

Process Safety **MANAGEMENT**

Facilitator Guide

*Solving
the
Puzzle*



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Overview

The following sections provide detailed information, discussion topics and review questions for each of the 14 elements of Process Safety Management, or PSM. The roles, job functions and responsibilities of the group being trained will determine the depth and scope of information covered for each element.

The objective of PSM is to prevent catastrophic incidents caused by the uncontrolled release of highly hazardous chemicals. Process Safety Management can accomplish this goal through a systematic approach that includes identifying, analyzing and controlling the chemicals in the process.

To be effective, Process Safety Management requires the participation of all personnel at your facility. This includes the plant manager, supervisors, engineers, operators, mechanics and even contractors. Each person needs to contribute his or her specific expertise, whether it is experience, technology or process knowledge.

Getting Started

Training Materials

Collect all of the necessary materials and supplies before training begins. Here are some suggested materials and supplies:

- A training location that is free of distractions, has good lighting, and a comfortable temperature.
- Desks and chairs arranged so that everyone will be able to see the viewing screen, the facilitator, and each other.
- The video, a VCR, and a TV with a remote. Make sure the video is rewound.
- An employee handbook and pen/pencil for each trainee. Each handbook includes a quiz at the back, which can be used to test comprehension and document training.
- Other supplies and equipment you may need are: blackboard chalk, paper, handouts, transparencies, overhead projector, markers, notepads, etc.
- Additional information, such as a copy of the regulation or other reference tools.

Getting Started continued

Preparation

A successful presentation requires preparation and planning. Give yourself several days before the training session to get organized.

- Locate and schedule the training site as soon as possible.
- Notify trainees of the training date and time, the training schedule, and proper dress.
- Obtain all necessary equipment and supplies.
- Make sure you know how to operate the TV, VCR, and other equipment. Check to ensure that it is working properly. Replace or repair any damaged equipment.
- Review all training materials, including the Facilitator's Guide, handouts, and any other reference materials.
- Prepare your presentation, including a lesson plan or outline of the training. Include the training goals and objectives. Some presentation guidelines are included on the next page. A sample lesson plan has been included on page f of this Facilitator's Guide.
- A day or so before conducting the training session, you may want to have participants take the quiz as a pre-test. The results of this test can help you to determine weak areas to focus on during the training session.
- Preview the videotape. Note any key points you want to expand upon in your training.

Presentation Guidelines

How you present the training course can have a great impact on learning. By following these simple presentation guidelines and keeping your objectives in mind, you can effectively and efficiently get the most out of your training session.

Organize Training Time Efficiently

In today's busy work climate it can be difficult to find the time needed for training, so it is important to be organized and well-prepared when you do schedule training sessions. Whether you use Summit's suggested lesson plan or not, it is important to have a lesson plan prepared that you can implement comfortably. This ensures that time spent in training is productive and beneficial for everyone.

Stress the Purpose and Goals of Training

Training needs to be goal-oriented. State the purpose of training in a clear, specific manner - whether it's to reduce injuries, increase production, improve quality, improve working conditions, etc. Review the goals and objectives of the training so trainees know what is expected of them.

Capture Their Attention

Training needs to be interesting and compelling to hold trainees' attention. To help motivate learners, give them specific evidence that their effort makes a difference and provide feedback on their progress. Also, remember that the first experience with a new subject usually forms a lasting impression on the learner. By making that experience a positive one, you can help ensure your audience retains the information learned.

Presentation Guidelines continued

Make New Learning Experiences Pleasant

For some adults, past experiences with education were unpleasant and not helpful. Adults learn best when they feel comfortable. By making the learning environment open and friendly, you can help adults to feel secure in their new learning experience. Offer support and feedback as often as possible, and be ready to provide extra attention to those who may require it.

Ask If There Are Any Questions

When most adults learn new information that conflicts with what they already know, they are less likely to integrate those new ideas. It is very important to make sure participants fully understand the training and do not have any unresolved questions. Provide for a question and answer period so participants can resolve those questions and/or answer questions throughout the training session.

Lesson Plan

As a qualified trainer, your job is to effectively communicate a great deal of information in a well-organized manner. By preparing a lesson plan, you can ensure that each minute of the training session is productive. Summit has provided a suggested lesson plan for your use.

1. Program Objective

This guide reviews *Process Safety Management*. In it, we will cover:

- Employee Participation
 - Process Safety Information
 - Process Hazard Analysis
 - Management of Change
 - Pre-Startup Safety Review
 - Operating Procedures
 - Hot Work Permits
 - Employee Training
 - Incident Investigation
 - Mechanical Integrity
 - Emergency Planning & Response
 - Contractor Safety
 - Audits
 - Trade Secrets
-

2. Show the Video: “*Process Safety Management*”

3. Discussion and Demonstration

To help relate the training to your site, you may wish to incorporate your own discussion topics and exercises. Key issues you might consider include:

- Discuss your facility’s procedures for conducting the various elements of Process Safety Management
- Employee training required
- Safe work procedures

Lesson Plan continued

4. Use Handbooks to Reinforce Training

The handbooks increase comprehension and reinforce the information learned in the video program by explaining the main points and expanding on the original material. For increased employee information retention, go over one section at a time and stop to answer questions. The quiz at the back of the Facilitator's Guide is provided to document employee training. Answers to the quiz are in bold.

5. Questions and Answers

Provide for a Q&A session to answer any questions. It may be necessary to review some of the material when providing answers. The employee handbook, equipment manuals, and other reference tools may be helpful.

Frequently Asked Questions

Is there a procedure that must be followed when there is a change in the process?

All changes, including those that are temporary, are required to be documented. These written procedures must include authorization requirements for the proposed change, the technical basis for the change, health and safety considerations, changes required for operation and maintenance procedures and the time period for the change. A Pre-Startup Safety Review must be performed if the change is significant enough to require a modification in the Process Safety Information. This should be done after the change and before hazardous chemicals are introduced into the process.

What is an Incident Investigation Team and what is its purpose?

The job of the Incident Investigation team is to investigate incidents that resulted or could have resulted in a catastrophic incident. Members of this team include personnel who must be proficient in investigative, fact finding and reporting skills and the process involved. At the end of the investigation, they must compile a report containing the description of the incident and the date it occurred, the date the investigation began, a description of the investigation and findings of the factors that contributed to the incident.

Introduction

Processes that use highly hazardous chemicals could cause danger to you and damage to the facility and the surrounding community if an explosion, spill or fire happened in the work place.

This has been demonstrated with recent explosions that have been highlighted in the news in the past few years.

Objective

The objective of Process Safety Management, or PSM, is to prevent any incidents which could lead to property damage, major injuries or even death. This overview of PSM will help you

see how your job fits together with the other elements of PSM. By following procedures for PSM and respecting the potential hazards, you can prevent incidents in your facility.

There are 14 elements in Process Safety Management:

- Employee Participation
- Process Safety Information
- Process Hazard Analysis
- Management of Change
- Pre-Startup Safety Review
- Operating Procedures
- Hot Work Permits
- Employee Training
- Incident Investigation
- Mechanical Integrity
- Emergency Planning & Response
- Contractor Safety
- Audits
- Trade Secrets

Employee Participation

A written plan of action is needed which details employee participation in the process.

Your participation in the different elements of PSM is important. Whether it is your knowl-

edge, work experience, training or education, your participation is a valuable part of its success.



Process Safety Information

Written Process Safety Information is needed.

There are three kinds of Process Safety Information:

- Information on the process chemicals
 - Information on the process technology
 - Information on the process equipment
-

Process Chemical Information

Process Chemical Information includes toxicity, permissible exposure limits (PELs), physical data, reactivity, corrosion and erosion effects, thermal and chemical stability and the potential effects of accidental mixing of different chemicals.

Process Technology Information

This information includes a block flow diagram or simplified process flow diagram showing the flow of the material and process chemistry. Process Technology Information also includes an evaluation of the results of a change, the

inventory of chemicals used, and safe upper and lower limits for variables such as temperature, pressures, flow and composition.

Process Equipment Information

Process Equipment Information includes the materials of construction, piping instrument diagrams, electrical classification, design codes and standards used, safety systems, and relief and ventilation system designs. Newer processes will also include material and energy balances. Documentation will verify equipment follows generally accepted good engineering practices.

Process Hazard Analysis

An investigation team will perform an initial Process Hazard Analysis.

Process Hazard Analysis (PHA) is a way of thinking of all the possible things that could go wrong in the process that would result in a catastrophic incident. If you conduct a PHA, there are four main steps you need to follow:

1. Identify possible problems in the process
2. Identify possible causes and results

3. Develop prevention techniques
4. Evaluate the current system and operations

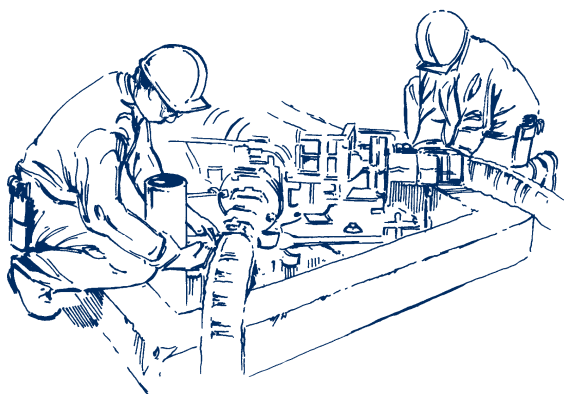
Process Hazard Analysis is conducted by plant personnel who are knowledgeable in engineering, the process being analyzed and/or the methodology being used.



Management of Change

Written procedures are needed to manage changes to process chemicals, technology, equipment, procedures, and also to facilities that affect a covered process. Even temporary changes are subject to management of change.

Changes in process technology include changes in the flow route. Changes may also happen in production rates, operating conditions to improve yield and quality, and to equipment.



"Replacement in kind" is not considered change. For example, if you replace a valve in the process with one that has the

same design, it would not be considered a change in the process.

Written procedures should accompany all changes. This should include:

- Time period for the change
- Technical basis for the change
- Health and safety considerations
- Authorization for the proposed change
- Changes required for operation and maintenance procedures

Follow-up should be performed to see if the change requires any changes to the process safety information and/or process hazard analysis.

KEY POINT

Follow-up to see if the change requires any changes to the process safety information and/or process hazard analysis.

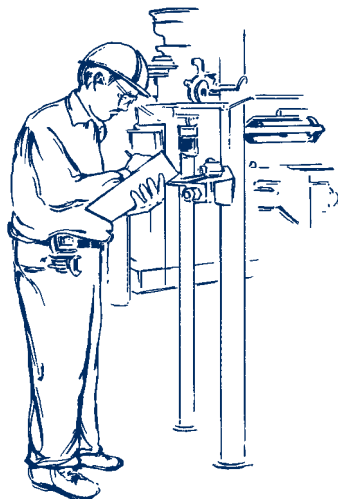
Pre-Startup Safety Review

A pre-startup safety review needs to be performed for new and modified facilities when the modification requires a change in the process safety information.

A pre-startup safety review is a final check to make sure all steps have been taken to ensure safe operation of the process.

Before hazardous chemicals are put into the process, the pre-startup safety review will make sure that the following have been done:

- All construction and equipment meet design requirements.
- For new facilities, a process hazard analysis has been performed and any recommendations have been resolved or carried out before start-up.
- Safety, operating, maintenance and emergency procedure meet all requirements and are in place.
- Training of each employee involved in operating a process has been completed.



Operating Procedures

Written operating procedures are needed to provide clear instructions for safely conducting all activities in the process.



The operating procedures describe in detail the duties to be performed and operating conditions kept for each part of the process.

This includes steps for startup, operating procedures for normal, temporary and emergency situations, and emergency and normal shutdown procedures.

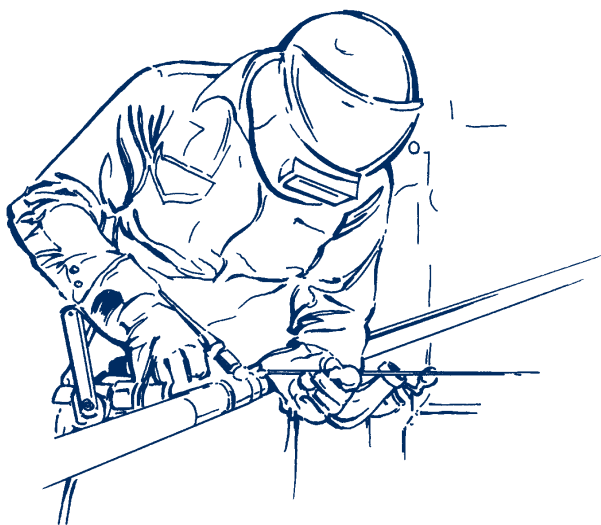
The procedures spell out operating limits for each part of the

process, results of deviation and how they can be avoided and corrected if they do happen.

Operating procedures also include health and safety provisions, data that needs to be recorded, the built-in safety systems in the process, safe work practices for procedures that affect the process such as a lock-out and tagout, and what constitutes upset conditions.

Hot Work Permits

A hot work permit is required for hot work jobs carried out on or near a covered process.



Hot work includes any spark-producing activities, devices and open flames such as welding, soldering or grinding. The permit provides the following information:

- Identity of the object that the hot work is being done on.

- Dates the work is authorized for.
- Fire prevention and protection requirements.

All affected personnel, such as operators, should be notified of the hot work. The permit must be kept on file until the hot work is done.

Employee Training

Employees involved in the process will be trained on an overview of the process and their specific job function as it relates to the process.

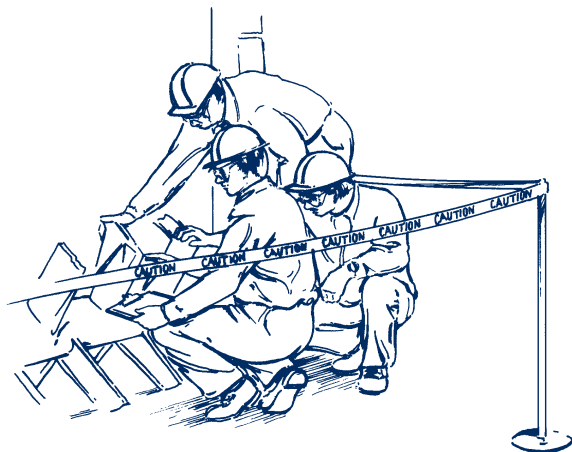
Refresher training and documentation is necessary at least every three years.

If you are involved with the process, directly or indirectly, it is important that you understand the safety and health haz-

ards of the chemicals and the process. This includes operators, maintenance and support personnel, and outside contractors.

Incident Investigation

Any incident or near miss that ended in or could have resulted in a dangerous release of a highly hazardous chemical in the work place should be investigated within 48 hours of the event.



Objective

The objective of the incident investigation is to find possible causes of all incidents or “near misses” and solutions to prevent them from happening again.

The Investigation Team

The investigation team should be skilled in investigating, fact finding and reporting skills, and the process involved.

If the incident involved a contract employee, then the team must have a contractor representative.

The team’s job is to analyze all possible causes of the incident, gather a list of the sequence of events, and determine the cause of incident.

Finally, the investigation team puts together a report that is shared with all personnel involved in or affected by the incident.

The report must have the following information:

- A description of the incident and the date it happened
- The date the investigation began
- A step-by-step description of the investigation
- The investigation team's findings of the factors that led to the incident
- Recommendations to eliminate chances of a similar incident occurring in the future.

KEY POINT

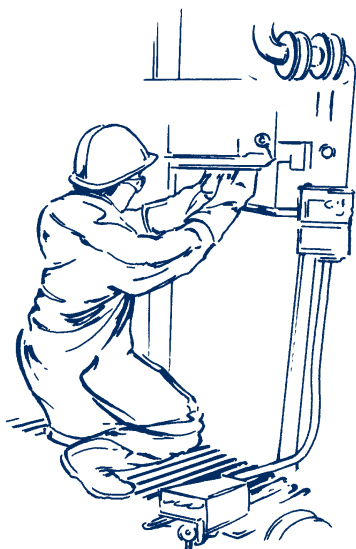
The team's findings and recommendations are detailed in a written report.

Mechanical Integrity

The Mechanical Integrity of process equipment must be maintained.

Maintaining mechanical integrity means making sure that process equipment operates the way it is designed to without any problems. A mechanical integrity program includes the following:

- Develop and use written maintenance procedures
- Train maintenance personnel
- Set up and document testing and inspection procedures
- Correct equipment defects
- Assure quality of new equipment, materials and parts



A quality assurance system is also a part of the PSM program because it helps to keep the integrity of the process by making sure proper materials are used and the right codes, standards and procedures are followed.

Emergency Planning & Response

An Emergency Action Plan for the whole plant should include procedures for handling small releases.

An Emergency Action Plan should include arrangements for warning and clearing all personnel from the facility if a major accidental release of highly hazardous chemicals happens.

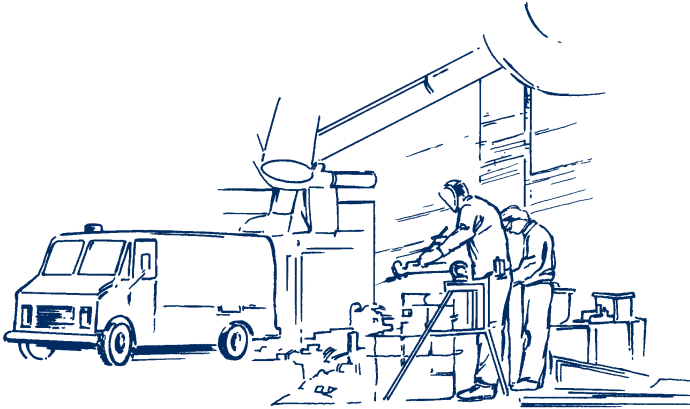
Additional training for cleanup teams will be provided. This should include safe work practices and steps for cleanup and disposal of hazardous chemicals.

Plans and procedures are also needed for the handling of small spills.



Contractor Safety

The safety record of a contractor should be checked. The contractor will need to train his employees on the safe work practices and safety rules of the facility, the potential hazards involved, and the Emergency Action Plan.



The safety record and training program of a contractor must be verified **BEFORE** the job is awarded. This includes any maintenance, repairs, turn-around jobs, major renovations or specialty work.

BEFORE the contractor begins work in the process area, all contract employees should be told about the possible hazards, safe work practices, and the Emergency Action Plan.

The contractor must train his or her employees on safe work practices and document that training was given and understood. The contractor is responsible for making sure his or her employees follow all safety rules and for telling the facility about any safety hazards that the contract work might cause or that his employees identify.

Audits

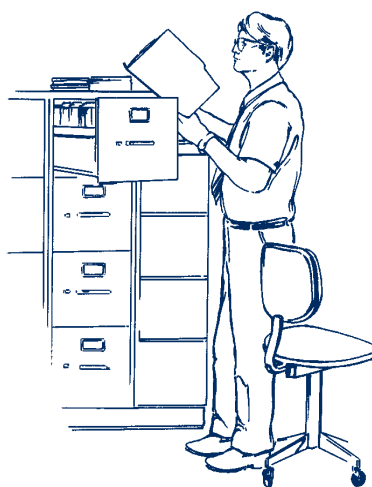
To make sure that evaluations of the Process Safety Management system are carried out and proper procedures are being followed, an audit will be completed at least every three years.

An audit is a way of checking to make sure that all elements of PSM are being followed and meeting their goals.

It is done by at least one person who is knowledgeable in the process.

The audit is usually done with a checklist and includes a review of logs, records and visual observations and inspections.

The most important part of the audit is a follow-up on all recommended actions to improve PSM at your facility.



Trade Secrets

Your employer will make available to proper personnel any information needed to comply with the standard.

All information needed for gathering process safety information, developing process hazard analysis and operating procedures, conducting incident investigations, emergency response and planning, and audits should be made available

to the proper personnel.

If this information is made available to you, you may be required to enter a confidentiality agreement if it involves trade secrets.

Test Yourself With This Process Safety Management Quiz

Your Name

Date

1. Process safety information includes information on which of the following?
 - A. Audits
 - B. Employee training
 - C. Process technology
 - D. None of the above
2. The four main steps in process hazard analysis are identifying potential problems, identifying probable causes and consequences, prevention techniques and evaluation of current system and operations.
 - A. True
 - B. False
3. A methodology used to conduct a process hazard analysis is:
 - A. Family tree diagram
 - B. What-if/checklist
 - C. Fault tree analysis
 - D. Both B and C
4. Management of change occurs when there are changes in process chemicals, technology, equipment, procedures or facilities.
 - A. True
 - B. False
5. Which of the following information should be documented when a change in the process takes place?
 - A. Technical basis for the change
 - B. Changes required for operation & maintenance procedures
 - C. Health & safety considerations
 - D. All of the above
6. A pre-startup safety review should be performed after hazardous chemicals have been introduced into the process.
 - A. True
 - B. False

7. What operating guidelines do the operating procedures spell out?
 - A. Temperature ranges
 - B. Hazard limits
 - C. Flow rates
 - D. Both A and C
8. Hot work permits do not always need to identify the object on which the hot work is being performed.
 - A. True
 - B. False
9. Refresher training for employees must be provided how often?
 - A. Every year
 - B. At least every three years
 - C. Once a month
 - D. Never
10. Incident investigations should begin within 48 hours of the incident.
 - A. True
 - B. False
11. Maintaining mechanical integrity means that equipment is kept in good operating conditions and proper procedures are followed.
 - A. True
 - B. False
12. The standard requires employers to establish and implement written operating procedures that must address steps for each operating phase.
 - A. True
 - B. False
13. The contractor does not have to train employees on:
 - A. Rescue procedures
 - B. Safe work practices
 - C. Potential hazards
 - D. Provisions of the emergency action plan
14. The employer must conduct evaluations of the process safety management system at least every three years.
 - A. True
 - B. False
15. The employer must make available to the proper personnel all necessary information to comply with the standard without regard to possible trade secret status of the information.
 - A. True
 - B. False

Quiz Answers

1. C Process technology
2. A True
3. D Both B and C
4. A True
5. D All of the above
6. B False
7. D Both A and C
8. B False
9. B At least every three years
10. A True
11. A True
12. A True
13. A Rescue procedures
14. A True
15. A True

Notes



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