MANAGEMENT OF CHANGE (MOC)

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Acronym's in this Presentation

- CCPS – Center for Chemical Process Safety
- MOC – Management of Change
- eMOC – Electronic Management of Change
- PSSR – Pre-startup Safety Review
- SIS – Safety Instrumented System
- NEP – National Emphasis Program
- RFC – Request for Change
- KMS – Knowledge Management System
- SOP – Standard Operation Procedures
- PSI – Process Safety Information
- RAGAGEP – Recognized and General Accepted Good Engineering Practice
- PHA – Process Hazard Analysis
- HAZOP – Hazard and Operability Study (aka PHA)
- RIK – Replacement in Kind
- RCA – Root Cause Analysis
- CPI – Chemical Process Industry
Don Abrahamson

- Worked in the CPI for 45 years
- Retired from Occidental Chemical in 2006 as the Director of Risk Engineering and Process Safety to join Celanese
- Retired from Celanese in 2010 as the Global Process Safety Manager
- Formed Abrahamson Consulting LLC in 2010
  - AIChE - Center for Chemical Process Safety (CCPS) Staff Consultant
  - Clients include: BP; Occidental Oil and Gas; Olin; Invista; PAS; Enerkem; Cabot; Celanese; ABB; E.Vironment and API
Topics for Tonight

- Sustainable Process Safety Management Systems
- CCPS Risk Based Process Safety
- Management of Change MOC
  - Why manage change
  - MOC Overview
  - MOC Systems - MOC Procedures
  - Sources of change
  - MOC Challenges and potential solutions
  - Thoughts on MOC Metrics
Sustainable Process Safety Systems

- Tribal
- Sustainable (Operational Excellence)
- Failures
- Bureaucracy

- Document & Standardize Knowledge
- Improved Metrics
- Train and/or Simplify

Skilled / Trained

People

Weak

Management Systems

Documented
Let’s talk about MOC
Why Changes Need to be Managed
Non-PSM Areas
What Happened

- Bellows failed after 3 months of service from torsional stresses
- 30 tons of cyclohexane released
- Ignition and vapor cloud explosion
- 28 fatalities and 87 injuries, some injuries off site
- Occurred on Saturday when only operating staff present
Lessons Learned

- Recognize that there is a change
- Include the right multidisciplinary expertise
- Use the right hazard analysis technique
- Authorize the changes at the level appropriate considering the hazards and risks
- Communicate the new operating procedures in writing including the hazards and safe operating limits
- Provide appropriate training
Change — any change (modification) to process chemicals, technology, equipment, or procedures and changes to facilities that affect a covered process except

- Replacement in kind (A replacement which satisfies the design specification)
- Those that satisfy the design specifications

Many companies apply their MOC system to all process and not just covered process
Helps to ensure that changes to a process do not inadvertently introduce new hazards or unknowingly increase the risk of existing hazards

Includes a review and authorization process for evaluating proposed adjustments to facility design, operations, organizations

System to ensure that introduced changes are thoroughly scrutinized prior to implementation

- More than 80% of large losses are related to change
- 9% of OSHA Refinery NEP citations were for MOC
Management Of Change

- All changes must be evaluated, communicated and coordinated prior to execution
- Rational basis required to initiate the process.
- Applies to physical equipment, products, operating conditions, staffing, (Plus?)
- Includes organizational changes
- Includes these types
  - Permanent changes
  - Temporary changes
  - Emergency changes including bypassing of safety critical equipment
  - Personnel changes
**Classic MOC Flowchart Example**

1. **Identify need for change**
   - Prepare request-for-change form (RFC)

2. **Is proposed change to be pursued?**
   - YES
     - Is change per MOC definition?
       - YES
         - Conduct multi-disciplinary review to identify potential hazards and associated tasks. Document controls required for implementation.
       - NO
         - Who can initiate change? Can anyone in the facility
           - Could be performed by the originator or one designated person
         - Complete RFC and return to originator
     - NO
       - Proceed outside of MOC system
         - Complete RFC and file to allow auditing

3. **Is multi-disciplinary review required?**
   - YES
     - Conduct review by an individual to identify potential hazards and associated tasks. Document controls required for implementation.
   - NO
     - Initial Review
     - NO, RIK
     - Classification Review

**Source**: CCPS book on Management of Change
MOC Flowchart Continued

Authorization Review

Complete tasks identified as required before implementation

Have all pre-implementation tasks been completed?

Implement change using controls specified by site procedures and MOC review

Have all post-implementation tasks been completed?

Complete MOC documentation and file

Source: CCPS book on Management of Change
Common to see multiple MOC procedures (PSI, Procedure “SOPs”, Pipe Clamps, Facility, Personnel, Temporary Trailers, Temporary By-passes…)

eMOC (Stature, KMS, Home Grown)
  - KMS is the eMOC system that I have seen the most (OXY, BP…)
  - Home grown systems (Celanese, Albermarle, Olin, BP)

Hybrid systems
  - eMOC – PSM regulatory higher risk changes to PSI
  - Paper MOC – Non-PSI, non-PSM, lower risk…

Chemical industry more risk driven
Refining / Oil and Gas industry more regulatory driven
Companies often have more than one procedure for managing change:

- Classic PSM - changes to PSI (permanent, temporary and emergency)
- Procedure
- Interlock by-pass
- Leak repair
- Facility – Siting and temporary buildings
- Personnel
- Quality
- Non-PSM
- Rarely do sites capture all MOCs in one MOC system
Sources of Change

- Engineering studies (trouble shooting, capacity increase, new products, process improvements)
- Obsolete equipment replacement
- Failed equipment
- SIS By-pass
- Corrective actions from incident investigations (RCA)
- Corrective actions from audits
- Recommendations from Process Hazard Analysis (PHA)
- Other?
Common Challenges

- Technical Basis often not understood
  - Often people restate the purpose of the change
  - Engineering design basis
  - Company engineering standard
  - Recognized and Generally Accepted Good Engineering Practice (RAGAGEP)

- Determining the appropriate level of Hazard Review
  - Example tool – Simple 2 X 2 “Risk Matrix”
  - Training of affected employees

- Example MOC Metrics
Determining Level of Hazard Review

- Level of hazard review not always appropriate
- Review level should be commensurate with risk

- **Level I** – Completed for all MOCs (Basic check list to identify hazards)

- **Level II** (Expanded check list with “What If” brainstorming)

- **Level III** (HAZOP or equivalent)
## Determining Level of Hazard Review

<table>
<thead>
<tr>
<th>Hazard Review Level</th>
<th>Significance of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Degree of Hazard</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Level 1</td>
</tr>
<tr>
<td>High</td>
<td>Level 2</td>
</tr>
</tbody>
</table>
Four suggested types:

- **Training – Class room with testing (~1%)**
  - MOC Trainer prepares training material
  - Training materials presented
  - Employees are tested – test records are evidence of training

- **Training / Notification – Presentation with no testing (~10%)**
  - MOC Trainer prepares presentation
  - Presents material to employees
  - Employees sign attendance sheet, which is evidence of training

- **Notification – Email with no testing (~80%)**
  - MOC Trainer prepares and sends email with read receipt requested
  - Email read receipt is evidence of training

- **Awareness – Email with no read receipt (~9%)**
  - MOC Training prepares and sends email
  - Email is saved as evidence of training
MOC Metrics

- Number of RIKs
- Number requests not initiated
- Number of MOCs initiated by type
- Number of MOCs by risk classification (Level I, Level II and Level III)
- Number of MOCs completed incorrectly
- Number of qualified Level III reviewers
- Number of Temporary MOCs
- Number of Emergency MOCs
- Number of PSSR completed incorrectly
MOC Metrics Continued

- Number of MOC implemented prior to completion of the PSSR
- Number of open MOCs
- Average length of time MOCs are open
- Number of MOCs in approval / review process
- Average time (days) to approve MOCs
- Average time (days) to close MOC after start-up
- Oldest MOC
- Number of times MOC are “touched” (opened, updated, reviewed, approved…)
Conclusions – Comments – Questions

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