

Date: Thu, 21 Sep 2000 17:57:00 -0600

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Subject: Yellow Alert: Chemical Explosion at Morton Specialty Chemicals

This lessons learned document was composed from a message distributed by the Chemical Safety Board. The full report of the United States Chemical Safety and Hazard Investigation Board investigation of this accident is available at

<http://www.chemsafety.gov/reports/2000/morton/docs/chemical-1A.pdf>.

Title: Yellow Alert- Chemical Explosion Prompts CSB to Analyze Reactive Chemical Safety

Date: September 11, 2000 Identifier: 2000-RL-HNF-0038

Lessons Learned Statement: Inadequate control of an exothermic reaction can result in serious damage to facilities, injuries to personnel, and release of hazardous materials to the environment.

Discussion of Activities: The Paterson plant of the Morton Specialty Chemical Company (now Rohm and Haas Company) manufactures a series of dye products. In April 1998, an explosion and fire occurred during the production of Yellow 96 Dye, which was used to tint petroleum fuel products. A 2,000-gallon kettle being used to produce the dye experienced an uncontrolled rapid temperature and pressure rise (runaway chemical reaction), which resulted in the explosion, injuries, and release of material into the community. Yellow 96 Dye was produced by the mixing two reactive chemicals, ortho-nitrochlorobenzene (o-NCB) and 2-ethylhexylamine (2-EHA).

Analysis: The Board concluded that the safety programs that were used by Morton for managing reactive chemical hazards did not uncover the potential for a catastrophic runaway chemical reaction in the production of Yellow 96 Dye. The Board also found that important safety information and recommendations about the hazards of the Yellow 96 Dye process discovered by Morton's United Kingdom research facility were not made known to development and production people at the Paterson facility. This resulted in design flaws and omissions in the kettle and operating instructions used to produce the dye. Investigators further determined that company training and operating procedures did not prepare operators to safely operate the process to produce the dye or to recognize hazardous situations that would require evacuation of the facility. Some of those injured had stayed near the kettle even while pressure was building uncontrollably and the vessel was rumbling and showing other signs of an impending explosion.

Recommended Actions: The Board recommended that EPA and OSHA issue joint guidelines for the management of reactive chemical process hazards. The Board noted that existing federal safety standards do not provide sufficient guidance for reactive chemical process safety in such areas as reporting and investigating deviations from normal operations, the use of chemical screening techniques, and proper design for pressure relief, emergency cooling and safety interlock systems. The Board also recommended that OSHA and EPA join the CSB, and other chemical safety organizations, including industry, in a CSB "hazard investigation" of reactive chemical process safety. Unlike an investigation of a particular incident such as the one at

Morton, the CSB hazard investigation will examine a series of related incidents to identify common incident causes so that the Board may make recommendations for preventing them in the future. This hazard investigation will result in further recommendations for preventing incidents similar to the 1998 explosion at Morton. The Board said that the CSB would seek input from interested parties regarding the design and conduct of the hazard investigation.

Estimated Savings/Cost Avoidance: N/A

Priority Descriptor: YELLOW/Caution

Work / Function: Other - Chemical Management

Hanford Functional Categories: N/A

Hazard: Personal Injury / Exposure - Hazardous Material; Environmental Release

ISM Core Function: Analyze Hazards; Develop/Implement Controls

Originator: U.S. Chemical Safety and Hazard Investigation Board

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Authorized Derivative Classifier: Not required

Reviewing Official: John Bickford

Keywords: chemical safety; runaway reaction; Yellow 96 Dye, ortho-nitrochlorobenzene (o-NCB), 2-ethylhexylamine (2-EHA).