2008 September Client Committee Meetings and Conference
Tutorial and Training Sessions

TUTORIAL: Design, Operation and Maintenance of Capacitor Banks

Sunday, September 21st
12:30 PM – 5:30 PM
Windsor Ballroom
Free of charge – no need to register

This tutorial will address common problems that are frequently encountered in the day to day operation of large capacitor banks. Maintenance personnel regularly have to maintain large capacitor banks that have design and application problems. These issues, when built into the system, can make it very difficult for the continuous operation without repeated failures. This tutorial will address common mistakes that are often made with large banks of capacitors.

The focus of this seminar will be broken down into three sections; capacitors, switching devices, and protection. Each segment will address a specific topic that can affect the safe and reliable operation of capacitor banks.

Capacitors

Capacitor design, application, and common types of failures will be covered by Mr. Karl Fender, Cooper Power Systems. Mr. Fender will review items such as: single bushing versus two bushing design, common types of capacitor failures, advantage of fused/fuse-less capacitors, and other topics that are important when selecting capacitors for different applications.

Karl Fender is the Global Product Manager at Cooper Power Systems, McGraw-Edison Power Capacitors. He joined Cooper Power Systems in 1993 after 5 years in the U.S. Navy. Karl has held several positions within Cooper Power Systems in both design engineering and marketing. He earned a B.S. degree in electrical engineering from the University of South Carolina, where he is currently pursuing an MBA, and is a member of several capacitor related IEEE working groups.

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Switching

Switching shunt capacitor banks often results in voltage and current transients of varying magnitudes depending on various system conditions including capacitor bank size and configuration. Quite often these transients can be devastating and cause damage not only to equipment at the station where the bank is being energized but also to distant stations.

The following transient phenomena are common:

- Overvoltages at the bus where the cap bank is energized
- Overvoltages resulting at adjacent stations due to remote switching
- High magnitude and high frequency inrush currents.
- In addition, the de-energizing of a capacitor bank can also result in significant transients.

Hence, the circuit device and necessary aids are critical in controlling the impact of transients when switching a capacitor bank. Normal circuit switchers can be equipped with pre-insertion resistors or inductors to dampen the effects of severe transients. In instances where breakers are used as a switching device, pre-insertion resistors are common for this application.

Another common method for reducing the voltage and inrush current transients is to employ controlled switching. This method, employed at vacuum switches and SF6 breakers, consists of closing each phase at voltage zero as opposed to closing all three phases simultaneously.

It is planned to have both a Joslyn and an ABB technical representative on hand to provide details of their companies' approaches to the switching transients listed above.

Protection

Protection of capacitor banks is also very critical in preserving this asset. As with any protection, early detection is the key to avoiding costly damage.

Hence, engineers should pay close attention to this useful asset and make sure that their capacitor banks are adequately protected.

The protection applied at capacitor banks is dependent on the configuration of the bank; such as simple wye ungrounded, simple wye grounded, split wye connection, fused, fuseless, etc. Each of these categories requires specific protection schemes.

Ed Khan, Doble Engineering Protection Specialist will address these issues.

The main intention of this tutorial is that the attendees will take away excellent information that can be shared among their respective colleagues. This has been and will continue as a common theme in all the Doble Conference events. We invite you to join us in Atlanta and share what you know or learn something new.

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OPTIONAL TRAINING: Basic Protective Relaying ($375 per person)

Monday, September 22nd
8:00 AM – 5:00 PM
Windsor DE Ballroom
$ 375 per person includes breakfast and lunch
Presented by Ed Khan and Jay Gosalia, Doble Engineering Company

The Basic Protective Relaying Course is geared towards entry level engineers making their way into the field of relay protection and for technicians who would like to obtain the theory and practices of protective relaying. The course is intended to provide a conceptual level of knowledge without the vigorous mathematical details. The course will start with an introduction to protective relaying and then get into the following topics: differences between electro-mechanical, solid state and microprocessor relays, current and voltage transformers, basic over current relaying, distance protection, transformer protection, differential protection, basics of communication assisted protection, reclosing of circuits, remote and local backup protection.

OPTIONAL TRAINING: Introduction to ProTesT ($ 475 per person)

Tuesday, September 23rd
8:00 AM – 5:00 PM
Windsor DE Ballroom
$ 475 per person includes breakfast and lunch
Presented by Calvin Vo and Scott Short, Doble Engineering

Introductory level (no prior experience with ProTesT required)
Power companies worldwide rely on ProTesT for automated testing of relays and power system protection schemes. With ProTesT you can perform virtually any test needed on your protection scheme, including steady-state calibration, dynamic state simulation, transient simulation and end-to-end testing. This full day workshop will include an overview of the ProTesT system – what it is and how it works. You'll become familiar with its menus and features, and how to organize your database. After this introduction each attendee will make a test plans for overcurrent, distance and other protective functions. Upon completion of this workshop attendees will have gained the ability to work with ProTesT to build test plans, as well as using existing plans to test relays.

NOTE: This is a hands-on class. Bring your own computer with ProTesT loaded in advance, stop by the PTUG Clinic on Sunday or Monday if needed. During the workshop you will be divided into groups and each group will be provided an instrument, a relay and instructors assistance.

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TRAINING: DTAWEB

Friday, September 26th
Windsor DE
Free of charge but pre-registration is required due to 50 person class limit
Presented by Marshall Turley, Doble Engineering Company

This session will take the user from basics all the way through the wide variety of features of DTAWeb, and will begin with a review of these features including:

1. Database management, controlling data flow into and out of the database
2. Using queries to obtain company-wide information on oil lab data, DTA, and SFRA data
3. Adding attachments, such as infrared scans or nameplate drawings associated with a particular apparatus, to the database
4. Tabulating, graphing, and viewing selected data
5. Backing up your data
6. Editing and updating files, merging file duplicates, and otherwise correcting file nameplate data

It will then continue in individual groups of about five, each headed by a Doble Client Service Engineer, so that individuals can obtain some hands-on experience creating queries and using the program features. This will be an excellent opportunity to address individual questions you may have about performing a particular function.

OPTIONAL TRAINING: ProTesT Settings Workshop ($ 475 per person)

Friday, September 26th
8:00 AM – 5:00 PM
Venetian IV-VI Ballroom
$ 475 per person includes breakfast and lunch
Presented by Ed Khan, Doble Engineering Company

Advanced level with prior experience in ProTesT required.
This Workshop is for those individuals who would like to learn about ProTesT's advanced Settings features. Attendees should have completed the Introduction to ProTesT class or have a working knowledge of ProTesT. You will learn how to set up macros so they can be automatically populated based on setting of the relays. With this knowledge you will have the ability to program settings into ProTesT. You will be able to create test plans that will automatically update based on the relay settings, eliminating the need to enter the information manually.

NOTE: This is a hands-on class. Bring your own computer with ProTesT loaded in advance, stop by the PTUG Clinic on Sunday if needed. There will be a limited number of relays available for your use after class and during breaks.

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OPTIONAL TRAINING: One-Day Laboratory Seminar ($ 395 per person)

Friday, September 26th
7:30 AM – 4:30 PM
Venetian I-11I Ballroom
$ 395 per person includes breakfast and lunch
Presented by Paul Griffin and Lance Lewand, Doble Engineering Company

This day-long seminar is for engineers, chemists, and others who review data to assess transformer condition. This interactive seminar combines theoretical background with practical experience and hands-on examples using case studies to illustrate common problems found in the field.

Participants will**:**

- Learn about the quality of oils on the market today
- Discover how knowing about the aging characteristics of insulating materials can help you extend the life of your transformer
- Learn how to take oil samples, avoiding common pitfalls and saving time and money by sampling only once
- Diagnose apparatus problems with dissolved gas-in-oil analysis
- Find out how to assess the condition of the paper insulation
- Detect the presence of incipient-fault conditions and categorize them
- Establish the correct method of analyzing the moisture-in-oil results
- Study the significance of dissolved and particulate metals and other particle contamination found in electrical apparatus
- Understand how to determine the condition of electric apparatus using laboratory tests