



Piping, Boilers-Pressure Vessel and
Rotating Equipment: Design
Calculations & Operation



Piping, Boilers-Pressure Vessel and Rotating Equipment: Design Calculations & Operation

Introduction:

This Steam Boilers training seminar will focus on the study of correct operation and routine maintenance to ensure that the boiler plant remains at peak efficiency, keeping running costs to a minimum. The piping and pressure vessel design training seminar provides participants with the best practices and procedures for boiler operation and maintenance. The goal of this training seminar is to ensure participants gain a comprehensive understanding of commercial, industrial, and utility boiler systems.

This Steam Boilers training seminar covers the principle of operation of steam boilers, types, and the main components of steam boilers. Boiler inspections, maintenance, operating controls testing, and troubleshooting will all be discussed. Also, the protection and burner management system will be discussed.

Overall, this Steam Boilers training seminar is designed to help maximize safety, dependability, and efficiency, thus extending boiler life, improving boiler efficiency, saving energy costs for the employer, and establishing a culture of safe work practices among the employees. In addition, we will focus on the Design, inspection, and testing methods of static Working principles.

Targeted Groups:

- Process, Mechanical, and Chemical Engineers.
- Operation and Maintenance Engineers.
- Project Engineers.
- Supervisors and Managers.
- Technical Personnel involved in the inspection.

Course Objectives:

At the end of this piping and pressure vessel design course, the participants will be able to:

- Boiler Control Strategies: Safeguards, Interlocks, and Alarm Systems.
- Explain PLC for boiler controls practical.
- Burner Management System BMS.
- Safe Start-Up and Shutdown Procedure.
- Scale and Corrosion Control.
- Chemical and Physical Treatment of Feed Water.
- Deaeration of Feed Water: Removing Oxygen and CO₂.

Targeted Competencies:

By the end of this piping and pressure vessel design training, the participant's competencies will be able to:

- Boiler Efficiency: Economic and Environmental Aspects.
- Boiler Feed Water Preheating Train.
- Air Economizers and Waste Heat Utilization.
- Boiler Performance and Specifications.
- Evaluate Boiler Efficiency.
- Boiler Blow-Down Control Recovery.
- Steam Distribution System Losses.

Course Content:

Unit 1: Boiler Inspection, Maintenance, and Repairs:

- Routine and Periodic Boiler Inspections: Risk Based Inspection RBI.
- Common Boiler Problems in Operation.
- Abnormal Operating Conditions and Operator Actions.
- Maintenance Work Done Periodically.
- Checklist for Maintenance of Fuel Supply System.
- Maintenance of Condensate Recovery and treatment.
- Use CMMS computer-managed maintenance systems.

Unit 2: Boiler Troubleshooting and Accident Prevention:

- Boiler Failures and Accidents: Root Cause Analysis.
- How to apply FMEA Failure Mode Effective Analysis.
- Boiler Troubleshooting Guide.
- Applying RBI Risk-Based Inspection techniques.

Unit 3: Pressure Vessels, Tanks, and Piping Systems:

- Pressure Vessels and Steam Boilers.
- Above Ground Storage Tanks: Operation and Safety.
- Pipelines and Piping Systems: Operation and Safety.
- Pressure Relief Valves: Selection and Sizing.
- ASME BPV VIII & ASME B31.3 Standards and API Codes.
- Storage Tanks: External & Internal Maintenance Techniques.
- Cathodic Protection of Pipelines and Storage Tanks.

Unit 4: Boilers and Valves: Design and Fundamentals of Operation:

- Design and Operation of Boilers.
- Operation and Control Methods.
- Types of Valves.
- Inspection Techniques for Boilers and Valves.

Unit 5: Inspection, Monitoring & Maintenance Engineering:

- Risk Management and Mitigation Technologies: ALARP Criteria.
- Risk Based Inspection RBI API 580 For Station Omega Pressure Equipment NDT.
- Pipeline Internal and External Corrosion Direct Assessment ICDA & ECFA Methods.
- Repair Modern Technologies.
- Review, Summary, and Conclusions.

Unit 6: Design, Operation, and Monitoring Methods:

- Pump Types, Positive Displacement, and Dynamic.
- Pump curves and Pump Selection.
- Pumping system optimization.
- Energy-saving opportunities for pumps.

Unit 7: Steam Turbines, Design, Operation, and Monitoring Methods:

- Fundamentals of Steam.
- Design and Operation of Steam Turbines.
- Boiler Types and Characteristics.
- Performance of Steam Turbines.

Unit 8: NACE Corrosion:

- Define corrosion and recognize the economic, environmental, and safety impact of corrosion.
- Recognize terms and definitions of basic electrochemistry, as well as define the processes and concepts of electrochemistry, oxidation and reduction reactions, thermodynamics, kinetics, and passivity.
- Identify the characteristics of commonly-encountered corrosive environments such as atmospheric, water and other electrolytes, soil, and high-temperature environments.
- Distinguish between engineering materials such as metals, non-metals, composites, concrete, and ceramics and their relationship to corrosion control.
- Discuss the various forms of corrosion, how to recognize each form, materials subject to each form, environments that promote each form, and how to control each form.
- Explain how corrosion can be controlled during the design process through construction, as well as process parameters, drainage, dissimilar metals, crevices, and corrosion allowance.
- Give examples as to how and when to use the control corrosion methods of design, material selection, modification of the environment, protective coatings, and cathodic and anodic protection.
- Differentiate between inspection and monitoring and identify the common testing techniques for each.



Unit 9: API 571 - Corrosion & Materials:

- Scoring Area.
- Exam Structure.
- Important Damage Mechanisms.
- Check if You are Qualified To Take The API 572 Exam.
- How to Register for the API 571 Exam?
- API 571 Certification, Recertification, Rescheduling, and Cost, and API 571 Exam tips.

Unit 10: Expansion Effects and Compensating Methods:

- Piping Systems Calculation.
- Pipe Expansion.
- Methods of Compensation.
- Thermal Force Calculations.
- Possible Equivalent Stresses Caused by Additional External Loads.
- Expansion Devices.
- Calculation of Anchor Force Using a Bellow.
- Bellow Material and Life.
- Use of Hinged Compensators.