

COURSE OVERVIEW PE0050J1 Applied Process Engineering Elements

Course Title

Applied Process Engineering Elements

Course Date/Venue

Session 1: February 11-15, 2024/Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
 Session 2: March 03-07, 2024/Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey



Course Reference

PE0050J1

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.



The 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 eductors. 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

Doha	US\$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	US\$ 6,000 per Delegate + VAT . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), 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


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. Attalla Ersan, PEng, MSc, BSc, is a Senior Process Engineer with over 40 years of extensive experience within the Oil & Gas, Hydrocarbon and Petrochemical industries. His expertise widely covers the areas of Crude Distillation Process, Saturation Gas Process, Process Plant Operations, Process Plant Startup & Operating Procedure, Ethylene & Vinyl Chloride, Ethane Cracking Furnaces Operations, Ethylene & Polyethylene Operation, Acid Gas Treatment, Sulphur Recovery, EDC & VCM, Caustic Soda Storage, Debottle-necking, Process Operation, Oil Movement, Storage & Troubleshooting, Process Equipment Application & Troubleshooting, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Start-up, Commissioning & Troubleshooting, Piping Systems & Process Equipment, Operation of Process Equipment, Ethylene Furnace Design & Safe Operation, Boiler & Steam System Management, Safety Audits, Process Engineering, Root Cause Investigations, Pyrolysis Cracking, Gas Plant Commissioning, Loss Prevention Techniques, Occupational Hazards, Hot Tapping & Tie-Ins, Pre-Start-Up Safety Review (PSSR), Standard Operating Procedure (SOP), Emergency Operating Procedure (EOP), Permit to Work Systems (PTW), Control Room Emergency Response, Steam Cracking, Steam Generation, Binary Fractionators Operations, Tanks Farm & Metering Station Techniques, Gas Treatment, Sulphur Recovery Process Unit Operation, Permit to Work System, Emergency Response Planning, Boiler & Steam System Management, Waste Heat Recovery, Boiler Plant Safety, Boiler Controls, Steam Distribution Systems, Steam Traps, Pollution Control, Cracked Gas Compressor, Reboilers, Sulphur Unit Air Blower, Steam Turbine, Distillation Columns, Gas Treatment, Waste & Water Treatment Units, Pumps Operations & Maintenance, Pump Technology, Compressor Maintenance & Troubleshooting, Boiler Operation & Maintenance & Water Treatment Technology, Fired Heaters, Air Coolers, Heat Exchangers, Pumps, Compressors, Pressure Vessels & Valves, Application of Standards in Boiler, Pressure Vessel & Piping Systems, Compressors, Turbines, Motors, Turbo-expanders, Gears, Heat Exchanger, Hazard and Operability (HAZOP) Study, Process Hazards Analysis (PHA), Risk Management, Occupational Health, Safety & Industrial Hygiene, HAZOP Facilitation, Loss Prevention, Consequence Analysis Application, Gas Detectors Operation, Accident/Incident Investigation (Why Tree Method), Occupational Exposure Assessment, Fire Fighting & First Aid, Environmental Management and Basic Safety Awareness. He is currently the CEO of Ersan Petrokimya Teknoloji Company Limited wherein he is responsible for the design and operation of Biogas Process Plants.

During his career life, Mr. Attalla has gained his practical and field experience through his various significant positions and dedication as the **Policy, Organization & Manpower Development Head, Training & Development, Head, Technical Writer/Author, Ethylene Plant – Pyrolysis Furnace Engineer, Production Engineer, Process Training Coordinator, Ethylene Plant Shift Supervisor, Ethylene Plant Panel & Fit Operator, Process Training & Development Coordinator, Technical Consultant, and Instructor/Trainer** for Qatar Vinyl Company Limited and Qatar Petroleum Company (QAPCO).

Mr. Attalla is a **Registered Professional Engineer** and has a **Master's degree of Education in Educational Training & Leadership** and a **Bachelor's degree of Petrochemical Engineering**. Further, he is a **Certified Instructor/Trainer, Certified Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and holds various certification in **Writing Effective Scheme of Work, Put it in writing – the GM way, Efficient Business Writing Program, Fundamentals of Process Control and Safe Process Units Start-up Shutdown**. He has further 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

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0900	Process Engineering Process Engineering Overview
0900 – 0930	Chemical & Physical Principles Dimensions & Units • Processes & Process Variables • Process Data Representation & Analysis
0930 – 0945	Break
0945 – 1100	Chemical & Physical Principles (cont'd) Basic Chemical Calculations • Stoichiometry • Properties of Matter
1100 – 1230	Process Development Process Sketch • Block Diagram • Process Flow Diagrams (PFDs) • Piping & Instrumentation Diagrams (P & IDs) • Other Diagrams • Unit Operations
1230 – 1245	Break
1245 – 1400	Fluid Dynamics Static Fluids • Fluid Flow
1400 – 1420	Revision & Quiz
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2

0730 – 0930	Fluid Dynamics (cont'd) Piping Systems Design • Complex Flow Systems • Miscellaneous Flow Systems
0930 – 0945	Break
0945 – 1100	Flow Equipment Fluid Flow Equipment Drivers & Power Cycles • Compressible Flow Piping – Safety and Control
1100 – 1230	Flow Equipment (cont'd) Pumps, Basic Concepts, Cavitation • Compressors • Fans • Agitation & Mixing • Filtration
1230 – 1245	Break
1245 – 1400	Heat Transfer Energy Balances • Heat Exchangers Overview
1400 – 1420	Revision & Quiz
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0930	Heat Transfer (cont'd) Heat Exchangers Design • Shell & Tube Heat Exchangers (TEMA Type)
0930 – 0945	Break
0945 – 1100	Heat Transfer (cont'd) Air Coolers • Fired Heaters
1100 – 1230	Mass Transfer Physical Behavior Pure Components
1230 – 1245	Break



1245 – 1400	Mass Transfer (cont'd) Distillation
1400 – 1420	Revision & Quiz
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4

0730 – 0930	Mass Transfer (cont'd) Calculation Methods • Trays Performance & Constrains, Tray Efficiency
0930 – 0945	Break
0945 – 1100	Mass Transfer (cont'd) Crude Unit Optimization • Packing, Trays Versus Packing Comparison • Humification & Refrigeration
1100 – 1230	Chemical Reactors Petroleum Processing Reactions
1230 – 1245	Break
1245 – 1400	Chemical Reactors (cont'd) Kinetics • Reactor Types
1400 – 1420	Revision & Quiz
1420 – 1430	Recap
1430	Lunch & End of Day Four

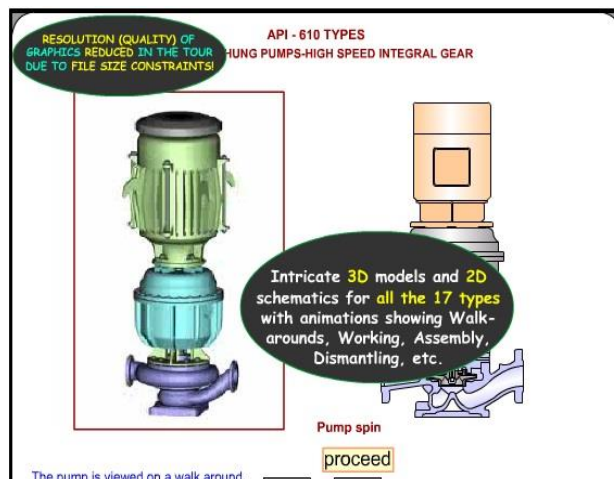
Day 5

0730 – 0930	Process Control PID Controllers • Feedback, Feed Forward and Cascade Controls • DCS Advanced Control
0930 – 0945	Break
0945 – 1100	Materials of Construction Selection Criteria • Construction Materials • Code & Standards to Avoid Catastrophes
1100 – 1230	Materials of Construction (cont'd) Material Selection (Ferrous Material, Non Ferrous Material, others) • Corrosion Considerations
1230 – 1245	Break
1245 – 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

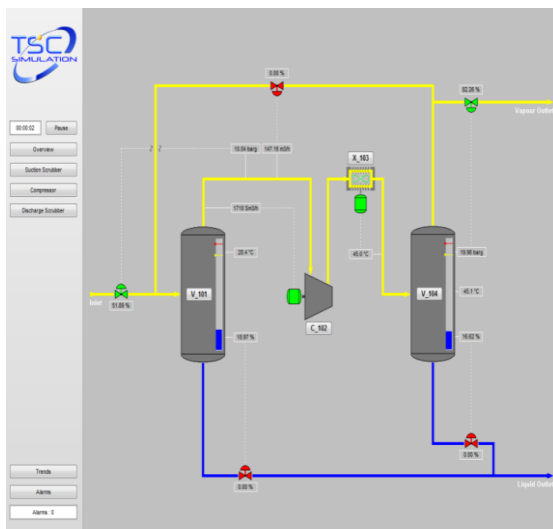


Simulator (Hands-on Practical Sessions)

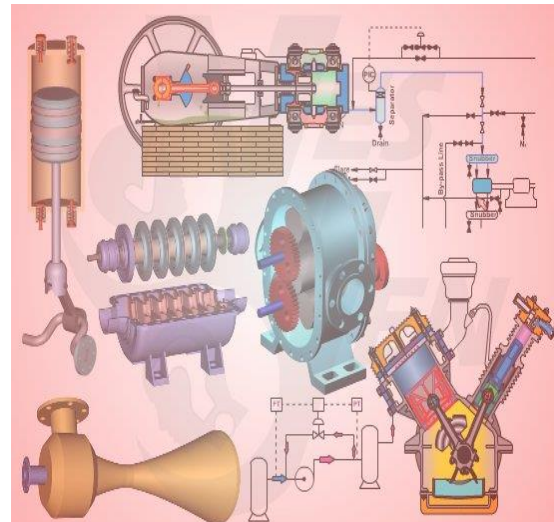
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor”, “CBT on Compressors”, “Steam Turbines & 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.



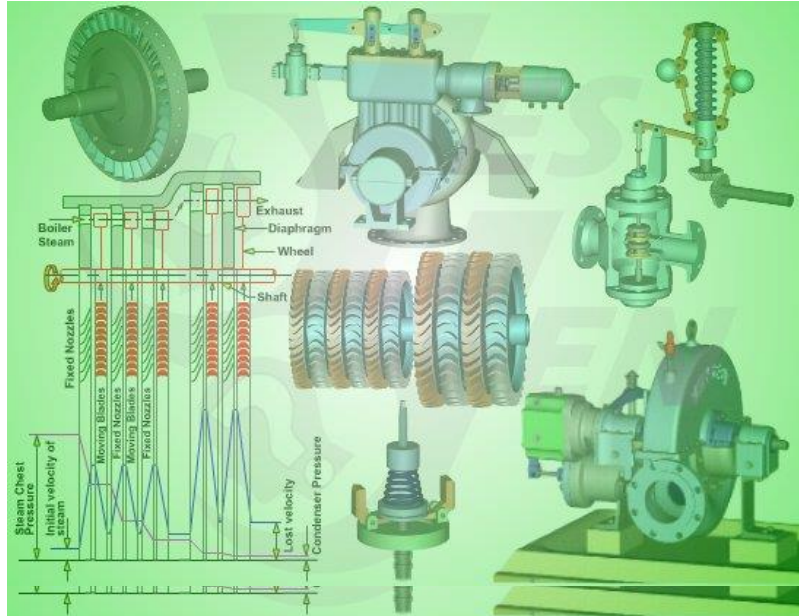
Centrifugal Pumps and Troubleshooting Guide 3.0



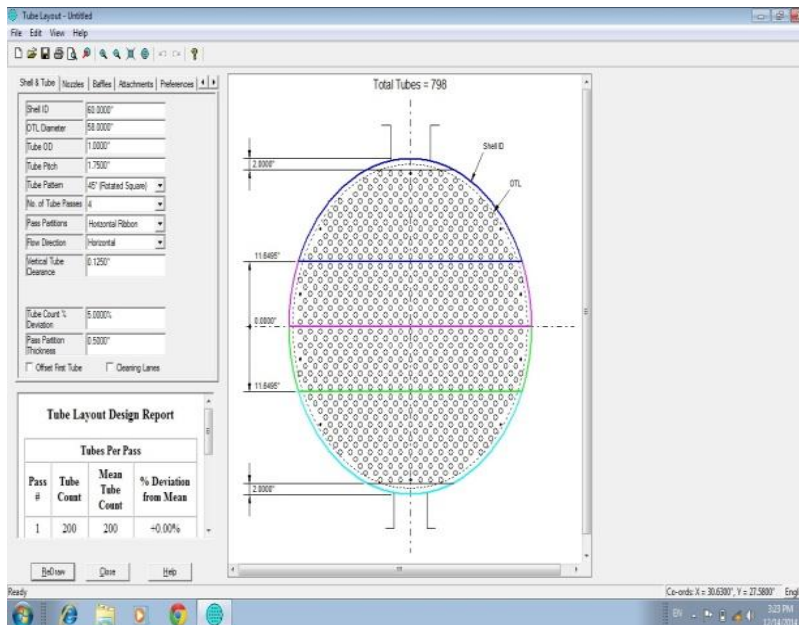
SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors

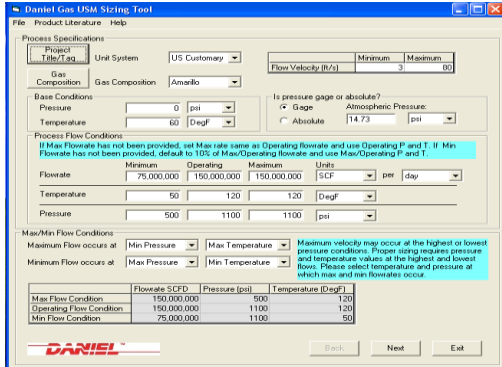


Steam Turbines & Governing System CBT

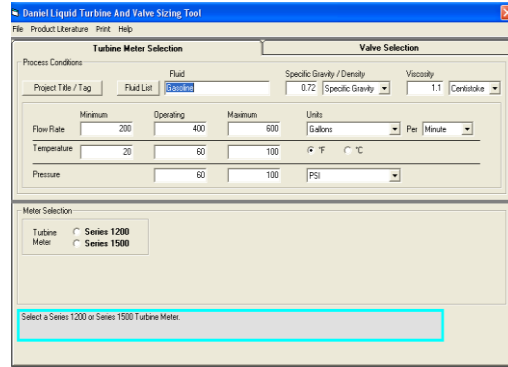


Heat Exchanger Tube Layout

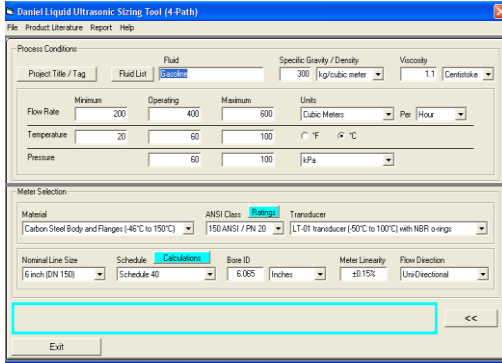




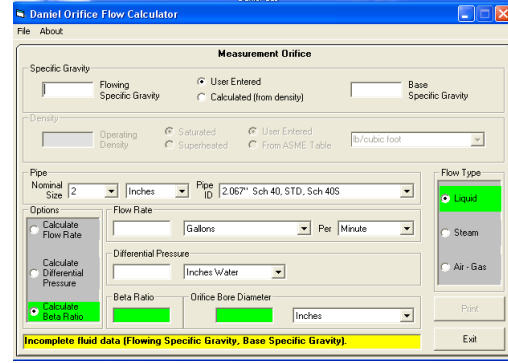
Gas Ultrasonic Meter (USM) Sizing Tool Software



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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