

Lesson Learned Briefing

No.: LL09-0030

Title: Inadequate Handling of Oxidizing Waste Results in Explosions

Event: LBNL Event

Event Date: 03/31/2009

Category: ES&H - Chemical Hygiene, Waste Management

Lesson Learned Statement:

Some incidents involving mixing incompatible wastes can be avoided if staff recognizes the properties of the hazardous materials they are working with and follow the requirements of separation and segregation of incompatible wastes. Alternate procedures such as deactivating waste mixtures that continue to react during waste collection are additional controls that can be implemented.

Discussion:

THE INCIDENT

On March 31, a new visiting scientist (guest) in the Materials Sciences Division added isopropyl alcohol waste to a glass waste container of aqua regia (nitric and hydrochloric acids). These materials are incompatible and the oxidation of the alcohol by the nitric acid resulted in the buildup of pressure in the bottle. 30 minutes later it exploded, shattering the fume hood sash, destroying the satellite accumulation area secondary containment and scattering glass debris and acid mist throughout much of the lab. Nobody was present thus there were no injuries or exposures.

This is the 4th burst waste container in MSD in 4 years, all involving oxidizing waste that was either inappropriately mixed with a fuel (2) or that spontaneously degraded and pressurized closed containers (2, specifically piranha etch). A similar cause may have contributed to a subsequent incident at the ALS Division at LBNL and more recently at LANL. Recently, there was a near miss in MSD with a pressurized container of aqua regia waste.

These repeated failures indicate that several existing administrative controls intended to prevent incidents of this type were not followed. Also an evaluation should be conducted to identify additional engineering controls to reduce the likelihood of this type of event or consequences should a waste handling error occur.

The investigation of the March 31 explosion also identified other important

contributing causes, including the failure to properly authorize work, the failure to identify and manage cultural/personality biases in the new guest, the failure to properly monitor the performance of a new person in the lab, the potential for confusion due to the different work authorization rules on the UC Berkeley campus and LBNL and the existence of Division policies that made it difficult for this supervisors to implement the LBNL policy for work review and authorization.

THE INVESTIGATION

The investigation of the March 31 event revealed a number of root and contributing causes for this explosion, which are presented here in summary form:

1) The guest was allowed to perform work at LBNL yet she had not completed required formal chemical and waste safety training and was not provided with continuous oversight/assistance, as required by policy. Also, the "on the job training" was not effective, resulting in some confusion about waste handling requirements. Because she had been working for several months in this PI's lab on the UC Berkeley campus in compliance with campus work authorization rules everyone assumed that she was also qualified and authorized to work at the PI's LBNL labs, which was incorrect.

2) The Job Hazards Analysis (JHA) governing the work had not been reviewed or approved by her supervisor, but rather by an administrator who was neither qualified or authorized to perform this work. Contributing to this breakdown in work authorization was a Division policy that permitted only Principal Investigators to authorize work/sign JHAs, which resulted in a span of control that was too large for the PI to manage effectively in this case. It should be noted that the JHA was correctly completed despite these process shortcomings, and appropriate controls were identified but not implemented.

3) The guest brought cultural/personality biases to the workplace that were not detected or managed properly. She was in a great hurry to leave the lab on the day she inappropriately mixed the organic and nitric acid wastes due to the impending darkness and her great fear of walking alone at night in Berkeley. When the time came to dispose of the alcohol, she became confused about which container to use and she made a snap decision to mix the wastes even though she knew that it might result in a reaction. She was unaware that after-dark home escort services are available both from LBNL and UC Berkeley. In addition, she was reluctant to ask for help, as she felt that this would be an imposition on her hosts.

4) LBNL policy and procedures for the collection of oxidizing waste may not be optimal. There have been a number of similar waste container explosions in MSD and around the complex. Reliance exclusively on administrative controls rather than first implementing feasible engineered controls may not be "best practice". Deactivating waste mixtures or otherwise rendering them safe for storage by either dilution or neutralization is a method that could reduce the likelihood of incidents resulting from the mixing of incompatible waste chemicals.

Priority Boxes: ORPS Reportable OSHA Recordable PAAA Other

ISM Code: Develop and Implement Hazard Controls

Uploaded documents/attachments:

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