

COURSE OVERVIEW PE0903

Furnace Safe Operation & Optimization

Course Title

Furnace Safe Operation & Optimization

Course Date/Venue

October 11-15, 2026/Meeting Room A, Centro
Corniche Al Khobar by Rotana, Al Khobar, KSA

Course Reference

PE0903

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description



This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Furnace Safe Operation & Optimization. It covers the industrial furnaces, furnace components and construction; the fuel systems and combustion basics; the furnace instrumentation and controls, furnace safety systems and hazards associated with furnace operation; the furnace pre-start inspection, safe furnace start-up procedures, burner operation and flame management; the furnace operating parameters, furnace shutdown procedures and safe operating practices; the combustion efficiency optimization and heat transfer optimization; and the furnace performance indicators.



During this interactive course, participants will learn the draft and air flow optimization, emissions control and advanced furnace optimization techniques; the furnace inspection techniques and preventive and predictive maintenance; the common furnace problems, tube failures and damage mechanisms; the refractory failure analysis, root cause analysis and troubleshooting and furnace reliability improvement; and the energy conservation, cost optimization, operational risk management, emergency response and incident management.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain a comprehensive knowledge on furnace safe operation and optimization
- Discuss industrial furnaces, furnace components and construction as well as fuel systems and combustion basics
- Recognize furnace instrumentation and controls, furnace safety systems and hazards associated with furnace operation
- Carryout furnace pre-start inspection, safe furnace start-up procedures, burner operation and flame management
- Apply furnace operating parameters, furnace shutdown procedures and safe operating practices
- Implement combustion efficiency optimization and heat transfer optimization and identify furnace performance indicators
- Employ draft and air flow optimization, emissions control and advanced furnace optimization techniques
- Apply furnace inspection techniques and preventive and predictive maintenance
- Identify common furnace problems and tube failures and damage mechanisms
- Carryout refractory failure analysis, root cause analysis and troubleshooting and furnace reliability improvement
- Employ energy conservation and cost optimization, operational risk management as well as emergency response and incident management

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Howard 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 furnace safe operation and optimization for production operation staff including process engineers, supervisors, foremen, technicians and operators. Further, the course is suitable for control, instrumentation and maintenance staff who are involved in furnaces and fired process heaters.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Howard 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 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:



Dr. Tony Dimitry, PhD, MSc, BSc, is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Petroleum, Oil & Gas, Petrochemical, Nuclear & Power** industries. His expertise covers **Furnace Troubleshooting, Furnace Safe Operation & Optimization, Combustion in Boiler Furnace Tank Farm Operations & Maintenance, Storage Tank Systems, Process Flow Diagrams (PFDs), Piping & Instrumentation Diagrams (P&IDs), Asset Integrity Management, Risk Based Assessment (RBA), Root Cause Analysis (RCA), Condition Based Monitoring (CBM), Preventive & Predictive Maintenance, Pressure Vessels, Corrosion Management and Tank Farm Safety Systems, Pipeline Operation & Maintenance, Process Equipment & Piping System, Risk Based Inspection (RBI), Reliability Centred Maintenance (RCM), Asset Management Best Practices, Heat Exchanger, Pumps & Compressors, Tanks & Tank Farms, Static Equipment, Failure Analysis, Pipeline System Operation, Pipeline System Maintenance, Piping Support, Piping Design, Maintenance Planning, Scheduling & Work Management, Asset Performance Management (APM) Implementation, Inspection Planning & Management Systems, Engineering Risk Management for Industrial Facilities, Facility Integrity Management Systems (FIMS), Maintenance Optimization & Cost Reduction Techniques, Engineering Failure Investigation & Lessons Learned, Operational Excellence in Asset-Intensive Industries, Reliability Engineering Principles & Applications, Maintenance Key Performance Indicators (KPIs) & Benchmarking, Equipment Lifecycle Management & Sustainability, Industrial Asset Digitalization & Smart Maintenance, Maintenance Management Systems & CMMS Applications, Maintenance Strategy Development & Optimization, Operational Readiness & Asset Assurance Programs, Reliability, Availability & Maintainability (RAM) Engineering, Asset Lifecycle Cost Analysis & Optimization, Maintenance Auditing & Performance Assessment, Engineering Materials Selection & Degradation Mechanisms. Further, he is also well versed in **HAZOP, HAZMAT, HAZID, HAZCOM, FMEA, PHA, PTW, JSA, Fire Fighting & Rescue Operations, Fire Prevention & Safety, Emergency Response Management, Emergency Planning, Offshore Safety & Offshore Rescue, Hazardous Materials Management, Incident Command System, Confined Space Rescue, High Rise Rescue** as well as **Risk Management, Reliability & Loss Prevention, Emergency Preparedness & Response** (oil spillage and gas explosions), **Health & Safety Management, Crisis Management, Safety Management, Occupational & Health Hazards and Preventive Maintenance, Layers of Protection Analysis (LOPA), Safety Integrity Level (SIL) Assessment & Verification, Bow-Tie Risk Analysis Methodology, Quantitative Risk Assessment (QRA), Process Safety Management (PSM), Human Factors Engineering in Process Safety, Inherently Safer Design (ISD), Safety Critical Elements (SCE) Management, Barrier Management & Performance Standards and Process Safety Performance Indicators & Metrics.** He is also well-versed in various simulators such as **i-Learn Vibration, AutoCAD, Word Access, Aspen One, Fortran, VB, C ANSYS, ABAQUS, DYNA3D, Ceasar, Caepipe, MS Project, Maximo, Automation Studio and SAP.** Currently, he is the **Maintenance Manager** of the PPC Incorporation wherein he is responsible for the maintenance and upgrading of all **Power Station** components.**

During his career life, Dr. Dimitry held a significant position such as the **Operations Engineers, Technical Trainer, HSE Contracts Engineer, Boilers Section Engineer, Senior Engineer, Trainee Mechanical Engineer, Engineer, Turbines Section Head, Professor, Lecturer/Instructor and Teaching Assistant** from various multinational companies like **Chloride Silent Power Ltd., Technical University of Crete, National Nuclear Corporation, UMIST Aliveri Power Station and HFO Fired Power Station.**

Dr. Dimitry has **PhD, Master and Bachelor** degrees in **Mechanical Engineering** from the **Victory University of Manchester** and the **University of Newcastle, UK** respectively. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an associate member of the **American Society of Mechanical Engineers (ASME)** and **Institution of Mechanical Engineers (IMechE).**

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 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: Sunday, 11th of October 2026

0730 – 0800	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	<i>PRE-TEST</i>
0830 – 0930	<i>Introduction to Industrial Furnaces</i> <i>Types of Industrial Furnaces Used in Process Industries • Applications in Refineries, Petrochemical & Power Plants • Heat Transfer Mechanisms (Radiation, Convection & Conduction) • Furnace Performance Objectives & Operating Philosophy</i>
0930 – 0945	<i>Break</i>
0945 – 1030	<i>Furnace Components & Construction</i> <i>Radiant & Convection Sections • Burners, Tubes, Refractory & Insulation Systems • Stack, Dampers & Air Preheaters • Structural Components & Support Systems</i>
1030 – 1130	<i>Fuel Systems & Combustion Basics</i> <i>Gaseous & Liquid Fuel Characteristics • Fuel Supply Systems & Pressure Control • Air-to-Fuel Ratio Fundamentals • Combustion Chemistry & Flame Characteristics</i>
1130 – 1215	<i>Furnace Instrumentation & Controls</i> <i>Temperature, Pressure & Flow Measurements • Oxygen Analyzers & Combustion Monitoring • Burner Management System (BMS) • Distributed Control System (DCS) Integration</i>
1215 – 1230	<i>Break</i>



1230 – 1330	Furnace Safety Systems Process Safety Management (PSM) Requirements • Emergency Shutdown (ESD) Systems • Flame Detection & Burner Interlocks • Furnace Permissives & Trip Logic
1330 – 1420	Hazards Associated with Furnace Operation Fire & Explosion Hazards • Fuel Gas Leakage & Ignition Risks • Tube Overheating & Rupture • Carbon Monoxide & Confined Space Hazards
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: Monday, 12th of October 2026

0730 – 0830	Furnace Pre-Start Inspection Mechanical Integrity Verification • Fuel System Inspection • Instrument & Control Checks • Burner Readiness Verification
0830 – 0930	Safe Furnace Start-Up Procedures Purging Requirements • Pilot Ignition Sequence • Main Burner Light-Off Procedures • Temperature Ramp-Up Techniques
0930 – 0945	Break
0945 – 1100	Burner Operation & Flame Management Flame Stability Principles • Flame Shape Optimization • Preventing Flame Impingement • Multiple Burner Balancing
1100 – 1215	Furnace Operating Parameters Draft Control • Bridgwall Temperature Monitoring • Tube Metal Temperature Limits • Stack Temperature Optimization
1215 – 1230	Break
1230 – 1330	Furnace Shutdown Procedures Planned Shutdown • Emergency Shutdown • Cooling Procedures • Post-Shutdown Inspection
1330 – 1420	Safe Operating Practices Operating Limits • Alarm Response Procedures • Permit to Work (PTW) Requirements • Operator Rounds & Inspection Routines
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: Tuesday, 13th of October 2026

0730 – 0830	Combustion Efficiency Optimization Excess Oxygen Control • Air-to-Fuel Ratio Optimization • Flame Tuning Techniques • Fuel Consumption Reduction
0830 – 0930	Heat Transfer Optimization Maximizing Radiant Heat Transfer • Improving Convection Efficiency • Tube Heat Absorption Optimization • Reducing Heat Losses
0930 – 0945	Break
0945 – 1100	Furnace Performance Indicators Thermal Efficiency Calculations • Fuel Efficiency Benchmarking • Stack Loss Analysis • Energy Performance Indicators (KPIs)



1100 – 1215	Draft & Air Flow Optimization Natural versus Forced Draft • Balanced Draft Operation • Damper Adjustment • Air Leakage Detection
1215 – 1230	Break
1230 – 1330	Emissions Control NOx Formation Mechanisms • CO Emissions Reduction • Smoke & Opacity Control • Environmental Compliance
1330 – 1420	Advanced Furnace Optimization Techniques Online Combustion Analyzers • Automated Combustion Control • Digital Performance Monitoring • Energy Management 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: Wednesday, 14th of October 2026

0730 – 0830	Furnace Inspection Techniques External Visual Inspections • Internal Inspection Procedures • Tube Condition Assessment • Refractory Inspection Methods
0830 – 0930	Preventive & Predictive Maintenance Maintenance Planning • Burner Maintenance • Instrument Calibration • Condition Monitoring Techniques
0930 – 0945	Break
0945 – 1100	Common Furnace Problems Flame Instability • Burner Fouling • Tube Hot Spots • Draft Imbalance
1100 – 1215	Tube Failures & Damage Mechanisms Overheating Failures • Creep Damage • Corrosion & Oxidation • Thermal Fatigue
1215 – 1230	Break
1230 – 1330	Refractory Failure Analysis Cracking Mechanisms • Spalling & Erosion • Hot Spot Identification • Repair Methods
1330 – 1420	Root Cause Analysis & Troubleshooting Systematic Troubleshooting Methodology • Failure Investigation Techniques • Corrective Action Planning • Lessons Learned Documentation
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, 15th of October 2026

0730 – 0830	Furnace Reliability Improvement Reliability-Centered Maintenance (RCM) • Failure Prevention Strategies • Critical Equipment Management • Reliability Performance Metrics
0830 – 0930	Energy Conservation & Cost Optimization Fuel Saving Opportunities • Waste Heat Recovery Systems • Air Preheater Optimization • Economic Performance Evaluation
0930 – 0945	Break

0945 – 1100	Operational Risk Management <i>Hazard Identification (HAZID) • Hazard & Operability Study (HAZOP) • Layers of Protection Analysis (LOPA) • Risk Mitigation Strategies</i>
1100 – 1230	Emergency Response & Incident Management <i>Furnace Emergency Scenarios • Fire Response Procedures • Explosion Response Planning • Incident Reporting & Investigation</i>
1230 – 1245	<i>Break</i>
1245 – 1315	Practical Furnace Performance Assessment Workshop <i>Combustion Tuning Exercises • Efficiency Calculation Workshop • Performance Data Interpretation • Troubleshooting Case Studies</i>
1315 - 1345	Best Practices & Continuous Improvement <i>International Codes & Standards (API, NFPA, ASME, OSHA) • Operational Excellence Principles • Digitalization & Smart Furnace Technologies</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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