Process Safety Management
Overview
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What Can We Expect?

- Determine coverage under the PSM standard
- Provide a brief overview of the PSM standard
- Describe the National Emphasis Program for inspections of PSM covered chemical facilities
- Clarify recent letters of interpretation and policy updates for PSM covered facilities
- OSHA inspection procedures
- Discuss compliance assistance resources
- Questions
What is PSM?

• 29 CFR 1910.119:
  
  – Requirements for safe management of hazards associated with processes using, storing, manufacturing, or handling highly hazardous chemicals.
  
  – Emphasizes management of hazards through comprehensive program that integrates established technologies, procedures and practices
PSM History

- Years of unexpected releases of toxic, reactive or flammable liquids and gases in processes involving highly hazardous chemicals
- Incidents/disasters resulting in death and injury
- Proposed standard published 1990
- Clean Air Act Amendments enacted 1990
- Final Rule issued 1992
Personal Safety vs. PSM

- A superior **personal safety record** does not necessarily mean a facility’s process safety performance is acceptable.

- OSHA often encounters facilities with superior personal safety records that have had a **major process safety incident**.
Personal Safety vs. PSM

- **PROCESS SAFETY** incidents are low probability/high consequence events.
- Conversely, **PERSONAL SAFETY** incidents tend to arise from higher probability/lower consequence events.
- Process safety requires a strong **MANAGEMENT SYSTEMS** approach to identify and control hazards.
**Process Safety Management Elements**

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<th>(a) Application</th>
<th>(i) Pre-Startup Safety Review</th>
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<td>(p) Trade Secrets</td>
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</tbody>
</table>
What is covered?

• Processes including:
  – 10,000 pounds of flammable liquids or gasses
  – Threshold quantity (TQ) of a highly hazardous chemical (HHC)
    • 130+ chemicals listed in Appendix A
    • Toxic and/or reactive chemicals
## Appendix A

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS*</th>
<th>TQ**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
<td>2500</td>
</tr>
<tr>
<td>Acrolein (2-Popenal)</td>
<td>107-02-8</td>
<td>150</td>
</tr>
<tr>
<td>Acrylyl Chloride</td>
<td>814-68-6</td>
<td>250</td>
</tr>
<tr>
<td>Allyl Chlorid</td>
<td>107-05-1</td>
<td>1000</td>
</tr>
<tr>
<td>Allylamine</td>
<td>107-11-9</td>
<td>1000</td>
</tr>
<tr>
<td>Alkylaluminum</td>
<td>Varies</td>
<td>5000</td>
</tr>
<tr>
<td>Ammonia, Anhydrous</td>
<td>7664-41-7</td>
<td>10000</td>
</tr>
<tr>
<td>Ammonia solutions (greater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>than 44% ammonia by weight)</td>
<td>7664-41-7</td>
<td>15000</td>
</tr>
<tr>
<td>Ammonium Perchlorate</td>
<td>7790-98-9</td>
<td>7500</td>
</tr>
<tr>
<td>Ammonium Permanganate</td>
<td>7787-36-2</td>
<td>7500</td>
</tr>
</tbody>
</table>
What is covered?

• Example: Ammonia
  – TQ > 10,000 pounds for anhydrous (gas) ammonia
  – Mostly used in refrigeration
What isn’t covered?

• Retail facilities
• Oil or gas well drilling or servicing operations
• Normally unoccupied remote facilities
• Hydrocarbon fuels used solely for workplace consumption (ie vehicle refueling)
• Flammable liquids with flash point below 100F and stored in atmospheric tanks and kept below boiling point without refrigeration
Process Safety Information (PSI)

• Employers must compile written process safety information (PSI)
  – Hazards of the HHCs used/produced
  – Technology of the process
  – Equipment in the process
• Process Hazards
  – Permissible exposure limits (PEL)
  – Physical data
  – Reactivity data
  – Corrosivity data
  – Thermal/chemical stability
  – Effects of mixing

• SDS may be source
PSI

• Process Technology
  – Block flow diagram/process flow diagram
  – Process chemistry
  – Maximum intended inventory
  – Safe upper/lower limits
    • temperatures, pressures, flows, compositions, pH
  – Evaluation of consequences of deviation
PSI

• Process Equipment
  – Materials of construction
  – Piping and Instrumentation diagrams (P&IDs)
  – Electrical classification
  – Relief system design and design basis
  – Ventilation system design
  – Design codes and standards (ASME, API, ANSI, CGA, IIAR, etc)
  – Material and energy balances (built after 1992)
  – Safety systems (interlocks, detection, suppression)
Piping and Instrumentation Diagram (P&ID)
The employer shall document that the equipment complies with **Recognized and Generally Accepted Good Engineering Practices (RAGAGEP)**—ASME, CGA, API, ANSI, IIAR, etc.

- RAGAGEP also applies to Mechanical Integrity
- RAGAGEP is for equipment design, inspection and testing, and frequency of inspection and testing
Examples of RAGAGEP

- ASME (American Society of Mechanical Engineers)
- ANSI (American National Standards Institute)
- CGA (Compressed Gas Association)
- API (American Petroleum Institute)
- ASTM (American Society for Testing and Materials)
- IIAR (International Institute of Ammonia Refrigeration)
- Manufacturer (Operations/Maintenance manuals)
- Internal RAGAGEP
Process Hazard Analysis (PHA)

- PHA is a thorough, systematic approach for identifying, evaluating and controlling the hazards of processes involving HHCs
  - The employer must perform a PHA on all covered processes
  - The PHA format must meet the complexity of the process
  - The PHA must identify, evaluate, and control the hazards involved in the process
PHA

- PHA Methods
  - What-if
  - Checklist
  - What-if/checklist
  - Hazard and operability study (HAZOP)
  - Failure mode and effects analysis (FMEA)
  - Fault tree analysis, or
  - An appropriate equivalent methodology

» See OSHA publication 3133 for more information
PHA

• PHA shall address:
  – Hazards of the process
  – Prior incidents
  – Engineering and administrative controls
  – Consequences of failure of those controls
  – Facility siting
  – Human factors

• Shall be performed by a team
• Shall establish a system to address findings
• Revalidation every 5 years
Operating Procedures

• Written operating procedures for safely conducting activities in each covered process

• Covering:
  – Initial startup, normal/temporary/emergency operations, shutdowns
  – Operating limits, consequences of deviation, and steps required to correct
  – Safety/Health considerations
    • Hazards of chemicals, unique hazards, material control
    • Engineering controls, administrative controls, PPE
    • Safety systems and their functions
Operating Procedures

• Must be readily available to employees

• Reviewed as necessary to reflect current practices

• Annual certification of review
Employee Participation

• Employers must consult with employees and their reps on the development of the elements of process safety management

• Employers shall provide employee access to all information required by the PSM standard

• Employer shall develop a written plan regarding the implementation of employee participation
Training

• Initial training in the process
  – Overview of process and ops procedures
  – Safety and health hazards
  – Emergency operations/shutdown
  – Safe work practices applicable to employee’s tasks

• Refresher training at least every 3 years

• Documentation of training (must state the means by which the training was shown to be effective)
Mechanical Integrity

• Written procedures for maintaining the on-going integrity of:
  – Pressure vessels
  – Piping systems
  – Relief and vent systems and devices
  – Emergency shutdown systems
  – Controls (monitoring devices, sensors, alarms, interlocks)
  – Pumps
Mechanical Integrity

• Inspection and testing of equipment shall follow RAGAGEP
• Maintenance employees shall be trained
• Inspections shall be documented
• Equipment deficiencies shall be corrected in a safe and timely manner (ensure safe operation)
Rusted and broken cable to the “snappy joe” shut off valve

Rusted cable repaired by attaching new cable to old rusted piece
Missing paint and rust on ammonia piping. No flow direction or phase markings. Color?

Broken pressure gauges
Management of Change (MOC)

• Written procedures to manage changes to process chemicals, technology, equipment, and procedures that affect a covered process
  – technical basis for proposed change
  – impact of change on safety and health
  – modifications to operating procedures
  – time period for the change
  – authorization requirements for the change
• Does not include “replacements in kind”
• Requires updated PSI, op procedures, training
The other elements...

(a) Application
(b) Definitions
(c) Contractors
(i) Pre-Startup Safety Review
(k) Hot Work Permits
(m) Incident Investigation
(n) Emergency Planning and Response
(o) Compliance Audits
(p) Trade Secrets
Appendix C
(1910.119)

• Non-mandatory Compliance Guidelines
  – Detailed description of each element of the standard
  – Plain language summary and recommendations
  – Good introduction to the standard
<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>% of PSM Citations</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Mechanical Integrity</td>
<td>26.9</td>
<td>26.9</td>
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<tr>
<td>d</td>
<td>Process Safety Information</td>
<td>19.6</td>
<td>49.2</td>
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<tr>
<td>e</td>
<td>Process Hazard Analysis</td>
<td>15.3</td>
<td>64.5</td>
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<tr>
<td>f</td>
<td>Operating Procedures</td>
<td>10.5</td>
<td>74.9</td>
</tr>
<tr>
<td>l</td>
<td>Management of Change</td>
<td>5.2</td>
<td>80.1</td>
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<tr>
<td>h</td>
<td>Contractors</td>
<td>4.7</td>
<td>84.9</td>
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<tr>
<td>o</td>
<td>Compliance Audits</td>
<td>3.6</td>
<td>88.5</td>
</tr>
<tr>
<td>n</td>
<td>Emergency Response and Planning</td>
<td>3.4</td>
<td>91.9</td>
</tr>
<tr>
<td>g</td>
<td>Training</td>
<td>3.2</td>
<td>95.1</td>
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<tr>
<td>c</td>
<td>Employee Participation</td>
<td>2.1</td>
<td>97.2</td>
</tr>
<tr>
<td>m</td>
<td>Incident Investigation</td>
<td>1.3</td>
<td>98.5</td>
</tr>
<tr>
<td>i</td>
<td>Pre-startup Review</td>
<td>1.1</td>
<td>99.6</td>
</tr>
<tr>
<td>k</td>
<td>Hot Work</td>
<td>0.4</td>
<td>100</td>
</tr>
</tbody>
</table>
Process Safety Management Updates

• Updated NEP

• PSM related memos/interpretations:
  – Appendix A Concentrations
  – Retail Exemption
  – RAGAGEP
Chemical NEP Update for 2016

• Release was scheduled for April
• Updated to include refineries
  – Refinery inspections distributed based on total number per region
• Five targeting categories
  – Ammonia refrigeration – 25 percent
  – Ag ammonia – 10 percent
  – Refineries – based on total per region
  – Chemical facilities (NAICS 325) – 40 percent
  – Other – 25 percent
Change to 1992 Retail Exemption

• Retail Exemption Interpretation
  – Aligns OSHA method with commerce department NAICS Codes
  – Only retail groups 44 and 45 are granted the retail exemption from PSM
    • Sale of...small allotments...to the general public
  – Biggest impact on NAICS 424910 – Farm Supply Merchant Wholesalers
    • However, over 130 unique NAICS codes were using the old interpretation
Change to 1992 Retail Exemption

- **Retail Exemption**
  - **Enforcement Delay**
    - No enforcement until October 1, 2016
  - **PSM program development is complex**
    - Compliance assistance is critical

Listed PSM Chemicals

• **Memo on Appendix A Concentrations**
  – Aligns OSHA method for calculating threshold quantities for PSM coverage with EPA RMP approach
  – 1% di minimus concentration
  – <10 mm Hg partial pressure not covered

• No formal enforcement delay
## Appendix A
(Concentrations)

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS*</th>
<th>TQ**</th>
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<tbody>
<tr>
<td>Dimethyldichlorosilane</td>
<td>75-78-5</td>
<td>1000</td>
</tr>
<tr>
<td>Dimethylhydrazine, 1,1-</td>
<td>57-14-7</td>
<td>1000</td>
</tr>
<tr>
<td>Dimethylamine, Anhydrous</td>
<td>124-40-3</td>
<td>2500</td>
</tr>
<tr>
<td>2,4-Dinitroaniline</td>
<td>97-02-9</td>
<td>5000</td>
</tr>
<tr>
<td>Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration greater than 60%)</td>
<td>1373-23-4</td>
<td>5000</td>
</tr>
</tbody>
</table>
How Does OSHA come to inspect a facility?

• Programmed Inspections
  – National, Regional or Local Emphasis Programs

• Unprogrammed Inspections
  – Complaints (from employees or their reps)
  – Referrals (from other sources)
  – Reports of fatalities or accidents
FY 15 NEP’s

- Amputations in Manufacturing
- Lead Exposures (GI and Construction)
- Silica Exposures (GI and Construction)
- Hexavalent Chromium Exposures
- Chemical Processing Safety
- Combustible Dust
- Trenching and Excavation
- Primary Metals Industries (Foundries)
- Nursing Homes
- Isocyanates
FY 16 Regional and Local EPs

• Regional Emphasis Programs
  – Fall Hazards in Construction
  – Roadway Work Zone Activities
  – Silica in Cut Stone and Slab Handling
  – Oil and Gas Industry
  – Grain Handling Facilities
  – Workplace Violence in Residential Intellectual and Developmental Disability Facilities

• Local Emphasis Programs
  – Hazards in Automotive Services (Billings/Bismarck/Englewood)
  – Asbestos Abatement (Englewood)
  – Scrap & Recycling (Englewood)
  – Wood Manufacturing and Processing (Billings)
Inspection Procedures

• Opening Conference
  – Explain the purpose, nature and scope of the inspection
  – Background information
  – Answer questions
• Walkaround Inspection
  – Observe worksite, look for hazards
  – Employee Interviews
  – Potential sampling/measurement
• Closing Conference
Inspection Procedures (continued)

• Closing Conference
  – Discuss validity of complaint items
  – Discuss findings/hazards observed
  – Discuss abatement
  – Discuss employer rights/possible citations
Tips for a Successful OSHA Inspection

• Know the hazards in your industry
• Know the hazards of your office operations
• Know your injury history/trends
• OSHA Top 10
• Written Programs and Training Records
• Prepare your staff to participate
Frequently Cited OSHA Standards

Frequently Cited OSHA Standards

This page allows the user to list the most frequently cited Federal or State OSHA standards for a specified 6-digit North American Industry Classification System (NAICS) code. Also available is Industry Profile for OSHA Standard which lists NAICS classifications having the most occurrences of citations for a specified OSHA standard.

Select number of employees in establishment:
- All
- 1-9
- 1-19
- 1-99
- 20-49
- 20-99
- 50-99
- 100-249
- 1-249
- 250+

Federal or State Jurisdiction: Federal

NAICS:

(Submit empty for NAICS list)

Submit

The data shown reflects OSHA citations issued by the Federal or State OSHA during the specified fiscal year; see definitions. If you are interested in obtaining the NAICS code for a particular industry, references are available on the NAICS Manual. This manual contains descriptions of every NAICS sector.

https://www.osha.gov/pls/imis/citedstandard.html
OSHA Consultation

- Free
- Non-enforcement
- Confidential
- On-site audits
- Training
- Sampling/Monitoring
- Program Review

http://csu-cvmbs.colostate.edu/academics/erhs/osha/Pages/default.aspx
OSHA Compliance Assistance

New Compliance Assistance Products

The following are some of OSHA's recently issued or updated compliance assistance products. Many publications with an OSHA publication number can be downloaded or ordered from the OSHA Publication page. They can also be ordered by telephone from the OSHA Publications Office at (202) 693-1888 or (800) 321-OSHA (6742).

Draft Safety and Health Program Management Guidelines

Hazard Alerts

Web Resources
- Worker Rights (updated 2016, January).
OSHA Compliance Assistance

• Regional Compliance Assistance Newsletter

• Send request to olaechea.john@dol.gov to subscribe
QUESTIONS?
Disclaimer

- This information has been developed by an OSHA Compliance Assistance Specialist and is intended to assist employers, workers, and others as they strive to improve workplace health and safety. While we attempt to thoroughly address specific topics, it is not possible to include discussion of everything necessary to ensure a healthy and safe working environment in a presentation of this nature. Thus, this information must be understood as a tool for addressing workplace hazards, rather than an exhaustive statement of an employer’s legal obligations, which are defined by statute, regulations, and standards. Likewise, to the extent that this information references practices or procedures that may enhance health or safety, but which are not required by a statute, regulation, or standard, it cannot, and does not, create additional legal obligations. Finally, over time, OSHA may modify rules and interpretations in light of new technology, information, or circumstances; to keep apprised of such developments, or to review information on a wide range of occupational safety and health topics, you can visit OSHA’s website at www.osha.gov.
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