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

Course Title
Process Control, Instrumentation, Troubleshooting & Problem Solving

Course Date/Venue
November 24-28, 2024/Boardroom 2 Meeting Room, Gezi Hotel Bosphorus, Istanbul, Turkey

Course Reference
IE0038

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 one of our state-of-the-art simulators.

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 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, instrumentation, troubleshooting and problem solving
- Discuss process control covering control history, basic measurement definitions, P&ID symbols, 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 the various process considerations for the instrumentation for industrial applications

- Review and employ the different types of control loop strategies 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 proper techniques in troubleshooting process operations and carryout successful troubleshooting activities
- Analyze the mental problem-solving process and demonstrate the use of the troubleshooter's worksheet
- Practice the rules-of-thumb techniques for troubleshooting process equipment and enumerate the typical causes of problems with process equipment that covers an extensive range of process equipment
- Develop problem solving, data gathering and interpersonal skills and recognize the importance of these skills in troubleshooting process operations
- Practice the troubleshooting skills by working in small workshops on a wide range of case studies drawn from the process industries

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$ 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:

Mr. Attalla Ersan, PEng, MSc, BSc, is a **Senior Engineer** with over **35 years** of extensive experience within the **Oil & Gas**, **Hydrocarbon** and **Petrochemical** industries. His expertise widely covers the areas of **Process Analyzer & Analytic Instrumentation**, **Process Control**, Instrumentation, Troubleshooting & Problem Solving, **Process Plant** Operations, **Process Plant** Startup & Operating Procedure, **Control Room** Emergency Response, **SIL Criteria**, Calibration & Configuration of Installed Instrumentation, **PLC & DCS**, **Bearing** Replacement, **Control Valves**, **Emergency Response** Planning, **Boiler & Steam** System Management, **Process Control** Design & Plant Modelling, **Process** Instrumentation & Automation, **Process Control** Instrumentation, **Analyzer Measurement** Systems, **Pressure** Management and Selection & Sizing of all Instrumentation. Further, he is also well-versed in **Permit to Work** System, **Power Transformers**, **Power System** Analysis, **Power Supply** Substations, **Electric Power System** Operation, Fundamentals of **Power System Equipment**, **Power System Stability**, **Power System Harmonics** Analysis, Mitigation & Solution Strategies, **Power System**, Generation & Distribution, **AC & DC Motors**, **Substations, Switchgears & Distribution**, **Electro-mechanical Protection Relays**, Engineering Drawings, Industrial **Power System Coordination**, Distributed Control System (**DCS**), **Honeywell TDS 3000 DCS**, **Liquid** and **Gas Flowmetering**, **Meter** Calibration, Hazard and Operability (**HAZOP**) Study, Process Hazards Analysis (**PHA**), **HAZOP** Facilitation, **Loss Prevention**, Consequence Analysis Application, **Gas Detectors** Operation, **Accident/Incident Investigation** (**Why Tree Method**), **Occupational Exposure** Assessment, **Fire Fighting & First Aid**, **Environmental** Management and Basic **Safety** Awareness. Project Management, Human Resources Consultancy, Manpower Planning, Job Design & Evaluation, Recruitment, Training & Development and Leadership, Creative Problem-Solving Skills, Work Ethic, Job Analysis Evaluation, Training & Development Needs, Bidding & Tendering, Technical Report Writing, Supervisory Leadership, Effective Communication Skills and Total Quality Management (TQM). He is currently the **CEO** of **Ersan Petrokimya Teknoloji Company Limited** wherein he is responsible for the design and operation of Biogas Process Plants.

During his career life, Mr. Ersan has gained his practical and field experience through his various significant positions and dedication as the **Policy**, **Organization & Manpower Development Head**, **Training & Development**, **Head**, **Ethylene Plant – Pyrolysis Furnace Engineer**, **Production Engineer**, Process Training Coordinator, Ethylene Plant Shift Supervisor, Ethylene Plant Panel & Fit Operator, Process Training & Development Coordinator, **Technical Consultant**, and **Instructor/Trainer** for Qatar Vinyl Company Limited and Qatar Petroleum Company (QAPCO).

Mr. Ersan is a **Registered Professional Engineer** and has a **Master's degree** of **Education** in **Educational Training & Leadership** and a **Bachelor's degree** of **Petrochemical Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, 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: ***Sunday 24th 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*** *Control History ● The Process of Control ● Basic Measurement Definitions ● P&ID symbols ● 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***
1430	*Lunch & End of Day One*

Day 2: ***Monday 25th 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	***Process Considerations*** *End Connections ● Face to Face Criteria ● Materials Selection ● Modes of Failure ● Leakage Rates*
1330 – 1420	***Practical Session*** *Control Valve Sizing*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: **Tuesday 26th of November 2024**

0730 – 0830	***Control Loop Strategies*** *Introduction ● Variables ● Basic Elements ● Manual Control ● Feedback Control ● System Responses ● ON-OFF Control ● Three Term Control*
0830 – 0930	***Video Presentation*** *Three Term Control*
0930 – 0945	*Break*
0945 – 1100	***Distributed Control Systems*** *Introduction ● Traditional Process Controllers ● Three Term Control ● Architecture of Controllers ● Software ● Programming ● Execution Time ● Programming vs. Configuration ● 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*
1330 – 1420	***SCADA Systems*** *Basic Definitions ● Level of Hierarchy ● Communication Systems ● SCADA Configuration*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: **Wednesday 27th of November 2024**

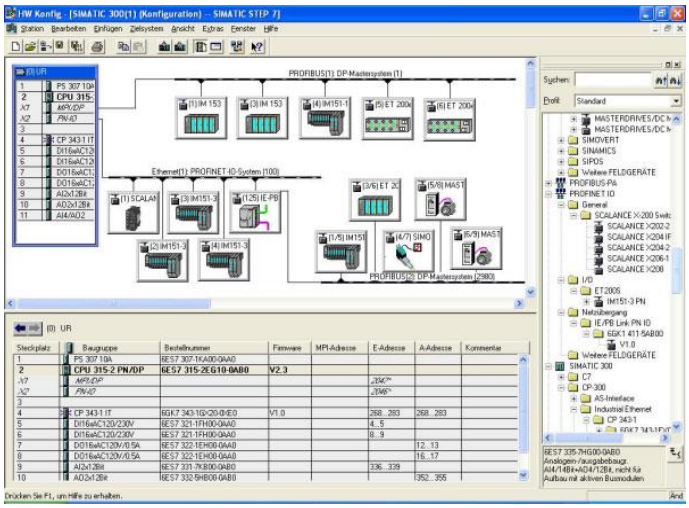
0730 – 0930	***Process Troubleshooting*** *Characteristics of a Trouble-Shooting Problem ● Characteristics of the Process Used to Solve Trouble-Shooting Problems*
0930 – 0945	*Break*
0945 – 1130	***The Mental Problem-Solving Process*** *Problem Solving ● Troubleshooting ● Overall Summary of Major Skills and a Worksheet ● Example Use of the Trouble-Shooter's Worksheet*
1130 – 1215	***Rules of Thumb for Troubleshooting*** *Overall ● Transportation Problems ● Energy Exchange ● Homogenous Separation ● Heterogenous Separations ● Reactor Problems ● Mixing Problems ● Size-Decrease Problems ● Size Enlargement ● Vessels, Bins, Hoppers and Storage Tanks ● "Systems" Thinking ● Health, Fire and Stability*
1215 – 1230	*Break*
1230 – 1420	***Problem Solving Skills*** *Developing Awareness of the Problem-Solving Process ● Strategies ● Exploring the "Context": What is the Real Problem? ● Creativity ● Self-Assessment*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5: **Thursday 28th of November 2024**

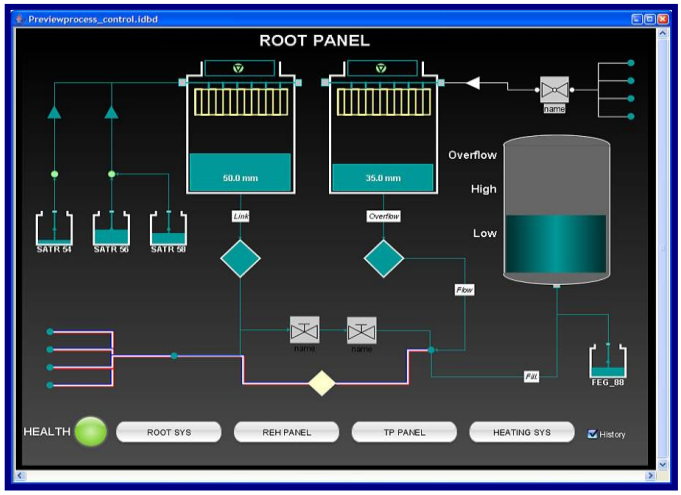
0730 – 0930	***Data Gathering Skills*** *How to Select Valid Diagnostic Actions ● Consistency: Definitions, Cause-Effect and Fundamentals ● Classification ● Recognizing Patterns ● Reasoning*
0930 – 0945	*Break*
0945 – 1145	***Interpersonal Skills*** *Interpersonal Skills ● Factors that Affect Personal Performance ● The Environment*
1145 – 1215	***Case Studies - Working in Groups***
1215 – 1230	*Break*
1230 – 1345	***Case Studies - Working in Groups***
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 one of our state-of-the-art simulators "Siemens SIMATIC Step 7 Professional Software", and "HMI SCADA".



Siemens SIMATIC Step 7 Professional Software



HMI SCADA

Course Coordinator

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