Human Factors Issues are Key to Addressing Major Accident Hazards
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Agenda

HF is critical to MAH Safety

HF Not Applied

HF Applied

HF Resources
HF Are Key to Addressing MAH risk

- Majority of Accidents have HF&O cause
- People and their actions are critical to both operations and safety
- Prevent human error- Left side of the bow tie
- Prevent a person failing as a barrier- Right side of the bow tie
HF and Process Safety
(this does not mean we blame the human) It means we realize how important people are as a critical barrier to MAH. We look at all the elements which affect their performance in order to change the environment to make it less likely that we have a repeat incident.
**HF and Process Safety**

**Australian Regulator**

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<tr>
<th>Common Taphroot® Root Causes for All incidents</th>
<th>2005</th>
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So what affects human performance:

The design of equipment and workspace to facilitate ease of use; understanding the human tasks and designing the system around that.

Processes, procedures and culture which encourage safe and efficient working-training, fatigue management, written procedures
HF and Process Safety

It takes **people** to:
- Design
- Construct
- Control
- Operate
- Repair
- Replace
- Maintain
- Control Damage
HF and Process Safety

What opportunity for human error exists? (Left side of bow tie)

What hazards are operators exposed to? (Occupational Safety)

How do we improve human performance? (Right side of bow tie)
Both reports into the incident said that the metrics for assessing safety were focused on OHS and personal safety rather than system safety. This has been a big PROBLEM in western culture. We have worried too much about what harm the system can do to people. Not enough about what harm people can do to the system.
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- Legislation and Regulation: Occupational safety focus.
- Processes and Procedures: Routine deviation from procedures in tank filling and more generally with safety related rules. No safety critical communication protocols. Inadequate shift hand-overs.
- Workspace: Maintenance contractors within blast zone. Lack of supervisory and technically trained personnel during unit start up.
- Equipment: Malfunctioning and incorrectly designed instrumentation did not alert operators to the actual condition of the unit, and a poorly designed computerised system hindered operators’ ability to determine if the tower was overfilling.
- Operator: Fatigue- 30 days in a row of 12 hour shifts. Workload- one person running three refinery units.

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Multiple preventable holes in HF&O Barriers

- Restarting Raffinate Unit
- Start-up Procedure
- Level Alarm High
- Level Alarm High High
- Worker Response
- Safety Valve Failure
- Liquid Carrying into Blowdown Drum and Stack
- Trailers outside blast zone
- Vapour Cloud Explosion
- Trailers within Blast zone
- Vapour Cloud Explosion – Multiple Fatalities

- Common Practice to Not Follow Start-Up Procedure Violations Culture
- Malfunctioning and incorrectly designed instrumentation did not alert operators to the actual conditions of the unit
- Work orders closed although work not completed Focus on production and cost cutting
- Fatigued – 30 consecutive days of 12 hour shifts
- Workload – One person running multiple units
- Inadequate shift handover
- Lack of supervisory and technically trained personnel during unit start-up

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Incidents occur due to the gaps in the system which lead to the person being involved in the incident.

To reduce process safety incidents we must identify and close the gaps in the system which allow/encourage humans to make errors.
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Energy Institute
https://www.energyinst.org/technical/human-and-organisational-factors/

Abnormal Situations Management Consortium
http://www.asmconsortium.net/deployment/guidelines/Pages/default.aspx

Health and Safety Executive
http://www.hse.gov.uk/humanfactors/index.htm

NOPSEMA
HF Applied
HSE UK Regulator

1. Managing Human Failures (Incident investigation and SCTA)
2. Effectiveness of Procedures
3. Training and Competency (including non-technical skills)
4. Staffing: Workload, Safe Staffing Levels, Supervision, Contractor Management
5. Organisational Change and Transition Management
6. Safety Critical Communications
7. Human Factors Engineering in Workspaces: Control Room and Facilities
8. Fatigue and Shiftwork
9. Organisational Culture (Safety Culture, Just Culture, Learning)
10. Maintenance, Inspection and Testing
Key Process Data is more easily seen in a low contrast display. Abnormal Situations Management (ASM) Guidance ("Effective Operator Display Design") which is based on human ability to process information is revolutionizing HCI.
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Procedures

Reviewed all Facility procedures and identified 8 with High Process Safety Human Error Risk.

Overhauled High Risk procedures in line with HF Guidance for Procedures, made modifications to procedures, automation introduced.

There are now more effective barriers in place to prevent Major Accidents.
HF Training provided to Incident Investigators greatly improves the quality and effectiveness of recommendations made. Note- this is an occupational safety example but the understanding of human action also applies to process safety.
OGP 454 ‘Human Factors Engineering in Projects

**Stop for Safety- Poor design for human task- Lance removal on froth tanks so physically difficult that a process safety issue was created.**
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Resource Sheet:
Application of HF to Projects and Operations
HF Are Key to Addressing MAH risk

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Any Questions?

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