Introduction to Process Safety Principles

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Contents

- What is Process Safety?
- Standards and Rules
- Resources for a Young Professional (YP)

What is Process Safety?

Industry Success:

- **Illness and injury statistics now dominant metric.**
- **Industry has driven down rate**

Personal Safety is:

- Classic worker health and safety
- 'Slips, Trips, and Falls'
- Protective Equipment
- Hot work permits
- Industrial Hygiene

What is Process Safety?

Process Safety is:

- Major Accident Prevention
- Fires, Explosions, Toxics
- Accidental chemical releases
- Unintended reactions

Industry success:

- New or modified standards and practices covering process safety, instrumentation and controls, mechanical integrity, operator procedures, and management systems.

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Process Safety - On-shore

- Federal Agency
  - Occupational Safety and Health Administration (OSHA)
- Promulgated – 1990
  - Clean Air Act Amendments
- Standard
  - OSHA 1910.119 "Process Safety Management (PSM) of Highly Hazardous Chemicals"
- Applies - now
  - Locations with specific chemicals and quantities

Process Safety – Offshore – Outer Continental Shelf

- Federal Agency
  - US Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE)
- Ruling - Sept. 2010
  - Workplace Safety Rule on Safety and Environmental Management Systems (SEMS)
- Standards
  - API RP 75
  - 30 CFR Part 250, Subpart S
- Applies - Comply by Nov. 15, 2011

Practical Limitation:

This presentation cannot cover all elements of PSM or SEMS.

Everyday Impact of PSM

- Process Safety Information – OSHA PSM
  - Safety and Environmental Information - API RP 75
- Operating Procedures
- Hazard Analysis
- Management of Change
- Pre-Startup Safety Review
- Mechanical Integrity
  - Quality Assurance/Mechanical Integrity - API RP 75

Process Safety Information (PSI)

- Timing - Written prior to hazard analysis and thereafter part of MOC
- Resource - Process Technology, Equipment, and Chemical Hazard Information

Process Flow Diagram	P&IDs	Materials of Construction
Safe Operating Limits	Relief System	Thermal and Chemical Stability
Consequence of Deviations	Interlocks, ESD	Inadvertent Mixing

- Similar to Safety and Environmental Information within API RP 75

Operating Procedures

- Timing - Initially written prior to PSSR and thereafter reviewed and certified annually (and with each MOC)
- Resource - PSI and operating steps for each phase

Normal, temporary, emergency operations	Start up (Initial, post turnaround, post unplanned shutdown)	Shutdown (Normal and Emergency)

- Tip - Consider all modes of operations during your work.
  - For petrochemical facilities, less than 10% of the time is spent in transient operations; however, 75% of major accidents occur during non-routine operations

Hazard Analysis

- Timing - Every 5 years
  - 10 years for low priority facilities per API RP 75
- Simple Description - Qualitative evaluation of hazards by experienced team

Process Hazards	Previous Incidents	Human factors
Facility siting (potential releases and their potential impact)	Consequence of failure of Monitoring, Controls, Alarms, Interlocks, ESD	Various methods (HAZOP, FMEA, What-If, LOPA, Fault Tree, etc)

- Tip - In practical terms, establishes hazard baseline. After such, managing change is key.

Management of Change (MOC)

- Timing - Prior to non ‘replacement in kind’ change
- Simple description - Written procedures to manage change to process, technology, equipment, facilities, procedures, and personnel (RP 75).

Technical basis	Potential impact on Safety and Health	Update PSI and procedures
Prior to PSSR and start up	Inform and train employees and contractors	Timing and Authorization requirements

- Tip - Managing change is key to safe design and maintaining safe operations.

Pre-start up Safety Review (PSSR)

- Timing - Prior to Implementation of ‘Significant’ Change
- Simple description - A safety review prior to start up by those responsible for operations and maintenance

Change in accordance with specifications	Safety, operating, maintenance, and emergency procedures in place and adequate	Hazard Analysis recommendations resolved
Training completed	PSI current	Safe work practices in place

Mechanical Integrity

- Timing - Continuous
- Simple description - Written procedures to design, fabricate, install, test and inspect, monitor, and maintain 'mechanical intent' of critical process equipment

Pressure vessels, piping systems, pumps	Relief and vent systems	Emergency shutdown systems
Controls, alarms, and interlocks	Deficiencies outside limits are corrected	Suitability with process application

- Tip - Mechanical integrity extends beyond preventive maintenance and testing. It is a means of ensuring the on-going performance of critical equipment.

Summary

- Process safety isn't one department
  – it's everyone's responsibility
- Process safety isn't a one-time job or a project
  – it's everyday, all day
- Process safety isn't paperwork
  – it's a way of thinking and acting

- Process safety is a culture; it's a way of doing business.

16

References

- API RP 75, “Recommended Practice for Development of a Safety and Environmental Management Program for Offshore Operations and Facilities,” 3rd Edition, May 2004, Reaffirmed May 2008
- Bridges et. al., “How to Efficiently Perform the Hazard Evaluation Required for Non-Routine Modes of Operation (Startup, Shutdown, Online Maintenance),” AIChE, GCPS, March 2011
- OSHA 1910.119 “Process Safety Management (PSM) of Highly Hazardous Chemicals”
- OSHA 3132, “Process Safety Management,” U.S. Department of Labor Occupational Safety and Health Administration, 1994 (reprinted)