

Date: Mon, 23 Mar 1998 10:25:16 -0600  
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Subject: Yellow Alert: Unknown Liquid Reacts with Drum

**Title: YELLOW - Unknown Liquid Reacts in Legacy Drum**

Identifier: INEEL Lessons Learned #98091  
Date: January 22, 1998

**Lessons Learned Statement:** Storage of incompatible materials must be prevented Complete and standardized records must be kept of container contents. If personnel are opening containers with unknown contents or inadequate records, they must use the most conservative assumptions while performing their tasks.

**Executive Summary:** A legacy drum was opened and incompatible materials were found inside with an unknown liquid bubbling in the bottom of the drum. There were no personnel injuries or releases to the environment. This event underscores the need to design and implement systems to prevent the storage of incompatible materials and ensure that complete and standardized records are kept of container contents.

**Discussion of Activities:** In July 1997, an Advisory Engineer/Scientist and several laborers were conducting an inventory of legacy drum contents at the Idaho National Engineering and Environmental Laboratory (INEEL). The materials were from experiments conducted at the site during the 1970s and 1980s. The records characterizing these materials were less than adequate.

One particular drum contained several containers of organics, acids, and other constituents. While removing the organics, a laborer saw a small amount of liquid (less than a gallon) bubbling in the bottom of the drum. Knowing that organics and acids can produce hydrogen gas when they combine, the personnel replaced the drum's lid, evacuated and isolated the area, and contacted the INEEL Hazardous Materials Team. The Team found no reactions that created heat, combustible gas, or vapors; carbon monoxide was the only reactant present. Further investigation showed the liquid was nitric acid reacting with metal of the drum.

**Analysis:** There are two conditions that caused this event:

1. Incompatible materials were stored together. Personnel and supervisors who packed the drum did not demonstrate a fundamental knowledge of chemical handling and storage compatibility requirements.
2. The records characterizing the drum contents were deficient. Record keeping during this era was less than adequate by today's standards, and the people who originally worked on these projects are no longer employed at the INEEL.

Another aspect to consider is that personnel were wearing the proper protective equipment to handle compatible, hazardous materials, but not incompatible materials. There were no injuries in this event, but the lack of respiratory protection could have had serious consequences.

## **Recommended Actions:**

1. A system should be established to properly characterize questionable legacy waste materials and repackage incompatible materials as necessary.
2. The INEEL Interim Waste Tracking System should be implemented in all facilities to track legacy waste that has already been characterized. Currently at the INEEL, each program provides its own funding and uses its own recordkeeping methods.
3. When opening containers having unknown contents or questionable records, personnel should use the most conservative approach when planning, preparing work control documents, conducting hazard analysis, and performing tasks.

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Functional Categories (DOE): Environmental Restoration and Waste Management, Occupational Safety and Health

Functional Categories (User-Defined): Environmental Protection Objectives/Waste Management Occupational Safety and Health

Key Word(s): drums, legacy, incompatible materials, recordkeeping

References: ORPS Report ID-LITC-TRA-1997-0015

**Follow-up Action:** Information in this report is accurate to the best of our knowledge. As a means of measuring the effectiveness of this report please notify Terry Pierce at (208)526-4288 or by electronic mail at [txp@inel.gov](mailto:txp@inel.gov) of any action taken as a result of this report or of any technical inaccuracies you find. Your feedback is important and appreciated.