High Reliability Organizing Conference

Deepwater Horizon Incident Investigation

April 20, 2011
Disclaimer

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WHAT IS THE CSB?

• An *independent* U.S. federal agency
  – investigating chemical accidents
  – promoting prevention – public knowledge

• Authorized by Congress in 1990

• Five Board Members; approx 45 staff

• Modeled after NTSB

• Intent of CSB investigations are to get to root cause(s) and make recommendations toward prevention

• Not regulatory; no enforcement authority
Deepwater Horizon (DWH) Incident

- April 20\textsuperscript{th}, 2010
- 11 deaths
- 17 serious Injuries
- ~5 million barrels of oil spilled in Gulf
- Tremendous Economic Impact
Summary of Event

- 9:47 PM on April 20, 2010 a flow of hydrocarbons came up the riser and onto the Deepwater Horizon Drill rig from the Macondo Well (Depth - 5000 feet of water; depth of well 13,000 feet below sea floor)
- A series of two or more explosions and a massive fire occurred shortly after
- The rig sank and bent the riser and drill pipe attached to the rig
- Blow Out Preventer (‘Fail Safe Device’) did not stop the flow of oil
- 83 Days and 5 million gallons later the oil spill is stopped
Organizations Investigating

- Chemical Safety Board
- Presidential commission
- Joint Investigation Team (DOI / USCG)
- National Academy of Engineers
- Deepwater Horizon Study Group (Center for Catastrophic Risk Management, UC Berkley),
- Department of Justice
- BP
- Det Norske Veritas (DNV) Report on Blow Out Preventer
Presidential Commission

Root Causes

• Systemic failures by industry management
  BP, Transocean (largest drill operator in the world),
  Halliburton (cement contractor), etc.
  – Management of decision making
  – Problems with communication
  – Lack of integration of various corporate cultures,
    decision making protocol and procedures (all
    contractors)

• Failure of government to provide effective oversight

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Industry Management and Communication

• Did not adequately identify or address risks associated with late changes to well design and procedures
  – Modifications done in ad-hoc fashion
    • Abandonment procedure
    • Cementing testing

• Communication between BP and contractors
  – ‘Excessively compartmentalized’
  – Decision making process unclear
Regulatory Oversight Failures

• Critical aspects left to industry; no regulatory review
  – Negative pressure testing
  – Cement

• Regulations lacking

• Regulator lacked authority; conflicted mission

• Regulator training appeared to be deficient
Commission Recommendations

• Department of Interior should develop a ‘safety case’ type of approach

• Independent agency – within DOI – to regulate off-shore safety

• Institute of Nuclear Power Operations (INPO) type organization for off-shore drilling

• “Transform the industry safety culture”
  – question data, raise concerns, double check
  – Greater attention to even minor anomalies

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Deepwater Horizon Study Group

• Comparison with the BP Texas City Accident
  – multiple system operator malfunctions during a critical period in operations,
  – “casual compliance” with operating procedures,
  – Instrument data interpretation,
  – inappropriate assessment and management of operations risks,
  – inadequate communications
  – improper management of change

• Recommendation
  – Develop and Maintain Industrial and Governmental HROs
  • Organizations with core Systems Safety Cultures
National Academy of Engineers
Interim Report Findings

• lack of a suitable approach for anticipating and managing the inherent risks
• failure to learn from previous near misses
• lack of a systems approach that would integrate the multiplicity of factors potentially affecting the safety of the well
• Changing key Supervisory personnel just prior to well abandonment procedures began
CSB Investigation

- Only independent federal safety agency investigating

- Experience with process safety and safety systems (staff, other investigations)

- Root cause examination of safety systems not examined by others
  - E.g. human and organizational factors

- Organizational continuity provides for recommendations follow-up and advocacy to ensure implementation
CSB Investigation

- Examine specifics of organizational factors
  - Staffing and organizational structure (changes)
  - Safety Metrics
  - Awards and Bonuses
- Human factors analysis of how mistakes occurred
  - Reliance on human intervention
  - Evidence / Explanations for “inexplicable” decisions leading up to the incident
  - Control / display panels
- Examination of effectiveness of regulations
  - Mineral Management Service (MMS) regulations in place at the time
  - Adequacy of proposed Bureau of Ocean, Energy Management, Regulation and Enforcement (BOEMRE) model
  - Elements needed to avoid future incident
  - INPO type organization for Off-Shore or Oil Sector

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• Examination of regulatory effectiveness
  • How does safety experience of the regulatory regime in place at the time of the incident stack up against other countries? Why?
  • What changes may have prevented the incident

• BOP testing, examining functioning and role as an alleged “fail-safe” device
  • Not available for evaluation in other reports
  • Information which may be important in determining why ‘inexplicable’ decisions were made
  • BOP design adequacy
Blow Out Preventer

BOP and LMRP are stacked (BOP pictured here)

57 feet
400 tons
Lessons Learned?

- Deepwater Horizon: Presidential Commission recommends “transform the industry safety culture”
- BP Texas City: CSB finds that BP had not instilled “a common unifying process safety culture among its U.S. refineries.”
- Three Mile Island: Presidential Commission recommends: “To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, and practices -- and above all -- in the attitudes of the Nuclear Regulatory Commission and ..... the nuclear industry.”

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Will Off-Shore Drilling be transformed like the Nuclear Industry

- Nuclear Industry, post TMI, developed a real belief that “if one of us fails, we all fail”
- Nuclear Industry agreed to collect and share accident, near miss and indicator data (thru INPO)
- Unclear whether same climate exists among Off-Shore companies
  - Deepwater was ‘just a rogue operator’
  - Sharing of ‘lessons learned’, accident data, and near miss data is limited
  - Public Reaction
Taking Safety Culture from theory to practice

• Lots of buzz about ‘Safety Culture’
  – Different definitions
    • Better term is probably System Safety Culture

• Some observations which suggest more work to be done
  – Bonuses tied solely to production or to personal safety performance
  – Bonuses lost if accidents / incidents (disincentive for reporting)
  – Personal safety still seems to be the focus; not safety systems
    • assumption that good personal safety equals good process safety
  – Normalizing problems
  – Complacency – no ‘big’ accidents so start to not be concerned with little things

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Some Final Thoughts

– Must get true buy-in at all levels (Board to workers)
  • Include different perspectives from the beginning of a project / problem assessment
– Must develop and track process safety metrics (not only personal safety measures)
– ‘Real’ Worker involvement – not disincentive based programs
– Must pay attention to the small stuff
– ‘Fixing’ the regulation by adding specific regulatory requirement that addresses problem in latest major accident may not be the correct fix
– Procedure ‘fixed’ by longer more complex procedure that addresses the last problem
– Must be careful about the Technological Fixes
  • New technology may introduce new risks
– Focus on principles of HRO and not on label
  • Benchmarking ?
Contact the CSB

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