COURSE OVERVIEW IE0273
Process Control & Control Loops & PID Tuning

Course Title
Process Control & Control Loops & PID Tuning

Course Date/Venue
November 10-14, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
IE0273

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 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 basic knowledge on process controller, control loop and valve tuning
- 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 process controller, control loop & valve tuning for engineers 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 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: -

- 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, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Engineer** with **35 years** of extens experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utiliti** industries. His experience widely covers in the areas of **Flow Measurement** Devic **PLC-HMI Controls**, Total Quality Management (**TQM**), Internal Audit Techniques in **TQ** Quality Management System (**QMS**), **Water Network** Pipe Materials & Fittings, **Mappi & Inventory** of Pipes & Fittings in the Water Supply System, **Water Distribution Syst** Operator, **Sewer System and Sewage Flows**, **Ultrasonic Inspection**, and **Advanc Visual Techniques** of Predictive Maintenance, Water Meter Reading (**MMR**), **Waste Water Syst** Planning & Design, **Network Management & Supervision**, **Leakage Prevention & Control**, **Water Le Detection**, Waste Water Treatment, **Water Utility Regulation and Economics**, **Water Netwo Systems**, **Health & Safety Rules & Regulations**, Safety Procedures in **Water Networks**, **Saf Management**, Principles of **Routine** and **Preventive Maintenance**, **Accident Investigation**, **Operati** & **Maintenance of Sewerage System**, Advanced Distributed Control System (**DCS**), **DCS** Operation Configuration, **DCS** Troubleshooting, **DCS Yokogawa** ProSafe-RS Safety Instrumented System, **D Yokogawa** Centum VP, **DCS Emerson** DeltaV, **DCS GE Mark VI**, Programable Logic Controller (**PL** Supervisory Control & Data Acquisition (**SCADA**) Systems, **Process Control**, **Control Systems & Da Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, Safety Instrumented Systems (**SI** Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Telemetry** Systems, **Boiler Control Instrumentation**, Advanced Process Control (**APC**) Technology, Practical **Fiber-Optics** Technolo **Compressor** Control & Protection, **GE Gas Turbines**, **Alarm** Management Systems, **Engi** Management System, **Fieldbus** Systems, **NEC** (National Electrical Code), **NESC** (National Electri Safety Code), **Electrical Safety**, **Electrical Hazards** Assessment, **Electrical Equipment**, Electri Transient Analysis Program (**ETAP**), Power **Quality**, Power **Network**, Power **Distribution**, **Distributi Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **Power Syst** Harmonics, **Power System** Planning, Control & Stability, **Power Flow** Analysis, **Smart Grid Renewable** Integration, **Power System Protection & Relaying**, Economic Dispatch & Grid Stabi Constraints in Power Plants, Electrical Demand Side Management (DSM), Electrical **Substatio Substation Automation** Systems & Application (IEC 61850), **Distribution Network** System Desi **Distribution Network Load**, Electrical **Distribution** Systems, **Load Forecasting** & System Upgra (Distribution), **Overhead Power Line** Maintenance & Patrolling, High Voltage **Switching** Operatio Industrial **UPS Systems & Battery** Power Supplies, Electric **Motors & Variable Speed Driv Generator** Maintenance & Troubleshooting, **Generator** Excitation Systems & AVR, **Transform** Maintenance & Testing, Lock-Out & Tag-Out (**LOTO**), Confined Workspaces and **Earthing & Groundi** He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Contro Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Lo Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities includ Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Serv Pricing, Evaluations & Tariffs, Project Management, Teaching and Consulting. His vast indust experience was honed greatly when he joined many International and National Companies such **Siemens**, **Electricity Authority**, Egyptian Electricity Holding, Egyptian Refining Company (ER **GASCO**, Tahrir Petrochemicals Project, and **ACETO** industries as the **Instrumentation & Electri Service Project Manager**, **Energy Management Engineer**, **Department Head**, **Assistant Profess Project Coordinator**, **Project Assistant and Managing Board Member** where he focused more dealing with Technology Transfer, System Integration Process and Improving Localization. He was furth greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Componer** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features

Dr. Ahmed has **PhD**, **Master's** & **Bachelor's** degree in **Electrical Engineering** from the **University Wisconsin Madison**, **USA** and **Ain Shams University**, respectively. Further, he is a **Certifi Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership a Management** (**ILM**), an active member of IEEE and ISA as well as numerous technical and scient papers published internationally in the areas of Power Quality, Superconductive Magnetic Ener Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedd Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power Syst Stability.

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: ***Sunday, 10th of November 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Control Fundamentals*** *Terminology ● Principles of Control ● Basic Control Loop*
0930 – 0945	*Break*
0945 – 1100	***Control Fundamentals (cont'd)*** *Advanced Control Loop ● Control Algorithm ● Control System*
1100 – 1215	***Control Valve Types*** *Butterfly ● Eccentric ● Rotary Plug ● Ball ● Plug ● Linear Valves ● Globe ● Cage ● Double Port*
1215 – 1230	*Break*
1230 – 1420	***Control Valve Types (cont'd)*** *How to Select the Right Valve?*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Monday, 11th of November 2024***

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: ***Tuesday, 12th of November 2024***

0730 – 0930	***Different Tuning Rules Available*** *Overshoot ● Lambda Tuning ● Trial Tuning*
0930 – 0945	*Break*
0945 – 1100	***Different Tuning Rules Available*** *Cohen Coon Tuning ● Process Controlability ● Suggestions & Rules of Thumb*
1100 – 1215	***Fundamentals of Control Systems*** *On-Off Control ● Cascade ● Ratio ● FF ● FB*
1215 – 1230	*Break*

1230 – 1420	***Fundamentals of Control Systems (cont'd)*** *Prop. Band ● Integral ● Derivative ● Direct/Reverse*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 13th of November 2024

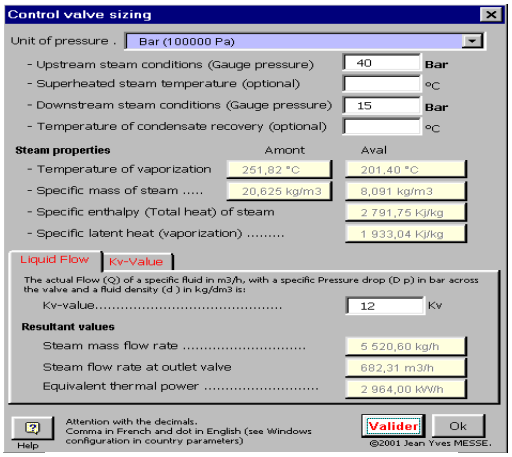
0730 – 0930	***Tuning of PID Controllers*** *Open Loop ● Ziegler Nichols*
0930 – 0945	*Break*
0945 – 1100	***Tuning of PID Controllers (cont'd)*** *Continuing Cycling Method ● Response Lags ● Closed Loop Control*
1100 – 1215	***VIDEO Presentation*** *Control Tuning*
1215 – 1230	*Break*
1230 – 1420	***Concepts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

Day 5: Thursday, 14th of November 2024

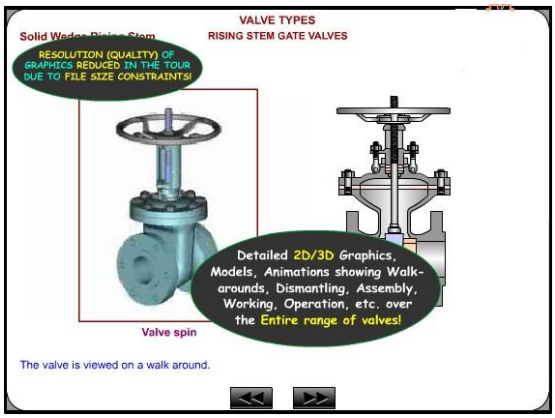
0730 – 0930	***Auto Tuning & New Developments***
0930 – 0945	*Break*
0945 – 1100	***Good Practices & Troubleshooting Tuning***
1100 – 1215	***Good Practices & Troubleshooting Tuning (cont'd)***
1215 – 1230	*Break*
1230 – 1345	***Types of Control Valves, Actuators & Valve Selection***
1345 – 1400	***Course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

Simulator (Hands-on Practical Sessions)

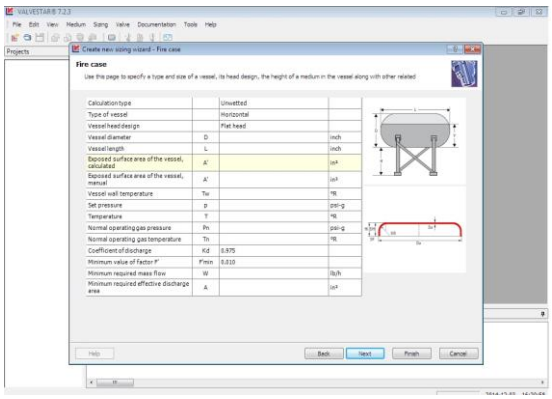
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE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



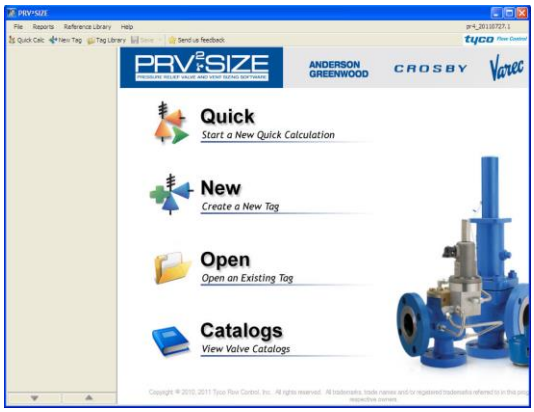
Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software



PRV²SIZE Software

Course Coordinator

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