Global Process Industry Initiatives to reduce Major Accident Hazards

Robin Pitblado
DNV Houston
Oct 2008
Process Safety Challenges Continue

- Seveso (?/?) 1976
- Flixborough (28+/36) 1974
- P36 (10+/2) 2001
- Humber Oil Refinery (0+/0) 2001
- Grangemouth (0+/0) 2000
- Norco, Louisiana (4+/42) 1988
- Henderson, Nevada (2+/350) 1988
- Buncefield, UK (0+/40) 2005
- Toulouse (29+/650) 2001
- Japan (1+/250) 2008
- China Blowout 250+/ 2008
- Skikda (27+/56) 2004
- Texas City (15+/170) 2005
- Pasadena, Texas (23+/232) 1989
- Longford (2+/ numerous) 1998
- Bhopal (20,000+/50,000) 1984
- Piper Alpha (167+/?) 1988
But are major accidents rare events?

- In January 2005, as part of an internal R&D project, DNV developed a new internal database system to record major incidents and accidents in the refining & petrochemical industry.

- Since its inception, the database has recorded over 1800 incidents, which have been classified as follows:

<table>
<thead>
<tr>
<th>Incident Type</th>
<th>Number</th>
<th>Consequence</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of containment</td>
<td>745</td>
<td>Loss of life</td>
<td>163</td>
</tr>
<tr>
<td>Fire</td>
<td>538</td>
<td>Injury</td>
<td>276</td>
</tr>
<tr>
<td>Explosion</td>
<td>369</td>
<td>Site Evacuation</td>
<td>114</td>
</tr>
<tr>
<td>Environmental release</td>
<td>44</td>
<td>Regulatory Fines</td>
<td>674</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Production Downtime</td>
<td>219</td>
</tr>
</tbody>
</table>
Personal Safety ↑ vs Process Safety ↓ / ⇒

**Improvement**

Personal safety trends down strongly over past 10-15yrs

Many exemplar companies

**Static or Worse**

Refinery Damage costs trend upwards over 30yrs

Wharton finds no significant improvement in RMP incidents
US Lessons: Texas City Wake-up Call

- PSM style regulations have been in place in USA for 15yrs

- Texas City event 2005
  - VCE event (15 fatalities / 170 injured)
    - Main causes: Startup management, loss of containment, blowdown to atmosphere, trailer proximity

- 2007 – Baker Panel (scope: SMS & culture at 5 US refineries)
  - Recommendations in 4 main areas:
    - Leadership, Integrated PSM, PSM knowledge all levels, PS culture
    - They believe findings apply to MOST process facilities, not just BP

- BP is addressing technical and management issues
  - Integrity Management, Operations Management System, Control of Work

- US Process Industry implementing Baker findings
  - Companies and OSHA carrying out in-depth audits of PSM implementation
  - CCPS issues Risk Based Process Safety Guideline
EU Lessons: Major accidents, new approaches

- Seveso Directive (onshore), UK and Norway regs (offshore)
  - Several major accidents forced upgrades to Seveso directive
  - Directive risk based, but deficiencies identified in application of risk and SMS
  - North Sea suffered 2 disasters in 1980’s –
    - No disasters since – but 3 near misses in 2007 in Norway
    - UK also some near misses – but good reduction in leak occurrences

- EU sponsors ARAMIS project for barrier based approach to risk assessment
- Shell pioneers barrier approach (Bow Tie), StatoilHydro also technical barrier approach
- Current lesson is greater focus on barriers, especially technical barriers
Brazil lessons

- **Onshore**
  - APPOLO Project – Bahia area covers 52 chemical companies
  - Braskem (Diniz) takes base findings and integrates into Barriers & SMS audits
  - Similar to best ideas in EU and USA

- **Offshore**
  - Petrobras implements Operational Excellence program (PEGASO)

- **Other**
  - Vale striving for world-class safety performance
  - Risk-based hazard identification and management system
  - Major focus also on Safety Culture (similar Baker Panel finding)
Other Geographies Lessons / Approaches

- Middle East
  - Positive benchmarking through GCC area meetings and sharing
  - Saudi Aramco – new risk-based SMS, in-depth risk assessment approach
  - Kuwait – extensive SMS and risk assessment approach
  - Abu Dhabi – Full HSE safety case study / document required
  - Safety culture not yet a major driver in the region

- Asia
  - Malaysia Petronas using risk based processes (similar to Shell)
  - Indonesia – mainly SMS focus, also risk assessment at LNG facilities
  - India – Mainly SMS focus, simple risk assessments for compliance focus
  - China – Starting PSM focus
CCPS Risk-Based Process Safety / DNV isrs7+PSM share good ideas
- Commitment to process safety – leadership and workforce
- Understand hazards and risks – to focus mitigation resources
- Manage risks – ongoing safe operations, manage changes, emergency planning
- Learn from experience – suitable metrics and opportunities to improve
Novel Approach: 5 P’s for Process Safety

**People**
- Leadership Involvement
- Skills & Competence
- Proactive Safety Culture
- Operational Discipline

**Process**
- Reinvigorate PSM Programs
- Conduct of Operations
- Audits / Technical Barriers

**Performance**
- Accountability – Managers / staff
- Leading and lagging PS metrics
- Mesh KPI's: Business-PS-Enviro

**Plant**
- Address outstanding actions
- Revisit key issues – siting etc
- Implement barrier based risk
- Learn from Accidents

**Perspective**
- Web-based tools for visualization
- All staff access + customized pages
- Continuous updating of risk status
Example Web pages for Perspective

Interactive Map of GASCO Assets

Kindly use the Interactive Assets Map below to learn more about GASCO gas plants. You can click zoom in and pan inside the interactive map. Clicking on the links will take you to the respective asset top-pages.