



IE186: Process Control and Safeguarding



Training Description:

Control systems for industrial applications have advanced dramatically during the last decade. They become more modular and more sophisticated offering a vast variety of control functions for all the systems that operate within a modern "intelligent" facility. Enhanced functionality of the automation systems also means more complexity, interactive strategies, new technologies and systems management with resulting better control and improved safety and reliability.

The ANSI SP 84 (formerly ISA 84.01) "Application of Safety Instrumented Systems for the Process Industries" standard requires that companies assign a target safety integrity level (SIL) for all safety instrumented systems (SIS) applications. The assignment of the target SIL is a decision requiring the extension of the process hazards analysis (PHA). The assignment is based on the amount of risk reduction that is necessary to mitigate the risk associated with the process to an acceptable level. All of the SIS design, operation, and maintenance choices must then be verified against the target SIL.

This intensive training course provides participants with the perfect bridge between theories and practical knowledge gained on the plant floor. It provides a thorough exposition of control components, pneumatics, actuators, and regulators and details their application to the industrial process. The course is designed for engineers and technicians in order to update them with the latest technologies in process automation, control and safeguarding. It covers the systematic method for selecting safety integrity levels (SIL's) for safety instrumented systems (SIS).

Some of the material in this course is based on the application of the safety life cycle as it is described in the international standards ANSI SP 84 "Application of Safety Instrumented Systems for the Process Industries" and EN/IEC 61508/61511. This course expands upon the framework developed in these standards. In addition to describing the tasks that users should perform during the safety life cycle, this course also provides detailed procedures for accomplishing these tasks. These procedures are based on risk analysis and reliability engineering principles from a variety of disciplines. Each topic will be discussed in a logically organized manner and contains an abundance of realistic problems, examples, and illustrations to challenge the participants to think and encourage them to apply this knowledge to the solution of practical problems.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply and gain an in-depth knowledge and skills in process control, instrumentation and safeguarding
- ✓ Practice pressure measurement, level measurement, temperature measurement & flow measurement and recognize their importance in process control
- ✓ Identify the various types of Control Valves and learn how to choose the right valve using the selection guidelines and application comparison
- ✓ List the various types of actuators and be able to demonstrate valve selection & sizing
- ✓ Illustrate field communications including their classifications and safety considerations
- ✓ Apply the basic control concepts, including variables, elements, system responses and on-off control and implement modes of control

- ✓ Discuss the principles, types, features, configurations and functions of distributed control systems (DCS), programmable logic controllers (PLC) and SCADA systems and recognize their practical applications in process control
- ✓ Apply the safety engineering principles and standards and learn the concept of safety life cycle as well as its various models and phases
- ✓ Practice hazard analysis as applied in process control safeguarding and employ the safety instrumented functions (SIF), SIS and SIL techniques
- ✓ Employ the alarm management concepts, principles, architecture, displays, functions and operator considerations
- ✓ Recognize the future trends in measurement, control system & communication technology

Training Designed for:

This course is intended for process control engineers and supervisors, instrumentation and control system engineers, automation engineers, application engineers and technologists, process engineers, electrical engineers and supervisors and those involved in the design, implementation, upgrading and safeguarding of industrial control systems.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction
- ❖ Review of Course
 - Objectives of Course
 - Timetables
- ❖ Introduction to Process Control
 - Basic Concepts
 - Performance Terms
 - Process Control Fundamentals
- ❖ Pressure Measurement
 - Bourdon Spring
 - Spring & Bellows Element
 - Diaphragm Elements
 - Pressure Transducers
 - Installation Considerations
- ❖ Level Measurement
 - Main Types
 - Buoyancy Tape Systems
 - Hydrostatic Pressure
 - Ultrasonic Measurement
 - Radar Measurement
 - Electrical Measurement
 - Installation Considerations



- ❖ **Video Presentation**
 - Radar Level Measurement
- ❖ **Temperature Measurement**
 - Thermocouples
 - RTD's
 - Installation Considerations
- ❖ **Flow Measurement**
 - Differential Pressure Flowmeters
 - Oscillatory Flow Measurement
 - Non-Intrusive Flowmeters
 - Mass Flow Meters
 - Positive Displacement Meters
 - Installation Considerations
 - Selection Guidelines
- ❖ **Video Presentations**
 - Coriolis Mass Flow Measurement
 - Ultrasonic Flowmeter

DAY TWO:

- ❖ **Control Valve Types**
 - Rotary
 - Linear
 - Valve Selection
 - Price Comparison
 - How to Choose the Right Valve
 - Selection Guidelines
 - Application Comparisons
- ❖ **Video Clips**
 - Control Valve Assembly Break
- ❖ **Actuator Selection**
 - Types of Actuators
 - Linear Actuators
 - Rotary Actuators
 - Actuator Forces
 - Positioners
 - Fail Safe Systems
- ❖ **Video Clips**
 - Actuator Assembly
- ❖ **Process Considerations**
 - End Connections
 - Pressure Classes
 - Face to Face Criteria
 - Materials Selection
 - Modes of Failure

- Leakage Rates
- ❖ **Video Clips**
 - Valve Sealing
- ❖ **Practical Session**
 - Valve Selection & Sizing
- ❖ **Video Clips**
 - Control Valve Assembly
- ❖ **Field Communications**
 - Introduction
 - Transmitter Classifications
 - HART and 4-2-mA
 - Driving the Circuit
- ❖ **Video Presentations**
 - HART Communications
 - Safety Considerations
 - Intrinsic Safety
 - Explosion-Proof Approval Standards
 - Oxygen Service

DAY THREE:

- ❖ **Basic Control Concepts**
 - Variables
 - Basic Elements
 - Manual Control
 - Feedback Control
 - System Responses
 - ON-OFF Control
 - Three Term Control
- ❖ **Video Presentation**
 - Three Term Control
 - Modes of Control
 - Stability
 - Ultimate Gain
 - Tuning Methods
 - Ratio Control
 - Cascade Control
 - Application Examples
- ❖ **Distributed Control Systems**
 - Introduction
 - Traditional Process Controller
 - System Architecture
 - DCS Types
- ❖ **Programmable Logic Controllers**
 - Introduction



- History
- Today's Position
- Principles of Operation
- System Components
- I/O Interfaces
- Configuration
- ❖ **SCADA Systems**
 - Basic Definitions
 - Levels of Hierarchy
 - SCADA Configuration

DAY FOUR:

- ❖ **Safety Engineering**
 - Introduction
 - Standards
 - Basic Fundamentals
 - Safety Life Cycle
 - Hazard Analysis
 - Safety Requirements Specification
- ❖ **Video Presentation**
 - HAZOP
- ❖ **Safety Instrumented Functions**
 - Definition
 - Example of a Safety Function
 - What a SIF is
 - What a SIF is not
 - How SIF fits with SIS and SIL
 - Summary
 - Bibliography
- ❖ **Safety Integrity Level**
 - Introduction
 - Definition
 - Selection Procedure
 - Practical Examples
- ❖ **Safety Instrumented Systems**
 - Introduction
 - Probability of Failure
 - System Architecture
 - Safety PLC
 - Major Systems
 - Typical Questions & Answers
- ❖ **Practical Sessions**
 - This hands-on and includes simulator, real-life case studies and exercises



DAY FIVE:

- ❖ **Alarm Management**
 - Introduction
 - Architecture
 - Update Times
 - Speed of Response
 - Operator Considerations
 - Alarm Displays
 - Alarm Priorities
 - Alarm Functions
 - Seven Steps to Alarm Management
- ❖ **Video Presentation**
 - Explosion at BP Texas City Refinery
- ❖ **Future Trends**
 - Measurement Technology
 - Control System Technology
 - Communication Technology
- ❖ **Video Presentation**
 - 3 Beam Ultrasonic Flowmeter
- ❖ **Case Studies**
 - Piper Alpha Disaster
 - Bhopal Gas Tragedy
 - Chernobyl Disaster
- ❖ **Addendums**
 - Review, Wrap-up Session
- ❖ **Course Conclusion**
- ❖ **Post-Test and Evaluation**

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

Practical Sessions will be organized during the course for participants to practice the theory learnt. Participants will be provided with an opportunity to carryout various exercises using one of our state-of-the-art simulators “Allen Bradley SLC 500”, “AB Micrologix 1000 (Digital or Analog)”, “AB SLC5/03”, “AB WS5610 PLC”, “Siemens S71200”, “Siemens S7-400”, “Siemens SIMATIC S7-300”, “Siemens S7-200”, “GE Fanuc Series 90-30 PLC”, “Siemens SIMATIC Step 7 Professional Software”, “HMI SCADA”, “Gas Ultrasonic Meter Sizing Tool”, “Liquid Turbine Meter and Control Valve Sizing Tool”, “Liquid Ultrasonic Meter Sizing Tool” and “Orifice Flow Calculator”.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

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Training & Career Development Department