High Reliability Organizing Conference 2011

Learning from the Buncefield Incident

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About UKPIA

- The United Kingdom Petroleum Industry Association (UKPIA) represents the interests of nine member companies engaged in the UK downstream oil industry on a range of common issues in non-competitive areas. The downstream oil industry covers a wide range of activities including refining, product import and distribution by sea, pipeline, rail and road, along with retail filling stations.

- We inform our members of proposed legislation and related developments, and help form and advocate the industry's position.

- We provide an authoritative source of information and reference on the UK downstream industry.

- Similar to the National Petrochemical and Refiners Association (NPRA) in the US.
Buncefield – what happened?

- On the night of the 10th December 2005, Tank 912 at the Hertfordshire Oil Storage Terminal was filling with petrol from a pipeline.
- At 05:37 on the 11th December, petrol began to spill from the vents in the tank roof.
- A large flammable vapour cloud formed around the tank to a diameter of ~360 metres (250,000 litres of petrol had escaped).
- The vapour cloud was noticed by members of the public and tanker drivers on site, and the fire alarm button was pressed at 06:01.
- This automatically started the firewater pump, which was the probable ignition source for the vapour cloud.
- Fortunately there were no fatalities, but 40 people were injured.

Picture Source: Buncefield MIIB Report
Buncefield – why did it happen?

- **Technical reasons:**
  - Defective level gauge
  - Defective independent high level switch
  - Defective bunds

- **Organisational and management reasons:**
  - No shared understanding of the critical nature of equipment or how it should operate
  - Operational pressures
  - Lack of control of tank filling operations at the terminal
  - No robust procedures
  - Lack of effective audit
  - Inadequate indicators of process safety performance
  - Inadequate board level focus

Picture Source: UK Health and Safety Executive
Buncefield – Consequences

• Five companies prosecuted, fines in excess of $7,000,000

• Cost of investigating the incident, and implementing the lessons learned runs into multi million $

• Full extent of the environmental impact may not yet be known

• Society expects that this will not happen again

Picture Source: UK Health and Safety Executive
Key Leadership and HRO messages

• No single failure of equipment or process caused the incident

• Many weaknesses across all aspects of the design operation and maintenance of the site contributed to failure
  – the level gauge did not fail, it was known to be faulty.
  – the independent high level switch did not fail, it had been left in an inoperable state

• Managing major hazard risks is a complex process and needs constant attention

• Learn to learn from, and share with others

• Measure your performance, and react to early signs of weakness

Picture Source: UK Health and Safety Executive
Tackling the issues - A new way of working

- 25 recommendations relating to the design and operation of fuel storage sites from the investigation board, covering technical and organisational factors

- Other recommendations relating to emergency response and land use planning (siting) policy subject to further guidance

- Industry, regulator and unions worked collectively to respond to these recommendations - Process Safety Leadership Group (PSLG)

- Guidance on technical issues resulted in start and finish tasks, with implementation timescales agreed with the regulator

- Guidance on organisational factors provide the basis for new working arrangements
Technical resolutions

• Primary Containment
  – Installation of automatic overfill protection systems for finished gasoline tanks
  – Overfill protection systems *designed, operated and maintained* to IEC 61511 ‘Functional Safety - Safety Instrumented Systems for the process industry sector’

• Secondary Containment
  – Increasing Bund capacity
  – Decreasing permeability ‘leak tight’

• Tertiary Containment
  – Assessing tertiary containment measures should failure of secondary containment occur
Organisational resolutions

What the investigation board said

- Recommendation 19: *The sector should work with the Competent Authority to prepare guidance and/or standards on how to achieve a high reliability industry through placing emphasis on the assurance of human and organisational factors in design, operation, maintenance, and testing*

- Recommendation 21: *The sector should put in place arrangements to ensure that good practice in these areas, incorporating experience from other high hazard sectors, is shared openly between organisations*

- Recommendation 23, 24: *The sector should setup arrangements to collate incident data on high potential incidents including overfilling, equipment failure, spills and alarm system defects, evaluate trends, and communicate information on risks, their related solutions and control measures to industry*

- Recommendation 25: *In particular the sector should draw together current knowledge of major hazard events, failure histories of safety and environmental protection critical elements, and developments in new knowledge and innovation to continuously improve the control of risks...*
Organisational resolutions

• How these were tackled:

  – R19: Targeted guidance for:

    » Pipeline transfer procedures
    » Tank operating procedures
    » Staffing levels and shift handover

  – Wider leadership and HRO issues addressed through the Process Safety Leadership Groups ‘Principles of Process Safety Leadership’

    » R23, 24, 25: Implemented through Trade Association sector level initiatives
    » R21: Sharing and learning between sectors through the formation of the Process Safety Forum
Organisational resolutions

- UKPIA’s ‘Commitment to Process Safety’
  - Supported from board level, involvement of workforce
  - Promoting excellence through self assessment modules in key areas
  - Performance analysis through sector level review of self assessments ‘Where am I, what can I do to improve?’
  - Adoption of sector level leading and lagging performance indicators
  - Sharing and learning with other sectors through the process safety forum

Note: Figures for illustrative purposes only
Organisational resolutions

• Process Safety Forum

  – Many best practices outside our industry sector have applicability in our sector - encourage active engagement with others to seek improvement opportunities
  – Share Process Safety Initiatives (e.g. UKPIA Commitment to Process Safety Self Assessment tools)
  – Learn from incidents
Organisational resolutions

- **Example 1 – Spillage during tanker loading**
  - Significant gasoline spillage during tanker loading activity
  - Incident reviewed by the Process Safety Forum - Safety Alert issued
  - Further guidance generated through the Chemical and Downstream Oil Industry Forum for
    - Overfill prevention at terminal loading bays
    - Hazard awareness during loading activities

*Picture Source: UK Tank Storage Association*
Organisational resolutions

- Example 2 – Nimrod XV-230 Disaster
  - Catastrophic mid-air fire and explosion of RAF Nimrod XV230 following air-to-air refuelling modification
    » Safety Case regime ineffectual
    » Inadequate consideration for the needs of aged aircraft
    » Personnel weaknesses
    » Unacceptable procurement process
    » Poor safety culture
  - Investigation report reviewed by the Process Safety Forum to identify potential lessons for our sector
    » Competency management systems
    » Procurement systems
  - UKPIA worked closely with the UK Sector Skills Council to develop a framework for good competency management
Organisational resolutions

• Future opportunities for learning
  
  – Deepwater Horizon - Macondo Gulf of Mexico Disaster
    » Review emerging reports and recommendations for potential cross sector learning
  
  – Fukushima nuclear accident
    » Impact of natural hazards, climate change
    » Potential lessons for other industry sectors
    » Recommendations from these lessons
Continuing to work together

- **Chemical and Downstream Oil Industry Forum (CDOIF)** continues the collaborative working of the PSLG
  - Aims to encourage health, safety and environmental improvements with cross-sector benefits
  - Facilitates information sharing and exchange to identify key issues and topics
  - Initiating appropriate task and finish groups to take forward developments on these issues
  - Provides a horizon-scanning function to raise awareness of and influence health, safety and environment outcomes
Final Thoughts

- The small things accumulate... Incidents are often caused by multiple (sometimes seen as insignificant) weaknesses
- Fixing the small things often have big returns, for example they may identify faulty safety equipment before they are required to take action
- There should be a constant expectation that safe operations will be delivered, at all levels within an organisation
- Work together, stretch out and see what can be learnt from other diverse sectors, many weaknesses are the same regardless of the organisation
- Promote collaborative working between industry, regulator and unions - determine what needs to be done and how to achieve it in a way that satisfies the needs of all
- Think about High Reliability Supply Chains, everyone has a responsibility to ensure safe operations, including equipment and service suppliers, consultancies

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More Information

More information on UKIA’s commitment to process safety, self assessment tools, CDOIF guidance, and safety alerts issued by the process safety forum can be found on our website:

www.ukpia.com/process-safety

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