PLANT CONTROL SYSTEMS & INSTRUMENTED PROTECTION SYSTEMS

IPC017

COURSE DESCRIPTION

This course applies fundamental instrumentation and control engineering principles to oil and gas facilities design and operation and is designed to accelerate the development of new Facilities Instrumentation and Control Engineers. Using individual and group problem solving, attendees will learn about field measurement devices, valves and actuators, documentation, programmable logic controllers, power supplies, PLC, SCADA, DCS, SIS, hazardous areas, and installation methods. It is of utmost importance that a plant manager understands the essential aspects of Product Knowledge, Plant Safety, Environmental Regulations, Plant Operations and Business Principals.

COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Understand the principles and practice of instrumentation and control engineering
- Develop skills in analyzing and interpreting control systems
- Prepare control system documentation
- Apply effective techniques to installation and maintenance
- Take an informed and active role in control system operations

WHO SHOULD ATTEND

- Managers
- Controllers
- Field operators
- Operations engineers
- Technicians requiring knowledge of control and automation in a control system environment

COURSE DURATION

5 Working Days

1. Review of Process Control and Introduction to DCS

   - Review of sensors, instrumentation, and process control systems
   - Control Algorithms
     - Proportional (P)
     - Proportional and Integral (PI)
     - Proportional, Integral, and Derivative (PID)
   - Distributed Control Systems: Introduction
     - Overview, Features, Advantages, Where used
     - Functions, Architecture, I/O, components
     - Hardware, software, system interfacing
   - Programmable Logic Controller (PLC) – brief overview
   - Supervisory control and direct digital control
   - Supervisory Control and Data Acquisition (SCADA) – brief overview
   - DCS, PLC and SCADA compared

2. DCS Configuration and Networking

   - Distributed Control Systems: Structure and Configuration
   - DCS block diagrams, components, architecture, redundancy concepts
   - DCS hardware configuration
   - DCS Hardware & Software Internals
     - Process variables, software variables, tags
     - Human Machine Interface (HMI)
     - Alarms, Trends
     - Databases
   - Basic DCS Controller Configuration
   - Sequential Controllers for Batch Processing
   - Controllers for Continuous Processes: Function Blocks
   - Hierarchical Structure of control systems: ISA-95
   - Data Communications and Networking
     - Signal Transmission
     - Physical Network Structures
     - Logical Network Structures
     - Communication Standards
     - Control in the Field (CIF)
   - DCS applications and case study (Oil & Gas)

3. HMI, Alarms, and DCS Operation

- Human Machine Interfaces: Introduction, features, requirements
- Plant mimic and animation
- DCS Operator Stations
- Interface Categories
- Recorders, Loggers, Trend Displays, and Data Archiving
- HMI in the Control Room and in the Field: Mobile and remote devices
- Alarm Management
    - Key Requirements
    - Alarm System Functions
    - Alarms philosophy, control & Management
    - Development and Applications, Logs, trends and reports
- DCS Operation
    - Operational view of DCS
    - Role of operators
    - Integration and Optimization of DCSs
    - DCS Configuration
    - DCS Integration

4. Maintenance and Troubleshooting

- Maintenance Considerations
- Maintenance Requirements: System and Components
- Procedure for Checking Control Loop Calibration
- Identify proper tools and test equipment for troubleshooting
- Troubleshooting
    - Proper troubleshooting methods
    - Identify typical communication malfunctions and faults
    - Identifying failures, malfunctions, and faults
    - Diagnostics through DCS Modules, and Programs (code)
    - Diagnostics through Internal Variables and Bits of DCS
    - Diagnostics of Communication faults
- Advanced Process Controllers
    - Feed forward Control
    - Cascade Control
    - Statistical Process Control

- Basics of advanced process control and optimization
- Latest DCS Trends
  - Monitoring and control in the Field
  - Industrial Internet
  - Internet of Things
  - Mobile and remote devices