Introduction to Safety Instrumented Systems

4-day program

Section 1 - Introduction

- Introduction to SIS
- Introduction to BPCS
- Difference between SIS and BPCS
- Scope of the SIS
- Safety Instrumented Function - Definition
- SIF Prevents a Specific Hazard
- SIS is Protective in Nature
- Hazards Protected by SIS
- Concern for SIS Design, Maintenance, and Operation
- Regulation and Standards
- Standard SIS Design

Section 2 – Applied areas

- Automatic vs. Manual Action
- Failure and Loss of Containment Point
- Improper Testing
- Equipment Selection
- Bypassing
- Accident Causal Factors
- Practical Example: High-Pressure Anti-Backflow
- Layer of Protection Analysis
- Anti-Backflow SIF: Proposed SIL 2 Design
- Anti-Backflow SIF: Proposed SIL 2 Design Verification

Section 3 – Safety Lifecycle

- Industry Standard for Safety Instrumented Systems (SIS)
- IEC 61511 Standard Safety Lifecycle
- Typical SIS Project Lifecycle
- Safety Integrity Level Selection
- Philosophy of Layers of Protection
- SIS Risk Reduction
- Model of Accident Causation
- Initiating Event Frequency
- Requirements of an Independent Protection Layer
- Credit for Layers of Protection
- Risk Tolerance Criteria – Target Selection
- LOPA Example – Distillation Column
- Risk Tolerance – Distillation Column
- LOPA Event Tree for Distillation Column
- Conceptual Design Attributes

- Safety Requirements Specifications
- SIL Verification
- Reliability Models
- Fault Tolerance
- Management of Change

Section 4 – Guidance for IEC 61511-1

- Management of functional safety
- Safety life-cycle requirements
- Verification
- Process hazard and risk assessment (H&RA)
- Allocation of safety functions to protection layers
- SIS safety requirements specification
- SIS design and engineering
- SIS application program development
- Factory acceptance testing (FAT)
- SIS installation and commissioning
- SIS safety validation
- SIS operation and maintenance
- SIS modification
- SIS decommissioning
- Information and documentation requirements
- Example of SIS logic solver application program development using function block diagram
    - General
    - Application program development and validation philosophy
    - Application description
    - Application program safety life-cycle execution