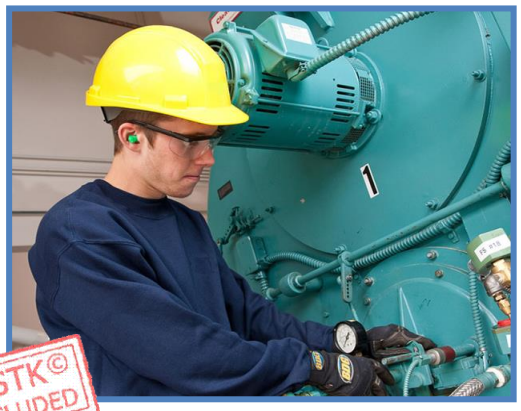
COURSE OVERVIEW ME0180
Boiler & Steam System Management
Performance, Efficiency, Troubleshooting, Tune-Up, Heat Recovery & Optimization

Course Title
Boiler & Steam System Management: *Performance, Efficiency, Troubleshooting, Tune-Up, Heat Recovery & Optimization*



Course Date/Venue
Session 1: January 10-14, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar
Session 2: October 17-21, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
ME0180

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description







This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Boiler & Steam System Management: Performance, Efficiency, Troubleshooting, Tune-Up, Heat Recovery & Optimization. It covers the boiler types, design and operating principles, boiler components and steam system layout; the combustion fundamentals, fuel characteristics and boiler performance indicators and KPIs; the steam properties and thermodynamics and common boiler operational challenges; the boiler efficiency measurement methods; and the major boiler heat losses covering dry flue gas losses, moisture and hydrogen losses, radiation and convection losses and blowdown heat losses.

Further, the course will also discuss the combustion air and draft system optimization, burner operation, flame characteristics, flue gas analysis and performance diagnosis; the energy efficiency improvement opportunities and steam distribution system design and losses; the proper selection, operation and maintenance of steam traps; the condensate recovery, feedwater management and boiler blowdown management; the economizers and waste heat recovery and advanced heat recovery options; and the boiler operational troubleshooting.

During this interactive course, participants will learn the water-side problems, chemistry control and fire-side problems and inspection; the boiler tube failures, root causes, boiler safety systems and interlocks; the preventive and predictive maintenance strategies, boiler tune-up procedures, integrated steam system optimization and advanced control and automation; the energy audits and performance benchmarking; and the environmental performance and emissions control.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge on boiler and steam system management covering performance, efficiency, troubleshooting, tune-up, heat recovery and optimization
- Recognize boiler types, design and operating principles including boiler components and steam system layout
- Discuss combustion fundamentals, fuel characteristics and boiler performance indicators and KPIs
- Identify steam properties and thermodynamics and common boiler operational challenges
- Apply boiler efficiency measurement methods and identify major boiler heat losses covering dry flue gas losses, moisture and hydrogen losses, radiation and convection losses and blowdown heat losses
- Carryout combustion air and draft system optimization, burner operation and flame characteristics and flue gas analysis and performance diagnosis
- Discuss energy efficiency improvement opportunities and steam distribution system design and losses
- Apply proper selection, operation and maintenance of steam traps including condensate recovery and feedwater management and boiler blowdown management
- Illustarate economizers and waste heat recovery, advanced heat recovery options and boiler operational troubleshooting
- Recognize water-side problems and chemistry control, fire-side problems and inspection, boiler tube failures and root causes as well as boiler safety systems and interlocks
- Employ preventive and predictive maintenance strategies, boiler tune-up procedures, integrated steam system optimization and advanced control and automation
- Apply energy audits and performance benchmarking including environmental performance and emissions control

Exclusive Smart Training Kit - H-STK®



*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of boiler and steam system management for facilities engineers, operating engineers, energy engineers, managers, supervisory personnel, designers, inspectors, consultants and other technical staff who are involved in the performance, efficiency, troubleshooting, tune-up, heat recovery and optimization of boiler and steam system. The course will provide a clear and refreshing examination of boilers and their systems. It covers a range from very large to small boiler systems and is not specifically oriented toward utility plants.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours

Certificate Accreditations

Haward's certificates are accredited by the following international accreditation organizations:

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Alex Iliadis is a **Senior Process Engineer** with over **30 years** of in-depth industrial experience within the **Petrochemical**, **Oil & Gas** and **Refinery** industries. His wide expertise covers in the areas of **Process Reactors**, **Catalytic Reformer Unit**, **Process Systems** Foundations, **Gas Processing Plant** Operations & Control, **Gas Processing** Monitoring & Troubleshooting, **Chemical Engineering**, **Process Equipment Design & Troubleshooting**, **Polymers & Polymerization**, Applied **Process Engineering**, **Process Plant** Optimization, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process** Plant Performance & Efficiency, **Flare Blowdown & Pressure Relief Systems**, **Polypropylene** Manufacturing, **Polyethylene** & Process Troubleshooting, **Ammonia**, **Ethylene**, **Solvents**, **Gas Feed**, **EDC**, **VCM**, **PP**, **PVC**, **Chlorine**, **Fluidized Bed Reactor**, **Oil Movement & Storage**, **Power Plant Chemistry**, **Catalyst** Manufacturing Techniques, **Fuel Systems** Management, **Process Design & Optimization**, **Aviation Fuel**, **Diesel Engine**, **Jet Fuel**, **Petrol**, IP Octane, Cetane Control, **Pipeline Distribution**, **Boiler** Fundamental Preparation, Flocculation Sedimentation, Hotline Water Softening Processes, **Desalination Processes**, **Reverse Osmosis**, **Molecular Sieves**, Loop Water Management System, **Sludge Removal**, **Cooling Water System**, **Tank Farms**, **Hydrocarbons**, **Energy Conservation**, **Plant Electrical Power Generation & Cogeneration**, **Natural Gas Equipment & Networks**, **Furnaces/Combustion Facilities**, **Equipment Engineering Design**, **Rotating Equipment** (**Pumps**, **Compressors**, **Gas Turbines**, **Refrigeration Systems**, etc), **LPG Storage Installations**, **Petroleum Refining Storage Tunnel Installations**, **Industrial & Commercial Refrigeration Systems** and various application codes such as the API, ANSI, ASME, SHRAE, NFPA, ASTM, etc.

During his career life, Mr. Iliadis has gained his practical and field experience through his various significant positions and dedications as the **Production & Technical Manager**, **Technical & Logistics Manager**, **Project Manager**, **Project Director**, **Start-up Leader**, **Technical Section Head**, **Engineering Consultant** and **Process Design & Project Engineer** for **Hellenic Petroleum**, **EXXON**, **ESSD-PAPPAS** Refining & Petrochemicals and EBZ Sugar Production Plant industry within the **European** & the **USA** regions.

Mr. Iliadis has a **Bachelor** degree in **Chemical Engineering** from the **University of Thessaloniki** (**Greece**). Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops, seminars and conferences internationally.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Boiler Types, Design & Operating Principles*** *Fire-Tube versus Water-Tube Boilers • Packaged Boilers versus Field-Erected Boilers • Natural versus Forced Circulation Systems • Pressure, Temperature, and Capacity Classifications*
0930 – 0945	*Break*
0945 – 1030	***Boiler Components & Steam System Layout*** *Boiler Drum, Tubes, Headers and Furnace • Burners, Fans and Draft Systems • Steam Headers, Mains and Branch Lines • Condensate Return and Feedwater Systems*

1030 – 1130	***Combustion Fundamentals & Fuel Characteristics*** *Combustion Chemistry and Stoichiometric Air • Fuel Types: Gas, Oil, Coal, Biomass • Excess Air and Flue Gas Composition • Impact of Fuel Quality on Performance*
1130 – 1215	***Boiler Performance Indicators & KPIs*** *Boiler Efficiency Definitions and Types • Evaporation Ratio and Steam-to-Fuel Ratio • Heat Rate and Specific Fuel Consumption • Availability, Reliability and Load Factor*
1215 – 1230	*Break*
1230 – 1330	***Steam Properties & Thermodynamics*** *Saturated versus Superheated Steam • Pressure–Temperature Relationships • Enthalpy, Entropy, and Steam Tables • Practical Steam Calculations for Operators*
1330 – 1420	***Common Boiler Operational Challenges*** *Load Variation and Cycling Problems • Low Efficiency Symptoms • Unstable Flame and Combustion Issues • Early Warning Signs of Poor Performance*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Boiler Efficiency Measurement Methods*** *Direct (Input–Output) Method • Indirect (Heat Loss) Method • Comparison of Efficiency Methods • Field Efficiency Testing Practices*
0830 – 0930	***Major Boiler Heat Losses*** *Dry Flue Gas Losses • Moisture and Hydrogen Losses • Radiation and Convection Losses • Blowdown Heat Losses*
0930 – 0945	*Break*
0945 – 1100	***Combustion Air & Draft System Optimization*** *Forced, Induced and Balanced Draft • Air–Fuel Ratio Optimization • Impact of Excess Air on Efficiency • Fan Control and Damper Tuning*
1100 – 1215	***Burner Operation & Flame Characteristics*** *Burner Types and Design Principles • Flame Stability and Shape Analysis • Ignition Systems and Safety Interlocks • Burner Adjustment and Tuning Basics*
1215 – 1230	*Break*
1230 – 1330	***Flue Gas Analysis & Performance Diagnosis*** *O_2, CO_2, CO and NOx Measurement • Interpreting Flue Gas Analyzer Data • Combustion Efficiency Calculations • Identifying Incomplete Combustion*
1330 – 1420	***Energy Efficiency Improvement Opportunities*** *Operational Best Practices • Load Matching and Turndown Optimization • Fuel Switching Considerations • Short-Term versus Long-Term Efficiency Gains*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Steam Distribution System Design & Losses*** *Steam Piping Layout and Sizing • Pressure Drop and Velocity Limits • Steam Leakage Identification • Insulation Requirements and Heat Losses*
0830 – 0930	***Steam Traps: Selection, Operation & Maintenance*** *Types of Steam Traps and Applications • Failure Modes: Open, Closed, Leaking • Trap Testing and Inspection Methods • Impact of Trap Failures on Efficiency*
0930 – 0945	*Break*
0945 – 1100	***Condensate Recovery & Feedwater Management*** *Benefits of Condensate Recovery • Condensate System Components • Flash Steam Recovery Principles • Water and Chemical Cost Savings*
1100 – 1215	***Boiler Blowdown Management*** *Continuous versus Intermittent Blowdown • Blowdown Rate Optimization • Heat and Water Losses from Blowdown • Blowdown Heat Recovery Systems*
1215 – 1230	*Break*
1230 – 1330	***Economizers & Waste Heat Recovery*** *Economizer Design and Operation • Feedwater Temperature Improvement • Flue Gas Temperature Reduction Limits • Corrosion and Fouling Considerations*
1330 – 1420	***Advanced Heat Recovery Options*** *Air Preheaters • Condensing Economizers • Heat Recovery from Exhaust and Drains • Integration with Process Heating Systems*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Boiler Operational Troubleshooting*** *Low Steam Pressure Problems • Poor Load Response and Instability • Flame Failure and Trips • High Stack Temperature Diagnosis*
0830 – 0930	***Water-Side Problems & Chemistry Control*** *Scale Formation and Heat Transfer Loss • Corrosion Mechanisms • Carryover and Foaming Issues • Boiler Water and Feedwater Chemistry Control*
0930 – 0945	*Break*
0945 – 1100	***Fire-Side Problems & Inspection*** *Soot Formation and Fouling • Tube Overheating and Flame Impingement • Refractory Damage • Fire-Side Inspection Best Practices*
1100 – 1215	***Boiler Tube Failures & Root Causes*** *Overheating and Creep Failures • Corrosion and Erosion Mechanisms • Thermal Stress and Fatigue • Failure Analysis and Prevention*
1215 – 1230	*Break*
1230 – 1330	***Boiler Safety Systems & Interlocks*** *Pressure Relief Valves • Flame Scanners and Safety Trips • Low-Water Cutoff Systems • Operator Response to Emergencies*

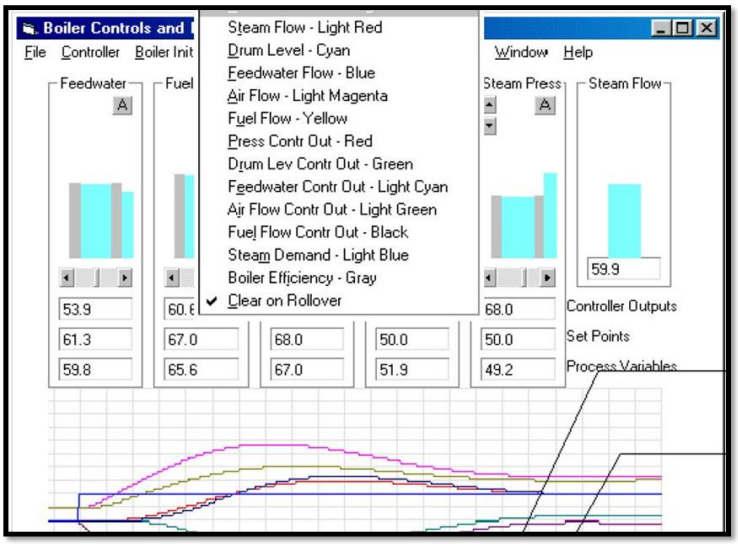
1330 – 1420	***Preventive & Predictive Maintenance Strategies*** *Inspection Planning and Scheduling • Condition Monitoring Techniques • Maintenance KPIs and Documentation • Reliability-Centered Maintenance (RCM)*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: ***Thursday, 05th of February 2026***

0730 – 0830	***Boiler Tune-up Procedures*** *Pre-Tune-up Inspection Checklist • Burner and Air Damper Adjustments • Fuel Valve Calibration • Post-Tune-Up Performance Verification*
0830 – 0930	***Integrated Steam System Optimization*** *Boiler–Process Matching • Pressure Level Optimization • Demand-Side Management • Steam System Balancing*
0930 – 0945	*Break*
0945 – 1100	***Advanced Control & Automation*** *Boiler Master Control Concepts • Oxygen Trim and Combustion Control • Variable Frequency Drives (VFDs) • Digital Monitoring and Analytics*
1100 – 1215	***Energy Audits & Performance Benchmarking*** *Boiler and Steam System Energy Audits • Identifying Savings Opportunities • Performance Benchmarking Methods • Cost–Benefit Analysis of Improvements*
1215 – 1230	*Break*
1230 – 1300	***Environmental Performance & Emissions Control*** *NOx, CO and Particulate Emissions • Combustion Optimization for Emissions Reduction • Regulatory Compliance Considerations • Sustainable Boiler Operation Strategies*
1300 – 1345	***Best Practices, Case Studies & Action Planning*** *Industry Best Practices and Lessons Learned • Case Studies on Efficiency Improvement • Developing Site-Specific Action Plans • Continuous Improvement Roadmap*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

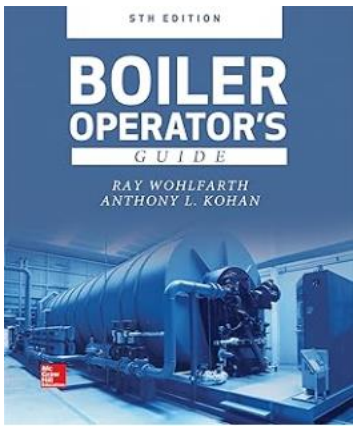
Practical session will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulator "Win Boiler Sim".



Win Boiler Sim

Book(s)

As part of the course kit, the following e-book will be given to all participants:



Title : Boiler Operator's Guide
ISBN : 978-1260026993
Author : Ray Wohlfarth and Anthony L. Kohan
Publisher : McGraw-Hill
Pages : 752 pages

Course Coordinator

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