



Safe Operation & Maintenance of
Circuit Breakers and Switchgear



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Introduction

Circuit breakers, fused switches, and switchgear in Motor Control Centres MCC are critical for the electrical operation and maintenance of electrical plants. Correct initial selection, operation, and maintenance paired with a comprehensive understanding of installation, local substation and system ratings, and operation of various breakers are crucial for troubleshooting and repair.

The course on Safe operation and maintenance of circuit breakers and switchgear equips participants with crucial skills to ensure safe installation, operation, and maintenance. This safety operation and maintenance circuit breaker course enables them to identify faults and underlying causes efficiently, reducing the risk of further failures.

Ensuring the electrical operation and maintenance of critical infrastructure like circuit breakers and switchgear is vital for the smooth functioning of electrical equipment in various settings, including marinas and industrial plants.

This safety operation and maintenance circuit breaker conference delves into these components' operation and maintenance systems, focusing on safe and efficient handling per established guidelines for safe process operations and maintenance.

Operation Safe: Guidelines for Safe Process Operations and Maintenance

Forging a safe operation mindset is central to the electrical operation and maintenance of circuit breakers and switchgear. This segment provides guidelines for the safe operation and maintenance of marinas and similar settings, reinforcing the principles of energy operation and maintenance solutions and solidifying the practices that ensure safety and efficiency in operations.

- Apply guidelines for safe process operations and maintenance.
- Ensure safety in energy operation and maintenance protocols.
- Adopt an operation-safe culture in everyday practices.

Throughout this safety operation and maintenance circuit breaker conference, emphasis will be placed on energy operation and maintenance solutions and specialized operation and maintenance training and management, providing participants with the knowledge and skills needed to excel in their roles within maintenance and operations.

Targeted Groups

- Electricians.
- Electrical supervisors.
- Plant electricians.
- Operations and maintenance engineers, supervisors, and technicians.
- Maintenance technicians.

Conference Objectives

At the end of this safety operation and maintenance circuit breaker conference, participants will:

- Grasp the operational characteristics of circuit breakers and switchgear.
- Learn the troubleshooting procedures for circuit breakers and associated switchgear.
- Enhance capabilities in the use of test equipment.
- Understand failure modes and failure analysis for fuses, circuit breakers, and switchgear, including air brake, vacuum, and SF6 devices.
- Maintain an updated awareness of electrical safety in substations and control centers.
- Assess fault levels in substations.

Targeted Competencies

At this safety operation and maintenance circuit breaker conference, target competencies will:

- Know the types of switchgear and disconnectors.
- Understand comprehension of electrical systems, load and fault requirements.
- Familiarity with substation layouts and equipment from 0.4 - 36kV.
- Learn about health and safety and equipment fault voltages during earth fault conditions.
- Know proficiency in switching plant maintenance, inspection, testing, and certification.
- Understand electrical hazards, safe working distances, and permits to work.
- Ability to recognize unsafe situations.
- Learn competence in safe earthing of equipment during maintenance, lockouts, and labelling.

Conference Content

Unit 1: The Technology of Circuit Breakers and Switchgear

- Typical Substation Arrangements and MCCs.
- Definitions and terminology.
- Fault level calculations.
- Motor and generator fault contributions.
- Low voltage equipment.
- Medium voltage equipment.
- High voltage equipment.
- Nameplate Ratings and Interpretation.
- CT's and VT's.
- Basic protection requirements.

Unit 2: Operation of Various Types of Interrupting Equipment

- Fuses on motor starting types.
- Fused switches.
- Moulded Case-Type Breakers.
- Air break switches.
- Vacuum contactors - fused.
- Vacuum circuit breakers.
- SF6 puffer and rotating arc devices.
- Special insulating requirements for 36kV.
- Understand issues with solid and gaseous insulation.

Unit 3: Electrical Operation and Maintenance Strategies

- Digital voltmeter DVM.
- Oscilloscopes.
- Megger.
- Frequency meter.
- Temperature Probes/IR Pyrometers.
- Ammeters.
- Power meters.
- Load banks.
- Cable fault locators.

Unit 4: Special Techniques

- NEC checklists to ensure the correct installation.
- Troubleshooting of Electrical Equipment.
- Methods.
- Terminology.
- Principles.
- Special techniques.
- Single line drawings.

Unit 5: The Interpretation and Use of Drawings

- Single-line electrical drawings.
- Control schematics.
- Basic generic wiring lists.
- Nameplate information.
- Logic and Standard Symbols.
- Concepts of Step and Touch Potential.

Unit 6: Operation and Maintenance Management

- The identification of a troubleshooting step-by-step sequence.
- Procedure preparation.
- Documentation.
- Follow-up processes.
- Safety considerations and training.

Unit 7: The Identification and Repair of Problems/ Failures

- Common mode failures.
- Phase imbalance - lost phase.
- Phase sequence checkout.
- Contact pitting/arcng - why?
- Load and fault rating.
- Electronic component failure.
- Fuse.
- Switches.
- Control circuits.
- Ground faults on the cable and busbar faults.
- A review of Safety Requirements.
- Area classifications.
- NEC electrical codes.
- Safety information.