

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

Course Title

Process Equipment Design, Sizing,
 Selection, Applications & Troubleshooting

Course Date/Venue

Session 1: May 10-14, 2026/Crowne Meeting
 Room, Crowne Plaza Al Khobar, an
 IHG Hotel, Al Khobar, KSA
 Session 2: October 04-08, 2026/Tamra Meeting
 Room, Al Bandar Rotana Creek, Dubai,
 UAE



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 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. Mike Poulos 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 **Root Cause Analysis (RCA)**, **Root Cause Failure Analysis (RCFA)**, **Root Cause Analysis Study**, **Root Cause Analysis Techniques & Methodologies**, **Process Troubleshooting**, **Process Equipment Design & Operation**, **Process Design Specifications**, **Process Calculation Methods**, **Process Engineering Standards**, **Standard Process Design**, **Engineering Specifications**, **Operational Upsets**, **Root Cause Analysis (RCA)**, **Surge Pressure Scenarios Identification**, **Surge Analysis**, **RCA & Surge Analysis Software**, **Petroleum Processing**, **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**, **VCM**, **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 (QRA)**, **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 was the **President** of the **Thessaloniki HELPE Industrial Complex HSE Committee** wherein he was responsible for proposing, monitoring and reviewing all HSE projects in the plants. Further, he held significant positions as the **Chemical Plants Technology Engineer**, **PVC Plant Production Engineer**, **Operating Manuals Issuer**, **Engineer**, **PVC Plant Shutdown Coordinator**, **Instructor/Trainer**, **PVC Plant/CC Solvents Plants Acting Section Head** and **Chemicals Distribution Section Head** from Hellenic Petroleum.

Mr. Poulos has a **Bachelor degree** in **Chemical Engineering** from the **Thessaloniki Polytechnic**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and an **author** of the **Operating Manuals of the New Engineers & Plant Personnel for the New Equipment (Reactor Dumping, Steam Stripping Facilities, VCM Recovery Facilities)**. Moreover, he has further delivered numerous trainings, courses, workshops, seminars 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 – 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

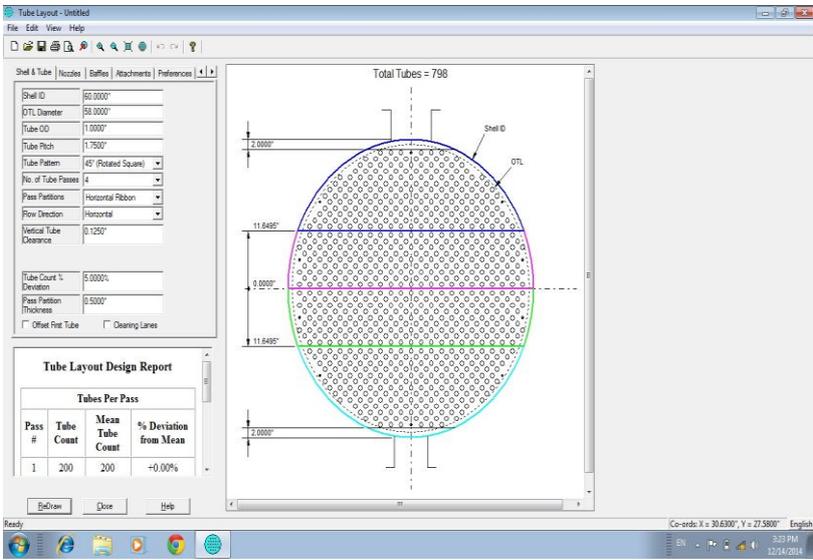
0730 – 0930	Fractionator Columns Fractionator Types: Simple * Complex Columns • Design Methods – Process/Hardware • Process Design Procedure/Examples: Simple Column-Stabilizer; Complex Column-Crude Column
0930 – 0945	Break
0945 – 1045	Fractionator Columns (cont'd) Internals: Trays, Packing/Grids, etc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

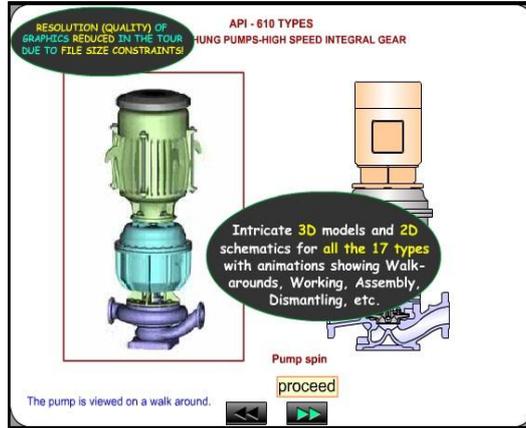


The screenshot shows the 'Tube Layout -Untitled' software interface. On the left, there is a 'Shell & Tube' configuration panel with fields for Shell ID, OTL Diameter, Tube OD, Tube Pitch, Tube Pattern (45° Rotated Squares), No. of Tube Passes (4), Pass Partitions (Horizontal Ribbon), Flow Direction (Horizontal), Vertical Tube Clearance (0.1250"), Tube Count % Deviation (5.0000%), Pass Partition Thickness (0.5000"), and checkboxes for 'Offset First Tube' and 'Cleaning Lanes'. Below this is a 'Tube Layout Design Report' table:

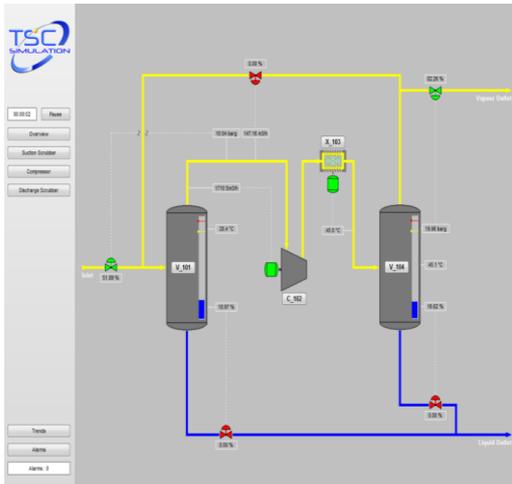
Tubes Per Pass			
Pass #	Tube Count	Mean Tube Count	% Deviation from Mean
1	200	200	+0.000%

The main window displays a circular tube layout with dimensions: Total Tubes = 798, Shell ID, OTL, and various diameters and pitches. The status bar at the bottom shows 'Co-ords: X = 30.6300", Y = 27.5800" English' and the date '12/14/2014'.

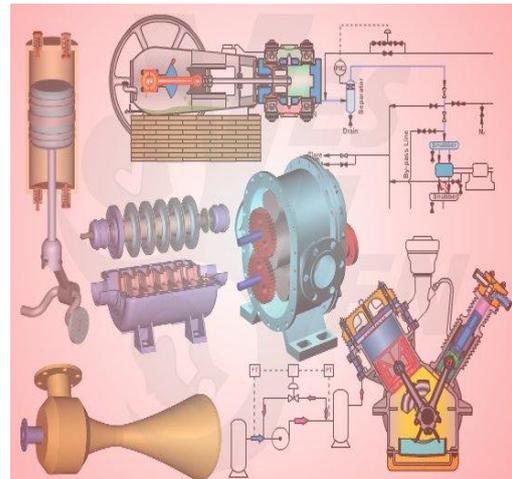
Heat Exchanger Tube Layout



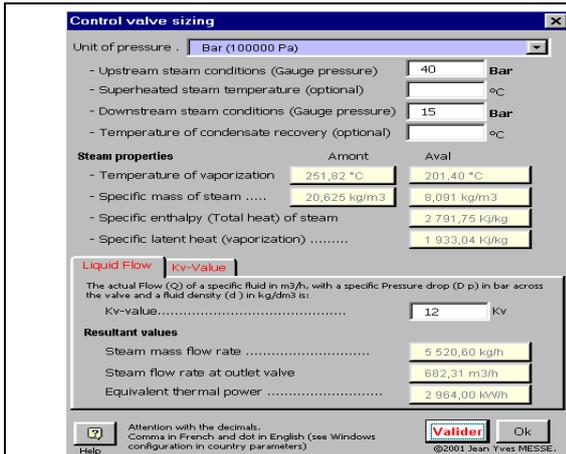
Centrifugal Pumps and Troubleshooting Guide 3.0



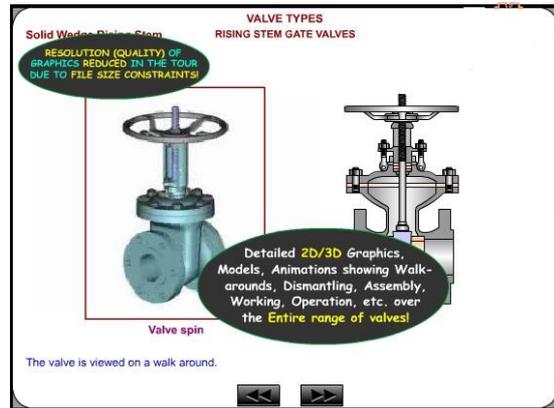
SIM 3300 Centrifugal Compressor Simulator



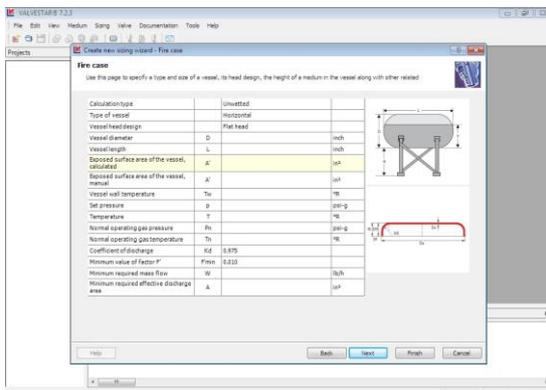
CBT on Compressors



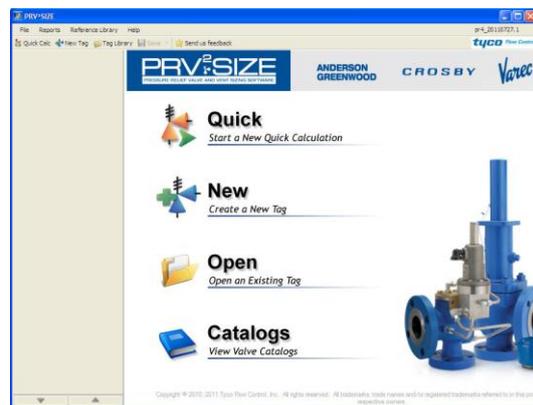
Valve Sizing Simulator



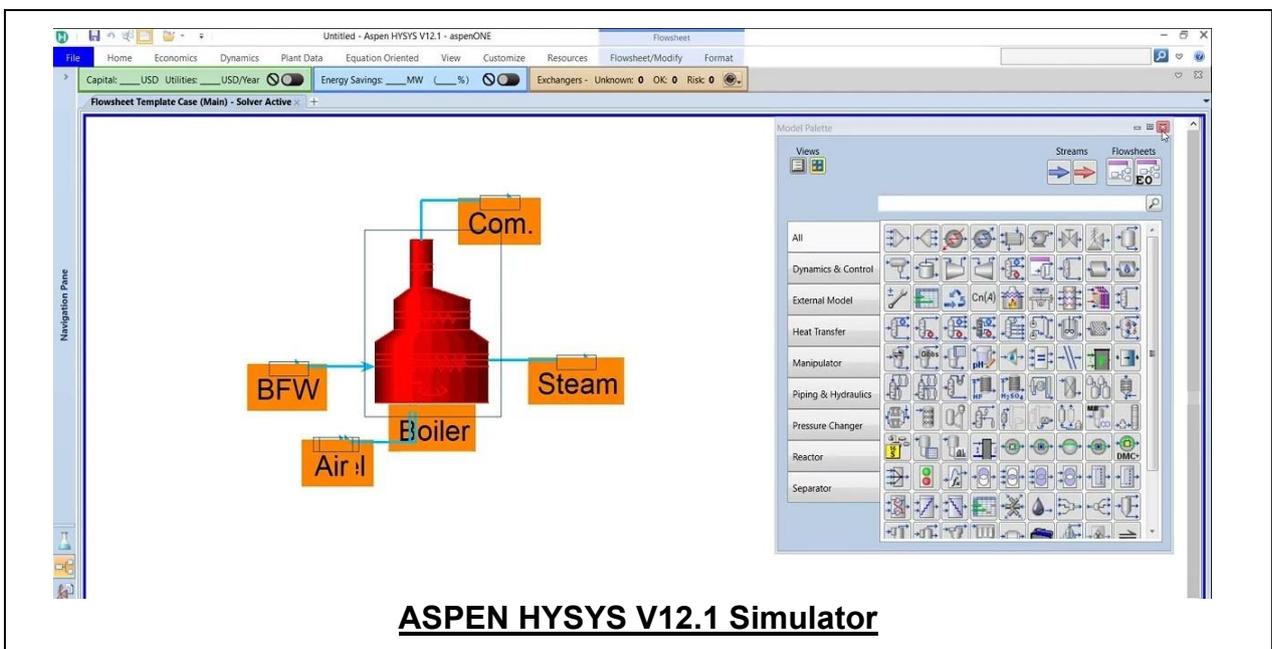
Valve Simulator 3.0



Valvestar 7.2 Simulator



PRV²SIZE Simulator



ASPEN HYSYS V12.1 Simulator

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org