



## Advanced Circuit Breaker Operation and Maintenance

| Date                | Venues | (\$)Fees | Book your seat               |
|---------------------|--------|----------|------------------------------|
| 16 Jun -20 Jun 2024 | London | 5500     | <a href="#">Register Now</a> |

### Introduction

Circuit breakers play an important role in the safe distribution of electrical power. The equipment needs to be operated, maintained and installed in a safe manner securing continuity of supply to consumers. Circuit switchers have been developed to overcome some of the limitations of fusing for substation power transformers. The method or arc extinction determines the types of circuit breaker.

Circuit switchers have SF6 gas interrupters and are designed to provide three-phase interruption (solving the unbalanced voltage considerations) and to provide protection for transient over voltages and overloads at a competitive cost between the costs of power fuses and circuit breakers.

#### The seminar will highlight:

- Electric power systems are designed to be as fault free as possible through appropriate network design, equipment design, proper installation and on-going maintenance
- The Circuit breaker and its associated fault detection equipment, protective relaying, is an extremely important device, through its role of clearing short-circuit currents, disconnecting faulty elements from the power network, and thus maintaining the overall integrity of the power network
- If faults are not controlled they can cause unnecessary loss of electricity service with all of its many ramifications
- The circuit breaker selection and arc extinction methods are of great importance
- Minimising downtime by proper and systematic maintenance program

### Objectives

#### At the end of the seminar, you will learn to:

- Appreciate the importance of preventive maintenance check and servicing of the various types of circuit breakers
- Determine safe systems of work and operations
- Develop maintenance activities and maintaining system safety
- Understand the component functionalities of the gas and vacuum circuit breakers
- Explain methods of arc extinction for MV HV circuit breakers
- Recognise routine inspections and the functions of the micro-processor component in the circuit breakers

### Training Methodology

Participants will be able to share knowledge and first hand experiences related to circuit breaker operations and maintenance. Active participation between trainer and delegates and also among delegates will be carried out by discussing case studies, video clips and PowerPoint presentation. Open discussions among delegates will result in formulating solutions to maintenance issues of circuit breakers.

# Organizational Impact

**Upon completion of the seminar, the organisational impact would be:**

- An understanding for the need for routine inspection and maintenance
- Using selected videos and case studies to illustrate the material being discussed
- An emphasis to ensure material is appropriate to the organisations being represented with regards to the types of circuit breakers and switchgears are installed in their premises
- An awareness and understanding of the course objectives
- Safe working practices being stressed and risk management analysis are applied when the need arises
- Exposed to the state of the art circuit breakers availability

# Personal Impact

**On successful completion of this seminar, delegates will be able to understand:**

- The construction, the arc extinguishing principles of different types of circuit breakers currently in use and the relevance to operations and maintenance
- The micro-processor operation and impact on the fault clearing and tripping process
- Expand their knowledge on circuit breaker standards and the relevance to specifications and procurement
- Circuit breakers and switchgear maintenance requirements and techniques
- The use of partial discharge and thermograph techniques when dealing with condition monitoring
- Understand the components of the new generation circuit breakers

# Who Should Attend?

The technicians and maintenance staff will be able to comprehend the types, construction, operations, function of circuit breakers. This will enable them to carry out effective maintenance activities.

**This seminar is suitable to a wide range of professionals but will greatly benefit:**

- Electrical managers
- Electrical engineers
- Maintenance technicians
- Project engineers
- HSE professionals

## SEMINAR OUTLINE

### DAY 1

#### **Introduction - Reasons for Faults and Classification of Faults**

- Distinction between load and fault current
- Sources of short-circuit current
- Introduction to fault calculations
- Balanced and unbalanced faults
- Measurement - voltage and current transformers
- Types of protection systems
- The role and importance of the circuit breaker in power systems

### DAY 2

## General Principles of Arc Extinction

- Air-Break
- Vacuum
- Gas
- Substation layouts
- Principles of arc extinction
- General construction principles
- Performance characteristics
- Arc chute functions

## DAY 3

### Vacuum

- History – The early years
- The vacuum arc – An overview
- Current interruption in vacuum
- Methods of keeping the arc diffuse
- Current chopping – general implications
- Vacuum interrupters in series
- Design of vacuum switchgear
- Maintenance and testing requirements

## DAY 4

### SF6 Gas

- Properties of SF6
- Principles of arc extinction
- Features of construction
- Insulation principles
- Gas leak problems
- Specific supervision requirements
- Circuit power factor considerations
- Maintenance and testing requirements


## DAY 5

### International Standards

- Importance and relevance to specifications
- Circuit breaker failure and the effects on power system operation
- Circuit breaker inspection, testing and maintenance program
- The Principles of modern substation control systems
- Power circuit breaker maintenance
- Case studies
- Wrap up session with Q&A

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