COURSE OVERVIEW ME1155
Valve Maintenance & Repair

Course Title
Valve Maintenance & Repair

Course Date/Venue
June 15-19, 2025/Crowne Meeting Room, Crowne Plaza Al Khobar, Al Khobar, KSA

Course Reference
ME1155

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 Valve Maintenance and Repair. It covers the valve types and functions, valve components and materials and valve flow characteristics; the valve sizing and selection, actuators, positioners and valve standards; the best practices covering pre-installation inspections and checks, alignment and orientation considerations, gasket selection, flange connections, torque specifications and bolt tightening sequences; the hydrostatic and pneumatic testing procedures, leak testing and seat tightness verification, functional testing of actuators and positioners; and the documentation of commissioning results.

Further, the course will also discuss the maintenance activities, lubrication practices, inspection intervals, checklists, record-keeping and maintenance logs; the predictive maintenance techniques, vibration analysis and acoustic emission monitoring; the thermography for detecting anomalies and data analysis for maintenance decision-making; diagnosing leakage, sticking and noise problems, the causes of valve failure; and the corrective actions and repair strategies.

During this interactive course, participants will learn the safety considerations in valve maintenance; the lockout/tagout procedures, personal protective equipment (PPE) requirements, handling hazardous materials and environments and emergency response planning; the disassembly and inspection procedures; the valve seat and seal maintenance; the actuator and positioner maintenance, control valve maintenance and safety relief valve maintenance; the high-pressure and high-temperature valves, non-return and check valves, control valve dynamics and the valve automation and smart technologies; the recurring valve failures, root cause analysis methodologies; the collaborative problem-solving approaches and documentation and communication of findings; the regulatory requirements for valve maintenance; the preparation for audits and inspections, record-keeping, traceability and continuous improvement and compliance strategies; the valve maintenance schedules, resource planning and budgeting and overall maintenance strategies; and the presentation and critique of maintenance plans.

Course Objectives

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

- Apply and gain an in-depth knowledge on valve maintenance and repair
- Identify valve types and functions, valve components and materials and valve flow characteristics
- Recognize valve sizing and selection, actuators, positioners and valve standards
- Carryout best practices covering pre-installation inspections and checks, alignment and orientation considerations, gasket selection and flange connections and torque specifications and bolt tightening sequences
- Apply hydrostatic and pneumatic testing procedures, leak testing and seat tightness verification, functional testing of actuators and positioners and documentation of commissioning results
- Schedule maintenance activities based on valve criticality and apply lubrication practices for moving parts, inspection intervals and checklists and record-keeping and maintenance logs
- Employ predictive maintenance techniques covering vibration analysis and acoustic emission monitoring, thermography for detecting anomalies and data analysis for maintenance decision-making
- Diagnose leakage, sticking and noise problems, identify causes of valve failure and apply corrective actions and repair strategies
- Carryout safety considerations in valve maintenance covering lockout/tagout procedures, personal protective equipment (PPE) requirements, handling hazardous materials and environments and emergency response planning
- Apply disassembly and inspection procedures, valve seat and seal maintenance, actuator and positioner maintenance, control valve maintenance and safety relief valve maintenance
- Determine high-pressure and high-temperature valves, non-return and check valves, control valve dynamics and valve automation and smart technologies

- Analyze recurring valve failures and apply root cause analysis methodologies, collaborative problem-solving approaches and documentation and communication of findings
- Implement regulatory requirements for valve maintenance, prepare for audits and inspections, record-keeping and traceability and continuous improvement and compliance strategies
- Create valve maintenance schedules and apply resource planning and budgeting, integrate with overall maintenance strategies and presentation and critique of maintenance plans

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 valve maintenance and repair for mechanical technicians and maintenance personnel, plant engineers and maintenance engineers, instrumentation and control technicians, operations and process supervisors, pipeline and utility operators 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 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.

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

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 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 **Valve** Selection & Maintenance, **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**), 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**, Environmental Management System (**EMS**), 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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1:- ***Sunday, 15th of June 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Valve Types & Functions*** *Overview of Valve Roles in Refinery Systems • Classification: Gate, Globe, Ball, Butterfly, Check, Safety & Control Valves • Selection Criteria Based on Process Requirements • Common Applications within Refinery Units*
0930 – 0945	*Break*
0945 – 1030	***Valve Components & Materials*** *Key Parts: Body, Bonnet, Stem, Seat, Disc, Actuator • Material Selection for Different Process Fluids & Temperatures • Corrosion Resistance & Material Compatibility • Standards & Codes Governing Valve Materials*
1030 – 1130	***Valve Flow Characteristics*** *Understanding Flow Patterns: Linear, Equal Percentage, Quick Opening • Impact on Process Control & Efficiency • Cv & Kv Values: Definitions & Calculations • Pressure Drop Considerations Across Valves*
1130 – 1215	***Valve Sizing & Selection*** *Factors Influencing Valve Sizing: Flow Rate, Pressure, Temperature • Sizing Calculations for Different Valve Types • Software Tools for Valve Sizing • Case Studies on Valve Selection in Refinery Scenarios*
1215 – 1230	*Break*
1230 – 1330	***Actuators & Positioners*** *Types of Actuators: Manual, Electric, Pneumatic, Hydraulic • Role of Positioners in Valve Control • Calibration & Maintenance of Actuators • Troubleshooting Common Actuator Issues*
1330 – 1420	***Valve Standards & Certifications*** *Overview of ASME, API, ISO Standards Relevant to Valves • Certification Requirements for Safety & Control Valves • Compliance with Refinery Regulatory Frameworks • Documentation & Traceability of Valve Certifications*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2:- ***Monday, 16th of June 2025***

0730 – 0830	***Valve Installation Best Practices*** *Pre-Installation Inspections & Checks • Alignment & Orientation Considerations • Gasket Selection & Flange Connections • Torque Specifications & Bolt Tightening Sequences*
0830 – 0930	***Commissioning & Operational Testing*** *Hydrostatic & Pneumatic Testing Procedures • Leak Testing & Seat Tightness Verification • Functional Testing of Actuators & Positioners • Documentation of Commissioning Results*
0930 – 0945	*Break*

0945 – 1100	***Preventive Maintenance Programs*** *Scheduling Maintenance Activities Based on Valve Criticality • Lubrication Practices for Moving Parts • Inspection Intervals & Checklists • Record-Keeping & Maintenance Logs*
1100 – 1215	***Predictive Maintenance Techniques*** *Vibration Analysis & Acoustic Emission Monitoring • Thermography for Detecting Anomalies • Use of Smart Sensors & IoT in Valve Monitoring • Data Analysis for Maintenance Decision-Making*
1215 – 1230	*Break*
1230 – 1330	***Troubleshooting Common Valve Issues*** *Diagnosing Leakage, Sticking & Noise Problems • Identifying Causes of Valve Failure • Corrective Actions & Repair Strategies • Case Studies on Troubleshooting in Refinery Settings*
1330 – 1420	***Safety Considerations in Valve Maintenance*** *Lockout/Tagout Procedures • Personal Protective Equipment (PPE) Requirements • Handling Hazardous Materials & Environments • Emergency Response Planning*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3:- ***Tuesday, 17th of June 2025***

0730 – 0830	***Disassembly & Inspection Procedures*** *Step-by-Step Disassembly of Various Valve Types • Inspection of Internal Components for Wear & Damage • Measurement of Critical Dimensions & Tolerances • Documentation of Inspection Findings*
0830 – 0930	***Valve Seat & Seal Maintenance*** *Techniques for Lapping & Polishing Valve Seats • Replacement of Seals, Gaskets & Packing • Selection of Appropriate Sealing Materials • Testing for Seat Leakage Post-Maintenance*
0930 – 0945	*Break*
0945 – 1100	***Actuator & Positioner Maintenance*** *Calibration of Positioners for Accurate Control • Inspection & Servicing of Actuator Components • Troubleshooting Signal & Power Issues • Upgrading Actuators for Improved Performance*
1100 – 1215	***Control Valve Maintenance*** *Specific Considerations for Control Valve Internals • Trim Inspection & Replacement • Addressing Issues like Cavitation & Erosion • Control Loop Tuning Post-Maintenance*
1215 – 1230	*Break*
1230 – 1330	***Safety Relief Valve Maintenance*** *Understanding Set Pressure & Blowdown Adjustments • Testing Procedures for Safety Valves • Compliance with API & ASME Codes • Documentation & Tagging Post-Servicing*

1330 – 1420	***Workshop Practices & Tool Usage*** *Selection & Use of Specialized Valve Maintenance Tools • Safety Protocols in Workshop Environments • Handling & Storage of Valve Components • Waste Management & Environmental Considerations*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4:- ***Wednesday, 18th of June 2025***

0730 – 0830	***High-Pressure & High-Temperature Valves*** *Design Considerations for Extreme Service Conditions • Material Selection & Thermal Expansion Issues • Maintenance Challenges & Solutions • Case Studies on High-Pressure Valve Applications*
0830 – 0930	***Non-Return & Check Valves*** *Functionality & Importance in Process Safety • Common Failure Modes & Diagnostics • Maintenance & Testing Procedures • Selection Criteria for Different Process Needs*
0930 – 0945	*Break*
0945 – 1100	***Control Valve Dynamics*** *Understanding Control Valve Behavior in Process Loops • Interaction with Process Variables & Control Systems • Diagnosing Control Valve Performance Issues • Strategies for Optimizing Control Valve Operation*
1100 – 1215	***Valve Automation & Smart Technologies*** *Integration of Valves with Control Systems (DCS/PLC) • Use of Smart Positioners & Diagnostics Tools • Remote Monitoring & Control Capabilities • Cybersecurity Considerations in Automated Systems*
1215 – 1230	*Break*
1230 – 1330	***Troubleshooting Complex Valve Issues*** *Analyzing Recurring Valve Failures • Root Cause Analysis Methodologies • Collaborative Problem-Solving Approaches • Documentation & Communication of Findings*
1330 – 1420	***Regulatory Compliance & Auditing*** *Understanding Regulatory Requirements for Valve Maintenance • Preparing for Audits & Inspections • Record-Keeping & Traceability • Continuous Improvement & Compliance Strategies*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

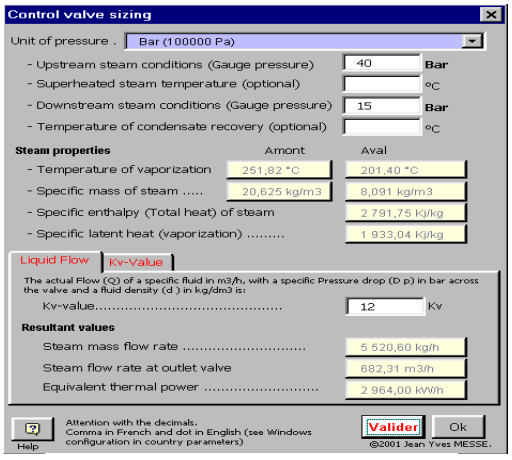
Day 5:- ***Thursday, 19th of June 2025***

0730 – 0930	***Hands-on Valve Maintenance Workshop*** *Guided Practice on Disassembly & Reassembly • Real-World Scenarios for Troubleshooting • Use of Diagnostic Equipment & Tools • Safety Drills & Emergency Response Simulations*
0930 – 0945	*Break*
0945 – 1100	***Case Studies & Group Discussions*** *Analysis of Past Incidents & Maintenance Challenges • Sharing Experiences & Best Practices • Collaborative Problem-Solving Exercises • Lessons Learned & Knowledge Transfer*

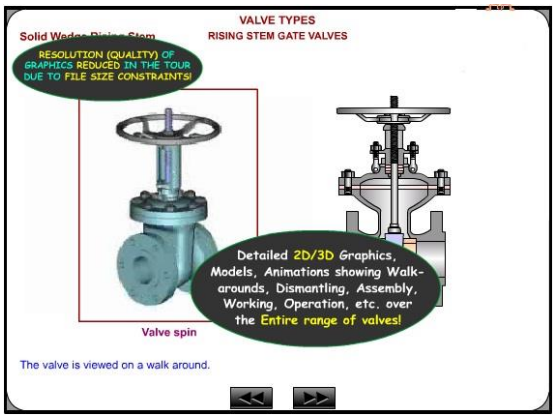
1100 - 1215	***Development of Maintenance Plans*** *Creating Valve Maintenance Schedules • Resource Planning & Budgeting*
1215 – 1230	*Break*
1230 – 1345	***Development of Maintenance Plans (cont'd)*** *Integration with Overall Maintenance Strategies • Presentation & Critique of Maintenance Plans*
1345 – 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*

Simulator (Hands-on Practical Sessions)

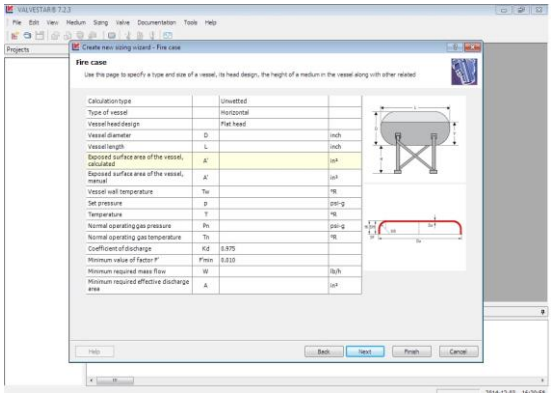
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the state-of-the-art "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE Software".



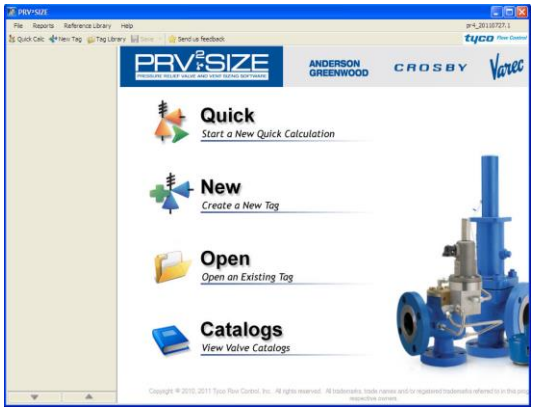
Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV²SIZE Software

Course Coordinator

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