



MU242: Boiler Operation & Performance

Training Description:

This training course provides a comprehensive coverage of the modern high-pressure boilers. It has been completely revised, reorganized and updated to include the latest techniques in boiler operation, maintenance, failure analysis, failure prevention, performance, optimization, life assessment, inspection, protection, control, troubleshooting, safety, emission and steam system management. Major sections on boiler failure analysis, examinations and prevention are now included in the course to reflect the new trend in the industry of extending the life of capital equipment and improving the plant overall reliability. The course utilizes actual case studies from around the world to highlight the topics discussed.

The course provides practical information that can be readily applied to pinpoint and minimize energy losses in boiler plants and energy distribution systems. Participants will be guided through their plant system component by component, showing exactly where and how performance can be improved. Facts will be given on different fuel types and firing methods, and how modern high-efficiency boiler designs and control systems work.

Following easy-to-implement guidelines and helpful time-saving diagrams, participants will go over strategies to methodically achieve the maximum utilization of fuel and energy to keep operating costs low and equipment performance high.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply a comprehensive knowledge, skills and proper techniques in boiler operation, maintenance, failure analysis, troubleshooting, performance, optimization and steam system management
- ✓ Implement proper procedures for boiler failure analysis, investigation & examination and follow the modern techniques in preventing boiler failures and increasing the life of your boiler
- ✓ Pinpoint and minimize energy losses in your boiler plant and improve its performance and efficiency
- ✓ Employ systematic techniques in boiler maintenance, inspection, testing, control, operation, tuning, start-up & shutdown and troubleshoot your boiler system in a safe manner and clean environment

Training Designed for:

This course is intended for Utility Superintendents, Powerhouse Supervisors, Maintenance Engineers, Design Engineers, Corrosion Engineers, Plant Engineers, Metallurgists, Materials Engineers, Boiler Engineers, Supervisors, Foremen and other Technical Staff. Further, Reliability, Mechanical Integrity and Safety Engineers will benefit from this important course.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course" if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Introduction
- ❖ **Boiler & Boiler Systems**
 - Types of Boilers, Configurations & Characteristics of Each Type, Codes & Standards, How to Use Steam Tables, Circulation of Boiler Water, Combustion, Boiler Fluid Flow Paths, Thermodynamics, Fuel, Air, Feedwater, Steam or Hot Water
- ❖ **Burners, Superheaters & Reheaters**
 - Gas burners, Oil Burners, Combination Gas/Oil Burners, Gas and Oil Trains, Waste Heat Recovery, Superheaters, Reheaters, Attemperators Configuration and Characteristics of Each Type, Relevant Metallurgy and Alloy Materials and Creep Factor

DAY TWO:

- ❖ **Boiler Instrumentation and Controls**
 - Modulating Control System, Fixed Positioning, Parallel Positioning with Operator, Trim Fuel and Air Metering, Oxygen Trim, Feed Water Control, Primary Control Sequence of Operation, Flame Monitoring Devices, Y-S 7800 Control System, Fireeye Flame Monitor, Microprocessor Based Burner, Management System, Controls and Safety Devices for Automatically Fired Boilers, NFPA-85 Series
- ❖ **Boiler Startup and Shutdown**
 - Preparation for Startup, The Pre-Startup Walk Through, Filling the Boiler Drum, Establishing Flow Through the Boiler, Establishing a Boiler Flame, Basic Shutdown Procedures, Reducing Firing Rate, Reducing Steam Flow, Reducing Air and Gas Flow, Maintaining Flow Through Superheater
- ❖ **Boiler Operation & Steam System Management**
 - 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, Safety Valves & Low Water Cutoff Control

DAY THREE:

- ❖ **Boiler Efficiency & Waste Heat Recovery**
 - Heat Exchanger Efficiency, Combustion Efficiency Data Collection, Optimum Oxygen Percentage, Optimum Stack Temperature, Waste Heat Recovery
- ❖ **Combustion Analysis & Tuning Procedures**
 - Combustion Efficiency Data Collection, Optimum Oxygen Percentage, Optimum Stack Temperature, Tips and Generally Accepted Practices
- ❖ **Boiler Inspection & Testing**
 - Internal Inspection, External Inspection, Operational Inspection, Hydrostatic Pressure Test, Common Inspection Code Violations
- ❖ **Boiler Maintenance & Protection**
 - Waterside Maintenance, Fireside Maintenance, Operating and Safety Control Maintenance, General Maintenance, Daily Maintenance, Weekly Maintenance, Monthly Maintenance, Annual Maintenance, Preventive Maintenance
- ❖ **Reliability-Centered Maintenance (RCM)**

- Overview of the RCM Process, Failure Consequences, Managing & Resourcing the RCM Process

DAY FOUR:

❖ **Boiler Failure Analysis**

- Overview of Failure Analysis, Principles & Approaches in Failure Analysis, Objectives of Failure Analysis, Scope of Planning, Complexity of Investigation, Physical Causes & Time of Occurrence, Root Cause, Avoiding Errors, Planning & Preparation, Open-Mind/Open-Toolbox Approach, Structural Decision Making & Problem Solving, Practices & Procedures, Failure Mode & Effect Analysis (FMEA)

❖ **Organization of a Boiler Failure Investigation**

- What is a Failure, Why do Failure Happen, Why is a Failure Investigation Performed, Problem Solving Process, Nine Steps of a Failure Investigation, Failure Investigation Pitfalls

❖ **Conducting a Boiler Failure Examination**

- Basic Approach to Failure Analysis, Failure Analysis Procedures, Assembling Background Data, Non-Destructive Testing (NDT), Fractures, Corrosion, Failures, Thermal & Creep Fatigue

❖ **Simulator (Hands-on Practical Sessions)**

- Practical session will be organized during the course for participants to practice the theory learnt. Participants will be provided with an opportunity to carryout various exercises using the simulator "Win Boiler Sim" or similar

DAY FIVE:

❖ **Boiler Failure Prevention**

- Concepts of Failure Prevention, Material Selection for Failure Prevention, Design & Failure Prevention, Product Liability & Design, Hazard, Risk & Danger, Manufacturing Defects, Design Defects, Failure Related to Casting, Failure Related to Welding

❖ **Boiler Life Assessment & NDT**

- Industry Perspectives, Life Assessment, Liquid Penetrant, Magnetic Particles, Ultrasonic, Eddy Current, Radiography, Elevated Temperature

❖ **Boiler Emissions & Pollution Control**

- Six Criteria Air Pollutants, NOx and SOx, VOCs, Pollution Control Systems

❖ **Boiler Troubleshooting & Safety**

- Steam Traps, Loss of Boiler Flame, Low and High Water, Loss of Boiler Auxiliaries, Boiler Leaks, Boiler Overpressure, Equipment Fires, Foaming, Lockout/Tagout, Confined Spaces, Boiler Accidents – Cause & Effect

❖ **Course Conclusion**

❖ **POST-ASSESSMENT and EVALUATION**

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615