

Chemical Occurrences - December, 1997

Class 1:

None

Class 2:

Savannah River - An employee was splashed in the face by sodium hydroxide when a filter housing failed. The employee was examined by an ophthalmologist, who prescribed eyedrops, and allowed to return to normal work duties.

Oak Ridge (2) - Fish and salamander kills were caused by chlorinated water releases. One occurrence was believed due to dechlorinator system malfunction and the other due to overflow when a valve was inadvertently opened.

Other Occurrences of Note:

[NOx Alarms](#) ** [Employee Exposures at ORNL](#) ** [Hydrogen Leak/Ignition](#) **
[Gas Generation in Storage Containers](#)

A search of ORPS for occurrences having chemical safety relevance conducted for the month of December 1997 produced 21 reports representing potential chemical safety concerns. These occurrences are listed in [Attachment 1](#). There were three occurrences categorized as "Unusual" with the remainder identified as "Off-normal". The Office of Environmental Management (EM) was Cognizant Secretarial Office (CSO) for 13 occurrences, and Defense Programs (DP) and Energy Research (ER) each reported four. The CSO designation may change after the distribution of this monthly memorandum, and this change will be reflected in Quarterly and Annual Reviews.

There were three Class 2 occurrences reported during December. There were 12 Class 3 occurrences. ([Class definitions](#)) Among the Class 3 occurrences, in addition to those noted previously, was the discovery of explosive materials in a laboratory at Mound believed to have been cleared of all such materials. Potential safety analysis inadequacies were noted at Savannah River and Fernald involving the generation and/or accumulation of gases in storage tanks. Acid leaked from a corroded valve at Savannah River; the valve was constructed of carbon steel instead of stainless ([See OEWS 97-53](#)).

Summaries of Class 2 Occurrences:

Employee Sprayed by Sodium Hydroxide (EM): (SR--WSRC-LTA-1997-0039) On December 18, at Savannah River, a laboratory technician received a chemical splash to the face. The technician had been using a 5 mL syringe to push sample liquid containing sodium hydroxide through a filter into a sample bottle. The filter housing/holder failed and approximately 1-2 mL of the liquid splashed on the technician's face. The technician was wearing the prescribed protective equipment: safety glasses with side shields, labcoat. The employee used a safety shower to flush face and eyes, and also was escorted to an eye wash station. EMTs transported the employee to the WSRC Medical Department. Medical provided treatment and released the technician with instructions to immediately see an ophthalmologist for an extensive eye examination. The ophthalmologist provided eye drops. The individual was cleared to return to normal work duties.

Preliminary investigation into the causes of the occurrence found that the 5 mL syringe and filter were not compatible. Management issued a notice to personnel to stop use of less than 10 mL syringes in conjunction with Gelman Non-Sterile Acrodisc Syringe Filters.

Fish and Salamander Kill due to Unexpected Chlorine Concentration (ER): (ORO--ORNL-X10PHYSICS-1997-0003) On December 8, during normal monitoring, personnel observed several dead minnows near an outfall from the Holifield Heavy Ion Research Facility. ORNL Office of Environmental Protection personnel determined that the minnow mortality was most likely the result of a chlorine excursion from the outfall that represented a concentration which exceeds what is expected as a result of normal operations. More dead minnows and salamanders were subsequently noted in the area. Immediate review of the dechlorinator system was instituted.

Fish and Salamander Kill due to Chlorinated Water Overflow (ER): (ORO--ORNL-X10PLEQUIP-1997-0014) On December 29, an operator, taking normal shift readings, opened a valve leading to a compressor. Another valve leading to the compressor was also open. Only one valve should have been open. Excess water was pumped into a cooling tower, and the overflow discharged to White Oak Creek through an outfall into a creek. The make-up water is chlorinated. The discharge continued for almost seven hours with a flow rate of approximately 100 gallons/minute. Office of Environmental Protection personnel performed chlorine sampling in the creek near the outfall and did not find detectable chlorine levels. However, dead fish were found just downstream of the outfall. The discharge pipe was rerouted so as not to discharge to the creek but to the ground.

Other Occurrences of Note:

On December 20 and again on January 1, an area instrument in the Off Gas Instrument Room read a high level of NO_x (OH-WV-WVNS-VFS-1997-0009). Local area alarms and remote alarms were received at the Vitrification Process Control Room. The set point for the alarm is 2.4 ppm, and the readings were between 4 and 6 ppm. There was a plant page made to evacuate the building. Initial troubleshooting indicated that an off gas analyzer instrument failed in the area simultaneously to the high area alarm, indicating that there was probable sampling tubing failure in the instrument, causing NO_x to be released to the room. It was subsequently determined that analyzer tubing had come loose from the analyzer.

Two occurrences involving employee exposures to chemicals took place at Oak Ridge National Laboratory (ORO--ORNL-X10BOPLANT-1997-0007 and ORO--ORNL-X10PHYSICS-1997-0002). In the first occurrence, 15 employees were moved "for personal comfort" after odors came into their offices from a drain unplugging repair job where a chemical drain cleaner was being used. Eight of the employees reported to medical, where they were checked and released. After the unplugging was completed, air samples were taken. There were no detectable findings of sulfuric acid, hydrogen sulfide, or ammonia. In the second case, personnel reported a leaking regulator on a small cylinder containing boron trifluoride (a corrosive source gas used in accelerator technology). The employees discontinued their operation and contacted supervision. The supervisor sent the two workers to the ORNL medical facility for a precautionary evaluation. No physical effects from the gas release were noted. The Hazardous Waste Operations Group responded and removed the cylinder to a safe area where it was "bled down".

At Y-12, during a lithium deuteride production run, a cooling air valve was discovered to be in the closed position contrary to procedure (ORO--LMES-Y12SITE-1997-0050). The closed valve resulted in an eventual gasket failure, which allowed a leakage of hydrogen gas. Elevated temperatures allowed the escaped hydrogen to ignite, resulting in a small flame which was extinguished by operations personnel

using an argon purge. There were no injuries to personnel as a result of the incident. An investigation has been initiated.

Finally, two more occurrences concerning the potential for generation of gases in storage containers merit brief mention. At Savannah River (SR--WSRC-HTANK-1997-0035), based on the confirmation that there is a potential for retention and rapid release of flammable gases (primarily hydrogen) in stored wastes, an Unreviewed Safety Question was determined to exist. Hydrogen is generated by radiolytic decomposition of water in the radioactive solutions stored in the waste tanks, and organics are received from other processing facilities and processed with the waste stream. Gases can be trapped in the supernate, sludge, or salt over time, and released with agitation. These releases can result in scenarios different than those assumed in accident analysis for tank deflagrations and seismic events. It was recognized that the current Authorization Basis for these tanks has not fully addressed these potential releases of trapped gas during normal operations; therefore, an Unreviewed Safety Question exists. At Fernald (OH-FN-FDF-FEMP-1997-0055), it was discovered that monitoring of a sodium sulfide tank as required by the Basis of Interim Operations had lapsed. Independent review of the USQD by DOE-FEMP determined there was not an adequate basis in the document for omitting the monitoring requirement. When the facility was operating, this 3.6% solution was used as a reducing agent for the nitrogen oxide scrubber. If sodium sulfide were to be mixed with an acid or other oxidizer, the reaction would form toxic hydrogen sulfide.

Additional information regarding these occurrences and others will be discussed in an upcoming Quarterly Review; some are currently summarized on this website. As occurrence reports are finalized, lessons learned will be communicated.

This report approved by

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Note:

A version of this report is distributed via e-mail either as a WordPerfect or a text file. Please contact **John Usher** (516-344-2096, Fax: 516-344-3957, E-mail: usher@bnl.gov) at Brookhaven National Laboratory to be placed on e-mail distribution. If you want to receive hardcopy, please contact John Usher who will make every effort to accommodate you.

Please feel free to use the other resources available on the DOE Chemical Safety Program homepage. The Internet address is http://tis-hq.oh.doe.gov/web/chem_safety/.