



U. S. Chemical Safety and Hazard Investigation Board RECOMMENDATION STATUS CHANGE SUMMARY

Report:	Improving Reactive Hazard Management
Recommendation Number:	2001-1-H-XX-R1
Date Issued:	October 8, 2002
Recipient:	Occupational Safety and Health Administration
New Status:	Closed – Reconsidered/Superseded <i>(Superseded by 2021-02-I-WV-R13)</i>
Date of Status Change:	June 26, 2023

Recommendation Text:

Amend the Process Safety Management Standard (PSM), 29 CFR 1910.119, to achieve more comprehensive control of reactive hazards that could have catastrophic consequences.

- *Broaden the application to cover reactive hazards resulting from process-specific conditions and combinations of chemicals. Additionally, broaden coverage of hazards from self-reactive chemicals. In expanding PSM coverage, use objective criteria. Consider criteria such as the North American Industry Classification System (NAICS), a reactive hazard classification system (e.g., based on heat of reaction or toxic gas evolution), incident history, or catastrophic potential.*
- *In the compilation of process safety information, require that multiple sources of information be sufficiently consulted to understand and control potential reactive hazards. Useful sources include:*
 - *Literature surveys (e.g., Bretherick's Handbook of Reactive Chemical Hazards, Sax's Dangerous Properties of Industrial Materials).*
 - *Information developed from computerized tools (e.g., ASTM's CHETAH, NOAA's The Chemical Reactivity Worksheet).*
 - *Chemical reactivity test data produced by employers or obtained from other sources (e.g., differential scanning calorimetry, thermogravimetric analysis, accelerating rate calorimetry).*
 - *Relevant incident reports from the plant, the corporation, industry, and government.*
 - *Chemical Abstracts Service.*
- *Augment the process hazard analysis element to explicitly require an evaluation of reactive hazards. In revising this element, evaluate the need to consider relevant factors, such as:*
 - *Rate and quantity of heat or gas generated.*
 - *Maximum operating temperature to avoid decomposition.*
 - *Thermal stability of reactants, reaction mixtures, byproducts, waste streams, and products.*
 - *Effect of variables such as charging rates, catalyst addition, and possible contaminants.*
 - *Understanding the consequences of runaway reactions or toxic gas evolution.*

Board Status Change Decision:

A. Rationale for Recommendation

After a number of high-consequence incidents resulting from runaway chemical reactions, including the April 21, 1995, explosion and fire at the Napp Technologies specialty chemical plant in Lodi, New Jersey, which resulted in five worker fatalities, and the April 8, 1998, explosion and fire at the Morton International dye manufacturing plant in Paterson, New Jersey, which injured nine, the U.S. Chemical Safety and Hazard Investigation Board (CSB) undertook a comprehensive hazard study of reactive chemical hazard management in the United States.

In total, the CSB identified 167 serious reactive incidents in the United States between 1980 and 2001; 48 of these incidents resulted in 108 fatalities. In addition, more than half of these incidents involved chemicals not covered by existing Occupational Safety and Health Administration (OSHA) or Environmental Protection Agency (EPA) standards. While the bulk of the incidents were in the chemical manufacturing industry, 30% occurred at industrial facilities that use or consume chemicals in bulk quantities.

As a part of its hazard study, the CSB examined applicable regulations issued by OSHA pertaining to reactive hazards. The CSB concluded that OSHA's Process Safety Management (PSM) standard, 29 CFR 1910.119, applies only to single component highly reactive chemicals¹ and that 50% of the reactive incidents reviewed in the CSB hazard study were not covered under the PSM standard. The CSB also determined that existing sources of incident data -- including those at OSHA -- were not adequate to identify the number, severity, and causes of reactive incidents or to analyze incident frequency trends. Moreover, there is no publicly available database for sharing lessons learned from reactive incidents. Additionally, incident data collected by OSHA and the EPA provide no functional capability to track reactive incidents to analyze incident trends and develop preventive actions at a national level.

Consequently, the Board issued two recommendations to OSHA to address these issues. The first recommendation, CSB Recommendation No. 2001-01-H-XX-R1, asked OSHA to amend the PSM standard to achieve more comprehensive control of reactive hazards that could have catastrophic consequences. The second recommendation, CSB Recommendation No. 2001-01H-XX-R2 (R2), asked OSHA to implement a program to define and record information on reactive incidents that OSHA investigates or requires to be investigated under OSHA regulations. This status change summary addresses **CSB Recommendation No. 2001-1-H-XX-R1**.

B. Response to the Recommendation

Though, this is the CSB's oldest open recommendation, in the 20+ years since the recommendation was issued OSHA has not initiated, nor has the agency indicated its intent to initiate, rulemaking efforts that would revise the Process Safety Management standard, 29 CFR

¹ Congress specified that highly hazardous chemicals include: "toxic, flammable, highly reactive, and explosive substances" in the Clean Air Act Amendments of 1990. Section 304 of that amended Act required OSHA to promulgate the PSM standard. OSHA chose to regulate only those chemicals classified as reactive category "3" or "4" that were listed in NFPA 49, Hazardous Chemicals Data (1975 edition), as "highly hazardous chemicals."

1910.119, consistent with the CSB’s Recommendation. Additionally, recommendation has been reiterated four times since it was issued. The following is a list of the investigation reports reiterating the recommendaiton:

- AirGas Facility Fatal Explosion (2017)
- Midland Resource Recovery Explosion (2019)
- AB Specialty Silicones Explosion and Fire (2021)
- Bio-Lab Lake Charles Chemical Fire and Release (2023)

This recommendation was superseded by **CSB Recommendation No. 2021-02-I-WV-R13** from the CSB’s [Optima Belle Explosion and Fire Investigation Report \(2023\)](#).

C. Board Analysis and Decision

CSB policy allows a recommendation to be superseded when it is replaced by a new more appropriate recommendation to the same recipient and covering the same or similar issues. **CSB Recommendation No. 2001-1-H-XX-R1** was issued October 8, 2002, from the CSB’s Reactive Hazard Study. Since that hazard study was completed, the CSB has investigated 11 additional incidents involving reactive chemicals that are not covered by the PSM standard. Those incidents resulted in 28 fatalities and hundreds of injuries. **CSB Recommendation No. 2021-02-I-WV-R13** is a more appropriate recommendation in that it incorporates the lessons learned by the CSB from those incidents. This new recommendation also updates the list of references to include various published standards and guidelines for handling reactive chemicals that did not exist at the time the CSB’s Reactive Hazard Study was published or were previously unidentified.

The Board looks forward to OSHA’s cooperation in implementing the superseding recommendation. Based upon the information above, the Board voted to change **CSB Recommendation No. 2001-1-H-XX-R1** to: “**Closed –Reconsidered/Superseded.**”