COURSE OVERVIEW PE0382
Fired Heaters Operation and Troubleshooting

Course Title
Fired Heaters Operation and Troubleshooting

Course Date/Venue
January 27-31, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
PE0382

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 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

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 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.

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 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:

- 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.

- 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.

Accommodation

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

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, PEng, MSc, MBA, BSc, is a **Senior Engineer** with over **30 years** of practical experience within the **Oil**, **Gas**, **Refinery** and **Petrochemical** industries. His wide expertise includes **Process Plant** Optimization Technology & Continuous Improvement, **Process Engineering Calculations**, **Process Plant** Start Up & Commissioning, Applied **Process Engineering** Elements**, Coke Cooler**, **Process Plant** Start-up & Commissioning, **Process Plant** Troubleshooting, **Operations Abnormalities & Plant Upset**, **Process Equipment** Applications & Troubleshooting, **Process Plant Performance & Efficiency**, **Gas Sweetening & Sulphur Recovery**, **Distillation-Column** Control & Troubleshooting, **Oil Movement & Troubleshooting**, **Process Plant Operations & Control**, **Process Equipment** Operation, **Fired Heaters & Air Coolers** Maintenance, **Heat Exchangers**, **Pumps & Compressors**, **Crude Desalter**, **Pressure Vessels & Valves**, **Steam Trapping & Control**, **Pumps & Valve** Maintenance & Troubleshooting, **Turbomachinery**, **Mechanical Alignment**, **Rotating Equipments**, **Diesel Generators**, **Lubrication** Technology, **Bearing**, **Predictive & Preventive** Maintenance, **Root Cause Analysis**, **Boilers**, **Oil Field** Operation, **Production** Operation, Plant Operation & Commissioning, **Crude Oil De Salting** Process, **Gas Conditioning**, **NGL Recovery & NGL Fractionation**, **Flare** System, **Storage Tanks**, **Oil Recovery** System and **Chemical Injection**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager - Equipment Construction**, **Construction Superintendent**, **Project Engineer** and **Design Engineer**. His duties covered **Plant Preliminary Design**, **Plant Operation**, **Write-up** of **Capital Proposal**, **Investment Approval**, **Bid Evaluation**, **Technical Contract Write-up**, **Construction** and **Sub-contractor Follow up**, **Lab Analysis**, **Sludge Drying** and **Management** of **Sludge Odor** and **Removal**. He has worked in various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has a **Master** and **Bachelor** degrees in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU** in **USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA**. Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) and a **Certified Instructor/Trainer**.

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: ***Monday, 27th of January 2025***

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: ***Tuesday, 28th of January 2025***

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: : **Wednesday, 29th of January 2025**

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: **Thursday, 30th of January 2025**

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: **Friday, 31st of January 2025**

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*

Practical Sessions

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

Course Coordinator

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