Land Use Planning & Process Safety

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Agenda

- Scope
- Drivers
- Strategies

Scope

- New "greenfield" facilities
- New activities or expansions at existing facilities
- Continuing activities at existing facilities

Risk 101

US EHS Regulations/Standards "Risk Based"

- $Risk_{chemical} = f$[Hazard (H), Exposure (E)]
- $Risk_{safety} = f$[Consequence (C), Probability (p)]

Manage the Exposure
Manage the Probability
Manage the Risk

Traditional EHS Risk Management Strategies

- Siting Criteria – site risky activities away from people or vulnerable populations
- Buffer Zones – create/acquire unpopulated areas around risky activities
- Risk management
  - Regulatory limits
  - Control equipment
  - Management systems
  - Emergency plans
  - Recovery plans (technical & financial)

But . . .

- Populations grow
- More effects research
- More monitoring capabilities
- Accidents happen/systems fail
- More public engagement
- Public less tolerant of risk – of any kind

"New" Regulatory Approaches

- Multi-National/Federal:
  - US Emergency Planning & Community Right-to-Know Act (EPCRA)
  - US Clean Air Act
  - Land Use Planning – Netherlands
  - Product Testing & Bans (REACH)
- State:
  - New Jersey Toxic Catastrophe Prevention Act (TCPA)
  - California Proposition 65
- Local:
  - Contra Costa County, CA Industrial Safety Ordinance
  - Environmental Justice

Security Concerns

- Chemical Facility ≈ Terrorist target (Bhopal)
- Chemicals ≈ Chemical weapons
- HazMat shipments ≈ Moving bombs
- Cyber ≈ Remote control/detonation

- Baltimore City Ordinance
- New Jersey Executive Order
- New York Security Regulations
- US Chemical Facility Anti-Terrorism Standards (CFATS)

Strategies: Beyond Regulatory Compliance

- Performance – beyond compliance/ continuous improvement/metrics
- Community engagement
- Safety culture
- *Reducing the hazard*

Strategy: Reduce the Hazard

- 2 Hazards:
  - Characteristics of the material
  - Characteristic of the process
- Eliminate the Hazard
- Reduce the Hazard
- Manage the Residual Risk

Inherently Safer Design

- Eliminate the hazard (1st Order ISD)
  - For example, elimination of a material from site with no need for substitution
- Reduce the hazard (2nd Order)
  - Substitution of one material for a 'more inherently safe' material – still have a consequence, just reduced or different
  - Minimization, but not complete elimination
- Residual Risk (Layers of Protection)
  - Reduce the potential/frequency of an accident

Inherently Safer Design: Hazard Elimination/Reduction Strategies

Strategy	Examples
Substitute	Replace material with a less hazardous substance.
Minimize	Use smaller quantities; eliminate unnecessary equipment; reduce size of equipment or volumes processed.
Moderate	Use less hazardous conditions, a less hazardous form of material or facilities which minimize the impact of a release.
Simplify	Design facilities which eliminate unnecessary complexity and make operating errors less likely.

Inherently Safer Design: Risk Management Hierarchy

- Inherent
  - Eliminate or modify the hazard and/or risk by employing one of four strategies of substitution, minimization, moderation, simplification.
- Passive
  - Minimize the hazard by process and equipment design features which reduce either the frequency or consequences of the hazard without the active functioning of any device.
- Active
  - Using controls, safety interlocks, and emergency shutdown systems to detect and correct process deviations.
- Procedural
  - Using operating procedures, administrative checks, and emergency response to prevent incidents, or to minimize the effect of an incident.

Source: Center for Chemical Process Safety, AIChE

Concluding Thoughts

- Society less and less risk tolerant
- Public policy drivers shifting
  - From risk to hazard
  - From federal to local level
- Enlightened companies embracing strategic approach to pre-emptive risk identification & management

Thank You

Questions?

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