



TRAINING AND TUTORIALS

FREE TUTORIALS ON SUNDAY & THURSDAY

FREE SUNDAY TUTORIAL: “Moisture Dynamics in Oil-Paper and Sulfur Hexafluoride Insulation Systems”

Sunday, October 4th, 1:00 PM – 5:30 PM

Free of charge – no need to register

Part 1: Moisture Dynamics in Oil-Paper Insulation Systems

Part 1 will be about 2 hours in duration and will discuss in detail moisture dynamics in oil-filled electrical apparatus insulation systems. Presenters Paul Griffin and Lance Lewand of Doble Engineering Company located in Watertown, MA USA will discuss the following subjects:

1. How Moisture Enters or Is Created in a Transformer Insulation System
 - Water ingress points
 - Trapped moisture
 - Degradation of Cellulosic Insulation
2. The Basics
 - Forms of water - Free, emulsified, dissolved and vapor
 - Water Solubility in Oil
 - The Concept of Relative Saturation
3. Sampling to Estimate Moisture in the Insulation System
4. Effects of Water on Insulating Materials and Moisture Dynamics
 - Reduction of dielectric strength of both solid and liquid insulation
 - Aging of the cellulosic insulation
 - Production of water vapor bubbles during overloads
 - The effects of temperature and temperature cycling – possible condensation
 - Issues with “dumping” load and short time period restart
 - Influence of ambient temperature and operating environment
5. Suggested moisture limits
 - Oil upon receipt
 - Equipment upon receipt
 - Service aged equipment such as transformers, load tap changers (LTCs) and oil circuit breakers (OCBs)



Paul J. Griffin

Mr. Griffin has been with Doble since 1979 and held the position of Laboratory Manager before becoming Vice President of Laboratory Services. Since joining Doble, Mr. Griffin has published over 50 technical papers pertaining to testing of electrical insulating materials and laboratory diagnostics. He is a Fellow of ASTM and a member of Committee D-27 on Electrical Insulating Liquids and Gases. He was formerly ASTM Subcommittee Chairman on Physical Test, ASTM Section Chairman on Gases in Oil, and the Technical Advisor to the U.S. National Committee for participation in the International Electrotechnical Commission, Technical Committee 10, Fluids for Electrotechnical Applications. Mr. Griffin is a member of the IEEE Insulating Fluid Subcommittee of the Transformer Committee, and the American Chemical Society.

Lance Lewand

*Lance Lewand is the Laboratory Manager for the Doble Materials Laboratory and is also the Product Manager for the Doble **DOMINO**, which is a moisture-in-oil sensor. The Materials Laboratory is responsible for routine and investigative analyses of liquid and solid dielectrics for electric apparatus. Since joining Doble in 1992, Mr. Lewand has published over 50 technical papers pertaining to testing and sampling of electrical insulating materials and laboratory diagnostics.*

Mr. Lewand was formerly Manager of Transformer Fluid Test Laboratory and PCB and Oil Field Services at MET Electrical Testing Company in Baltimore, MD for seven years. His years of field service experience in this capacity provide a unique perspective, coupling laboratory analysis and field service work.

Mr. Lewand received his bachelors of science degree from St. Mary's College of Maryland. He is actively involved in professional organizations the American Chemical Society, representative of the U.S. National Committee for TC10 of the International Electrotechnical Commission (IEC), and ASTM D-27 since 1989 and is the sub-committee chair 06 on Chemical Tests. He is also the secretary of the Doble Committee on Insulating Materials.

Part 2: Moisture Dynamics in SF₆ Insulation Systems

Part 2 will be about 2 hours in duration and will discuss in detail moisture dynamics in SF₆ insulation systems mainly those associated with breakers.

Presenter Lukas Rothlisberger of the Dilo Company located in Odessa, FL USA will provide presentations on the following topics:

1. Importance of Moisture in SF₆ Equipment
 - In new gas
 - Why is it important in gas-filled equipment (breakers and GIS)
 - How SF₆ interrupts
 - How moisture affects the operation of the gas-filled equipment
2. Sampling
 - How to take a sample
 - How much gas to bleed before taking a sample
 - Materials to use
 - Sample containers
 - When to take a sample



3. Measurements

- How to make measurements - taking a correct dew point measurement and the materials to be used to do so
- Units – The difference between gauge pressure and absolute, correcting the measurement for pressure
- Units – dew point, relative saturation, concentration (ppmv and ppmw) and relative merits
- How much gas to use when taking a sample
- Difference in testing SF₆ for moisture from a breaker versus testing SF₆ for moisture from a cylinder

Lukas Rothlisberger

Mr. Rothlisberger has over 14 years experience working with greenhouse gas equipment. He has been employed by DILO since 1997. Since 2000 he is – and the position he currently holds – CEO/General Manager. DILO is a manufacturer of equipment (valves/fittings, recovery systems, test equipment) for SF₆ handling and maintenance. It is estimated that over 90% of electric utilities in the United States use equipment manufactured by DILO to handle/maintain their SF₆ gas.

Mr. Rothlisberger is responsible for all of DILO's operations in North- and Latin America. In addition to day to day operations, specific job duties include providing safety and handling training for SF₆ users, assisting SF₆ users in setting up internal SF₆ handling guidelines, and making sure that proper equipment is selected. He is participating on numerous SF₆ Teams at utilities throughout the Americas. He is a contributing member of the CIGRE SF₆ Task Force (B3.02.01) and one of the Co-authors for the CIGRE SF₆ Recycling Guide, Revision 2003. Mr. Rothlisberger is also a member of the NEMA SF₆ Task Force as well as IEC.

He has written a number of technical papers about SF₆ handling and has presented them for various organizations including US EPA, Finepoint, Doble and IEEE.

Presenter Ian Wylie of Powertech Laboratories located in Canada will provide presentations on the following topics:

4. Ingress of water into the breaker

- Describe the chemical/physical phenomena for water entering the breakers/GIS even at high pressures
- The role of partial pressures
- Leaks in a porous casting, pipe threaded connections
- Leaks at flanges and o-ring/gasket sealed connections
- Other areas that are prone to leakage
- Other areas that one may not expect water to ingress
- Tools to aid in leak detection

5. Chemical interactions of water inside SF₆ breakers

- Steady state conditions of moisture inside gas filled equipment
- Which components absorb the most moisture
- How does moisture react once inside the equipment
- Chemical compounds (byproducts) that are produced through SF₆ and moisture interactions



- Danger and Remediation of moisture and SF₆ related byproducts
- Safety considerations and the use of Personal Protective Equipment (PPE)

Ian Wylie

Ian Wylie joined Powertech Labs Inc. in 1990 after receiving his Bachelor of Science with Honours degree in Chemistry from Acadia University in 1989. After familiarization with many of the insulating fluid analyses, he began work on various research projects. These include development and testing of a sulphur hexafluoride gas (SF₆) decomposition product detector, reclamation of spent Fuller's Earth, GVRD and B.C. Hydro vehicle fleet emission estimates, set up and operation of battery test facility and has worked extensively with Powertech Labs Inc. patented sodium based PCB destruction process. Mr. Wylie has comprehensive experience with gas handling techniques and systems, vacuum technology and his current interests include SF₆ research projects focusing on handling, reclamation and recycling as well as field detection and analysis of SF₆ and SF₆ decomposition products. Mr. Wylie has authored papers and reports, and made presentations at technical conferences on sulphur hexafluoride gas assessment and handling.

Presenter Lloyd Traylor of Dominion Technical Solutions located in Virginia, USA will provide presentations on the following topics:

6. Specifications and guidelines on what is considered acceptable or dry, moderately wet and unacceptably wet on the Dominion system
 - New material - in gas bottles
 - In new equipment
 - In-service breakers
 - In-service GIS
7. The role of desiccant bags
 - When and how often bags should be changed
 - How to know if they are saturated
8. Field processing
 - Equipment and techniques used to remove moisture from in service gas

Lloyd Traylor

Mr. Traylor received his Associate Degrees in Applied Electronics from John Tyler Community College in 1970. Since that time he has held various support and management positions with Dominion Virginia Power for the past 39 years. He has also served as the Vice Chair and Chair of the Doble Client Committee on Circuit Breakers and is presently the Technical Consultant specializing in the area of transmission class circuit breakers for Dominion Technical Solutions.

Presenter Alex Salinas of Southern California Edison (SCE) located in California, USA will provide presentations on the following topics:

9. Specifications and guidelines on what is considered acceptable or dry, moderately wet and unacceptably wet on the SCE system
 - New material - in gas bottles



- In new equipment
 - In-service breakers
 - In-service GIS
10. Lack of failures due to moisture issues in SF₆ breakers
- Why moisture related failures are so rare
 - Why it is still important to test for moisture
 - Some of the more common failure modes in SF₆ breakers
 - Case Study

Alex Salinas

Alex Salinas has worked at various field and management positions at Southern California Edison for the last 27 years. He is currently manager of the Substation Technical Support and Strategy group that supports the maintenance, construction and test organizations. He is currently chairman of the Doble Client Committee on Circuit Breakers. He has earned a BA degree in Business Administration and MBA degree from the University of La Verne. He also received a Master of Science degree in Advanced Management from Claremont Graduate University.

Closure of the Insulating Materials Tutorial

FREE THURSDAY TUTORIAL: "Partial Discharge Tutorial"

Thursday, October 8th, 8:00 AM – 10:00 AM

Free of charge – no need to register

Part 1: Basic Partial Discharge aka PD101

Presented by G. Matthew Kennedy, Doble Engineering Company

Partial Discharge (PD) is not well understood by the average test technician or engineer in the field. Furthermore, the term "PD" is often used generically but really encompasses several type of sensing and modes of transmission. This seminar will try and break down a few of these modes to include RFI and electrical methods and explain how they generate a signal and how they are measured. Diagnostic algorithms and analysis methods will also be presented that are commonly used in PD assessment.

Part II: Partial Discharge Failures in HV Apparatus

Alan Wilson, Doble PowerTest Company

It's important to understand the implications of PD in real world HV apparatus. This session will explore several case studies and answer the questions why is PD an important Failure Mode & how does partial discharge lead to a failure. This presentation will also present how condition assessment strategies along with PD analysis can assess risk.

Who should attend: Anyone interested in understanding partial discharge activity in high voltage apparatus and those wanting to learn how partial discharge monitoring techniques can help prevent failures should attend.



PROTECTION TESTING USERS GROUP WORKSHOPS

OPTIONAL TRAINING: Basic Protective Relaying (\$ 525 USD per person)

Sunday, October 4th, 8:00 AM – 5:00 PM

\$ 525 USD per person includes breakfast, lunch and course material

Presented by Ed Khan, 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 (\$ 525 USD per person)

Monday, October 5th, 8:00 AM – 5:00 PM

\$ 525 USD per person includes breakfast, lunch and course material

Presented by 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 create 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. If you need the latest ProTesT version loaded on your computer stop by the PTUG Clinic on Sunday or Monday for assistance. During the workshop you will be divided into groups and each group will be provided an instrument, a relay and instructor assistance.



OPTIONAL TRAINING: ProTesT Settings Workshop (\$ 525 USD per person)

Thursday, October 8th

8:00 AM – 5:00 PM

\$ 525 USD per person includes breakfast, lunch and course material

Presented by Murray Gillett, 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. If you need the latest ProTesT version loaded on your computer stop by the PTUG Clinic on Sunday or Monday for assistance. There will be a limited number of relays available for your use after class and during breaks.



FRIDAY LAB SEMINAR

OPTIONAL TRAINING: One-Day Laboratory Seminar (\$ 445 USD per person)

Friday, October 9th

8:00 AM – 5:00 PM

\$ 445 USD per person includes breakfast, lunch and course material

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