

Date sent: Tue, 22 Sep 1998 11:34:53 -0500  
From: Meredith Brown [racer@lanl.gov](mailto:racer@lanl.gov)  
Subject: Yellow Alert: Mercury Contaminated Detector

## A PANTEX PLANT LESSONS LEARNED

### Title: (YELLOW) **Unexpected Mercury Contamination Found in Building 12-19W Leak Detector**

Identifier: Pantex LL440.2Y  
Date: 9/21/98

#### **Lesson Learned Statement:**

Process and impacts analyses involving hazardous chemicals are essential to good workmanship and the production of a good product. Normally, the operator of the glass rack can observe liquid mercury being pushed into a sample bottle and also apply controls to prevent or minimize such a transfer. But, this will not be the case in Building 11-51 at Pantex. In Building 12-21 Gas Lab, where the sample bottles are oriented with the valve down, the chance of liquid mercury entering the bottle is reduced. With this event, operators must be aware that the glass rack in Building 11-51 orients the sample bottle with the valve up.

The valve oriented up can allow liquid mercury to enter the bottle during the transfer of the organics/water sample from the burette. In this event, the sample bottle was placed in liquid nitrogen to facilitate the sample transfer. When a sample bottle is placed in liquid nitrogen to facilitate the transfer of the sample, there is a possibility that the operator can miss mercury entering the bottle, because liquid nitrogen increases the transfer of mercury vapor.

#### **Discussion of Activities:**

On January 29, 1998, an electronics shop technician discovered mercury in the inlet of an Alcatel leak detector used by the gas laboratory. The electronics technician had just finished changing the oil on the detector pump, and was proceeding with further maintenance on the equipment when he noticed what appeared to be a small amount of mercury on the screen over the inlet. The electronics technician alerted gas laboratory personnel to the potential problem. Gas laboratory personnel monitored the leak detector and work area for mercury. They found contamination at the pump exhaust, and in the oil that had been removed from the pump. There was no indication of an airborne mercury contamination hazard to the gas laboratory personnel. However, gas laboratory personnel were sent for medical screening as a precautionary measure. The technician who changed the oil on the contaminated pump was also sent to the medical facility for a mercury screen.

Gas laboratory personnel began monitoring the sample bottles and other equipment, which interface with these sample bottles, for mercury contamination. Personnel monitored the other leak detector which showed to be clean. Of the bottles checked to date, two bottles found in the gas laboratory had very small amounts of liquid mercury present. The tag on one of the bottles

showed that it had come from Building 12-84, Bay 19. The orientation of the bottles that are attached to the manifold in Building 12-84, Bay 19, is with the valve pointing down. When the bottle valve was opened, liquid in the bottle could have dropped into the manifold. It was concluded that the manifold in Building 12-84, Bay 19, had been potentially contaminated, by the contaminated bottle, when the sample bottle was attached and opened.

### **Analysis:**

The gas laboratory personnel went to Building 12-84, Bay 19, to do further investigation and monitoring. The direct cause of the occurrence was the mercury found in the manifold of Building 12-84, Bay 19 plus the Gas Lab's leak detector and manifolds in Building 12-21 and Building 12-19 West. The mercury contamination in the manifolds and leak detector came from sample bottles that were internally contaminated with mercury during glass rack operations. Glass racks segregate gases for analysis using mercury to pump the gases to sample bottles attached to the glass rack.

Mercury vapor contamination was found inside the manifold and inside the vacuum pump. The Industrial Hygiene Department was contacted to perform further monitoring for mercury. The pump and manifold were locked out to prevent further use until decontaminated. Although there was no airborne mercury hazard or contamination found outside of the equipment, the production technicians (PTs) who work with this equipment were also sent to the medical facility for mercury screening as a precautionary measure.

Upon discovery of contamination in the manifold and pump in Building 12-84, Bay 19, further surveys were initiated for similarly oriented manifolds in Buildings 12-84, Bay 20, and 12-104, Bay 16. These surveys showed that there was no contamination in these two manifolds.

The results for the first set of personnel who submitted blood screen samples were completed, and show no mercury. Screens for the crafts personnel who work on the pumps and for the PTs in Building 12-84, Bay 19, were also conducted. A total of sixteen personnel have been tested for mercury exposure of which only one showed a reading. The reading is well below accepted standards of exposure. The acceptable environmental exposure range for mercury, as shown on the medical analyses, is 0 - 15.0 mcg/L. One person's report read 2.5 mcg/L (normal results) while the rest of the reports showed no mercury was detected.

Investigation and monitoring for mercury contamination was expanded from buildings 12-19W and 12-84/Bay 19 to Buildings 12-84/Bay 20, 12-104/Bay 16, 12-86/Bay 9, 12-21 Gas Lab, 11-14, 11-51, to all plant vacuum pumps, and some weapon systems. The initial checking of sample bottles for mercury contamination encompassed 75 cc bottles only, of which there were approximately 600-700. The Corrective Action Plan has expanded the examination to other sized sample bottles.

The total number of bottles to be examined will range between 1000 to 1200. At this point over 600 sample bottles have been checked for mercury contamination by Gas Lab personnel.

### **Recommended Actions:**

At the inception of the glass racks 25 years ago, mercury was the only reliable transfer medium because it did not interfere with analyses. As technology improved, the glass racks were updated to reduce the potential of mercury contamination. Currently, a prototype stainless steel rack using diffusion pumps instead of mercury has been assembled and is being validated. This is an action in the Corrective Action Plan intended to eliminate mercury use in the racks.

All sample bottles in the laboratory are being tested for mercury contamination. Areas which use the gas sample bottles were contacted about the potential for mercury contamination, and told to return any gas sample bottles to the gas laboratory. An Engineering Instruction was implemented in the gas laboratory to check all gas sample bottles prior to releasing them for use.

Additional monitoring for mercury contamination was initiated on laboratory analytical instruments and other equipment with which the gas bottles are used. The contaminated manifold and vacuum pump in Building 12-84, Bay 19, were locked out to prevent further use until they are decontaminated.

A Corrective Action Plan has been developed and has been signed. The plan looks at continued investigation and monitoring, restorative measures, testing protocols, and long term elimination of the mercury sources (glass racks). The Corrective Action Plan identifies potentially mercury contaminated equipment, rectifies any mercury contamination, analyzes potential programmatic impacts, and develops procedures and methodologies to eliminate problems. The overall target date for completion of the corrective actions identified in the Corrective Action Plan is December 31, 1998. The segregation and labeling of the sample bottles are actions in the Corrective Action Plan.

The procedures for the glass rack operations did not caution the technician to ensure no mercury entered the bottle or to notify the Gas Lab supervisors if liquid mercury did enter the bottle. Since the sample bottles used on the glass rack will not be used for other processes, no glass rack operating procedures are to be rewritten.

The Gas Lab had no procedure requiring the testing of the sample bottles for mercury. This was due to the fact that the Gas Lab personnel did not realize that several of the sample bottles had been contaminated with mercury. The Gas Lab currently has begun testing all sample bottles for both liquid mercury and mercury vapor. Those bottles determined to have no mercury contamination are bar coded. Bottles contaminated with mercury are labeled "For Glass Rack Use Only".

There was no procedure in place to segregate sample bottles used on the glass rack from those used on the other vacuum systems at the plant. The Gas Lab now has sample bottles that are labeled "For Glass Rack Use Only".

Reference: ALO-AO-MHSM-PANTEX-1998-0007

Originator: Murchison, David C. (806)477-6431

Contact: Lorelei Woods (806)477-4470

Authorized Derivative Classifier: Murchison, David C. (806)477-6431

Reviewing Official: Max Schneider, DOE-AAO

Priority Descriptor: YELLOW

DOE Functional Category: Occupational Safety and Health

Keywords: Contamination, environmental, hazard, vacuum pumps, safety, bottles