

**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	August 25-29, 2024	Club B, Ramada Plaza By Wyndham Istanbul City Center, Istanbul, Turkey
2	September 22-26, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
3	October 21-25, 2024	Hampstead Meeting Room, London Marriott Hotel Regents Park, London, United Kingdom
4	December 22-26, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

**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	<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.
Dubai	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . This rate includes H-STK® (Howard Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
London	<b>US\$ 8,800</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 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. 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	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction to Pumps and Valves</b> Highlighted Problem Areas
0930 – 0945	Break
0945 – 1100	<b>General Description of Centrifugal Pumps and Turbines</b>
1100 – 1215	<b>Centrifugal Pumps</b> Torque, Head and Flow Calculations
1215 – 1230	Break
1230 – 1330	<b>Axial Flow Pumps</b> Torque and Power Calculations
1330 – 1400	<b>Video: Basic Pump Types and Technologies</b>
1400 – 1420	<b>Discussion</b>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

**Day 2**

0730 – 0830	<b>Pump Performance Curves</b> Centrifugal Multistage Pump • Mixed-Flow Machines • Effect of Impeller Speed and Diameter on Performance
0830 – 0930	<b>Pump Specific Speed and Specific Radius</b>
0930 – 0945	Break
0945 – 1100	<b>Centrifugal Pumps Basics</b> Types of Centrifugal Pumps • Self-Priming Pumps • Specific Speeds • Suction Specific Speed • Optimum Efficiency Point
1100 – 1215	<b>Centrifugal Pump Design Issues</b> Balancing Disc • Impeller NPSHR • Impeller Centre-Rib • Mechanical Seals • Velocity Head • Affinity Laws • Suction Lift • Re-Rate/Retrofit • Head-Rise • Radial/Horizontal Split Case
1215 – 1230	Break
1230 – 1400	<b>Centrifugal Pump Installation Guidance for Optimum Performance</b> Foundation Problems • Soft Foot • Suction Pipe • Suction Strainer
1400 – 1420	<b>Video: Fundamentals of Pump Performance</b>
1420 – 1430	<b>Recap</b> 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 Two



**Day 3**

0730 – 0930	<b>Optimum Centrifugal Pump Operation</b> 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	<b>Centrifugal Pump Maintenance</b> 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	<b>Centrifugal Pump Re-Rate/Retrofit</b> Impeller Cut • NPSH • De-Staging • Electric Motor Sizing • Effect of Viscosity Changes on Optimum Performance
1215 – 1230	Break
1230 – 1300	<b>Video: Pump Hydraulic Loads, Critical Speed and Torque</b>
1300 – 1330	<b>Video: Bearings, Seals and Couplings</b>
1330 – 1420	<b>Discussion Forum</b>
1420 – 1430	<b>Recap</b> 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	<b>Principles of Control Valve Technology [ 1 ]</b> 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	<b>Principles of Control Valve Technology [ 2 ]</b> Actuators and Positioners • Valve Testing • Transmitters for Each of the Process Variables • Smart Transmitters • Control Loop Testing
0930 – 0945	Break
0945 – 1100	<b>Valve Control Loops</b> The 3-15 psi and 4 - 20 MA Control Loops • Digital Transmission and the Control Room
1100 – 1215	<b>Control Strategies for Optimum Valve Performance</b> Manual Control • Feedback Control • Feed Forward Control • Simple On-Off Control
1215 – 1230	Break
1230 – 1330	<b>Other Control Strategies</b> Proportional, Integral and Derivative Control-Valve Systems
1330 – 1420	<b>Analogue and Digital Control Signals</b> Direct Digital Control, Analogue/Digital Conversion, Digital/Analogue Conversion
1420 – 1430	<b>Recap</b> 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



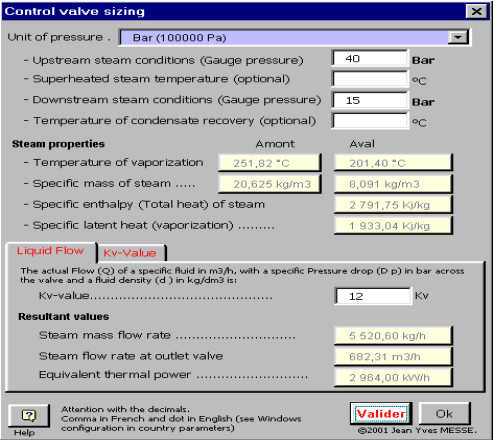


**Day 5**

0730 – 0930	<b>Valve Safety Issues</b> <i>Cleanliness, Fault-Finding Instrumentation, Preventive Maintenance</i>
0930 – 0945	<i>Break</i>
0945 – 1215	<b>Centrifugal Pump Troubleshooting</b> <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	<b>Video: Special Pump Topics</b>
1300 – 1345	<b>Discussion Forum</b>
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>

## 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 carryout various exercises using our state-of-the-art “Valve Sizing Software”, “Valve Software 3.0”, “Valvestar 7.2 Software”, “PRV<sup>2</sup>SIZE 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 <sup>3</sup> / 8.091 kg/m <sup>3</sup>
- 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 m<sup>3</sup>/h, with a specific Pressure drop (D p) in bar across the valve and a fluid density (d) in kg/dm<sup>3</sup> is:

Kv-value : 12 Kv

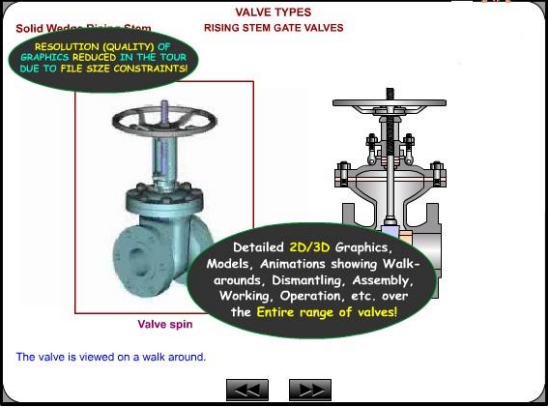
**Resultant values**

Steam mass flow rate	5 520,60 kg/h
Steam flow rate at outlet valve	682,31 m <sup>3</sup> /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

©2001 Jean-Yves MESSE



**VALVE TYPES**  
RISING STEM GATE VALVES

Solid Water Rising Stem

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

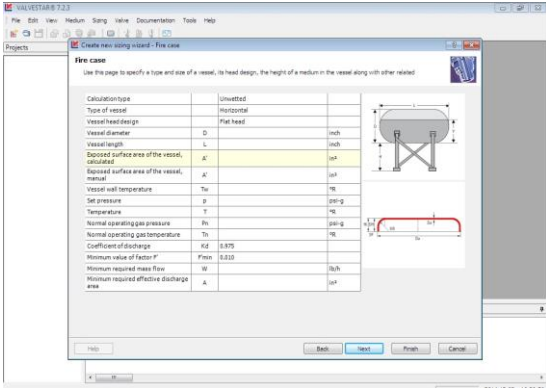
Detailed 2D/3D Graphics, Models, Animations showing Walk-arounds, Dismantling, Assembly, Working, Operation, etc. over the Entire range of valves!

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 Sizing 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 <sub>c</sub>
Exposed surface area of the vessel, manual	A <sub>m</sub>
Vessel wall temperature	T <sub>w</sub>
Set pressure	P
Temperature	T
Normal operating gas pressure	P <sub>n</sub>
Normal operating gas temperature	T <sub>n</sub>
Coefficient of discharge	K <sub>d</sub> 0.875
Minimum value of factor F	F <sub>min</sub> 0.020
Minimum required mass flow	W
Minimum required effective discharge area	A

Back Next Finish Cancel



**PRV<sup>2</sup>SIZE**

Anderson Greenwood Crosby Valtec

Quick  
Start a New Quick Calculation

New  
Create a New Tag

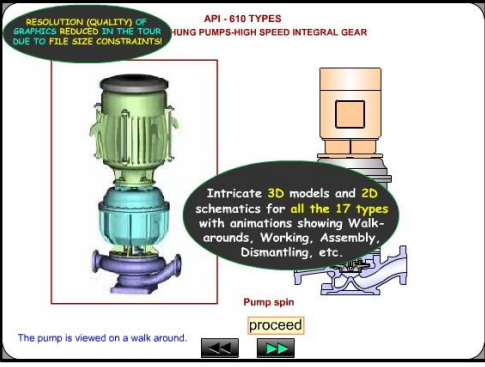
Open  
Open an Existing Tag

Catalogs  
View Valve Catalogs

Copyright © 2010, 2011 Type Flow Control, Inc. All rights reserved. All trademarks, trade names and/or registered trademarks referred to in this document are the property of their respective owners.

**Valvestar 7.2 Software**

**PRV<sup>2</sup>SIZE 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

The pump is viewed on a walk around.

proceed

**Centrifugal Pumps and Troubleshooting Guide 3.0**

## Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: [mari1@haward.org](mailto:mari1@haward.org)