

Health & Safety: Process Safety

Process Safety

What is Process Safety? Process Safety Management (PSM) is recognized as Good Manufacturing Practice. In many countries PSM is covered by specific regulations. The general intent of PSM is to provide safe processes that define and manage risk based on common management practice designed to identify and mitigate hazards.

Important Definitions

Process:

Any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or on-site movement of such chemicals, or combination of these activities.

Highly hazardous chemicals (HHC):

Those chemicals possessing toxic, reactive, flammable or explosive properties.

What is Included in PSM?

- Personal safety
- Safety of the (manufacturing) process
- Management systems
- Technology
- Loss prevention
- Risk management
- Risk communication
- On-site concerns

OSHA PSM Expectations

- Performance-based results (“Show me—Don’t just tell me”)
- Risk-based criteria (have a plan for understanding and addressing concerns)
- General duty and obligation (provide safe work environment)
- Loss prevention (security for physical assets and inventories)
- Responsible care for site, people and environment

13 Key Elements of PSM & Overview of Each Element

1. **Management support and employee participation:** written plan, employee consultation, access to process hazard analysis (PHA), education and awareness, communication incident investigation
2. **Process safety information:** process information, process flow and piping and instrument diagrams (P&I diagrams), process chemistry, hazard information of chemicals, maximum inventory, safe upper and lower control limits, consequences of deviation from safe limits, toxicity data, permissible exposure limits (PEL's), reactivity data, corrosivity data, thermal and chemical stability data, equipment description, electrical classification, relief systems design basis, etc.
3. **Operating procedures:** clear written instructions for initial start-up, normal operation and normal shutdown, safety systems and their functions, document control and update of procedures, etc.
4. **Training:** initial training before operating the process, periodic refresher training, communication of change, contractor training, verification of understanding, employee feedback, documentation of training, etc.
5. **Process hazards analysis (PHA):** initial PHA before start of process and periodic review of PHA thereafter, using methodologies such as What-if, Check list, Failure mode and effects analysis-FEMA, Fault tree analysis-FTA, haz-op (hazards and operability), PHA for management of change
6. **Mechanical integrity:** written procedures to maintain mechanical integrity of (critical) equipment including pressure vessels and storage tanks, piping systems, pumps, relief and vent systems, emergency shutdown systems, controls, alarms, sensors, and interlocks, training for maintenance activities, inspection and testing program, quality assurance program, etc.
7. **Management of change:** written procedure to document technical basis for requested change, impact on safety and health, modifications to operating procedures, necessary time period for the change, authorization requirements
8. **Contractor expectations:** use contractor's safety record as part of selection process; inform contractors of potential process hazards; explain facility's emergency plan; control entrance, presence and exit; evaluate contractor safety performance; maintain injury/illness log for contractors
9. **Conventional safety systems/programs:** fire prevention and protection, hot work permit, line break permit, confined space entry permit, electrical lock-out/tag-out

procedure

10. **Pre-startup safety review:** required for new or modified facilities before introducing any highly hazardous chemical in the process to verify that construction and equipment are in accordance with design specifications, safety, operating and emergency procedures are in place, PHA's have been conducted and recommendations addressed, employees have been trained
11. **Incident investigation:** start investigation within 48 hours, appropriate team composition, report to include date of accident, date and time investigation began, description of incident, contributing factors, causes, recommendations, retain report for 5 years
12. **Emergency planning:** plan to include procedures for handling both large and small releases, drills and training, escape procedures and route assignments, procedure for employees who remain to operate critical equipment, procedures to account for employees after evacuation, rescue and medical duties, means of reporting fires and other emergencies, names and titles of persons to be contacted for further information
13. **PSM quality audits:** conduct at least every 3 years, team should include at least one person knowledgeable in the audit process and one person knowledgeable in the manufacturing process, prepare report of findings, determine response to each finding and track to completion, retain copies of two most recent reports

Managing Risks

- Risk reduction can be accomplished by lowering the probability an incident will occur ("prevention" approach) or reducing the consequences of occurrence ("mitigation" approach) or a combination of both
- It is generally preferred to try and prevent a risk from occurring before trying to mitigate the risk.
- A cost-benefit analysis (comparing the extent of risk reduction and the cost to implement changes) can help identify and select cost effective options for risk reduction that will best serve the goals of ensuring safety in the workplace.