COURSE OVERVIEW PE0050-3D
Basics of Process Engineering

Course Title
Basics of Process Engineering

Course Reference
PE0050

Course Duration/Credits
Three days/1.8 CEUs/18 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	June 22-24, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	August 04-06, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	October 19-21, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
4	December 08-10, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

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 covers the application of chemical engineering theory to the practical demands of applied process engineering. The course will be presented in interactive format with many industrial examples and case studies. Participants will have the opportunity to solve sample problems with the help of the instructor.

The first part of the course will cover the basics of unit operations and the development of an effective process. Topics included are the preparation of process flow diagrams (PFDs) and P&IDs. These diagrams represent the organization and control of equipment in a petrochemical plant or refinery.

This is followed by the calculation of material flows and the concept of a material balance. Included are techniques on the sizing and evaluation of piping networks (including pipe segments, fittings, parallel piping systems, valves and controls equipment).

Pressure drop calculations are presented for a variety of systems – ordinary Newtonian liquids, vapors and mixed phase systems, reacting systems, packed beds and fluidized beds.

Next, the design and evaluation of major fluid flow equipment is presented. This includes pumps (all types) and compressors as well as fans, vacuum pumps, ejectors and educators. The associated drivers for these machines are discussed, especially steam turbines and the steam-power cycle found in all petrochemical plants and refineries
The materials portion of the course is followed by a presentation on energy balances and heat transfer equipment. Refrigeration energy balance, compressor selection, and power requirements are covered. Focus is on the cycles typically found in refineries and petrochemical plants, including cascaded and open systems.

In the next section of the class, materials of construction (MOC) are discussed and selection guidelines presented. Finally, heat transfer equipment selection, design and rating are discussed.

On completion of this course, participants will have the ability to understand and prepare PFDs and P&IDs, perform material/heat balance and fluid flow calculations. Participants will also be able to design, rate and select the major process equipment which accounts for most of the capital investment in refineries and petrochemical plants.

During the class, participants will be given detailed procedures and worksheets for performing the appropriate calculations. Many of the examples have been developed on EXCEL; these programs will be given to the participants on a CD. The tools provided should aid in the design and operation of chemical systems. This is an interactive course with numerous case studies and a CD with solved problems, worksheet and shortcut techniques.

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 and discuss the chemical & physical aspects as well as the processes and process variables used in applied process engineering
- Prepare PFDs and P&IDs in a professional manner
- Perform material/heat balance and fluid flow calculations
- Acquire knowledge with the various process development including process sketch, diagrams and unit operations
- Employ the application of fluid dynamics specifically its piping system design and flow systems and determine the different flow equipment used in process engineering
- Enumerate heat transfer components by explaining the elements of energy balances, heat exchangers, air coolers and fired heaters
- Develop an understanding on mass transfer attributes including distillation, tray performance & constraints, humification and refrigeration
- Identify the different types of chemical reactors and describe petroleum processing reactions including hydro treating, catalytic reforming & hydro cracking
- Discuss the process control applied in process engineering and identify the various construction materials as well as the method of selecting the materials to be used
- Carryout process risk analysis particularly the various evaluation methods and HAZOP study

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 the major elements of applied process engineering for process and project engineers as well as piping designers. The course will also be valuable as a refresher for experienced chemical engineers and those who are not familiar with some aspects of applied process engineering. Additionally, managers and supervisors who have no formal training in chemical engineering should find value in this course.

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$ 3,750 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 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 **1.8 CEUs** (Continuing Education Units) or **18 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. Andrew Ladwig is a **Senior Process & Mechanical Maintenance Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Ammonia Storage & Loading** Systems, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, **Industrial Liquid Mixing**, **Extractors**, **Fractionation**, **Water Purification**, **Water Transport** & Distribution, **Environmental Emission Control**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, **Plant Startup & Shutdown**, **Process Troubleshooting** Techniques and Oil & Gas Operation/Surface Facilities. Further, he is also well-versed in **Rotating Machinery** (**BRM**), **Rotating Equipment** Operation & Troubleshooting, Root Cause Analysis (**RCA**), **Process Plant** Shutdown, Turnaround & Troubleshooting, Planning & Scheduling **Shutdowns & Turnarounds**, Optimizing **Equipment Maintenance** & Replacement Decisions, **Maintenance Planning & Scheduling**, **Material Cataloguing**, Maintenance, Reliability & Asset Management Best Practices, **Storage Tanks Operations** & Measurements, **Tank** Inspection & Maintenance, **Pressure Vessel** Operation, **Flare & Relief** System, **Flaring System** Operation, **PSV** Inspection & Maintenance, **Centrifugal & Reciprocating Compressor**, **Screw Compressor** Troubleshooting, **Heat Exchanger** Overhaul & Testing, **Pipe Stress** Analysis, **Control Valves & Actuators**, **Vent & Relief System**, **Centrifugal & Reciprocating Pump** Installation & Repair, **Heat Exchanger** Troubleshooting & Maintenance, **Steam Trapping & Control**, **Control & ESD** System and Detailed Engineering Drawings, Codes & Standards.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses and conferences 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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Basics of Process Engineering*** *Process Engineering Overview*
0930 – 0945	*Break*
0945 – 1100	***Chemical & Physical Principles*** *Dimensions and Units ● Processes and Process Variables ● Process Data Representation and Analysis ● Basic Chemical Calculations ● Stoichiometry ● Properties of Matter*
1100 – 1230	***Process Development*** *Process Sketch ● Block Diagram ● Process Flow Diagrams (PFDs) ● Piping and Instrumentation Diagrams (P & IDs) ● Other Diagrams ● Unit Operations*
1230 – 1245	*Break*
1245 – 1400	***Fluid Dynamics*** *Static Fluids ● Fluid Flow ● Piping Systems Design ● Complex Flow Systems ● Miscellaneous Flow Systems*
1400 – 1420	***Revision and Quiz***
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor (s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be discussed tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Flow Equipment*** *Fluid Flow Equipment Drivers and Power Cycles ● Compressible Flow Piping – Safety and Control ● Pumps, Basic Concepts, Cavitation ● Compressors ● Fans ● Agitation & Mixing ● Filtration*
0930 – 0945	*Break*
0945 – 1100	***Heat Transfer*** *Energy Balances ● Heat Exchangers Overview ● Heat Exchangers Design ● Shell & Tube Heat Exchangers (TEMA Type) ● Air Coolers ● Fired Heaters*
1100 – 1230	***Mass Transfer*** *Physical Behavior Pure Components ● Distillation ● Calculation Methods ● Trays Performance and Constrains, Tray Efficiency*
1230 – 1245	*Break*
1245 – 1400	***Mass Transfer (cont'd)*** *Crude Unit Optimization ● Packing, Trays versus Packing Comparison ● Humification & Refrigeration*

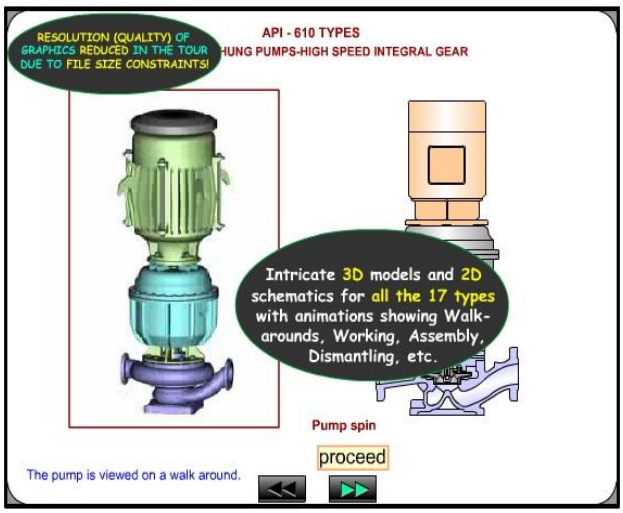
1400 – 1420	***Revision and Quiz***
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor (s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be discussed tomorrow*
1430	*Lunch & End of Day Two*

Day 3

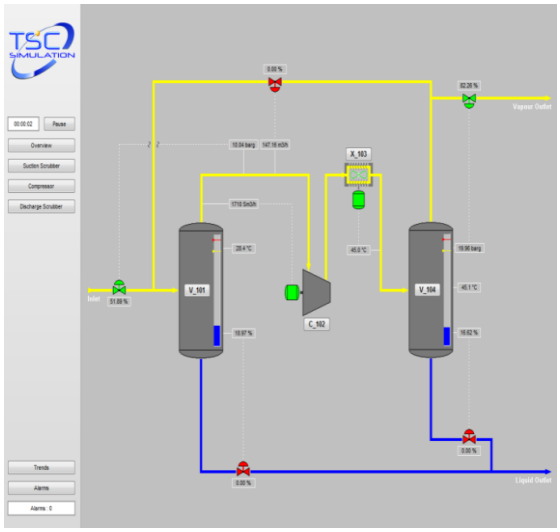
0730 – 0930	***Chemical Reactors*** *Petroleum Processing Reactions ● Kinetics ● Reactor Types*
0930 – 0945	*Break*
0945 – 1045	***Process Control*** *PID Controllers ● Feedback, Feed Forward and Cascade Controls ● DCS Advanced Control*
1045 – 1145	***Materials of Construction*** *Selection Criteria ● Construction Materials ● Code & Standards to Avoid Catastrophes ● Material Selection (Ferrous Material, Non Ferrous Material, others) ● Corrosion Considerations*
1145 – 1200	*Break*
1200 – 1300	***Process Risk Analysis*** *Risk Priority Matrix ● Evaluation Methods ● HAZOP Study*
1300 – 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)

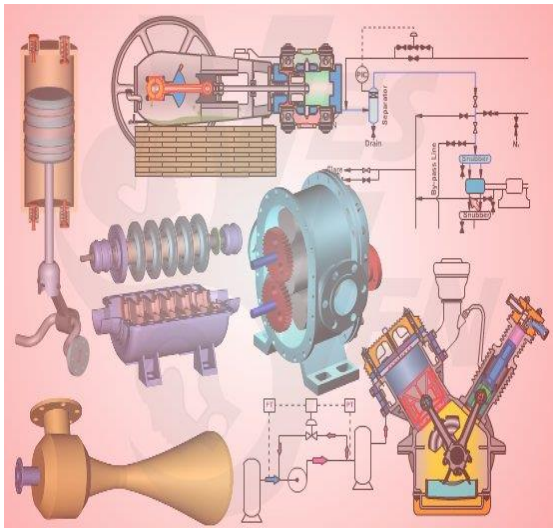
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor", "CBT on Compressors", "Steam Turbines & Governing System CBT", "Heat Exchanger Tube Layout", "Gas Ultrasonic Meter (USM) Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator" simulator.



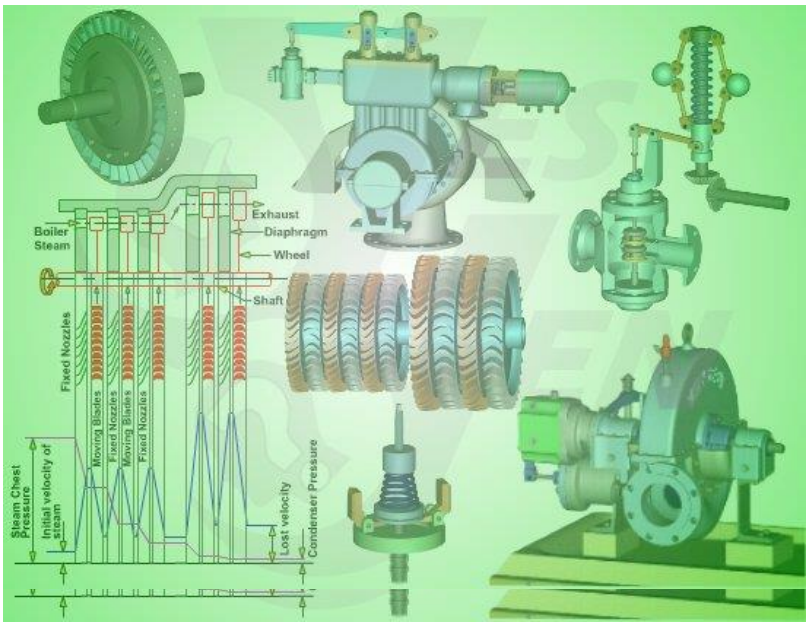
Centrifugal Pumps and Troubleshooting Guide 3.0



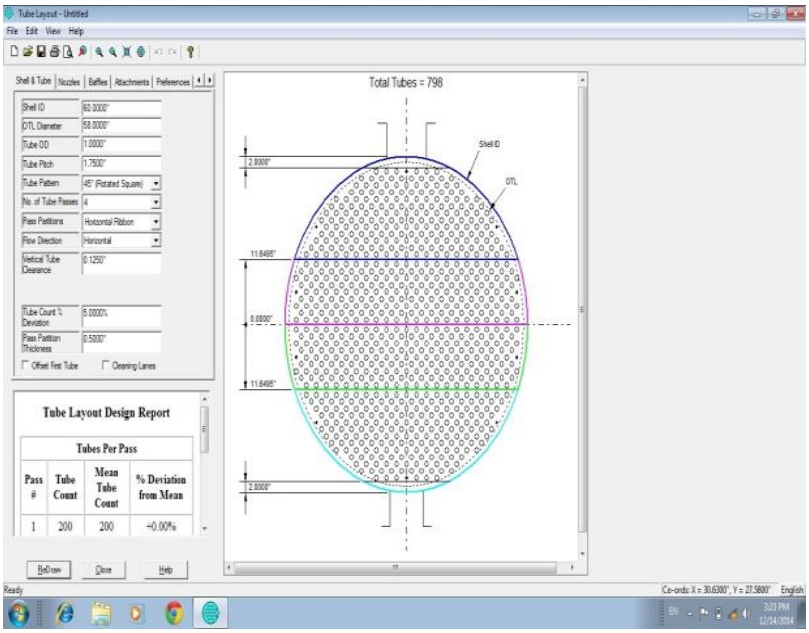
SIM 3300 Centrifugal Compressor Simulator



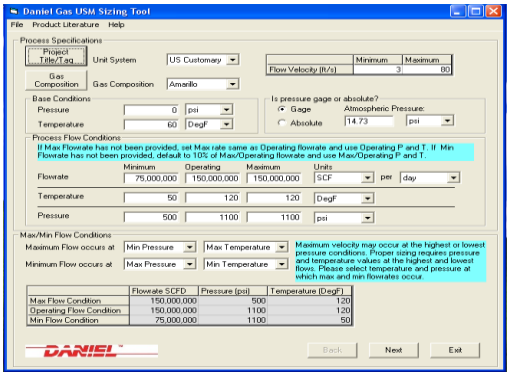
CBT on Compressors



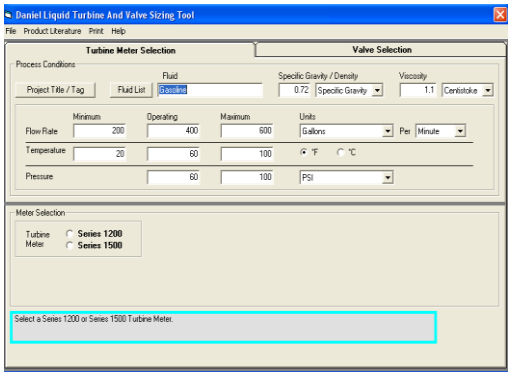
Steam Turbines & Governing System CBT



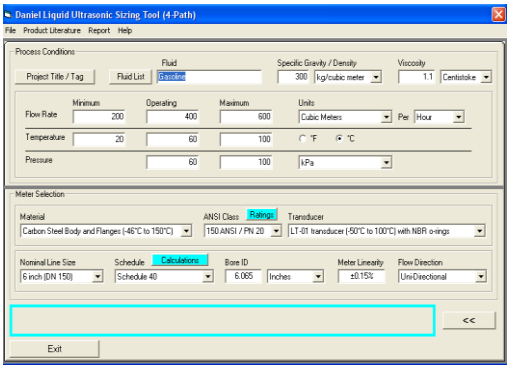
Heat Exchanger Tube Layout



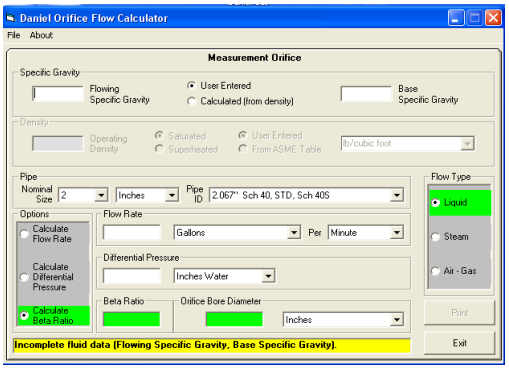
Gas Ultrasonic Meter (USM) Sizing Tool Software



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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