

Training Title

MAINTAIN PROCESS CONTROL SYSTEMS

Training Duration

5 days

Training Venue and Dates

	Maintain Process Control				
PE001	Systems	5	04-08 Nov, 2024	\$6,500	London, UK

In any of the 4 or 5-star hotels. The exact venue will be informed once finalized.

Training Fees

- \$6,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch.

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

The importance of the control system in a plant's process safety, quality, environmental controls, cycle times, and production rates—basically the heart of the process operations.

Process control technology is the ability to monitor and control a continuous process in real time and for systems with large dead times, interactions, and multiples constraints, the ability to provide the necessary patience, anticipation, and forecast of future, for moving the operation to its optimum. This allows the process conditions to be adjusted faster and responsively, and avoids the dead time associated with monitoring the finished goods.

The importance of measurement instrumentation as input to the controllers should have reproducibility and repeatability to meet the process control purpose. The sensor information is combined and processed using controllers of the process.

Programmable Controllers are used in every aspect of industry to expand and enhance production; It uses digital and analog I/O modules to interface to sensors, actuators and other equipment which can be made available in redundant or triplicated configuration

This course applied process control and ESD safety system philosophy and its major components, theory of operations, types and applications, fundamental of instrumentation and control principles, attendees will learn about field measurement devices, types of signals, final control element, closed loop, control mode of operation, DCS components and operation,

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Safety Instrumented System (SIS) for process industries using IEC 61508 & IEC 61511, High integrity Pressure Protection System (HIPPS), Systems integration, Process troubleshooting & Alarm management system (alarm & trip), Fire and Gas system types, components and operations.

Participants will gain a better understanding of process control components and systems.

TRAINING OBJECTIVES

By the end of the course, participants will be provided with the basic theoretical and practical understanding of:

- The impact of modern instrumentation
- Signal Category, Standard Ranges
- The major technologies used in the measurement of Flow, Level, pressure and temperature principle of operation.
- Control system basics
- Feedback control strategies, control hierarchy, process dynamic,
- On-Off control, controller modes, proportional, integral and derivative
- Applications with Cascade control, ratio control and feedforward control
- Recognize and Understand the objectives of principal PLC functions
- Identify the basic components of PLC and where they are utilized.
- Identify the Programmable logic controllers' basic architecture.
- Power supply module function and circuits.
- Input / Output modules types and function.
- Processor module typical function.
- Memories and memory allocation.
- Programming devices.
- PLC programming languages.
- Identify the basic IEC 611313 programming languages: Relay Ladder Diagram (RLD), Structured Text (ST), Function Block Diagrams, Instruction List (IL) and sequential Function Chart (SFC)
- DCS components and operation, system architecture, redundancy concept and hardware configuration, HMI, types of display, reporting and trending
- Alarm management system and process troubleshooting
- Safety Instrumented System (SIS) and HIPPS.
- Fire & Gas system technology, types of sensors, theory of operations and applications

TOPICS COVERED

- What is control system?
- Purpose of instrumentation
- Variables measured and controlled
- Final control elements

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- Basic measurement concepts
- Flow measurement
- Level measurement
- Pressure measurement
- Temperature measurement
- Basic Control Theory
- Closed Loop Control
- PLC components, architectures and applications
- DCS components and operation
- Safety Instrumented System (SIS)
- High Integrity Pressure Protection System (HIPPS)
- Alarm management system
- Process troubleshooting

WHO SHOULD ATTEND?

- Process Control Engineers
- Safety Engineers
- Control Systems Engineers
- Instrumentation Engineers
- Operations Managers
- Maintenance Technicians
- Plant Managers
- Safety Analysts

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions and motivating everybody to find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of the multiple-choice type will be made available on a daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

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DAILY OUTLINE

INTRODUCTION TO INSTRUMENTATION AND CONTROL SYSTEM

- Measured and controlled variables
- Performance terms and specifications
- Measurement terminology
- P&ID symbols

FLOW MEASUREMENT

- Basic fluid properties
- Reynolds number
- Flow measurement and rangeability
- Flow measuring sensors types
- Differential pressure flowmeters
- Mechanical flowmeters
- Ultrasonic flowmeters
- Mass flow-meters, Coriolis.

LEVEL MEASUREMENT

- Basic principles
- Float systems
- Displacement systems
- Conductive level detection
- Ultrasonic level measurement
- Radar gauging

PRESSURE MEASUREMENT

- Basic principles
- Bourdon tubes
- Diaphragm elements
- Electrical displacement sensors

TEMPERATURE MEASUREMENT

- Basic principles
- Thermocouples
- Resistance thermometry
- Thermistors
- Radiation thermometry

FUNDAMENTALS OF PROCESS CONTROL

- Process Dynamic
- ON/OFF control
- Proportional control
- Proportional offset
- Integral action

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- Integral windup
- Stability
- Derivative action
- PID control
- Control algorithms
- Load disturbances and offset
- Feedforward control, cascade and ratio control

FUNDAMENTALS OF TUNING

- Basic principles
- Open loop reaction curve method (Ziegler-Nichols)
- Default and typical settings
- Closed loop continuous cycling method (Ziegler-Nichols)

BASIC VALVE THEORY

- Valve types
- Control valve characterization
- Defining the valve flow coefficient, C_v
- Inherent characteristics
- Valve testing and diagnostics

FUNDAMENTALS OF PLC HARDWARE

- PLC hardware configurations
- Electrical wiring for inputs and outputs
- Electrical Ladder Diagrams and wiring symbols
- Block diagram of typical PLC
- PLC processor module – memory organization
- Input and output sections - module types, Power supplies

PLC PROGRAMMING

- Programming languages
- Types of PLC languages
- Ladder Diagram Format
- Ladder relay instructions
- Timers and Counters
- Methods of representing Logic, Boolean Algebra, instruction code and graphical presentation
- Fundamental ladder logic instruction set

DATA COMMUNICATION & PROTOCOLS

- RS-232 interface standard
- RS-485 interface standard
- Data high way plus DH+
- Network topology and Protocols
- Local area network (LAN)

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- Ethernet
- Token path

INTRODUCTION TO IEC 61131-3 Standard

- Concepts
- Common elements
- Programming languages: Ladder Diagram
- Function block diagrams

DISTRIBUTED CONTROL SYSTEM (DCS)

- System architecture
- Major component
- Controllers
- I/O System
- Communication
- Human Machine Interface (HMI)
- Types of display, Trends, Alarms and overview.
- DCS management of abnormal conditions
- System integration
- Troubleshooting from operation prospective.

SAFETY INSTRUMENTED SYSTEM

- What is Safety Instrumented System?
- Main components associated with an SIS
- Risk reduction
- Required Safety Integrity level (SIL)

HIGH INTEGRITY PRESSURE PROTECTION SYSTEM (HIPPS)

- Device integrity and architecture
- Process sensors
- Logic solver
- Final element
- Diagnostic
- Testing frequency
- Common cause failures
- Operations and troubleshooting

ALARM MANAGEMENT SYSTEM

- Introduction
- History of alarm system
- Definitions
- Alarm basics
- Alarm management costs and design
- Alarm management and safety instrumentation
- Alarm set point

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- Alarm presentation
- Alarm processing
- Improving the plant's alarm management
- Symptoms of alarm management problems
- The tools and elements of A.M
- A.M improvement and rationalization
- Emergency shutdown procedure

FIRE & GAS SYSTEM

- System choices and considerations
- Smoke detectors, types, principle of operations and applications
- Thermal sensors
- Gas detection, Combustible Gas detectors, and toxic gas detectors
- Fire detection, optical flame sensors, UV, IR, UV/IR, dual IR, Multi-IR
- System architecture
- Logic Solver, input / output device interface with logic solver.
- Typical triplicated system example for tricon controller in fire & gas system

NOTE:

Pre & Post Tests will be conducted.

Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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P.O BOX 45304
ABU DHABI, U.A.E

T +971 2 6264455
F +971 2 6275344

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