COURSE OVERVIEW IE0031
Maintain Process Control Systems

Course Title
Maintain Process Control Systems

Course Reference
IE0031

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	April 28 – May 02, 2024	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
2	July 28 – August 01, 2024	The Kooh Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE
3	December 23-27, 2024	Hampstead Meeting Room, London Marriott Hotel Regents Park, London, United Kingdom
4	February 23-27, 2025	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey

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 process control system and controller turning. It covers the process control terminology, need and benefits; the control theory basics; the process control variables and applications including on/off control applications of temperature and level; the control loop components and symbols used for the equipment and technology; and the feedback control and feedforward.

Further, the course will also discuss the components and applications of field instrumentation control loops; the control valves covering actuators and positioners, classification, principles, application-function and on-off valves; the smart transmitters configuration and calibration; the types of control loop diagrams, P&ID reading and interpretation; the field process control system design and installation; and the PID controller, proportional control (P), integral (reset) action and derivative or rate action.

During this interactive course, participants will learn to employ the controller algorithms and tuning including the algorithms types and the necessity for controller tuning; discuss the methods of tuning PID control, set tuning parameters PID and applications and troubleshoot PID control loops; recognize the process control systems for ratio control, cascade control and feedforward control; differentiate the oil production separator control system and turbine and compressor lube/seal oil control system; and identify the main components of PLC and DCS systems.

Course Objectives

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

- Apply and gain a basic knowledge on process control system and controller turning
- Define process control system including its terminology, need and benefits as well as consider safety and abnormal situations
- Discuss the control theory basics consisting of control loop types, the task necessary for process control to take action and the terms commonly used
- Identify process control variables and applications including on/off control applications of temperature and level
- Recognize the control loop components and symbols used for the equipment and technology
- Employ feedback control and feedforward as well as describe the components and applications of field instrumentation control loops
- Discuss the control valves covering actuators and positioners, classification, principles, application-function and on-off valves
- Configure and calibrate smart transmitters by using HART communicator and process switches
- Identify the types of control loop diagrams, P&ID reading and interpretation
- Design and install field process control system and multivariable loops
- Apply PID controller, proportional control (P), integral (reset) action and derivative or rate action
- Employ controller algorithms and tuning including the algorithms types and the necessity for controller tuning
- Explain the methods of tuning PID control, set tuning parameters PID and applications and troubleshoot PID control loops
- Recognize the process control systems for ratio control, cascade control and feedforward control
- Differentiate the oil production separator control system and turbine and compressor lube/seal oil control system
- Describe the main components of PLC and DCS systems

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 process control system and controller turning 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

Doha	**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.
Dubai	**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.
London	**US$ 8,800** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), 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: -

- 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.

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. Alaa Abdel Kerim, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with over **35 years** of extensive experience in **ABB 11kV Distribution Switchgear**, **Operation & Maintenance of Rotork**, **Electrical Safety**, **HV Cable** Design, **Cable** Splicing & Termination, **Cable** Jointing Techniques, **High Voltage** Electrical Safety, **Electrical Drawing & Schematics**, **Electrical Power**, **Electrical Wiring**, Machines, **Transformers**, **Motors**, **Power Stations**, **Substation** Site Inspection, **HV/MV Cable Splicing**, **High Voltage Circuit Breaker** Inspection & Repair, **Cable & Over Head Power Line**, **High Voltage Power System** Safe Operation, High Voltage Safety, **High Voltage Transformers**, Safe Operation of **High Voltage & Low Voltage Power Systems**, **Fundamentals of Electricity**, **Electrical Standards**, Practical **High Voltage Safety Operating Procedures**, Modern Power System **Protective Relaying**, **Electrical & Control System** Testing, **Design**, **Commissioning**, **Operation** and **Maintenance** of **Switchgears**, **Transformers**, **Substations**, **Medium & High Voltage Equipment** and **Circuit Breakers**, **Electrical Motors & Variable Speed Drives**, **Power System** Equipment, **Distribution Network** System, **Electric Distribution System Equipment**, Practical Troubleshooting of **Electrical Equipment & Control Circuits**, **Electrical & Control System** Testing & Commissioning, **LV/MV/HV Circuit Breakers** Inspection & Maintenance, Electrical **Power Substation** Maintenance, **Power Stations**, **Uninterruptible Power Systems** (**UPS**), **Battery Chargers** and **AC** & **DC Transmission**, **DCS**, **PLC**, **SCADA**, **Siemens SIMATIC S7** Maintenance & Configuration, **Siemens Simatic S7 PLC**, **Siemens WINCC, Siemens SIMATIC & WinCC**, **Siemens**, PLC Simatic **S7-400/S7-300/S7-200**, **HMI**, **Automation System**, **Process Control & Instrumentation**, **Hydrocarbon**, **Level & Flow Measurements**, **Analytical Instrumentation**, **Find Control Elements**, **Control Loop Operation**, **Data Acquisition & Transmission**, **Electronics Technology**, **Power Systems Control**, **Power Systems Security**, **Power Transmissions**, **Power Generation**, **Electrical Substations** and **MV/LV Electrical System**.

During his career life, Dr. Alaa has been practically and academically involved in different **Power System** and **Instrumentation international companies** and **Universities** as a **Senior Professor** & **Consultant**, **Instrumentation Engineer** and **Electrical Engineer**. His recent practical applications experience includes the design, supply, installation, operation of full **DCS**, **SCADA**, **PLC**, **HMI Automation System** for **Sumid Line Petroleum**, **Siemens USA**, **AREVA USA** to name a few. His experience also includes electrical coordination, protection level adjustments and electrical testing.

Dr. Alaa has a **PhD** in **Electrical Engineering** from the **Technical University of Gdansk**, **Poland** and has **Master** and **Bachelor** degrees in **Electrical Machine & Power Engineering** from **Cairo University** and **Helwan University**, respectively. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings and workshops worldwide.

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	***Definitions & Theory of Process Control System*** *Definition of Terminology Associated with Process Control System ● Need and Benefits of Process Control ● Consideration of Safety & Abnormal Situations in Process Control System*
0930 – 0945	*Break*
0945 – 1100	***Control Theory Basics*** *Types of Control Loops & The Task Necessary for Process Control to Take Actions ● Definitions of the Terms Commonly Used in Process/Process Control ● Various of Process Variable Which Commonly Controlled with the Real Plant Operation ● Advanced Control Loop*
1100 - 1145	***Process Control Variables & Applications*** *Process Variable (PV), Manipulated Variable (MV) & Setpoint SP or Set Value (SV) ● Process Control Loops (Level, Pressure, Temperature, Flow)*
1145 - 1230	***ON/OFF Control Applications (Temperature & Level)*** *Open Loop & Closed Loop Diagrams ● Manual & Automatic Control Comparison & Applications*
1230 – 1245	*Break*
1245 – 1330	***Hands - on Practical Training Using Digital Temperature Indicating Controller*** *Video Presentation*
1330 - 1420	***Components of Control Loops & the Symbols Used*** *The Equipment & the Technology ● The Symbols Referring to Common P&ID and SATORP P&ID*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Feedback Control & Feedforward*** *Applications Feedforward Plus Feedback*
0830 - 0930	***Components & Application of Field Instrumentation Control Loops*** *Sensors, Transducers, Transmitters, Controllers & Control Valves*
0930 – 0945	*Break*
0945 – 1100	***Control Valves*** *Actuators & Positioners, Classification, Principles, Application Function – Isolation, ON-OFF Valves ● Configuration & Calibration of Valve Positioners (Smart & Pneumatic)*
1100 – 1230	***Configuration & Calibration of Smart Transmitters*** *Using HART Communicator ● Process Switches (Installation & Calibration) ● Pressure , Level, Temperature & Flow*
1230 – 1245	*Break*

1245 – 1420	***Types of Control Loop Diagrams, P&ID Reading & Interpretation*** *Design & Installation of Field Process Control System ● Multivariable Loops*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***PID Controller Theory*** *Control Algorithm (Three-Term PID) PID Controller Modes ● Proportional, Integral or Reset & Derivative or Rate Action*
0830 - 0930	***Proportional Control (P)*** *Proportional Control Algorithm ● Offset ● Manual Reset*
0930 – 0945	*Break*
0945 – 1100	***Proportional Control (P) (cont'd)*** *Proportional Gain, Proportional Band, Limits of Proportional Action Determining the Controller Output ● Direction of Control Action (Direct and Reverse Action) ● Bumpless Transfer Between Manual & Automatic Control System ● Setting Values of Gain & Proportional Band ● Tuning of Proportional Control System*
1100 – 1230	***Integral (Reset) Action*** *Integral Action Eliminates Offset ● Setting Value of Integral or Reset Time ● Video Presentation ● Proportional-Integral Control Applications ● Tuning PI Process Control Loops*
1230 – 1245	*Break*
1245 – 1420	***Derivative or Rate Action*** *Setting value of Derivative or Rate Action ● Precaution When Using Derivative Action*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

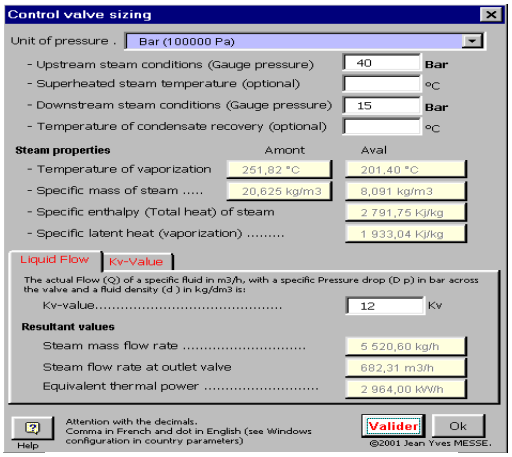
0730 – 0830	***Controller Algorithms & Tuning*** *Types of Algorithms – the Difference & the Working Principles ● The Necessity for the Controllers Tuning ● Proportional, Integral, Derivatives – The Definition & Application ● Sharing the Example from the Real Running Unit in SATORP*
0830 - 0930	***Tuning PID Controller*** *Methods of Tuning PID Controller ● Setting Tuning Parameters PID & Applications ● VIDEO Presentation ● Troubleshooting of PID Control Loops*
0930 – 0945	*Break*
0945 – 1100	***Hands on PID Practical Training on Digital Indicating Controller***
1100 – 1230	***Process Control Systems*** *Ratio Control ● Cascade Control ● Feedforward Control*
1230 – 1245	*Break*
1245 – 1420	***Cascade Control*** *Cascade Heat Exchanger Control System ● Cascade, Feedfoward & Boiler Level Control ● Cascade Control Tuning Guidelines*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 5

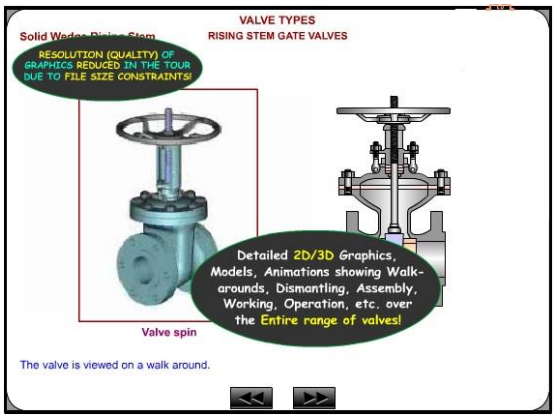
0730 – 0830	***Ratio Control*** *System & Application of Ratio Control System*
0830 - 0930	***Oil Production Separator Control System*** *Two and Three Phase Oil Separator Control System*
0930 – 0945	*Break*
0945 - 1100	***Turbine & Compressor Lube/ Seal Oil Control System*** *Compressor Surge Control*
1100 - 1230	***Introduction to PLC & DCS*** *Main Components of PLC & DCS Systems*
1230 – 1245	*Break*
1245 – 1345	***VIDEO Presentation*** *Control Tuning*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

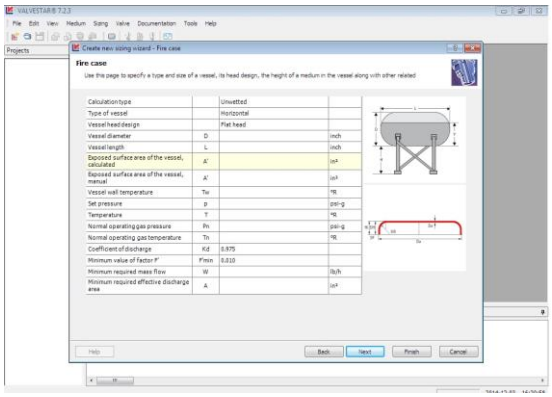
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE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



Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software

PRV²SIZE Software

Course Coordinator

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org