



Training Program:

Fundamental Of Electrical And Instrumentation Design

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Introduction:

This highly participative BTS training course is designed to provide you with the skills to understand how Electrical and Instrument systems are designed, installed and operated in industrial process plants, particularly in the oil and gas, mining and minerals processing and heavy industries.

This Electrical and Instrumentation training course is interactive and encourages delegates to participate through questions and answers, along with opportunities to discuss with the presenter specific issues which may result in appropriate solutions.

Participants will learn:

- A brief revision the Fundamentals of Electricity
- How to read Single-Line Diagrams
- The Key Requirements of Plant and Facilities Power Distribution
- The Selection of Motors and Motor Control for various applications
- How Hazardous Areas are Classified
- How Electrical Equipment is selected for Hazardous Areas
- The Fundamentals of Control Systems and Instrumentation
- How to Read Loop Diagrams
- The importance of Secure Earthing (Grounding) and Bonding
- The Operation and Maintenance of EIC Equipment to ensure Plant Safety

Who Should Attend?

The Electrical and Instrumentation training course is designed to provide a practical insight for personnel who interface with electrical systems in the Oil and Gas, Minerals Processing, Mining and Heavy Industries, or work in the engineering consulting industry servicing these clients.

It is specifically tailored to suit those who have a basic understanding of electrical principals, and require further knowledge of electrical and instrument systems to more effectively manage their work and where necessary execute multi-discipline projects. Personnel who should attend are:

- Project Professionals and Engineers
- Facilities Engineers
- Process and Chemical Engineers
- Mechanical Engineers
- Maintenance Technicians

It is also a useful introduction for inexperienced Electrical and I&C engineers (i.e. graduates and the like) to gain an understanding of the practical issues that they will face in their careers.

Training Methodology

This BTS training course will combine presentations with interactive practical exercises, supported by video materials, activities and case studies. Delegates will be encouraged to participate actively in relating their particular protection requirements at their workplace.

There will be adequate time given for group discussion during and at the end of each session, including detailed case studies and anecdotes on based on the subject matter and the facilitator's own experience in the field.

Course Objectives:

This course is designed to enable participants to:

- Review the basic fundamentals of electricity
- Understand fundamental safety requirements for personnel and equipment
- To read single line drawings and identify components of electrical equipment
- Understand the types of equipment used in electrical power systems
- Learn about electrical distribution systems and how they are configured
- Understand the importance of hazardous area requirements
- Learn the basics of instrumentation and control systems in a plant or facility
- The importance that I&C in the safe and reliable operation of the facility
- Understand earthing (or grounding) and bonding to ensure safety
- Understand the importance of operating EIC equipment with its design limits
- The importance of the maintenance of Electrical Equipment

Course Outline

Day 1 - Fundamentals of Electricity

- A Brief History of Electricity
- AC and DC Currents and Voltages and how they are generated, High, Medium and Low Voltages
- The use of DC, Single and 3 phase AC power systems
- Resistance, Inductance, Capacitance, Power Factor and Harmonics
- Summary of Documents for IC&E systems, including how to read Single Line Diagrams and Loop Drawings
- Power System Overview and Major Components
 - Generators
 - Circuit Breakers
 - Transformers
 - Cables
 - Switchboards and Motor Control Centres
 - Motors
 - Standby and Emergency Power Systems

Day 2 - Application of Major Equipment

- Plant or Facilities Power Sources: Grid, Internal Power Generation.
- Transformers: Power, Distribution, Instrumentation.
- Switchgear: Circuit Breakers, Isolators, Contactors and Relays.
- Motors and Motor Control Systems: Induction, Synchronous, Special, DOL and reduced voltage starters, Variable Speed Drives.

- Instrument and Control System Fundamentals: Sensors, Controllers, Final Elements, Modern Distributed Control

Day 3 - Safety, Earthing (Grounding) and Bonding, Hazardous Area Requirements

- Electrical Safety in Industrial Facilities
 - Electric Shock and Personnel Protection
 - Prevention of physical contact by personnel where live equipment may be present
 - Switching and Operating Electrical Equipment
 - Safety Procedures, Lock-outs and Training for safe operation
- Earthing (Grounding) and Bonding
 - Earthing Requirements for Electrical Equipment and Installations
 - Bonding of conductive structures to prevent dangerous voltages in facilities
 - Instrument and Control Earthing and Bonding
 - Testing of Earthing and Bonding Systems
- Hazardous Area Identification and Classification
 - Principles of Hazardous Area requirements
 - Selection and types of Hazardous Area Certified Equipment
 - Installation of Hazardous Area Equipment, including cabling
 - Operation and Maintenance of Hazardous Area Equipment

Day 4 - Electrical Protection and Instrument Control

- Power System Protection and Co-ordination
- Automation in Power Systems
- Field Measurement and Control Devices
- Programmable Electronic Systems (PLC, DCS, SIS, SCADA, EID)
- Control System Networking and Communication

Day 5 - Reliability and Security of Electrical and Control Systems

- Power Supplies: Main, Standby. Back-up and Emergency.
- Redundancy in power supplies, distribution networks, communication and control networks, safety systems etc.
- Practical Applications
- System Security, Including Denial of Service and Sabotage from External Sources.
- Summary and Discussion

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.