MERCURY

Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas

6 – 10 June 2027
Sharm El-Sheikh (Egypt)



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Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas

Ref: 121864_1055370 **Date:** 6 – 10 June 2027 **Location:** Sharm El-Sheikh (Egypt) **Fees:** 5500 Euro

Introduction

This Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas course provides an understanding of how to operate and maintain boilers and electrical heaters used in natural gas facilities. It examines operating principles, equipment components, process controls, and essential safety requirements for reliable thermal systems. Participants explore practical maintenance concepts for improving equipment availability, efficiency, and operational stability. The program covers inspection, troubleshooting, preventive maintenance, performance monitoring, and common equipment problems. It addresses combustion management, heat transfer, electrical systems, instrumentation, pressure control, and emergency operating practices. Participants will develop sound technical knowledge for safe and effective boiler and electrical heater operation in natural gas environments.

Targeted Groups

This Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas training targets professionals seeking knowledge and skills:

- Boiler operators managing natural gas heating systems.
- Maintenance engineers responsible for thermal equipment.
- Mechanical technicians performing boiler inspections.
- Electrical technicians supporting heater systems.
- Instrumentation engineers monitoring process controls.
- Utilities personnel managing plant heating operations.
- Process engineers evaluating thermal performance.
- HSE professionals overseeing equipment safety.

Course Objectives

Participants will achieve the following objectives by completing the Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas course:

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- Explain boiler operating principles and major equipment components.
- Describe electrical heater operating principles and heat-transfer functions.
- Identify critical operating parameters for natural gas heating systems.
- Apply appropriate boiler startup and shutdown procedures.
- Explain safe electrical heater operating practices.
- Recognize common combustion, pressure, temperature, and flow problems.
- Describe preventive maintenance requirements for boilers and heaters.
- Evaluate inspection findings and identify developing equipment abnormalities.
- Explain burner operation and natural gas combustion control.
- Assess boiler efficiency through operating and performance indicators.
- Identify electrical heater faults and basic troubleshooting approaches.
- Explain instrumentation requirements for temperature, pressure, and flow control.
- Apply safe isolation principles during maintenance activities.
- Recognize abnormal operating conditions and appropriate response requirements.
- Support reliable operation through systematic monitoring and maintenance planning.

Targeted Competencies

Participants will gain the following competencies during the Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas program:

- Understanding boiler components and operating cycles.
- Understanding electrical heating principles and equipment configurations.
- Monitoring pressure, temperature, flow, and combustion parameters.
- Applying safe boiler startup and shutdown practices.
- Recognizing abnormal operating conditions.
- Identifying common burner and combustion problems.
- Evaluating heater electrical performance.
- Supporting preventive maintenance activities.
- Interpreting basic operating and maintenance information.
- Applying equipment inspection principles.
- Supporting troubleshooting and fault identification.
- Understanding instrumentation and control functions.
- Recognizing safety-critical equipment conditions.
- Improving operational reliability through systematic monitoring.

Studying Scenarios

In this Advanced Operation and Maintenance of Boilers and Electrical Heaters Used in Natural Gas training, participants develop skills through the following scenarios:

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- Reviewing a boiler startup sequence before plant operation.
- Analyzing unstable burner flame and combustion conditions.
- Evaluating high boiler pressure during operation.
- Assessing an electrical heater temperature deviation.
- Reviewing preventive maintenance findings from equipment inspection.
- Analyzing abnormal instrument readings and control responses.
- Studying emergency shutdown actions during unsafe conditions.

Course Content

Unit 1: Fundamentals of Natural Gas Heating Systems

- Understand the role of thermal systems in natural gas facilities.
- Review basic principles of heat generation and transfer.
- Identify common boiler applications in gas processing operations.
- Examine electrical heater applications in natural gas facilities.
- Distinguish between direct and indirect heating arrangements.
- Review major operational factors affecting heating performance.
- Identify major components of industrial electrical heaters.
- Explain electrical resistance heating principles.
- Examine heating elements and electrical connections.
- Review temperature control and power regulation.
- Understand heater enclosure and protection requirements.
- Examine electrical load and operating conditions.
- Identify factors affecting electrical heater efficiency and reliability.

Unit 2: Boiler Construction and Operating Principles

- Identify the main components of industrial boilers.
- Examine combustion chambers, burners, tubes, drums, and heat-transfer surfaces.
- Explain how natural gas combustion produces useful thermal energy.
- Review water circulation and steam generation principles.
- Examine boiler pressure and temperature relationships.
- Understand the function of safety valves and protective devices.
- Review factors affecting boiler efficiency and reliability.
- Review safe boiler startup procedures.
- Examine normal boiler operating sequences.
- Understand burner ignition and flame monitoring.
- Monitor boiler pressure, temperature, and water level.
- Examine fuel gas pressure and flow requirements.
- Review boiler shutdown and isolation procedures.
- Identify abnormal operating conditions requiring operator attention.

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Unit 3: Boiler Maintenance, Inspection, Efficiency, and Performance Monitoring

- Review preventive maintenance requirements for industrial boilers.
- Examine burner and combustion component inspections.
- Assess boiler tubes and heat-transfer surfaces.
- Review water-side inspection and cleanliness requirements.
- Examine valves, pumps, seals, and mechanical connections.
- Identify signs of corrosion, scaling, leakage, and overheating.
- Understand maintenance records and equipment condition monitoring.
- Examine key indicators of boiler operating efficiency.
- Review fuel consumption and heat-output relationships.
- Understand combustion efficiency and excess-air control.
- Identify causes of heat-transfer losses.
- Examine stack temperature as a performance indicator.
- Review methods for detecting declining thermal performance.
- Support continuous improvement through operating data analysis.

Unit 4: Electrical Heater Operation, Maintenance, Instrumentation, and Control

- Review safe electrical heater startup procedures.
- Examine normal operating parameters and control settings.
- Monitor temperature, current, voltage, and power consumption.
- Inspect heating elements for damage or deterioration.
- Review electrical connections and terminal conditions.
- Examine insulation and grounding requirements.
- Apply systematic preventive maintenance practices.
- Identify instruments used to monitor boilers and heaters.
- Examine temperature, pressure, flow, and level measurements.
- Understand control loops for thermal process stability.
- Review alarms, trips, and protective interlocks.
- Examine burner management and heater protection systems.
- Identify inaccurate readings and instrument abnormalities.
- Understand the importance of calibration and functional testing.

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Unit 5: Troubleshooting, Safety, and Integrated Operational Reliability

- Identify common boiler operating problems.
- Examine causes of flame failure and unstable combustion.
- Review responses to high pressure and overheating.
- Identify common electrical heater faults.
- Examine causes of element failure and abnormal current.
- Apply structured troubleshooting principles.
- Review emergency shutdown and safe isolation requirements.
- Recognize hazards associated with natural gas and high-temperature equipment.
- Develop systematic approaches to equipment monitoring.
- Review preventive and condition-based maintenance principles.
- Prioritize maintenance according to equipment criticality.
- Examine recurring failures and their contributing factors.
- Review inspection findings and maintenance documentation.
- Support spare-parts planning for critical thermal equipment.
- Integrate operating data into maintenance decisions.
- Promote reliable, efficient, and safe heating-system performance.

Final Insights & Key Takeaways

Participants gain a structured understanding of boiler and electrical heater operation, maintenance, troubleshooting, control, and safety within natural gas facilities. The course strengthens the ability to monitor thermal equipment, recognize operational abnormalities, support preventive maintenance, and improve equipment reliability and performance.