PROJACS ACADEMY
by egis

Advanced Circuit Breakers Operation and Maintenance

البرنامج المتقدم في تشغيل وصيانة القواطع الكهربائية

06 – 10 November 2023

Dubai / UAE

Introduction

This Advanced Circuit Breakers Operation and Maintenance training course begins with the fundamental principles of arc extinction with progression of incorporating green gas resulting in the reduction of global warming potential and reduction of carbon footprint.

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.

Hybrid circuit breakers, and state of the art high voltage circuit breakers incorporating alternatives to sulphur hexafluoride are the more efficient and safer for the environment. Higher ratings for high voltage vacuum circuit breaker are commonly installed today.

Objectives

At the end of this training course, participants will learn to:

- Appreciate the importance of preventive maintenance check and servicing of the various types of circuit breakers
- Determine safe operation of the gas insulated switchgear circuit breaker and its associated components
- Develop maintenance activities and maintaining system safety
- Understand the component functionalities of the gas and vacuum circuit breakers
- Explain methods of arc extinction for live tank and dead tank circuit breakers
- Recognise the importance of installing high voltage circuit breakers with green gas and clean air arc extinction designs

Who Should Attend?

- Electrical Managers
- Electrical Engineers
- Maintenance Technicians
- Project Engineers
- HSE Professionals

Course Outline

Day One

Roles of Circuit Breakers under Fault Conditions

- Distinction between Load and Fault Current
- Sources of Short-circuit Current
- Introduction to Fault Calculations
- Symmetrical and Asymmetrical Faults
- Overview of Power System Categories and with Time Current Curves
- Importance of Instrument Transformers
- Types of Protection Systems with LSIG Characteristics
- The Role and Importance of the Circuit Breaker in Power Systems

Day Two

General Principles of Arc Extinction Air, Gas and Vacuum Circuit Breakers

- Air-Break or Air Circuit Breaker
- Performance Characteristics and Arc Chute Functions
- Vacuum Circuit Breaker Design and Construction
- High Voltage Live Tank and Dead Tank Vacuum Circuit Breaker
- Maintenance and Testing Requirements for VCB
- Gas Insulated Switchgear SF6 Circuit Breaker Construction and Operations
- Substation Layouts and Merits
- Digital Substation Circuit Breakers

Day Three

Eco Efficient Gas for New Generation Circuit Breakers as Alternative to Sulphur Hexafluoride (SF6)

- Hybrid High Voltage Circuit Breakers
- Green Gas for Grid or g3 alternative to SF6
- SF6 alternative Eco Efficient Gas
- Air Plus Insulation an alternative to SF6
- Fluoroketone alternative to SF6
- 8VN1 Clean Air Insulation
- Blue GIS VCB with Clean Air Technology
- Roles of Circuit Breakers and Substation Protection

Day Four

Operations and Maintenance of SF6 Gas Circuit Breaker

- 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 Five

Circuit Breaker Specifications, Testing and Maintenance Programmes

- 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

Training Method

- Pre-assessment
- Live group instruction
- Use of real-world examples, case studies and exercises
- Interactive participation and discussion
- Power point presentation, LCD and flip chart
- Group activities and tests
- Each participant receives a 7” Tablet containing a copy of the presentation, slides and handouts
- Post-assessment

Program Support

This program is supported by interactive discussions, role-play, case studies and highlight the techniques available to the participants.

Schedule

The course agenda will be as follows:

- Technical Session 08.30-10.00 am
- Coffee Break 10.00-10.15 am
- Technical Session 10.15-12.15 noon
- Coffee Break 12.15-12.45 pm
- Technical Session 12.45-02.30 pm
- Course Ends 02.30 pm

Course Fees*

- **3,200 USD**
  **VAT is Excluded If Applicable*