



## Industrial Automation for Oil and Gas Applications - IC2 - eLearning course

### COURSE

#### About the Course

This introductory-level course provides an introduction and overview of process control/safety and SCADA systems, instrumentation, and control valves applications typically encountered in oil and gas facilities. The focus is to understand terminology, concepts, theory of operation, typical equipment specification and configurations, installation requirements, and common pitfalls.

#### Target Audience

Process, chemical, and mechanical engineers, (i.e., non-instrumentation and non-electrical disciplines), as well as other technical and non-technical professionals with little or no background in IC&E systems.

#### You Will Learn

##### Control Systems for Oil and Gas Applications

- Describe the relationship between current, voltage, and resistance
- Differentiate between self-powered and loop-powered devices
- Explain the nature of backup AC and DC power
- Describe what is control, types of control, and its purpose and architecture
- Identify the nature of analog and digital input and output signals
- Describe signals, the use of pneumatic actuators and control systems, and managing noise
- Identify various signal converters and types of wiring and cabling
- Describe instrument tag numbers, PID symbols, and documentation
- Explain Safety Instrumented System (SIS) and their uses
- Recognize the importance of identifying risks and hazards, and conducting assessments and analysis to address them
- Differentiate between BPCS and SIS
- Recognize the importance of SIL 1 to SIL 4 classifications
- Describe the SIS lifecycle
- Identify the need for product and application diagnostics
- Define management of change (MoC)
- Identify the need for a safety requirement specification
- Identify the purpose of an uninterruptible power supply (UPS)

## **Instrumentation Selection for Oil and Gas Applications (General)**

- Identify fluid properties as they relate to instruments selection in the oil and gas industry.
- Describe the material selection criteria in instrument selection.
- Gain guidance on some of the material compatibility requirements within the industry
- Discuss the operation of switches, relays and solenoids
- Describe the basic principles underlying the 4-20 mA instrument signal control loop
- Describe typical instrumentation documentation
- Describe the three main types of instrument connections

## **Instrumentation Selection for Oil and Gas Applications (Flow)**

- Review the basics of flow profiles
- Discuss the different technologies used for flow switches
- Identify the working principle, and advantages and disadvantages of the following positive displacement meters
- Identify the working principle, advantages and disadvantages of the following head loss meter technologies
- Describe the basic working principle of a turbine meter
- Explain Faraday's law and how this may be applied to the measuring liquid flow
- Describe the working principle of Doppler-based meters
- Review the working principle of transit-time meters
- Explain the working principles of clamp-on meters
- Review some of the tube arrangements used in Coriolis measurement
- Describe the phenomenon of vortex shedding and the formation of vortices
- Explain how the Strouhal factor varies with the bluff body shape and Reynolds number
- Describe the working principle of a typical vortex meter
- Discuss the role of a three-phase separator
- Identify the need for multiphase flow metering (MPFM)
- Explain the differences between calibration, verification, proving, and validation
- Discuss some of the on-site open and closed tank prover systems
- Explain the working principle of a bidirectional pipe prover
- Describe the working principle of eight unidirectional pipe prover
- Review the use and working principle of piston provers
- Describe the role of a LACT system
- Discuss the role of environmental influences
- Identify some common selection criteria
- Explain Safety Instrumented System (SIS) and their uses

## **Instrumentation Selection for Oil and Gas Applications (Level)**

- Review basic reasons for measuring level

- Discuss the pros and cons of using a bridge
- Explain the basic functions of a stilling well
- Describe how a simple sight glass is used to monitor the level
- Review how float systems can provide direct reading outputs
- Examine the use of hydrostatic pressure measurement in an open tank level measurement
- Describe the use of electronic remote diaphragm seals
- Discuss the working principle of ultrasonic gap point level meter
- Examine the working principles of conventional pulse radar
- Describe a simple laser-based level measuring system
- Examine the working principle of a Geiger Muller tube
- Explain principle of tank strapping

### **Instrumentation Selection for Oil and Gas Applications (Pressure, Temperature)**

- Review the fundamental principles of temperature measurement
- Describe the correct application and installation of RTDs, thermocouples, and thermistors
- Describe the requirements for specifying thermowells
- Review the basics of radiation thermometry
- Describe the working principles of the main types of mechanical pressure measurement and their applications
- Describe the features of multi variable pressure transmitters

### **Instrumentation Selection for Oil and Gas Applications (Analysis)**

- Describe the basic elements of an analysis system
- Review the need for basic sediment and water (BS&W) measurement
- Explain the need to measure pH in the oil and gas industry
- Describe the basis of Thin Layer Chromatography (TLC)
- Describe the basis of colorimetry
- Describe the working principle of UV fluorescence
- Select an instrument suitable to measure H<sub>2</sub>S in a gas stream
- Describe the technologies available for oxygen measurement

### **Control Valves for Oil and Gas Applications**

- Provide an overview of valve construction
- Briefly discuss the various methods of valve actuation
- Discuss the relevance of the vena contracta
- Compare the difference between flashing and cavitation
- Describe the various types of control valves
- Describe the various types of actuation devices

- Provide a basic overview of pressure regulators and their applications

## Course Content

- Control Systems for Oil and Gas Applications (Part 1)
- Control Systems for Oil and Gas Applications (Part 2)
- Instrumentation Selection for Oil and Gas Applications (General)
- Instrumentation Selection for Oil and Gas Applications (Flow)
- Instrumentation Selection for Oil and Gas Applications (Level)
- Instrumentation Selection for Oil and Gas Applications (Pressure, Temperature)
- Instrumentation Selection for Oil and Gas Applications (Analysis)
- Control Valves for Oil and Gas Applications

## Product Details

Categories: [Upstream](#)

Disciplines: [Instrumentation, Controls & Electrical](#)

Levels: [Basic](#)

Product Type: [Course](#)

Formats Available: [On-Demand](#)

Instructors:

## On-Demand Format

| Course | On-Demand (Available Immediately )

\$3,890.00

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