

Date: Thu, 22 Mar 2001 10:38:51 -0700
From: Meredith Brown <racer@lanl.gov>
Subject: Yellow Alert: Protecting Workers From Exothermic Chemical Reaction

Title: Yellow Alert: Protecting Workers From Exothermic Chemical Reaction

Date: 03/22/01 Identifier: 2001 HQ-EH-2001-001

Summary: Workplace hazards should be properly identified and understood, so that controls are properly developed and implemented. An activity hazard analysis (AHA) must define all "basic job steps" to be performed. It is also important that critical Material Safety Data Sheet (MSDS) information be captured in the hazard analysis. Critical information for all chemical constituents and possible solutions needs to be integrated into work controls. Technical understanding of solution(s) and potential reactivity as it relates to the job activity is essential.

Line managers must ensure that when the field activity deviates from expected conditions, a time out is called to identify and control the work activity and resulting hazards. During the pre-job briefing, workers need to be made aware of the hazards associated with potential chemical solutions, both planned and unplanned.

Roles and responsibilities for all aspects of the activity should be unambiguous from the planning stage, through implementation, to completion of the activity. Line managers need to ensure that all personnel involved with a work activity clearly understand their roles and responsibilities.

Discussion: On August 22, 2000, a laborer working on an environmental management technology deployment project at the Portsmouth Gaseous Diffusion Plant required hospitalization after receiving serious burns from a violent exothermic chemical reaction of sodium permanganate and sodium thiosulfate. A Type B Accident Investigation Board was appointed to determine why this accident occurred and what can be done to prevent a recurrence. The full report, documenting the results of the Board, is available electronically at <http://tis.eh.doe.gov/oversight>.

Analysis: The DOE Accident Investigation Board determined that the direct cause of the accident was that the laborer placed crystalline thiosulfate into a 5-gallon bucket that contained about 3 gallons of concentrated sodium permanganate solution. The violent release of a steam bubble generated from the exothermic reaction caused the solution to be ejected over 15 feet into the air from the 5-gallon bucket and onto the laborer causing serious burns.

Resolution: Facility managers and DOE Field Element Managers should consider the issues in this lessons learned alert and take appropriate actions as follows:

In defining the work and analyzing the hazards for activities involving chemical solutions, the facilities should:

- Ensure that the activity hazard analysis defines all basic job steps to be performed.
- Ensure that current and correct MSDS information is available and captured in the hazard analysis.
- Analyze the potential reactivity of chemical solutions associated with job activities.
- Ensure that neutralization and handling requirements are addressed.
- Ensure that roles and responsibilities are clearly defined and understood.

In developing and implementing controls for activities involving chemical solutions, the facilities should:

- Ensure that the controls and requirements are clearly stated and are implemented in the field.
- Implement appropriate personnel protective equipment requirements.
- Develop hazard controls for chemical solutions neutralization associated with job activity.
- Implement appropriate hazard communication requirements.
- Ensure that the most up-to-date technical information is utilized.

In order to perform work safely for activities involving chemical solutions, the facilities should:

- Ensure that workers are made aware of and understand the hazards associated with each chemical.
- Establish controls to ensure that incompatible materials are stored with an appropriate separation.
- Ensure that lessons learned for incidents involving chemical reactions are disseminated and appropriately incorporated into the facilities' safety program.
- Ensure that their chemical safety program encourages adherence to industry good practice guidelines for safety management of reactive chemical processes.

Descriptor: Yellow / Caution

DOE Functional Category: Conduct of Operations - Procedure Development, Work Control, Work Planning, Environmental Restoration

Hazard: Personal Injury / Exposure - Hazardous Material (General)

ISM: Analyze Hazards, Define Work, Develop / Implement Controls, Perform Work

Originator: Prakash Kunjeer DOE EH-21 Office of Special Projects

Validator: Dennis Vernon, DOE EH-21 Office of Special Projects

Contact: Brenda Hawks, Oak Ridge Operations Office, (865)576-2503, HawksBL@oro.doe.gov

ADC: NA

Reviewing Official: Chip Lagdon, DOE EH-21 Office of Special Projects

Keywords: Work planning, chemical hazards

References: ORO--ORNL-X10LIFESCI-2000-0005