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.

Personnel Safety and Egress Audit Worksheet

XXXXXXXXX Coker Unit

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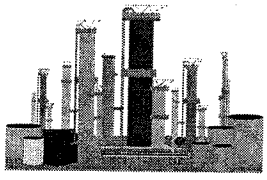
Operation / Maintenance Task	
Location	
Hazard	
Existing Hazard Mitigation. List what's currently in place to protect the worker from the hazard while completing this task.	
Possible improvements to protect worker from hazard during task.	
Existing Egress Mitigation. List what's currently in place to facilitate worker in safe 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.	

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., Harvard Business School Study, 1990

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 Sharing 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