

# Electrical Installations in Hazardous Areas

## INTRODUCTION

- Preventing the unintentional ignition of explosive atmospheres is a critical safety and economic aspect of all petroleum and chemical plant operations.

In this training seminar, you will learn how to:

- Identify and Quantify the Hazardous Areas
- Select appropriate Electrical Equipment and Instruments for those areas
- Recognise the Different Methods of Protection, e.g. Ex d or Ex ia and how they work
- Install, Inspect and Maintain the Certified Equipment

## OBJECTIVES

Participants attending the training seminar will:

- Provide a clear understanding of Hazardous Area current custom and practice with particular respect to the following:
- Defining the hazard, classifying hazardous materials, understanding the nature of the risk and the necessity to eliminate sources of ignition
- The relationship between area classification and the various different types of Ex apparatus
- The relationship between electrical equipment and gas groups and temperature classes
- The installation and maintenance of the different types of equipment i.e. flameproof, increased safety, intrinsic safety, etc.
- The need for, and typical approach to, electrical equipment inspection
- The documentation of the Hazardous Area

This training seminar is intended to give:

- An in depth understanding of Hazardous Areas from the initial nature of the problem
- Some case studies of industrial accidents, through the identification and classification of the hazard, selection and use of protected equipment
- The administration of Hazardous Areas in terms of record keeping and certificates

## **TRAINING METHODOLOGY**

- This Electrical Installations in Hazardous Areas training course is intended to provide an understanding of Hazardous Areas and its recognised working practices. Participants are actively encouraged to engage in discussion and participation is encouraged throughout the training seminar.

## **ORGANISATIONAL IMPACT**

- This Electrical Installations in Hazardous Areas training course is a legal obligation in the countries of the European Union, but is optional rather than mandatory in the countries of the GCC. By providing this training for their employees, companies in the GCC will be aware of latest international standards for Hazardous Area training.
- International best practice in explosion prevention
- In house ability to review and up-date Hazardous Area classification
- Appropriate selection of equipment for zone 0 zone 1 and zone 2 leading to cost savings
- In house ability to inspect and evaluate existing equipment

## **PERSONAL IMPACT**

- Raised awareness of explosion hazards, how they arise and how we protect ourselves
- Understanding of zones, apparatus groups and Temperature classes
- Increased knowledge with respect to carrying out Hazardous Area classification and defining the nature and size of the hazardous zones
- Understanding the relationship between flammable materials and the equipment that can be installed in those areas
- Ability to read and understand certification labels

## **WHO SHOULD ATTEND?**

- This 5-day training course is a single and comprehensive training package which involves a combination of formal lectures, practical exercises, demonstrations and written exercises.
- It is primarily aimed at:
- Safety or electrical or instrumentation, engineers or technicians working with Hazardous Areas or potentially explosive atmospheres
- It is assumed that most attendees will be familiar with industrial electrical practice although specific prior knowledge of Hazardous Areas is not a prerequisite.

## Course Outline

### Introduction and History

- A Brief History of Industrial Fires and Explosions
- Materials
- Understanding the important characteristics of hazard materials and how they behave when they are ignited. Looking at the data tables and seeing how flash point, boiling point, L.E.L. etc. influence our approach to the materials
- Area Classification

### Area Classification

- Apparatus Groups and Temperature Classes
- How apparatus and hazard materials are matched together in terms of ignition energies, flame transmission characteristics and ignition temperatures? How groups and T Classes have changed over the years and from country to country and where to find the information to make comparisons?
- Source of Ignition
- A look at some of the possible sources of ignition, e.g. static electricity, light metal thermite reactions, friction etc., which can occur in Hazardous Areas. Also considering some of the steps which can be taken to eliminate them
- Methods of Protection
- Considering the recognised methods of protection. The fundamental concept in each case and the zones in which they may be employed
- Ex d Flameproof
- Ex i Intrinsic Safety
- Ex e Increased Safety
- Ex p Pressurised
- Ex N Type N
- Ex m, Ex o, Ex q, Ex s
- Exercise
- Ex d Flameproof
- Considering in depth the concept of Flameproof protection, how it works, how it must be installed, how it must be inspected & maintained. Looking at weatherproofing, corrosion, gaps, fasteners, etc

### Equipment Inspection Exercise Session 1

- Examining samples and answering questions about them
- Intrinsic Safety
- As for flameproof, an in depth look at the subject considering minimum ignition energies, associated apparatus and systems, simple apparatus, IS clean earth, floating systems, system matching, etc
- Intrinsic Safety Installation
- Segregation of cables, screens and armour, earthing and bonding, induction and invasion, creepage and clearance etc

## Ex p Pressurised Apparatus

- A close examination of this method of protection, what it can be applied to, when certification is possible and how to maintain it. Where pressurised rooms fit in and how uncertified pressurised enclosures may be used in zone 2
- Type N
- A thorough examination of type N considering non-sparking, enclosed break, energy limitation, and restricted breathing concepts. Also making comparisons with the concepts of protection already covered in detail
- The Less Common Types of Protection
- A look at Ex m, Ex o, Ex q, and Ex s considering each in turn and pointing out the safety critical features. Also considering combined or dual certification and the combination of many concepts of protection into one item of equipment
- Equipment Inspection
- Labels, Marking and Certificates
- A look at the codings, certificate numbers and other essential markings on labels and certificates. Including a paper exercise to identify equipment

## Installation, Inspection and Maintenance

- Considering the guidance of National codes of practice in terms of wiring and cabling, identification, isolation, inspections and maintenance. Examining inspection schedules and referring back to the concepts of protection to ensure that the attendees are comfortable with the inspection requirements for all types of equipment. Prioritising repairs, i.e. which failures are immediately life threatening and which could become so in time
- Cable entries
- Considering cable and conduit entries to all types of enclosures and protection concepts. Also looking at adapters and reducers, plugs and correct selection in each circumstance
- Equipment Inspection Exercise Final session
- Legislation
- What the Law has to say, standards, certificates, codes, European directives, the HSE and how it all ties together?
- Considering the records that should be kept by a company in order to manage a Hazardous Area installation
- General Discussion