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MV & HV Circuit Breaker Maintenance Training

View Course Details

COURSE DATES AND TIMES

April 14-15 , 2026

10:00am - 4:30pm ET

December 7-8 , 2026

10:00am - 4:30pm ET

Medium & High Voltage Circuit Breaker Maintenance - This 12-hour (2 Day) live online training course is designed for engineers and technicians from utilities or industries who participate in the design, installation, testing, or maintenance of high voltage circuit breakers and substation controls. Participants will increase their knowledge of circuit breakers and learn techniques for diagnostics, testing, and maintenance of medium & high voltage circuit breakers. Information presented will concentrate on medium voltage vacuum circuit breakers and high voltage SF6 circuit breakers since these are types most commonly applied in power systems, but other types will be discussed as well.

Learning Outcomes

- Understand purpose for circuit breakers and their function in power systems
- Recognize the various bus configurations used in substations, switching stations, and generation stations
- Understand operation of batteries, chargers, trip/close, and control circuits
- Know how to apply and connect current transformers in protection circuits
- Recognize tradeoffs for reclosing on transmission & distribution lines
- Learn testing and maintenance procedures for circuit breakers
- Understand breaker failure schemes
- Explore options for interfacing protective relays with circuit breakers

WHO SHOULD ATTEND

- Substation Construction Technicians
- Substation Design Engineers
- Substation Operation/Maintenance Engineers & Technologists
- Relay Technicians
- Generation Engineers & Technicians
- Testing & Commissioning Engineers
- Maintenance Engineers & Technologists
- Control System Engineers
- System Protection Engineers
- Consulting Engineers
- Transmission & Distribution Engineers

STUDENTS RECEIVE

- Certificate of Course Completion
- FREE 100-Page Digital Electrical Maintenance Handbook (Value $20)
- $100 Coupon Toward any Future Electricity Forum Event (Restrictions Apply)
- 1.2 Continuing Education Unit (CEU) Credits
- FREE Digital Magazine Subscription (Value $25.00)
- Course Materials in PDF Format

COURSE OUTLINE

Medium & High Voltage Circuit Breakers – Course Outline

DAY ONE

Circuit Breaker Application in Power Systems

- Purpose for circuit breakers
- History of circuit breakers
- Application of reclosers on medium voltage distribution systems
- Substation medium voltage circuit breakers
- Substation high voltage transformer protection
- Switching station high voltage line protection
- EHV systems

Bus Configurations

- Single bus
- Main & Transfer

- Ring bus
- Double bus – double breaker
- Comparison of configurations

Disconnect Switches

- Vertical break
- Side break
- Center break
- Vee-switch
- Double break
- Loadbreak switches
- Switch ratings
- Switch maintenance

Medium Voltage Circuit Breaker Types (2-35 kV)

- Air circuit breakers (ACB)
- Oil circuit breakers (OCB)
- Vacuum circuit breakers (VCB)
- Metal-clad switchgear

High Voltage Circuit Breaker Types (50-245 kV)

- Circuit breaker mechanisms
- Dead tank SF6 circuit breakers
- Live tank SF6 circuit breakers and circuit switchers
- SF6 alternative gasses
- Oil circuit breakers (OCB)
- High-voltage VCB’s
- Air-blast circuit breakers

Extra-High Voltage Circuit Breaker Types (345 kV and above)

- Reclosing (79)
- Pros and cons of reclosing on line faults
- Distribution circuits, reclosing considerations
- Transmission circuits, reclosing considerations

DAY TWO

Current Transformers

- Types of current transformers
- CT ratios & polarity
- CT accuracy, burden, and saturation
- Shorting CT secondary circuits, test switches
- Open-circuit CT voltage and safety considerations
- CT magnetization
- CT Connection in ring bus / breaker & a half schemes

Substation DC Systems

- Purpose for DC systems in substations
- Batteries, different types and comparison
- Battery capacity, battery installation
- Battery chargers
- Trip circuits
- Close circuits
- DC circuit monitoring
- Trip coil redundancy

Circuit Breaker Testing

- Micro-ohm resistance (ductor)
- Trip Coil signature (first-trip testing)
- Travel Analysis
- Power factor testing
- Monitoring opening times through MP relays

Circuit Breaker Maintenance

- OCB – Dissolved Gas Analysis and dielectric strength
- OCB – metal content in oil
- SF6 – Purity and decomposition
- Vacuum – high-pot testing
- Vacuum – erosion and gap
- Lubrication
- Battery maintenance
- Trip checks

Troubleshooting Circuit Breaker Problems

- Failure to trip or close
- Slow tripping times

- Slow closing times
- Mechanism problems
- Overtravel and rebound
- Interruption failure

Bus Protection and Breaker Failure schemes

- CT connections in different bus configurations
- Bus differential relays
- Breaker failure protection

Connection to Relays and SCADA

- Breaker status indication
- SCADA alarms related to circuit breakers
- Electro-mechanical relay control schemes
- Microprocessor (MP) relay control schemes
- Integration of circuit breakers with MP logic

COURSE SCHEDULE

Both Days:

Start: 10:00 am - Eastern Time

Finish: 4:30 pm - Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company’s location.

Request Quote