

H S E

HEALTH

SAFETY

ENVIRONMENT



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Assessment of Process Hazards, Risk, and Appropriate Protection Systems

Duration: 5 Days



Methodology

This interactive Training will be highly interactive, with opportunities to advance your opinions and ideas and will include;

- Lectures
- Workshop & Work Presentation
- Case Studies and Practical exercise
- Videos and General discussions

Certificate

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration.

Who Should Attend?

New graduates who wish to gain an understanding of practical process design issues, individuals who are managing and performing process design and process hazard evaluations or risk assessments for operating facilities or are coordinating project activities, and individuals who require an understanding of relief system design.

Course Objectives:

The purpose of this course is to:

- Discuss the range of general process hazards that may result in loss of containment or loss of production with the consequent potential for on-site and off-site injury
- Present a general review of the hazard identification techniques that have been developed in the petrochemical industry for identifying and assessing risk, either qualitatively or quantitatively
- Present the concept of risk and methodologies by which the level of risk associated with a system can be assessed in an objective manner
- Present an outline of inherently safer concepts
- Explain the LOPA (Layer of Protection Analysis) methodology with its assumptions, advantages, and disadvantages
- Present an outline of the fully quantitative methodologies (Fault Tree and Quantitative Risk Assessment) that may be required for some complex studies
- Discuss the various types of protection that can be employed, including the basic process control system, relief devices, and Safety Interlock Systems (SIS)
- Present detailed discussion of relief valve issues
- Present detailed discussion of SIS systems, including their specification, analysis, installation, and testing

Course Outline:

- **General Process Hazards**
 - Flammability - Fire/Explosion/Ignition and Prevention
 - Materials of Construction and Corrosion
 - Health Hazards Awareness
 - Reactive Chemical Hazards
 - Process Equipment (Loading/Unloading, Storage, Unit Operations)
 - Electrical System Hazards
 - Piping Systems
 - Heat Transfer Fluid System Issues
 - Thermal Insulation Issues
 - Human Error
- **Process Hazard Identification Techniques**
 - Risk Identification and Assessment [Process Hazard Assessment (PHA) and Risk]
 - Introduction to:
 - What-If
 - Checklist
 - What-If/Checklist
 - FEMA
 - HAZOP
 - LOPA
 - Fault Tree
 - QRA
- **Risk**
 - What is risk?
 - How Can Risk be Assessed?
 - Objective Consequence and Risk Tolerance Criteria
 - Corporate Process Safety Management Systems

- **Plant Design, Inherently Safer Concepts, Management Systems, and Post-Event Mitigation**
 - Plant Design
 - Process
 - Site
 - Layout
 - Civil
 - Structural/Architectural
 - Utilities
 - Inherently "Safer" Design Philosophy
 - Documentation
 - Management of Change
 - Fire Protection
- **LOPA (Layer of Protection Analysis)**
 - Terms Used in LOPA
 - Where LOPA Fits in Family of Risk Assessment Techniques
 - Strengths and Weaknesses of LOPA
 - Methodology
 - Consequences and Severity
 - Scenario Development
 - Initiating Events
 - Independent Protection Layers (versus Safeguards)
 - Calculations
 - Making Risk Decisions
 - Advanced LOPA Topics
 - Using LOPA for Other Applications
 - Implementing LOPA in an Organization
 - Objective Risk Tolerance Criteria
 - Culture
 - Commitment
 - Worked Examples

- **Types of Protection (Basic Process Control System, Relief**

- Valves, SIS)**

- Introduction to Process Monitoring and Control (BPCS)
 - Instrumentation
 - Testing
 - Alarm Action
 - Alarm Management
 - Mechanical Interlocks
 - Procedural Interlocks
 - Independent Interlocks
 - Introduction to Safety Interlock Systems
 - Introduction to Relief and Discharge Systems

- **Relief Valves**

- Function of Relief Systems
 - Equipment Design Issues
 - Codes, Laws, Standards and Practices, Design Pressure and Temperature, Maximum Allowable Working Pressure, Basic Pressure Relief System Requirements, etc.
 - Determination of Relief Loads
 - Evaluating Reactive Chemical Hazards
 - Storage Tanks
 - Pressure Relief Device Selection
 - Pressure Relief Device Sizing
 - Single Phase
 - Two Phase
 - Device Specification and Installation
 - Flare Headers
 - Pressure Loss Calculations
 - Discharge Systems
 - Documentation
 - Inspection and Maintenance

- **Safety Interlock Systems**

- Purpose of SIS Systems
- Nomenclature
 - SIS
 - SIF
 - SIL
- Basic Concepts
- Security
- Redundancy
- Test Frequency
- Base Data
- Vendor Options
- Design Options
- Maintenance
- Human Error
- **Examples and Problems**