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IE210:
Instrument Protective Function (IPF)

Training Description:

This intensive training course will help the participants to improve compliance and reduce costs by guiding them through the development of the safety system including safety system layout, product selection and safety analysis to help them meet machinery safety performance level (PL) requirements as outlined by global standard (EN) ISO 13849-1.

The operation of many industrial processes, especially those in the chemical or oil & gas industries, involve inherent risk due to the presence of dangerous chemicals or gases. Safety Instrumented Systems (SIS) are specifically designed to protect personnel, equipment, and the environment by reducing the likelihood or the impact severity of an identified emergency event. Explosions and fires account for millions of dollars of losses in the chemical or oil & gas industries each year. Since a great potential for loss exists, it is common for industry to employ Safety Instrumented Systems (SIS) to provide safe isolation of flammable or potentially toxic material in the event of a fire or accidental release of fluids.

IEC 61511 has been developed as a Process Sector implementation of the international standard IEC 61508: "Functional safety of electrical / electronic / programmable electronic safety-related systems." The standard has two concepts, which are fundamental to its application; the safety lifecycle and safety integrity levels (SIL). The safety lifecycle forms the central framework which links together most of the concepts in this international standard.

It is a good engineering procedure for safety instrumented system (SIS) design. In the safety lifecycle, process risks are evaluated and SIS Performance requirements are established (availability and risk reduction). Layers of protection are designed and analyzed. Finally, a SIS (if needed) is optimally designed to meet the particular process risk. Safety integrity levels are order of magnitude levels of risk reduction. There are four SIL's defined in this standard, just as in IEC 61508. SIL1 has the lowest level of risk reduction. SIL4 has the highest level of risk reduction. The standard suggests that applications which require the use of a single safety instrumented function of SIL 4 are rare in the process industry and that they shall be avoided where reasonably practicable. The standard is primarily concerned with safety-instrumented systems for the process industry sector (sensors, logic solvers and final elements are included as part of the safety instrumented system). It also deals with the interface between safety instrumented systems and other safety systems in requiring that a process hazard and risk assessment be carried out.

This course will explain the basic concepts, definitions and commonly used terms in Safety Instrumented Systems and provide a basic understanding of SIS related concepts.

Further, the course discusses the fundamentals of ANSI/ISA 84.00.01-2004 Parts 1-3 (IEC 61511 modified). The course content is designed to provide the participant with an understanding of how to implement the requirements of the safety instrumented system (SIS) standards, to perform layers of protection analysis, to create a design to meet the safety integrity level (SIL), and to verify that the SIL has been achieved. It will also introduce the participant to the guidance contained in draft technical report, ISA TR84.00.04, which concerns implementation of ANSI/ISA 84.00.01-2004.

Training Objectives:

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

- ✓ Get certified as a "Certified SIL Professional"

- ✓ Apply a comprehensive knowledge in Safety Instrumented Systems (SIS), Safety Integrity Level (SIL) and Emergency Shutdown Systems (ESD) covering functional safety
- ✓ Emphasize the safety instrumented system management responsibilities and interpret the applicable safety standards such as IEC 61508, IEC 61511, ANSI/ISA S84.01
- ✓ Identify the phases of the safety life cycle and determine the safety requirement specification
- ✓ Carryout the various process hazard analysis namely the fault tree analysis, event tree analysis & FMEA and heighten awareness on HAZOP study
- ✓ Use a system approach on safety instrumented systems including its function and level and improve SIL determination using the ALARP method, semi quantitative methods, safety layer matrix method, risk graph method and LOPA Method
- ✓ Acquire knowledge on SIL verification and validation using a structured approach and review and improve SIS documentation
- ✓ Perform proof testing on SIS and ESD in process industry and conduct diagnostic procedures and partial valve stroking
- ✓ Perform the process of selecting sensors, final elements and logic solvers and discuss safety software models including their application
- ✓ Employ the operation and maintenance of SIS and ESD following the guidelines and procedures on planning and implementation
- ✓ Recognize the importance of SMART Safety Instrumented Systems including the intelligent field devices, digital communications, smart logic solvers and complete loop solution and implement SMART SIS

Training Designed for:

This course is intended for those in charge of functional safety. The course is also aimed at those involved in analyzing and controlling the ESD and those involved in the process safety, SIS, SIL, SIF, process control, process instrumentation and functional safety in process plants.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction
- ❖ Review of Course
  - Table of Contents
- ❖ Case Studies
  - Bhopal Gas Tragedy
  - Piper Alpha Disaster
  - Chernobyl Catastrophe
  - Bruncefield Oil Depot Explosion
- ❖ Safety Standards
  - Introduction
  - IEC 61508
  - IEC 61511
  - ISA S84

- Summary

❖ Safety Instrumented Systems – Management Responsibilities
- Safety Management
- Tolerable Risk
- Risk Reduction
- Risk Measurement
- Risk Management
- Layers of Production

❖ Safety Life Cycle Introduction
- Overview
- Phases of the Safety Life Cycle
- Safety Requirement Specification

❖ Process Hazard Analysis
- Introduction
- HAZOP Study
- Fault Tree Analysis
- Event Tree Analysis
- Failure Mode and Effects Analysis (FMEA)

❖ Video Presentation – HAZOP

❖ Recap

DAY TWO:

❖ Safety Instrumented Systems
- Introduction
- Safety PLC
- System Architecture
- Summary

❖ 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 (SIL)
- Introduction
- General
- SIL application
- Low Demand Mode vs Continuous Mode
- Probability of Failure on Demand
- Summary

❖ SIL Determination
- Summary

- Introduction
- Safety Integrity Level Concepts
- ALARP Method
- Semi Quantitative Methods
- Safety Layer Matrix Method
- Risk Graph Method
- LOPA Method

❖ Recap

DAY THREE:

❖ SIL Verification & Validation
- Introduction
- Verification
- Validation
- A Structured Approach
- Test Planning
- System Decomposition

❖ Integrated Fire & Gas Systems
- Introduction
- Industry Safety Performance Standards
- Components of a Good Fire & Gas System
- Application
- Conclusions

❖ Proof Testing Diagnostics
- Proof Testing
- Diagnostics
- Partial Valve Stroking

❖ Selecting Sensors and Final Elements
- Introduction
- Non-Essential Components
- Certified or Proven
- Probable Causes of Failure
- Smart Field Instruments
- Digital Valve Controller
- General Requirements for Fail Safe Operations

❖ Video Presentation
- HART Digital Communications

❖ Recap

DAY FOUR:

❖ Selecting Logic Solvers
- Preface
- Introduction
- Typical Specification
- Technologies for Logic Solvers

- Programmable Systems for Logic Solvers
- Overall PLC Reliability
- Major Systems
- Summary

❖ Video Presentation
- SIS Engineering

❖ SIS Software
- Introduction
- Development Life Cycle
- Certified Software Models
- Asset Management Software
- Summary

❖ Operation and Maintenance
- Overview
- Planning
- Procedures
- Operations
- Maintenance
- Predictive Maintenance
- Summary

❖ SMART Safety Instrumented Systems
- Overview
- Why it matters?
- What is a Smart SIS?
- Intelligent Field Devices
- Digital Communications
- Smart Logic Solvers
- Complete Loop Solution
- Lower Costs
- Smart SIS Implementation

❖ Practical Sessions
- This hands-on and includes simulator, real-life case studies and exercises

DAY FIVE:

❖ Practical Examples
- Determination of SIL by Risk Graph Method
- Determination of SIL by Risk Matrix Method
- Multiple Layers of Protection

❖ Frequently Asked Questions

❖ Addendums
- Explosion at BP Texas City Refinery
- Other Subjects

❖ Video Presentation
- CSB Report on Explosion at BP Texas City Refinery

- 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 the "Safety Automation Builder Software (Rockwell Automation)" simulator.

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