COURSE OVERVIEW ME1148
Features and Technology of Pumps & Pipe Systems

Course Title
Features and Technology of Pumps & Pipe Systems

Course Date/Venue
Session 1: May 25-29, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar
Session 2: September 21-25, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
ME1148

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 participants with a detailed and up-to-date overview of Features and Technology of Pumps & Pipe Systems. It covers the purpose, applications and types of pump systems and basic fluid mechanics for piping and pumping; the pump classifications and operations, pipe materials and classifications, pipe flow fundamentals and pump and pipe system components; the centrifugal pump technology and positive displacement pump technology; the pump sizing and selection and pump installation and commissioning; the common pump issues and troubleshooting covering cavitation and air entrainment, seal and bearing failure, excessive vibration and noise and overheating and dry running; and the pump efficiency and energy considerations including pipe sizing and flow calculations.

During this interactive course, participants will learn the pressure losses and pump head, surge and water hammer control, thermal effects and pipe expansion, pipe supports and layout and CAD and simulation tools for pipe systems; the pump control systems, instrumentation for pipe and pump monitoring, valve automation and control; the maintenance strategies for pump and pipe systems; the system integration and P&ID interpretation and safety and environmental considerations; the smart pumping systems and IIoT and corrosion; and the erosion in piping systems and energy optimization in pump and pipe networks.

Course Objectives

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

- Apply and gain an in-depth knowledge on features and technology of pumps and pipe
- Discuss the purpose, applications and types of pump systems and basic fluid mechanics for piping and pumping
- Recognize pump classifications and operations, pipe materials and classifications, pipe flow fundamentals and pump and pipe system components
- Identify centrifugal pump technology and positive displacement pump technology as well as carryout pump sizing and selection and pump installation and commissioning
- Recognize common pump issues and troubleshooting covering cavitation and air entrainment, seal and bearing failure, excessive vibration and noise and overheating and dry running
- Apply pump efficiency and energy considerations including pipe sizing and flow calculations
- Recognize pressure losses and pump head, surge and water hammer control, thermal effects and pipe expansion, pipe supports and layout and CAD and simulation tools for pipe systems
- Discuss pump control systems and apply instrumentation for pipe and pump monitoring, valve automation and control and maintenance strategies for pump and pipe systems
- Carryout system integration and P&ID interpretation and discuss safety and environmental considerations, smart pumping systems and IIoT, corrosion and erosion in piping systems and energy optimization in pump and pipe networks

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 all significant aspects and considerations of features and technology of pumps and pipe for mechanical engineers, process engineers, piping engineers, maintenance engineers and technicians, operations and plant personnel, utility and facility engineers, project and design engineers, technical supervisors and team leaders, engineering consultants and contractors and other technical staff.

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.

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. Karl Thanasis, PEng, MSc, MBA, BSc, is **Senior Mechanical & Maintenance Engineer** with over **45 years** of extensive industrial experience. His wide expertise includes **Piping & Pipeline**, Maintenance, Repair, **Shutdown**, **Turnaround & Outages**, **Maintenance & Reliability** Management, **Mechanical Maintenance** Planning, Scheduling & Work Control, Advanced Techniques in **Maintenance** Management, **Predictive & Preventive** Maintenance, **Maintenance & Operation Cost Reduction** Techniques, Reliability Centered Maintenance (**RCM**), **Machinery Failure** Analysis, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Root Cause Analysis & Reliability** Improvement, **Condition** Monitoring, **Root Cause Failure Analysis** (RCFA), **Steam Generation**, **Steam Turbines**, **Power Generator Plants**, **Gas Turbines**, **Combined Cycle Plants**, **Boilers**, **Process Fired Heaters**, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, **Heat Exchangers**, Heat Transfer, Coolers, **Power Plant** Performance, Efficiency & Optimization, **Storage Tank** Design & Fabrication, **Thermal Power Plant** Management, **Boiler & Steam** System Management, **Pump** Operation & Maintenance, **Chiller & Chiller Plant** Design & Installation, **Pressure Vessel**, **Safety Relief Valve** Sizing & Selection, **Valve** Disassembling & Repair, Pressure Relief Devices (**PSV**), **Hydraulic & Pneumatic** Maintenance, Advanced **Valve** Technology, **Pressure Vessel** Design & Fabrication, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, Mechanical **Seals**, Packing, **Blowers**, **Bearing** Installation, **Couplings**, **Clutches** and **Gears**. Further, he is also versed in **Wastewater Treatment** Technology, **Networking** System, **Water Network Design**, Industrial **Water Treatment** in Refineries & Petrochemical Plants, **Piping** System, Water Movement, Water Filtering, Mud Pumping, **Sludge Treatment** and **Drying**, **Aerobic Process** of **Water Treatment** that includes **Aeration**, **Sedimentation** and **Chlorination Tanks**. His strong background also includes **Design** and **Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps**, **Filters**, **Metering Pumps**, **Aerators** and **Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager - Equipment Construction**, **Construction Superintendent**, **Project Engineer** and **Design Engineer**. His duties covered **Plant Preliminary Design**, **Plant Operation**, **Write-up** of **Capital Proposal**, **Investment Approval**, **Bid Evaluation**, **Technical Contract Write-up**, **Construction** and **Sub-contractor Follow up**, **Lab Analysis**, **Sludge Drying** and **Management** of **Sludge Odor** and **Removal**. He has worked in various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has a **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU** in **USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA**. Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide.

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

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 Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop 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 Pumping Systems*** *Purpose and Applications • Types of Pump Systems • Overview of Pipe Networks • Integration with Process Systems*
0930 – 0945	*Break*
0945 – 1030	***Basic Fluid Mechanics for Piping & Pumping*** *Properties of Fluids (Density, Viscosity) • Pressure and Head Relationships • Bernoulli's Principle • Flow Regimes (Laminar versus Turbulent)*
1030 – 1130	***Pump Classifications & Operations*** *Centrifugal versus Positive Displacement • Dynamic versus Kinetic Energy Pumps • Pump Curves and Performance • Applications and Selection Criteria*
1130 – 1215	***Pipe Materials & Classifications*** *Metallic versus Non-Metallic Pipes • Pipe Schedule and Wall Thickness • Corrosion Resistance • Application-Based Material Selection*
1215 – 1230	*Break*
1230 – 1330	***Pipe Flow Fundamentals*** *Flow Rate and Velocity Calculations • Pressure Drop and Head Loss • Friction Factors and Reynolds Number • Equivalent Length Concept*
1330 – 1420	***Pump & Pipe System Components*** *Valves (Gate, Globe, Ball, Check) • Flanges and Fittings • Strainers and Filters • Expansion Joints and Supports*
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 One*

Day 2

0730 – 0830	***Centrifugal Pump Technology*** *Impeller Types and Configurations • Pump Casing Types (Volute, Diffuser) • Single versus Multistage • Priming and NPSH*
0830 – 0930	***Positive Displacement Pump Technology*** *Gear, Vane and Lobe Pumps • Piston and Diaphragm Pumps • Flow Rate Control • Pressure Capabilities*
0930 – 0945	*Break*
0945 – 1100	***Pump Sizing & Selection*** *Determining System Head • Selecting Flow Rate • Affinity Laws • Matching Pump to Application*
1100 – 1215	***Pump Installation & Commissioning*** *Baseplate Alignment • Suction and Discharge Piping • Vibration Isolation • Operational Checks*
1215 – 1230	*Break*
1230 – 1330	***Common Pump Issues & Troubleshooting*** *Cavitation and Air Entrainment • Seal and Bearing Failure • Excessive Vibration and Noise • Overheating and Dry Running*
1330 – 1420	***Pump Efficiency & Energy Considerations*** *Pump Efficiency Curves • Energy Usage Metrics • Variable Speed Drives (VSDs) • Lifecycle Cost Analysis*
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 – 0830	***Pipe Sizing & Flow Calculations*** *Continuity Equation • Darcy-Weisbach Equation • Hazen-Williams Formula • Pipe Sizing Charts*
0830 – 0930	***Pressure Losses & Pump Head*** *Frictional Losses • Minor Losses (Fittings, Valves) • Elevation Changes • Total Dynamic Head (TDH)*
0930 – 0945	*Break*
0945 – 1100	***Surge & Water Hammer Control*** *Causes and Impact • Analysis and Modeling • Air Chambers and Surge Tanks • Valve Closure Control*
1100 – 1215	***Thermal Effects & Pipe Expansion*** *Expansion Loops and Joints • Pipe Stress Analysis • Anchor and Guide Systems • Thermal Insulation*
1215 – 1230	*Break*
1230 – 1330	***Pipe Supports & Layout*** *Types of Supports (Rigid, Spring) • Pipe Routing and Slope • Expansion and Contraction Allowances • Support Spacing Guidelines*
1330 – 1420	***CAD and Simulation Tools for Pipe Systems*** *Introduction to Pipe Design Software • Simulation of Flow and Pressure • 3D Modeling of Piping Systems • Case Study: Pipe Network Simulation*
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

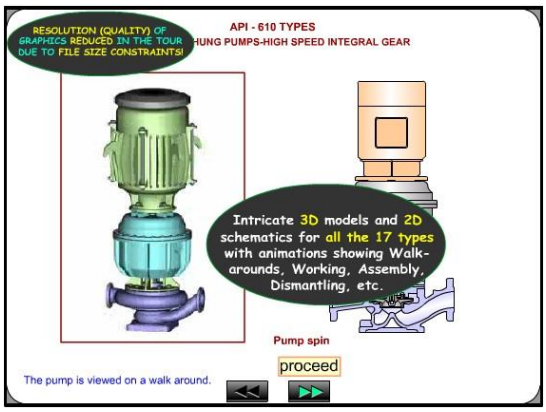
0730 – 0830	***Pump Control Systems*** *Pressure and Flow Sensors • on/off Control versus VFD Control • PID Control Logic • Smart Pump Technology*
0830 – 0930	***Instrumentation for Pipe & Pump Monitoring*** *Flow Meters (Ultrasonic, Magnetic) • Pressure Gauges and Transmitters • Temperature Sensors • Vibration Monitoring Systems*
0930 – 0945	*Break*
0945 – 1100	***Valve Automation & Control*** *Actuated Valve Types • Solenoids and Motor-Operated Valves • Remote Control and SCADA Integration • Positioners and Limit Switches*
1100 – 1215	***Maintenance Strategies for Pump &Pipe Systems*** *Preventive Maintenance Schedules • Predictive Maintenance (Vibration, Thermal) • Root Cause Analysis of Failures • Spare Parts and Inventory Management*
1215 – 1230	*Break*
1230 – 1330	***System Integration & P&ID Interpretation*** *Understanding Piping and Instrumentation Diagrams • Symbols and Legends • Control Loops and Instrumentation Mapping • Integration with Process Control Systems*
1330 – 1420	***Safety & Environmental Considerations*** *Leak Detection Systems • Overpressure Protection • Safe Handling of Hazardous Fluids • Environmental Regulations*
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

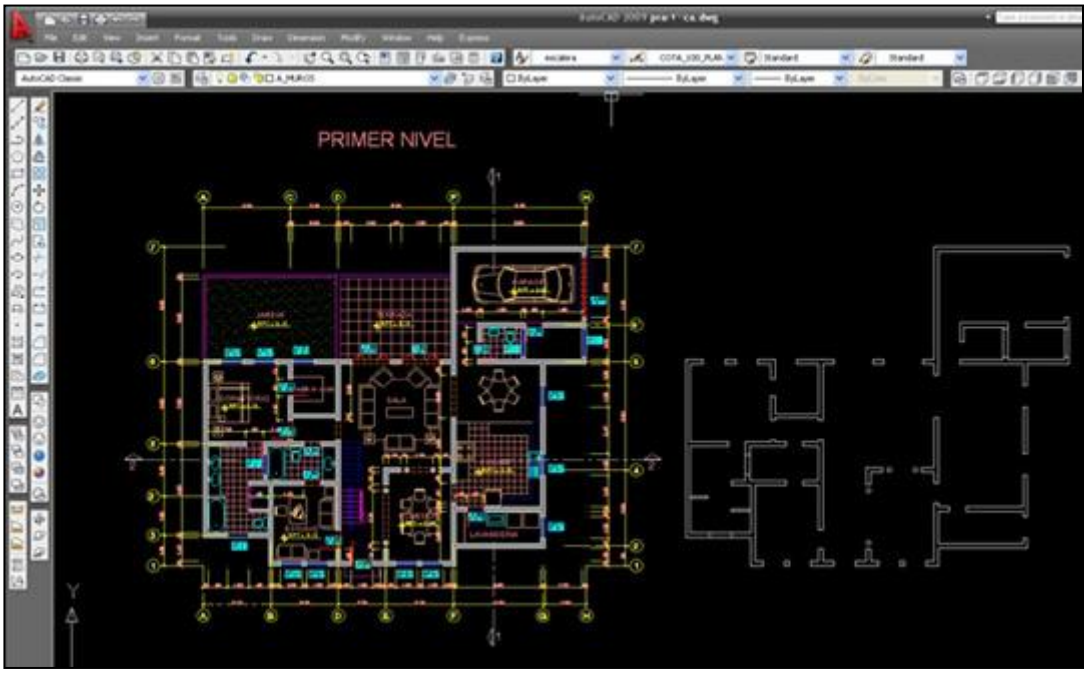
0730 – 0830	***Smart Pumping Systems & IIoT*** *Internet of Things (IoT) in Pumps • Wireless Monitoring and Alerts • Predictive Analytics and AI • Data Logging and Trend Analysis*
0830 – 0930	***Corrosion & Erosion in Piping Systems*** *Mechanisms of Corrosion and Erosion • Corrosion Protection Methods • Cathodic Protection • Coatings and Linings*
0930 – 0945	*Break*
0945 – 1100	***Energy Optimization in Pump & Pipe Networks*** *Energy Audit Methods • Efficiency Upgrades • Optimization Case Studies • Payback Analysis*
1100 – 1215	***Case Studies: Real-World Systems*** *Water Supply System • Industrial Process Circulation • Firefighting Pump Network • District Cooling Systems*
1215 – 1230	*Break*
1230 – 1345	***Hands-on Workshop & Group Exercises*** *Pump Performance Evaluation • Pipe Network Flow Simulation • Troubleshooting Scenarios • P&ID Drawing Interpretation*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (Hands-on Practical Sessions)

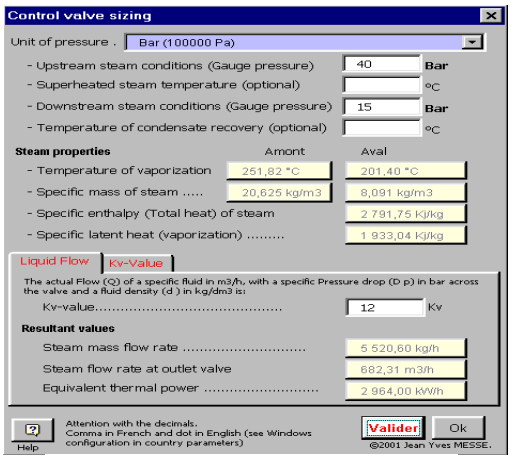
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art Simulator "Centrifugal Pumps and Troubleshooting Guide 3.0", "AutoCAD", "Valve Sizing Software",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



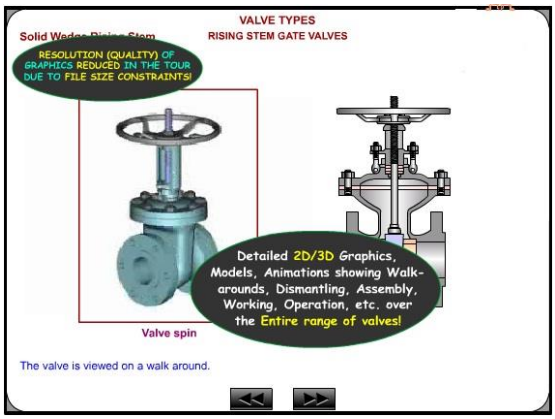
Centrifugal Pumps and Troubleshooting Guide 3.0



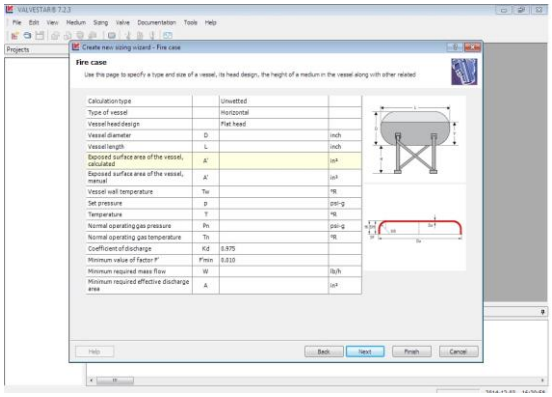
AutoCAD



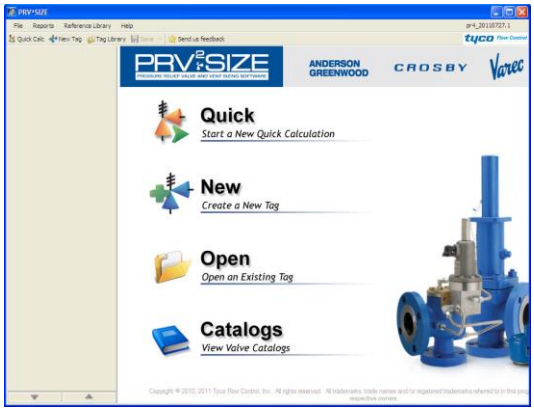
Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV²SIZE Software

Course Coordinator

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