Standard approach to risk management

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Risk Assessment Defined

- Qualitative or quantitative procedure that answers:
  - What can fail or go wrong?
  - What are the consequences of each event?
  - What is the likelihood of each event?
  - How do the likelihood and severity combine to give an overall statement of the risk?
Risk Management Defined

“The systematic application of management policies, procedures and practices to the tasks of analyzing, assessing and controlling risk in order to protect employees, the general public, the environment and company assets while avoiding business interruptions.”

AIChE Center for Chemical Process Safety
Review of Terms

Risk
The probability that a hazard will result in a specified level of loss.

- Defined mathematically as:
  Risk = [Severity] x [Frequency]

Risk Assessment
The application of a procedure that asks:
- What can fail or go wrong?
- What are the consequences?
- What is the likelihood?
- How do the likelihood and consequences combine to give a statement of risk?

Qualitative Risk Assessment
A team of experienced personnel judge the consequences and likelihoods of events of concern based upon their experiences.

Quantitative Risk Assessment
Qualified analysts apply validated modeling tools, data and mathematical techniques to quantify the consequences and likelihoods of events of concern, which are then combined in risk statements.
Chevron Corporate HES Risk Management Process

- Structured process
- Clearly stated objectives
- Enterprise-wide scope
- Mapped to specific OE expectations
- Defined roles and responsibilities
- Specific leading and lagging measures reported annually at the corporate level
- Common risk assessment and management procedure: **RiskMan2**

HES Risk Management Standard Process

- Purpose, Objectives, Scope
- Procedure (RiskMan2)
- Resources, Roles, Requirements
- Measurement and Verification
- Continual Improvement
Starting Point
Asset/Project With Widely Varying Types of Facilities and Hazards

Sub-Procedure 1
Identify, Group and Prioritize

Sub-Procedure 2
Perform High-Level Risk Assessment to Identify HES Risks and Determine Further Risk-Assessment Needs

Sub-Procedure 3
Perform Targeted Detailed Risk Assessments

Sub-Procedure 4
Develop and Implement Risk Reduction Plan and Document Closure of Actions

Sub-Procedure 5
Periodically Revalidate

Risk Following Mitigation

Health Safety Environment

High-Level HES Risk Profile

1 2 3
Qualitative to Quantitative Transition

- Increasing Consequences
- Increasing Uncertainty
- Increasing Rigor of Risk Assessment

Numbers of Facilities

Level of Risk Assessment Effort

Qualitative Risk Assessment

Quantitative Risk Assessment
Examples of Detailed Safety Studies

Qualitative:
- Checklists
- What-if checklist
- HAZOP (HAZard and OPerability) Study
- Failure modes and effects analysis (FMEA), semi-qualitative
- Other qualitative reviews (layout studies, essential system survivability analyses [ESSAs], etc.)

Quantitative assessments:
- Consequence modeling:
  - Flammable release
  - Toxic release
  - Fire/radiant heat
  - Explosion (vapor cloud explosion [VCE], rapid phase transition [RPT], pressure volume [PV] rupture, etc.)

- Full quantitative safety risk assessment