Coker Egress and Personnel Safety Auditing

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What’s going on?
Numerous serious coking incidents in the past few years....

- Continuous improvements in Refinery Safety Systems
  - PHA becoming more sophisticated to identify and prevent loss of containment.
  - Safety interlocks to prevent maloperation becoming more complex and more routinely used for coker switchdecks.
  - Emergency Response at sites are continuously improving.
Analyzing coker incidents occurring in the past 10 years

- Common threads
  - Companies suffering major incidents often have:
    - Excellent PHA Systems
    - Excellent Emergency Response
  - Whatever the root cause, incidents often manifest themselves at the top head, bottom head, and drain.

Identifying Safety System Gaps in Cokers

- Focusing on the possibility of incidents at each historical source: top head, bottom head, drain, etc...
- Disciplined, systematic evaluation of hazards from each source for each operational and maintenance location.
- Audit with the right folks: Operators, Unit Engineers, Site Loss Prevention Personnel.
**Personal Safety and Egress Audit Worksheet**

**XXX XXXXXX Coker Unit**

<table>
<thead>
<tr>
<th>Operation / Maintenance Task</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hazard</strong></td>
<td></td>
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</tbody>
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**Existing Hazard Mitigation:** List what's currently in place to protect the worker from the hazard while completing this task.

**Possible improvements to protect workers from hazard during task:**

**Existing Egress Mitigation:** List what's currently in place to facilitate worker egress in the event of hazard.

**Possible improvements to facilitate emergency egress in the event of hazard:**

**Can task be moved to safer location?** If practical to relocate job to safer location, list possible improvements to facilitate.

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**Typical Identified Items Include:**

- Results are site and layout specific.
- Some Big Rocks
  - Items such as automated unheading, deluge systems, water curtains between unheading and switch deck.....
- Some smaller, low capital improvements that really improve safety and egress.
  - Egress Routes and catwalks, Removal of obstructions, Procedures, Relocation of controls...
Why Share Best Practices?

- "Our research has found it not uncommon to find 3 to 1 differences between best and worst plants in the same firm..."

- "If below average plants were brought up to average performance, profits would increase over 20%.”

  Chew et. al.,

Why Share Some Best Practices within Industry?

- To Help Eliminate Injuries and Incidents
- To Give the General Public a higher level of Confidence
- To Help Improve Regulations
- To Reduce Risk - breaking the chain of events
Drivers to Implement Best Practices

- Too many incidents
- Incidents were being repeated
- Poor linkage with the operators/mechanics
- Refining Profitability was not acceptable
- Benchmarking showed a gap

CHEVRON BEST PRACTICES

Process Teams

- Crude Distillation
- Reforming
- Cokers
- Cracking/Alkylation
- Hydroprocessing
- SRU/Amine/Treating

System-Wide Teams

- Reliability Focused Maint.
- Information Technology*
- Training*
- Energy/Utilities*
- Process Control*
- Tank Field Operations

*have now evolved into Natural Teams
CHEVRON BEST PRACTICES

Key Enablers of a Successful Best Practices Effort

- Visible Top Management Support
  - VP, Refinery Managers Set Clear Expectations
  - Managers are Sponsors

- Front-End Loading
  - Takes 6-12 months to Achieve Results & Gain Credibility
  - Developing Metrics early in the process

- Masters/Experts Critical
  - Provide Continuity, Keep Process Moving Forward

- Involvement of Process Owners
  - Line Management Involved in Development/Implementation, & in Setting Long Term Vision, consistent w/business plans

- Behavioral Change at Every Level
  - Operating Supervisors Willing to Meet Off-line, Share ideas
  - Tech Mgrs Shaking Control Over R&D, Long Term Planning
  - Employees Accepting BP as Integral Part of Doing Business

CHEVRON BEST PRACTICES

Some Early Barriers & Concerns

- "Everyone's Plate is already too full...best practices is an add-on..."
- Assumption that this is just another fad, program of the month...
- No rewards or recognition for best practices work
- Process is ponderous: travel, meetings, conference calls...
- Undue burden on smaller facilities
- Frequent changes in membership, best practices not a criteria for selection
- Master selection rushed, not all fully qualified to meet expectations
- Team member often did not have authority to speak for refinery
- Communication on best practices within a facility poor
Coker Scorecard

- Coker Injuries - Chev/Contr
- Coker Incidents/Costs
- Coker Unplanned Shutdowns
- Coker non-energy costs
- Coker Energy Consumption
- Coker VCM
- Best Practice Implementation