The Future of the OSHA PSM Standard

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Rules of This Training Course

- This is an Open Discussion Course
  - Relax and Learn
  - Ask Questions
  - Participate in Discussions
  - Share Experiences
  - Share Best Practices
  - Enjoy Yourself
Why PSM?

PSM is a result of significant process industry incidents, for example:

- 1984 Bhopal, India, Chemical Release and Fatalities
- 1985, Institute, West Virginia chemical plant incident (evacuations of local communities, no fatalities)
- 1989 Pasadena, Texas, chemical plant explosion, 23 deaths and over 100 confirmed injuries
- Congressional pressure, concerns over protecting the Public and workers
- OSHA PSM rules issued 1992, EPA RMP Rules issued 1996

Ammonium Nitrate Explosion – Texas City, TX - April 16, 1947
Why PSM – Pictures #1

Cyclohexane Release & Explosion at Nypro Plant - Flixborough, England - June 1, 1974

Flammable LPG in Tank Explosion – Mexico City, Mexico – November 19, 1984
Why PSM – Picture #2

Release of Extremely Flammable gases from polyethylene reactors & Explosion at Phillips 66 – Pasadena, TX – October 23, 1989

Aluminum Wheel manufacturing Dust accumulation at Hayes Lemmerz in Huntington, IN, October 29, 2003
What is PSM

- PSM = Process Safety Management
  - PSM is an analytical tool focused on preventing releases of any substance defined as a "highly hazardous chemicals" by the EPA or OSHA
  - OSHA 29 CFR 1910.119 - A program aimed at preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals
  - AIChE - The application of management principles, methods, and practices for the prevention and control of releases of hazardous chemicals and energy
14 Elements of OSHA PSM

- Employee Participation Plan
- Process Safety Information (PSI)
  - Documentation of the process
- Process Hazard Analysis (PHA)
- Operating procedures
- Training
  - Operators & Other personnel
- Contractors
  - Evaluation, Selection, & Training
- Pre-Start-Up Safety Reviews
14 Elements of OSHA PSM

- Mechanical Integrity
  - Maintenance Procedures and logs, Quality Assurance
- Hot Work Permit
  - Non-routine work authorization
- Management of Change
  - MOC procedures, EH&S considerations, Authorization
- Incident Investigation
- Emergency Planning and Response
- Compliance Audits
- Trade Secrets
Initial Legislative and Agency Action

- Clean Air Act of 1990 required OSHA and EPA to issue regulations
- OSHA Process Safety Management (PSM) regulations first published in 1990, effective 1992
- Clean Air Act of 1990 authorized an independent investigation agency
- U.S. Chemical Safety and Hazard Investigation Board (CSB) established in 1998
Chemical Safety Board

- **CSB Mission:**
  “The CSB conducts root cause investigations of chemical accidents at fixed industrial facilities… The agency does not issue fines or citations, but does make recommendations to plants, regulatory agencies such as the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA), industry organizations, and labor groups. Congress designed the CSB to be non-regulatory and independent of other agencies so that its investigations might, where appropriate, review the effectiveness of regulations and regulatory enforcement.” (CSB website, [www.csb.gov](http://www.csb.gov))
Incidents & Investigations since 1992
PSM Implementation

- Repeated incidents at site of 1989 explosion in Pasadena, Texas
- Creation of the Chemical Safety Board (CSB)
- BP Refinery Incidents in Illinois, New Jersey
- Valero Refinery Incidents, 2006, 2007
- Total Fina Refinery Explosion, Borger/Amarillo, Texas, 2008
- Etc., Etc.
Why PSM – Pictures #3

Leak in the propane deasphalting unit & pipe rack collapse - Valero Refinery Explosion – Sunray, TX – February 16, 2007

Ammonium Nitrate Explosion – West, TX – April 18, 2013
One worker was killed and approximately seven others were injured, during a maintenance operation on a heat exchanger. Ammonia over-pressured inside the exchanger, causing it to rupture. June 11, 2008
OSHA Response

- Current emphasis program to inspect chemical facilities for PSM compliance
- Refinery emphasis inspection program underway
- Chemical processing facilities are next in cue
- Other petroleum processing facilities to be inspected under the program
- Congress considering additional mandates
OSHA PSM Approach

- **Traditional OSHA**
  Industrial Hygiene (slips, trips and falls)
  Relatively frequent, low consequence events
  Regulations are prescriptive

- **PSM Regulation**
  Industrial fires and toxic gas releases
  Relatively rare, high consequence events
  Regulation is performance oriented
### OSHA PSM Approach

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- **Occupational Safety**
- **Process Safety**
OSHA PSM Program Goals

- Targets protecting workers, on-site personnel
- OSHA list of Highly Hazardous Chemicals focused on immediate, on-site hazards
- Seeks implementation across chemical processing industry of key findings from incident investigations
- Requires maintaining documents and records as long as the life of the process
- Is a “performance-based” standard, identifies minimum program expectations
EPA RMP Program Goals

- Primarily concerned with preventing off-site consequences, short- and long-term
- Separate list of chemicals of concern (primarily airborne materials)
- Adopted or referenced OSHA PSM as basis of program
- Requires submitting various documents, plans and updates to the agency
Regulated Industries

- **Processes that:**
  - Contain > 10,000 lbs. flammable liquids or gases
  - Contain > listed threshold quantity (TQ) of toxic chemical

- **Definition of “process”**
  - … any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release…
PSM Exemptions

- Hydrocarbons used only for fuel (not part of a process)
- Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration. (Meer decision)
- Retail facilities
- Oil or gas well drilling or servicing operations
- Normally unoccupied remote facilities
What else is NOT Included in PSM

- Combustible Dust
- Reactive Chemicals
- High temperature and/or high pressure operations
- Any toxic material that is NOT listed in PSM

Trichlorosilane \((\text{HSiCl}_3)\) (AEGL3 = 33 ppm) **LISTED**

Silicon Tetrachloride \((\text{SiCl}_4)\) (AEGL3 = 25 ppm) **NOT LISTED**

Both Materials ignite in air and react with water to form HCl
14 Elements of PSM by Class

- **Commit to Process Safety**
  - Employee Participation

- **Understanding Hazards and Risks**
  - Process Safety Information
  - Process Hazards Analysis

- **Learning from Experience**
  - Incident Investigations
  - Compliance Audits

- **Manage Risk**
  - Operating Procedures
  - Hot work permits
  - Mechanical integrity
  - Contractors
  - Training
  - Management of Change
  - Pre-startup safety review
  - Emergency Procedures

- **Trade Secrets**
14 Elements of PSM - Protect Employees

http://en.wikipedia.org/wiki/Process_safety_management
“Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.”
Status of OSHA PSM Standard

- OSHA PSM has improved overall safety in refineries & Specialty Chemicals Companies, but based upon accident levels in all industries – Exposed Weaknesses in Standards

- Why?
  1. Lots of industries with flammable and other hazardous chemicals which are not regulated
  2. Insufficient training of OSHA inspectors & incomplete inspections
  3. Looking at Documentation and not actual practices in field
  4. Incomplete and insufficient Hazardous Chemical lists and too many exclusions
Future of OSHA PSM Standard

• Late 2013 – December 9 to be exact OSHA issued RFI (Request for Information) under an Executive Order - EO #13650
• Four main goals of this Executive Order #13650
  1. Improve operational coordination with State, local, and tribal partners;
  2. Enhance Federal agency coordination and information sharing;
  3. Modernize policies, regulations, and standards; and
Future of OSHA PSM/EPA RMP Standard

• Group was led by individuals from:
  1. Environmental Protection Agency (EPA)
  2. Department of Labor (DOL)
  3. Department of Homeland Security (DHS)
  4. Included other departments and agencies involved in the oversight of chemical facility safety and security

• EPA followed with an RFI to improve its RMP program on 7/24/2014
Future of OSHA PSM/EPA RMP Standard

- Final Report on all gather information was issued in April 2014 – All future Actions will minimize risks:
  1. Strengthening community planning and preparedness
  2. Enhancing Federal operational coordination
  3. Improving data management
  4. Modernizing policies and regulations
  5. Incorporating stakeholder feedback and developing best practices
Future of OSHA PSM/EPA RMP Standard

- Fewer exemptions to PSM standard, PSM/RMP now include:
  1. Oil and gas well drilling and production facilities included
  2. Atmospheric and very low pressure <50 psig storage tanks
  3. Extraction and other non-chemical production facilities
  4. Retail facilities with highly hazardous chemicals (ammonia for refrigeration)
  5. Eventually - all facilities with highly hazardous chemicals for whatever use including for fuel will be covered
Unified very comprehensive and unified hazardous chemical list for both agencies:

1. Include reactive chemicals and exothermic reactions
2. Quantities maybe lowered and enforcement will include chemicals without quantities – have it PSM will apply
3. Explosive Chemicals added – ammonium nitrate
4. Big ?? - What to do about combustible dusts – OSHA has NEP program & NFPA sets forth some standards – but what about industries where there are reactions or products which are contain both flammable solvents & combustible dust products
Expansion of the original 14 PSM elements to CCPS (Center for Chemical Process Safety) 20 which include additional management-system elements:

- Many organizations still struggle with:
  - Inadequate process safety management system performance
  - Resource pressures
  - Stagnant process safety results

- Instituted **Risk Based Process Safety - RBPS**
  - Framework for next generation Process Safety Management
  - Program to promote PSM to Process Safety Excellence
What Does CCPS RBPS do?

- Provides Process Safety Professionals:
  - Tools to build and operate more efficient PSM systems
  - Provides guidance on how to:
    - Design a Process Safety Management Systems
    - Correct a Deficient System
    - Improve PSM practices
  - Recognizes that all hazards are not equal – focuses more resources on greater hazards with higher risks
  - Put just enough energy into each activity to meet the needs of that activity – utilize a limited but correct number of resources to achieve the balance between companies safety performance and business performance goals.
What Does CCPS RBPS do?

• Three main criteria RBPS system focuses on:
  1. Understanding of the hazards and risks of the facilities and operations
  2. Understanding of the demand for (and resources used in) process safety activities
  3. Understanding of how process safety activities are affected by the process safety culture within the organization

• Based upon over 15+ years of PSM implementation at facilities, best practices from a variety of industries, and worldwide regulatory requirements and standards

• System may encompass all process safety issues involved in the manufacturing, use, storage or handling of hazardous substances or energy
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20 Elements of CCPS RBPS – 4 pillars

- **Commit to Process Safety** – core value to do right things, in right ways, and at the right times, even when no one is looking
  1. Process Safety Culture
  2. Standards, Codes, Regulations and Laws
  3. **Process Safety Competency** – learn new things & retain
  4. Workforce Involvement – Employee Participation
  5. Stakeholder Outreach

- **Understanding Hazards and Evaluate Risks** – foundation of RBPS for allocating appropriate resources
  6. Process Knowledge Management - PSI
  7. **Hazards Identification** & Risk Analysis - PHA
20 Elements of CCPS RBPS – 4 pillars

- Manage Risk – ongoing execution of RBPS tasks to effectively: a.) operate and maintain processes that pose risk; b.) keep changes to those processes within risk tolerances; c.) prepare for, respond to, and manage incidents that do occur

8. Operating Procedures
9. Safe Work Practices
10. Asset Integrity & Reliability – Mechanical Integrity (MI)
11. Contractor Management
12. Training and Performance Assurance
13. Management of Change
20 Elements of CCPS RBPS – 4 pillars

14. Operational Readiness - PSSR
15. Conduct of Operations

• Learn From Experience – metrics used as motivation for action
17. Incident Investigation
18. Measurement and Metrics
19. Auditing
20. Management Review and Continuous Improvement
Strive to Do Better

- **Safety Culture is KEY**
  - Culture is the result of all the actions and inactions in institutional or workforce memory that influence individual behaviors and tendencies.
  - The essential features of a good safety culture are:
    - Safety as a core value
    - Strong leadership
    - Sense of vulnerability
    - High standards of performance
    - Timely response to safety issues and concerns
    - Individuals successfully fulfilling their safety responsibilities
    - Formalization of a safety culture
    - Deference to expertise emphasis and approach
    - Questioning/learning environment
    - Continuous monitoring of performance
    - Mutual trust
    - Open and effective communication
Strive to Do Better

- For sustainable performance an organization must focus on its process safety culture
Strive to Do Better

Building Blocks of PSM
A Bottom-Up Approach

Safe Work Practices
Management of Change
Mechanical Integrity
Process Hazards Analysis
Process Safety Information

Most people focus here
SOPs should be the last resort For PSM!
PHAs are worthless without the PSI!!
Update PSM standard to define RAGAGEP (Recommended and Generally Accepted Good Engineering Practices) and include what those standards are

1. Include References to NFPA (National Fire Protection Association) and Dept. of Transportation (DOT) standards
2. Include references to best practices for Specific Equipment
3. Include updates for management of, storage and handling of ammonium nitrate
4. Cover dismantling and disposal of explosives, blasting agents and pyrotechnics
• Improved Emergency Response & Training & Public Awareness:
  1. Include local and state training on chemicals and facilities in their area
  2. Improved emergency planning & coordination with local and state authorities
  3. Improved first responders requirements and training
  4. Requirement for enhancing awareness and information sharing with communities around chemical facilities
Other requirements of new standard:

1. Explicit requirement that employers manage organizational changes
2. Mechanical Integrity requirement for all safety-critical elements
3. Requirement for Third party compliance audits
4. Updating the PSM requirements for Flammable Liquids and also the spray finishing involving flammable and combustible materials
• Any Questions or Comments?

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