TETRA TECH RPS ENERGY | TRAINING

N736: Process Piping Code, P&IDS and Engineering Drawings Interpretation

Format and Duration
Classroom - 3 Days

Instructor(s): Prof. David Newman

Summary

The use of piping and piping systems plays a critical role within a range of industries – oil and gas, process, petrochemicals, nuclear, etc. As with other operational assets all piping systems may be susceptible to damage from mechanical forces, vibration, corrosion, fatigue, etc. One of the most significant damage mechanisms on piping is known as Corrosion Under Insulation (CUI).

This course will present delegates with a detailed insight into piping and piping systems covering design, materials, fabrication, piping protection, piping codes and standards, piping and instrumentation diagrams (P&IDs) and their interpretation. It is noted for clarification that there is often a lot of confusion between What Is Piping and What Is A Pipeline – sometimes these terms are used interchangeably which is incorrect as piping is governed under international standard ASME B31.3 whereas pipelines are governed under ASME B31.4 (liquid pipelines) and ASME B31.8 (gas pipelines).

Learning Outcomes

Participants will learn to:

1. Demonstrate a comprehensive understanding of Process Piping Codes and Standards, including key piping codes such as ASME B31.3 and API 570.
2. Evaluate piping engineering materials, emphasizing the factors that influence material design and selection based on the types of fluids and gases transported under operational conditions.
3. Examine the properties and testing of piping materials.
4. Explore piping manufacturing methodologies, including seamless and welded pipes, as well as extrusion processes.
5. Classify and differentiate between various 'Piping Classes' and 'Piping Classification' systems.
6. Describe various piping and piping system fittings, including end connections, bends, reducers, flanges, valves, and pipe supports.
7. Analyze the design of piping systems within process plant design, focusing on plot plans and battery limits.
8. Evaluate potential issues with piping, including failure modes and the consequences of such failures.
9. Interpret Piping and Instrumentation Diagrams (P&IDs), including the symbols used for piping, valves, and instrumentation.
10. Examine Process Flow Diagrams (PFDs) and their significance in process design.
11. Review material take-offs (MTOs) and Bills of Materials (BOM) for accurate project planning.
12. Discuss regulatory and safety requirements relevant to piping design.

Training Method

This is a classroom course consisting of lectures, videos, discussions sessions, case studies and course assessments.

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Who Should Attend

This course is intended for graduate engineers, piping, materials and corrosion, integrity, facilities, operations & maintenance and health and safety engineers.

Course Content

Part 1

Process Piping - Codes and Standards and Piping Design

- Introduction to Process Piping Codes (ASME, API, ANSI, ISO)
- Overview of ASME B31.3 (Process Piping) and other key standards (B31.1, API 570, API 650).
- Importance of codes in design, safety, and compliance.
- Understanding material classifications and specifications.
- Key Design Considerations in Process Piping - Pipe strength, pressure-temperature ratings, and stress analysis basics.
- Types of pipes, fittings, flanges, and valves.
- Welding procedures, NDT (Non-Destructive Testing), and inspection requirements.

Case Studies & Exercises

Part 2

Piping & Instrumentation Diagrams (P&IDs)

- Fundamentals of P&IDs
- Introduction to P&IDs and their role in process industries
- Symbols, line types, abbreviations, and legends in P&IDs
- Reading and Interpreting P&IDs
- How to trace fluid flow paths and piping arrangements
- Equipment, valves, and instruments in P&ID
- Control systems, alarms, interlocks, and process safety features
- Fundamentals of PFDs and Block Diagrams
- Looking at P&IDs, PFDs, UFDs - Practical Exercises & Group Work
- Interactive session: Analyzing and interpreting real P&IDs from industry projects
- Group challenge: Troubleshooting piping issues using P&IDs

Case Studies & Exercises

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Part 3

Engineering Drawings Interpretation & Practical Application

- Types of Engineering Drawings in Piping
- Introduction to piping isometrics, orthographic projections, and sectional views.
- Understanding weld maps, fabrication drawings, and spool drawings.
- Reviewing bill of materials (BOM) and material take-offs (MTOs).
- Piping Layouts & Construction Considerations
- Fundamentals of piping support, expansion loops, and routing.
- Pipe insulation, heat tracing, and stress analysis basics.
- Pipe corrosion protection – CUI
- Construction, fabrication, and site installation guidelines.
- Final Case Study & Assessment
- Hands-on project review: Reading and interpreting engineering drawings.
- Assessment: Participants analyse a full set of P&IDs and piping drawings.

Case Studies & Exercises