COURSE OVERVIEW ME0397
Pump and Valve Operation and Maintenance

Course Title
Pump and Valve Operation and Maintenance

Course Date/Venue
Session 1: June 16-20, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 20-24, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
ME0397

Course Duration/Credits
Five days/3.0 CEUs/3.0 PDHs

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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

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

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**. 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.

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 Water Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical**, **Power & Water Utilities** and other **Energy** sectors. His expertise widely covers in the areas of **Dismantling & Installing Membranes**, Operation, Maintenance Optimization & Troubleshooting of Flat Sheets **Membrane System**, **Membrane Unit** Operation & Troubleshooting, Industrial **Membranes** Separations, **Membranes Desalination**, **Water Chemistry** for **Power Plant**, **Water** Sector Orientation, Environmental Impact Assessment (**EIA**), **Potable Water**, **Reverse Osmosis** Treatment Technology and **Chlorination** System, **Well** Inventory, Monitoring & Conservation, **Qualitative Analysis** of Soil & Ground Water, **Water** Networking, **Hydraulic Modelling** Systems, **Pumping** Stations, **Centrifugal Pumps**, **Pipelines & Pumping**, **Water Reservoirs**, **Water Storage Tanks**, Extended Activated **Sludge** Treatment, **Sewage & Industrial Wastewater** Treatment & Environmental Protection, Supervising & Monitoring **Sewage Works**, **Water Desalination** Technologies, **Water Distribution & Pump** Station, Best **Water Equipment** Selection & Inspection, **Hydraulic Modelling** for Water Network Design, **Water Utility** Industry, **Water Desalination** Technologies & New Development, **Water Hydrology**, **Water Pipes & Fittings**, **Water Hydraulic** Modelling, **Water Storage Reservoir**, **Reservoirs & Pumping** Stations Design & Operation and **Pumping** Systems. Further, he is also well-versed in **Ammonia Manufacturing & Process Troubleshooting**, **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, **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**, **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, **Process Gas Plant** Start-up, Commissioning & Problem Solving, **Process Liquid, Process Handling & Measuring** Equipment, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control**, **Column, Pump & Exchangers**, Troubleshooting & Design, Rotating Equipment Operation & Troubleshooting, **Control & ESD** System, Root Cause Analysis (**RCA**), **Dangerous Goods**, **Production Optimization**, Permit to Work (**PTW**), Project Engineering, Data Analysis, **HAZOP** Study, Sampling & Analysis, **Job Analysis** Techniques, **Hazardous Material** Classification & Storage/Disposal, **Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), **Process Hazard** Analysis (**PHA**), 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 **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Water Engineer**, **Process Engineer**, **HSE Supervisor**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **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 is a **Registered SAQA Qualification** (**NQF Level 4**) in **Chemical Operations**. Further, he is a **Certified Multi-Skilled** in **Instrumentation** and **Mechanical Engineering**, 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	***PRE-TEST***
0830 – 0930	***Introduction to Pumps and Valves*** *Highlighted Problem Areas*
0930 – 0945	*Break*
0945 – 1100	***General Description of Centrifugal Pumps and Turbines***
1100 – 1215	***Centrifugal Pumps*** *Torque, Head and Flow Calculations*
1215 – 1230	*Break*
1230 – 1330	***Axial Flow Pumps*** *Torque and Power Calculations*
1330 – 1400	***Video: Basic Pump Types and Technologies***
1400 – 1420	***Discussion***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Pump Performance Curves*** *Centrifugal Multistage Pump ● Mixed-Flow Machines ● Effect of Impeller Speed and Diameter on Performance*
0830 – 0930	***Pump Specific Speed and Specific Radius***
0930 – 0945	*Break*
0945 – 1100	***Centrifugal Pumps Basics*** *Types of Centrifugal Pumps ● Self-Priming Pumps ● Specific Speeds ● Suction Specific Speed ● Optimum Efficiency Point*
1100 – 1215	***Centrifugal Pump Design Issues*** *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	***Centrifugal Pump Installation Guidance for Optimum Performance*** *Foundation Problems ● Soft Foot ● Suction Pipe ● Suction Strainer*
1400 – 1420	***Video: Fundamentals of Pump Performance***
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 Two*

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

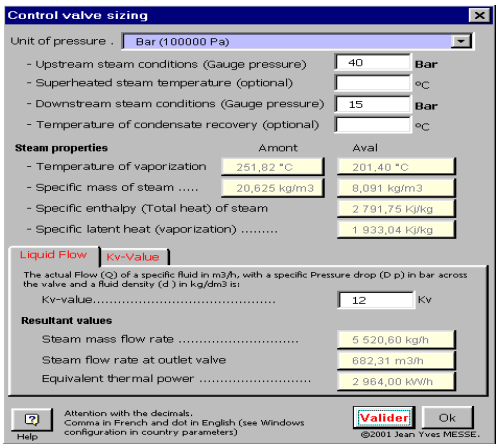
0730 – 0830	***Principles of Control Valve Technology [1]*** *Types of Control Valves, e.g. Globe, Butterfly, Ball and Cage Valves etc. ● Control Valve Flow Characteristics ● Noise and Cavitation in Control Valves*
0830 – 0930	***Principles of Control Valve Technology [2]*** *Actuators and Positioners ● 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

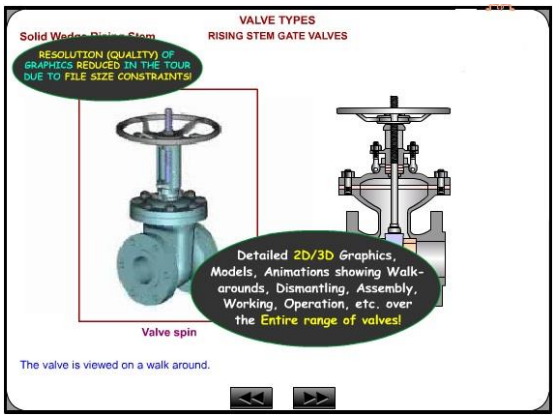
0730 – 0930	***Valve Safety Issues*** *Cleanliness, Fault-Finding Instrumentation, Preventive Maintenance*
0930 – 0945	*Break*
0945 – 1215	***Centrifugal Pump Troubleshooting*** *Bearing Failures ● Bearing Housing Oil Leakage ● Cavitation Noise and Damage ● Impeller Cavitation/Erosion ● Vibration ● Cracked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

Simulators (Hands-on Practical Sessions)

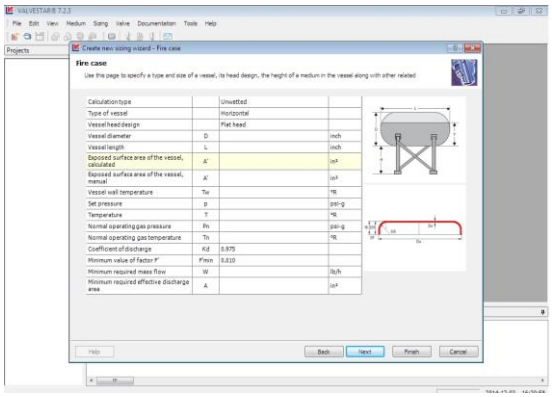
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software", "PRV²SIZE Software" and "Centrifugal Pumps and Troubleshooting Guide 3.0" simulators.



Valve Sizing Software

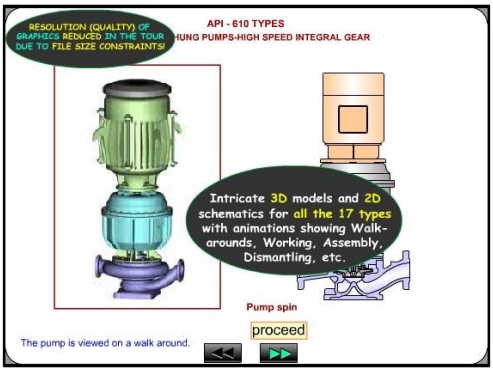


Valve Software 3.0



Valvestar 7.2 Software

PRV²SIZE Software



Centrifugal Pumps and Troubleshooting Guide 3.0

Course Coordinator

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