

Training Title

BOILER OPERATION, MAINTENANCE & WATER TREATMENT TECHNOLOGY

Training Duration

5 days

Training Venue and Dates

PE255	Boiler Operation, Maintenance & Water Treatment Technology	5	01 – 05 December, 2019	\$4,250	Dubai, UAE
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In any of the 5 star hotels. The exact venue will be informed once finalized.

Training Fees

- 4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch.

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

There are three critical points to consider in the operation of any boiler Plant. Corrosion removes metal from heat-exchange surfaces. There is no mechanism to put it back. When there is no longer sufficient wall thickness, the component will fail and in the process, operating staff can be injured or killed and production can be brought to an abrupt stop. Deposition on heat-exchange surfaces prevents the heat from going where it should. That loss of heat transfer results in higher production costs and once the margin of reserve is gone, production will be limited. There is an inherent sampling problem in all systems. It is not possible to take a sample from the region where active corrosion or deposition could be occurring. Is it possible to take meaningful data?

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Boilers are one of the most common emission sources and range in use from small fire tube boilers to large utility boilers associated with power plant facilities. The course discusses uses of boilers, heat transfer methods and fundamentals of operation of modern industrial and utility boilers including those fired by natural gas, biomass, municipal waste and coal (circulating fluidized bed units). The course also discusses steam turbines and power generation. This is followed by a detailed discussion on emissions and control techniques such as Low-NO_x burners, FGR, staged combustion, SCR and SNCR. New technologies such as Ultra Low-NO_x 9 ppm burners, applicable federal and local BACT regulations, permitting requirements and agency inspection procedures and safety concerns are thoroughly discussed.

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TRAINING OBJECTIVES

Upon the successful completion of this course, participants will be able to:-

- Understand the properties of hot water and steam, the thermodynamics of steam generation, and the steam plant operation.
- Understand general boiler descriptions and classifications and the auxiliary equipment and fittings necessary for the operation of boiler systems.
- Have a good understanding of boiler failure, and be able to learn and pinpoint likely failure location and boiler failure mechanisms and the preventive and /or corrective steps to eliminate or reduce damage.
- Understand heat transfer modes and the combustion processes and how to calculate combustion and boiler efficiency in steam boilers, as well as the formation of NO_x in combustion.
- Understand the objectives of the principal boiler control functions
- Recognize and understand typical boiler control diagrams and their design intentions.
- Contribute to the setting up and tuning of boiler control loops.
- Identify principles and design concepts governing:
 - Boiler feed water control
 - Steam demand and firing rate control
 - Flue gas analysis and fuel combustion trimming controls
 - Furnace draft measurement and control
 - Main steam and reheat steam temperature control
- Understand the importance of boiler safety control.
- Understand the importance and objectives of boiler water treatment.
- Understand major problems related to water treatment: e.g. Scaling, corrosion, and the carry-over types, etc., and how to overcome them both chemically and mechanically.
- Understand water-formed and steam formed deposits
- Understand the problems associated with long-term and short term overheating of boiler tubes.
- The effect of fouling on the performance.
 - What impurities are present in water and why water treatment need? In addition, the consequences of none treating water.
 - Boiler and distillers basic principles.
 - The production of high quality water suitable for use in producing steam in high and low pressure boilers.
 - The types of failures found in boilers.
 - The causes and effects of boiler and evaporators major problems
 - The causes and effects of boiler and condensate return line corrosion, and the treatment methods for acidic caustic, oxygen, and carbon dioxide corrosion, including sulphite, hydrazine and amine treatment.

WHO SHOULD ATTEND?

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Experienced boiler operators who need to fill knowledge gaps or to help prove competence, Boiler Supervisees, process Engineers, utility Engineers

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

DAILY OUTLINE

DAY 1

Types of Boilers

- Fire Tube Boilers – Horizontal & Return Tubular Boiler and Internal Furnace Boiler
- Water Tube Boilers – A Type, D Type, O Type & Hot water systems
- Superheaters
- Condensing Boilers
- Configurations & Characteristics of Each Type
- Advantages & Disadvantages of each type
- Codes & Standards – British Standards, American Standards & ASME Codes
- Circulation of Boiler Water
- How to use Steam Tables
- Operating a High Pressure Boiler at Low Pressure
- Conserving energy

Water Tube Boiler's Part

- Drum and drum internals
- 1st pass & 2nd pass
- Boiler headers
- Refractors and insulation
- Super heaters
- De-super heater
- Soot blower
- Economizer

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- Burning equipment – Oil and Gas burner
- Rotor Air heater, Steam Air heater, forced draft fans
- Boiler Feed water pumps

DAY 2

Boiler Water Treatment

- Boiler Feed Water Quality
- Mechanical & Chemical Derivation
- Boiler Water Chemicals Selection & Dozing
- Steam Purity & Controlling Steam pH
- Laboratory Control of Boiler Water
- Operator Interpretation of Boiler Water Chemical Analysis Results
- Sampling Boiler Water & Steam Produced

Start-up & Shutdown Procedures

- Introduction to boiler start up and shutdown
- Preparation for start up
 - Filling the boiler drum
 - The Pre-Start-up walk through
 - Establishing flow through the boiler
- Boiler light- off and warm-up
 - Lighting off the boiler
 - Preparations for light –off
 - Warming up the boiler
- Establishing a boiler flame
 - Starting up the pulverizes
- Basic Shutdown Procedures
 - Introduction to shutdown procedures
 - Reducing firing rate and pulverizer shutdown
 - Reducing steam flow
 - Reducing air and gas flow

DAY 3

Normal Operation and Boiler Efficiency

- Introduction to normal operation and efficiency
- Normal Operation and Steady State Conditions
- Maintaining Design steam temperature and pressure
- Maintaining proper combustion conditions
- Maintaining proper feed water conditions
- Monitoring the steam/water circuit
- Control room instrumentation for the steam/water cycle
- Automatic control systems
- Monitoring combustion and the Air/Gas Circuit
- Monitoring Combustion Conditions

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- Operator Checks
- Methods of Controlling Steam Temperature
- De-super heaters
- Burner tilting
- Gas Bypass and Gas Recalculation
- Soot-blowing
- Ash Handling
- Bottom Ash Pulling
- Fly Ash pulling

DAY 4

Boiler Control System

- Introduction
- Combustion Control
- Feed Water Control
- Functional Description
- Multiple Boiler System
- Oil Flow Measurement
- Fuel/Air Ratio Control

Burners

- Performance Measures: Safety, Combustion Efficiency, Design, Reliability and Low Maintenance Requirements
- Types: Oil Burners, Gas Burners and Mixed Dual Fuel Burner
- Control Systems
- Manual Control with Position Indicators
- Manual Positioning Control
- On-Off Control
- Modulating Control
- Metered Control System
- Oxygen Trim Controls
- Oxygen / Co Trim Controls
- Maintenance & Cleaning of the Pressure Jet/Fluid
- Atomizing and the Rotary Cup Burners

DAY 5

Troubleshooting & Emergencies

- Causes of Boiler Explosions
- Loss of Boiler Flame
- Situations that can lead to a loss of boiler flame
- Verifying a loss of boiler flame
- Loss of Boiler Auxiliaries

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- Loss of forced draft fans, induced draft fans or air pre-heaters
- Loss of boiler water circulating pumps or boiler feed pumps
- Boiler Leaks
- Boiler tube leaks and ruptures
- Leaks outside the boiler
- Leaks in the boiler casing
- Boiler Overpressure
- Safety valves
- Causes of boiler overpressure
- Leaking safety valves
- Equipment Fires
- Spontaneous combustion
- Bunker fires, feeder fires, pulverizer fires and air
- Preheater fires
- Equipment fire safeguards
- Foaming
- Causes of foams formation
- Problems arises from foam
- Antifoam types & application
- Shift routine sampling & testing of foam tendency & control

Maintenance & Protection of Boilers

- General Maintenance
- Daily, Weekly, Monthly & Annual Maintenance
- A Complete Preventive Maintenance & Checklist of Program & Records.
- Opening & Entering a Boiler
- External Cleaning
- Internal Cleaning
- Tube Plugging
- Renewing a Main Bank Tube
- Super-heater Cleaning, Repair & Removal
- Hydraulic Testing
- Boiling out & Drying of Refractories
- Ideal Boiler Preservation
- Steam & Water Leaks
- Damper Maintenance
- Removal of Refitting Intrascope Nozzle Caps Maintenance of fans
- Assembly Procedure

Post Course Test

NOTE:

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Pre & Post Tests will be conducted

Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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