

**COURSE OVERVIEW PE0382**  
**Heat Exchangers & Fired Heaters**

**Course Title**

Heat Exchangers & Fired Heaters

**Course Date/Venue**

September 08-12, 2024/Ras Al Khaimah Meeting Room, The Tower Plaza Hotel, Dubai, UAE

**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

### 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**.

### 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 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.

**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. Mervyn Frampton** is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Oil & Gas, Refinery, Petrochemical and Utilities** industries. His expertise lies extensively in the areas of **Process Troubleshooting, Distillation Towers, Fundamentals of Distillation** for Engineers, **Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Distillation Column Operation & Control, Oil Movement Storage & Troubleshooting, Process Equipment Design, Applied Process Engineering Elements, Process Plant Optimization, Revamping & Debottlenecking, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Monitoring, Catalyst Selection & Production Optimization, Operations Abnormalities & Plant Upset, Process Plant Start-up & Commissioning, Clean Fuel Technology & Standards, Flare, Blowdown & Pressure Relief Systems, Oil & Gas Field Commissioning Techniques, Pressure Vessel Operation, Gas Processing, Chemical Engineering, Process Reactors Start-Up & Shutdown, Gasoline Blending for Refineries, Urea Manufacturing Process Technology, Continuous Catalytic Reformer (CCR), De-Sulfurization Technology, Advanced Operational & Troubleshooting Skills, Principles of Operations Planning, Rotating Equipment Maintenance & Troubleshooting, Hazardous Waste Management & Pollution Prevention, Heat Exchangers & Fired Heaters Operation & Troubleshooting, Energy Conservation Skills, Catalyst Technology, Refinery & Process Industry, Chemical Analysis, Process Plant, Commissioning & Start-Up, Alkylation, Hydrogenation, Dehydrogenation, Isomerization, Hydrocracking & De-Alkylation, Fluidized Catalytic Cracking, Catalytic Hydrodesulphuriser, Kerosene Hydrotreater, Thermal Cracker, Catalytic Reforming, Polymerization, Polyethylene, Polypropylene, Pilot Water Treatment Plant, Gas Cooling, Cooling Water Systems, Effluent Systems, Material Handling Systems, Gasifier, Gasification, Coal Feeder System, Sulphur Extraction Plant, Crude Distillation Unit, Acid Plant Revamp and Crude Pumping. Further, he is also well-versed in HSE Leadership, Project and Programme Management, Project Coordination, Project Cost & Schedule Monitoring, Control & Analysis, Team Building, Relationship Management, Quality Management, Performance Reporting, Project Change Control, Commercial Awareness and Risk Management.**

During his career life, Mr. Frampton held significant positions as the **Site Engineering Manager, Senior Project Manager, Process Engineering Manager, Project Engineering Manager, Construction Manager, Site Manager, Area Manager, Procurement Manager, Factory Manager, Technical Services Manager, Senior Project Engineer, Process Engineer, Project Engineer, Assistant Project Manager, Handover Coordinator and Engineering Coordinator** from various international companies such as the **Fluor Daniel, KBR South Africa, ESKOM, MEGAWATT PARK, CHEMEPIC, PDPS, CAKASA, Worley Parsons, Lurgi South Africa, Sasol, Foster Wheeler, Bosch & Associates, BCG Engineering Contractors, Fina Refinery, Sapref Refinery, Secunda Engine Refinery** just to name a few.

Mr. Frampton has a **Bachelor's degree in Industrial Chemistry** from **The City University in London**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

**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 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: Sunday, 08<sup>th</sup> of September 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0915	<b>Heat Exchangers</b> 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	<b>Heat Exchangers (cont'd)</b> Shell & Tube • Fixed Tube Sheet • Floating Tube Sheet • Return Bend Heat Exchanger • Plate Type Heat Exchanger
1030 – 1200	<b>Heat Exchangers (cont'd)</b> Double Type Heat Exchanger • Parallel Flow • Counter Flow • Temperature Approach in Heat Exchanger • LMTD • Correction Factor
1200 – 1215	Break
1215 – 1420	<b>Heat Exchangers (cont'd)</b> Allocation of Fluid in Heat Exchanger • Shell & Tube Passes • Cross Flow Heat Exchanger • Overall Heat Transfer Coefficient
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

**Day 2: Monday, 09<sup>th</sup> of September 2024**

0730 – 0915	<b>Heat Exchangers (cont'd)</b> Principles of Heat Allocation • Corrosion • Fouling • Temperature • Pressure
0915 – 0930	Break
0930 – 1030	<b>Heat Exchangers (cont'd)</b> Differential Pressure • Viscosity • Design Considerations • Hair Pin Heat Exchanger • Aerial Cooler
1030 – 1200	<b>Heat Exchangers (cont'd)</b> Main Components • Draft • Louvers • Blades • Vibration
1200 – 1215	Break
1215 – 1420	<b>Heat Exchangers (cont'd)</b> 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	<b>Recap</b>
1430	Lunch & End of Day Two



**Day 3: Tuesday, 10<sup>th</sup> of September 2024**

0730 – 0915	<b>Fired Heaters</b> 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	<b>Fired Heaters (cont'd)</b> Convection Section • Stack Temperature • Causes of High Stack Temperature • Flue Gas Composition • Burners • Effect of Excess Air on Combustion
1030 – 1200	<b>Fired Heaters (cont'd)</b> 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	<b>Fired Heaters (cont'd)</b> 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	<b>Recap</b> 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: Wednesday, 11<sup>th</sup> of September 2024**

0730 – 0915	<b>Fired Heaters (cont'd)</b> Combustion Process • Fuel & its Flame Colour • Combustion Losses • Ignition Temperature
0915 – 0930	Break
0930 – 1030	<b>Fired Heaters (cont'd)</b> Flame Temperature • Excess Air • Combustion Control • NOX Burner
1030 – 1200	<b>Fired Heaters (cont'd)</b> NOX Formation • Furnace Operation • Furnace Draft • Coking
1200 – 1215	Break
1215 – 1420	<b>Fired Heaters (cont'd)</b> Ignition • Furnace Operation • High Pressure Fir - Box Furnace • Furnace Tube Life
1420 – 1430	<b>Recap</b> 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



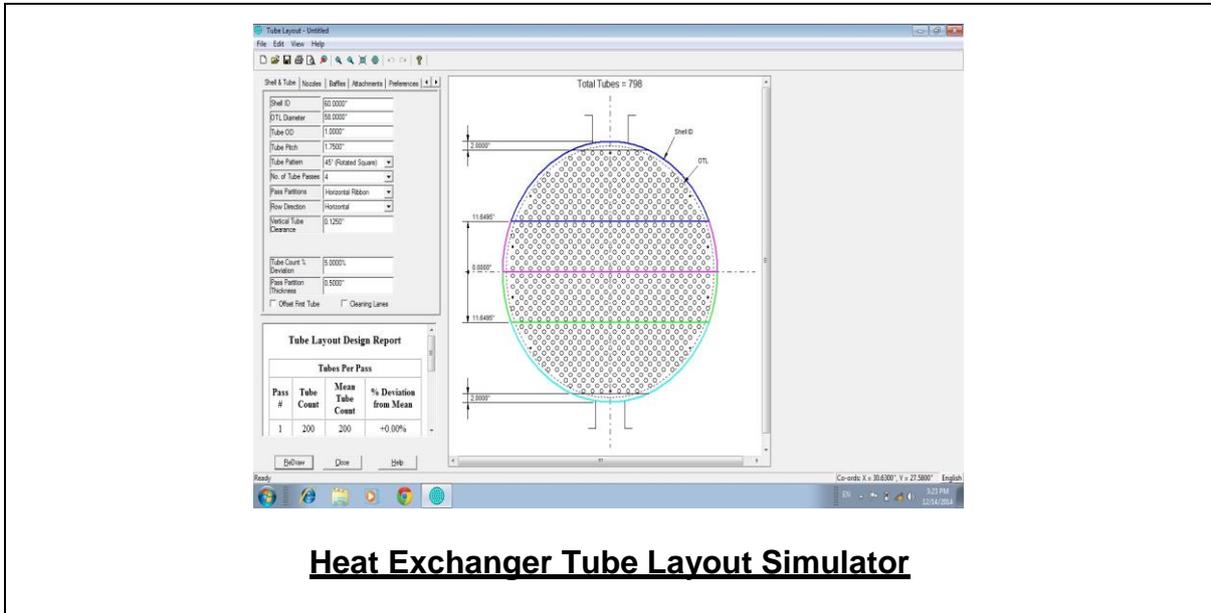


**Day 5: Thursday, 12<sup>th</sup> of September 2024**

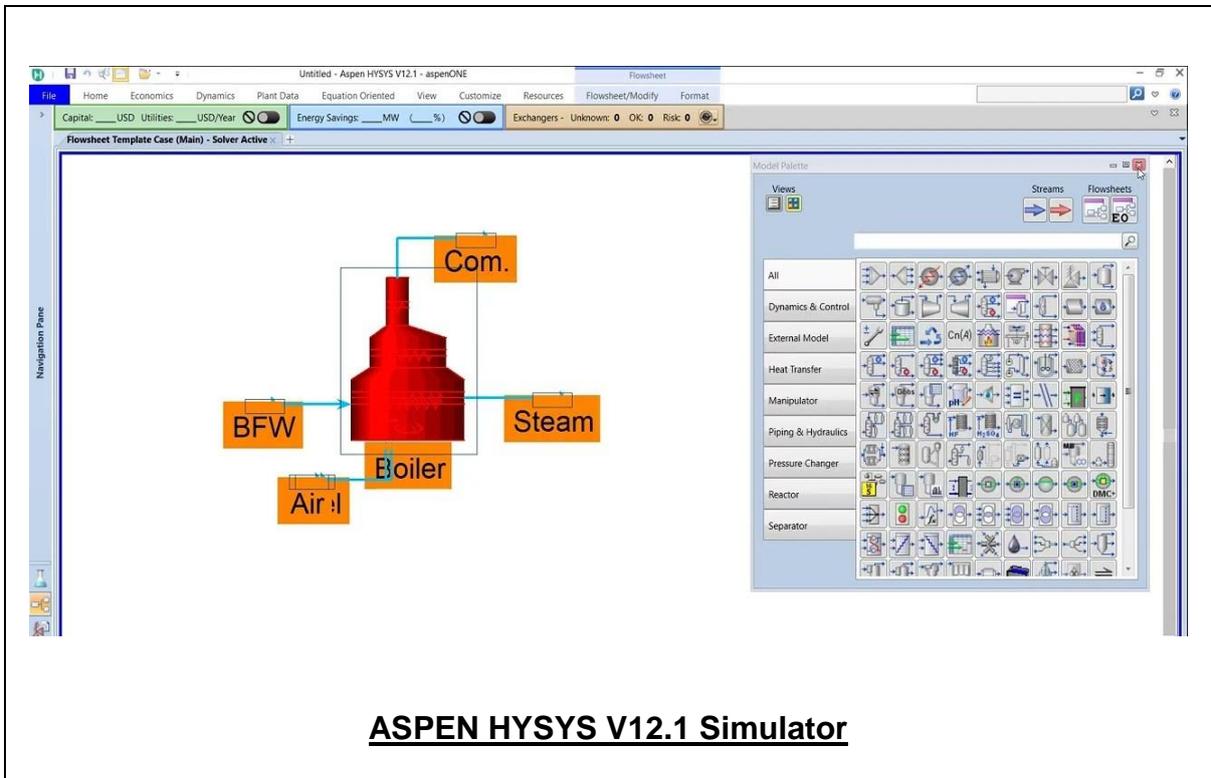
0730 – 0915	<b>Fired Heaters (cont'd)</b> Furnace Start Up • Maximum Skin Temperature • Flame Distribution • Balance of Flow • Pre-Start Up • Ignition of Burner Under Pressure • Furnace Shut Down
0915 – 0930	Break
0930 – 1100	<b>Fired Heaters (cont'd)</b> Furnace Heat – Off • Furnace Emergency Shut Down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