COURSE OVERVIEW ME0075
Control Valves and Actuators

Course Title
Control Valves and Actuators



Course Date/Venue
Session 1: June 20-24, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar
Session 2: November 28-December 02, 2027/Meeting Plus 9, City Centre Rotana, Doha, Qatar

Course Reference
ME0075

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.



It is claimed that the majority of control valves throughout the world have not been correctly sized and that large numbers operate on manual mode. Whether this is true or not is difficult to establish but we do know that the method of sizing and selecting a control valve for a specific application is generally not well understood. Although there are many factors that need to be taken into account the subject is not difficult to understand if dealt with in a logical manner. We also find that many maintenance problems result from people treating the symptoms of a problem rather than tackling the true cause – a basic understanding of the principles is all that is usually needed to solve the problem for good.



This course is designed to provide participants with a detailed and an up-to-date overview of control valve sizing, selection, operation, testing, maintenance and troubleshooting. It covers the valve characteristics and trim selection; the process of control valve sizing; the control valve accessories such as auxiliary hand-wheels, pressure regulators, position transmitters, volume booster, limit switches and solenoid valves; and the process of control valve selection.

Further, the course will also discuss the control valve performance which includes process variability, actuator-positioner design, valve type, sizing, response and characterization; the common valve problems and its solutions; the use of system approach to prevent the occurrences of the problems; the different operational issues of control valves and actuators; the various control valve failures and their potential causes; the field communications and its importance; the practical application on control valves and actuators; the development, features and functions of smart valves and positioners; the diagnostic testing in valves; and the fire safe valves.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply systematic techniques in the sizing, selection, operation, testing, maintenance and troubleshooting of control valves
- Discuss the valve characteristics and trim selection and illustrate the process of control valve sizing
- Recognize the process consideration in control valves and actuators particularly the materials selection, modes of failure, leakage rates and international standards
- Identify the control valve accessories such as auxiliary hand-wheels, pressure regulators, position transmitters, volume booster, limit switches and solenoid valves and describe the process of control valve selection
- Apply operation checks covering control valves performance, t63, response, dead and dynamic time
- Employ control valve performance which includes process variability, actuator-positioner design, valve type, sizing, response and characterization
- Analyze common valve problems and present various solutions and use system approach to prevent the occurrences of the problems
- Review and improve the different operational issues of control valves and actuators and determine the various control valve failures and their potential causes
- Implement the three (3) approaches to control valve maintenance covering reactive, preventive and predictive
- Employ the immediate maintenance or repairing action in case of any discrepancies
- Recognize field communications and its importance and employ practical application on control valves and actuators
- Identify development, features and functions of smart valves and positioners and apply diagnostic testing in valves
- Explain fire safe valves by discussing its standards, examples, sealing and leakage

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 control valves and actuators for those involved in the sizing, selection, operation, testing, maintenance and troubleshooting of such equipment. This includes control valve and plant safety specialists, instrumentation and control engineers, electrical engineers, project engineers, process control engineers, consulting engineers, maintenance engineers, maintenance planners and systems engineers.

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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 Maintenance 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**, **Ammonia Storage & Loading** Systems, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, **Industrial Liquid Mixing**, **Extractors**, **Fractionation**, **Water Purification**, **Water Transport** & Distribution, **Environmental Emission Control**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, **Plant Startup & Shutdown**, **Process Troubleshooting** Techniques and Oil & Gas Operation/Surface Facilities. Further, he is also well-versed in **Rotating Machinery** (**BRM**), **Rotating Equipment** Operation & Troubleshooting, Root Cause Analysis (**RCA**), **Process Plant** Shutdown, Turnaround & Troubleshooting, Planning & Scheduling **Shutdowns & Turnarounds**, Optimizing **Equipment Maintenance** & Replacement Decisions, **Maintenance Planning & Scheduling**, **Material Cataloguing**, Maintenance, Reliability & Asset Management Best Practices, **Storage Tanks Operations** & Measurements, **Tank** Inspection & Maintenance, **Pressure Vessel** Operation, **Flare & Relief** System, **Flaring System** Operation, **PSV** Inspection & Maintenance, **Centrifugal & Reciprocating Compressor**, **Screw Compressor** Troubleshooting, **Heat Exchanger** Overhaul & Testing, **Pipe Stress** Analysis, **Control Valves & Actuators**, **Vent & Relief System**, **Centrifugal & Reciprocating Pump** Installation & Repair, **Heat Exchanger** Troubleshooting & Maintenance, **Steam Trapping & Control**, **Control & ESD** System and Detailed Engineering Drawings, Codes & Standards.

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.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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.

Accommodation

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

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 – 0900	***Review of Course*** *Objectives of Course ● Timetables*
0900 – 0915	*Break*
0915 – 1030	***Control Valve Theory – Basic Principles*** *Introduction ● Definition of a Control Valve ● Types of Energy ● What is Happening Inside a Control Valve ● Choked Flow ● Cavitation ● Flashing*
1030 – 1100	***Video Presentation***
1100 – 1200	***Control Valve Types*** *Rotary ● Linear*
1200 – 1230	***Video Clips***

1230 – 1245	*Break*
1245 – 1330	***Characteristics & Trims*** *Valve Characteristics ● Application Examples ● Cavitation Control ● Anti-Cavitation Trim ● High Pressure Drop-Applications ● Low Noise Trim ● Diffusers*
1330 – 1420	***Control Valve Sizing*** *General ● Valve Coefficient (Cv) ● Simplified Sizing Equation ● Comparison of Valve Types ● Turndown vs Rangeability*
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 – 0900	***Process Considerations*** *End Connections ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● Leakage Rates ● International Standards*
0900 – 0915	*Break*
0915 – 0945	***Video Clips***
0945 – 1100	***Actuators & Positioners*** *Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Actuators*
1100 – 1230	***Video Clips***
1230 – 1245	*Break*
1245 – 1315	***Accessories*** *Auxilairy Hand-wheels ● Pressure Regulators ● Lock-up Valves ● ON-OFF Valve ● Position Transmitters ● Volume Boosters ● Limit Switches ● Solenoid Valves*
1315 – 1400	***Control Valve Selection*** *Introduction ● Decision Criteria ● Materials of Construction ● Valve Characteristics ● Actuator Considerations ● Price Comparison ● Selection Guidelines ● Application Comparisons ● Computer Sizing Programmes ● Summary*
1400 – 1420	***Video Clip***
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 – 0800	***Operational Issues*** *General Review ● Installation ● Maintenance ● Troubleshooting ● Corrosion ● Galling*
0800 – 0900	***Operation Checks*** *Control Valve Performance Characteristics – Dead Band ● T63 ● Response ● Dead ● Dynamic Time*

0900 – 0915	*Break*
0915 – 1100	***Control Valve Performance*** *Process Variability ● Dead Band ● Actuator/Positioner Design ● Valve Response Time ● Valve Type & Characterisation ● Valve Sizing*
1100 – 1230	***Common Valve Problems*** *Water Hammer Effects ● High Noise Levels ● Noise Attenuation ● Fugitive Emissions*
1230 – 1245	*Break*
1245 – 1330	***Control Valve Failures & Potential Causes*** *Introduction ● Physical Failures ● Velocity Problems ● Erosion by Cavitation ● Erosion by Abrasion ● Noise ● Vibration*
1330 – 1420	***The Three Approaches to Control Valve Maintenance*** *Reactive ● Preventive ● Predictive*
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 – 0800	***Immediate Maintenance or Repairing Action in Case of Any Discrepancies*** *Disassembly Protocols ● Critical Inspection ● Lapping & Grinding ● Assembly Clearances Setting ● Pressure Testing & Sealing*
0800 – 0900	***Field Communications*** *Analogue Signals ● Digital Communications ● Fieldbus Technologies*
0900 – 0915	*Break*
0915 – 0945	***Video Presentation***
0945 – 1230	***SMART Valves & Positioners*** *Introduction ● Development ● Digital Valve Controllers ● Case Study ● Future Development*
1230 – 1245	*Break*
1245 – 1420	***Proof Testing & Diagnostic*** *Safety Instrumented Systems – An Overview ● Proof Testing ● Partial Valve Stoking ● Diagnostics*
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*

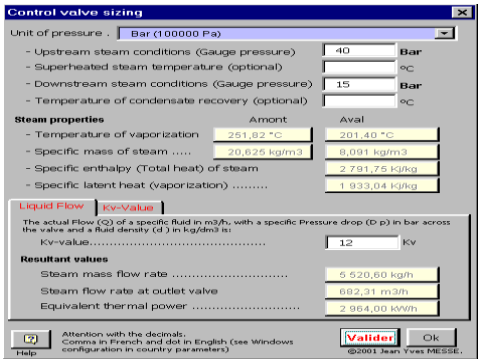
Day 5

0730 – 0900	***Fire Safe Valves*** *Introduction ● Requirements ● Sealing & Leakage ● Design Standards & Testing ● Examples*
0900 – 0915	*Break*
0915 – 1100	***Addendum*** *Typical Example ● Choke Valve ● Other Subjects*
1100 – 1230	***Practical Exercises***

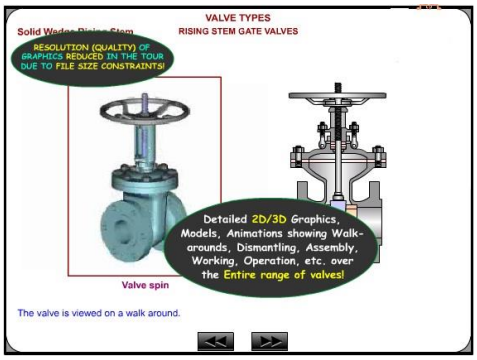
1230 – 1245	*Break*
1245 – 1345	***Computer Sizing Programme*** *Simple Water ● Simple Air ● High Pressure Drop Water ● H2SO4*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (Practical Sessions)

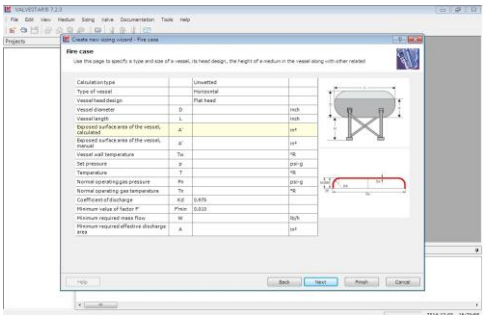
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE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



Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV²SIZE Software

Course Coordinator

Jaryl Castillo, Tel: +974 6652 9196, Email: jaryl@haward.org