

**Training Title**

**INDUSTRIAL SUBSTATION MAINTENANCE**

**Training Duration**

**5 days**

**Training Venue and Dates**

<b>REF</b> EE075	<b>Industrial Substation Maintenance</b>	<b>5</b>	<b>07-11 Apr 2025</b>	<b>\$6,500</b>	<b>London, UK</b>
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Training will be held at any 4 or 5-star Hotels. The exact venue will be informed once finalized.

**Training Fees**

- \$6,500 per participant for Public Training including Course Materials/Handouts, Tea/Coffee, Refreshments & Lunch

**Training Certificate**

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

**TRAINING OVERVIEW**

Industrial substation maintenance involves the regular inspection, testing, and servicing of electrical equipment within substations that supply power to industrial facilities. This essential process ensures the reliability, safety, and efficiency of electrical systems critical for uninterrupted operation of industrial processes. Maintenance activities typically include checking transformers, circuit breakers, switchgear, protective relays, and other components to prevent malfunctions, minimize downtime, and ensure compliance with regulatory standards.

**TRAINING OBJECTIVES**

- Substation types, applications, components and safety procedures
- 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.
- Switchgear arrangement, torque requirements, insulation systems and maintenance intervals
- Perform switchgear inspection and maintenance in lab.
- Battery types, applications, systems and components
- Perform battery maintenance and testing in lab.

**WHO SHOULD ATTEND?**

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, trainees from all industries, especially oil and gas fields will benefit. Participants need no specific

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requirements other than a good understanding of electricity and magnetism and some relevant experience.

### TRAINING METHODOLOGY

This training program is lecture-based and customized to the needs of the audience, providing meaningful experience for personnel that work in petroleum plants.

Daily sessions include formal presentations, prepared in Power Point, interspersed with directed discussions and case studies.

In addition to formal lectures and discussions, the delegates will learn by active participation through the use of problem-solving exercises, group discussions, analysis of real-life case studies etc. All attendees receive a course manual as a reference.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

### DETAILED COURSE OUTLINE

#### Day-1

##### 1.1. Introduction

- Student introduction
- Purpose Of Electrical Maintenance
- The golden triangle of Maintenance
- Electrical safety rules
- Pretest

##### 1.2. Electrical Distribution System

- References
- Distribution System Background
  - 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

##### 1.3. Air Circuit Breaker

- Construction
- Operation C/H

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- Rating And name plate data
- Protection C/H
- Applications

**1.4. Vacuum Circuit Breaker**

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

**1.5. Oil Circuit Breaker**

- Construction
- Operation C/H
- Rating And name plate data
- Protection C/H
- Dissolved Gas Analysis
- Applications

**1.6. 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**

**1.7. Power Transformers**

**1.7.1. Transformer 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)

**1.7.2. 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

**1.7.3. General diagnostic**

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- 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

**1.7.4. Lightning Arrestors**

- Types
- Inspection
- Testing

**Day-4**

**1.7.5. Ground Grid Systems**

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

**Day-5**

**1.7.6. Batteries and Chargers**

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

**1.7.7. Open session for questions, answers and case studies**

**TRAINING OUTCOME**

At the end of this training Participants will be able to:

Following the attendance at this course, participants will return to their respective organizations equipped with new or refreshed skills to ensure that each power components related to the industrial substations are tested and maintained in a fashion that ensures reduced costs and or start-up delays plus identified faults or problems are repaired, and the underlying causes are identified and eliminated to reduce further failures

**NOTE:**

**Pre & Post Tests will be conducted.**

**Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.**

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