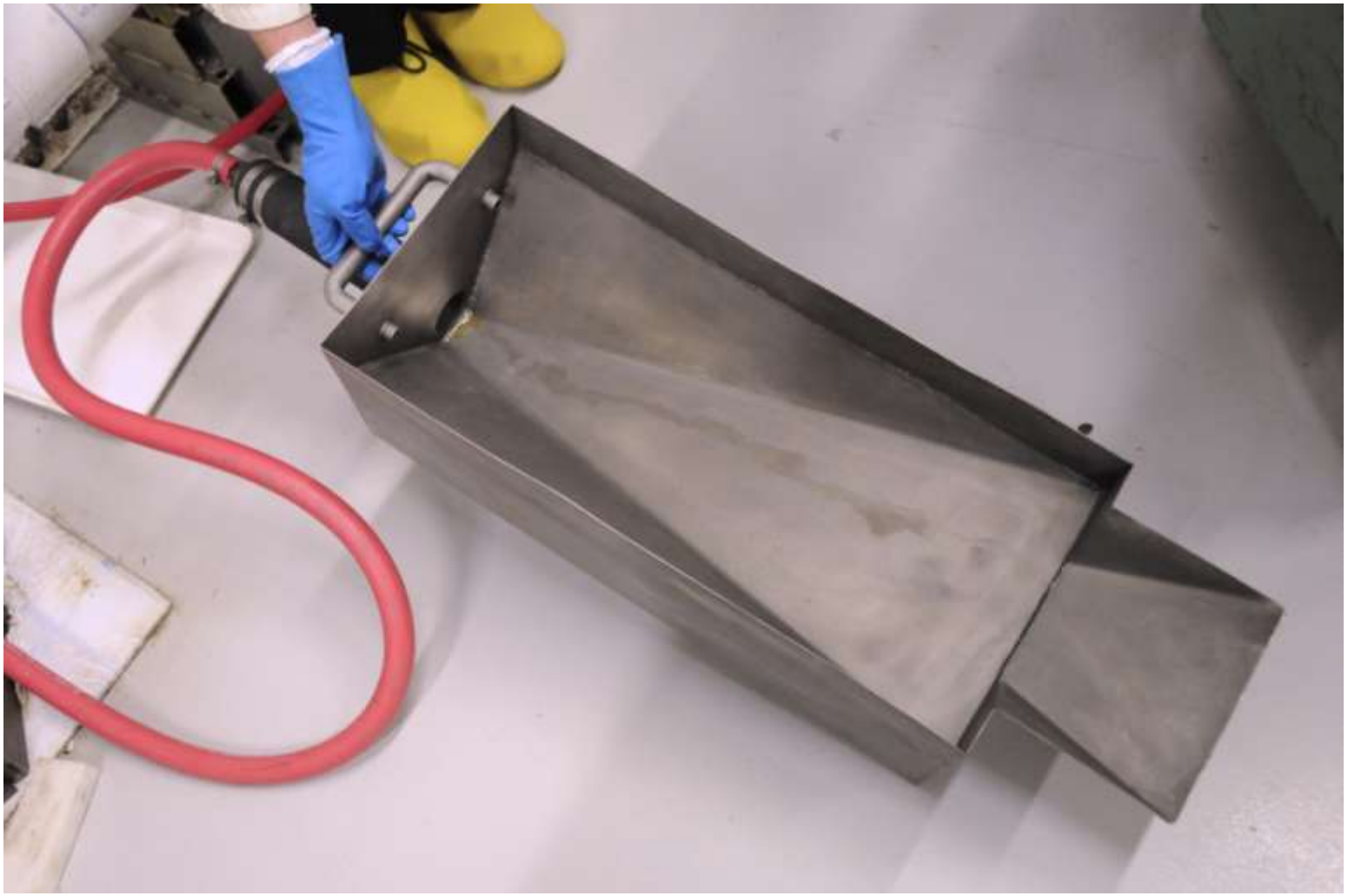
Horizontal Band Saw

Timeline Leading to the Event

- In storage in a SeaLand container
- SER 03-087 requests use of saw in a new sectioning facility.
- NCS requirement:
  - Favorable geometry coolant system
  - 350 g ^{235}U limit
  - Built-in sump must be disabled
- Diverter tray designed in March 2004
  - No formal review of the tray design

Favorable Geometry System

Diverter Tray



Diverter Tray Installed

Time Line Leading to the Event

- Equipment released on May 12, 2004.
- Release stated: NCS verified that the machine was connected to the new coolant system.
  - No check was made to verify that the old sump was unusable.
  - The sump inlets and outlets were plugged but the sump was never sealed off.
- Operators were not aware there was a sump in the saw.

July 15, 2009

- Operators noticed an oily substance leaking from a screw hole on the side of the saw.
- Used a screw to plug the leak.
- Notified the area manager.
- Work was stopped and NCS was notified.

July 15, 2009

- The operator removed the diverter tray.
  - Original sump was full of cutting fluid
  - Leaking screw hole was near the top of the sump
- The area was secured and cordoned off.
- Safety basis was reviewed and determined that no controls were in place to ensure safe operation.

July 15, 2009

- ESH&S manager, NCS manager and an NCS engineered returned for a further look at the saw.
- Estimated volume was 53 liters and there was an unknown amount of uranium.
- The EOC was activated.
- An Alert was declared.
- NRC Operations Center was notified.
- NCS Engineer was on the bridge line with the NRC.

July 15, 2009

- Assessment of the configuration:
  - Cutting fluid does not chemically react with the uranium
  - No agitation or flow in the system
  - A layer of uranium-bearing sludge could be on the bottom
  - Estimated critical mass was 1300 g ^{235}U
- No immediate action was required since the system was static.

July 15, 2009

- Handheld NDA measurements did not indicate a layer of uranium material in the sump.
- COLIWASA sampling did not find a sludge layer in the sump.
- Highest well count results from COLIWASA samples was 0.18 g ^{235}U/liter
- The EOC stood down but the area remained cordoned off.

Recovery

- Cutting fluid was drained into 2.5 liter bottles and counted.
- Only a small amount of saw fines were found.
- Total estimated ^{235}U was 13.76 g.

Conclusions from Investigation

- Diverter tray design not evaluated.
  - Tray did not completely divert liquid flow.
  - Tray could vibrate out of position during operation.
- NCS Requirement not adequately verified.
  - Disabling of the sump not adequately verified.

Corrective Actions

- Equipment Modification
  - Equipment re-evaluated and modified under current change management procedures.
  - Sump was removed.
- NCS release
  - Enhances instructions on verification of requirements.
  - Implemented requirement that two NCS engineers perform verifications.
- Performed extent-of-cause and condition reviews.

Presentation to the NRC

- Calculated minimum critical mass: 1430 g ^{235}U.
- The system is cleaned out after a calculated loss of 350 g ^{235}U.
- Total losses (May 2006 to July 2009), 981 g ^{235}U
- Criticality would require:
  - Four occurrences of the diverter tray not fully installed *and*
  - All the cutting fluid bypassing the diverter tray and entering the sump when the calculated loss was at 350 g ^{235}U.
- Conclusion: Criticality could not have happened.