

Safety Instrumented Systems

Overview and Awareness



Kenexis Training

Safety instrumented systems (SIS) are some of the most common and effective safeguards that protect process plants. Ensuring their appropriate design is a mission critical task that is typically performed in conformance with international standards such as IEC 61511 (2016) Functional Safety – Safety Instrumented Systems for the Process Industry Sector (or national versions, such as ISA 84.00.01 in the United States). This standard provides a safety lifecycle framework which guides the activities that should be accomplished to achieve functional safety, along with establishing the performance criteria, called Safety Integrity Levels (SIL) that define SIS performance. This course provides an overview and awareness level of discussion of SIS design that is appropriate for all personnel that interact with SIS in any way. The course includes informative examples that highlight the concepts of SIS design and employs a post instructional survey to ensure that the presented materials was understood and retained.

In this course, you will:

- Understand the definition of a Safety Instrumented System (SIS) and how it is distinct from other protection layers and basic process control systems
- Understand what a Safety Instrumented Function (SIF) is and how a SIF relates to the SIS and how it relates to a specific preventable hazard
- Review the relationship between the SIS standards like IEC 61511 and typical national laws and regulations through the concept of recognized and generally accepted good engineering practices (RAGAGEP)
- Learn what causal factors have historically contributed to process industry accidents related to SIS and how the standards now address those issues
- Learn what a Safety Integrity Level is and how they are defined, selected and verified
- Understand how process hazards analysis, like hazards and operability studies (HAZOP) lead to the selection of SIL targets through Layer of Protection Analysis (LOPA)
- Understand the components of safety requirements specifications and how they are developed and presented during project execution and ongoing use
- Learn what factors affect the ability of a SIF to achieve its performance targets and how those factors are considering when performing calculations to verify SIL achievement
- Understand the interactions of the safety instrumented system that occur during the operations and maintenance phase of the lifecycle like bypassing, testing, and repair of overt failures

About Kenexis

Kenexis is an independent consulting engineering firm that provides process safety and cybersecurity services and software including process hazards analysis, risk analysis, fire and gas mapping, and industrial control systems cybersecurity. Kenexis headquarters is in Columbus, Ohio since 2004, with offices in Houston and Abu Dhabi. More information is available at <https://www.Kenexis.com>.

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Course Materials

- SIS -Overview and Awareness Workbook and Study Guide
- Kenexis SIS Engineering Handbook
- Course Completion Certificate

Course Outline

Section 1 – Introduction

- Definition of SIS
- SIS Difference from BPCS
- Safety Instrumented Functions
- Regulations and Standards
- Application Exercise #1

Section 2 – Lessons Learned

- Reliance on Manual Actions
- Improper Testing
- Poor Equipment Selection
- Poor Bypassing Choices
- Implication of Lessons Learned
- Practical Example of Application of IEC 61511

Section 3 – The Safety Lifecycle

- Industry Standards for SIS
- IEC 61511 Lifecycle and Requirements
- Safety Integrity Level Selection
- Safety Requirements Specifications
- Conceptual Design and SIL Verification Calculations
- Operation and Maintenance Phase
- Management of Bypasses
- Management of Change

Course Formats

In addition to the online self-paced course, you can contract Kenexis to provide an instructor at your location or license the training content for your corporate learning management system.

Online – Self-Paced

- Through Kenexis Learning Management System (www.kenexislms.com)
- 2.5 hours of instruction video
- Application exercise and Post-instruction quiz

Instructor Led

- Kenexis instructor presentation at your facility
- Total duration approximately 4 hours
- Contact Kenexis for a quotation

Corporate LMS

- Online course materials are licensed for use in your corporate learning management system (LMS) for a large number of users
- Materials supplied include video files, PDF files of course materials, electronic editable versions of exercises and quizzes
- Technical support (remote) to assist in