



## **The 75th Annual International Conference of Doble Clients Tutorial and Training Sessions**

### **TUTORIAL: ASSET HEALTH INDICES**

*Sunday, April 6<sup>th</sup>*

*1:00 PM – 5:00 PM*

*America Ballroom Center & South, Westin Copley*

The Asset and Maintenance Management Committee will offer a tutorial about Asset Health Indices. The tutorial will include a discussion of the methods being used to assign weights to equipment inputs to establish overall equipment, system and station health indexes. It will also include aging of substation assets, methods for assessing life including transformer life assessment and end of life determination. The speakers include:

#### **Tom Kydd, Hydro One**

Tom Kydd has 29 years of extensive and diverse experience in the electric utility business. Starting in field operations with Ontario Hydro his career has spanned many aspects of both the Transmission and Distribution businesses with Hydro One including substation operations, substation power maintenance, design application, and equipment specialist support. He has held senior positions related to Asset Management since 1998, including recent responsibility for managing the Transmission and Distribution Station maintenance and capital investments programs. Mr. Kydd currently serves as Committee Chairman of the Doble Client Asset and Maintenance Management technical committee. He has presented in both North America and Europe, plus he has published technical papers on the subjects of Optimized Asset Management through Improved Information in an Asset Management Organization, Insulator Contamination and Power Washing, Mobile Unit Substation Usage and Refurbishment and Application of Transformer Specifications and Life Cycle Cost Considerations - A Utility Perspective and Aggregate Health Indices as Used for Asset Investment Decisions and Universal Understanding.

#### **John Stead, AltaLink**

John Stead is a Senior Equipment Specialist at AltaLink in Calgary, AB, Canada. Presently he is developing an Asset Management Strategy including a front-end application capable of assessing equipment on multiple conditions taken from various sources tied to the corporate CMMS. He has been involved in the maintenance and operation areas of the utility industry for over 35 years. Mr. Stead is also Senior Consultant with Stead Consulting Inc. During the last several years he has been a Senior Consultant working with Canadian and American utilities in the development of and training in maintenance programs and procedures. Prior to that he was with a Technical Services group that supplied technical support to line organization groups of all disciplines with Trans Alta Utilities. John is a recognized expert on Bushing Diagnostics and has presented several technical papers on Bushing Maintenance and Forensic Analysis of Bushing Failures at Doble conferences. He is the author of over 20 technical papers and is presently the Vice Chairman of both the Doble Advisory Committee and the Bushing Insulator & Instrument Transformer Committee.

#### **Dr. Charles Feinstein, Santa Clara University**

Charles D. Feinstein is Associate Professor of Operations and Management Information Systems at the Leavey School of Business, Santa Clara University. He also teaches in the department of Management Science and Engineering at Stanford University. Dr. Feinstein is co-founder of VMN Group LLC, a quantitative consulting company that specializes in creating decision support software. Dr. Feinstein has over 25 years of experience in research, teaching and application of mathematical methods and modeling. His areas of expertise include optimization, decision analysis, system dynamics, and systems analysis. He has written and presented extensively on managing aging infrastructure, project prioritization methodologies, electricity transmission and distribution system risk analysis, and the application of distributed resources to electric distribution system planning.



## **TRAINING: POWER FACTOR AND APPARATUS TESTING**

*Monday, April 7<sup>th</sup>*

*Copley Marriott*

*Mike Horning, Doble Engineering Company*

*Theory, 10:45 AM – 12:00 PM, Transformers and Bushings, 1:30 – 3:45 PM*

*Robert Sarni, Doble Engineering Company*

*Circuit Breakers and Instrument Transformers, 4:00 – 6:00 PM*

The classes on power factor testing continue to be popular. To begin, the fundamentals of why the power factor tests are so valuable will be covered in the theory portion of this series of classes. The application of these tests will be explained for transformers, bushings, circuit breakers and instrument transformers. Case studies are included to show how apparatus problems have been found by applying the fundamentals of the theory.

## **TRAINING: TRANSFORMER LOAD TAP CHANGER FUNDAMENTALS**

*Tuesday, April 8<sup>th</sup>*

*7:30 AM – 12:00 PM*

*Copley Marriott*

*Steve Larson, Manager*

*Snohomish Public Utility District*

The Load Tap Changer (LTC) Fundamentals class will aid the participant in understanding how LTC's are constructed and operate. Components of the LTC such as moving/stationary contacts, reversing switch, collector ring, preventive autotransformer, leads and barrier board are identified and discussed. The various designs, such as arcing tap switch reactive & resistive, diverter switch resistive, transfer switch reactive, and vacuum bottle will also be discussed, as well as comparing high and low side LTC configurations and series transformer types. This class will also explain how LTC controllers work, the meaning of settings, how to choose appropriate settings, test and troubleshoot them, and use controllers when paralleling transformers.

## **TRAINING: UNDERSTANDING TRANSFORMER NAMEPLATES**

*Tuesday, April 8<sup>th</sup>*

*1:30 – 3:30 PM*

*Copley Marriott*

*David L. Harris, P.E., Customer Technical Executive*

*Waukesha Electric Systems*

This class will give recent utility personnel additions who may not have the experience reading the nameplates of transformers an introduction on the topic. How to identify the winding configurations and the load tap changer will be discussed. De-energized tap changers and cooling ratings will be described.



## **TRAINING: DC TESTING OF TRANSFORMERS – INSULATION AND WINDING RESISTANCE AND TESTING OF CORE GROUND**

*Tuesday, April 8<sup>th</sup>*

*3:30 – 5:00 PM*

*Copley Marriott*

*James R. White, Director of Training*

*Shermco Industries*

This tutorial will present information on dc testing of transformers, including insulation resistance, winding resistance and testing of a transformer's core ground. Although ac testing of insulation provides more accurate evaluation, DC testing is often performed on smaller transformers, especially dry-types. The winding resistance test is especially important when changing load-tap changers and for locating loose connections that are internal to a transformer and, therefore, inaccessible. Lastly, the core ground test ensures that the laminations are properly grounded so as to prevent circulating currents within the core, causing overheating and damage.

## **TRAINING: DTAWeb**

*Wednesday, April 9<sup>th</sup>*

*8:30 AM – 12:00 PM*

*Copley Marriott*

*Ken Elkinson, Doble Engineering Company*

Recently Doble Engineering has implemented a system where Clients may store Doble Test Assistant data sets in a Doble Engineering database called DTAWeb. This system allows controlled access to the stored information over the World Wide Web. At this time there are over 800 users from over 200 Doble Client companies using the system. There have been 117,000 apparatus test histories loaded into DTAWeb including over 3,600 SFRA traces. In this class the user of the system learn the benefits of this new system and how to maximize the features of DTAWeb.

## **TRAINING: SWEEP FREQUENCY RESPONSE ANALYSIS**

*Wednesday, April 9<sup>th</sup>*

*4:00 – 6:00 PM*

*Copley Marriott*

*Matt Kennedy, Doble Engineering Company*

This year after the SFRA User Group Meeting there will be training on the use of the Swept Frequency Response Analysis technique. A review of the fundamentals will be covered and examples of apparatus problems will be shown.



## **TRAINING: CAPACITOR BANK UNDERSTANDING, CONDITION ASSESSMENT AND FIELD TESTING USING THE COST EFFECTIVE METHOD**

*Wednesday, April 9<sup>th</sup>*

*4:00 PM – 6:00 PM*

*America Ballroom North, Westin Copley*

*Long Pong, Doble Engineering Company*

With the increase of electricity demand, capacitor banks are suddenly everywhere with different sizes, arrangements and technologies. Often the maintenance personnel receives little information or training on how to deal with this apparatus, so they struggle to manage this asset, to monitor its conditions, or to troubleshoot a defective capacitor unit once it is mounted in a bank. This training starts off by introducing the capacitor technologies (fuse and fuseless), bank arrangements (parallel, serial, grounded and ungrounded), protection schemes and failure mechanisms. The class describes available test methods but will concentrate on the effective method, using the M4000 that Doble Clients already have. The test technique, called the Doble CapBank test, does not require disconnecting the capacitor unit during testing, so the technique can reduce testing time by 70% and may be performed during commissioning, maintenance or troubleshooting. Test procedures for different capacitor bank arrangements and data analysis will be covered to assess their condition and to manage this asset. Also, case studies of field testing will be discussed.

## **TRAINING: BASIC PROTECTIVE RELAYING**

*Thursday, April 10<sup>th</sup>*

*7:30 AM – 12:00 PM, 1:30 – 5:00 PM*

*Copley Marriott*

*Ed Khan, Doble Engineering Company*

The Basic Protection Relaying course is geared towards entry level engineers making their way into the field of relay protection and for technicians who 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 cover the following topics:

- Introduction to Relays.
- Differences Between Electro-Mechanical, Solid State and Microprocessor Relays.
- Current and Voltage Transformers
- Basic Overcurrent Protection
- Distance Protection
- Transformer Protection.
- Basics of Communication Assisted Protection
- Reclosing of Circuits
- Remote and Local Backup Protection