

## COURSE OVERVIEW PE0052

### Chemical Engineering for Non-Chemical Engineers

#### Course Title

Chemical Engineering for Non-Chemical Engineers

#### Course Reference

PE0052

#### Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

#### Course Date/Venue

Session(s)	Date	Venue
1	January 05-09, 2025	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
2	April 28-May 02, 2025	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	July 06-10, 2025	Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA
4	October 12-16, 2025	TBA Meeting Room, Taksim Square Hotel, Istanbul, Turkey

#### 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 fundamental concepts of chemical engineering and provide you with a solid working knowledge associated with it. If you are a non-chemical engineer, this course will enable you to confidently talk to and work effectively with chemical engineers and process equipment. Many technical professionals today find themselves working with large-scale chemical processes even-though they do not have formal training in Chemical Engineering.

The course intends to fill this gap and provide you with this knowledge in the chemical engineering fundamentals and the ability to apply this knowledge to specify, design, operate, maintain and trouble-shoot chemical processes.

The course also discusses the specifications of pumps and heat exchangers; the mass transfer phenomena; the simple process calculations; troubleshooting process equipment and providing fixes; the process design activities; the process drawings; the safety guidelines to a process or chemical plant; and the basic chemical engineering jargon and terminology.



### Course Objectives

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

- Apply and gain a good working knowledge on the fundamentals of chemical engineering
- Prepare specifications of pumps and heat exchangers
- Apply mass transfer phenomena including agitation scale-up
- Perform simple process calculations
- Troubleshoot process equipment and provide fixes
- Contribute to process design activities
- Determine process drawings and link them to plant operation
- Apply safety guidelines to a process or chemical plant
- Carryout water treatment covering ion-exchange, treatment for inhabitation of microbiological growth in circulating water and closed loop water treatment-corrosion prevention
- Determine oxygen scavenging (hydrazine treatment), coordinated phosphate treatment in boiler and condensate water polishing
- Identify basic chemical engineering jargon and terminology

### 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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

### Who Should Attend

The course provides an overview of all significant aspects and considerations of chemical engineering for non-chemical engineers such as industrial engineers, electrical engineers, mechanical engineers, civil engineers, control & instrumentation engineers, plastics and material engineers, maintenance engineers, food scientists, environmental engineers, chemists, maintenance supervisor, shift trades people and other environmental, chemical, laboratory, operations, process and production technical staff.

### 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 the course.

### 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. Mervyn Frampton** is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Oil & Gas, Refinery, Petrochemical** and **Utilities** industries. His expertise lies extensively in the areas of **Catalyst Technology, Refinery & Process Industry, Chemical Analysis, Process Plant, Commissioning & Start-Up, Alkylation, Hydrogenation, Dehydrogenation, Isomerization, Hydrocracking & De-Alkylation, Fluidized Catalytic Cracking, Catalytic Hydrodesulphuriser, Kerosene Hydrotreater, Thermal Cracker, Catalytic Reforming, Polymerization, Polyethylene, Polypropylene, Pilot Water Treatment Plant, Gas Cooling, Cooling Water Systems, Effluent Systems, Material Handling Systems, Gasifier, Gasification, Coal Feeder System, Sulphur Extraction Plant, Crude Distillation Unit, Acid Plant Revamp and Crude Pumping.** Further, he is also well-versed in HSE Leadership, Project and Programme Management, Project Coordination, Project Cost & Schedule Monitoring, Control & Analysis, Team Building, Relationship Management, Quality Management, Performance Reporting, Project Change Control, Commercial Awareness and Risk Management.

During his career life, Mr. Frampton held significant positions as the **Site Engineering Manager, Senior Project Manager, Project Engineering Manager, Construction Manager, Site Manager, Area Manager, Procurement Manager, Factory Manager, Technical Services Manager, Senior Project Engineer, Project Engineer, Assistant Project Manager, Handover Coordinator** and **Engineering Coordinator** from various international companies such as the **Fluor Daniel, KBR South Africa, ESKOM, MEGAWATT PARK, CHEMEPIC, PDPS, CAKASA, Worley Parsons, Lurgi South Africa, Sasol, Foster Wheeler, Bosch & Associates, BCG Engineering Contractors, Fina Refinery, Sapref Refinery, Secunda Engine Refinery** just to name a few.

Mr. Frampton has a **Bachelor degree** in **Industrial Chemistry** from **The City University** in **London**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

**Course Fee**

Dubai	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Abu Dhabi	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Al Khobar	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	<b>US\$ 6,000</b> per Delegate + <b>VAT</b> . 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	<b>PRE-TEST</b>
0830 - 0930	<b>Process Flow Sheet</b> Process Flow Diagrams (PFD's) • Piping and Instrumentation Diagrams (P&ID's) • Process Legends Used in Flow Sheets
0930 - 0945	Break
0945 - 1230	<b>Stoichiometry</b> Dimensions and Units • Processes and Process Variable • Process Data Representation and Analysis • Basic Chemical Calculations
1230 - 1245	Break
1245 - 1330	<b>Stoichiometry (cont'd)</b> Material Balance without Chemical Reactions • Material Balance with Chemical Reactions • Energy Balance • Combustion
1330 - 1420	<b>Fluid Mechanics</b> Fluid Statics and its Applications • Fluid-Flow Phenomena • Basic Equations and Fluid Flow • Flow of Incompressible Fluids in Conduits and Thin Layers • Flow of Compressible Fluids • Flow Past Immersed Bodies • Transportation & Metering of Fluids • Agitation & Mixing
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day One

#### Day 2

0730 - 0930	<b>Heat Transfer and Its Applications</b> Heat Transfer By Conduction in Solids • Principles of Heat Flow in Fluids • Heat Transfer to Fluids Without Phase Change
0930 - 0945	Break
0945 - 1030	<b>Heat Transfer and Its Applications (cont'd)</b> Heat Transfer to Fluids with Phase Change • Radiation Heat Transfer • Heat-Exchange Applications • Evaporation
1030 - 1230	<b>Mass Transfer and Its Applications</b> Equilibrium-Stage Operation • Distillation • Leaching & Extraction • Introduction to Multi Component Distillation
1230 - 1245	Break
1245 - 1420	<b>Mass Transfer and Its Applications (cont'd)</b> Principles of Diffusion and Mass Transfer Between Phases • Gas Absorption • Humidification Operations • Adsorption • Drying of Solids
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day Two

#### Day 3

0730 - 0930	<b>Chemical Engineering Thermodynamics</b> Fundamental Quantities • First Law of Thermodynamics • Volumetric Properties of Pure Fluids • Heat Effects • Second Law of Thermodynamics • Thermodynamic Properties of Fluids
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0930 – 0945	Break
0945 – 1030	<b>Chemical Engineering Thermodynamics (cont'd)</b> Thermodynamic Properties of Homogenous Mixtures • Phase Equilibria • Chemical Reaction Equilibrium • Thermodynamics of Flow Processes • Conversion of Heat into Work by Power Cycles • Refrigeration & Liquification • Thermodynamic Analysis of Processes
1030 – 1230	<b>Water Treatment</b> Ion-Exchange • Treatment for Inhibition of Microbiological Growth in Circulating Water
1230 – 1245	Break
1245 – 1420	<b>Water Treatment (cont'd)</b> Closed Loop Water Treatment-Corrosion Prevention • Oxygen Scavenging (Hydrazine Treatment)
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4**

0730 – 0830	<b>Water Treatment (cont'd)</b> Coordinated Phosphate Treatment in Boiler • Condensate Water Polishing
0830 – 0930	<b>Chemical Kinetics</b> Basic Definitions • Kinetics of Homogenous Reactions • Interpretation of Batch Reactor Data • Introduction to Reactor Design • Single Ideal Reactors • Design for Single Reactions • Design for Multiple Reactions • Temperature and Pressure Effects
0930 – 0945	Break
0945 – 1030	<b>Chemical Kinetics (cont'd)</b> Non Ideal Flow • Mixing of Fluids • Introduction to Design for Heterogeneous Reacting Systems • Fluid -Particle Reactions • Fluid -Fluid Reactions • Solid-Catalyst Reactions • Reactivating Catalysts
1030 – 1230	<b>Process Equipment Design</b> Design Considerations • Storage Vessels • Pressure Vessels
1230 – 1245	Break
1245 – 1420	<b>Process Equipment Design (cont'd)</b> Reactors • Heat Exchangers • Evaporators and Crystallizers
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Four

**Day 5**

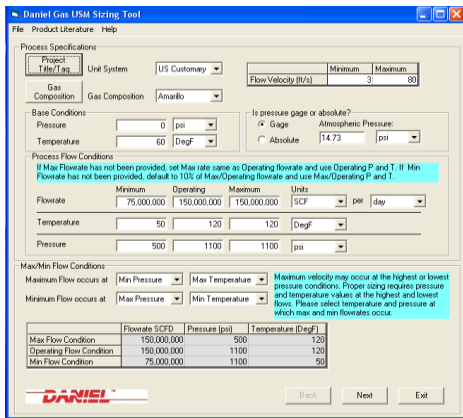
0730 – 0830	<b>Process Equipment Design (cont'd)</b> Distillation and Fractionation Equipments • Agitators • Filters • Dryers • Process Hazards and Safety Measures • Fundamentals of Computer Aided Design
0830 – 0930	<b>Process Control and Instrumentation</b> Quantities of Measurement • Process Instrumentation • Temperature
0930 – 0945	Break
0945 – 1230	<b>Process Control and Instrumentation (cont'd)</b> Pressure • Level • Flow
1230 – 1245	Break
1245 - 1345	<b>Process Economics</b> Investment & Profitability • Accounting & Cost Control • Manufacturing - Cost Estimation • Fixed & Capital Cost Estimation



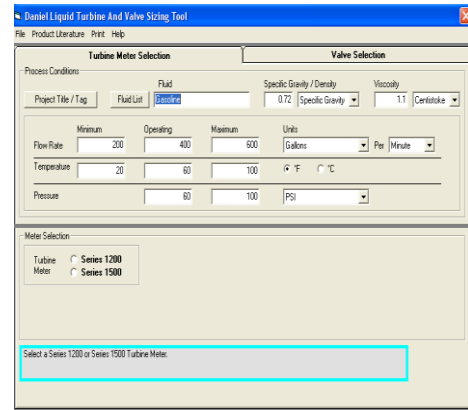
1345 – 1400	<b>Course Conclusion</b>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch &amp; End of Course</i>

**Simulator (Hands-on Practical Sessions)**

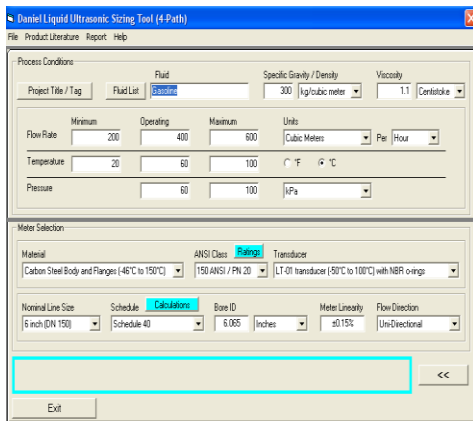
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using “Gas Ultrasonic Meter (USM) Sizing Tool Software”, “Liquid Turbine Meter and Control Valve Sizing Tool Software”, “Liquid Ultrasonic Meter Sizing Tool Software”, “Orifice Flow Calculator Software”, “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor Simulator”, “CBT on Compressors”, “Steam Turbines & Governing System CBT”, “Single Shaft Gas Turbine Simulator”, “Two Shaft Gas Turbine Simulator”, “Valve Sizing Software”, “Valve Software 3.0”, “Valvestar 7.2 Software”, “PRV<sup>2</sup>SIZE Software” and “ASPEN HYSYS” simulator.



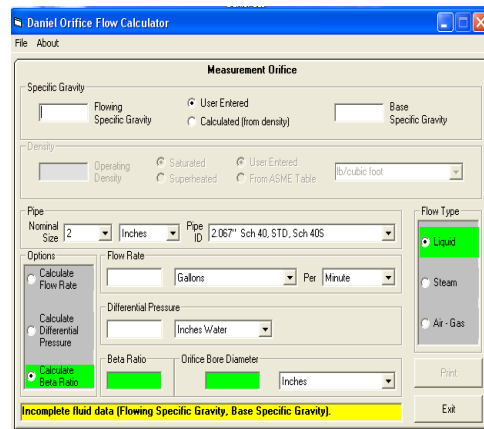
**Gas Ultrasonic Meter (USM) Sizing Tool Software**



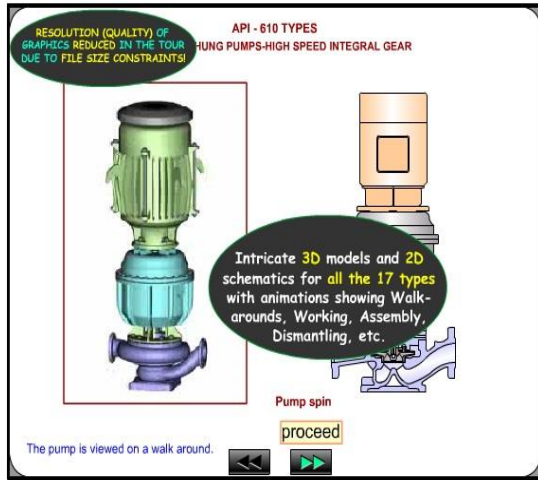
**Liquid Turbine Meter and Control Valve Sizing Tool**



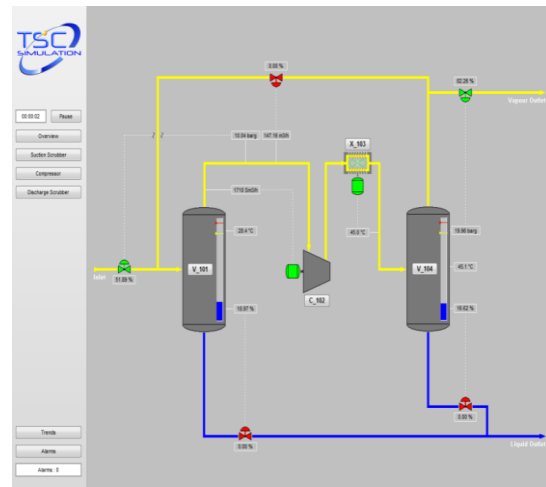
**Liquid Ultrasonic Meter Sizing Tool Software**



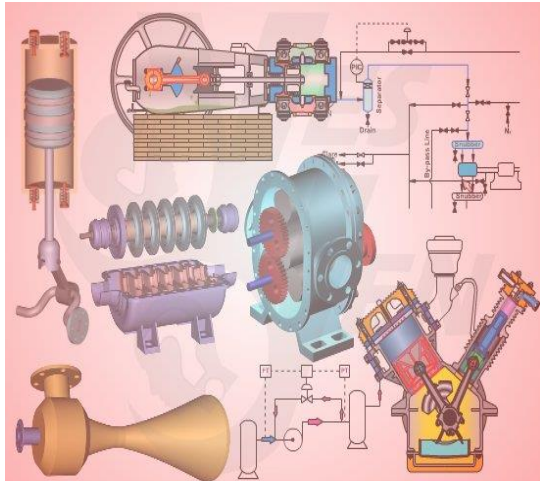
**Orifice Flow Calculator Software**



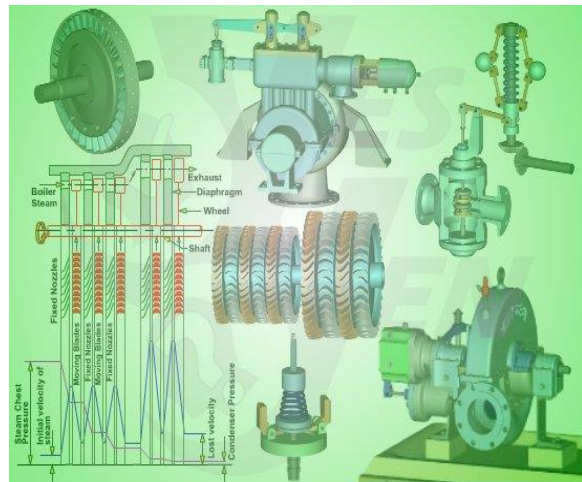
**Centrifugal Pumps and Troubleshooting Guide 3.0**



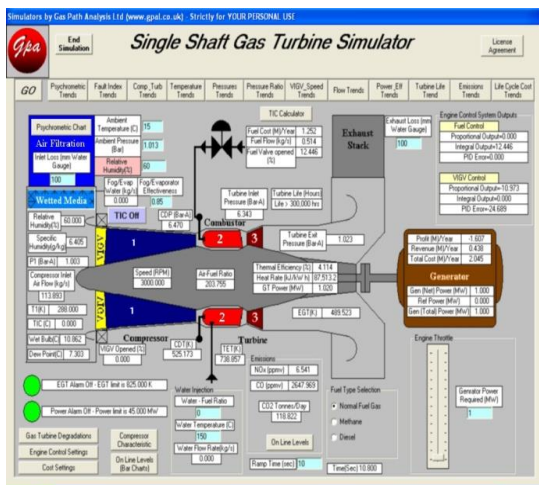
**SIM 3300 Centrifugal Compressor Simulator**



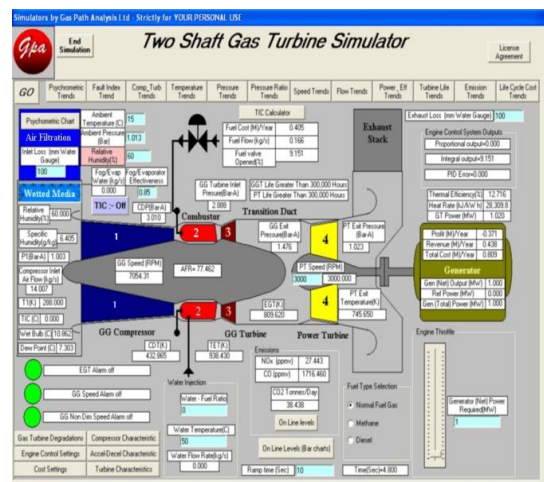
**CBT on Compressors**



**Steam Turbines & Governing System CBT**

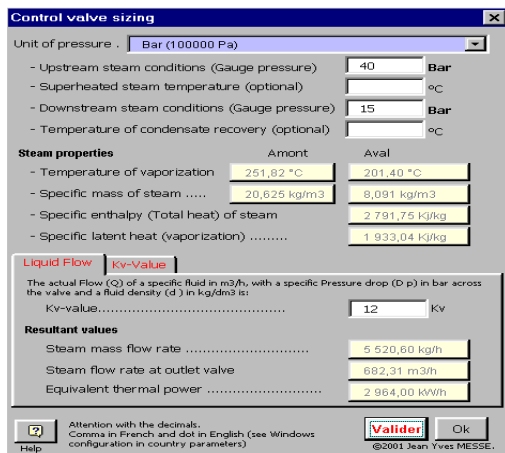


**Single Shaft Gas Turbine Simulator**

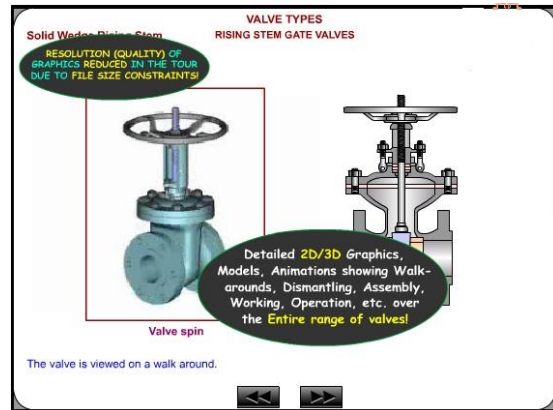


**Two Shaft Gas Turbine Simulator**

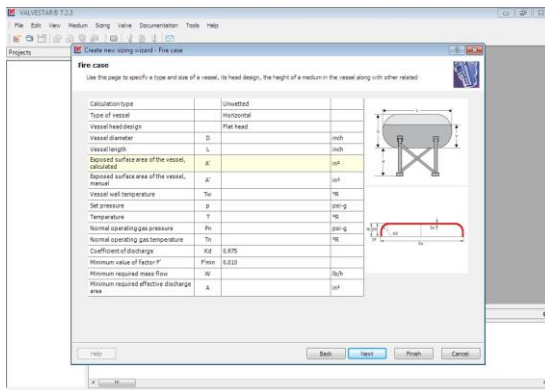




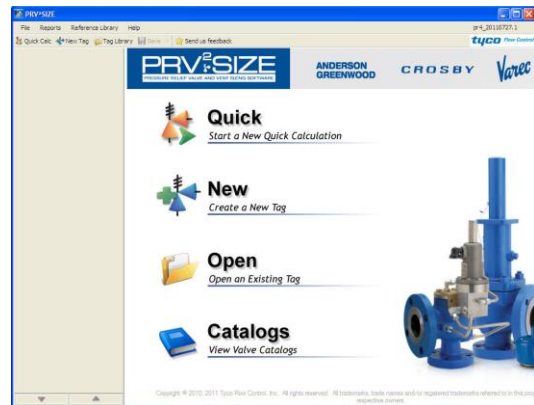
Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV2SIZE Software

Case: Material Stream	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1 Name	Inlet Gas - TEG Feed	Water to Sulf Gas + H2O	Gas to Contactor	Water Out	Dry Gas	Rich TEG	LP TEG	Regen Blms	Lean from L/R Regen Feed	Sour Gas	MakeUp TEG - L to P				
2 Pressure [psia]	500	900.000003	900.000003	900.000003	900.000003	25.9999995	14.9999995	14.9999995	14.9999995	14.7000006	14.9999995	14.8999995	14.8999995	14.8999995	14.8999995
3 Temperature [F]	85	120	530.7966455	84.99999992	84.99999992	88.06347147	86.303068	55.52179436	395.9997533	293.1300076	213.9999992	215.0294178	60.00000003	293.103	293.103
4 Mass Flow [lb/hr]	20245.09	1128.655036	29.81661056	20264.90543	2.64985089	20232.15092	1158.763688	1158.763688	1128.505832	1128.505832	30.25785545	0.449067849	1128.65	1128.65	1128.65
5 Std Ideal Liq Vol Flow [USGPM]	121.4389	1.99999998	0.03965099	121.4735526	0.00528069	121.391831	2.081423034	2.081423034	1.99978142	1.99978142	0.08168692	0.00026536	2.00000	2.00000	2.00000
6 Vapor Phase Friction	1	0	0.54564212	0.999986593	1	0	0	0.03618442	0	0	0	0.033093166	1	1	1
7 Molar Enthalpy [lbu/lbmole]	-36778.2	-32352.6255	-20799.3134	-3668.54492	-36837.0705	-112788.6653	-36742.92402	-292762.5031	-292762.5031	-299364.866	-309800.1105	-283847.528	-83043.3196	-342637.6707	-309804
8 Utility Type															
9 Stream Price Factor															
10 Stream Price Basis	Molar Mol Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow	Molar Flow
11 Cost Flow [Cost/hr]															

ASPEN HYSYS Simulator

Course Coordinator

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