



N636: Fundamentals of Instrumentation and Controls (I&C) Training

Tutor(s): David Clarke

2 Days

Competence Level:
Awareness



Classroom Course

Summary

This 2-day course includes instruction on the fundamentals of instrumentation and controls as they apply to the oil and gas industry. Instrumentation and controls provide the basic building blocks for all automated control systems which we observe in every modern operating oil and gas facility. Solid robust and reliable instrumentation and controls not only ensures efficient and profitable plant operations, but also includes safe functionality of the process, protection of the environment and regulatory compliance when required. This course provides the opportunity for the participants to obtain a solid understanding of various technologies used for process measurements, final control elements and basic regulatory controls, including an understanding of common pitfalls related to design, maintenance and operational issues of instrumentation and controls.

Learning Outcomes

Participants will learn to:

1. Define and compare a wide range of industrial process technologies used to perform common measurements, including pressure, temperature, level and flow.
2. Identify and understand basic control system theory and various control strategies, and analyze both the effectiveness of the control strategy and potential failure mechanisms.
3. Read and interpret Piping and Instrumentation Diagram (P&ID) instrumentation and controls.
4. Identify the basic steps required to properly specify and size a control valve in common services—i.e., What do I need to know? What can go wrong?
5. Conduct and participate in various project meetings including: design review, Process Hazard Analysis (PHA) reviews, start-up planning, and operational improvement.
6. Develop maintenance standards and practices as related to instrumentation and controls, synthesizing knowledge of correct terminology and skills to communicate effectively.
7. Assemble and manage multi-discipline teams (e.g., instrumentation and controls engineers, technologists, and technicians).
8. Classify the special considerations required for designing, implementing, maintaining, and operating safety instrument functions, including: What is a safety instrument? What is a Safety Instrumented System? What do I need to know?

Duration and Training Method

Two classroom days providing 1.6 CEU (Continuing Education Units) or 16 PDH (Professional Development Hours).

Who Should Attend

This course focuses on instrumentation and controls used in the oil and gas process industries. The knowledge and understanding provided is typically required by engineers and technologists in the design phase and by operations and maintenance staff once facilities are up and operating. This course is suitable for anyone with an interest in wanting to know how instrumentation and control systems should be designed, maintained and improved. This provided knowledge can also be used in assessing process safety, emergency situations and regulatory compliance issues.



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Prerequisites and Linking Courses

The following course(s), or equivalent knowledge, experience and training, is a prerequisite.

- P&ID (Piping and Instrumentation Diagram) and Engineering Drawings Interpretation
- In addition, this course provides the basic foundation for:
- PHA / HAZOP Facilitation
- PH & RA ENG TÜV (Rheinland) Certificate

Course Content

Day One

1. Key Concepts
 - a. Introduction
 - b. Workshop overview
 - c. Definitions
2. Process Measurements
 - a. Purpose
 - b. Types of process measurements
 - c. Terminology
 - d. Design Considerations
 - e. Maintenance/Operations Considerations
 - f. Pressure
 - g. Temperature
 - h. Level
 - i. Flow
 - j. Custody Transfer
 - k. Other
 - l. Signal Communication
 - m. Quiz / Review

Day Two

1. Control Elements
 - a. Terminology
 - b. Manipulated Variables
 - c. Final Control Elements
 - d. Control Valves
 - e. Maintenance/Operations Considerations
 - f. Types
 - g. Characterization
 - h. Sizing
 - i. Design Considerations
 - j. Variable Frequency Drives
 - k. Quiz / Review



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2. Basic Regulatory Control
 - a. Purpose
 - b. Terminology
 - c. Basic Control Theory
 - d. Control Algorithms
 - e. Control Strategies
 - f. Loop Tuning
 - g. Design Considerations
 - h. Operation/Maintenance Considerations
 - i. Advanced Regulatory Control
 - j. Quiz / Review