COURSE OVERVIEW PE0020
Process Equipment: Fired Heaters, Air Coolers, Heat Exchangers, Piping, Pumps, Compressors, Process

Course Title
Process Equipment: Fired Heaters, Air Coolers, Heat Exchangers, Piping, Pumps, Compressors, Process

Course Reference
PE0020

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

Course Date/Venue

Date	option	Venue
August 24- 28, 2025	1	Boardroom 1 Meeting Room, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
	2	Neftchilar Meeting Room, Baku Marriott Boulevard, Baku, Azerbaijan

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 state-of-the-art course is designed to provide a comprehensive understanding of process equipment design concepts and techniques. Process design methods and criteria are presented and discussed to familiarize engineers with practical techniques for selection, sizing and design of process equipment for refineries, petrochemical and related oil and gas processing plants.

During the course period, participants will be trained on short-cut methods, rules-of-thumb and example problems on the course topics, which include process design, categories & constraints; hydrocarbon properties, parameters and definitions; development of process design data & methods; engineering flow diagrams & specifications; sizing, selection & design of major process equipment; mechanical & safety aspects; cost estimating; and process design specification packages.

In addition to basic calculation procedures for design and rating of process equipment, design approaches in revamp of existing plant facilities are also discussed and guidelines provided. Each session will be conducted in a lecture/discussion format designed to provide intensive instruction and guidance.

Course Objectives

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

- Apply proper principles, procedures and techniques in the design, sizing, selection, application and troubleshooting of process equipments
- Calculate, evaluate and compile basic process data essential for design of process equipment and plant
- Perform evaluations of existing equipment designs and revamp methods
- Prepare comprehensive process design specification document package
- Prepare scoping cost estimates and conduct evaluations of equipment and contractors' design proposals
- Maintain and troubleshoot process equipment and solve their related problems

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 is intended for process engineers engaged in the design of new process equipment and revamp of existing plants and who also in-charge of troubleshooting and maintaining of such equipment. The course is also recommended for mechanical, equipment and project engineers who wish to learn basic principles of process design and process equipment and who are willing to troubleshoot and maintain such equipment.

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
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.

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, BSc, PMI-PMP, CSSBB, 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 Unit Operations & Maintenance**, **Piping** Systems, Troubleshooting of **Pumps**, **Compressors** & **Heat Exchangers,** Operation & Maintenance of **Fired Heaters, Air Coolers, Operations Asset Process Plant** Start-up & Commissioning, **Process Plant** Monitoring, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Integrity**, **Flare**, **Blowdown & Pressure Relief Systems** Operation, Maintenance & Troubleshooting, Dynamics of the **Petrochemicals Industry**, Understanding the **Global Petrochemical Industry**, **Petrochemicals** Analysis, **Naphtha & Condensate** in **Petrochemicals**, **Feedstock** Handling & Storage, **Natural Gas Liquids & Petrochemical Industry** and **Markets**, **Refinery & Process Industry**, **Refinery** Optimization, **Refinery** Operations Troubleshooting, **Refinery** Production Operations, **Refinery Process Safety**, **Process Safety Design**, **Petroleum Refinery** Process, **Asset Operational Integrity**, **Refinery Induction**, **Crude Distillation**, **Crude Oil Properties**, **Distillation Column** Operation & Control, **Oil Movement** Storage & Troubleshooting, Root Cause Analysis (**RCA**) for **Process & Equipment Failures**, **Process Equipment** Design, Applied **Process Engineering** Elements, **Catalyst** Selection & Production Optimization, Operations Abnormalities & Plant Upset, **Clean Fuel** Technology & Standards, **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**, **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**, **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**, **Project Engineering Manager**, **Construction Manager**, **Site Manager**, **Area Manager**, **Procurement Manager**, **Factory Manager**, **Technical Services Manager**, **Senior Project 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 Project Management Professional** (**PMI-PMP**), a **Certified Six Sigma Black Belt** (**CSSBB**) from **The International Six Sigma Institute**, a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**), a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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, 24th of August 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction*** *Nature of Design ● Design Constraints ● Design Categories*
0930 – 0945	*Break*
0945 – 1130	***Petroleum Properties & Definitions*** *Composition of Petroleum ● Petroleum Processing: An Overview ● Hydrocarbon Properties: (Pure Hydrocarbons, Defined Mixtures, Undefined Mixtures) ● Characterization Parameters & Definitions*
1130 – 1230	***Development of Process Data*** *Process Design Tasks & Sequence ● Process Calculations Methods: (Empirical Procedure, Rigorous Procedure)*
1230 – 1245	*Break*
1245 – 1420	***Development of Process Data (cont'd)*** *Process Design Simulation Techniques: (Commercial Packages, Equipment Software, Process Data Packages) ● Data Compilation and Presentation: (Process Flow Diagram, Equipment Data Sheets, Accuracy and Significance)*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Monday, 25th of August 2025***

0730 – 0930	***Equipment Sizing, Selection & Design*** *Process Equipment Categories ● Required vs. Calculated Data*
0930 – 0945	*Break*
0945 – 1045	***Piping*** *Fluid Flow Equations ● Pressure Loss Categories ● Pipe Properties ● Sizing Criteria ● Two-Phase Flow ● Sizing Methods ● Maintenance & Troubleshooting*
1045 – 1230	***Pumps*** *Categories & Types ● Performance Characteristics ● Key Design Parameters ● Calculation Method/Typical Format and Examples ● Pump Selection Guidelines ● Maintenance & Troubleshooting*
1230 – 1245	*Break*
1245 – 1420	***Compressors*** *Categories and Types ● Compression Process ● Characteristics & Terminologies ● Key Design Parameters ● Compressor Control Methods ● Calculation Method/Typical Format & Examples ● Selection Guidelines ● Maintenance & Troubleshooting*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: Tuesday, 26th of August 2025

0730 – 0930	***Heat Exchangers*** *Types ● Shell-and-Tube Construction – TEMA ● Heat Transfer Relation ● Key Design Considerations, Fouling Factors, Process Applications*
0930 – 0945	*Break*
0945 – 1045	***Heat Exchangers (cont'd)*** *Reboilers ● Calculation Methods – Short-cut with Example ● Rating Existing Exchangers with Example ● Selection Guidelines ● Maintenance & Troubleshooting*
1045 – 1230	***Air Coolers*** *Types – Forced and Induced Air ● Key Design Considerations ● Air vs Water Cooling ● Calculation Procedure – Approximate Method ● Maintenance & Troubleshooting*
1230 – 1245	*Break*
1245 – 1330	***Direct-Fired Heaters*** *Types – Size and Configuration ● Design Considerations – Process & Combustion ● Control Systems ● Maintenance & Troubleshooting*
1330 – 1420	***Process Vessels*** *Types & Functions, Design Considerations ● Calculation Method & Examples ● Maintenance & Troubleshooting*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

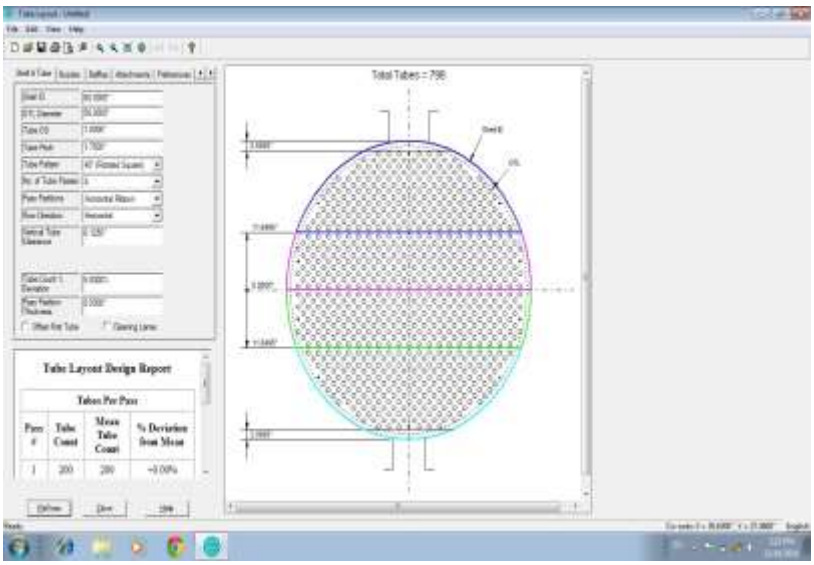
Day 4: Wednesday, 27th of August 2025

0730 – 0930	***Fractionator Columns*** *Fractionator Types: Simple * Complex Columns ● Design Methods – Process/Hardware ● Process Design Procedure/Examples: Simple Column-Stabilizer; Complex Column-Crude Column*
0930 – 0945	*Break*
0945 – 1045	***Fractionator Columns (cont'd)*** *Internals: Trays, Packing/Grids, etc ● Hydraulic Criteria ● Performance Comparison ● Process Specification Data Sheets ● Maintenance & Troubleshooting*
1045 – 1130	***Reactors*** *Fixed-Bed Reactors Types ● Design Considerations ● Sizing Methods – Press Drop Calc ● Internals ● Maintenance & Troubleshooting*
1130 - 1230	***Control Valves*** *Types ● Design Considerations ● Valve Sizing ● Valve Selection ● Actuator Types ● Actuator Selection ● Calculation Methods & Examples*
1230 – 1245	*Break*
1245 – 1420	***Ancillary Equipment*** *Steam Jet Ejectors ● Pressure Relief Devices ● Maintenance & Troubleshooting*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5:	Thursday, 28th of August 2025
0730 – 0930	***Mechanical & Safety Aspects*** *Codes, Standards and Specifications ● Materials of Construction – Overview ● Safety in Design – Equipment Spacing*
0930 – 0945	*Break*
0945 – 1045	***Cost Estimating*** *Cost Estimating Methods ● Estimate Types and Accuracy ● Equipment Installation Factors ● Contingency Allowances ● Cost Escalation*
1045 – 1230	***Process Design Specifications*** *Purpose of Specification Package ● Types of Specification Packages ● Specification Package Contents*
1230 – 1245	*Break*
1245 – 1330	***Process Design Specifications (cont'd)*** *Process Design in Project Cycle ● Cost of Process Design*
1330 – 1345	***Q & A Discussion***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

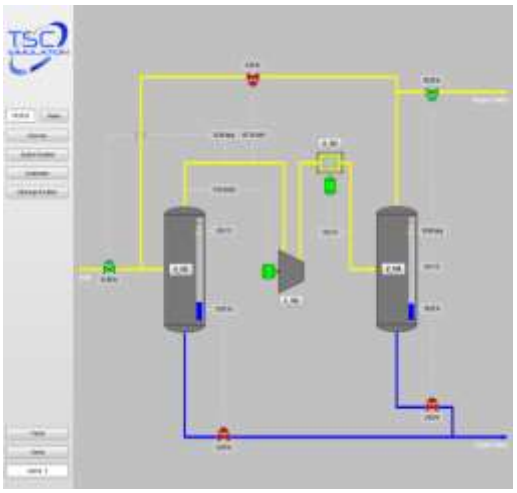
Simulator (Hands-on Practical Sessions)

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 simulators "Heat Exchanger Tube Layout", "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor", "CBT on Compressors", "Valve Sizing Simulator", "Valve Simulator 3.0", "Valvestar 7.2 Simulator" and "PRV²SIZE Simulator".

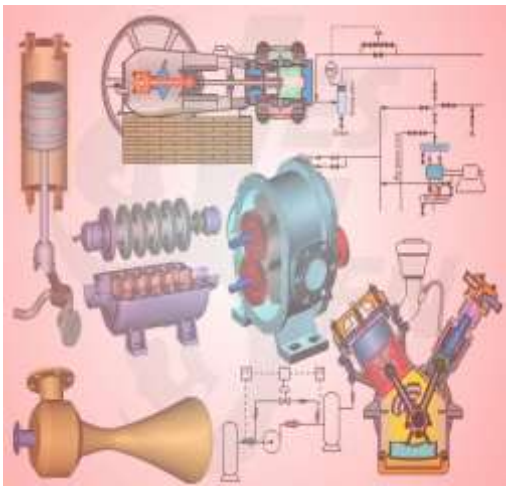


Heat Exchanger Tube Layout

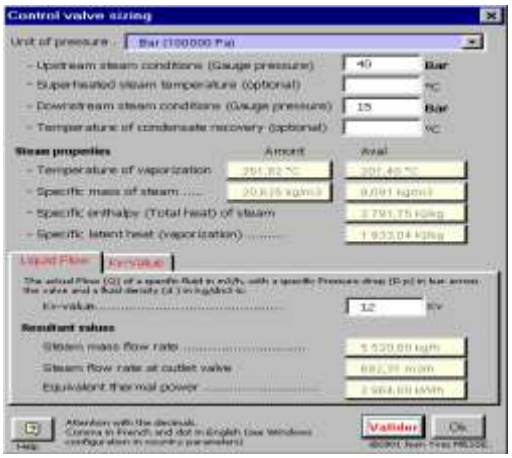
Centrifugal Pumps and Troubleshooting Guide 3.0



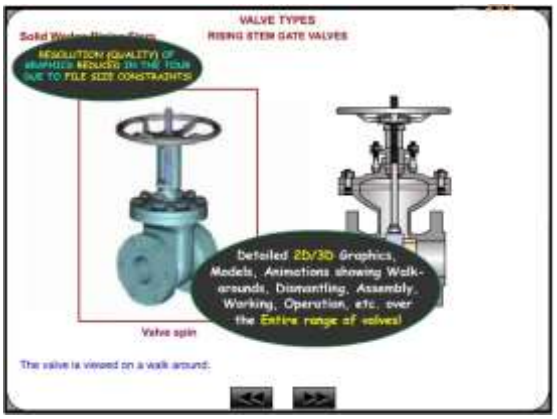
SIM 3300 Centrifugal Compressor Simulator



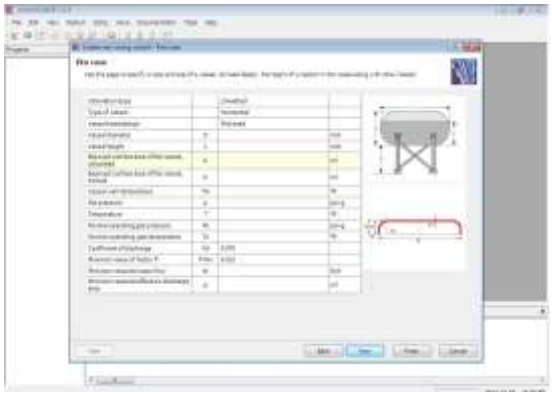
CBT on Compressors



Valve Sizing Simulator



Valve Simulator 3.0



Valvestar 7.2 Simulator

PRV²SIZE Simulator

Course Coordinator

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