COURSE OVERVIEW IE0131
Understanding and Tuning Controllers and Control Loops

Course Title
Understanding and Tuning Controllers and Control Loops

Course Date/Venue
Session 1: February 23-27, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: October 05-09, 2025/ Al Khobar Meeting Room, Hilton Garden Inn, Al Kho-bar, KSA

Course Reference
IE0131

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 valve simulators.

This course is designed to provide an introduction to process control to engineers and other technical staff. It teaches the base fundamentals, as well as open and closed loop tuning methods. The course is developed with field tuning in mind, not control design.

The course will discuss the control fundamentals and terminology including the principles, control loop as well as the various types and right selection of control valve and describes the process control methods and characteristics of control valve.

It illustrates the different tuning rules available and explains the fundamentals of control systems, proper tuning of PID controllers, the concepts and application of feed forward control, auto tuning and new developments and troubleshooting tuning.

The various types of control valves, actuators and valve selection will also be discussed during the course.

Course Objectives

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

- Apply and gain a good working knowledge on tuning controllers and control loops
- Carryout tuning concepts for controllers based on business need
- Discuss the control fundamentals and terminology including the principles, control loop as well as the various types and right selection of control valve
- Describe the process control methods and characteristics of control valve
- Illustrate the different tuning rules available and explain the fundamentals of control systems
- Demonstrate the proper tuning of PID controllers and the concepts and application of feed forward control
- Identify auto tuning and new developments and employ good practices and troubleshooting tuning
- Discuss the various types of control valves, actuators and valve selection

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of tuning controllers and control loops for senior engineers, engineers, senior foremen, foremen and other technical staff who are willing to learn more about single loop controllers, PID and tuning. The course explains the essence of feedback control without going in-depth into math.

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 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 accreditation 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, Haward Technology has the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Ihab Al-Mughrabi, BSc, CAP, is a **Senior Instrumentation Engineer** with extensive years of experience in the areas of **Control Loops, Instrumentation Control & Automation**, **Fiscal Metering** Systems, **Pressure Control Valves**, Control Valves Selection & Sizing, **Instrument & Telecom** Construction & Commissioning, **HAZOP**, **Instrument** Calibration & Control, **Fiber Optics**, **Process Instrumentation**, **Safeguarding & Asset Integrity** Systems, **Motorized & Pneumatic Valve Actuators**, **Control System** Specification, **CCTV** System, FATs & SATs, **Metering Skid**, Programmable Logic Controllers (**PLC**), Distributed Control Systems (**DCS**), Supervisory Control & Data Acquisition (**SCADA**) Systems, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Flowmetering & Custody** Measurement, **Multiphase Flowmetering**, Measurement & Control, **Process Control**, **Control Systems & Data Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, **Alarm** Management Systems, **Engine** Management System, **Fieldbus** Systems, **P&IDs**, Instrument Index & Data Sheets, Loop, Sequence, Hook Up & Control Panel Drawings, Control Philosophy, Cause & Effect Diagrams, System Architecture, Electrical Equipment Installation, **Pneumatic & Hydraulic Systems**, **Power Electronics VSD, Electrical Wiring (Control & Power)**, **Pneumatic & Hydraulic Diagram**, **AutoCAD & PROEngineer (2D & 3D)**, **CISCO, MATLAB SimPowerSystems**, **Switchgear**, **Control Gear**, **Transformer**, Panels & Boards, **Cabling**, Termination & Testing, Instrument, JB, Cabinets & Panel Installation, Instrument Air & Impulse Line Installation, Factory & Site Acceptance Tests for DCS, ESD, Fiscal Metering Skid & Control Valves and Root Cause Analysis.

During his career life, Mr. Ihab has gained his practical and field experience through his various significant positions and dedication as the **Senior Control Engineer**, **Electrical & Instrumentation Engineer**, **Instrumentation Engineer**, **Electrical Maintenance Department Head** and **Senior Technical Instructor/Trainer** for numerous international companies like the Arab Aluminum Industry CO. LTD, **Jordan Petroleum Refinery** CO., Jordan Bromine CO. and **ADNOC Refining Co**., just to name a few.

Mr. Ihab has a **Bachelor's degree** in **Mechatronics Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Automation Professional** (**CAP**) from the International Society of Automation (**ISA**), **Safety Instrument System Expert**, **Certified Project Management Professional**, **Certified Functional Safety Engineer** and has delivered numerous trainings, courses, seminars and workshops internationally.

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 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	***Control Fundamentals*** *Terminology ● Principles of Control ● Basic Control Loop ● Advanced Control Loop*
0930 - 0945	*Break*
0945 – 1100	***Control Fundamentals (cont'd)*** *● Introduction to Different Types of Control Loops (Open, Close) ● Introduction to Different Types of Complex Control Loops ● Control Algorithm ● Control System*
1100 – 1215	***Control Valve Types*** *Butterfly ● Eccentric ● Rotary Plug ● Ball ● Plug*
1215 – 1230	*Break*
1230 - 1420	***Control Valve Types (cont'd)*** *Linear Valves ● Globe ● Cage ● Double Port ● How to Select the Right Valve?*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Process Control Methods*** *Open Loop ● Process Behaviour ● Time Lags ● Selection of Type of Controller ● Proportional*
0930 - 0945	*Break*
0945 – 1100	***Process Control Methods(cont'd)*** *Integral ● Derivative ● Feedback ● Cascade ● Ratio ● Feed Forward*
1100 – 1215	***Control Valve Characteristics*** *Selection of Flow Characteristics ● Sizing Steps ● Classification*
1215 – 1230	*Break*
1230 - 1420	***Control Valve*** *Cavitation ● Flashing ● Noise*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Different Tuning Rules Available*** *Basic Tuning (Proportional, Integral etc.) ● Overshoot ● Lambda Tuning ● Trial Tuning*
0930 - 0945	*Break*
0945 – 1100	***Different Tuning Rules Available (cont'd)*** *Cohen Coon Tuning ● Process Controllability ● Suggestions & Rules of Thumb*
1100 – 1215	***Fundamentals of Control Systems*** *On-Off Control ● Cascade ● Ratio ● FF*
1215 – 1230	*Break*
1230 - 1420	***Fundamentals of Control Systems(cont'd)*** *FB ● Prop. Band ● Integral ● Derivative ● Direct/Reverse*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 4

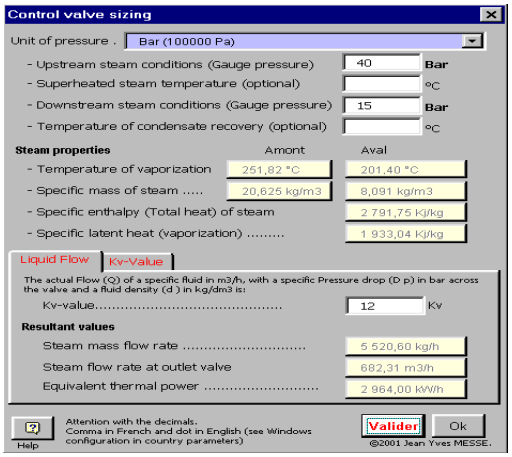
0730 – 0930	***Tuning of PID Controllers*** *Open Loop ● Ziegler Nichols ● Continuing Cycling Method*
0930 - 0945	*Break*
0945 – 1100	***Tuning of PID Controllers (cont'd)*** *Response Lags ● Closed Loop Control*
1100 – 1215	***VIDEO Presentation*** *Control Tuning*
1215 – 1230	*Break*
1230 - 1420	***Concepts & Application of Feed Forward Control***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 5

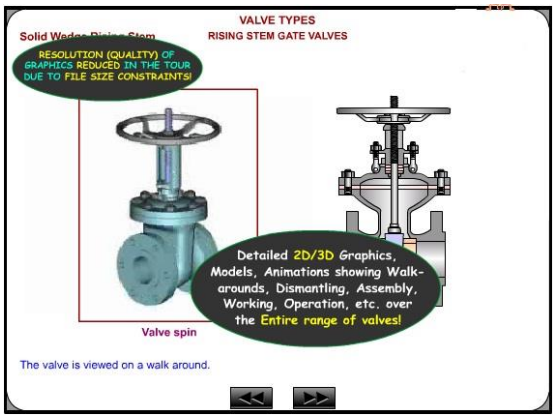
0730 – 0930	***Auto Tuning & New Developments***
0930 - 0945	*Break*
0945 – 1100	***Good Practices & Troubleshooting Tuning***
1100 – 1215	***Types of Control Valves, Actuators & Valve Selection***
1215 – 1230	*Break*
1230 - 1345	***Types of Control Valves, Actuators & Valve Selection (Cont'd)***
1345 - 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Practical Sessions)

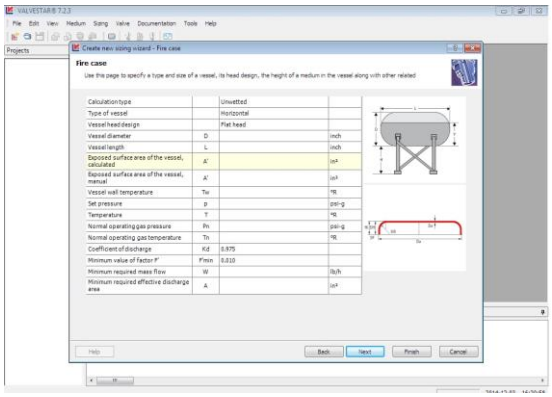
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE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



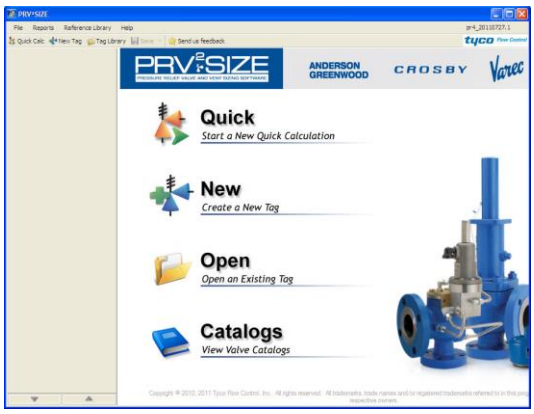
Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV²SIZE Software

Course Coordinator

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