



**Training Program:**

**Electrical Authorization for working on Electrical  
Equipment**

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## Introduction:

Electricity is a mainstay and the backbone of oil and gas operations. Whether it is transmitted from external sources or generated on-site, it is used to provide the power required by the systems and equipment that are associated with the daily operations of the plant. Given the various uses and power levels required, working with electricity is dangerous and as such needs to be subject to strict guidelines to ensure a stable and safe environment for all personnel.

This course has been designed to provide participants with an understanding of the safety structure and protocols required when working in an electrical environment. Emphasis will be placed on the need for ensuring constant and continuous adherence to these processes and to ensure the safety of all personnel working within the operating area.

Upon completion of this course, participants will gain an understanding of the criticality and purpose of the policies and procedures associated with electrical systems and equipment. Having this knowledge will help each technician develop confidence and professional enthusiasm, therefore, increasing their efficiency.

The course will also accurate troubleshooting and subsequent repair of electrical equipment is necessary in today's sophisticated industrial environments to ensure continued efficient operation and productivity of the equipment. Delegates are encouraged to raise queries both during and at any time after attending the course. Delegates are also encouraged to bring any specific issues that they may wish to raise to this course.

## Course Objectives

- To develop a structured approach to electrical troubleshooting using common terminology and to provide troubleshooting methods and solutions for various electrical equipment and control systems problems. To develop a better understanding of various test equipment used in electrical troubleshooting.
- To develop a better understanding of various electrical equipment and control systems design, functionality and failure modes.
- To better understand work practices, which allow for successful troubleshooting including job plans.
- To provide examples of successful troubleshooting techniques and 'hands on' experiences plus case studies and group problem solving exercises.
- To provide troubleshooting methods and solutions for various electrical equipment and control systems problems.

# Course Outlines

## THE TECHNOLOGY OF ELECTRICAL EQUIPMENT

**Definitions and descriptions of electrical equipment used in industrial applications including:**

### **Source Equipment – transformers**

- power supplies (UPS)
- batteries
- generators

### **Switching Equipment – switchgear**

- motor control centre (MCC)
- disconnects
- contactors
- overload relays
- starters
- neutral ground resistors (NGR)

### **Control Equipment – variable frequency drives (VFD)**

- programmable logic controllers (PLC)
- distributed control systems (DCS)
- power monitoring and control
- relays and timers
- limit switches
- temperature switches
- pressure switches
- level switches

- speed switches
- vibration switches
- safety and shutdown switches
- motor/feeder protective devices

#### **Load Equipment – motors (AC induction, asynchronous, DC)**

- heaters
- solenoids
- valve actuators
- signaling and alarm devices

#### **TROUBLESHOOTING APPLICABLE TO THE ABOVE LIST**

- methods
- terminology
- principles
- special techniques

#### **TEST EQUIPMENT**

- digital volt meter (DVM)
- oscilloscope or oscillograph
- megger
- hi-pot tester
- frequency meter
- ammeter (inline, clamp-on)
- power meter (watt, VAR)
- current transformer
- specialised equipment

**TYPICAL PROBLEMS/FAILURES**

- common mode failures
- phase imbalance
- contact pitting/arcing
- electronic control component failure
- blown fusing
- damaged windings
- worn bearings
- damaged brushes
- burnt ballasts
- damaged excitation circuits
- battery cell failure
- inverter/rectifier failure
- high voltage bushing failure
- switch failure
- ground fault

**TYPICAL TROUBLESHOOTING JOB PLAN DEVELOPMENT**

- identify troubleshooting step sequence
- prepare procedures
- documentation
- follow-up
- regulatory requirements
- training

## TYPICAL ELECTRICAL DRAWINGS AND SYMBOLS

- single line
- control wiring
- distribution
- symbols

## Electrical Awareness and Safety

- Electrical safety documents
- Electrical safety rules
- Electrical areas