

ANNUAL INTERNATIONAL CONFERENCE OF DOBLE CLIENTS

The Annual International Conference of Doble Clients is highly regarded as one of the most valuable events in the world for the electric power industry. The topics presented at the Conference are selected each year by representatives from electric utilities worldwide. This means that the top priority of the Doble Client Conference is to present unique information tailored to electric utility key interests and challenges. 2008 will mark the 75th Annual International Conference of Doble Clients!

HISTORY OF DOBLE CLIENT CONFERENCE

The first Doble Client Conference was held in 1934 and lasted three days. The invitations to the first Conference were relatively informal and were accompanied by requests that the clients bring their power factor test sets for overhaul and calibration. Attendance at the first Conference totaled 20, including 12 engineers representing 11 utilities in Massachusetts, New York, Pennsylvania, and Rhode Island. It's interesting to note that the original 11 utilities still remain active Doble Clients today.

Starting in 1935, design engineers of the large electrical manufacturers were invited to participate in the Doble Conferences. The major bushing manufacturers presented information on the theory of the design and construction of bushings manufactured by General Electric, Ohio Brass, and Westinghouse manufacturing companies. These early presentations obviously were extremely helpful in promoting a better understanding of bushing construction which related to enlightened interpretation of field results and improved maintenance practices.

Participation in the Conference by power-system operators has developed over the last seventy-five years from the original 12 companies to a group now representing over 90% of the electric energy generated in North America. The Doble Client Group includes electric utility systems in all 50 of the United States, nine provinces in Canada, and every Continent except Antarctica.

The mission of the Client Conference was – and still is - “to assemble all those involved in the design, testing, maintenance, and operation of power system apparatus (in particular the insulation system of that apparatus) to meet and share their product performances for the common good.”

A CONFERENCE DESIGNED BY UTILITY CLIENTS; AND FOR UTILITY CLIENTS

As the Doble Client Group grew, and the Doble Client Conference expanded its scope, the need grew for a better way to coordinate the cooperative research on power apparatus systems, studies of operating experiences, and the dissemination of information gathered

by clients. To accomplish this, the Doble Client Committees were created in 1936. Today there are nine Client Committees that help the entire Doble Client Group investigate and discuss the problems associated with the testing and maintenance of electrical insulation and the operation of electric power apparatus. While the Doble Engineering Company is responsible for the overall quality and character of its Conference, the development of the Annual Conference Program, including the formulation of Technical Questionnaires, comes about as a result of twice yearly meetings of the nine Doble Client Committees.

The current Committees include: Asset and Maintenance Management; Arrestors, Capacitors, Cables and Accessories; Bushings and Instrument Transformers; Circuit Breakers; Insulating Materials; Oil; Protection Automation, Communication and Controls; Rotating Machinery; and Transformers. The Doble Client Advisory Committee made up of representatives from each Client Committee, represents the “technical” committees and considers matters of common interest to those committees and the client group.

The Doble Client Committees are composed primarily of representatives of electric power companies and specifically do not include manufacturers, although many manufacturers are also Doble Clients. This does not mean the Conferences exclude manufacturers. On the contrary, Doble cooperates closely with manufacturers in seeking solutions to their mutual concerns. However, the Doble Conference Program (subjects for presentation, authors, and technical questionnaires) is ultimately the decision of the apparatus-users—the Doble Client Utility Group. And that is why it is called *A Conference Designed by Utility Clients; and For Utility Clients*.

WHO’S AT THE CONFERENCE?

All sectors of the electric power industry are represented in the Doble Client Group. The full range of viewpoints and perspectives on topics are voiced at the Client Conference by the participants from those organizations. At the discretion of the Client Committees and Doble Engineering, information on new maintenance developments and the findings of investigations and research may be brought to the forum of the Client Conference by qualified non-client guests.

Client Organizations Participating at the Client Conference

- Electric Power Utilities (investor-owned, government, public, municipal, coops)
- Industrial Maintenance Divisions
- Test and Maintenance and Service Divisions
- Apparatus Repair and Refurbishing Organizations
- Insulating Oil Refiners
- Insurers and Underwriters
- OEMs
- Manufacturers

Invited Non-Client Organizations Often Participating at the Client Conference

- Insurers and Underwriters
- Electric Power Research Institute
- CIGRE
- Edison Electric Institute
- Electrical Insulation Research Center (University of Connecticut)
- Research Laboratories
- Universities
- Consultants

“I HEARD IT AT THE DOBLE CLIENT CONFERENCE”

Here are some of the important developments in electrical maintenance practice that were brought to the attention of the electric power industry at the Doble Client Conference in the year indicated.

Insulation Power Factor Field Testing.....	Doble Engineering 1934
Circuit Breaker Contact Resistance Tests.....	Detroit Edison 1938
Circuit Breaker Timing/ Motion Analysis.....	Cincinnati Gas & Electric 1938
Transformer Turns-Ratio Measurement.....	Alabama Power 1944
Infrared-Thermo Graphic Scanning.....	Public Service Indiana 1969
Low-Voltage Impulse Testing Transformers.....	Bonneville Power Administration 1969
Automated Insulation Power-Factor Testing.....	Doble Engineering 1991
Winding Insulation Frequency Response Analysis.....	National Grid 1995
On-Line Diagnostic of Bushings.....	Doble Engineering 1996
Identifying and Addressing Corrosive Sulfur.....	Doble Engineering 2006

CONFERENCE ACTIVITIES AND BENEFITS

Over the course of one week, the Doble Client Conference offers a wide array of opportunities for participants to learn and exchange knowledge and experience:

- **Industry Best Practices at Conference Sessions**

Technical papers chronicling client experience, developments in maintenance tools and practices, advancements in apparatus design, and other relevant topics are presented and complemented by prepared and/or open discussions. Typically over 60 papers are presented at each Client Conference during a one week time span.

- **Meetings of the Doble Client Committees**

Client Utilities, Testing, and Industrial Companies learn the latest in apparatus troubles and failures, safety concerns, and manufacturer service advisories by attending the nine client committee meetings. Manufacturers and insurers are excluded from these meetings. This encourages open discussions by the utilities on apparatus concerns and solutions. For many utility attendees, these “closed door meetings” are the main reason for their participation year after year.

- **Specialized Tutorials**

The Client Committees sponsor Tutorials, conducted at both the Annual Client Conference and the September Client Committee Meetings that serve to educate and enlighten client representatives. Recent Tutorial subjects have included: Field Replacement of Bushings, Understanding Factory Testing of Transformers, Transformer Cooling, LTC Design and Maintenance, Polymer vs. Porcelain Bushings, Partial Discharge Measurements, Circuit Breaker Lubrication, Circuit Breaker Manufacturing Standards, SF₆ Discussion, Asset Replacement Methodologies, and Demonstrating Maintenance Effectiveness.

- **Training Track**

In response to client requests, the Conference program includes a multitude of training sessions on subjects such as Winding Resistance DC Insulation, Basic Power Factor Training, DTA Web, Circuit Breaker Controls, Transformer Design, LTC Basics, and Basic Protective Relaying.

- **Earn Continuing Education Credits**

Client Conference Attendees earn valuable Continuing Education Units (CEUs) and Professional Development Hours (PDHs) by attending the annual Doble Conference. Many engineers use these toward renewal of their PE license.

- **Doble User Group Meetings**

Clients that utilize Doble software systems (e.g. Doble Test Assistant- DTA) learn the status of the latest developments of these products, and provide input for future developments.

- **Doble Product Demonstration and Training**

Doble Engineering Company's wide arrays of products are demonstrated by knowledgeable staff members during the Conference, and interactive training sessions for Doble software systems are conducted.

- **Industry Expo**

Conference attendees can attend the annual industry expo which is held during the Conference. More than 60 suppliers in the electric power industry gather in one place allowing an excellent opportunity for attendees to network and gather information on the latest products and services for the industry.

- **Networking Between Conference Participants**

Since the Conference brings together electric power system maintenance experts from around the world, there is a tremendous opportunity for Conference delegates to meet and network with associates from electric utilities, service organizations, apparatus and material suppliers, other clients and guests.

Conference Proceedings

The tremendous wealth of information brought forth at each Doble Client Conference is assembled into an annual Doble Client Conference on-line Publication known as the Doble Client Conference Proceedings. Previously known as the "Conference Minutes", these are an invaluable resource for not only attendees but also those who are unable to attend the Conference. Clients can also view Proceedings from previous Client Conferences on the Doble Knowledge base.

Over the past seventy four years at the Doble Client Conferences, field maintenance practices and repair methods have developed that have ranged from field disassembly, repair and reassembly of the smallest bushing to that of a 1300-MVA 345/24.5-kV transformer weighing 440 tons. The Doble Client Group has also been directly responsible for numerous changes in apparatus insulation design and construction, which have improved operating performance as well as having enhanced testing and maintenance efficiency. For example, in 1948 the Doble Engineering Company, in cooperation with the Client Group, developed the Ungrounded-Specimen Tests (UST) Circuit. These permitted separate tests on bushings equipped with capacitance or potential taps without the necessity of removal of the bushing from apparatus and provided the impetus for development of the power-factor test tap in bushings rated 69 kV and below. In 1954 the application of RIV test methods in field testing of high-voltage bushings was introduced at the Doble Conference, and in 1971 detection of incipient faults in transformers by analysis of gasses dissolved in oil was introduced.

Technical presentations and discussions presented at the Annual International Conference of Doble Clients are incorporated into the Proceedings of the Conference. Access to this knowledge is available to Clients as part of the Doble Service Program. Taken together,

these decades of Proceedings dating back to 1934 are a rich source of information about the development of our reliable system of generation, transmission, and distribution of electric power.

Summary

Even though the Doble Client Conference has grown dramatically over the last seven decades, the original mission still remains nearly the same. The Doble Client Conference continues to serve the electric power industry by offering an objective platform for utilities to share information and knowledge about testing and maintenance practices and experiences. It continues to be a place where utility friendships are made and renewed, and where practical hands-on know-how is gathered and shared.

TENTATIVE LIST OF PAPERS FOR THE 2008 DOBLE CLIENT CONFERENCE To be held April 6 – 11, 2008 in Boston, Massachusetts, USA

The following is a tentative list of papers for the 2008 International Doble Client Conference. If you have questions, or would like additional information on any of the following subjects, please contact your Doble Client Service Engineer or Regional Sales Manager for assistance.

The following list is preliminary and subject to change.

Asset and Maintenance Management Committee

- 1. Reliability-Centered Maintenance of Oil Immersed Transformers: A Work Group Approach from Several Companies**
Iony Patriota de Siqueira, CHESF
- 2. Risk Management Associated with Power Transformers**
Mark Theyeri, Substation Maintenance Consulting LLC
- 3. Asset Management Begins with the Assets**
D. Angell, J. Gavin, T. McGrail, National Grid U.S.
- 4. Manhole Security: Protecting America's Critical Underground Infrastructure** Paul Joyal, National Strategies Inc.
- 5. Software for Determining Transformer Replacement**
Dr. Charles Feinstein, Santa Clara University
- 6. Component Reliability and Damage Costs in Distribution Systems-Athens Metro Case Study**
V. Papada, E. N. Dialynas, National Technical University of Athens-School of Electrical and Computer Engineering, Athens Metro Operational Company S.A.

7. **Selecting Health Indicators for Replacement of Multiple Assets**
John Stead, Altalink
8. **An Update on the Cigré World Wide Reliability Survey**
John Skog, Maintenance and Test Engineering LLC
9. **Making Sense out of the “Alphabet Soup” of Maintenance Strategies**
John Skog, Maintenance and Test Engineering LLC

Bushings, Insulators and Instrument Transformers Committee

1. **C1 and C2 Testing Sensitivity on a Current Transformer**
Jiten Jesing, CLP Power India
GPEC Paguthan CCP
2. **Field Experience with 800 kV Gas-Insulated Free Standing Voltage Transformers**
Viorika Aresteanu, Hydro Quebec & Herman Dietz, Trench Germany
3. **Failure of Two Balteau 115 KV Potential Transformers Type UXT -115**
Chad Bowman, Chelan Public Utility District &
Bill Fernihough, Doble Engineering Co.
4. **Failure of 800 kV Areva-Ritz Oil Current Transformers Type OSKF**
Viorika Aresteanu, Hydro Quebec
5. **Failures of Trench Type COTA High Voltage Bushings Manufactured in France with Copper Conductors**
Danny Bates, Alabama Power & David Caverly, Trench
6. **Analysis and Comparison of Failure Modes of OIP and RIP Bushings**
Marcos Caddah Melo, Furnas Brazil
7. **Factory Verses Field Testing of C2 for HSP Bushings**
Jerry Cotter, PG&E, & Matt Kennedy Doble Engineering Co.

Circuit Breaker Committee

1. **Revise the Doble Test Procedure for SF6 Dead Tank and Vacuum Breakers**
Joe Brown, Doble Engineering Company
2. **Detection of SF6 Circuit Breaker Problems Using the Doble Test Set**
William J. Fernihough, Doble Engineering Company
3. **Tracking Down the “Greenhouse Gas” SF6 with Infrared Thermography**
Author: Matt Knights, FLIR Systems
Possible discussion from Daniel Duran, Puget Sound Energy

- 4. SF6 Gas Management**
Kenji Hibi, Tokyo Electric Power Company
- 5. In-Service Assessment and Teardown of an ABB PME362-50-30 SF6 Filled Dead Tank Circuit Breaker**
Jay Garnett, National Grid and Chuck Sweetser, Doble Engineering Company
- 6. Oil Circuit Breaker (WE 2300-GW-20000) Failure Due To High Moisture Content**
Dale Rogers and Michael Smith, Progress Energy
- 7. Southern States Capacitor Switcher Problem Found by Doble Testing**
Mario Locarno, Doble Engineering Company
- 8. ABB Type 15-VHK-500 Vacuum Breakers Manufactured Between 1989 and 1997**
Robert Jensen, Salt River Project
- 9. Vacuum Bottle Monitoring**
Jennings Technology and Alex Salinas, Southern California Edison
- 10. New Battery Technology**
John Mandeville, American Electric Power
- 11. Remote Breaker Racking**
Brian Anderson, Colorado Springs Utilities
- 12. Switching 138kV Breakers with Capacitors using Gang Operated Switches Causes Arcing**
Timothy True, National Grid

Rotating Machinery Committee

DESIGN

- 1. New Generation of a Class 180 (H) Electrical Insulation System for High Voltage Machines**
Thomas Hillmer and Heinz Brandes, Von Roll Switzerland Ltd., Nancy Frost, Von Roll USA, Inc.

MAINTENANCE

- 2. Thermal Imaging of Carbon Brushes as a Maintenance Tool**
James Michalec, American Electric Power
- 3. Inspection, Test and Operating Issues with Collector Rings**
Clyde Maughan, Maughan Engineering

ENVIRONMENT

- 4. AEP and Hydrogen for Generator Cooling**
James Michalec, American Electric Power

TESTING AND DIAGNOSTICS

- 5. Electrical Testing and Tabulation of High Voltage Motors**
Eddie Brynjebo, ElektroSandberg Kraft
- 6. Condition Assessment of RM Field Poles Using M4000 Test Set**
Long Pong and Keith Hill, Doble Engineering
Hugo Simard, Alcan Power Operations
Vernon Ryman, PPL Electric Utilities
- 7. High Voltage Equipment Condition Assessment with EMI Diagnostics**
James Timperley, Doble Engineering
- 8. Continuous Partial Discharge Monitoring on Motors**
Igor Blokhintsev and Cal Patterson, Eaton Electric
- 9. Endwinding Vibration in Large Rotating Machines**
Andrew Tesla and Andre Tetreault, VibroSysM

FAILURES, TROUBLES AND NONCONFORMANCES

- 10. Flatiron G1 Stator Winding Insulation Failure – Coil Dissection Analysis and Dielectric Test Data Correlation**
Eric Eastment and Jill Smith, U. S. Bureau of Reclamation
- 11. Flatiron G1 Stator Winding Insulation Failure – Core Repair, Loop Testing, and Return to Service**
Eric Eastment and Jill Smith, U. S. Bureau of Reclamation
- 12. Motoring of a 350 MW, 20 kV, Hydrogen Cooled Electrical Generator, Ing.**
Alberto Quintero Nieves and Ing. Sergio Arroyo Ramos
- 13. Spark Erosion/Vibration Sparking in Stator Windings**
G. C. Stone, Iris Power Engineering
- 14. In-Situ Collector Connection Repair**
Mike Bresney, AGT Services, Inc.

Transformers Committee

DESIGN

- 1. Mobile Transformer and Substation Subjects**
Doble Clients, Manufacturers Panel Discussion

OPERATING USE

- 2. Investigation of Transformer Hydrogen Gassing**
Don Platts, PPL Electric Utilities
- 3. Innovative Power Flow Regulating Tap Changer Control Installed on Multiple Phase Shifting Transformers**
Hank Miller and John Burger, American Electric Power
Michael Thompson, Schweitzer Engineering Laboratories, Inc.
- 4. Resolution of a Stray Flux Problem Causing Heating of a Transformer Tank**
Alberto Quintero Nieves, Comision Federal de Electricidad, Mexico
- 5. Static Electrification**
Mr. Atsushi Eto, Tokyo Electric Power Company

MAINTENANCE PRACTICE

- 6. Low Frequency Heating Field Dry-Out of a 750MVA 500kV Autotransformer**
Elisa Figueroa - Hydro One
Ed teNyenhuis – ABB

LIFE CYCLE MANAGEMENT

- 7. Assessment of Insulation Dryness Using Dew Point Measurements of Transformers Below Freezing**
Phil Prout, National Grid
Rich Simonelli, Waukesha Electric Systems, Inc.
- 8. Shipping Damage of Transformers During Ocean Shipment**
Gert Coetzee, Eskom, SOUTH AFRICA

DIAGNOSTIC METHODS

- 9. SFRA - AEP's Prospective**
John Mandeville, AEP
- 10. Field Experiences with SFRA**
Matt Kennedy, Doble Engineering Company
- 11. Frequency Response Analysis for Fault Detection in Power Transformers**
Servando Sánchez, CFE-DCO MEXICO
Carlos Pérez, Universidad Michoacana de San Nicolás de Hidalgo (UMSNH) MEXICO
Alberto Avalos: UMSNH MEXICO

12. High Voltage Transformer Tests Uncover Manufacturing Defect Not Detected in the Factory

Robert Stephens - Exxon Mobile
Keith Hill, Doble Engineering Company
David Stelmach, Doble Engineering Company

13. Transformer Overall Test Power Factor Find Problems

Alan Wilson, Doble PowerTest

FAILURES AND TROUBLES

14. Transformer Failure and Teardown Report

Terry Troop, FirstEnergy

THE ENVIRONMENT

15. Transformer Damage Caused by an Earthquake

Mr. Atsushi Eto, Tokyo Electric Power Company