

# INDUSTRIAL SUBSTATION MAINTENANCE



**EPE157**  
**Electrical & Power**  
**Engineering**

**COURSE TITLE****INDUSTRIAL SUBSTATION MAINTENANCE****COURSE DATE/ VENUE**

18-22 July 2022

London, UK

**COURSE REFERENCE**

EPE157

**COURSE DURATION**

05 Days

**DISCIPLINE**

Electrical & Power Engineering

**COURSE INTRODUCTION**

Electrical substation maintenance is a key component of any substation owner's electrical maintenance program. It has been well documented that failures in key procedures such as racking mechanisms, meters, relays and busses are among the most common source of unplanned outages. Electrical transmission, distribution and switching substations generally have switching, protection and control equipment and one or more transformers.

Our electrical substation maintenance course focuses on maintenance and testing of switchgear, circuit breakers, batteries and protective relays.

This course will cover the maintenance and testing requirements for common substation devices, including power transformers, oil, air and vacuum circuit breakers, switchgear, ground grid systems, batteries, chargers and insulating liquids. This courses focuses on what to do, when to do it and how to interpret the results from testing and maintenance.

## **COURSE OBJECTIVE**

### **Upon successful completion of this course, the delegates will be able to:**

- ✓ Recognize Substation types, applications, components and safety procedures
- ✓ Identify Medium-voltage circuit breaker maintenance and testing methods
- ✓ Perform insulation resistance, contact resistance on air, oil and vacuum breakers, and tank loss index on oil circuit breaker and vacuum bottle integrity tests on vacuum breaker
- ✓ Discuss about Switchgear arrangement, torque requirements, insulation systems and maintenance intervals
- ✓ Perform switchgear inspection and maintenance in lab
- ✓ Explain Battery types, applications, systems and components
- ✓ Perform battery maintenance and testing in lab

## **COURSE AUDIENCE**

This course is intended for Electrical Engineers, Electrical Supervisors and Electrical Technicians engaged in the commissioning, testing, start-up, troubleshooting, maintenance and repair of Electrical Equipment and Control Systems. Because the methods and examples are generic, trainee from all industries especially oil and gas fields will benefit. Participants need no specific requirements other than good understanding of electricity and magnetism and some relevant experience.

## **COURSE CONTENT**

### **DAY 1**

#### Introduction

- Student introduction
- Purpose of Electrical Maintenance
- The golden triangle of Maintenance
- Electrical safety rules
- Pre test

## Electrical Distribution System

- References
- Distribution System Back ground
  - Transmission system configuration
  - System types
    - Radial systems
- Substation rating & Arrangements
- Verifying correct condition and operation of the switchgear
  - Visual Inspections
  - Mechanical Inspections and Tests
  - Electrical Tests
  - Functional Operation Test
  - Review of Testing and Inspection Results
  - Trouble shooting

## DAY 2

### Air Circuit Breaker

- Construction
- Operation C/H
- Rating and name plate data
- Protection C/H
- Applications

### Vacuum Circuit Breaker

- Construction
- Operation C/H
- Rating and name plate data
- Protection C/H
- Applications

### Oil Circuit Breaker

- Construction
- Operation C/H



- Rating and name plate data
- Protection C/H
- Dissolved Gas Analysis
- Applications

Verifying Correct Condition, Maintenance and Operation of Air, Vacuum & Oil Circuit Breakers

- Visual Inspections
- Mechanical inspection and tests
- Electrical Tests
- Review of testing and inspection results

### **DAY 3**

Power Transformers

Transformers types

- Distribution transformers
  - ANSI Liquid filled
  - Unit and substations transformers
  - Pad Mounted transformers
- Single and three phases
- Power transformers; large, medium and small transformers
- Voltage Transformer (VT) and current transformers (CT's)

Accessories & Protective Devices

- Double Float Buchholz relay
- Dial Type Contact Thermometer
- Magnetic oil –Level Indicator
- Protective devices for hermetically sealed transformers
- Pressure Relief device
- Dehydrating Breather
- Bushing Current transformer
- Additional accessories
- Protective relaying

## General diagnostic

- Insulation Resistance and Polarization Index
- Turns Ratio and Excitation Current
- Capacitance and Power Factor
- Winding Resistance
- Recovery Voltage Measurement
- Frequency Response Analysis
- Interpretation of test results
- Oil Quality Analysis
- Dissolved Gas Analysis

## Lightning Arrestors

- Types
- Inspection
- Testing

## **DAY 4**

### Ground Grid Systems

- Purpose
- Grounding theory
- Types of test equipment
- Inspection
- Testing

## **DAY 5**

### Batteries and Chargers

- Types of station batteries
- Battery systems
- Maintenance
- Inspection



## **COURSE CERTIFICATE**

**TRAINIT ACADEMY** will award an internationally recognized certificate(s) for each delegate on completion of training.

## **COURSE FEES**

\$6,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## **COURSE METHODOLOGY**

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions