COURSE OVERVIEW IE0038
Process Control, Instrumentation, Troubleshooting & Problem Solving

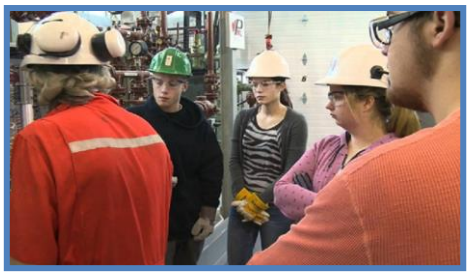
Course Title
Process Control, Instrumentation, Troubleshooting & Problem Solving

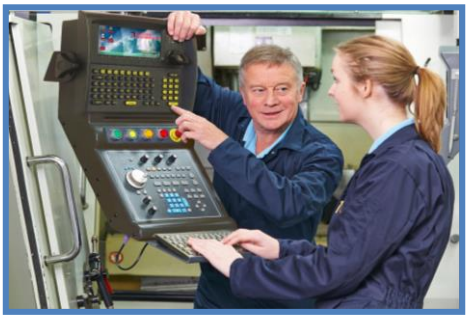
Course Date/Venue
November 18-22, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

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, 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 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 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 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 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. John Vorster, MSc, BTech, is a **Senior Instrumentation**, **Control & Energy Engineer** with over **25 years** of industrial experience within the **Oil**, **Gas**, **Process**, **Refinery**, **Power** and **Nuclear** industries. His wide expertise includes Programmable Logic Controller (**PLC**), **Process Control** Design & Plant Modelling, **Instrumentation**, **Automation**, **Process Control** Instrumentation, **Process Control**, **SCADA** System, Introduction to **SCADA**, **PLC & SCADA** for Automation & Process Control, Distributed Control System (**DCS**), **Instrumentation & Safeguarding**, **Process Control Measurement**, **Pressure** Measurements, **Temperature** Measurements, **Level** Measurement, **Flow** Measurement, **Control Valves & Actuators**, **Energy Management** System Awareness, **Renewable Energy**, **Energy** Conservation & Technologies, **Utility Systems**, **Nuclear** Energy, **Distributed Energy Systems**, **Natural Gas Distribution**, **Field Indication Instruments**, **P&ID** & Technical Specification, **Test Equipment Calibration**, **Field Bus** & **Field Communications**, Testing, Calibration & Maintenance of **Flow**, **Level**, **Pressure & Temperature**, **Loss Control** & **Multiphase Flowmetering**, **Custody Measurement** & **Loss Control**, **Flow Measurement** & **Custody Measurement**, **Flow Computer**, **Turbine Flowmeters**, **Ultrasonic Flowmeter**, **Positive Displacement Flowmeter**, **Coriolis Flowmeter**, **Flow Rate Corrections**, **Pressure Flow Transmitters**, **Pressure Methods**, **Flow Nozzles**, **Orifice Plates**, **Venturi Tubes**, **Pitot Tubes**, **Analyzer** Measurement Systems, **Pressure** Management, Selection & Sizing of all Instrumentation, **SIL** Criteria, Calibration & Configuration of Installed Instrumentation, **Bearing Replacement** and **Control Valves**. Further, he is also well-versed in HAZOP, LOPA Studies, Radiation Protection, Hazardous Substances, Hazardous Area Classification, Nuclear Devices Maintenance, Loop Drawings, Loop Calculations, Engineering Drawings, Shutdown Maintenance & Planning, Asset Management, Six Sigma, Energy Management & Measurements, Project Management, Strategic Resource Planning, Budget Preparation, ISO 9001, ISO 14000 and ISO 18000 standards. He is currently the **Instrumentation Analyzer & Engineer** of **Sasolburg** wherein he is in-charge of the design and monitoring of the analyzer measurement systems.

During his career life, Mr. Vorster has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Senior Trainer/Instructor**, **Senior Instrumentation Engineer**, **Instrumentation Engineer**, **Green Belt Project Leader**, **Instrumentation Technologist**, **Senior Instrumentation/Electrical Artisan**, **Instrumentation Artisan** and **Apprentice Instrumentation** for numerous international companies including **Sasolburg**, **DOW Chemical Company**, **Safripol** and **Iscor**.

Mr. Vorster has a **Master's** degree in **Engineering Development & Management**, as well as a **Bachelor's of Technology** degree and a **National Diploma** in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an **Appointed Radiation Protection Officer** and a **Qualified Instrument Mechanician**. Moreover, he is an active member of Project Management Institution (**PMI**) and South African Institute of Measure and Control (**SAIMC**) and has delivered numerous courses, workshops, conferences and seminars internationally.

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: ***Monday 18th of November 2024***

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: ***Tuesday 19th of November 2024***

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: Wednesday 20th of November 2024

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: Thursday 21st of November 2024

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*

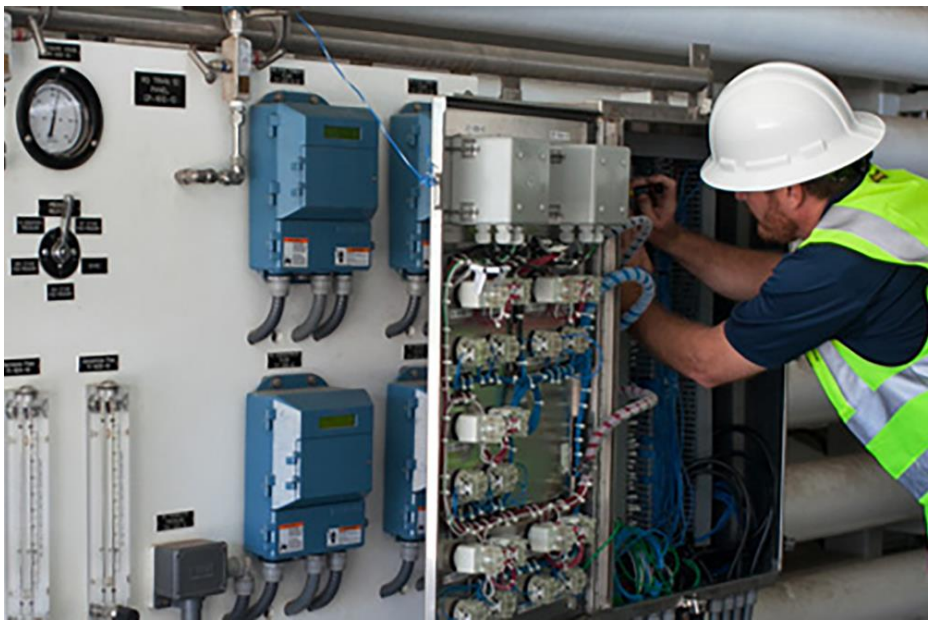
1215 – 1230	*Break*
1230 – 1420	***Best Practices for Maintaining Process Control Equipment*** *Plan and Schedule Maintenance Activities ● Train and Equip Maintenance Staff ● Monitor and Inspect Process Control Equipment*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief 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: Friday 22nd of November 2024

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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