COURSE OVERVIEW PE0020
Process Equipment Design, Sizing, Selection, Applications & Troubleshooting

Course Title
Process Equipment Design, Sizing, Selection, Applications & Troubleshooting

Course Date/Venue
Session 1: February 18-22, 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
PE0020

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.

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 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:-

- 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.

- 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. Mike Poulos, MSc, BSc, is a **Senior Process Engineer** with over **35 years** of industrial experience within the **Utilities**, **Refinery**, **Petrochemical** and **Oil & Gas** industries. His expertise lies extensively in the areas of **Process Equipment Design & Troubleshooting**, **Petroleum Processing**, **Process Design Specifications**, **Process Calculation Methods**, **Equipment Sizing & Selection**, **Piping**, **Pumps**, **Compressors**, **Heat Exchangers**, **Air Coolers**, **Direct-Fired Heaters**, **Process Vessels**, **Fractionator Columns**, **Reactors, Ancillary Equipment**, **Mechanical & Safety Aspects**, **Cost Estimation**, **Commissioning & Start-Up**, **Production & Cost Reduction**, Reactor Building Ventilation System, **PVC** Initiators Storage Bunkers, **PVC** Modernization & Expansion, **PVC** Reactor, **PVC** Plant Reactors Pre-Heating, **PVC** Plant Start-Up & Commissioning, **PVC** Plant Shutdown, **PVC** Driers Automation, **VC**M Recovery, **VCM** Sphere Flooding System, **VCM** Storage Tanks, Steam Tripping Facilities, Solvents Plant Automation Commissioning & Start-Up and Inferential Properties System. Further, he is also well-versed in Advanced Process Control Technology, Designing Process Plant Fail-Safe Systems, Quantitative Risk Assessment, On-Line Statistical Process Control, Principles and Techniques of Contemporary Management, Rosemount RS3, Polymer Additives, Polymer Reaction Engineering, Polymer Rheology and Processing, GRID Management and Batch Process Engineering.

During his career life, Mr. Poulos held significant positions as the **Chemical Plants Technology Engineer**, **PVC Plant Production Engineer**, **PVC Plant Shutdown Coordinator**, **PVC Plant/CC Solvents Plants Acting Section Head** and **Chemical Distribution Section Head** from Hellenic Petroleum, wherein he was responsible for the development of integrated system.

Mr. Poulos has **Master** and **Bachelor** degrees in **Chemical Engineering** from the **University of Massachusetts** and **Thessaloniki Polytechnic** respectively. Further, he is a **Certified Instructor/Trainer, a** and a **member** of the **Greek Society of Chemical Engineers** and **Greek Society of Engineers**.

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 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 – 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

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

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

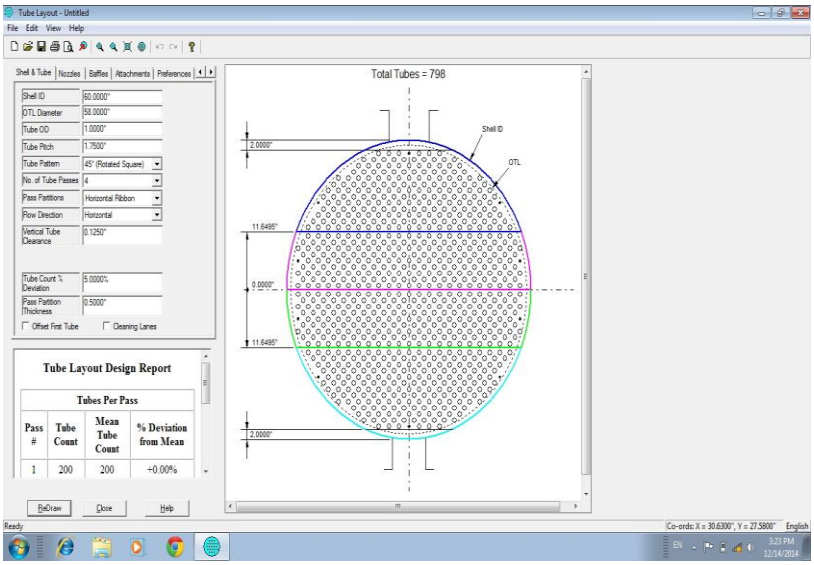
0730 – 0930	***Fractionator Columns*** *Fractionator Types: Simple * Complex Columns ● Design Methods – Process/Hardware ● Process Design Procedure/Examples: Simple Column-Stabilizer; Complex Column-Crude Column*
0930 – 0945	*Break*
0945 – 1045	***Fractionator Columns (cont'd)*** *Internals: Trays, Packing/Grids, 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

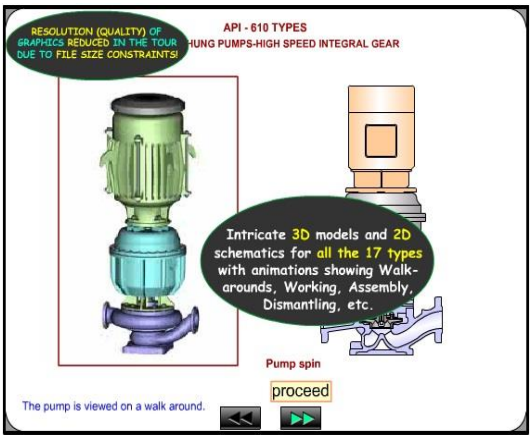
0730 – 0930	***Mechanical & Safety Aspects*** *Codes, Standards and Specifications ● Materials of Construction – Overview ● Safety in Design – Equipment Spacing*
0930 – 0945	*Break*
0945 – 1045	***Cost Estimating*** *Cost Estimating Methods ● Estimate Types and Accuracy ● Equipment Installation Factors ● 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)

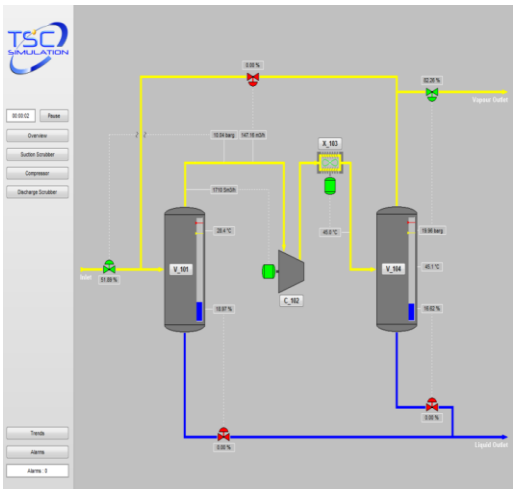
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Heat Exchanger Tube Layout", "Centrifugal Pumps and Troubleshooting Guide 3.0", "SIM 3300 Centrifugal Compressor", "CBT on Compressors", "Valve Sizing Simulator", "Valve Simulator 3.0", "Valvestar 7.2 Simulator", "PRV²SIZE Simulator" and "ASPEN HYSYS" simulator.



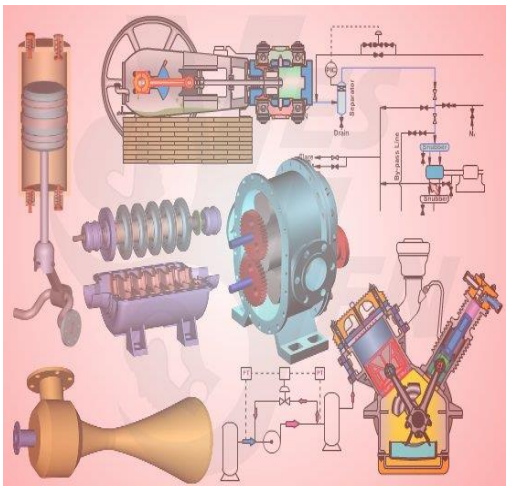
Heat Exchanger Tube Layout



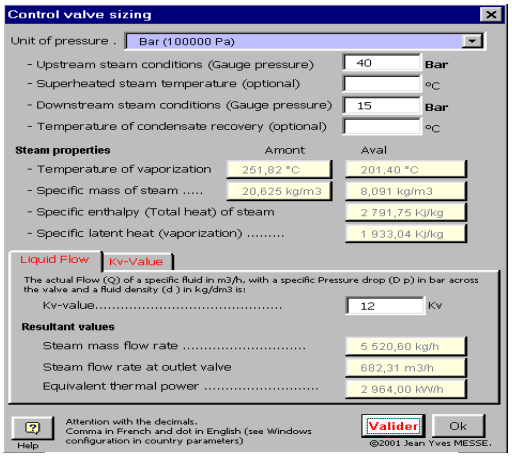
Centrifugal Pumps and Troubleshooting Guide 3.0



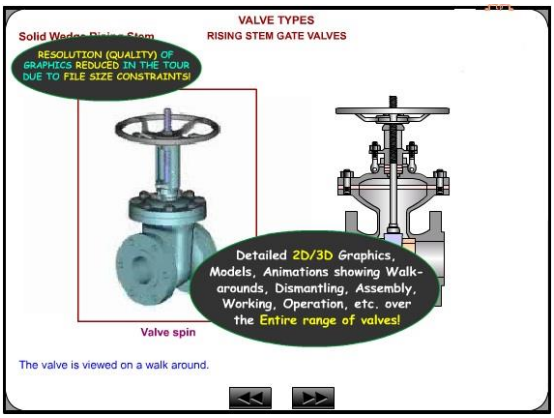
SIM 3300 Centrifugal Compressor Simulator



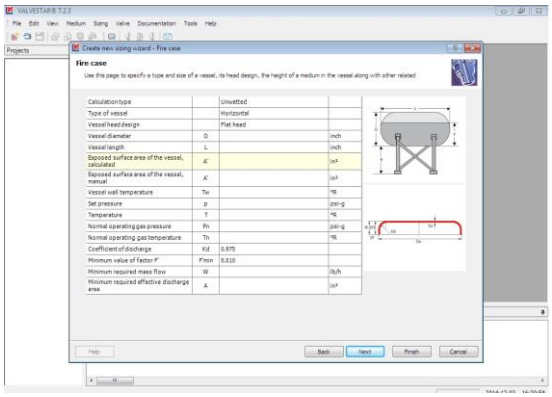
CBT on Compressors



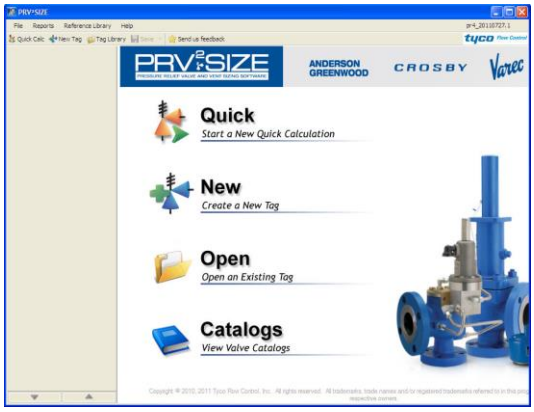
Valve Sizing Simulator



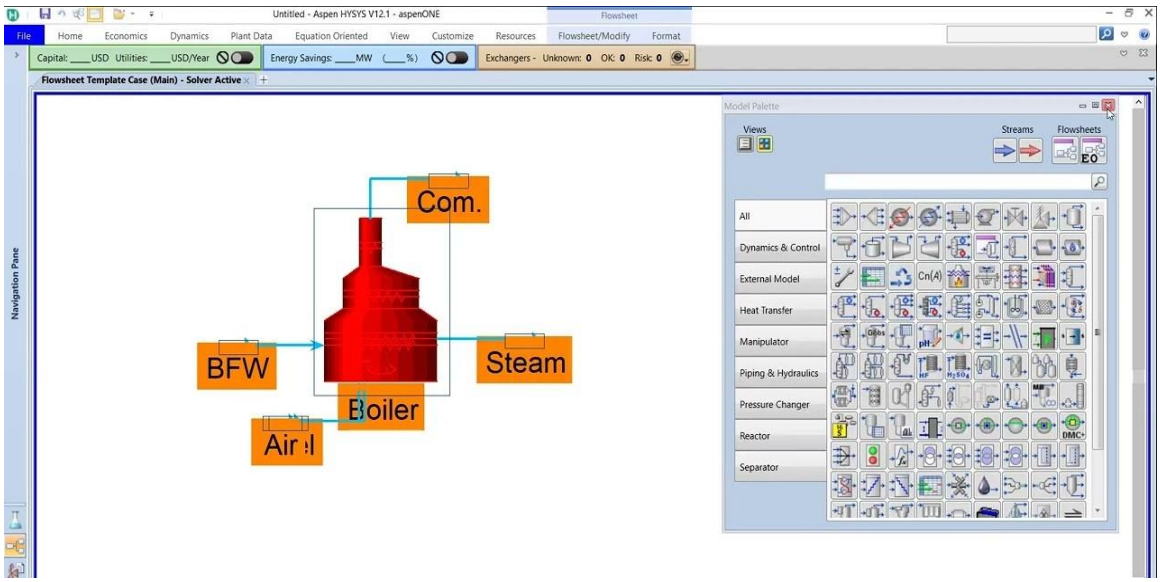
Valve Simulator 3.0



Valvestar 7.2 Simulator



PRV²SIZE Simulator



ASPEN HYSYS V12.1 Simulator

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