Safety in Process Equipment Design & Operation

INTRODUCTION

- In all steps of designing of pressure equipment related to hydrocarbons and chemical processing and applied in Oil & Gas, Chemical and Process industries, the process safety comes on the top of the list of all considerations. The safety remains to be of utmost importance during operation and maintenance and has to be verified with various methodologies.
- This Safety in Process Equipment Design & Operation training seminar 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 & 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 training seminar. Exercises and useful examples will be utilized throughout the training to emphasize the key learning points.

This training seminar will feature:

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

OBJECTIVES

At the end of this training seminar, the participants will be able to:

- Understanding different aspects of process design that influence process safety
- Appreciate "inherently safer design" for the entire process plant operation
- Evaluate mechanical integrity of process equipment
- Identify hazards associated with process fluids regarding impact on material degradation
- Follow code requirements for sizing relief valves to handle relief streams
- Operate Emergency De-Pressuring Systems (EDP) in case of fire and gas explosions

TRAINING METHODOLOGY

- This Safety in Process Equipment Design & Operation training seminar will be conducted along workshop principles with formal lectures and interactive examples, which will result in the active participation of all delegates in discussions and teamwork. Real life examples will be selected to illustrate the efficient operation and potential technical failures as well as their root causes. The emphasis will be on troubleshooting the problems and maintaining plant safety. There will be ample opportunities for active, open discussion and sharing professional experiences on various safety issues. All training seminar materials will be provided.

ORGANISATIONAL IMPACT

- On completion of this Safety in Process Equipment Design & Operation training seminar, the delegate will be able to critically analyse the safety methodologies employed within the organisation and instigate improvements where required.

The knowledge gained in this training seminar will:

- Enable the delegate to optimise the operation of various components of equipment while maintaining safety of the plant
- Give the delegate confidence to carry out risk minimization analyses on process equipment thereby avoiding failures
- Enable measures to enhance equipment status for the given operating conditions
- Give better handling of pressure relief system
- Enable better specification of new and replacement of old elements of piping system
- Allow tighter control of maintenance budgets by the avoidance of unplanned equipment failures in service

PERSONAL IMPACT

- Improved confidence when considering safety issues
- Better understanding of how the process design impacts safety of the plant
- Better grasp of maintenance and instrumentation on incident prevention
- Improved personal knowledge of risk and hazard analysis
- Better ability to troubleshoot difficult and hazardous situations
- Confidence and ability to select the appropriate depressuring plan thereby improving reliability and personal profile to senior management

WHO SHOULD ATTEND?

- Operation, Technical Service and Maintenance Professionals
- Technical Professionals responsible for maintenance and repair of equipment
- Professionals involved in inspection and maintenance and repair
- Project Engineers and HSE Professionals
- Technical Professionals dealing with risk assessment and integrity analysis

Course Outline

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 Optimized 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 Monitoring and Control

- Safety Instrumented Systems
- Process Plant Monitoring and Control System: SCADA
- Emergency De-Pressurig 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
- Final Conclusions