

Safety Bulletin

Process Safety Information (PSI)



Introduction

Process Safety Management (PSM) is a systematic approach to managing process safety hazards in facilities handling highly hazardous chemicals. One crucial component of PSM is Process Safety Information (PSI), which provides vital data and documentation essential for understanding the hazards associated with the process. This technical safety snippet aims to elucidate the significance, content, and management of the Process Safety Information element as mandated by the PSM rule.

1. Significance of Process Safety Information (PSI)

PSI serves as the cornerstone of an effective process safety management system. It encompasses comprehensive information about the hazards, equipment, materials, and procedures involved in the process. Access to accurate and up-to-date PSI is critical for ensuring the safety of personnel, protecting the environment, and preventing catastrophic incidents such as fires, explosions, or chemical releases.

2. Required Content of Process Safety Information

The PSM rule outlines specific elements that must be included in the Process Safety Information. These elements typically encompass, but are not limited to:

- Chemical properties and hazards: Information on the physical and chemical properties of the substances handled in the process, including reactivity, toxicity, flammability, and corrosivity.
- Process chemistry: Details regarding the chemical reactions, intermediates, and by-products involved in the process.
- Maximum intended inventory: The maximum quantity of highly hazardous chemicals present at any given time in the process.
- Safe upper and lower limits: Operating parameters such as temperature, pressure, and flow rates within safe limits to prevent hazardous conditions.
- Equipment design codes and standards: Specifications of design standards, codes, and engineering practices applicable to the process equipment.
- Material Safety Data Sheets (MSDS): Detailed information on the physical and chemical properties, health hazards, and emergency procedures for the hazardous chemicals used in the process.
- Process flow diagrams: Schematic representation of the process flow, including major equipment items, interconnections, and control points.
- Piping and instrument diagrams (P&IDs): Detailed drawings illustrating the piping arrangements, instrumentation, and control systems in the process.
- Electrical classification: Classification of hazardous areas and electrical equipment based on the potential presence of flammable gases, vapors, or dust.
- Safety systems: Description and documentation of safety systems, including alarms, interlocks, relief systems, and emergency shutdown procedures.

In This Issue

This Safety Bulletin serves as a guide to understanding and implementing the Process Safety Information element required by the Process Safety Management (PSM) rule. For specific regulatory requirements and best practices, consult relevant standards and guidelines.

Safety Bulletins are published monthly and can be located on the Nebula Safety & Environmental LinkedIn page or website.

<https://www.NebulaSafety.com>

The Table below provides a breakdown of the different aspects of a process classified by type under the title of PSI.³ For more information on each of these categories, see the past safety snippets linked below.

Part I

https://www.linkedin.com/posts/nebula-safety-and-environmental_gcps-2024-activity-7167984229778141185-KHWA/?utm_source=share&utm_medium=member_desktop

Part II

https://www.linkedin.com/posts/nebula-safety-and-environmental_excerpt-from-ensuring-success-in-pha-activity-7175520173238423552-Hw1x/?utm_source=share&utm_medium=member_desktop

Process Information Pertaining to...		
Chemical Hazards	Technology of the Process	Process Equipment
Toxicity Information	Block Flow Diagram	Materials of Construction
Permissible Exposure Limits	Process Chemistry	Piping and Instrumentation Diagrams
Physical Data	Maximum Intended Inventory	Electrical Classification
Reactivity Data	Safe Operating Limits	Relief System Design and Design Basis
Corrosivity Data	Consequences of deviation	Ventilation System Design
Thermal and Chemical Stability Data		Design Codes and Standards Employed
Hazards of Mixing		Material and Energy Balances
		Safety Systems

Table 1: Process Safety Information Classification

Additionally...

- The employer shall document that equipment complies with recognized and generally accepted good engineering practices.
- For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.³

3. Management of Process Safety Information

Effective management of Process Safety Information is essential to ensure its accuracy, accessibility, and relevance. This involves:

- Document control: Establishing procedures for the creation, revision, review, and approval of PSI documents to maintain accuracy and consistency.
- Accessibility: Ensuring that relevant personnel have access to the required PSI documents when needed for operational, maintenance, or emergency purposes.
- Training: Providing training to employees on how to interpret and utilize the information contained in PSI documents effectively.
- Periodic review: Conducting regular reviews and updates of PSI to reflect changes in process conditions, equipment, materials, or regulations.
- Change management: Implementing a robust change management process to assess and mitigate the impact of modifications to the process on safety and to update PSI accordingly.

Related Incident

Milling Company Explosion and Fire

In 2017, a corn dust fire at a grain milling facility resulted in a series of combustible dust explosions resulting in 5 employee fatalities and injuring another 14. The initial fire began when process equipment set fire to corn dust. The fire subsequently spread through the process, eventually leading to a dust explosion. This explosion caused dust to disperse into the air throughout the facility resulting in subsequent dust cloud explosions.



Figure 1: Didion Milling Company's Cambria Wisconsin Facility following May 31, 2017 Dust Explosion²

At the conclusion of their investigation, the United States Chemical Safety Board (CSB) noted a number of factors that contributed to the incident and its serious consequences.

Among the causes, the report noted that the facility did not maintain key process safety information, such as deflagration engineering control design documentation, dust collector design information, or dust explosibility data. This allowed the facility to make process changes without critical information, resulting in overlooking considerations related to potential hazards. This contributed to an “interconnected and unprotected design that allowed explosions and propagations to go unmitigated during the incident.”¹

Alongside updates to PSI tracking and development, the CSB recommended that the facility incorporate recording any paper-based process safety information into their existing electronic records management system so that the information can be reliably retained, retrieved, and analyzed in the event of a catastrophic incident damaging physical information.¹

Conclusion

Process Safety Information is a fundamental element of Process Safety Management, providing essential data and documentation for understanding and mitigating process hazards. By ensuring the completeness, accuracy, and accessibility of PSI, organizations can enhance process safety, protect personnel and the environment, and prevent catastrophic incidents.

References:

1: <https://www.csb.gov/file.aspx?DocumentId=6240>

2: <https://www.justice.gov/opa/pr/corn-milling-company-officials-sentenced-federal-prison-their-role-deadly-explosion-killed#:~:text=On%20May%2031%2C%202017%2C%20at%20around%2010%3A30%20p.m.%2C,and%20caused%20the%20collapse%20of%20multiple%20mill%20buildings.>

3: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.119>