



COURSE OVERVIEW PE0263 **Operation of Process Equipment**

Fired Heaters, Air Coolers, Heat Exchangers, Pumps, Compressors,
Pressure Vessels & Valves

Course Title

Operation of Process Equipment: *Fired Heaters, Air Coolers, Heat Exchangers, Pumps, Compressors, Pressure Vessels & Valves*

Course Date/Venue

Please see page 3

Course Reference

PE0263

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 course is designed to provide delegates with a detailed and up-to-date overview of fired heaters, air coolers, heat exchangers, pumps, compressors, crude desalter, pressure vessels & valves operations. It covers the objective and equipment layout of process equipment; developing of static and dynamic head in the operating volume of pumps for efficiency and control operation; the affinity laws as tools for efficient operation, pump auxiliaries, wear components, canned motor and magnetic drive pumps, flow pumps, servicing and condition monitoring; the main features of various types of compressors; the compressors classification based on design and application; the types, styles and configurations of centrifugal and axial compressors; and the main elements of centrifugal compressor construction and efficiency.



During this interactive course, participants will learn the compressor operation; the fin fan cooler including its types, operational efficiency and capacity control; the operation and troubleshooting of cooler; the heaters and their types, construction and operating parameters and inspection/testing requirements; the types and basic parts of furnaces; the fuel gas system of burners, gas burners, oil burners, flame impingement, draft and observations during normal operation; the heat exchangers, process vessels and valves; and the troubleshooting of different equipment and processes.



Course Objectives

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

- Apply and gain an in-depth knowledge on fired heaters, air coolers, heat exchangers, pumps, compressors, crude desalter, pressure vessels & valves operations
- Discuss process equipment including its objective and equipment layout
- Develop static and dynamic head in the operating volume of pumps for efficiency and control operation
- Discuss the affinity laws as tools for efficient operation, pump auxiliaries, wear components, canned motor and magnetic drive pumps, flow pumps, servicing and condition monitoring
- Explain the main features of various types of compressors, classify compressors based on design and application including world standards and codes related to compressor
- Identify the types, styles and configurations of centrifugal compressors and axial compressors
- Explain the main elements of centrifugal compressor construction and analyze centrifugal compressor efficiency
- Employ guidelines for trouble-free centrifugal compressor operation including troubleshooting, inspection and maintenance
- Operate compressor by analysing curves for surge, stall and choke as well as define appropriate equipment for safe operation
- Recognize fin fan cooler including its types, operational efficiency and capacity control
- Operate and troubleshoot cooler through key operational considerations and proper troubleshooting
- Discuss heaters and their types, construction and operating parameters, inspection/testing requirements
- Identify the types and basic parts of furnaces including their efficient operation and air control
- Analyze the fuel gas system of burners, gas burners, oil burners, flame impingement, draft and observations during normal operation
- Differentiate heat exchangers, process vessels and valves
- Troubleshoot different equipment and processes in a professional manner

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 an overview of all significant aspects and considerations of operation of process equipment for engineers, design engineers, maintenance staff and other 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 Date/Venue

Session(s)	Date	Venue
1	January 25-29, 2026	Safir Meeting Room, Divan Istanbul, Turkey
2	May 10-14, 2026	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
3	October 25-29, 2026	Crowne Meeting Room, Crowne Plaza Al Khobar, Al Khobar, KSA

Course Fee

Istanbul	US\$ 6,000 per Delegate + VAT . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	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.
Al Khobar	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.
In addition to the Course Manual, participants will receive an e-book “ <i>Operator’s Guide to Rotating Equipment: An Introduction to Rotating Equipment Construction, Operating Principles, Troubleshooting and Best Practices</i> ”, published by AuthorHouse.	

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

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.

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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.

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 **Process Troubleshooting, Distillation Towers, Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Distillation Column** Operation & Control, **Oil Movement** Storage &

Troubleshooting, **Process Equipment** Design, Applied **Process Engineering** Elements, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Monitoring, **Catalyst** Selection & Production Optimization, Operations Abnormalities & Plant Upset, **Process Plant** Start-up & Commissioning, **Clean Fuel** Technology & Standards, Flare, Blowdown & Pressure Relief Systems, **Oil & Gas Field Commissioning** Techniques, **Pressure Vessel** Operation, **Gas Processing**, **Chemical Engineering**, **Process Reactors** Start-Up & Shutdown, **Gasoline Blending** for Refineries, **Urea Manufacturing** Process Technology, Continuous Catalytic Reformer (**CCR**), **De-Sulfurization** Technology, Advanced Operational & Troubleshooting Skills, Principles of Operations Planning, **Rotating Equipment** Maintenance & Troubleshooting, **Hazardous Waste Management & Pollution Prevention**, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Energy Conservation** Skills, **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**, **Process Engineering Manager**, **Project Engineering Manager**, **Construction Manager**, **Site Manager**, **Area Manager**, **Procurement Manager**, **Factory Manager**, **Technical Services Manager**, **Senior Project Engineer**, **Process 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's degree** in **Industrial Chemistry** from **The City University** in **London**. Further, he is a **Certified Instructor/Trainer**, a **Approved Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and has 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	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Process Equipment <i>Process Equipment Objective • Types of Process Plants • Process Equipment Layout • Rotating Equipment • Stationery Equipment</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Pumps <i>Development of Static and Dynamic Head in the Operating Volume of Pumps for Efficiency and Control Operation • The Affinity Laws as Tools for Efficient Operation • Pump Auxiliaries</i>
1100 – 1230	Pumps (cont'd) <i>Wear Components • Canned Motor and Magnetic Drive Pumps • High Speed/Low Flow Pumps • Servicing and Condition Monitoring</i>
1230 – 1245	<i>Break</i>
1245 – 1420	Compressor Overview <i>Overview of the Main Features of Various Types of Compressors • Classification of Compressors Based on Design and Application • World Standards and Codes Related to Compressor Design</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>

Day 2

0730 – 0930	Types of Compressors <i>Types, Styles and Configurations of Centrifugal and Axial Compressors • Construction Features • Mode of Operation • Compressor Auxiliaries and Support Systems</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Centrifugal Compressor <i>Main Elements of Centrifugal Compressor Construction • Analysis of Centrifugal Compressor Efficiency • Guidelines for Trouble-free Centrifugal Compressor Operation</i>
1100 – 1230	Centrifugal Compressor (cont'd) <i>Troubleshooting Inspection and Maintenance • Centrifugal Compressors Anti Surge System and Surge Protection • Case Studies About Centrifugal Compressors</i>
1230 – 1245	<i>Break</i>
1245 – 1420	Compressor Operation <i>Analyse Operating Curves for Surge, Stall and Choke • Define Appropriate Equipment for Safe Operation</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Two</i>

Day 3

0730 – 0930	Fin Fan Cooler <i>Types • Operational Efficiency • Capacity Control</i>
0930 – 0945	<i>Break</i>



0945 – 1100	Cooler Operating & Troubleshooting <i>Key Operational Considerations • Air vs Water Cooling • Troubleshooting</i>
1100 – 1230	Heater <i>Heaters and their Types • Construction & Operating Parameters • Inspection/Testing Requirements</i>
1230 – 1245	Break
1245 – 1420	Furnaces <i>Types of Furnaces • Furnace Basic Parts • Efficient Operation, Air Control etc</i>
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4

0730 – 0930	Fuel Gas System <i>Burners • Gas Burners • Oil Burners</i>
0930 – 0945	Break
0945 – 1100	Fuel Gas System (cont'd) <i>Flame Impingement • Draft • Observations During Normal Operation</i>
1100 – 1230	Heat Exchangers <i>Types • Shell-and-Tube</i>
1230 – 1245	Break
1245 – 1420	Heat Exchangers (cont'd) <i>Heat Transfer Relation</i>
1420 – 1430	Recap
1430	Lunch & End of Day Four

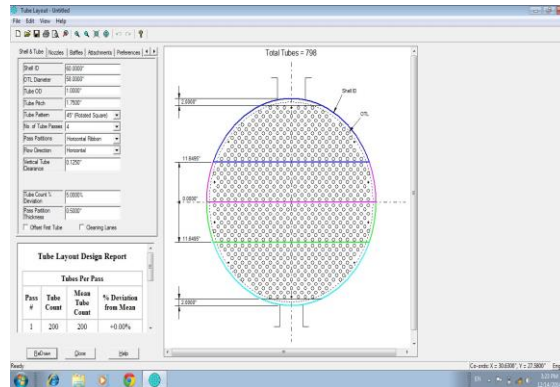
Day 5

0730 – 0930	Process Vessels <i>Types and Functions • Safety Aspects</i>
0930 – 0945	Break
0945 – 1215	Valves <i>Valve Theory • Valve Types • Applications</i>
1215 – 1230	Break
1230 – 1245	Valves (cont'd) <i>Function • Operation • Troubleshooting</i>
1245 – 1345	Troubleshooting of Different Equipment & Processes
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	Lunch & End of Course

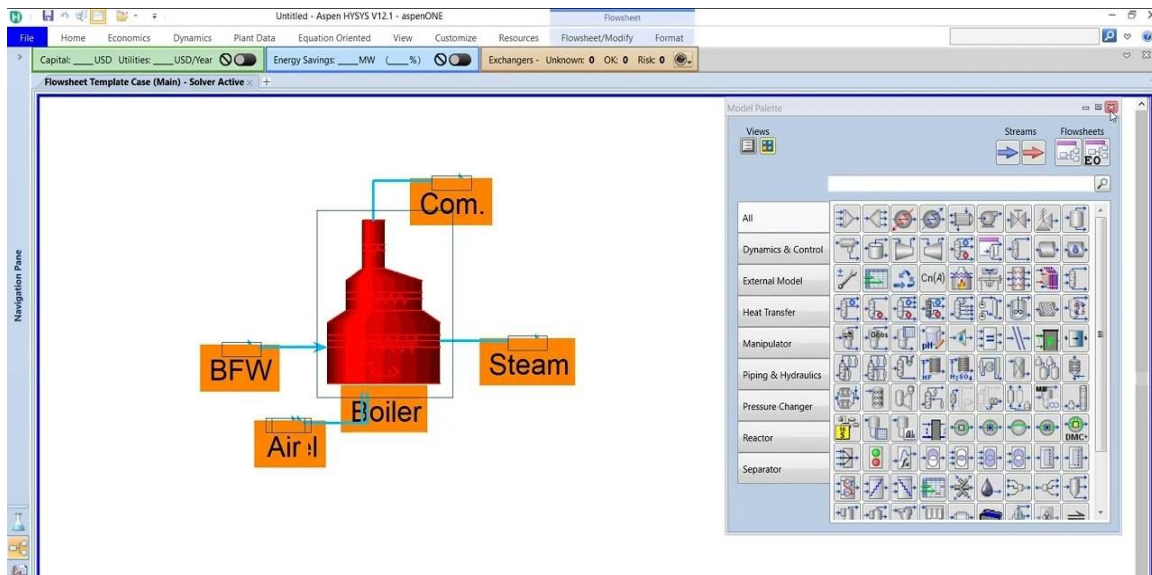


Simulator (Hands-on Practical Sessions)

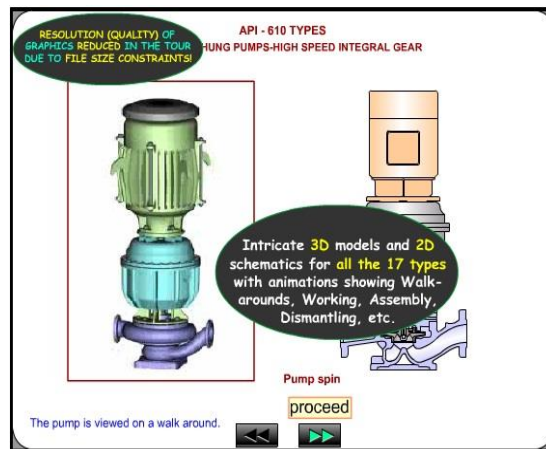
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators “Heat Exchanger Tube Layout”, “ASPEN HYSYS V12.1” simulator, “Centrifugal Pumps and Troubleshooting Guide 3.0”, “SIM 3300 Centrifugal Compressor”, “CBT on Compressors”, “Valve Sizing Simulator”, “Valve Simulator 3.0”, “Valvestar 7.2 Simulator”, “PRV²SIZE Simulator”, and.



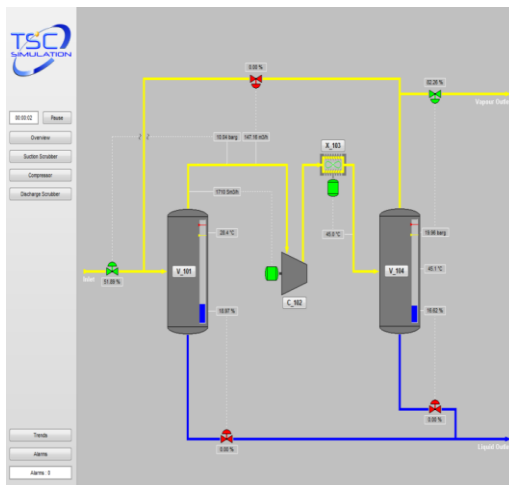
Heat Exchanger Tube Layout Simulator



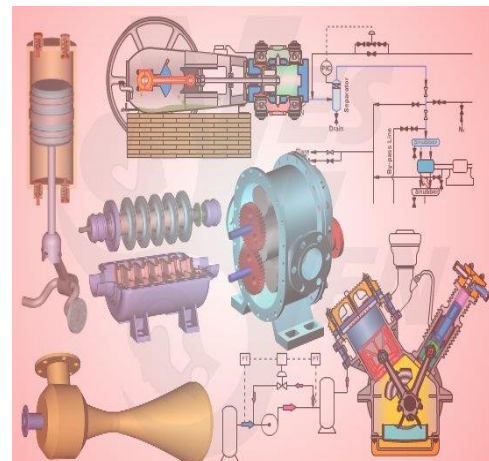
ASPEN HYSYS V12.1 Simulator



Centrifugal Pumps and Troubleshooting Guide



SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors

Control valve sizing

Unit of pressure : Bar (100000 Pa)

- Upstream steam conditions (Gauge pressure) 40 Bar

- Superheated steam temperature (optional) °C

- Downstream steam conditions (Gauge pressure) 15 Bar

- Temperature of condensate recovery (optional) °C

Steam properties

Amont Aval

- Temperature of vaporization 251,82 °C 201,40 °C

- Specific mass of steam 20,625 kg/m³ 8,091 kg/m³

- Specific enthalpy (Total heat) of steam 2 791,75 KJ/kg

- Specific latent heat (vaporization) 1 933,04 KJ/kg

Liquid Flow kv-Value

The actual Flow (Q) of a specific fluid in m³/h, with a specific Pressure drop (D p) in bar across the valve and a fluid density (d) in kg/dm³ is:

Kv-value..... 12 Kv

Resultant values

Steam mass flow rate 5 520,60 kg/h

Steam flow rate at outlet valve 882,31 m³/h

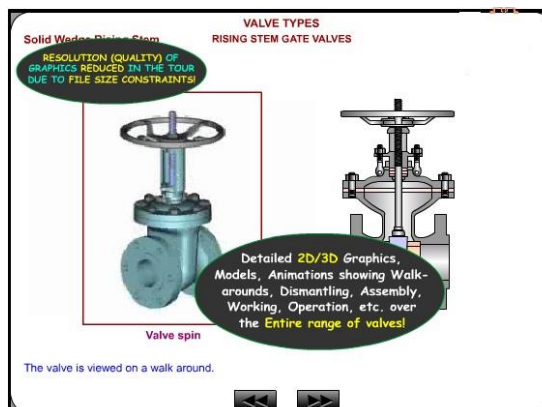
Equivalent thermal power 2 964,00 kWth

Attention with the decimals:
Comma in French and dot in English (see Windows configuration in country parameters)

Help Valider Ok

©2001 Jean Yves MESSE.

Valve Sizing Simulator



Valve Simulator 3.0

VALVESTAR 7.2.3

File Edit View Medium Sizing Valve Documentation Tools Help

Projects

Use the page to specify a type and size of a vessel, its head design, the height of a medium in the vessel along with other related

Fire case

Calculation type: Unsettled

Type of vessel: Horizontal

Vessel head design: Flat head

Vessel diameter: D m

Vessel length: L m

Exposed surface area of the vessel, liquid: A m²

Exposed surface area of the vessel, vapor: A m²

Vessel wall temperature: T_W °C

Set pressure: P MPa

Temperature: T °C

Normal operating gas pressure: P_g MPa

Normal operating gas temperature: T_g °C

Coefficient of discharge: K_d 0.875

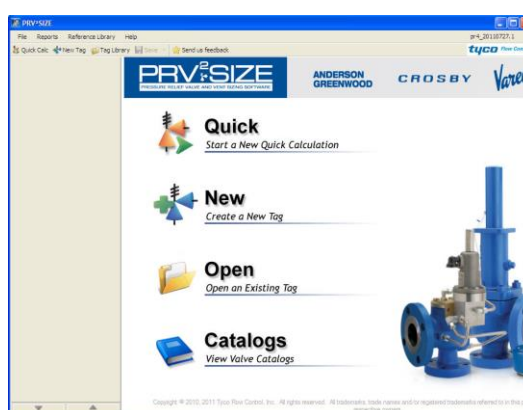
Minimum value of factor F: F_{min} 0.010

Minimum required mass flow: W kg/h

Minimum required effective discharge area: A m²

Back Next Finish Cancel

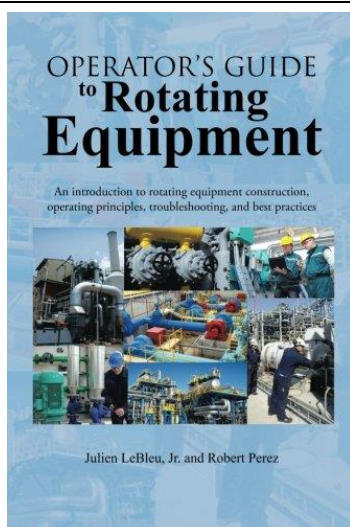
Valvestar 7.2 Simulator



PRV²SIZE Simulator

Book(s)

As part of the course kit, the following e-book will be given to all participants:



Title : Operator's Guide to Rotating Equipment: An Introduction to Rotating Equipment Construction, Operating Principles, Troubleshooting and Best Practices

ISBN : 978-1-49690-868-1

Authors : Julien LeBleu
Robert Perez

Publisher : AuthorHouse

Course Coordinator

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