Surviving a Process Safety Management Inspection

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- **Key Words:** OSHA, Inspections, Highly Hazardous Materials, Process Safety Management, PSM, Risk Management Program, RMP, Program-Quality-Verification, PQV, Compliance, Audits,

Abstract:

Objectives and Scope - The presentation will explain the PSM inspection process from the OSHA perspective, new developments in PSM and RMP, and common problems and compliance issues.

Abstract (Continued):

Issues/Conclusions - The PSM/RMP standards are performance based, with only few specifications. Since there are any number of ways compliance can be achieved, what does OSHA look for when evaluating these programs? What criteria will be used in determining what if any citations will be issued. What would a PSM inspection look like; partial inspection or PQV. In addition, what may be happening in the future and recent developments regarding scope and application.

Process Safety Management (PSM): An Integrated Approach to Chemical Safety

Overview

- OSHA's PSM standard
  - Scope/application - who needs to comply
  - What are the PSM requirements
- Major chemical incidents
  - How they could have been prevented using PSM
- Is PSM worth the effort?
- PSM enforcement data
- The PSM horizon??

Background

- Major international incidents (70's - mid 80's)
  - Flixbourough, Seveso, Bophal
- Major domestic incidents (mid 80's - 90's)
  - Institute, WVA, Shell-Norco, Phillips, Arco, Citgo
- Clean Air Act Ammendments 1990
  - PSM & RMP
  - CSB

Process Safety Management of Highly Hazardous Chemicals

- OSHA's rule promulgated May 22, 1992
- 29 CFR 1910.119
- Performance based comprehensive management program
- Holistic process lifecycle approach
  - One change can impact many elements of standard
- Integrates
  - Technologies, procedures, management practices

Purpose

- This section contains requirements for ***preventing*** or ***minimizing the consequences*** of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.

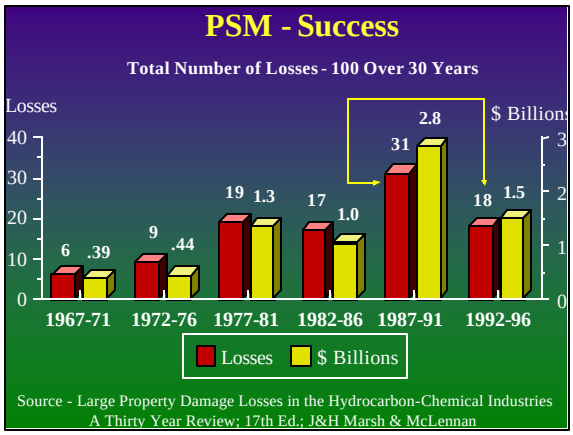
Impact of Rule

- 24,939 establishments
- 127 industry subgroups
  - Not just for refineries and chemical plants
- 3 million employees including contractors
- First 5 years:
  - Avoid 132 deaths
  - 767 injuries/illnesses
- Second 5 years:
  - Avoid 264 deaths
  - 1534 injuries/illnesses

Is Process Safety Working?

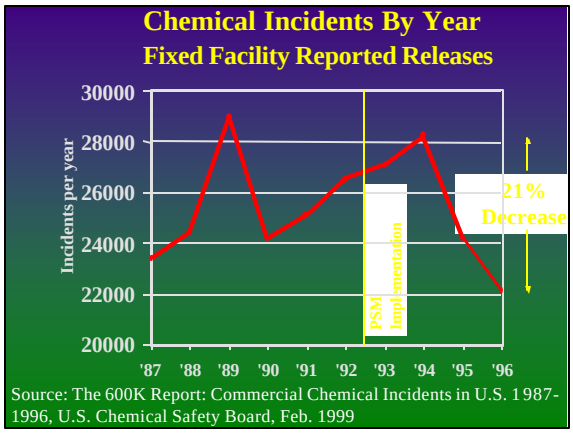
- **YES**
- Many anecdotal stories of individual company success
- M&M study of 100 major accidents over 30 years
- CSB 600K Report - 21% decrease in incidents in two years (1994-1996)

PSM - Success

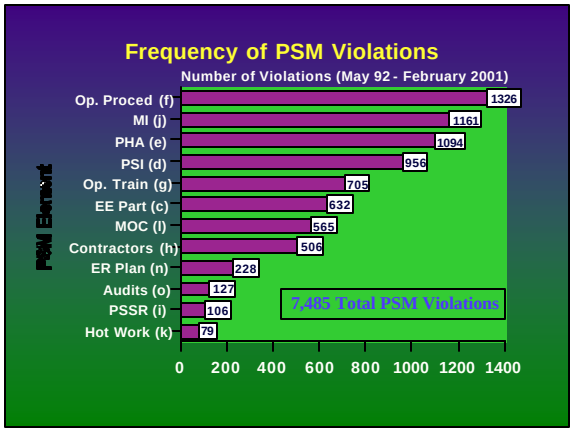


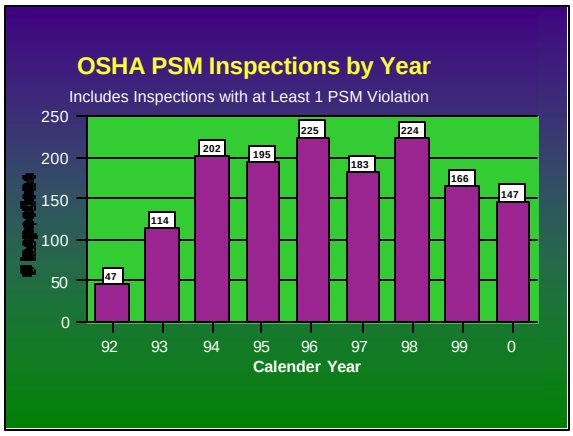
Source - Large Property Damage Losses in the Hydrocarbon-Chemical Industries A Thirty Year Review; 17th Ed.; J&H Marsh & McLennan

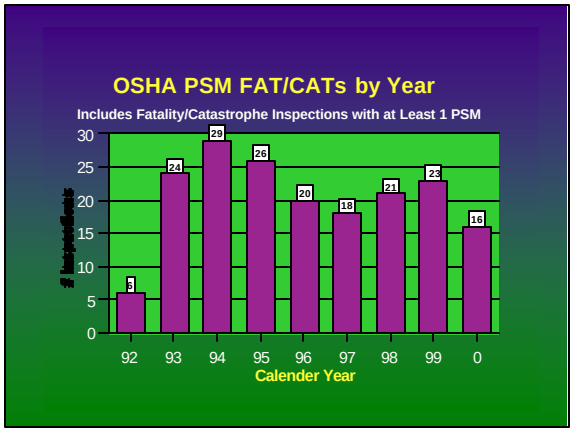
Chemical Incidents By Year
Fixed Facility Reported Releases



Source: The 600K Report: Commercial Chemical Incidents in U.S. 1987-1996, U.S. Chemical Safety Board, Feb. 1999

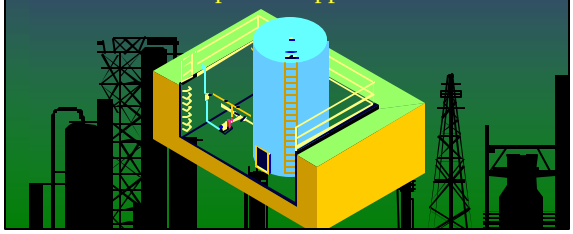

Frequency of PSM Violations
Number of Violations (May 92 - February 2001)
PSM Element
Op. Proced (f) 1326
MI (j) 1161
PHA (e) 1094
PSI (d) 956
Op. Train (g) 705
EE Part (c) 632
MOC (l) 565
Contractors (h) 506
ER Plan (n) 228
Audits (o) 127
PSSR (i) 106
Hot Work (k) 79
7,485 Total PSM Violations
0 200 400 600 800 1000 1200 1400


OSHA PSM Inspections by Year
Includes Inspections with at Least 1 PSM Violation
Inspections
250
200
150
100
50
0
47
114
202
195
225
183
224
166
147
92 93 94 95 96 97 98 99 0
Calender Year


OSHA PSM FAT/CATs by Year
Includes Fatality/Catastrophe Inspections with at Least 1 PSM
Inspections
30
25
20
15
10
5
0
5
24
29
26
20
18
21
23
16
92 93 94 95 96 97 98 99 0
Calender Year

Process Safety Management of Highly Hazardous Chemicals

1910.119(a)
Scope and Application



Application (a)

- Covers plants which have ***highly hazardous chemicals*** (HHC):
  - Have **toxic** or **reactive** chemical in processes
    - at or above a listed threshold quantity
  - Have **flammable liquids or gases** in processes in quantities in 10,000 pounds and above
  - Manufacture **explosives or pyrotechnics**
- 80% questions still (7 years after implementation) related to scope and application

Appendix A Materials

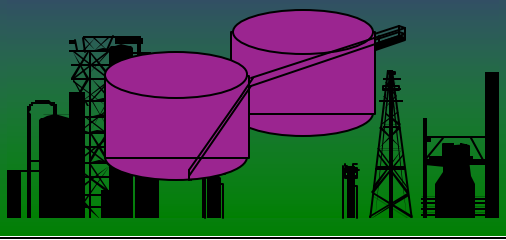
- Lists covered **toxic and reactive** materials
  - Approximately 135 specific materials
- Each material has its own **TQ**
  - e.g... Ammonia, Anhydrous - 10,000 lbs.
  - TQ based on maximum "*at any given time*"
- Listed reactives from NFPA 49 - Listed as 3 or 4
  - TQs established using 2.3 psi overpressure at 100 meters
- Listed toxics derived from compilation of several lists
  - New Jersey, Delaware, API 750, World Bank, EPA, ORC
  - TQs established using Turners Gaussian Dispersion Model

Flammable Liquids & Gasses

- TQ > 10,000 lbs (1250 gallons)
- Flammable liquid as defined by 1910.1200(c)
- To be covered process must have TQ of flammable gas **OR** liquids.
  - Do not aggregate these two classes

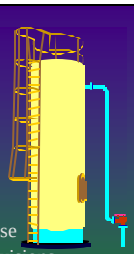
MEER Decision

- Flammable liquid storage tank exemption 1910.119(a)(1)(ii)(B)



MEER Decision (cont'd)

- Judge ruled - flammable liquids stored or transferred from atmospheric tanks are exempted regardless of quantity
- 29CFR1910.106 or General Duty clause use
  - use NFPA 30, Chapter 5 "PSM like" provisions
  - use API 2156 for terminals
  - blanket on storage > 0.5 psig would not fall under MEER
- OSHA intended to regulate stored flammable
  - Formulating best course of action to regulate



PSM Coverage of Explosives

- Manufacturing of explosives and pyrotechnics covered by PSM through incorporation
  - 1910.109(k)(2) & (3)
- No TQ listed for explosives
  - If you manufacture, you must comply with PSM
- Defined at .109(a)(3) as classified by DOT as Class A, B, or C explosive
- Cover devices intended to explode
  - PSM Does not cover explosive devices installed into larger devices not intended to explode
    - ejection seats, air bags (12/2/94 Rountree letter)

Single Process

- Any group of vessels which are:
  - **Interconnected**, and
  - **Separate** vessels
    - located such that a highly hazardous chemical could be involved in a potential release
- All equipment which could impact covered process would be considered part of single process
  - Evaluation needs to be iterative to determine extent of covered process
- Akzo Nobel interpretation (www.osha.gov)

Process - The 5 Activities Key to Coverage

- Any Activity Related to ***Highly Hazardous Chemicals*** (HHC) that:
  - **Uses**
  - **Stores**
  - **Manufactures**
  - **Handles**, and/or
  - **Onsite Movement**

Application (a) (cont'd)

- Does **NOT** apply to:
  - Hydrocarbon fuels used solely for workplace consumption as a fuel (a)(1)(ii)(A)
    - e.g.. propane for fork lifts, comfort heating
      - Unless part of a process containing another covered HHC
        - fuel gas used to heat refinery superheater
  - Flammable liquids stored or transferred which are kept below their atmospheric boiling point without benefit of chilling or refrigeration (a)(1)(ii)(B)
    - MEER ruling
      - Enforcement policy - Stay away from storage tanks (Miles memo 5/12/97 - OSHA website)

Application (a) (cont'd)

- Does **NOT** apply to:
  - Retail facilities (a)(2)(i)
  - Oil or gas well drilling or servicing (a)(2)(ii)
    - Generally - exception only applies when rig is on well.
  - Normally unoccupied remote facilities (NURF) (a)(2)(iii)

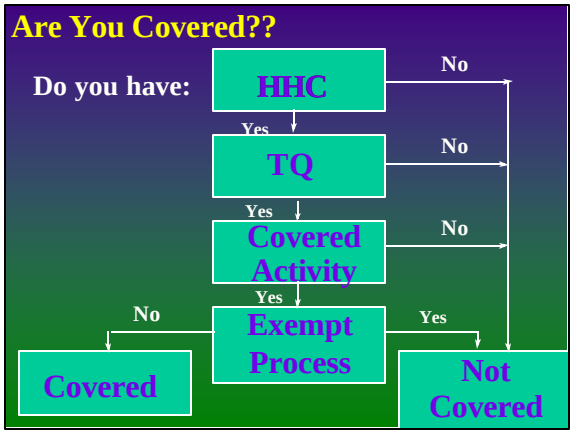
Retail Facility Exception

- Must be a covered process
- > 50% income obtained from direct sales to end users or consumers
- Don't use corporation's multiple sites to determine total income
  - Based on each establishment's income
- Interpretation letter - 11/8/95
  - Retail trade means sells merchandise to general public for personal or household consumption

Normally Unoccupied Remote Facility

- Covered Process must:
  - NOT be contiguous
  - Geographically remote from all other buildings, processes or persons
    - Intent is to have employees isolated from hazards
- Employees visit periodically
  - Check operations
  - perform operations & maintenance
- "Visit periodically"
  - Can be made on a scheduled basis
  - Bundy Letter (5/29/98) permits
    - Average 13 man-hours/week at NURF
  - Daily visits irrespective of duration not a NURF

Are You Covered??



PSM Definitions - 119(b)

- Atmospheric Tank
- Boiling point
- Catastrophic release
- Facilities
- Highly Hazardous Chemical
- Hot Work
- Normally unoccupied remote facility
- Process
- Replacement-in-kind
- Trade Secret

Employee Participation - 119(c)

- Develop employee participation plan
- Consult with employees on PHAs and other elements
- Provide access to records

Common Problems (c)

- No written employee participation program
- Employees unaware of program
- "Name" only participation
- No participation in the development of PSM program elements
- Workers don't know how to access info

Process Safety Information (PSI) 119(d)

- Employer must compile PSI to identify and evaluate hazards of process
- Significance of PSI
  - Critical for evaluating integrity, compatibility and safety considerations
  - Safety considerations cannot be adequately evaluated without detailed data
  - Provides basis for identifying and understanding hazards
  - Needed for PHA

Types PSI Required

- Three types information required
  - Chemical
    - Toxicity; PELs; physical, reactivity & corrosivity data; thermal and chemical stability data; inadvertent mixing
  - Technical
    - Flow diagrams; process chemistry; maximum intended inventory; upper/lower limits; consequence of deviation
  - Equipment
    - Materials of construction; P&IDs; electrical classification drawings; relief system design; ventilation design; design codes used; material & energy balances; safety systems

Common Problems (d)

- "Bad" MSDS sheets
- No data for process intermediates
- Upper and lower limits not established
- Chemistry info missing
- P & IDs wrong or missing
- Ventilation specs not available
- Relief valve sizing criteria

Process Hazard Analysis (PHA) 119(e)

- Cornerstone of regulation
- Systematic, thorough evaluation of hazards of process

PHA requirements

- Use appropriate methodology for complexity of process
  - What-If/Checklist; HAZOP; FMEA; Fault Tree, etc
- Criteria which must be addressed
  - Hazards of process
  - Previous incidents
  - Engineering & administrative controls
  - Consequences of failures of controls
  - Facility Siting
  - Human factors
  - Qualitative evaluation of failure of controls

PHA requirements (con't)

- Conducted by team knowledgeable in process
- Team must include at least 1 worker
- Findings must be promptly addressed and **resolved**

Common Problems (e)

- Inappropriate methodology
- All hazards not considered
- Employee participation
- Previous incidents not used
- Facility siting not addressed
- Tracking to closure!!!!!
- Items not resolved

Operating Procedures 119(f)

- Must be developed and **implemented**
  - Clear instructions at task level
- For each operating phase
  - Initial startup; normal, temporary and emergency operations; emergency shutdowns; startup after shutdown
- Operating limits
  - Consequence of deviations; steps to take to avoid deviations; and safety systems

Operating Procedures (con't)

- Safety and Health considerations
  - preventions/mitigations for exposures
- Safety systems and their functions
- Safe work practices
  - Entry and exit to covered process
  - Specific tasks/programs: confined space, LOTO, line breaking, etc.

Common Problems (f)

- No written procedures
- Phases of operations missing
- Procedures do not reflect practice
- Work practices vs procedures
- Procedures not readily available to operator
- Review and certification

Operator Training 119(g)

- Process overview
- Process hazards
- Job task specific
- Operating procedures
- Emergency procedures
- S&H specific hazards
- Safe work practices

Operator Training 119(g) (con't)

- Refresher training
  - At least every 3 years
- Employer must VERIFY adequacy of training
- A training record must exist for each employee

Common Problems (g)

- Operators not trained
- OJT only
- Relief operators, overtime, etc.
- Refresher training intervals
- All operators grand fathered
- Foreman, superintendent training

Contractor Safety 119(h)

- Employer responsibilities
  - Prior to hiring, evaluate contractors safety & health programs
  - Inform of hazards
  - Explain emergency action plan
  - Develop/Implement safe work practices
  - Evaluate contractors safety performance
  - Maintain contractors injury/illness log

Contractor Safety 119(h) (con't)

- Contractor responsibilities
  - Assure employees are trained
  - Assure employees instructed in emergency action plan
  - Document & verify employee training
  - Assure employees follow safe work practices
  - Advise facility of unique hazards
  - Advise employer of any hzards observed

Common Problems (h)

- Questionnaire vs evaluation
- Check in check out
- Contractors not trained
- Host inspections
- Contractor inspections
- Preferred contractor lists??

Pre-Startup Safety 119(I)

- Formalized double check prior to introduction of HHC
- Required for new and modified processes
- Requires
  - Construction/equipment in accordance with design
  - Procedures adaquate and in-place
  - New facilities have PHA that has been resolved; Modified facilities have gone through MOC
  - Training has been conducted

Common Problems (i)

- No PSSR conducted
- PHA recommendations not resolved prior to HHC introduction
- Confusion with MOC

Mechanical Integrity (MI) 119(j)

- Applies to specified equipment and others deemed critical by employer
  - lists includes controls and utility systems
- Must develop/**implement** task specific procedures
- Training for maintenance activities
- Inspection/testing at proper frequencies
- Documentation required
- Equipment deficiencies must be addressed before further use
- Quality Assurance

Common Problems (j)

- Procedures not established
- Corrosion rates not determined
- Inspection intervals too long - pipe, vessel, RV, pumps
- Internals vs externals vs on-stream
- Instrumentation calibration and inspection
- Rotating equipment - vibration analysis, lubricating fluids check etc.

Common Problems (j)

- Thin pipe and vessels
- Control loops by-passed
- Positive pressure ventilation system not maintained.
- Telltales between RD and RV not checked

Hot Work Permit 119(k)

- Authorization via hot work permit required
  - For hot work on or NEAR covered process
- Permit contents
  - Fire prevention requirements of 1910.252(a) must be implemented
  - date of authorization
  - Identity of hot work object
- Permit must be kept on file until completion of work

Common Problems (k)

- Object not identified
- No permits, permits pre -signed
- Detectors not calibrated or functioning or not used properly

Management of Change (MOC) 119(l)

- Develop/**implement** written program to manage changes
  - procedures, chemicals, technology, equipment and facilities
- MOC procedures must address
  - Technical basis; impact of change; operating procedures; time period; authorization
- MOC must be done anytime change in PSI

Common Problems (l)

- MOC not developed
- MOC not used (RIK)
- Signatures missing
- "Emergency" MOC's
- No follow through - P&Ids, procedures, training

Incident Investigation 119(m)

- Must investigate actual or potential (near-misses) catastrophic releases
- Investigation must begin within 48 hours
- Report with findings and recommendations
- System to promptly resolve recommendations
  - **Major incidents of mid 80s - early 90's`did not resolve information from earlier near-misses**
- Must review with affected employees
- Must retain report for 5 years

Common Problems (m)

- Investigations not conducted - leaks, pin holes, spills
- Contributing factors not identified eg. operator error
- Recommendations poor eg. "discipline operator", "report leak"
- Tracking recommendations to closure

Emergency Planning & Response 119(n)

- Establish/**implement** EAP for entire plant meeting 1910.38(a)
  - Pre-planning; escape procedures; notification procedures; alarm system; training
- EAP needs to include procedures for small releases

Common Problems (n)

- Assembly areas downwind
- Poor routes for exit
- Alarms not distinctive
- Training for hazmat and fire brigade
- PPE for responders
- Shelters in place
- Employees mitigating release ???

Compliance Audits 119(o)

- Certify that all elements of the standard developed and implemented
- Verify procedures are adequate/followed
- Develop report and recommendations
  - Document appropriate response to findings and deficiency correction
- Conduct at least every 3 years
  - At least one person knowledgeable in process
- Retain two most recent audits

Common Problems (o)

- Audits not conducted
- Bad audits
- Paper only, not practice
- Reports incomplete
- Recommendations poor
- Recommendations not tracked to closure

Trade Secrets 119(p)

- Protects process trade secrets
  - Protections afforded through OSHA HazComm standard 1910.1200
- Makes information available to those needing to comply with specific elements

On the PSM Horizon

- ANPRM due October '99
  - Reactive chemicals
  - MEER (storage flammable liquids) exemption
- NPRM projected Fall '00
  - Harmonization with EPA list of covered chemicals
- PSM-RMP coordination with EPA
- Response to CSB report recommendations

OSHA Contact Information

www.osha.gov

General Industry Compliance Assistance

202-693-1850