€TRAINING

Process Equipment & Piping Systems: Application, Design & Operation

8 - 12 December 2019
Amman (Jordan)
Vip Business Center

Process Equipment & Piping Systems: Application, Design & Operation

REF: E6100 DATE: 8 - 12 December 2019 Venue: Amman (Jordan) - Vip Business Center Fee: 2500 Euro

The mechanical integrity and reliability of process equipment and piping systems can only be achieved if they are designed by competent engineers and operated effectively within the design envelope, namely, the integrity operating window IOW.
This course provides the appropriate mix of fundamentals, methodologies, best industry practices, and practical tools to enhance the competencies and improve the performance of design, operation technical professionals individually and collectively with the objective of adding value to the organization and improving the plant safety and reliability.

The Goals:

The key objectives of this comprehensive course are as follows:

- To increase the participants' awareness and understanding that mechanical integrity of process equipment and piping systems depends jointly on the proper design, operation, condition assessment, and maintenance of the equipment, underscoring their vital individual and team roles in managing change.
- Provide participants with practical and sound methods and tools to enable them to carry out basic design calculations for pressure equipment in accordance with applicable industrial codes, standards and best practices.
- To provide the participants with a clear understanding of the degradation mechanisms that process equipment could be subjected to over their operating life, how to identify them, predict and determine their impact, and what appropriate measures can be taken to prevent and control the resultant damage.
- To provide the participants with the knowledge and failure analysis skills they need to conduct damage and failure analysis so as to prevent similar failures from happening.
- To enhance the knowledge and skills of the participants in hazard identification and analysis; and in risk assessment and management.

The Delegates:

This is a 'core' course for the professional development of engineers, technical professionals, operations and maintenance personnel involved in design, projects, operation, inspection and maintenance of oil & gas plants, oil refineries & petrochemical plants, and power plants.
New graduates will gain essential and integrated knowledge about pressure equipment and piping systems design and the significance of appropriate design, operation and maintenance on their mechanical integrity.

The Process:

The course combines structured and focused presentations and discussions of topics covered with actual relevant worked examples to enforce the learnings. It combines sound engineering principles, methods, applicable industry codes & standards and best industry practices with workshops that cover case studies of major failures and their root causes with particular emphasis on the learnings from these incidents to prevent similar failures.
To maximize learnings, optional Question & Answer sessions are available at the end of each day to avail participants the opportunity to ask the instructor one-on-one questions relating to the topics discussed as well as to other work related problems they may experience.
All delegates will receive a detailed set of course presentation and lecture notes which will provide an invaluable reference document.

The Benefits:

- Delegates will enhance their knowledge and expertise in pressure equipment and piping system design, and will be equipped with structured procedures and effective guidelines to perform design calculations.
- Participants will gain a sound working knowledge of the interdependence of design, operation, and maintenance on integrity, reliability and cost-effectiveness of piping systems.
- Participants will extend their knowledge of the requirements and application of relevant sections of the ASME Boiler and Pressure Vessel Code and B31 Piping Codes, as well as relevant API Codes, standards, and Recommended Practices such as API 510 and 570 in pressure equipment and piping system design, operation, inspection repairs and alterations.
- The delegates will gain sound and practical understanding of the major degradation mechanisms that affect process equipment and piping systems, how to predict them, how to assess their impact on process equipment over their operating life, and how to prevent and control these degradation and damage mechanisms using best industry practices including API 571 and API 580.
- Participants will add to their ability and skills in process equipment and piping failure detection and analysis, estimating failure consequences, and conducting level 1 fitness-for-service assessments in accordance with API/ASME 579.

The Results:

- This course will help the company achieve measurable improvement in mechanical integrity, as demonstrated by reduction in failure incidents, through improved competency in design as well as through effective interaction and collaboration between the engineering, operation and maintenance functions. As a result, company will be able to enhance its loss prevention and safety performance.
- The company will be able to enhance its ability to use risk-based inspection & maintenance, fitness-for-service assessments, and risk assessment methodologies to quantify and prioritize risks, and to allocate resources for optimum benefit. This will result in lower life cycle costs while complying with codes, standards, and other regulatory requirements.

The Core Competencies:

Delegates will enhance their competencies in the following areas:

- Working knowledge in mechanical design of pressure equipment and piping systems in compliance with applicable codes, standards, and regulations - ASME B&PVC Section VIII, B31.3
- The inter-dependence of design, operation, and maintenance for achieving mechanical integrity of pressure equipment and piping systems.
- Understanding, prediction and Identification and assessment of active degradation mechanisms and the failures they may cause.
- Failure investigation techniques and root cause analysis.
- Application of risk-based methodologies in inspection and maintenance - API 580.
- NDT methods and their effective application - ASMEB&PVC Section V.
- Performing Level 1 fitness-for-service assessments - API 579.
- Engineering materials properties and selection criteria for specific applications.
- Hazard identification and risk analysis and management.

The Programme Content:

Key Design Considerations, Guidelines and Practices:

- Process Equipment - An Overview.
- Plant Integrity and Reliability:
  - Interdependence of engineering, operation and maintenance.
  - Management of change.
- Fitness for Purpose:
  - Service conditions, equipment sizing and functional performance.
  - Business-Focused-Facilities - Appropriate quality at lowest life cycle cost.
- Safety by Design:
  - Worst foreseeable credible scenarios, safeguarding, best industry practices.
  - Codes, Standards, Industry Practices.
- Compliance with Regulations and Acts - HS&E requirements and considerations.

Design and Operation of Pressure Equipment:

- Pressure Vessels and Reactors:
  - Materials of construction and standards.
  - Basic Design Methodology.
  - ASME Boiler and Pressure Vessel Code Sections 2, 5, 8 and 9.
  - Worked examples.
- Storage Tanks:
  - Types and application; cone roof tanks, floating roof tanks.
  - Basic design methodology.
  - Overview of API 650.
- Piping Systems:
  - Materials of construction and standards.
  - Basic Design Methodology - hydraulic design, pressure integrity, mechanical integrity.
  - ASME B31.1 and B31.3.
  - Piping flexibility and support.
  - Piping system components - valves and fittings; classes, ratings.
  - Worked Examples.
- Overpressure Protection:
  - Types and application of pressure relieving devices.
  - Code requirements.
  - Sizing methodology: API 520 and 521.
  - Specific operation and maintenance requirements: API 576.

Design and Operation of Thermal Equipment:

- Process Heaters:
  - Types and configuration; box type, vertical cylindrical type.
  - Thermal and mechanical design.
  - API 560, API 530.
- Boilers:
  - Types and configuration; watertube, firetube and waste heat recovery boilers.
  - Fundamentals of design and operation.
  - Operating efficiency and testing.
  - ASME B&PVC Section 1 and Section 4, ASME PTC-4.

- Heat Exchangers:
    - Types and application; Shell & Tube Heat Exchangers, Plate Heat Exchangers, Air Cooled Heat Exchangers.
    - Thermal and mechanical design.
    - Overview of TEMA standards, API 660, API 661.
    - Operation, fouling, and effectiveness.

Design and Operation of Fluid Handling Equipment:

- Pumps:
    - Types and application; Centrifugal, Positive Displacement.
    - Performance characteristics.
    - Selection and design considerations and standards; ANSI, API 610.
    - Worked examples.
- Compressors:
    - Types and application; Centrifugal, Screw, Reciprocating.
    - Design considerations and standards.
    - Operation and troubleshooting.
- Electric motors:
    - Types and application.
    - Operation and troubleshooting.
- Condition Monitoring:
    - Vibration monitoring.
    - Lubricating oil analysis.
- Troubleshooting:
    - Methodology and guidelines.
    - Reliability improvement.

Degradation and Condition Assessment of Process Equipment:

- Degradation processes:
    - Corrosion, erosion, fatigue, hydrogen attack.
    - Overview of API 571.
- Industrial Failures and Failure Prevention.
- Inspection and Testing.
    - Inspection strategies, plans and coverage - Real function of inspection.
    - Nondestructive Testing NDT methods and their characteristics and applicability.
    - Risk Based Inspection RBI.
    - Overview of API 580 and API 581.
- Fitness-For-Service Assessment:
    - Overview of API 579.
    - Worked examples.
- Maintenance Strategies and Best Practices:
    - Optimum mix of reactive, preventive and predictive methods.
    - Reliability Centered Maintenance RCM.