

# Safety of Machinery Training Course (2010)

## Safety of Integrated Manufacturing Systems

### Background

Systems that incorporate two or more interconnected machines for specific applications such as component manufacturing, assembly, packaging, palletising, etc., are known as Integrated Manufacturing Systems (IMS).

The Machinery Directive 2006/42/EC places obligations on the **integrators of 'machinery'**, comprising the Integrated Manufacturing System, AND the manufacturers of **'partly completed machinery'**, to be integrated with other machinery, to comply with the essential health and safety requirements and to ensure that final integrated system is safe.

### Course Purpose

The objective of this course is to give the integrators of these complete Integrated Manufacturing Systems, and the designers of 'partly completed machinery', the knowledge and tools to integrate the machines and provide the necessary guarding & protective systems required to complete the IMS, to compile the information for safe use and to declare compliance for the Integrated Manufacturing System as a whole by CE Marking.

### Course Objectives

Learning objectives of this course:-

- For suppliers to understand the implications of supplying "Partly Completed Machinery"
- To understand the obligations of integrating two or more machines into an Integrated Manufacturing System (IMS).
- Familiarity with Harmonised Standards in particular the requirements of EN ISO 11161 for IMS's.
- To understand the range of hazards posed by Integrated Manufacturing Systems (IMS).
- To understand the process of risk assessment, risk evaluation and risk reduction applied to IMS's.
- To design suitable guarding and protective techniques,
- To design, coordinate & integrate safety related parts of the IMS control systems.
- To verify that the IMS meets with the Essential Health & Safety Requirements of the Directive(s).
- To compile a "Technical Construction File".
- To draw up a "Declaration of Conformity for the IMS,
- To legally apply the EU CE Mark.

### Who will benefit?

This course is designed for the integrators of machinery into Integrated Manufacturing Systems and also the designers & manufacturers of 'partly completed machinery'. The course will make them aware of the legal requirements and ensure that they are able to competently coordinate each of the machines safety systems, employ appropriate common guarding & protective measures and legally apply the CE Mark to the complete IMS.

## Course “Module” Overview:-

### **Europe & Directives – (Module 1)**

#### Objective:-

To develop an awareness of the aims of the European Union and their implementation using European Directives.

To introduce the Directives that call for CE Marking and to examine the essential requirements of the “New” Machinery Directive and the associated directives that may be applied in the machinery industry.

#### Key Topics:-

- Single European Market
- European Directives & their adoption into UK Law
- New Approach Directives, Essential Requirements & the CE Mark
- CE Marking Directives
- “New” Machinery Directive, its Essential Requirements & the implications of Annex IV
- Changes brought about by the “New” Machinery Directive
- Associated Directives:-
  - Low Voltage Directive & its Essential Requirements
  - EMC Directive & its Essential Requirements
  - Pressure Equipment Directive & its Essential Requirements
  - ATEX Directives & their Essential Requirements
  - Use of Work Equipment Directive
  - General Purpose Products Directive

### **“Partly completed machinery” & Integrated Manufacturing Systems**

#### Objective:-

To define a partly completed machine and the suppliers obligations when placing such machinery “on the market”.

To define an Integrated Manufacturing System (IMS) and establish the integrators obligations to integrate the machines in a coherent and coordinated manner and to understand of the purpose of CE Marking of the IMS under the “New” Machinery Directive..

#### Key Topics:-

- What is “partly completed machinery” and a Declaration of Incorporation
- How do manufactures of “partly completed machinery” comply?
- What do the integrators of two or more machines into an IMS have to do to comply?
- Identifying hazards and assessing risks associated with the IMS,
- Designing & integrating guarding and protective systems throughout the IMS,
- Coordinating & integrating the safety related parts of the IMS control systems.
- Compiling the information for safe use of the IMS,
- Compiling a Technical Construction File
- Preparing a Declaration of Conformity
- Applying the CE Mark on the IMS,
- The difference between CE Marking & PUWER98
- Enforcement

## European Harmonised Standards – (Module 4)

### Objective:-

To develop an understanding of standards and indicate the relationship between UK, European and International standards.

To examine the purpose of European Harmonised Standards, their development and relationship with Directives and CE Marking.

To introduce the core “Safety of Machinery” standards and EN ISO 11161 – “*Integrated Manufacturing Systems – Basic requirements*”

### Key Topics:-

- What is a Standard?
- UK, EU & International Standards
- What is a Harmonised Standard?
- Structure of a Harmonised Standard
- Safety of Machinery Standards – A, B & C type standard relationships
- An overview of the Safety of Machinery “core” standards
- EN ISO 11161 - Integrated Manufacturing Systems – Basic requirements

## Hazards & Risks – (Module 5)

### Objective:-

Defining hazards and risks associated with IMS's, their relationship and explore types of hazards & risk associated with machinery by typical examples.

### Key Topics:-

- What are hazards & risks?
- How are they related?
- Typical hazards
- Hazardous situations
- Hazardous zones
- Need for Risk Assessment

## Risks Assessment – (Module 6)

### Objective:-

Risk Assessment of IMS's, assessing risks associated with the integration of machinery and how control over the risks may be applied.

Examination of qualitative and quantitative method of risk assessment and how they are most suitably applied.

### Key Topics:-

- What is Risk Assessment?
- Risk Assessment as a problem solving “Tool”
- Types of risk
- Risk Control - Hazard identification, Risk Evaluation & Management
- Methods of Risk Assessment – Qualitative & Quantitative
- What is “suitable & sufficient”?
- Identification of Residual Risks
- Hints & Tips when undertaking a Risk Assessment

## **Risk Reduction – (Module 7)**

### **Objective:-**

To develop an understanding of the methods and processes of risk reduction related to risk assessment.

To examine various hierarchical methods of risk reduction.

### **Key Topics:-**

- Fundamentals & objectives of Risk Reduction
- The “3 step method” of risk reduction
- What is “reasonable practicability”
- Dealing with Residual Risks
- Risk reduction:-
  - by design
  - by guarding
  - by safety controls
  - by information
  - by personal protective equipment
  - by Safe Systems of Work
  - by training, supervision & organisation

## **Design of Safety Related Control Systems – (Module 8)**

### **Objective:-**

To develop a clear understanding of the purpose, requirements and realisation of the safety related parts of control systems.

To understand how to assess the required performance of a safety system in relation to the risks posed by an IMS and to develop a suitable and coordinated configuration.

To understand how a complete IMS safety system should encompass the electrical, pneumatic, hydraulic and mechanical parts of the control system.

To understand the need for quantified verification and validation of safety related control systems and the changes taking place in connection with so called “Functional Safety” (as implemented by EN 61508, EN 62061 & EN ISO 13849-1).

To become familiar with the available safeguards & protective devices and their appropriate application in an IMS.

To be able to coordinate the safety related parts of the control systems of the individual machines into a common IMS safety related control system.

### **Key Topics:-**

- The safety systems concept
- Resistance to Faults - Redundancy & Diagnostics
- Configuration of a safe related control system
- The “Safety Relay” – a magic box?
- Understanding “new” terminology & acronyms such as SRP/CS, SIL, PL, DC, etc.
- Designing & Integrating safety related control systems
- Electronic & Programmable Logic in safety related systems
- Implications of the replacement of EN 954-1 by EN ISO 13849-1
- What is “Black Box” technology & the application of EN ISO 13849
- Selection & application of safeguards & protective devices
- Coordinating the individual machines safety related control systems in the IMS
- Estimating the overall IMS safety systems required performance
- Quantified verification of complete safety related control systems
- Estimating actual performance against required performance of the system
- Verification & Validation of Safety Related Control Systems

## Protective Devices & Techniques – (Module 9)

Objective:-

An overview of protective devices available and techniques in their application

Key Topics:-

- Interlock Switches (contact & non-contact)
- Guard Locking devices
- Types of Light Curtains & similar devices
- Application of Light Curtains & similar devices
- Safety Mats and Edges
- Imaging Systems
- Two Hand and Hold-to-Run controls
- Motor Speed Controllers
- Emergency Stops

## Supplementary – Surgery

Objective:-

An opportunity for the attendees to introduce their “real” problems, machines and equipment, discuss and to apply and implement the knowledge gained under guidance of the presenter.

**Note:** the supplementary units are subject to the needs of the attendees and the venue. Surgery may require attendees wishing to bring drawings, documentation, photos, etc, and for on-site training, access to the equipment would be an advantage. Preparation is essential.

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