COURSE OVERVIEW PE1002
Direct Fired Heaters: Design and Operations

Course Title
Direct Fired Heaters : Design and Operations

Course Date/Venue
Session 1: April 13-17, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: September 07-11, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
PE1002

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

Course Description

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

This course reviews the design, operation and troubleshooting of fired heaters which will enable to improve heat exchanger effectiveness and extend equipment's life span by teaching the basic principles of fluid flow and heat transfer. Participants of the course will learn about the operation and troubleshooting of shell and tube heat exchangers as well as air-cooled and plate exchangers.

The course will also provide an insight to the design parameters of fired process heaters and ancillary equipment. Additional major topics include instrumentation and controls, operations, troubleshooting, mitigation of emissions, corrosion and fouling; the techniques to improve efficiency, run lengths, and safety; and modern diagnosis and control tools in a process heater to control draft or any other important variable will also be covered during the course

During this interactive course, participants will learn the basics of heat transfer and combustion; the design issues and radiant section; the convection section design; the excess air and combustion efficiency; the NOx control techniques and fired heaters classification; and the factors affecting the performance of fired heaters.

Course Objectives

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

- Apply and gain an in-depth knowledge on the design and operation of fired heaters
- Discuss the application of fired heaters including the parts, control and operating procedures of fired heater
- Identify the basics of heat transfer and combustion covering conduction, convection, radiation, fouling, heat transfer, combustion reactions, lean, rich and stoichiometric combustion
- Recognize the design issues as well as the radiant section, vertical cylindrical radiant section sketch, even tube number requirement and return bends
- Prepare process datasheet and identify parameters as critical for design of fired heaters
- Select equipment type-based on techno-economic analysis and recognize the critical inputs provided in thermal design software
- Analyze thermal design software output and discuss the features of optimum thermal design software
- Determine tubes per pass, number of passes, burner layout symmetry, convection section design, stack design and refractory design
- Discuss excess air and combustion efficiency including premixed and diffusion combustion
- Carryout NOx control techniques and fired heaters classification
- Respond to abnormal operating conditions as well as monitor and troubleshoot fired heaters a professional manner
- Identify the factors affecting the performance of fired heaters and optimize fired heater operation
- Employ performance monitoring and discuss draft, coking and skin temperature

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 on the design and operation of fired heaters for managers, process engineers, mechanical engineers, heat transfer engineers, project engineers, designers, maintenance personnel, operators and those who are involved in design, specification, and retrofitting of fired heaters.

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.

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, **Piping Systems**, 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.

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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation requ 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 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 – 0900	***Application of Fired Heaters***
0900 - 0930	***Parts of Fired Heaters***
0930 – 0945	*Break*
0945 - 1100	***Control of a Fired Heater***
1100 - 1230	***Operating a Fired Heater***
1230 -1245	*Break*
1245 - 1330	***Basics of Heat Transfer & Combustion***
1330 – 1420	***Conduction, Convection & Radiation***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Fouling & Heat Transfer***
0830 - 0930	***Combustion Reactions***
0930 – 0945	*Break*
0945 – 1100	***Lean, Rich & Stoichiometric Combustion***
1100 – 1230	***Design Issues***
1230 – 1245	*Break*
1245 – 1330	***Radiant Section***
1330 - 1220	***Vertical Cylindrical Radiant Section Sketch (Plan View)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Even Tube No. Requirement***
0830 - 0930	***Return Bends***
0930 – 0945	*Break*
0945 – 1030	***Preparation of Process Datasheet & Identification of Parameters as Critical for Design of Fired Heater***
1030 – 1130	***Selection of Equipment Type Based on Techno-Economic Analysis***
1130 – 1230	***Critical Inputs Provided in Thermal Design Software***
1230 – 1245	*Break*
1245 – 1330	***Optimum Thermal Design Software***
1330 – 1420	***Tubes Per Pass & Number of Passes***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

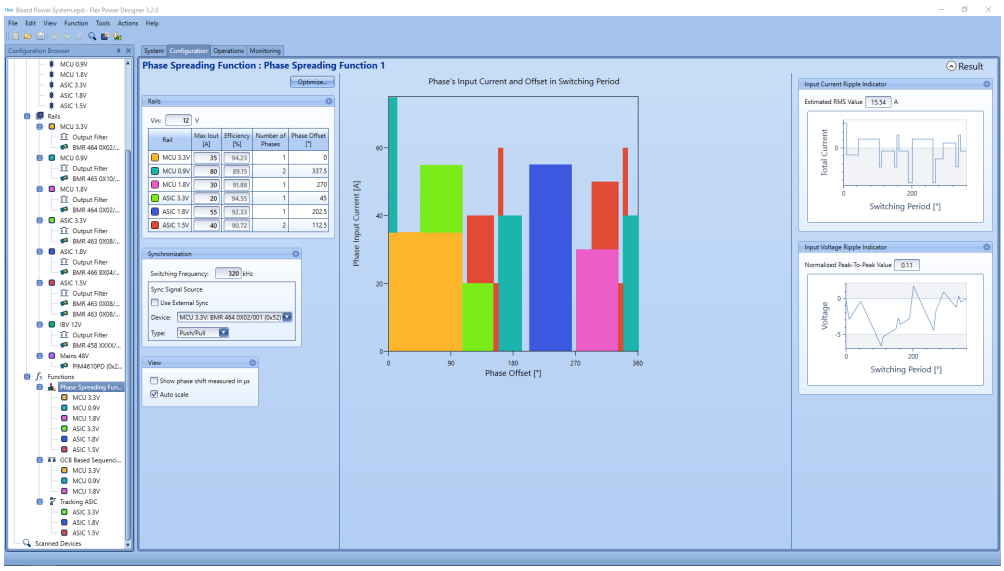
0730 – 0830	***Burner Layout Symmetry***
0830 - 0930	***Convection Section Design, Stack Design & Refractory Design***
0930 – 0945	*Break*
0945 – 1030	***Excess Air & Combustion Efficiency***
1030 – 1130	***Premixed & Diffusion Combustion***
1130 – 1230	***Techniques for NOx Control***
1230 – 1245	*Break*
1245 – 1330	***Classification of Fired Heaters***
1330 – 1420	***Responding to Abnormal Operating Conditions***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Monitoring & Troubleshooting of Fired Heaters***
0830 – 0930	***Factors Affecting the Performance of Fired Heaters***
0930 – 0945	*Break*
0945 – 1030	***Optimizing Fired Heater Operation***
1030 – 1115	***Performance Monitoring***
1115 – 1215	***Draft, Coking & Skin Temperature***
1215 – 1230	*Break*
1230 – 1330	***Troubleshooting of Fired Heaters***
1330 – 1345	***Case Studies***
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 the "Thermal Design" simulator.



Thermal Design Software

Course Coordinator

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