COURSE OVERVIEW IE0038
Process Control, Troubleshooting & Problem Solving

Course Title
Process Control, Troubleshooting & Problem Solving

Course Date/Venue
February 16-20, 2025/The Paragon Meeting Room, The H Hotel, Sheikh Zayed Road, Dubai, UAE

Course Reference
IE0038

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

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

Production processes consist of many complex apparatuses involving both moving and static parts as well as interconnecting pipes, control mechanisms and electronics, mechanical and hermal stages, heat exchangers, waste and side product processing units, power ducts and many others. Bringing such a complicated unit online and ensuring its continued productivity requires substantial skill at anticipating, detecting and solving acute problems. Failure to identify and resolve these problems quickly can lead to lost production, off-spec product, equipment loss, and even catastrophic accidents. Therefore, the ability to troubleshoot process operations is one of the most valuable skills operations personnel can possess.

Troubleshooting is the process used to diagnose the fault safely and efficiently, decide on corrective action and prevent the fault from reoccurring. Process engineering, especially troubleshooting, is different from most other branches of technology in another respect: It is not advancing very quickly.

The principles of distillation, hydraulics, phase separation, and heat transfer, as they apply to process applications, have been well known for quite some time. The challenge in troubleshooting consists of untangling the influence that human error, mechanical failure, and corrosion have on these well-known principles. The aspect of the job that makes it so difficult is that most process problems are initiated by human error – a never-ending source of surprise.

Process control is becoming an increasingly important engineering topic, since the subject plays a crucial role in the design, operation and maintenance in areas such as power plants and chemical and industrial process plants. Control systems have advanced dramatically during the last decade. They become more modular and more sophisticated offering a vast variety of control functions for all the systems that operate within a modern "intelligent" facility. Enhanced functionality of the automation systems also means more complexity, interactive strategies, new technologies and systems management with resulting better control and improved reliability.

This course is designed to provide instruction in process control, instrumentation and the different types of troubleshooting techniques, procedures, and methods used to solve process problems. Participants will use existing knowledge of equipment, systems and the instrumentation to understand the troubleshooting process operations of an entire unit in a facility. Participants study concepts related to troubleshooting commissioning, normal startup, normal operations, normal shutdown, turnarounds, and abnormal situations, as well as the Process team role in performing tasks associated with these concepts within an operating unit.

A major part of the course is devoted to a detailed exposition of currently used control valves, the associated terminology, valve performance, valve and actuator types, control valve accessories as well as to the correct selection and sizing of control valves for a wide range of applications. The course addresses the important issues related to valve installation and maintenance. In addition, this training course also utilizes an extensive collection of state-of-the-art, externally generated process management and video material concerned with all aspects of plant management, including smart wireless solutions to the collection of plant data. In addition, the subjects of digital control systems will be discussed with sections on Distributed Control Systems (DCS), Programmable Logic Controllers (PLC) and SCADA systems.

Course Objectives

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

- Apply and gain an in-depth knowledge on process control, troubleshooting and problem solving
- Discuss process control covering process control benefits, basic measurement definitions, control loops and typical applications
- List down the different technologies currently in use in pressure, temperature, level and flow measurement
- Identify the various types of control valve and use a system approach in actuator selection
- Determine flow characteristics, valve accessories, control valve sizing and leakage rates

- Review and employ the different types of control loop strategies, PID control mode and learn the features and application of Distributed Control System (DCS)
- Discuss the system components and operation of the Programmable Logic Controllers (PLC) and describe the configuration of the SCADA systems
- Employ process troubleshooting, process control maintenance, effective methods for troubleshooting and best practices for maintaining process control equipment
- Discuss the most famous problem with process control equipment and apply preventive maintenance procedures

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 a complete and up-to-date overview of the process control, instrumentation and various troubleshooting techniques and procedures used to solve process problems. Process control engineers, instrumentation engineers, control system engineers, automation engineers and process engineers will definitely benefit from the engineering problem solving approach of the course. Supervisors, technologists and other technical and operational staff will gain an excellent knowledge from the practical aspects of this course.

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. Said Ghanem, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with almost **20 years** of wide experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industry. His extensive experience widely covers in the areas of **Process Control & Instrumentation**, **Pressure & Temperature** Measurement, **Level & Flow** Measurement, **Control Valve & Actuator**, Distributed Control System (**DCS**), Programmable Logic Controllers (**PLC**), **Control System & Instrumentation**, **GE Steam Turbines**, **Speedtronic Mark II**, **V & VIe**, Control Systems, **GE Gas Turbine Frame V**, **Combined Cycle Power Plant**, **ABB DCS Control**, **Ansaldo Gas Turbine**, **Field Instrumentation & Calibration**, PLC Step7 Control Systems, **Transducers & Control Valves**, **Switches**, **Transmitters**, Proximity Sensors, Control Systems Cards, **Analog & Digital Multi-meters**, Druck DPI 610, Hand Pump, Hart Communicator 475, Two Ansaldo Gas Turbine Model AE94.2, Process, Control Philosophy ,Logic & Wiring Diagrams, Instrument Specifications & Data Sheets For Sensors, Control Valves, PRVs, Electrostatic Discharge (**ESD**), Digital & Microprocessor Based Instruments, Mark VI Control System Software Program (**Toolbox ST**), **Compact PCI Controller**, IO NET, IO Packs & Terminal Boards & Sulzer Turbines. Further, he is also well-served in Firefighting Systems, Smoke Detectors & Gas Detectors, Model Predictive Control (**MPC**) & Adaptive Control Strategies, **Control System** Optimization, **Real-Time Control System** Monitoring, **RCA** Methodologies, **Control Loops**, **Lean** Methodologies, Statistical Process Control (**SPC**), **Energy Efficiency & Process** Optimization, **Automation & Control** Systems, **Process** Safety & Troubleshooting, **Process** Safety Controls & Mitigation Strategies, **Rotating Equipment** (**Pumps**, **Turbines**, **Compressors**), Preventive Maintenance & Reliability-Centered Maintenance (RCM) and **Steam Generation** Systems.

During his career life, Mr. Said has held various significant positions as the **Instrumentation & Control Maintenance Engineer**, **Instrument Field Maintenance Engineer**, **Senior Instrument Maintenance Engineer**, **Lead Instrument & Control Engineer** and **Senior Trainer/Lecturer** from the Ministry of Electrical Energy, Egyptians Maintenance Company (EMC) and Belayim Power Station Petroleum Company (Petrobel).

Mr. Said has a **Master's** degree in **Electrical Engineering** and a **Bachelor's** degree in **Electrical**, **Communication & Electronic Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops and conferences 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: ***Sunday, 16th of February 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0815 – 0830	***Introduction*** *Course Content ● Objectives of Course*
0830 – 0930	***Introduction to Process Control*** *Process Control Definition ● Process Control Benefits ● Basic Measurement Definitions ● Process Control History ● Control Loops ● Typical Applications*
0930 – 0945	*Break*
0945 – 1100	***Pressure Measurement*** *Basic Principles ● Definition of Terminology ● Pressure Elements ● Pressure Transducers ● Installation Considerations ● Summary*
1100 – 1215	***Temperature Measurement*** *Principles ● Thermocouples ● RTD's ● Thermistors Thermometer ● Infra-Red Thermometry ● Installation Considerations*
1215 – 1230	*Break*
1230 – 1330	***Level Measurement*** *Main Types ● Sight Glass Method ● Buoyancy Tape Systems ● Hydrostatic Pressure ● Ultrasonic Measurement ● Radar Measurement ● Electrical Measurement ● Installation Considerations*
1330 – 1420	***Video Presentation*** *Radar Level Measurement*
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: ***Monday, 17th of February 2025***

0730 – 0830	***Flow Measurement*** *Differential Pressure Flowmeters ● Oscillatory Flow Measurement ● Non-Intrusive Flowmeters ● Mass Flow Meters ● Positive Displacement Meters ● Installation Considerations ● Selection Guidelines*
0830 – 0930	***Video Presentation*** *Coriolis Effect Mass Flowmeter*
0930 – 0945	*Break*
0945 – 1100	***Control Valve Types*** *Rotary ● Linear ● Control Valve Selection*
1100 – 1215	***Actuator Selection*** *Introduction ● Types of Actuators ● Linear Actuators ● Rotary Actuators ● Actuator Forces ● Positioners ● Fail Safe Actuators*
1215 – 1230	*Break*

1230 – 1330	***Control Valves*** *Basic Terminology ● Flow Characteristics ● Valve Accessories ● Control Valve Sizing ● Leakage Rates*
1330 – 1420	***Practical Session*** *Control Valve Sizing*
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: Tuesday, 18th of February 2025

0730 – 0830	***Control Loop Strategies*** *Introduction ● Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● ON-OFF Control ● PID Control Mode*
0830 – 0930	***Video Presentation*** *PID Control*
0930 – 0945	*Break*
0945 – 1100	***Distributed Control Systems*** *Introduction ● Traditional Process Controllers ● DCS Definition ● Architecture of Controllers ● Software ● DCS Network ● DCS Application ● DCS Operator WorkStation ● Function Blocks*
1100 – 1215	***Video Presentation*** *Distributed Control Systems*
1215 – 1230	*Break*
1230 – 1330	***Programmable Logic Controllers*** *Introduction ● Today's Position ● Principles of Operation ● System Components ● I/O Interfaces ● Configuration and Programming Languages*
1330 – 1420	***SCADA Systems*** *Basic Definitions ● Level of Hierarchy ● Communication Systems ● SCADA Benefits*
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: Wednesday, 19th of February 2025

0730 – 0930	***Process Troubleshooting*** *Troubleshoot Process Control Issues ● Effective Methods of Troubleshooting*
0930 – 0945	*Break*
0945 – 1130	***The Process Control Maintenance*** *Maintenance Definition ● Types of Maintenance ● Preventive Maintenance*
1130 – 1215	***Effective Methods for Troubleshooting*** *Identify the Problem ● Check the Software ● Check the Process ● Check the Human Factors ● Apply the Solutions*

1215 – 1230	*Break*
1230 – 1420	***Best Practices for Maintaining Process Control Equipment*** *Plan and Schedule Maintenance Activities ● Train and Equip Maintenance Staff ● Monitor and Inspect Process Control Equipment*
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: Thursday, 20th of February 2025

0730 – 0930	***Most Famous Problems with Process Control Equipment*** *Control Valves Problems and Methods of Solution ● Pressure Transmitter Problems with its Solution ● Capillary DPT ● Calibration*
0930 – 0945	*Break*
0945 – 1145	***Preventive Maintenance Procedures*** *PM Procedure for Pressure Transmitter ● PM Procedure for Temperature Transmitter*
1145 – 1215	***Case Studies - Working in Groups***
1215 – 1230	*Break*
1230 – 1345	***Case Studies - Working in Groups***
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*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises: -

Course Coordinator

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