

COURSE OVERVIEW PE0382
Heat Exchangers & Fired Heaters Operations & Troubleshooting

Course Title

Heat Exchangers & Fired Heaters Operations & Troubleshooting

Course Date/Venue

Session 1: April 27- May 01, 2025/Boardroom 1,
 Elite Byblos Hotel Al Barsha, Sheikh
 Zayed Road, Dubai, UAE

Session 2: December 14-18, 2025/Al Khobar
 Meeting Room, Hilton Garden Inn, Al
 Khobar, KSA



Course Reference

PE0382

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 the participants with a detailed and up-to-date overview on the operation and troubleshooting of heat exchangers and fired heaters. Participants will be able to respond to typical heat exchanger and fired heater problems that may occur during operation. The course will also cover the principles of heat transfer and the factors affecting heat transfer; the flow arrangements of fluids inside heat exchangers; and the various types and its major components.



During this course, participants will learn to apply the proper procedure in taking out of service and putting in service of heat exchangers; identify the various types of furnaces and the major parts of a horizontal and vertical furnace; recognize the types of gas burner and its properties; apply combustion process; employ furnace start up, shutdown and troubleshooting; identify the thin tube, hot spot, tube fire side heater, furnace explosion, flame temperature, flame stability and combustion.

Course Objectives

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

- Operate and troubleshoot heat exchangers and fired heaters in a professional manner
- Discuss the principles of heat transfer and the factors affecting heat transfer
- Illustrate flow arrangements of fluids inside heat exchangers and identify the types and its major components
- Apply proper procedure in taking out of service and putting in service of heat exchangers
- List the various types of furnaces and identify the major parts of a horizontal and vertical furnace
- Enumerate the types of gas burner and describe its properties as well as combustion process
- Employ furnace start up, shutdown and troubleshooting
- Identify thin tube, hot spot, tube fire side heater, furnace explosion, flame temperature, flame stability and combustion

Who Should Attend

This course provides an overview of all significant aspects and considerations of heat exchangers and fired heaters operation for process engineers, section heads, shift controllers, shift supervisors, operators and for those who are interested in heat exchangers and furnaces.

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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

Course Fee

US\$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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


Certificates are accredited by the following international accreditation organizations: -

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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.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. 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.

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. Karl Thanasis (Athanasios Karalis), PEng, MSc, MBA, BSc, is a **Senior Process & Mechanical Engineer** with **45 years** of extensive industrial experience within the **Oil & Gas, Refinery and Petrochemical** industries. His wide expertise includes **Control Valve Maintenance & Testing, Advanced Operational Skills, Process Equipment Design & Troubleshooting, Process Plant Optimization & Continuous Improvement, Production Process Optimization, Operations Planning Optimization, Process Equipment Design, Process Plant Performance & Efficiency, Process Integration & Optimization, Root Cause Analysis (RCA) Methods, Root Cause Analysis, Process Equipment & Piping System, Rotating Equipment Reliability Optimization & Continuous Improvement, Material Cataloguing, Mechanical & Rotating Equipment Troubleshooting & Maintenance, Rotating Equipment for Process Industry, Rotating Machinery Best Practices, Centrifugal Pumps Operation, Positive Displacement Pumps Repair, Pump Maintenance & Troubleshooting, Pressure Vessels, Heat Exchanger Maintenance & Repair, Heat Exchanger Inspection & Troubleshooting, Fin-fan Coolers, Fundamentals of Engineering Drawings, Codes & Standards, P&ID Reading Interpretation & Developing, Boiler Design, Boiler Inspection & Maintenance, Boiler Operation & Control, Boiler Troubleshooting & Inspection, Boiler Instrumentation & Control, Steam Boiler Maintenance, Boiler & Steam Generation System, Boiler Failure Analysis & Prevention, Boiler Burner Management, Boiler Water Treatment Technology, Machinery Failure Analysis, Preventive & Predictive Maintenance, Condition Monitoring, Root Cause Analysis (RCA), Root Cause Failure Analysis (RCFA), Reliability Centred Maintenance (RCM), Risk Base Inspection (RBI), Metallurgical Failure Analysis, Corrosion Failure Analysis, Steam Generation, Steam Turbines, Power Generator Plants, Gas Turbines, Combined Cycle Plants, Boilers, Process Fired Heaters, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, Heat Transfer, Coolers, Pumps, Turbo-Generator, Turbine Shaft Alignment, Lubrication, Mechanical Seals, Packing, Blowers, Bearings, Couplings, Clutches and Gears. Further, he is also versed in **Wastewater Treatment Technology, Networking System, Water Network Design, Industrial Water Treatment** in Refineries & Petrochemical Plants, **Piping System, Water Movement, Water Filtering, Mud Pumping, Sludge Treatment and Drying, Aerobic Process of Water Treatment** that includes **Aeration, Sedimentation and Chlorination Tanks**. His strong background also includes **Design and Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps, Filters, Metering Pumps, Aerators and Sludge Decanters**.**

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager, Plant Manager, Area Manager, Maintenance Manager, Engineering Manager, Technical Consultant & Trainer, Head of Capital Projects, Refractory Specialist, Construction Superintendent, Maintenance Supervisor, Project Engineer, Maintenance Engineer and Thermal Design Engineer** of various companies worldwide in the **USA, Germany, England and Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA and Greece** and has **Master's and Bachelor's** degree in **Mechanical Engineering with Honours** from the **Purdue University and Southern Illinois University (USA)** respectively as well as an **MBA** from the **University of Phoenix (USA)**. Further, he is a **Certified Instructor/Trainer, Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)**, a member of the **American Society of Heating, Refrigeration and Air-Conditioning Engineers** and delivered various trainings, courses, seminars and workshops worldwide.

Accommodation

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

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours: .

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course 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 – 0915	Heat Exchangers Introduction to Heat Exchangers • Principles of Heat Transfer • Factors Affecting Heat Transfer (Conduction, Convection & Radiation) • Flow Arrangement of Fluids Inside Heat Exchanger • Types of Heat Exchangers • Major Components
0915 – 0930	Break
0930 – 1030	Heat Exchangers (cont'd) Shell & Tube • Fixed Tube Sheet • Floating Tube Sheet • Return Bend Heat Exchanger • Plate Type Heat Exchanger
1030 – 1200	Heat Exchangers (cont'd) Double Type Heat Exchanger • Parallel Flow • Counter Flow • Temperature Approach in Heat Exchanger • LMTD • Correction Factor
1200 – 1215	Break
1215 – 1420	Heat Exchangers (cont'd) Allocation of Fluid in Heat Exchanger • Shell & Tube Passes • Cross Flow Heat Exchanger • Overall Heat Transfer Coefficient
1420 – 1430	Recap
1430	Lunch & End of Day One



Day 2

0730 – 0915	Heat Exchangers (cont'd) Principles of Heat Allocation • Corrosion • Fouling • Temperature • Pressure
0915 – 0930	Break
0930 – 1030	Heat Exchangers (cont'd) Differential Pressure • Viscosity • Design Considerations • Hair Pin Heat Exchanger • Aerial Cooler
1030 – 1200	Heat Exchangers (cont'd) Main Components • Draft • Louvers • Blades • Vibration
1200 – 1215	Break
1215 – 1420	Heat Exchangers (cont'd) Causes & Correction • Fouling Factor • Factors Affecting Heat Transfer • Procedure to Take Heat Exchanger Out of Service • Procedure to Put Heat Exchanger in Service
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0915	Fired Heaters Type of Furnaces • Major Parts of a Horizontal Furnace • Major Parts of a Vertical Furnace • Fire Box • Shock Tubes • Radiant Cone
0915 – 0930	Break
0930 – 1030	Fired Heaters (cont'd) Convection Section • Stack Temperature • Causes of High Stack Temperature • Flue Gas Composition • Burners • Effect of Excess Air on Combustion
1030 – 1200	Fired Heaters (cont'd) Fuel - Air Ratio • Types of Burners • Gas Burner Construction • Draft Inside Gas Burner • Pre-Mix Gas Burner • Non-Pre-Mix Gas Burner
1200 – 1215	Break
1215 – 1420	Fired Heaters (cont'd) Properties of Gas Burner • Draft Inside Gas Burner • Flash Back • Fuel Oil Burner • Steam - Air Atomising Burner • Combination Burner • Pilot Burner • Burner Management System
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4:

0730 – 0915	Fired Heaters (cont'd) Combustion Process • Fuel & its Flame Colour • Combustion Losses • Ignition Temperature
0915 – 0930	Break
0930 – 1030	Fired Heaters (cont'd) Flame Temperature • Excess Air • Combustion Control • NOX Burner
1030 – 1200	Fired Heaters (cont'd) NOX Formation • Furnace Operation • Furnace Draft • Coking
1200 – 1215	Break





1215 – 1420	Fired Heaters (cont'd) Ignition • Furnace Operation • High Pressure Fir - Box Furnace • Furnace Tube Life
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

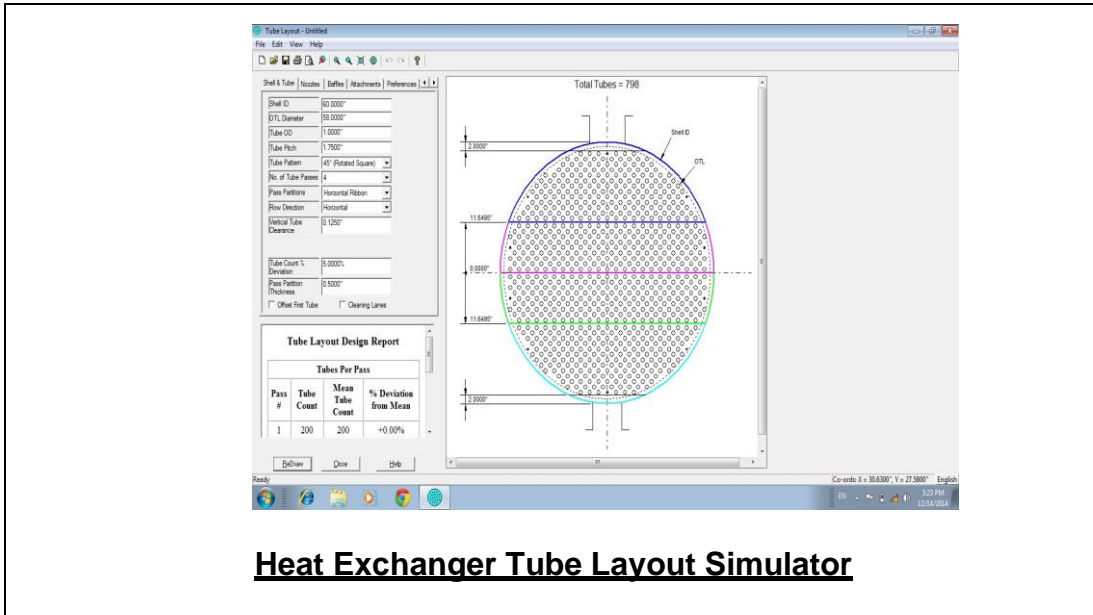
Day 5

0730 – 0915	Fired Heaters (cont'd) Furnace Start Up • Maximum Skin Temperature • Flame Distribution • Balance of Flow • Pre-Start Up • Ignition of Burner Under Pressure • Furnace Shut Down
0915 – 0930	Break
0930 – 1100	Fired Heaters (cont'd) Furnace Heat – Off • Furnace Emergency Shut Down • Action in the Event of Tube Rupture • Minor Tube Leak • Furnace Typical Operating Problems • Effect of Reduced Air • Absolute Combustion
1100 – 1200	Fired Heaters (cont'd) Oxygen Starvation • Fir Box & Flame Appearance • Secondary Combustion • Furnace Troubleshooting • Loss of Flame • Flame Control • Heater Tube Failure
1200 – 1215	Break
1215 – 1345	Fired Heaters (cont'd) High Temperature Creep • Purge Steam • Identifying Thin Tube & Hot Spot • Tube Fire Side Heater • Furnace Explosion • Flame Temperature • Flame Stability • Combustion
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

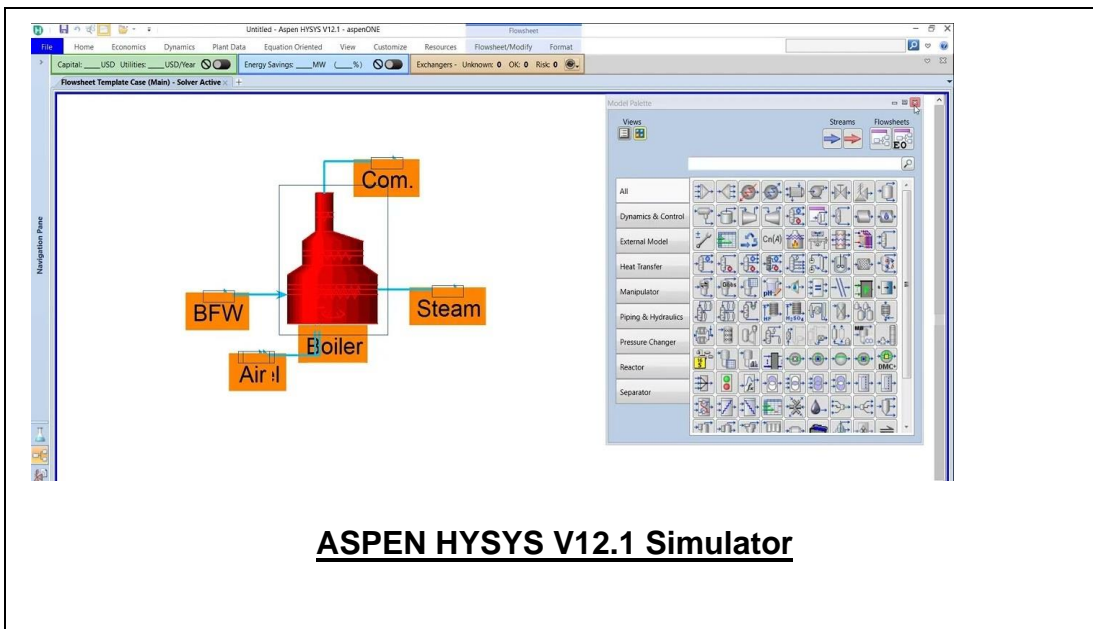


Simulator (Hands-on Practical Sessions)

Practical sessions 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 our state-of-the-art simulator “Heat Exchanger Tube Layout” and “ASPEN HYSYS V12.1” simulator.



Heat Exchanger Tube Layout Simulator



ASPEN HYSYS V12.1 Simulator

Course Coordinator

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