VPP and "Other" HSE Management Systems

August 2016
Scott E. Genta is a chemical engineer with 21 years of experience in the practical application of technical safety disciplines in the hazardous chemical and explosives industries. Experience includes OSHA’s “Process Safety Management” (PSM) regulation, and EPA’s “Risk Management Program” (RMP). Currently an Ambassador with OSHA’s Voluntary Protection Program (VPP) for the Region 9 Participants Association.

Mr. Genta has provided Process Safety Management and Process Hazard Analysis Training for many different companies and annually at the TCI Consulting course for DOD contractors.

Project Highlights Include
- PHA for High Pressure Water Washout of 155mm Munitions in the Ukraine and Belarus
- PHA for the Alaskan Pipeline
- Site Safety Support for Munitions Manufacturing Facility Start-up in Mulwala, Australia
Safety Management Services, Inc. (SMS)

• SMS is an Engineering Firm with expertise in:
  – Chemical processing, handling, transportation, and storage
  – Propellants, Explosives, and Pyrotechnics (PEP)

• Disciplines
  – Chemical Engineering
  – Mechanical Engineering
  – Physics
  – Chemistry
  – Process control
  – Computer technology
  – Electronics
SMS Capabilities

• Risk Management and Process Hazards Analysis Methodologies
  – Qualitative (HAZOP, FMEA, etc.)
  – Quantitative (Fault Tree, Probabilistic Analyses, etc.)

• Regulatory Compliance
  – Government & Industry
  – PSM, RMP, VPP, etc.

• Material Characterization Testing
  – Sensitivity & Reactivity Testing
  – DOT Classification Testing and Analysis
  – Test Equipment

• Facility Siting & Design
  – Quantity Distances, Venting, Barricades, Workstation Protection, etc.

• Training
  – Related to Risk Management and Explosives Safety
## Risk Management Heritage

<table>
<thead>
<tr>
<th>Year</th>
<th>Risk Management</th>
<th>Methods</th>
<th>Standards</th>
<th>Regulations</th>
<th>Other Standards</th>
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<tr>
<td>1960</td>
<td>Dupont Material characterization testing</td>
<td>Fault trees FMEA Probit analysis</td>
<td>Specialized testing &amp; modeling</td>
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Why all the Risk Management Systems?

• A number of world wide catastrophic events have lead to promulgation of the Process Safety Management (PSM) standard and the Voluntary Protection Program (VPP)
Major Disasters in the Chemical Industry:

Phopaul, India – Dec 2-3 1984

• A sudden release of 30 metric tons of Methyl Isocyanate (MIC) occurred at the Union Carbide pesticide plant. Revealed many poor safety management practices. Over 2,800 fatalities (other estimates are as high as 8,000) – Respiratory and Eye damage to over 20,000 and at lease 200,000 people fled the area.

Photo: Indian State government of Madhya Pradesh
2015 Tianjin explosions – 12 August 2015

- Fighters who first arrived on the scene proceeded to douse the fire with water as they were unaware that dangerous chemicals were stored on the site.
- The first explosion occurred and registered as a magnitude 2.3 earthquake. Estimated equivalence of 3 metric tons of TNT.
- Second more powerful one occurred, causing most of the damage and injuries with shock-waves felt many kilometers away. Estimated equivalence of 21 metric tons of TNT.
- Fire fighters used water in combating the initial fire, which may have led to water being sprayed on calcium carbide, releasing acetylene. Subsequent blasts could have caused the ammonium nitrate to detonate.
- Police arrested twelve people with suspected connections to the explosions, including the logistics' chairman, vice-chairman, and at least three other managers.

References:

"Timeline of Tianjin explosions". Shanghai Daily. 13 August 2015.
"Searching Questions Asked in the Aftermath of the Tianjin Blasts". Time. 14 August 2015.
## Risk Management Heritage

<table>
<thead>
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<td>Probit analysis</td>
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<td>NG Manufacture</td>
<td>In-process simulation</td>
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- Risk Management Heritage
- FMEA
- Improved Fault trees
- Probit analysis
- Hercules
- Dupont
- Others
- NG Manufacture
- Explosives Safety Standards
- In-process simulation
- OSHA 29 CFR 1910.119
- EPA RMP
- VPP Formally Announced
Growth of VPP
Federal & State

As of 06/30/2015

Calendar Year

Source: OSHA, Office of Partnerships & Recognition
OSHA’S VOLUNTARY PROTECTION PROGRAMS
MANAGEMENT GUIDELINES

MANAGEMENT

Leadership
- Commitment
- Organization
- Authority and Responsibility
- Accountability
- Resources
- Self Evaluation
- Goals & Planning

Employee Involvement
- 3 Meaningful Ways of Involvement
- Employee Notification
- Contractor Workers’ Safety

WORKSITE ANALYSIS
- Baseline Hazard Analysis
- Hazard Analysis of Routine Jobs
- Hazard Analysis of Significant Changes
- Self Inspections
- Employee Reports of Hazards
- Accident and Incident Investigation
- Pattern Analysis

HAZARD PREVENTION & CONTROL
- Engineering Controls
- Administrative Controls
- Hazard Correction Tracking
- Personal Protective Equipment
- Enforcement of Safety Rules
- Preventative Maintenance
- Emergency Preparedness
- Occupational Healthcare Program

SAFETY & HEALTH TRAINING
- Employee
- Supervisor
- Manager
- Training Process & Effectiveness
PSM Elements

Mission:
Protection of Employees, Public & Environment

- Process Hazards Analysis
- Process Safety Information
- Operating Procedures
- Training
- Mechanical Integrity
- Incident Investigation
- Emergency Planning and Response
- Trade Secrets
- Management Commitment
- Documentation Control/Access

- Contractors
- Pre-Startup Safety Review
- Hot Work Permits
- Management of Change
- Compliance Audits
- Employee Participation
- Work Site Analysis

- Operating Procedures
- Training
# PSM and VPP

<table>
<thead>
<tr>
<th>PSM Area</th>
<th>VPP Sub Element</th>
<th>VPP Element</th>
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<td>Process Safety Information</td>
<td>Resources</td>
<td>Leadership</td>
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<td>HA of Significant Changes</td>
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<td>Incident Investigation</td>
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## PSM and Corporate Management Systems (MS)

<table>
<thead>
<tr>
<th>PSM Element</th>
<th>Company MS</th>
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</table>
| Process Hazards Analysis (PSM)    | MS 605 – Risk Assessment  
                                    | MS 811 – PHA                                                             |
| Process Safety Information        | MS 371 – Hazardous Chemical Management  
                                    | MS 601 – Authoring SDS  
                                    | MS 801 – PSM  
                                    | MS 809 – PSI                                                             |
| Employee Participation            | MS 807 – Employee Participation and Trade Secrets  
                                    | MS 209 – HSE Communication  
                                    | MS 204 – HSE Objectives  
                                    | MS 206 – HSE Behavior/Culture                                            |
| Operating Procedures              | Operating procedures plus safe work practices:  
                                    | MS 301 – LTT  
                                    | MS 303 – Confined Space  
                                    | MS 311 – Line Breaking, etc.  
                                    | MS 813 – Operating Procedures                                           |
Other Management Systems
OSHA 29 CFR 1910.119

Process Hazards Analysis

- Identify failure scenarios
- Determine potential
  - Qualitative, quantitative
- Determine likelihood for:
  - Injury / death
  - Major damage
  - Release / spill
- Provide recommendations

EPA 40 CFR Part 68

Hazard Assessment

- Source characterization
- Modeling Selection
  - Toxic: Toxic End Point
  - Overpressure: 1 psi
  - Heat Flux: 5 kW/m²
- Receptor identification
- Risk Assessment
Management Systems in Europe

• In Europe, the catastrophic accident in the Italian town of Seveso in 1976 prompted the adoption of legislation on the prevention and control of “Major” accidents. Known as the Seveso-Directive.
• The directive was amended in view of the lessons learned from later accidents such as Bhopal and Toulouse (Seveso-II).
• In 2012 the directive (Seveso-III) was adopted taking into account changes in the EU legislation on the classification of chemicals and increased rights for citizens to access information and justice.
Management Systems in Europe

Seveso-Directive for the “Control of Major Accidents”

- Control of process defaults (Baseline Hazard Analysis)
- Control of degradation of enclosures (Overpressure devices, alarms, P.M., inspections) (Hazard Prevention and Control)
- Limitation of accidental releases (Hazard Prevention and Control)
- Control of the distribution of substances and/or energy (Hazard Prevention and Control)
- Spark prevention - all sources of ignition (Engineering Controls)
- Protection against fire, Explosion (Engineering Controls)
Management Systems in China

PSM related regulations in China

• China National Standard – Safety Production Segment: “General norms for safety standardization of hazardous chemical enterprises” (AQ 3013-2008)
  – Process Hazards Analysis (Part 5.5.4.3) (Baseline Hazard Analysis)
  – Pre-Start-up Safety Review (Part 5.5.4.4) (Self Inspections)

• China National Standard - Safety Production Segment: “Guidelines for process safety management of petrochemical corporations” (AQ/T 3034-2010) (Leadership)

• State Administration of Work Safety: “Guidance for strengthening the safety management of chemical process” (Leadership)
International Management Systems

• BS OHSAS 18001 - British Standard for Occupational Health and Safety Management Systems

• ISO 45001 – International Organization for Standardization - Occupational Health and Safety
## ISO vs VPP

<table>
<thead>
<tr>
<th>Element / Title</th>
<th>ISO 14001</th>
<th>OHSAS 18001</th>
<th>ISO 9001</th>
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How to Pull it all Together

Application for

VOLUNTARY PROTECTION PROGRAM (VPP)
Application / Annual Evaluation

Example - Self-inspections

- Waste Water Worksheet (Form B1004)
- SCBA Monthly Checklist (Form B1007)
- Fire Pump Check Sheet (Form B1036)
- Fire Extinguisher Monthly Inspection Report (Form B1706d)
- Escape Bottles Monthly (Form B1706e)
Example - Hazard Control Program

Blood Borne Pathogen Exposure 9-10-G0511
Respirator Protection Procedure 9-10-G0373
Lock Tag Try Procedure 9-10-G0301
Confined Space Entry Procedure 9-10-G0303
Line Breaking Procedure 9-10-G0311
Hot Work Procedure 9-10-G0389
Mulwala Redevelopment Project

- Lend Lease has been contracted by the Australian Department of Defence to design, construct, commission, and qualify a 530 tonnes per year single-base propellant (a type of explosive) process plant, upgrading the munitions factory that was built in the 1940’s to support World War II.
There are three main companies involved in the project:
  – Lend Lease holds the contract with the Department of Defence
  – ATK is sub-contracted as the technical provider and now leads and directs day to day operations of the plant
  – Thales is sub-contracted to provide plant operators

Other sub-contractors include:
  – Butko – General Maintenance and Construction
  – EDC & Watters - Electricians
  – Secom – Control Systems
  – Coulters - Pipe Fitting
  – SMS – Explosive Safety Consultants
The Challenges

• Pressure to Meet Schedule Constraints
  – Meet Specification
  – Meet Rate, etc.

• Pressure to Meet Budget Constraints
  – “Cowboy” Engineering
  – Use of “Low Cost” Provider
  – Sacrifice Quality
  – Less Oversight
  – Every Process Change Costs $$$

There are always these types of challenges in industry but when dealing with explosives or hazardous material the consequence of not doing it right the first time can be catastrophic.
The Solution?
OSHA’S VOLUNTARY PROTECTION PROGRAMS
MANAGEMENT GUIDELINES

MANAGEMENT
- Leadership
  - Commitment
  - Organization
  - Authority and Responsibility
  - Accountability
  - Resources
  - Self Evaluation
  - Goals & Planning

- Employee Involvement
  - 3 Meaningful Ways of Involvement
  - Employee Notification
  - Contractor Workers’ Safety

WORKSITE ANALYSIS
- Baseline Hazard Analysis
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SAFETY & HEALTH TRAINING
- Employee
- Supervisor
- Manager
- Training
  - Process & Effectiveness
Busy as a Beaver
Every Job Must be Thought Out Properly
Australian Management System

NSW Department of Planning’s
• Hazardous Industry Planning Advisory Paper (HIPAP) No 9 “Safety Management”
• Modeled after: Joint Australian/New Zealand Standard – AS-4801; OSHA 1910.119 & EPA RMP

PROGRAMS
• 4.2 Identification of Hazards and Risk Assessment
• 4.3 Operating Procedures
• 4.4 Process Safety Information
• 4.5 Contractor Management
• 4.6 Pre Start-up Safety Reviews
• 4.7 Equipment Integrity
• 4.8 Safe Work Practices
• 4.9 Management of Change
• 4.10 Accident/Incident Reporting and Investigation
• 4.11 Training and Education
• 4.12 Procurement
• 4.13 Emergency Planning
• 4.14 Security and Access Control
• 4.15 Auditing
Example:
Major Process Changes – Change to Contaminated Piping
Hazard Analysis of Significant Changes

Led to the Development of Process Change Hardware

These plugs allowed pipes to be filled with water for cutting and welding (hot work)
Results - Protection of Employees

Munitions Manufacturing Facility Start-up
Over 2.8 million safe Man Hours without a LTI
Summary

• Management Systems Work if applied correctly

• Aligning your corporate systems, international systems, etc. to the VPP elements will ensure your system is robust

• No other system highlights/stresses employee involvement better than VPP
Any Questions?