DOBLE TRAINING & EDUCATION COURSES

Circuit Breaker Testing Fundamentals & SF_6 Gas Handling Fundamentals

Overview:

Circuit breaker operational testing and management of SF_6 gas are key aspects in maintaining circuit breakers to help ensure reliable operation. This interactive 4-day course focuses on theoretical background with practical field experience to provide technicians with vital knowledge for optimizing circuit breaker reliability.

The first two days will cover circuit breaker testing. Moving parts on circuit breakers wear, alignments and clearances change and critical functions can be negatively affected. Tests made with circuit breaker testers reveal 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 each measurement, setup and test methodology, and acceptance criteria. A Vanguard specialist will provide training to decipher and review apparatus test results so that they are clear and easy to understand. Test results will be used for reporting and maintenance purposes and used for historical data samples to improve maintenance schedules.

In partnership with DILO, the second two days will focus on SF_6 gas handling fundamentals including theoretical and hands on training pertaining to safety, gas handling equipment and tooling, gas analysis, transportation, regulations and reporting. Test results will be used for reporting and maintenance purposesand used for historical data samples to improve maintenance schedules.

Learning Outcomes:

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

- Understand the operation of circuit breakers, 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 circuit breaker analyzers and VCBA S2 software to perform routine circuit breaker tests and manage test plans and test results
- Theoretical and practical experience with SF_6 gas handling equipment

Course Audience:

Substation test technicians working in operations, maintenance, engineering, or other service field in which knowledge of circuit breaker testing methods and evaluation and SF_6 gas handling is a required part of their job responsibilities.

Duration:

4 Days

Class Size:

8-15 Attendees

Credits:

Up to 3.2 CEUs or 32 Professional Development Hours

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COURSE OUTLINE

Circuit Breaker Testing Fundamentals & SF6 Gas Handling

The course program contains the following training outline:

Day 1

1. Terminology – Circuit breaker terminology such as velocity, timing, translation of graphical data, timing and stroke measurements will be discussed and explained.

2. Interruption and Theory – A circuit breaker's functional operation and all the factors that affect the efficiency and performance with respect to breaker manufacturer specifications will be covered.

3. Circuit Breaker Mechanisms – Various circuit breaker mechanisms will be introduced and their operations will be explained.

4. Circuit Breaker Timers – Electro-mechanical and Microprocessor-based timers will be introduced and their operations will be explained.

Day 2 (Hands on)

1. Testing with Vanguard CB Analyzers – Specific training will be provided for performing circuit breaker tests with Vanguard circuit breaker analyzers.

2. VCBA S2 Software – Users will be introduced to the Vanguard VCBA S2 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.

3. Case Studies – Field test results related to the material presented will be provided for seminar participants to discuss and analyze.

Day 3

1. SF_6 Gas – History, gas overview/contaminants, virgin vs reconditioned gas

2. SF_6 Safety – GIE, cylinders, decomposition

3. SF_6 Gas Analysis – Cylinder testing, GIE testing

4. SF_6 Gas Handling – Equipment & tooling, preparation, gas recovery, evacuation (air & moisture), refilling, decomposition (recovery)/pre-filters

5. SF_6 Gas Cylinders – DOT / ISO, transportation considerations

6. Regulations and reporting – Federal, state, accountability tools and management

Day 4 (Hands on)

1. Safety – Shop and gas handling safety review

2. SF_6 Gas Analyzer – General operation and handling, general maintenance

3. SF_6 Gas Handling – Identification of recovery equipment required, preparation for handling, operations, and general maintenance

4. Fittings and Hoses

5. Written and Practical testing

Presenter(s)

An experienced Vanguard Engineer or Technical Application Engineer.

An experienced DILO Engineer or Technical Application Engineer.

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