Process Equipment Design Skills Required for Effective Process Hazard Analysis For Offshore, Midstream, and Downstream Training Course

The success of every company depends on each employee's understanding of the key business components. Employee training and development will unlock the companies' profitability and reliability. When people, processes, and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner. Training and development are an investment in future success - give yourself and your employees the keys to success.

It is strategically important that your PHA team understands the fundamentals of process equipment design in the areas of heat exchanger, relief valve and flare sizing, rotating equipment sizing, metallurgy, distillation and process control safety integrity levels. **Without knowledge of these key process equipment fundamentals, critical aspects of the Process Hazard Analysis will be missed.**

Whether you have a team of new or seasoned employees, an understanding of these concepts is crucial to the discovery of process hazards. Sizing of RVs is critical to assuring that the RV will perform as required. The pressure rating of heat exchangers shell and tube is critical to assure the integrity of the heat exchanger. Process Control Safety Integrity Levels need to be understood to give correct safeguards.

Most studies show that a continuous reinforcement of best practices in operational principles is the most effective way to obtain the desired results. Training and learning should be an ongoing continuous lifelong goal.

Course Objective

This course will guide the participates to develop key concepts and techniques for required equipment sizing for effective PHAs.

Every PHA should require people trained in these key areas of process equipment design are in attendance

1. Hazard Analysis Techniques
2. Piping and Pressure Vessels Design Ratings
3. Heat Exchanger Design
4. Relief Valve and Flare System Design
5. Rotating Equipment Sizing Design
6. Metallurgy with Pressure and Temperature Limits
7. Distillation Design
8. Process Control with Safety Integrity Levels

This program will emphasize the process unit operation design fundamentals, safe utilization of these fundamentals by operations, engineering, maintenance and support personnel.

Outline

Introduction

- Overview of the Chemical Processing Industry

Review of Process Incidents

- Safety for the Chemical Processing Industry

Review of Process Hazard Analysis

Hazard Identification

a. Core knowledge needed for hazard identification

- Chemistry of the process
- Hazards of mixing
- Introduction to Metallurgy
- Introduction to Relief Valve Sizing
- Introduction to Process Control
- Introduction to Safety Integrity Levels
- Auditing Operating Procedures

b. What If

- Typical What If checklist

c. HAZOP

- Hazard Assessment Definition
- Review of actual industry hazards
- PHA Study Objectives
- Introduction of PHA Techniques / Probability Matrix
- Team Leader Responsibilities
- Preparation and Organization of PHA Studies
- Importance of Business Records / PHA Terminology
- Selection of Study Nodes / Design intent of node
- Introduction of Guide words
- Guidelines for managing the team
- Recording Study Results / Maintaining Quality Control
- Management of Results and Recommendations
- Communication of Results to Management

Piping and Pressure Vessels Design Ratings

- Overview of Piping and Pressure Vessel Equipment
- Code Safety Factors
- Design of Piping and Pressure Vessels
- Case Studies
  - Piping Check Valve Case Study
  - Hot Tapping Case Study
- Safety – Pressure Concerns

Heat Exchanger Design

- Overview of Heat Exchanger Equipment
- Design of Heat Exchangers
- Designing for Fouling Service
- Code Safety Factors – 10/13 Rule
- Relief Valve and Rupture Disk Requirements
- Case Studies
    - Heat Exchanger Case Study
- Safety – Pressure Concerns

Introduction to Flaring System Equipment

- Flare Headers
- Relief Valves
- Flares
- Overview of Application Codes

Overview of a Flare Header

- Comparison of Flare Header Designs
- Line Sizing Fundamentals
- Flare Line Routing
- Materials of Construction
- Flare Line Safety Case Study
- Piping Safety Guidelines

Overview of a Pressure Relieve Valve

- Design of a Pressure Relieve Valve
- Sizing a Pressure Relieve Valve
- Sizing Reliving Cases
  1. Fire Case
  2. Power Failure
  3. Cooling Water Failure
- Design Case Studies

Overview of a Flare

- Comparison of Flare Designs
  1. Elevated Flare
  2. Ground Flare
  3. Enclosed Flare
  4. Thermal Oxidizer
- Types of Flare Tips
- Sizing a Flare Tip
- Types of Flare Tip Seals
- Sizing a Flare Height (Simple Approach)
- Sizing a Flare Tip (Brzustowski's and Sommer's Approach)
- Design Case Studies

Flare Reduction by Layers of Protection Guidelines

- Layers of Protection Guidelines / Code Overview
- High Integrity Protection Systems (HIPS)

Rotating Equipment Sizing Design

Steam Turbines, Pumps and Compressors

- Overview of Rotating Equipment
- Safe Commissioning of Rotating Equipment
- Design of Rotating Equipment
- Case Study
  - Compressor Check Valve Case Study
  - Small Bore Piping Case Study
- Safety

Metallurgy with Pressure and Temperature Limits

- Overview of Code Temperature Limits and Safety Factors
- Overview of Code Pressure Limits and Safety Factors
- Low Temp Embrittlement
- Corrosion Issues

Distillation Design

- Overview of Distillation Equipment
- Design of Distillation Equipment
- Residence time of Towers, Trays, OH Receivers and Reboilers
- Designing for Fouling Service
- Case Study
  - Tower Inspection Failure
- Safety

Process Control with Safety Integrity Levels

Introduction to Regulatory Control

- Process Control

    1. Parts of the typical control loop
    2. Process & Instrument Diagrams (P&ID's)
    3. Commonly used process control signals

- Automatic Control
- Open and Closed Loop Systems
- Feedback and Feed forward Control

Safety Integrity Levels

- Safety Instrumented Functions (SIFs) Identification
- Determining SIL Requirements
- SIL Verification and Validation
- SIL Assessment Techniques

Who Should Attend:

- People who are making day to day decisions regarding operation, design, and economics of offshore, midstream and downstream process industry plants.

    1. 1st Line Operations personnel,
    2. Operation Supervisors,
    3. 1st Line Maintenance personnel,
    4. Maintenance Supervisors,
    5. Senior Plant Supervisors,
    6. Operations Engineers
    7. Process Support Engineers,
    8. Design Engineers,
    9. Cost Engineers
    10. Environmental Support Personnel

- Engineers, Operating Personnel, PSM Coordinators, HSE Managers and Engineers

- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding in Processing Plant Operations.

- Other professionals who desire a better understanding of subject matter

What you can expect to gain:

- Obtain the design knowledge required for Hazard Analysis

    1. Hazard Analysis Techniques
    2. Piping and Pressure Vessels Design Ratings
    3. Heat Exchanger Design
    4. Relief Valve and Flare System Design
    5. Rotating Equipment Sizing Design
    6. Metallurgy with Pressure and Temperature Limits
    7. Distillation Design
    8. Process Control with Safety Integrity Levels

- Gain an understanding of the design of these critical pieces of equipment.
- Review Safety Factors of Equipment Design
- Review safety guidelines of process equipment