Pure Blue
GAS & EQUIPMENT

PROCESS SAFETY MANAGEMENT

What You Need to Know for Your Plant
+ Implementation Checklist

OCTOBER 2016

INTRODUCTION TO PROCESS SAFETY MANAGEMENT

For any industry using highly hazardous chemicals (HHC) in routine operations, unexpected releases of toxic or reactive liquids and gases create the possibility of catastrophic incidents. Process controls and equipment safeguards are more complex; bringing new and unforeseen risks that can hamper operations and increase hazardous incidents if left unchecked. In accordance with OSHA requirements, plant owners must develop, revise and retain written process safety information and operating procedures and make them available for employees and regulatory authorities.

Process safety management (PSM) is a proactive method used to: identify, evaluate, mitigate or prevent chemical releases to target hazardous chemicals that have the potential to cause catastrophic incidents. The PSM serves as a framework for maintaining the integrity of operation procedures and processes involving HHC to minimize risks and prevent catastrophic incidents that could result in serious injury, property damage, lost production and detrimental environmental impact.

THE ELEMENTS OF PROCESS SAFETY MANAGEMENT

Process safety management is focused on reducing the frequency and severity of incidents that could expose employees to serious hazards. The PSM applies to companies dealing with any of more than 130 specific toxic and reactive chemicals in listed quantities, including flammable liquids and gases in quantities of 10,000 pounds or more. As defined by OSHA 1910.119, the PSM standard is comprised of 14 elements that employers are required to implement.

1. **Process Safety Information.** Compile written documents that clearly identify workplace chemical and process hazards as well as the equipment and technology used in the processes.
2. **Employee Involvement.** Establish a plan of action to encourage employee participation by creating a system that facilitates the flow of information and communication.
3. **Process Hazard Analysis.** Conduct thorough workplace hazard assessments to determine potential sources of endangerment and the safeguards to implement to prevent unwanted releases of HHC.
4. **Operating Procedures.** Develop and implement written documents for chemical processes, including procedures for operating phases and limitations to ensure safe work practices.
5. **Training.** Provide sufficient employee training in process and operating procedures. Initial training includes specific safety and health hazards, emergency operations and safe work practices as applicable to job tasks.
6. **Contractor.** Ensure contract employees are provided with necessary process safety information documents and training.
7. **Pre-Startup Safety Review.** Conduct reviews for new facilities, modified work sites and newly installed or modified equipment.
8. **Mechanical Integrity.** Establish systems for maintaining the integrity of crucial equipment through written procedures, employee training, inspections and equipment testing.
9. **Hot Work Permits.** Issue permits for hot work operations conducted on or near a covered process. The hot work permit indicates the dates authorized for this non-routine work and the objects on which hot work will be performed.
10. **Management of Change.** Develop written procedures covering changes to technology, equipment, facilities and process chemicals.
11. **Incident Investigation.** Establish a knowledgeable investigation team to review and report on incidents and take corrective actions based on report findings.
12. **Emergency Planning and Response.** Train employees and contract workers in emergency response procedures as required by the regulation promulgated pursuant to section 126(d) of the Superfund Amendments and Reauthorization Act.
13. **Compliance Audits.** Evaluate and verify that procedures and practices are being followed according to the PSM standard.
14. **Trade Secrets.** Grant access to necessary information to employees as it pertains to their responsibilities within the PSM standard, without regard to trade secret status. OSHA does not restrict employers from requiring employees to enter into confidentiality agreements.

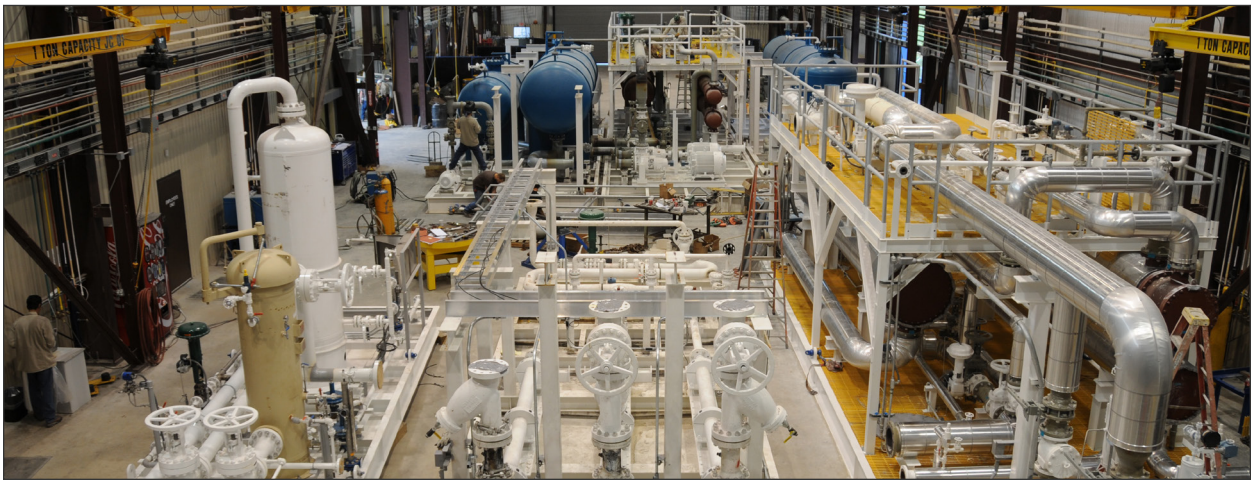
HOW PROCESS SAFETY MANAGEMENT WORKS

Process safety management begins with compiling the process safety information (PSI) documentation on process chemicals, technology and process equipment design—including complex and simplified diagrams of process flow, construction materials, temperature, equipment and major components and key utilities. The PSI must be completed prior to conducting a hazard analysis and serves as a comprehensive guide for implementing the rest of the OSHA requirements.

The PSI is necessary to devise training programs and operating procedures and in conducting the process hazard analysis, pre-startup safety reviews and compliance audits. PSI documentation should be made available to employees and contractors working with processes, along with insurance and enforcement officials and local emergency preparedness planners. As the PSI may contain trade secrets, recipients can be asked to sign a non-disclosure agreement.

Performed by a team of engineering and process operations experts with extensive knowledge of codes, standards, specifications and regulations applicable to the process, the process hazard analysis (PHA) evaluates equipment and instrumentation, utilities, human actions, the size and complexity of the process and the operating history of the process to identify potential hazards, such as causes and results of fires, spills of hazardous chemicals or releases of toxic or flammable chemicals. Based on findings, the PHA team makes recommendations for corrective action and improvements for operational control of processes. After the completion of the initial PHA, hazard assessments must be conducted every five years, or with the introduction of a new or modified process.

Standard operating procedures provide detailed instructions on carrying out procedures—performing tasks, recording data, maintaining operating conditions, collecting samples—while taking safety and health precautions. It covers human action as well as computerized process control systems, which add complexity to operating instructions and need to describe the logic of the software as well as the relationship between the equipment and control system. The operating procedures standard should be technically accurate, understandable and revised periodically to reflect current operations.



To develop a strong safety culture in the workplace, training programs must provide employees with ample skills and knowledge in subjects ranging from safe work practices and operating procedures to emergency evacuation and response. Training can take the form of classroom instruction or hands-on simulated situations, the latter being more effective in teaching correct procedures while demonstrating the consequences of not following established operating procedures. In addition to safety orientation and job specific training for employers, training information should be readily available for contractors and contract employees to ensure safety procedures are followed. Training programs should be re-evaluated periodically and revised as processes and procedures change.

When a new change in equipment or process technology is introduced, regardless of size, proper documentation and review must be conducted to ensure that safety and health considerations are incorporated into the new operating procedure or process. Management of change covers modification to equipment, raw materials and any processing conditions other than “replacement in kind.” Temporary and permanent changes are subject to PHA and mechanical integrity reviews to assure compliance with the PSM, which would in turn be revised to include changes to procedures and processes.

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Similar to the management of change system, pre-startup safety reviews are required for new or modified facilities to confirm that construction and equipment meet design specifications, this includes:

1. Putting procedures covering safety, operating, emergency and maintenance into place.
2. Completion of PHAs and any or all facility modifications to meet requirements, as well as safety training.

HOW TO DEVELOP A WRITTEN SAFETY PROGRAM

A company safety manual is the best way to make PSM materials available to those working with the processes. Start with this basic outline, using the OSHA standard and applicable industry standards as a guide to developing a customized safety manual.

Section One

- **Purpose –** A short statement regarding company safety culture.
- **Policy –** Conveys management support and intentions for the safety program.
- **Responsibilities –** Details the roles of management, supervisors and employees in routine and emergency operating procedures.

Section Two

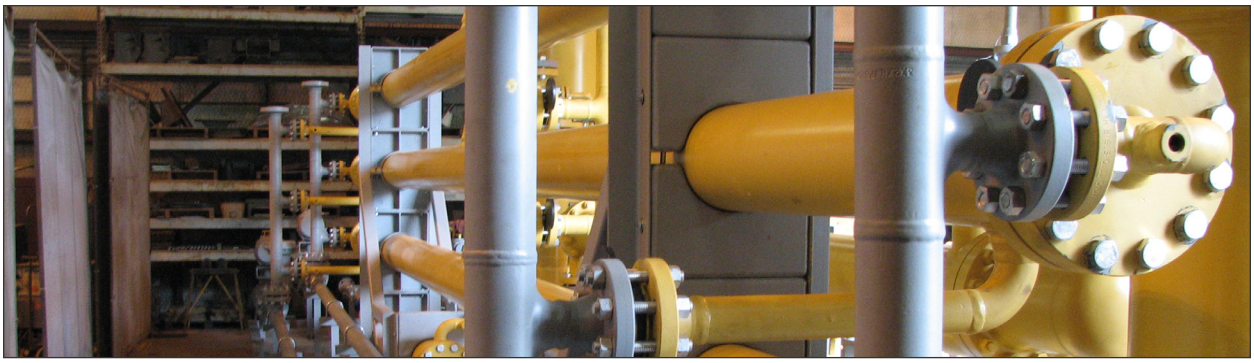
- **Training –** Covers the types of training (classroom, on-the-job or simulation) required for management, supervisors and employees, including how often training sessions are conducted and special certifications required to successfully complete in-house training.
- **Record-Keeping –** Identifies forms and documents to be used for audits, inspections and training and rules for submitting reports and filing paperwork.
- **Audits and Inspections –** Covers monitoring procedures and procedures for corrective action and program improvement.

Section Three

- **Hazards –** A comprehensive list of specific hazards, including descriptions of hazards and physical locations of hazards within the facility.
- **Hazard Controls –** An overview of hazard controls, which contains sub-sections covering the controls used to eliminate or control process hazards:
  - Engineering Controls cover the safeguards for equipment, machinery, monitoring devices.
  - Administrative Controls detail the use of procedures, assessments and inspections to identify hazards and take corrective action.
  - Training Controls review procedures for safety training programs.
- **Rules and Procedures –** Details safety procedures in routine work as well as emergency planning and response action plans.

PSM CHECKLIST FOR OPERATION MANAGEMENT

Take the next steps to launch an effective process safety management system with an implementation checklist. Keep track of the progress through the main phases of program development.



Phase One
Compile Information

		✔
1.	Identify equipment and technology used in the process	☐
2.	Identify hazardous chemicals handled in the process	☐
3.	Determine the risks and consequences of chemical release	☐
4.	Assign responsible teams to develop and implement each program element	☐
5.	Respond to PHA findings	☐

Phase Two
Prepare for Implementation

1.	Develop a comprehensive training system based on operating procedures	☐
2.	Create a paper trail to document every piece of equipment, technology and process in use as well as changes implemented, inspections, investigations and reports	☐
3.	Encourage employee feedback and reports on normal and abnormal situations	☐
4.	Identify opportunities for program improvement	☐
5.	Distribute company safety manual	☐

Phase Three
Post-Implementation Status Check

1.	Conduct audits of procedures, technology, equipment and employees	☐
2.	Schedule safety drills for emergency preparedness and response	☐

Effective process safety management ensures the proper development of plant procedures and systems to prevent unwanted releases and harmonize the flow of information to enhance process design practices and prevent incidents. Combined with effective management and leadership, PSM can boost employee safety and morale and improve productivity, stability and the quality of output of HHC processes.

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Interested in working together?
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