

## Circuit Breaker Maintenance and Mechanism Lubrication

### Overview:

Circuit breaker operational testing and lubrication of mechanisms are key aspects in maintaining circuit breakers to help ensure reliable operation. This interactive 3-day course focuses on theoretical background with practical field experience to provide vital knowledge for optimizing circuit breaker reliability.

The first two days will cover circuit breaker testing and maintenance. Moving parts on circuit breakers can wear and alignments and clearances can change causing critical functions to be negatively affected. Circuit breaker testing reveals these and other changes in advance of a failure, which could render the equipment inoperable and cause damage to the electrical power system. An introduction of various mechanism types, interrupters and testing methodologies will be discussed. For each test, there will be an in-depth discussion of the measurement, setup and test methodology, and acceptance criteria. Test results will be used for reporting and maintenance purposes and used for historical data samples to improve maintenance schedules. A specialist will provide training to decipher and review apparatus test results so that they are clear and easy to understand.

The third day, in partnership with FirstPower Group LLC, will provide the basics for a mechanism lubrication program. Making the right decisions about lubrication can ensure reliable, long life performance of circuit breaker mechanisms. Lubrication fundamentals, selecting the right greases and oils for circuit breaker applications, field practices and case studies will be discussed. Attendees will have a combination of classroom work and hands-on experience on various circuit breakers.

### Learning Outcomes:

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

- Understand the operation of circuit breakers
- Know when to perform routine circuit breaker tests
- Interpret test results, case studies, and numerous field examples
- Effectively create test plans using the manufacturer's circuit breaker specifications
- Confidently use Vanguard or Doble circuit breaker analyzers software to perform routine circuit breaker tests and manage test plans and test results
- Understand lubricant options, how lubricants work and why they fail
- Select and apply correct lubricants for circuit breaker mechanism components, for example trip latches on different mechanisms, prop bearings, cams, gears and chains
- Analyze lubrication related problems

### Course Audience:

Substation test engineers and technicians working in operations, maintenance, engineering, or other service field in which knowledge of circuit breaker testing methods and lubrication application are a required part of their job responsibilities.

**Duration:** 3 Days

**Class Size:** 8 - 15 Attendees

**Credits:** Up to 2.4 CEUs or 24 Professional Development Hours

We will provide a training manual (soft copy) to each participant and a training certificate for each participant that successfully passes the quiz.

## COURSE OUTLINE

# Circuit Breaker Maintenance and Mechanism Lubrication

The course program contains the following training outline:

### Day 1

- **Terminology** – Circuit breaker terminology such as velocity, timing, translation of graphical data, timing and stroke measurements will be discussed and explained.
- **Interruption and Theory** – Circuit breaker functional operation and all the factors that affect the efficiency and performance with respect to breaker manufacturer specifications will be covered.
- **Circuit Breaker Mechanisms** – Various circuit breaker mechanisms will be introduced and their operations will be explained.
- **Circuit Breaker Timers** – Electro-mechanical and microprocessor-based timers will be introduced and their operations will be explained.

### Day 2 (Hands-on)

- **Testing with Vanguard or Doble CB Analyzers** – Specific training will be provided for performing circuit breaker tests with Vanguard or Doble circuit breaker analyzers.
- **Software** – Users will be introduced to the Vanguard VCBA S2 or T-Doble application software and how to perform circuit breaker tests with the software. Topics will include creating test plans, translating data, and working with test records and test plans.
- **Case Studies** – Field test results related to the material presented will be provided for seminar participants to discuss and analyze.

### Day 3

- **Lubrication History and Selection Options** – Separating the technology of lubricants from marketing descriptions.
- **Language of Lubricants** – What are the components of lubricants, what is the difference between different lubricants, and why do lubricants fail.
- **Compatibility** – What happens when lubricants are mixed and when is it satisfactory to mix them.
- **Selection of Lubricants** – selecting the correct lubricant for the specific application.
- **Field Practices** – Do's and don'ts on actual circuit breakers, reducing the inventory of lubricants.
- **Hands-on Time in Shop** – Reinforce lubrication selection and application learned in classroom.

### Presenter(s):

An experienced Vanguard or Doble Technical Application Engineer

An engineer or technician experienced in circuit breaker lubrication.