COURSE TITLE: PRESSURE RELIEF & FLARE SYSTEMS

Course Duration: 2 days Classroom

Course Level: Foundation / Intermediate

Overview of Course:

The course covers relief, flare and vent systems design. It describes why specific equipment like separators and heat exchangers require relief protection and how to determine the relief cases for these items. The various elements of the relief system, from relief valves through piping and headers to flare knock out drums and flare tips, are covered as is the methods for determining overall system and peak relief loads.

The course also covers how plant depressuring systems are configured and why some of the specialised design principles such cold temperatures and acoustic vibration are critical to sound relief system design.

DESIGNED FOR YOU, IF YOU ARE...

- A Facilities or Process Engineer, either a Graduate or a more experienced Technical Professional looking to develop theoretical competence in relief and flare system design
- A Safety Engineer who seeks to gain competence in the principles and practices of relief and flare system design
- A Project Engineer or Manager who seeks greater understanding of the principles of sound relief and flare system design
- An Operations Engineer looking to deepen your knowledge of the design principles of the plants

HOW WE BUILD YOUR CONFIDENCE

The course links theory to application. It reinforces this through real industry examples and allows participants to practice the theory through worked examples as part of the sessions.

The course is highly interactive and participants are encouraged to share their own experiences and problems to the benefit of all.

THE BENEFITS FROM ATTENDING

By the end of the course, you will have a good understanding of how relief and depressuring systems are designed. You will appreciate the importance of establishing all relief cases that apply and how these are equipment-specific. You will know how to determine governing relief cases for the system and how to calculate peak relief system loads. You will have an introduction to how staggering and staging depressuring systems can lower peak loads and how important cold temperatures and acoustic vibration are in the system design.

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You will have gained this from seasoned professionals who have been involved directly with relief and flare system design and have real life experiences to offer not just textbook knowledge.

TOPICS

- History & Standards
- Establishing Relief Cases
- Overall Relief System Design
- Components in the Relief System
- Relief Devices and Sizing Methods
- Relief Piping Systems
- Depressuring Systems
- Types of Flares
- Flare Radiation
- Vent Dispersion

DAILY AGENDA

Day 1: Relief System Basics, Relief Cases and Relief System Design

- Some History of Relief Valves
- The Need for Relief Systems
    - Codes & Standards
- The Basic Relief & Flare System
- Relief & Flare System Design
    - Relief Cases
        - Reverse flow
        - Two phase relief
        - Double Jeopardy
        - Common Cause Failures
    - Relief System Design
        - Pressure Vessels
        - Heat Exchangers
        - Tanks
        - Pig Receivers & Launchers
        - Fire Relief
        - Vacuum Relief
    - Peak Relief Loads

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Exercise 1 – Relief Case & PRV Set Pressure

- Types of Relief Devices
  - Terminology
  - Reclosing
    - Conventional Spring-Operated
    - Balanced Bellows & Balanced Piston
    - Pilot-Operated
    - Pressure-Vacuum Valves
    - Temperature Relief Valves
    - Comparison of Different PRV Types
  - Non-Reclosing
    - Rupture Discs
    - Pin Devices

Exercise 2 – Identification of Relief Devices

- Relief Valve Sizing
  - Liquid Sizing
  - Steam Sizing
  - Gas Sizing
  - Factors in Sizing Equations
  - Effects of Back Pressure

Exercise 3 – Relief Valve Sizing Example

  - Flashing Liquid Sizing
  - 2-Phase Flow Sizing
  - Thermal Relief Valve Sizing
  - Fire Case Relief Valves
  - Multiple Relief Valves
  - Rupture Disc Sizing
- Installation
  - Initial Installation
  - Inlet & Discharge Piping

Exercise 4 – Valve Chatter

  - Reaction Forces
  - Relief Headers
  - Acoustic Induced Vibration

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- Cold Temperatures & Cold Creep
- Isolation Valves

Exercise 5 – Isolation Valve Interlocks

Day 2: Depressuring Systems, Flares and Vents

- Depressuring Systems
  - Rate of Depressurisation
  - Flare System Response
  - Depressuring Devices & Actuation

Exercise 6 – Automatic Blowdown Pros and Cons

  - Segregation & Staggering of Blowdown
- Flares
  - Types of Flares
    - Onshore Elevated & Ground
    - Offshore Flares
    - Flare Tips
  - Flare Radiation
  - Flare Radiation Calculations

Exercise 7 – Flare Radiation Calculation

  - Ground Flares
  - Flare Ignition
  - Smokeless Flaring
  - Purge Gas
  - Flare Knockout Drums
- Vents
  - Venting vs Flaring
  - Vent Dispersion
- Flare / Vent Gas Recovery Systems
  - General
  - Typical System Components
- Instrumented Protection Systems (a brief introduction)
  - Reasons for Using an IPS
  - Design & Standards
- Common System Design Pitfalls
  - Examples

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Exercise 8 – Fire Relief Valve Sizing

- Wrap-Up

INSTRUCTOR:

Phil Tudhope is currently Director of a consulting company, specialising in technical and project management training for graduates and more senior technical staff. He has a first class honours B.Sc. in Mechanical Engineering from Bristol University and is a Chartered Engineer, Fellow of the Institution of Mechanical Engineers and Affiliate Member of the Institution of Chemical Engineers.

Phil has over 40 years' experience in Project Management, Technical Development and Change Management in the oil & gas industry and proven technical and managerial capabilities to achieve results with a strong business focus and to effect significant positive change. He is a specialist in front-end (feasibility & concept selection) phases of upstream oil & gas developments with midstream (LNG) experience and project execution experience and has the ability to perform analysis and development work as well as lead and motivate teams.

Amongst other roles, he was Specialist Front End Advisor at Petronas Carigali, Chief Process Engineer at BG Group and Head of Upstream Engineering at Shell Technology India. He has experience worldwide in differing political, social and remote environments, having worked overseas for 28 years including the Far East, USA, Europe, the Middle East and India.

Phil is an experienced instructor including the development and delivery of technical and project management courses.

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