COURSE OVERVIEW PE0151
Process Engineering - Design and Operation

Course Title
Process Engineering - Design and Operation

Course Date/Venue
Session 1: July 21-25, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 07-11, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
PE0151

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

Course Description

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

This course is designed to provide participants with a detailed and up-to-date overview of process engineering design. It covers the basic chemical calculations and energy balances; the enthalpy changes accompanying chemical reactions as well as heat changes in mixing processes; the examples of alternative routes in process engineering and generalized approach to the chemical plant design; the operating instructions manual, conductance of performance test runs and troubleshooting; and the cost cutting measures, green engineering, process intensification, need for PFD and P&ID and block diagrams.

Further, this course will also discuss the development and utility of process flow diagrams; the development of piping and instrumentation diagrams; the process design of piping, process design of fluid moving devices and evaluation of centrifugal pump performance when handling viscous liquids; the power required in fan, blower an in adiabatic compressor; the flow meter, process design of orifice meter and rotameter and two phase flow; troubleshooting fluid flow systems and design of heat exchangers; the criteria of selection between horizontal condenser and vertical condenser; the multicomponent condensation, process design of reboilers and vaporizers and tinker's flow model; and the air cooled heat exchangers and air heaters including plate heat exchangers and spiral flow heat exchangers.

During this interactive course, participants will learn the brazed aluminium plate-fin heat exchanger and design of liquid-liquid extractor; the desirable solvent properties or choice of solvent and design of counter current multistage extractor; the supercritical extractor (SCE), process design of distillation columns, batch distillation and short path distillation; the reactive and catalytic distillation, azeotropes and separation thereof and the process design of absorbers; the design of packed tower type absorber and process design of spray chamber or spray tower type absorber; the venturi scrubber, process design of falling film absorber and process design of reactors; the batch reactor, continuous flow reactors and mixing for the different type of reaction systems; and the bubble column reactor and design of fixed catalyst bed reactors for gaseous reactions.

Course Objectives

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

- Apply and gain an in-depth knowledge on process engineering design
- Discuss process engineering, basic chemical calculations and energy balances
- Describe enthalpy changes accompanying chemical reactions as well as heat changes in mixing processes
- List various examples of alternative routes in process engineering and generalized approach to the chemical plant design
- Prepare operating instructions manual and discuss the conductance of performance test runs and troubleshooting
- Identify cost cutting measures, green engineering, process intensification, need for PFD and P&ID and block diagrams
- Illustrate the development and utility of process flow diagrams as well as the development of piping and instrumentation diagrams
- Review process design of piping and process design of fluid moving devices as well as evaluate centrifugal pump performance when handling viscous liquids
- Identify power required in fan, blower and in adiabatic compressor
- Determine flow meters, process design of orifice meter, process design of rotameter and two phase flow
- Troubleshoot fluid flow systems, design heat exchangers and identify the criteria of selection between horizontal condenser and vertical condenser
- Recognize multicomponent condensation, process design of reboilers and vaporizers and tinker's flow model
- Discuss air cooled heat exchangers and air heaters including plate heat exchangers and spiral flow heat exchangers
- Explain brazed aluminium plate-fin heat exchanger and the design of liquid-liquid extractor
- Select desirable solvent properties or choice of solvent and design of counter current multistage extractor
- Describe supercritical extractor (SCE), process design of distillation columns, batch distillation and short path distillation

- Define reactive and catalytic distillation, azeotropes and separation thereof and the process design of absorbers
- Design packed tower type absorber and process design of spray chamber or spray tower type absorber
- Explain venturi scrubber, process design of falling film absorber and process design of reactors
- Discuss batch reactor, continuous flow reactors and mixing for the different type of reaction systems
- Recognize bubble column reactor and design of fixed catalyst bed reactors for gaseous reactions

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 a basic overview of all significant aspects and considerations of process engineering design for those involved with the purchase, design, fabrication, or inspection of piping projects including users, manufacturers, repair organisations, inspection agencies and other organisations involved with the design, maintenance and repair of industrial plants.

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**. The 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 required can be arranged at the time of booking.

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. Kyle Bester is a **Senior Mechanical & Process Engineer** with extensive years of practical experience within the **Oil & Gas**, **Power & Water Utilities** and other **Energy** sectors. His expertise includes **Bearing & Bearing Failure** Analysis, **Centrifugal**, **Reciprocating** & **Screw** Compressor, **Gas Turbine** Repair, **Pump Installation & Operation**, **Compressors & Turbines** Troubleshooting, Coupling, Gear Boxes, Bearings & Lubrication, Mechanical Seals, Bearings & Seals, **Pressure Vessel** Design & Analysis, **Steam & Gas Turbine**, **High Pressure Boiler** Operation, **Compressors** Operation & Maintenance, **Pipe** Maintenance & Repair, **Centrifugal & Positive Displacement Pump**, **Rotating Machinery**, **PD Compressor & Gas Engine** Operation & Troubleshooting, **Hydraulic Tools & Fitting**, **Mass & Material Balance**, **Water Distribution & Pump Station**, **Tank Farm & Tank Terminal**, **Process Piping** Design, **Stack & Noise** Monitoring, **HVAC & Refrigeration** Systems, **Condition Monitoring** System, **Maintenance Planning & Scheduling**, **Maintenance Shutdown & Turnaround**, **Maintenance Audit** Best Practices, **Maintenance & Reliability** Management, Reliability, Availability & Maintainability (**RAM**), **Root Cause** Analysis, **Reliability-Centered Maintenance** (**RCM**), **Reliability Engineering Analysis** (**RE**), **Root Cause Analysis** (**RCA**), **Asset Integrity Management** (**AIM**), **Reactive & Proactive** Maintenance, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Maintenance Management & Cost Control**, **Operation of the Hydrocarbon** Process Equipment, **Fired Heaters**, **Air Coolers**, **Heat Exchangers**, **Crude Desalter**, **Pressure Vessels & Valves**, **Flare**, **Blowdown & Pressure Relief Systems** Operation, **Separation Techniques**, **Bulk Liquid Storage** Management & **Tanks Cleaning**, **Ammonia Manufacturing** & Process Troubleshooting, Process Equipment **Design**, Process Reactors and **Chemical** Engineering. Further, he is also well-versed in **Water Reservoir**, **Water Tanks**, **Water Pumping** Station, **Water Distribution** System, **Water Network** System, **Water Pipes & Fittings**, **Water Hydraulic** Modelling, **Water Storage Reservoir**, **Reservoirs & Pumping** Stations Design & Operation, **Pumping** Systems, Interconnecting **Pipelines**, **Water Network Hydraulic** Simulation Modelling, **Water Supply** Design, **Water Balance Modelling**, **Water Distribution Network**, **Water Network** System Analysis, **Water Forecasts** Demand, **Water Pipelines** Materials & Fittings, **Water Network** System Design, Pump Houses & Booster Pumping Stations, **Potable Water Transmission**, **Water Distribution Network**, Districts Meters Areas (DMAs), **Water Supply & Desalination Plants** Rehabilitation, **Water Reservoirs & Pumping Stations**, **Water Network System** Extension, Water Network System Replacement & Upgrade, **Water Networks** Optimization, **Water Supply & Distribution** Systems Efficiency & Effectiveness, **Pipe** Materials & Fittings, **Service Reservoir** Design & Operation, **Pipes & Fittings**, **Water Network** System Design & Operation, **Supply Water Network** Rehabilitation, **Water Loss** Reduction, **Main Water** System Construction, **Main Water Line** Construction, Transmission & Distribution **Pipelines**, **Water Distribution** Design & Modelling, **Water Supply** System, Oilfield **Water Treatment**, Best Practice in **Sewage** & Industrial **Wastewater Treatment** & Environmental Protection, **Water Distribution** Design & Modelling, **Desilting**, Treating & Handling Oily **Water**, **Water Chemistry** for **Power Plant**, **Water** Sector Orientation, Environmental Impact Assessment (**EIA**). He is currently the **Part Owner & Manager** of Extreme Water SA wherein he manages, re-designed and commissioned a water and wastewater treatment plants.

During his career life, Mr. Bester has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Asset Manager**, **Water Engineer**, **Maintenance Engineer**, **Mechanical Engineer**, **Process Engineer**, **Supervisor**, **Team Leader**, **Analyst**, **Process Technician**, **Landscape Designer** and **Senior Instructor/Trainer** for various international companies, infrastructures, water and wastewater treatment plants from New Zealand, UK, Samoa, Zimbabwe and South Africa, just to name a few.

Mr. Bester holds a **Diploma** in **Wastewater Treatment** and a **National Certificate** in **Wastewater & Water Treatment**. Further, he is a **Certified Instructor/Trainer**, an **Approved Chemical Handler** and has delivered numerous courses, trainings, conferences, seminars and workshops 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:

Day1

0730 – 0745	*Registration & Coffee*
0745 – 0800	*Welcome & Introduction*
0800 – 0815	PRE-TEST
0815 – 0845	***Introduction to Process Engineering***
0845 – 0915	***Basic Chemical Calculations***
0915 – 0945	***Energy Balances***
0945 – 1000	*Break*
1000 – 1015	***Enthalpy Changes Accompanying Chemical Reactions***
1015 – 1030	***Heat Changes in Mixing Processes***
1030 – 1045	***Examples of Alternative Routes in Process Engineering***
1045 – 1100	***Generalized Approach to the Chemical Plant Design***
1100 – 1130	***Preparation of Operating Instructions Manual***
1130 – 1145	*Break*
1145 – 1230	***Conductance of Performance Test Runs***
1230 – 1315	***Troubleshooting***
1315 - 1420	***Cost Cutting Measures***
1420 – 1430	Recap
1430	*Lunch & End of Day One*

Day 2

0730 – 0800	***Green Engineering***
0800 – 0830	***Process Intensification***
0830 – 0945	***Need for PFD & P&ID***
0945 – 1000	***Block Diagrams***
1000 – 1015	*Break*
1015 – 1045	***Development & Utility of Process Flow Diagrams***
1045 – 1100	***Development of Piping & Instrumentation Diagrams***
1100 – 1130	***Process Design of Piping***
1130 – 1200	***Process Design of Fluid Moving Devices***
1200 – 1215	*Break*
1215 – 1245	***Evaluation of Centrifugal Pump Performance When Handling Viscous Liquids***
1245 – 1330	***Power Required in Fan, Blower & in Adiabatic Compressor***
1330 - 1420	***Flow Meters***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0800	***Process Design of Orifice Meter***
0800 – 0830	***Process Design of Rotameter***
0830 – 0845	***Two Phase Flow***
0845 – 0900	***Troubleshooting of Fluid Flow Systems***

0900 – 0915	*Break*
0915 – 1000	***Design of Heat Exchangers***
1000 – 1045	***Criteria of Selection Between Horizontal Condenser & Vertical Condenser***
1045 – 1115	***Multicomponent Condensation***
1115 – 1200	***Process Design of Reboilers & Vaporizers***
1200 – 1215	*Break*
1215 – 1300	***Tinker's Flow Model***
1300 – 1330	***Air Cooled Heat Exchangers & Air Heaters***
1330 - 1420	***Plate Heat Exchangers***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

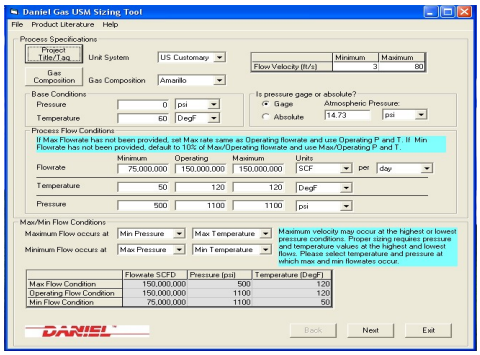
0730 – 0800	***Spiral Flow Heat Exchangers***
0800 – 0830	***Brazed Aluminium Plate-Fin Heat Exchanger***
0830 – 0900	***Design of Liquid-Liquid Extractor***
0900 – 0915	***Desirable Solvent Properties or Choice of Solvent***
0915 – 0930	*Break*
0930 – 1000	***Design of Counter Current Multistage Extractor***
1000 – 1030	***Supercritical Extractor (SCE)***
1030 – 1100	***Process Design of Distillation Columns***
1100 – 1145	***Batch Distillation***
1145 – 1200	*Break*
1200 – 1245	***Short Path Distillation***
1245 – 1330	***Reactive & Catalytic Distillation***
1330 - 1420	***Azeotropes & Separation Thereof***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

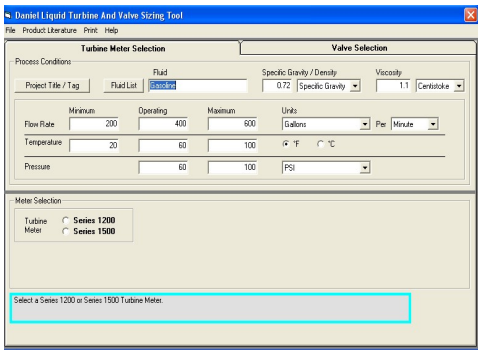
0730 – 0800	***Process Design of Absorbers***
0800 – 0830	***Design of Packed Tower Type Absorber***
0830 – 0900	***Process Design of Spray Chamber or Spray Tower Type Absorber***
0900 – 0930	***Venturi Scrubber***
0930 – 0945	*Break*
0945 – 1015	***Process Design of Falling Film Absorber***
1015 – 1045	***Process Design of Reactors***
1045 – 1130	***Batch Reactor***
1130 – 1215	***Continuous Flow Reactors***
1215 – 1230	*Break*
1230 – 1300	***Mixing for the Different Type of Reaction Systems***
1300 – 1330	***Bubble Column Reactor***
1330 - 1345	***Design of Fixed Catalyst Bed Reactors for Gaseous Reactions***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

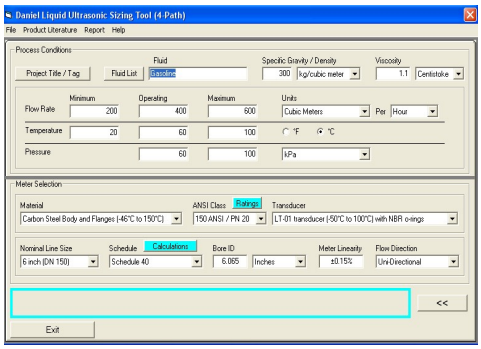
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using "Gas Ultrasonic Meter (USM) Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator" simulator.



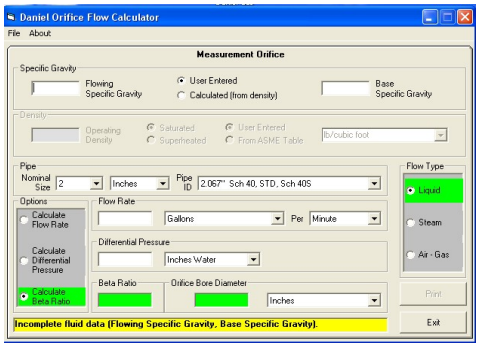
Gas Ultrasonic Meter (USM) Sizing Tool Software



Liquid Turbine Meter and Control Valve Sizing Tool Software



Liquid Ultrasonic Meter Sizing Tool Software



Orifice Flow Calculator Software

Course Coordinator

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