



## Safety in Process Equipment Design and Operation Training

### Description

#### Introduction

Safety in Process Design includes a wide range of subjects with many applications in Oil & Gas, Chemical and Process industries, related to hydrocarbons and chemical processing.

This training course provides an overview of important elements of process safety as they are often encountered in today's industrial practice. The emphasis is on engineering design aspects of Process Safety Management and it will highlight the safeguarding aspects of processing equipment inside the plant.

Techniques for analyzing and mitigating process safety hazards applicable to oil and gas processing will be reviewed. Integration of the concepts required to achieve an optimum approach to Process Safety Engineering is the main goal of this seminar. Exercises and useful examples will be utilized throughout the seminar to emphasise the key learning points.

#### Upon completion of this training course , the delegates will learn:

- Importance of the concept of “Inherently Safer Design”
- Design principles based on Codes and Standards for safe operation of process equipment
- Selection and sizing of safety valves and pressure relief systems
- Common process hazards analysis methods: HAZOP, LOPA, FMEA
- Detection and prevention methods for fire and explosion accidents
- Plant Equipment Inspection (NDT) and Maintenance Procedures

#### Objectives

- Comprehensive understanding of different aspects of process design that influence process safety
- Ability to select an “inherently safer design” for the entire process plant operation
- Knowledge on the mechanical structure integrity of process equipment
- Familiarity with hazards associated with process fluids regarding material degradation

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- Experience with the Code requirements for sizing relief valves, methodology for determining the relief flows and handling the relief streams.
  - Knowledge of how to operate with emergency depressuring systems (EDP) system for prevention of fire and gas explosions

## The Course Contents

### Overview of Safety in Process Design

- Definition of Safety in Process Design
- Overview of Historical Incidents and Problem Areas
- Components of Process Safety: People, Plant, Process
- Risk Identification and Safety Analysis
- Process Hazard Analysis: HAZOP, LOPA, FMEA
- Hazards Associated with Specific Plant Systems
- Elimination of Hazards through Process Design
- Prevention of Human Error through Process Control and Monitoring

### Inherently Safer Design

- “Inherently Safer Design” Methodology
- Pre-Design and Design Phases
- Materials of Construction and Optimised Fabrication
- Hazard Associated with Process Fluids and Chemical Reactions
- Corrosion, Erosion and Material Degradation
- Leakage and Loss of Primary Containment
- Dispersion of Hydrocarbon Release
- Flammability of Chemicals

### Safety of Process Equipment

- Hazard Associated with Process Equipment
- Safety Considerations in Reactor Design
- Design Procedure for Safety of Pressure Vessels, Storage Tanks, Reactors, Heat Exchangers
- Venting of Tanks and Vessels: Codes, Standards and Best Practices
- Piping System Design and Safety
- Design of Piping System Accessories: Valves, Fittings, Supports
- Assessment of Material Degradation during In-Life Cycle: Fitness for Service
- Monitoring, Testing and Inspection (NDT)

### Design of Pressure Relief Systems

- Design of Safety Valves
- Operation of Pressure Relief System
- Calculation and Sizing of Relief Loads of Pressure Relief Systems
- Pressure Relief Valves vs. Rupture Discs
- Codes, Standards and Best Practices
- Specifics of Pressure Relief Systems for Pumps, Compressors, Turbines

- Process Plant Disposal Systems
- Disposal Hazards, Risk Assessment and Environmental Factors

### **Process Monitoring and Control**

- Safety Instrumented Systems
- Process Plant Monitoring and Control System: SCADA
- Emergency Depressuring Systems (EDP)
- Prevention of Fire and Gas or Dust Explosions
- Safety Consideration in Plant Layout and Equipment Spacing
- Management of Change and Integrity Operation Window
- Plant Equipment Inspection and Maintenance Procedures

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