Safety Audits at Oil & Gas Industry
– A Supervisory Activity

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Presentation Outline

- HSE Audits
- Areas Covered in Audits
- Steps in Auditing
- Supervisory Role of Auditors
- Risk Management
- Conclusion
HSE Audits

- Compliance Safety Audits
- Quality Safety Audits
Areas Covered in Audits

- Leadership & Management Commitment
- Risk Identification
- Risk Management
- Review & Monitoring
Verify whether a Process safety culture

- Sense of Vulnerability Exists?
- Concern for preventing Process safety & personal safety incidents?
- Discussions/Field checks/Inspections
Supervisory Role of Auditors

Verification Process

- Leadership & commitment

Identification Vulnerability from Process Hazards
- Crude & Vacuum Distillation units
- Catalytic Reforming /HGU/Isomerisation units
- Delayed Coker, Fluidized Catalytic Cracking unit
- Hydrocracker Units & Sulphur block
- Offsite storage & handling and
- Refinery Flare systems & Acid Flare
Vulnerability from Process Hazards

Crude & Vacuum Distillation units
• Column operating above auto ignition temps - leaks will result in fire incident
• Air in leakage in Vacuum column – resulting in explosion
• Maintenance activities in running plants – in-adequate isolation, de-energizing, Inadequate purging to make Gas free

Catalytic reforming , H2 Generation, Hydro-treaters and Isomerization units
• H2 explosive limit 4 -74%: little energy required to ignite H2
• Material incompatibility& Failures, area classification, thermal stress
• N2 used for inverting as well as carrier gas
Vulnerability from Process Hazards

**Delayed Coker**
- Hazards from: Coke drum switching, Coke drum head removal and Column bottom circuit handling material above auto ignition temp

**Fluidized Catalytic Cracker**
- Risk during non routine, like S/ups & S/dn, equipment maintenance & utility interruptions leading to greater thermal induced stress
- Unstable catalyst circulation leads to surges in pressure & temp balance.
- Most hazardous operation during change of reactor Vapour Blind (Big blind)
Vulnerability from Process Hazards

Fluidized Catalytic Cracking Unit

Big Blind
Vulnerability from Process Hazards

**Hydrocracker Unit**
- Runway reaction leading to more heat generation, and effect can spiral out of control
- Delay in depressuration can result in temp excursion & catastrophe
- Handles large amount of H2S in high pressure section & in sour water systems
- Column bottom circuit handles materials above auto ignition temp

**Sulphur Recovery unit (SRU)**
- The Feed to Sulphur recovery unit contains toxic H2S
- Runway reaction at SRU during dechocking operation
Vulnerability from Process Hazards

Typical Single-Stage Hydrocracker Unit

- Fresh Feed
- Hydrogen Makeup
- Recycle Oil (Fractionator Bottoms)
- Makeup Compressor
- H.P. Hot
- Wash Water
- Separators
- Recycle Gas Compressor
- Flash Gas
- To Fractionator
- L.P. Cold
- Sour Water
- To Fractionator
Vulnerability from Process Hazards

Hydrocracker Unit

Depressuring Systems

To Recycle Gas Scrubber or Compressor

To Flare

To Sour Fuel Gas

PSV

21 kg/cm² Depressuring

7 kg/cm² Depressuring

To Pressure Controller

Cold Separator

To Flare

To Flare
Vulnerability from Process Hazards

Refinery Flare system & acid flare
- A liquid seal to maintain + ve pressure to prevent air entry
- Flare ignition failure leading to release of unburnt venting
- Pilot failure is risky
- Abnormal loading of flare due to sudden release
- The Acid flare KOP, a potential source of H2S exposure

Off site Storage & Handling system
- Leaks & overflow of tanks resulting fire & explosions
- Storage & transfer of material pose risk of fire & explosion from leaks
- Ignition sources are; static & open flames
- Fire, explosion & BLEVE from LPG leaks
Supervisory Role of Auditors

To identify Gaps in Process safety and Personal Safety Management systems

1. Work permit systems involving maintenance activities
2. SOPs, MOCs
3. Process Engg designs & Layouts
4. Start up/Shutdowns & Abnormal situation Handling
5. Assets Integrity & Equipment reliability
6. Electrical Safety including Area classification
7. Construction& Execution activity
Supervisory Role of Auditors

Risk Assessment
- Addressing all Process Hazard vulnerabilities
- Quantitative Risk Assessment
- Individual & Societal Risks
- Reassessment of Risk

Derives the Requirement of Hazard & Risk Reduction actions
Supervisory Role of Auditors

Risk Management

- Inbuilt Safety In Design
- Controlling Operation Safety and
- Asset Integrity

Adopting Technical Safety Standards
Supervisory Role of Auditors

Inbuilt Design In Safety

- Layout for Oil & Gas installations
- Design & Operating Philosophies on Press. Relief systems
- Instrumentations for Process systems
- Design & Operating Philosophies for Furnaces
- Classification of areas for electrical installations
Supervisory Role of Auditors

Controlling Operation Safety

- Work Permit System
- Fire Protection & Fire Proofing of facilities
- Inspection of pipes & Valves & Fittings
- Inspections of Above ground tanks
- Cross Country pipelines inspection
Supervisory role of Auditors

Review & Monitoring by management

- Shop Floor & Departmental Level
- Top Management Level

- All Incidents & Root causes
- Implementations of Risk reduction actions including audit recommendations
- Reassess vulnerabilities & Process Hazards
- Expedite actions with resources & targets
Conclusion

Identification Thru Field verification & evidence whether:

- Vulnerabilities are focused by Management
- Integrated involvement of the entire organisation
- Process Safety & Personal safety issues addressed
- Proactive Measures like adoptions of Tech Standards
- Managements Carries out HSE reviews & implement risk reduction measures