

Hg System Decommissioning Activities



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NFMCC Friday Meeting

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Day 1 Activities

- **Optical fibers removed except for VP #2**
- **Hg system draining preparations**
 - **Equipment in place (flasks, peristaltic pump, safety equipment, etc)**
 - **Extracted Hg system from solenoid**
 - **Radiation measurement center of snout $\sim 70 \mu\text{Sv}$**



Day 2 Activities

- **Started Hg draining operations**
 - **Pumped into intermediate container 1st time**
 - **Moved peristaltic pump to container exit to provide Hg sample per CERN request**
 - **During this operation, Hg continued to gravity-feed into container, overflowing it**
 - **Per procedure, sump tank drain valve should have been closed after pump into container**

Spill Conditions

- **Operators and monitoring personnel wearing respiratory protection at all times**
- **Local ventilation in use**
- **Estimate total overflow ~200 ml**
 - **Most contained within tray or within container bucket**
 - **~50 ml fell onto plastic or directly onto floor**

Spill Response

- **Drain valve immediately closed upon condition recognition**
- **Pumped Hg into flask to remove overflow condition from intermediate container, then closed flask**
- **Personnel not wearing PPE requested to leave area**
- **Prepared Hg vacuum cleaner, started cleanup of larger Hg pools then entire local area**
- **Wiped equipment with HgX solution and prepared to continue draining operations**
- **CERN fire brigade responded as required, inspected area, then allowed us to continue cleanup**
- **CERN Chemical Safety inspected operations, allowed draining operations to proceed**

More Day 2 Activities

- **After drain operations continued, syringe pump drained of Hg without incident**
 - Tilted Hg system as required to maximize fluid removed
 - Respirator use & local ventilation continued
 - Each full flask weighed and placed back into transport drums
 - Left Hg in vacuum cleaner storage canister and in plastic intermediate container
- **Vacuum cleaner and local ventilation exhaust monitored during cleanup – no vapors detected**

Day 3 Activities

- **Met with CERN Medical personnel**
- **Removed Hg from vacuum cleaner and plastic container, poured into shipping flask**
- **Cleaned floor with HgX solution, let dry ~4hrs, used vacuum to remove remaining liquid**
 - Hg vapors ~200 $\mu\text{g}/\text{m}^3$ at floor level, ~0 a few cm above floor
- **Placed Hg-absorbing powder on floor, left overnight**
- **Drained hydraulic fluid from HPU**

Hg Drained From System

- Includes Hg added from vacuum cleaner and intermediate container
- Includes CERN sample volume
- Hg left in syringe < 0.5 liter

CERN Operations						
System Fill 10 May 07			System Drain 5 Feb 08			
Flask No	Full (lbs)	Empty (lbs)	Loaded (lbs)	Empty (lbs)	Full (lbs)	Drained (lbs)
1	88.3	25.3	63.0	25.3	77.4	52.1
2	---	---	---	---	---	---
3	86.8	17.1	69.7	17.1	77.4	60.3
4	81.2	13.9	67.3	13.9	80.2	66.3
5	---	---	---	---	---	---
6	86.2	15.3	70.9	15.4	78.0	62.6
7	83.4	15.8	67.6	15.7	81.1	65.4
8	---	---	---	---	---	---
9	---	---	---	---	---	---
10	52.2	16.4	35.8	16.4	85.5	69.1
11	---	---	---	---	---	---
		Mass (lbs)	374.3		Mass (lbs)	375.8
		Mass (kg)	169.8		Mass (kg)	170.5
		Volume (liter)	12.5		Volume (liter)	12.6

Day 4 Activities

- **Blood sample taken by CERN Medical**
 - Test results available in 2 weeks
- **Cleaned Hg powder from floor**
 - Vapor levels decreased by factor of 2 or better
- **Reapplied powder to floor, will remove at 4pm**
- **Tools monitored and removed from area**
- **Hg system ready for transport**

Day 5 Activities

- **Performed final wipedown of spill area floor**
 - Hg vapor readings ~20 $\mu\text{g}/\text{m}^3$
 - Indications from CERN RP were they were satisfied with our efforts
- **Moved most of equipment out of ISR**
 - Optical diagnostics crate to be shipped to BNL
 - Some large items need to be moved from ISR



Lessons Learned

- **Don't deviate from procedure without careful consideration of possible consequences**
- **Perform dry run of operational procedures before real Hg operations**
- **Maximize amount of spill containment area**

Future Plans

- **Equipment to be removed from experimental areas by CERN transport group Feb/Mar**
- **One crate optical diagnostic equipment to be shipped to BNL soon**
- **Remaining MERIT equipment stored at CERN through Dec 07 for radiation decay**
- **Ship mercury and MERIT equipment to ORNL Jan 09**
 - **Current plans call for engineering study to modify syringe pump for use with new target (Pb-Bi)**
 - **Considering possibility of continuing Hg R&D**
 - **Appears ORNL is capable of performing integrated systems testing (no beam)**