PRACTICAL INDUSTRIAL SAFETY, RISK ASSESSMENT AND SHUTDOWN SYSTEMS FOR INDUSTRY

The design, installation and application of reliable safety instrumentation and shut-down systems, incorporating new standards, current practices and practical solutions

WHAT YOU WILL LEARN:

- Practical know-how and 'real-world' applications
- Detailed, up-to-date, functional safety instrumentation practices
- The knowledge to plan and participate in hazard and risk assessment studies
- The knowledge 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 systems

WHO SHOULD ATTEND:

- Design, installation and maintenance engineers and technicians in the process industries
- Engineering firms
- Instrumentation and control engineers and technicians
- Managers and sales professionals employed by end users
- System consultants
- System integrators

IDC TECHNOLOGIES

Technology Training that Works

The Program

DAY ONE

INTRODUCTION TO SAFETY INSTRUMENTATION

- Course outline and objectives
- Introduction to hazards and risks
- Overview of safety systems engineering
- Introduction to standards: IEC 61508, IEC 61511 and ISA S84
- Some implications of IEC 61508 for control systems
- The safety lifecycle model and its phases (SLC phases)
- Management of functional safety

HAZARD AND RISK ANALYSIS (IEC PHASES 1 AND 2)

- Identification of hazards, typical sources and examples
- Principles of risk reduction and layers of protection
- Process control versus safety control
- Simple and complex shut-down sequences, examples
- Risk classification and risk reduction terms: hazard demand rate, consequences of an incident, risk reduction factor, probability of failure on demand
- The concept of Safety Integrity Level (SIL)
- Quantitative method for determining SIL requirements

Practical exercise: determination of SILs for process examples

HAZARD STUDIES (SLC PHASE 3)

- Hazard and operability study (Hazop) methods
  - Hazard study levels 1, 2 and 3
- Hazops for control systems

Practical exercise: trial hazard study and extraction of results for safety functions

- Translating hazard study outputs into safety functions. (SLC phases 4 and 5): process and operational safety measures, the role of alarms functions in safety, safety instrumented functions
- Fault tree analysis techniques

Practical exercise: using fault trees to predict hazard rates and risk reductions, modelling of the SIS function

SAFETY REQUIREMENTS SPECIFICATION (SLC PHASE 4)

- How to define functional requirements for the safety instrumented system
  - Input requirements from the Hazop
  - Safety functional requirements
  - Safety integrity requirements
- Deciding the required Safety Integrity Levels (SILs): revision of quantitative method, introduction to qualitative methods, risk graphs and severity matrix for processes, risk graph methods for machinery safety categories

Practical exercise: exercise in SIL determination

Practical exercise: exercise in defining safety requirements

TECHNOLOGY CHOICES AND THE CONCEPTUAL DESIGN STAGE

- Finding the right equipment for the job (IEC phase 9)
- The safety instrumented system model and its components: sensors, logic solver, final elements, interfaces, power supplies
- Types of equipment and choices for the logic solver: simple interlocks, E/E/PES terminology, relay based systems, hard wired electronic systems, PES/PLC based systems, redundant PES configurations: 1oo2D, 2oo3, 2oo4D, developments in networking of SIS components

ENGINEERING THE SAFETY SYSTEM: HARDWARE (IEC PHASE 9 E/E/PES SAFETY LIFECYCLE)

- Project engineering responsibilities
- Realisation phase of IEC 61508
- Project activities and key design requirements
- 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
- A review of the ISA S84.01 standard requirements for SIS design
- Information flow and documents for the engineering stage

DAY TWO

ENGINEERING THE SAFETY SYSTEM: APPLICATION SOFTWARE (IEC PHASE 9 SOFTWARE SAFETY LIFECYCLE)

- Software components of a PES
- Safety critical systems: concerns about software
- Software safety lifecycle as per IEC 61508 part 3
- Safety lifecycle for application software as per IEC 61511
- Application software activity steps
- Application tools and documentation packages
- Certification of software

OVERALL PLANNING (IEC PHASES 6, 7, AND 8)

- The IEC requirements and the benefits arising
- Operation and maintenance
- Safety validation
- Installation and commissioning

INSTALLATION AND COMMISSIONING (IEC PHASE 12)

- Factory Acceptance Tests (FAT): benefits of FATs, using simulators for testing, essential documents
- Site installation practices: segregation principles, physical checkout forms, device functional checkouts
- Training functions
- Pre-commissioning acceptance tests
- Handover to operations

VALIDATION, OPERATIONS AND MANAGEMENT OF CHANGE (IEC PHASES 13, 14 AND 15)

- Validation: documented evidence that the overall safety requirements have been met
- Operations: standard operating procedures, IEC 61508 maintenance activities model, functional testing and safety audits, practical online test methods, on-line testing of ESD valves, test procedure documentation and records
- Managing changes: the need to manage changes, IEC Management Of Change (MOC) procedures

JUSTIFICATION FOR A SAFETY INSTRUMENTED SYSTEM

- Review of failure modes and their impact on plant safety
- The impact of nuisance trips
- How to calculate life cycle costs

SUMMARY, OPEN FORUM AND CLOSING

The Workshop

Many of today's computer controlled industrial processes involve large amounts of energy and have the potential for devastating accidents. Reliable, well-engineered safety systems are essential for protection against destruction and loss of life.

The safety instrumentation and shut-down systems workshop is an intensive, practical and valuable two-day course. 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 shut-down systems in your plant using international safety practices.

This workshop will provide 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 and could save your business a fortune in possible downtime and financial loss.

Pre-requisites

Fundamental knowledge of electrical 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.