



EE086

CIRCUIT BREAKERS Maintenance & Troubleshooting

Course Introduction:

This course is designed to update participants with the latest development of Circuit Breakers and to present some of the more common and updated aspects of low, medium and high voltage switchgear maintenance. It must be understood that there is an incredible variety of equipment used on low, medium and high voltage switchgear today. Circuit Breakers play an important role in the distribution and control of electrical power in manufacturing or power plant and in a utility distribution system. Negligent maintenance practices can lead to power system inefficiency and loss of system reliability.

An older plant may have switchgear that was built in the forties in the older areas and modern switchgear in other areas as the plant was upgraded. This course will present maintenance problems to the maintenance manager and technician. Newer plants will probably have modern equipment of a limited variety and manufacture. It is these similarities that will be covered in the course.

Course Objectives:

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

- Inspect, maintain, design, repair and troubleshoot circuit breakers
- Apply an in-depth knowledge and skills on LV/MV/HV circuit breakers
- Describe the switchgear details such as ratings, degree of protection, service conditions and ancillary equipment
- Explain switchgear asset management including CBM & RCM process, tripping devices, maintenance & testing and identify the various diagnostic techniques
- Identify & employ the different types of circuit breaker techniques and determine the vital equipments including batteries condition and monitoring
- Employ the substation maintenance techniques and discuss their description, structures, features and functions
- Apply the switchgear maintenance practices and improve maintenance and repair procedures
- Carryout maintenance work orders including their process development, procedures and problems encountered
- Introduce computerized maintenance management systems (CMMS) and recognize its importance in circuit breakers inspection, maintenance, design, repair & troubleshooting

Who Should Attend?

This course is applicable to engineers and other technical staff who need a sound understanding of Low, Medium and High Voltage Circuit Breaker inspection, maintenance, design, repair and troubleshooting.

Course Outline:

Day 1:

- **Introduction**
 - Voltage Convention
 - Fundamentals of Circuit Breakers
 - Types of Breakers, Construction
 - Ratings, Tripping Characteristics
- **Switchgear in a Network Context**
 - Single Line
 - Utilization
- **Introduction**
 - Voltage Convention
 - Fundamentals of Circuit Breakers
 - Types of Breakers, Construction
- **Switchgear in Historical Perspective**
 - Oil Circuit Breakers
 - Air Blast CB
 - SF6 and Vacuum CB
 - Operating Mechanisms

Day 2:

- **Switchgear Details**
 - Rating U_r , I_k , I_p , V_a
 - Degree of Protection
 - Service Conditions
 - Ancillary Equipment
- **Switchgear Asset Management**

- Equipment Register
- CBM and RCM Process
- Switchgear Diagnostic Techniques
- Tripping Devices & Maintenance and Testing

Day 3:

- **Circuit Breaker Diagnostic Techniques**
 - Diagnostic Techniques
- **Switchgear Vital Equipment**
 - Batteries Condition and Monitoring
 - Discussions
- **Substation Maintenance Techniques**
 - Description
 - Structures
 - Fuses, Arresters, Switches
 - Substation Compound
 - Switchgear Maintenance Practices

Day 4:

- **Substation Maintenance Techniques (cont'd)**
 - Metal Clad Switchgear
 - Maintenance Details
 - Metal Clad Switchgear Maintenance Details
 - Maintenance & Repair Fundamentals
 - Maintenance & Repair Procedures

Day 5:

- **Maintenance Work Orders**
 - Maintenance & Repair Procedures (cont'd)
 - Process Development
 - Procedures
 - Problems Encounters
 - Samples, Discussions
- **Fundamentals of Computerized Maintenance (CMMS)**

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session

10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

