Lessons Learned from the US Chemical Safety and Hazard Investigations Board

presented at

The IAEA International Conference on Human and Organizational Aspects of Assuring Nuclear Safety – Exploring 30 Years of Safety Culture

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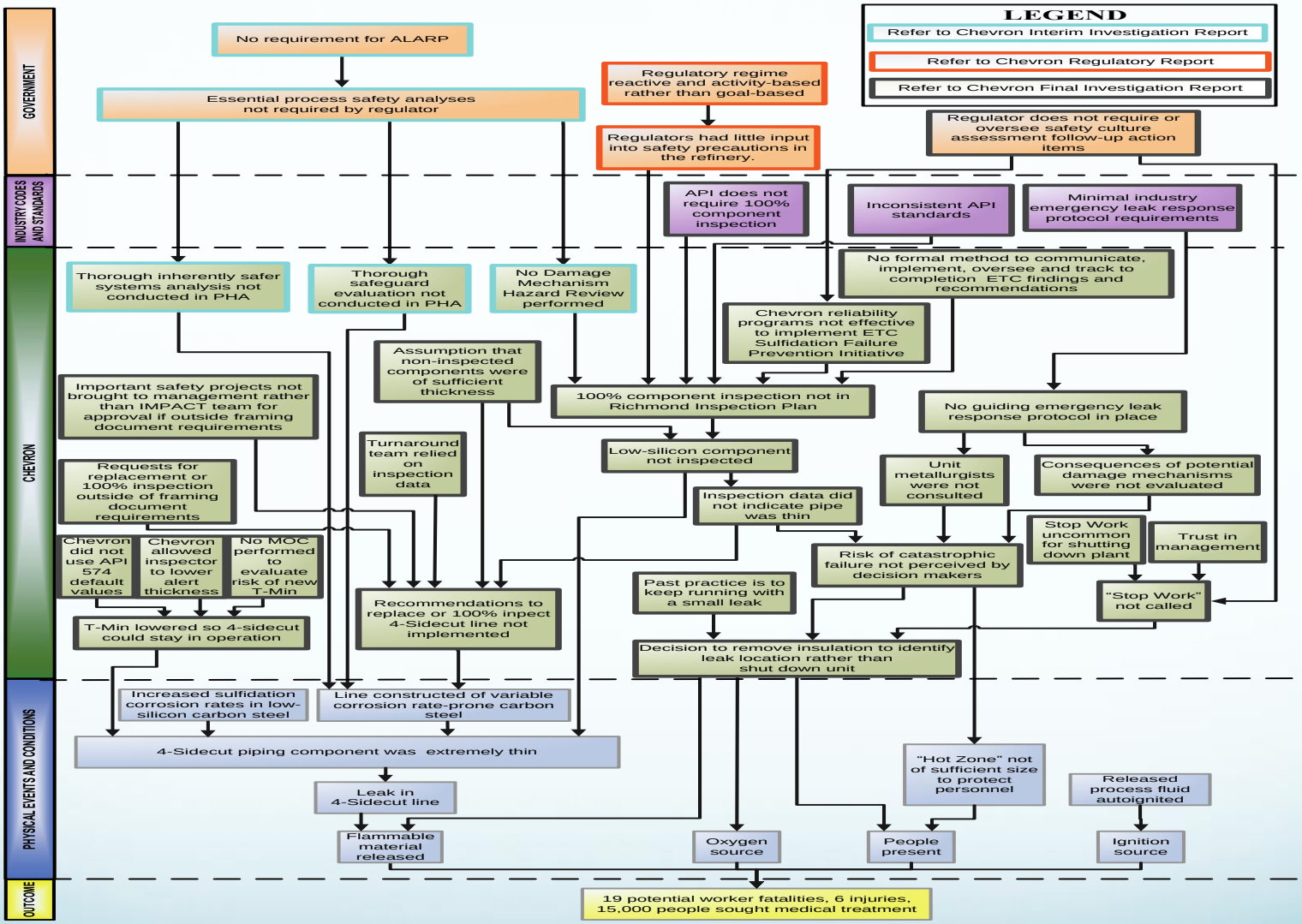
WHAT IS THE CSB?

- An *independent* U.S. federal agency
  - investigating chemical accidents
  - promoting prevention – public knowledge
- Authorized by Congress in 1990
- Five Board Members; approximately 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

CSB Investigation Approach

- Formal analysis to identify underlying technical, human factor, management system, organizational and regulatory causes of the incident.
  - Beyond immediate technical events and individual actions
  - Focus is on improving safety NOT assigning blame
- Addressing the immediate cause ONLY prevents that exact accident from occurring again.



CSB, Chevron Report, 2012

BP Texas City

- March 23, 2005
- 15 deaths and 180 injuries
- During startup, tower and blowdown drum overfilled
- Liquid hydrocarbon released, vapor cloud formed and ignited
- Explosion and fire

CSB Investigation

- Most extensive investigation in CSB history
- Conducted 370 interviews
- Reviewed over 30,000 documents
- Assessment of 5-years of electronic data from the computerized control board system
- Based on human factors framework (Reason, 1997) and methodologies used in investigations of other catastrophic incidents, such as Bhopal and Chernobyl

Baker panel findings

- BP had not provided effective process safety leadership
- BP had not established an open trusting relationship between management and the workplace
- Lack of a unifying process safety culture
- Personal Safety emphasis; not process safety
  - Reliance on low LTIR gave misleading risk indicator
- Cost cutting pressures seriously degraded infrastructure
  - Mgmt failed to assess impact of cost and staff reductions on safety

Safety Culture Attributes

- the degree to which the **workforce feels "empowered"** as to process safety
- the extent to which the workforce feels free to **report safety-related incidents**
- the **process safety awareness**, knowledge, and competency of the workforce;
- relationships and **trust** between different workforce / management and contractors
- whether **deviations** from policies and procedures are tolerated;
- the extent of **information flow** at all levels
- whether the workforce has a **shared belief that safety comes first**, regardless of financial, scheduling, or cost objectives; and
- the extent to which the workforce is **vigilant about process safety risks**, continuously tries to reduce them, and seeks to learn from incidents and near misses.

5+ Years Later …..

Lessons Learned??

Macondo

- April 20th, 2010
- 11 deaths
- > 60 injured
- ~5 million barrels of oil spilled in Gulf over 80+ days
- Tremendous Economic Impact

CSB Investigation

- Examine specifics of organizational factors
  - Staffing and organizational structure (changes)
  - Safety Metrics
  - Awards and Bonuses
  - Cost and Performance Pressures (cost and production goals)
- Human factors analysis of how mistakes occurred
  - Reliance on human intervention
  - Evidence / Explanations for “inexplicable” decisions leading up to the incident
  - Control / display panels
  - Decision making process

Macondo Safety Culture

"Government oversight must be accompanied by **sweeping reforms** that accomplish no less than a fundamental transformation of its **safety culture**" (POSC)

"The lack of a strong safety culture resulting from deficient overall systems approach is evident in the multiple flawed decisions that led to the blowout." (NAE)

Chevron Refinery, Richmond, CA

- August 6, 2012
- Flammable Vapor release and Fire
- 6 Injured
- ~ 15,000 sought medical treatment

California PSM Reform

- Employee Participation
- Process Safety Culture Assessment
- Human Factors
- Management of Organizational Change

10+ years after BP Texas City ……

How are things going?

Maintaining Safe Production

- **Cut exploration**
- **Reduce manning**
- **Reduce training**
- **Reduce maintenance**
- **Focus on today, not tomorrow?**

UK HSE, S. Mackenzie, 2015

Safety Performance

Personal

Process

UK HSE, 2015

Cautions / Challenges

- “the popularity of the concept has been counterproductive and there is a danger of it becoming meaningless” (M. Fleming, ‘Regulator’s Guide to Safety Culture and Leadership’)
- Overemphasis on the sharp end (front line worker) rather than the blunt end (organizational / management)
- Risk Tolerance
  - How is it defined and who defines it
- Safety culture study / change must consider **inequalities of power and authority**

Cautions / Challenges

- Unified safety culture vs. understanding different sub-cultures within an organization and optimizing how they work together
- Focus on Organizational Culture(s) influence on safety rather then Safety Culture
- Trusting and Reporting culture
- Look at the real effect of resource limitations on safety

Will Off-Shore Drilling and Refinery Safety 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 in Oil and Gas Industry
  - Deepwater was ‘just a rogue operator’
  - Sharing of ‘lessons learned’, accident data, and near miss data is limited
  - Reaction to the price of oil
  - Public Reaction

Thank You