PRACTICAL
SAFETY INSTRUMENTATION AND EMERGENCY SHUTDOWN SYSTEMS
USING IEC 61508

YOU WILL LEARN:

- Practical know-how and 'real-world' applications
- Detailed, up-to-date, functional safety instrumentation practices
- How to plan and participate in hazard and risk assessment studies
- To implement and operate safety systems
- Design and implementation skills for quality assurance in safety systems
- The knowledge to specify and critically evaluate safety systems
- Techniques to help ensure high reliability and maintenance of safety system

WHO SHOULD ATTEND:

- Instrumentation and Control Engineers and Technicians
- Process Engineers and Process Safety Managers
- Design and Maintenance Engineers and Technicians in the process industries.
- Process Safety Officers employed by end users
- Control System Integrators
- System Consultants

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The Workshop

Many of today's industrial processes involve large amounts of energy and/or hazardous materials, and have the potential for serious accidents. Reliable, well engineered safety systems are essential for protection against destruction and loss of life. Widely recognised IEC standards have helped to establish new levels of performance and sophistication in safety controls, which no company can afford to ignore. Correctly applied, these technologies increase productivity through avoidance of unnecessary shutdowns, minimise costs on testing and help you to demonstrate compliance with safety regulations.

The "Safety Instrumentation and Shut-Down Systems" workshop is an intensive, practical and valuable two-day workshop. We offer you the most vital, up-to-date information and practical know-how to enable you to participate in hazard studies and specify, design, install and operate the safety and emergency shutdown systems in your plant using international safety practices. It provides you with a broad understanding of the latest safety instrumentation practices and their applications to functional safety in manufacturing and process industries. This workshop is "not-to-be-missed" - it could save your business a fortune in possible downtime and financial loss!

Pre-requisites

Some knowledge of electrical, process or instrument engineering is required.

Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

To gain full value from this workshop, please bring your laptop/notebook computer.

The Program

INTRODUCTION TO SAFETY INSTRUMENTATION
- Overview of risk management principles
- Risk reduction by safety instrumented systems
- Introduction to Functional Safety Standards: IEC 61508, IEC 61511
- The safety lifecycle model and its phases (SLC Phases)

RISK ASSESSMENT AND SIL TARGETING
- Hazards: identification, typical causes and consequences
- Concept of layers of protection
- Process control versus safety controls
- Tolerable risk and the principles of ALARP
- SIL target requirements and why they are critical to project costs

Practical Exercise: *Using fault tress for calculating even rates and SIL targets*

SIL DETERMINATION METHODS AND SIL REVIEWS
- Outline of hazard study and HAZOP methods
- SIL reviews for retrofitting and upgrades
- Fault tree analysis techniques
- Determining SIL targets by LOPA and risk graph methods

Practical Exercise: *SIL determination by quantitative methods*

Practical Exercise: *Using a risk graph to determine SIL target*

ESSENTIAL COMPONENTS OF THE SIS
- The safety instrumented system model and its components
- Safety-Certified PLCs. Why regular PLCs are not acceptable
- Redundant PLC configurations 1002D, 2003, 2004D
- Developments in networking of SIS components

SYSTEM DESIGN AND INTEGRATION
- Structure of a typical process plant SIS
- Interfacing to the basic process control system
- Unified user interfaces
- Networking practices and the modular SIS

Practical Exercise: *Structuring an SIS*

INTRODUCTION TO THE IEC 61508 AND 61511 SAFETY LIFE
- Which standard to use for your project
- Safety life cycle: quality assurance and project management
- Identifying Safety Instrumented Functions (SIFs)
- Creating the Safety Requirements Specification (SRS)

DESIGNING SIS LOOPS TO MEET SIL TARGETS
- Design requirements of IEC 61511 and 61508
- Hardware reliability targets
- Fault tolerance and the minimum architecture requirements
- Systematic errors defined
- Software engineering essentials
- Designing to minimise spurious trips

Practical Exercise: *Loop design to a SIL Target*

RELIABILITY ANALYSIS FOR THE SIS LOOP
- Evaluating the SIL rating of the SIS function
- Failure modes and fault tolerance
- Terminology: MTBF, MTTF, MTTR and others
- Basic formulas to evaluate reliability
- Software tools and spreadsheets

Practical Exercise: *Comparing system reliabilities*

SELECTION AND QUALIFICATION OF FIELD INSTRUMENTS
- Impact of field devices on safety integrity
- How to specify and arrange sensors for safety duties
- Safety transmitters and smart transmitters in safety applications
- Guidelines for final elements

Practical Exercise: *Evaluating trip valve arrangements*

ENGINEERING THE SAFETY SYSTEM: HARDWARE
- Project engineering responsibilities
- Practical design features for safety systems including:
  - Energised versus de-energised trip systems
  - Steps to minimise common cause faults
  - Power sources
  - Diagnostics and testing facilities, overrides and bypasses
- Information flow and documents for the engineering stage

SIS APPLICATION SOFTWARE
- Safety lifecycle for application software as per IEC 61511
- Application software activity steps
- Programming and documentation packages
- Using certified software modules

PROOF TESTING METHODS AND MAINTENANCE STRATEGIES
- IEC 61508 maintenance activities model
- Practical on-line test methods
- On-line testing of ESD valves
- Managing changes

Practical Exercise: *Proof testing options using a smart positioner*

SUMMARY, OPEN FORUM AND CLOSING

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