

COURSE OVERVIEW ME0397

Practical Pump & Valve Technology

Selection, Operation, Control, Maintenance & Troubleshooting

Course Title

Practical Pump & Valve Technology: Selection, Operation, Control, Maintenance & Troubleshooting

Course Reference

ME0397

Course Duration/Credits

Five days/3.0 CEUs/3.0 PDHs



Course Date/Venue

Session(s)	Date	Venue
1	May 19-23, 2024	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey
2	September 22-26, 2024	The Kooh Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE
3	October 21-25, 2024	Hampstead Meeting Room, London Marriott Hotel Regents Park, London, United Kingdom
4	February 09-13, 2025	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar

Course Description



This practical highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The aim of this course is to provide delegates with a detailed and up-to-date overview of the operating performance of valves and pumps commonly employed in process plant and the manner in which they are chosen to provide the optimum configuration.



This course will concentrate on the fundamental aspects and operating principles and practice of pumps and control valves and will address the operating problems which are often experienced by plant personnel. This course will deliver this important engineering discipline whilst reducing to the absolute minimum the level of mathematics required.



On completion of this course, participants will be able to acquire the practical engineering knowledge to enable them not only to choose the correct device or combination of devices for a particular application but also to be in a position to resolve common operating problems associated with this topic. In addition, this course addresses the importance of safety in the selection and operation of these devices.

Course Objectives

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

- Select, operate, control, maintain and troubleshoot pumps and valves used in process industry
- Solve operating problems of pumps and valves which are often experienced by plant personnel
- Apply practical engineering knowledge that is essential not only to choose the correct device or combination of devices for a particular application but also to troubleshoot such devices correctly
- Recognize design issues and installation guidance for optimum performance of pumps and valves
- Employ proper techniques in operation and maintenance of pump and valves
- Implement proven control strategies for optimum pump and valve performance including analogue and digital controls signals

Who Should Attend

This course provides an overview of all significant aspects and considerations of pump and valve for project engineers, process engineers and plant engineers in the oil, chemical and other process industries, who require a wider and deeper appreciation of the operating characteristics and the procedure required for the selection of pumps and valves. No prior knowledge of the topic is required.

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


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.
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.
London	US\$ 8,800 per Delegate + VAT . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day
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.

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. Andrew Ladwig is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas, Refinery, Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting, Distillation Towers, Crude Oil Distillation, Fundamentals of Distillation for Engineers, Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Ammonia Storage & Loading Systems, Ammonia Plant Operation, Troubleshooting & Optimization, Ammonia Recovery, Ammonia Plant Safety, Hazard of Ammonia Handling, Storage & Shipping, Operational Excellence in Ammonia Plants, Fertilizer Storage Management (Ammonia & Urea), Fertilizer Manufacturing Process Technology, Sulphur Recovery, Phenol Recovery & Extraction, Wax Sweating & Blending, Petrochemical & Fertilizer Plants, Nitrogen Fertilizer Production, Petroleum Industry Process Engineering, Refining Process & Petroleum Products, Refinery Planning & Economics, Safe Refinery Operations, Hydrotreating & Hydro-processing, Separators in Oil & Gas Industry, Gas Testing & Energy Isolations, Gas Liquor Separation, Industrial Liquid Mixing, Wax Bleachers, Extractors, Fractionation, Operation & Control of Distillation, Process of Crude ATM & Vacuum Distillation Unit, Water Purification, Water Transport & Distribution, Steam & Electricity, Flame Arrestors, Coal Processing, Environmental Emission Control, R&D of Wax Blending, Wax Molding/Slabbing, Industrial Drying, Principles, Selection & Design, Certified Process Plant Operations, Control & Troubleshooting, Operator Responsibilities, Storage Tanks Operations & Measurements, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Performance, Efficiency & Optimization, Continuous Improvement & Benchmarking, Process Troubleshooting Techniques, Oil & Gas Operation/Introduction to Surface Facilities, Pressure Vessel Operation, Process Equipment Performance & Troubleshooting, Plant Startup & Shutdown, Startup & Shutdown the Plant While Handling Abnormal Conditions, Flare & Relief System, Process Gas Plant Start-up, Commissioning & Problem Solving, Process Liquid and Process Handling & Measuring Equipment. Further, he is also well-versed in **Compressors & Turbines** Operation, Maintenance & Troubleshooting, **Heat Exchanger** Overhaul & Testing Techniques, Balancing of **Rotating Machinery (BRM)**, **Pipe Stress** Analysis, **Valves & Actuators** Technology, Inspect & Maintain **Safeguarding Vent & Relief System**, Certified Inspectors for **Vehicle & Equipment**, Optimizing **Equipment Maintenance & Replacement** Decisions, Certified Maintenance Planner (**CMP**), Certified Planning and Scheduling Professional (**AACE-PSP**), **Tank Design**, Construction, Inspection & Maintenance, **Material Cataloguing**, Specifications, Handling & Storage, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control, Column, Pump & Exchangers**, Troubleshooting & Design, **Rotating Equipment** Operation & Troubleshooting, **Control & ESD** System, **Detailed Engineering Drawings**, Codes & Standards, **Budget** Preparation, Allocation & Cost Control, Root Cause Analysis (**RCA**), **Production Optimization**, Permit to Work (**PTW**), Project Engineering, **Data** Analysis, **Process Hazard** Analysis (**PHA**), **HAZOP** Study, Sampling & Analysis, **Training Analysis, Job Analysis** Techniques, Storage & Handling of **Toxic Chemicals & Hazardous Materials, Hazardous Material** Classification & Storage/Disposal, **Dangerous Goods**, Supply Chain, Purchasing, Procurement, **Logistics** Management & **Transport & Warehousing & Inventory, Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), Personal Protective Equipment (**PPE**), Fire & Gas, First Aid and Occupational Health & Safety.**

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer, Project Engineer, Reliability & Maintenance Engineer, Maintenance Support Engineer, Process Engineer, HSE Supervisor, Warehouse Manager, Quality Manager, Business Analyst, Senior Process Controller, Process Controller, Safety Officer, Mechanical Technician, Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma in Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and has delivered various trainings, workshops, seminars, courses 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	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Pumps and Valves <i>Highlighted Problem Areas</i>
0930 – 0945	<i>Break</i>
0945 – 1100	General Description of Centrifugal Pumps and Turbines
1100 – 1215	Centrifugal Pumps <i>Torque, Head and Flow Calculations</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Axial Flow Pumps <i>Torque and Power Calculations</i>
1330 – 1400	Video: Basic Pump Types and Technologies
1400 – 1420	Discussion
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>

Day 2

0730 – 0830	Pump Performance Curves <i>Centrifugal Multistage Pump • Mixed-Flow Machines • Effect of Impeller Speed and Diameter on Performance</i>
0830 – 0930	Pump Specific Speed and Specific Radius
0930 – 0945	<i>Break</i>
0945 – 1100	Centrifugal Pumps Basics <i>Types of Centrifugal Pumps • Self-Priming Pumps • Specific Speeds • Suction Specific Speed • Optimum Efficiency Point</i>
1100 – 1215	Centrifugal Pump Design Issues <i>Balancing Disc • Impeller NPSHR • Impeller Centre-Rib • Mechanical Seals • Velocity Head • Affinity Laws • Suction Lift • Re-Rate/Retrofit • Head-Rise • Radial/Horizontal Split Case</i>
1215 – 1230	<i>Break</i>
1230 – 1400	Centrifugal Pump Installation Guidance for Optimum Performance <i>Foundation Problems • Soft Foot • Suction Pipe • Suction Strainer</i>
1400 – 1420	Video: Fundamentals of Pump Performance
1420 – 1430	Recap <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch & End of Day Two</i>



Day 3

0730 – 0930	Optimum Centrifugal Pump Operation Start-up • Minimum Flow • Maximum Pump RPM • Motor Current/Specific Gravity • Entrained Gas • Operation at Shut Off • Temperature-Rise • Thermal Shock
0930 – 0945	Break
0945 – 1100	Centrifugal Pump Maintenance Case Gasket • Checking For Wear Clearance • Oil Change • Pump Storage • Bearing Failures • Bearing Housing Oil Leakage • Cavitation Noise and Damage • Pump Vibration • Cracked Volute Tongues
1100 – 1215	Centrifugal Pump Re-Rate/Retrofit Impeller Cut • NPSH • De-Staging • Electric Motor Sizing • Effect of Viscosity Changes on Optimum Performance
1215 – 1230	Break
1230 – 1300	Video: Pump Hydraulic Loads, Critical Speed and Torque
1300 – 1330	Video: Bearings, Seals and Couplings
1330 – 1420	Discussion Forum
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4

0730 – 0830	Principles of Control Valve Technology [1] Types of Control Valves, e.g. Globe, Butterfly, Ball and Cage Valves etc. • Control Valve Flow Characteristics • Noise and Cavitation in Control Valves
0830 – 0930	Principles of Control Valve Technology [2] Actuators and Positioners • Valve Testing • Transmitters for Each of the Process Variables • Smart Transmitters • Control Loop Testing
0930 – 0945	Break
0945 – 1100	Valve Control Loops The 3-15 psi and 4 - 20 MA Control Loops • Digital Transmission and the Control Room
1100 – 1215	Control Strategies for Optimum Valve Performance Manual Control • Feedback Control • Feed Forward Control • Simple On-Off Control
1215 – 1230	Break
1230 – 1330	Other Control Strategies Proportional, Integral and Derivative Control-Valve Systems
1330 – 1420	Analogue and Digital Control Signals Direct Digital Control, Analogue/Digital Conversion, Digital/Analogue Conversion
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four



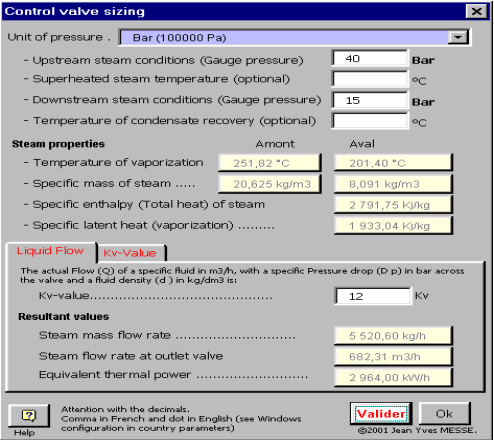


Day 5

0730 – 0930	Valve Safety Issues <i>Cleanliness, Fault-Finding Instrumentation, Preventive Maintenance</i>
0930 – 0945	<i>Break</i>
0945 – 1215	Centrifugal Pump Troubleshooting <i>Bearing Failures • Bearing Housing Oil Leakage • Cavitation Noise and Damage • Impeller Cavitation/Erosion • Vibration • Cracked Volute Tongues • Net Positive Suction Head</i>
1215 – 1230	<i>Break</i>
1230 – 1300	Video: Special Pump Topics
1300 – 1345	Discussion Forum
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Simulators (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 carry out various exercises using our state-of-the-art “Valve Sizing Software”, “Valve Software 3.0”, “Valvestar 7.2 Software”, “PRV²SIZE Software” and “Centrifugal Pumps and Troubleshooting Guide 3.0” simulators.



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

Amount	Aval
- Temperature of vaporization	251.82 °C / 201.40 °C
- Specific mass of steam	20.625 kg/m ³ / 8.091 kg/m ³
- 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

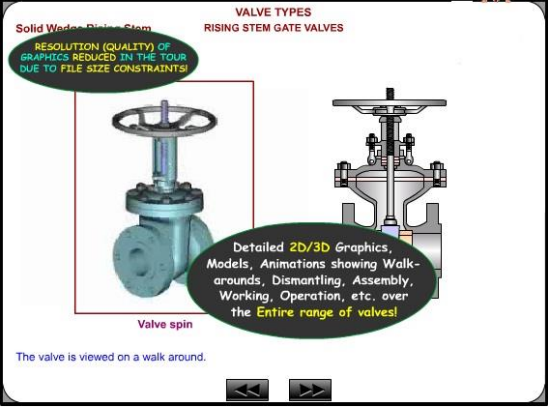
Resultant values

Steam mass flow rate	5 520,60 kg/h
Steam flow rate at outlet valve	682,31 m ³ /h
Equivalent thermal power	2 964,00 kW/h

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

Validier Ok

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VALVE TYPES
RISING STEM GATE VALVES

Solid Welder Rising Stem

RESOLUTION (QUALITY) OF GRAPHICS REDUCED IN THE TOUR DUE TO FILE SIZE CONSTRAINTS!

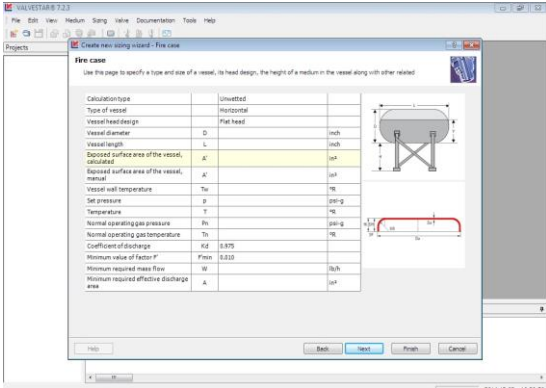
Detailed 2D/3D Graphics, Models, Animations showing Walk-arounds, Dismantling, Assembly, Working, Operation, etc. over the Entire range of valves!

Valve spin

The valve is viewed on a walk around.

Valve Sizing Software

Valve Software 3.0



VALVESTAR 7.2.3


File Edit View Medium Spring Valve Documentation Tools Help

Projects

Create new sizing record - File case

Use this 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

Calculation type	Unsettled
Type of vessel	Horizontal
Vessel head design	Flat head
Vessel diameter	D
Vessel length	L
Exposed surface area of the vessel, calculated	A _c
Exposed surface area of the vessel, nominal	A _n
Vessel wall temperature	T _w
Set pressure	P
Temperature	T
Normal operating gas pressure	P _n
Normal operating gas temperature	T _n
Coefficient of discharge	K _d 0.975
Minimum value of factor F	F _{min} 0.020
Minimum required mass flow	W
Minimum required effective discharge area	A



PRV²SIZE

Anderson Greenwood Crosby Valtec

Quick
Start a New Quick Calculation

New
Create a New Tag

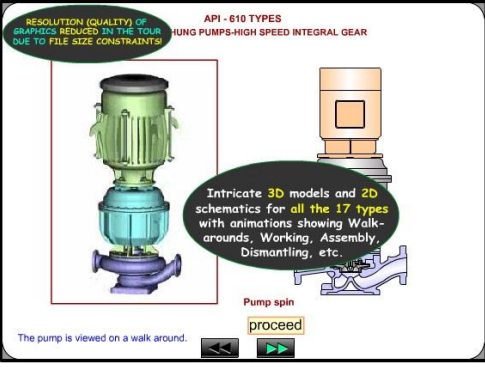
Open
Open an Existing Tag

Catalogs
View Valve Catalogs

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Valvestar 7.2 Software

PRV²SIZE Software



API - 610 TYPES
CENTRIFUGAL PUMPS-HIGH SPEED INTEGRAL GEAR

RESOLUTION (QUALITY) OF GRAPHICS REDUCED IN THE TOUR DUE TO FILE SIZE CONSTRAINTS!

Intricate 3D models and 2D schematics for all the 17 types with animations showing Walk-arounds, Working, Assembly, Dismantling, etc.

Pump spin

proceed

The pump is viewed on a walk around.

Centrifugal Pumps and Troubleshooting Guide 3.0

Course Coordinator

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