

Instrumentation and Process Control: From Basics to Advanced Techniques

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Energy Milestones Corporation Advancing Professionals to the next level

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Instrumentation and Process Control: From Basics to Advanced Techniques



Overview

The workshop starts off discussing aspects of transmitters, along with the modern choice of fieldbus, HART and other communication aspects. It then delves into the final control elements. This is followed by important aspects of pressure, level, temperature, and flow. The workshop then moves into process control and loop tuning, ending off with model-based control systems, and how this fits into the modern notion of process control.

Course Objectives

- Define the role and objectives of instrumentation in any plant
- Understand the importance of process variables in process control
- Develop their skills in selecting the right transmitter for an application
- Improve their skills in process control strategies
- Correctly implement loop tuning strategies (using numerous methodologies)
- Understand the concept of model-based control
- Comprehend the intricacies of IMC and MPC strategies

Course Content

1. Introduction to Process Variable Measurement
 - Sensors, Transducers and Instrumentation Systems
 - Instrumentation Signals
 - Instrumentation Terms and Definitions
 - HART Protocol
 - Fieldbus
 - Digital Communication and Techniques
 - A quick introduction to final control elements (including control valves, VSD and VFD)



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Course Content

2. Pressure, Level, Temperature, and Flow Measurement

- Pressure Measurement – principle of operation, devices, typical uses and installation considerations
- Level Measurement – principle of operation, devices, typical uses and installation considerations
- Temperature Measurement – principle of operation, devices, typical uses and installation considerations
- Flow Measurement – principle of operation, devices, typical uses and installation considerations

3. Process Control

- Process Dynamics
- Process Stability
- Process Responses
- Types of control that may be implemented
- The P part of PID Control
- The I part of PID Control
- The D part of PID Control
- Cascade Control

4. Advanced Control and Loop Tuning Strategies using Digital Controllers

- Ratio control
- Combined feed-forward and feedback control
- Open-loop tuning methods, using formulae
- Closed-loop tuning methods, using formulae
- Open-loop tuning, using trial and error
- Closed-loop tuning, using trial and error
- Dealing with processes that have large dead time



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Course Content

5. Model-Based Control, where a PID Controller isn't the Preferred Option

- Using a model-based controller
- Using a Smith Predictor
- Understanding Internal Model Control (IMC)
- Using a Dahlin's Controller
- Understanding and implementing Model Predictive Control (MPC)

Targeted Audience

- Plant Management Personnel
- Engineers from all disciplines
- Processing Control Technicians
- Supervisors
- People dealing with Instrumentation Equipment Selection

Course Methodology

Facilitated by an experienced professional trainer, this training course will be conducted as a highly interactive workshop session. A variety of training methodologies and facilitation techniques will be used before and during the course whenever applicable. These methods are aimed at enhancing individual and group interaction while maximizing learning. Some of these methods are:

- Online Pre-post Test
- Colorful Visual Aids
- Gamification
- Self-Assessment Instruments
- Simulations
- Case Studies
- Videos
- Group Exercises & Discussions
- Role plays
- Indoor & Outdoor games

