

Laboratory Services



TOGETHER WE POWER THE WORLD

MATERIALS LABORATORY—LONG BEFORE ELECTRICAL APPARATUS FAIL, SIGNS OF TROUBLE APPEAR!

Determine the condition of your generation, transmission or distribution system assets using analysis of the insulating liquid. Testing can detect developing apparatus problems such as, local overheating at a loose connection or electrical discharge between turns so problems can be managed. Oil degrades as a result of oxidation and operation. Degradation of the oil produces sludge and other by-products that can cause your equipment to fail. And if oil degradation was not enough, there are a variety of other conditions that will affect the performance of the oil and the apparatus. Condensation, leaking gaskets, internal arcing, to name a few, can drastically affect the dielectric properties of the liquid as well as the physical condition of the insulation. With proper diagnostic testing, catastrophic failures can be avoided.

What Type of Condition Assessment Program Do YOU Have?

The analytical services performed by Doble's Materials Laboratories provide you with the accurate information you need to intelligently diagnose any existing and potentially devastating problems in your liquid-filled equipment. Compared with the cost of premature or catastrophic failure, regularly scheduled oil testing is a cost effective and sound maintenance practice that is used to extend the life of your transformers and circuit breakers. Optimize your maintenance practices using the knowledge obtained from diagnostic oil testing. Perform maintenance where needed, rather than by a time based schedule.

Spend Your Maintenance Dollars Wisely

We've spent decades perfecting techniques for testing solid and liquid insulating materials to determine their condition and to detect apparatus problems. In fact, Doble pioneered methods that have since become industry standards. With over 50 tests to choose from, selecting the right ones



can be confusing. Let Doble's Materials Laboratories help you develop a comprehensive and cost-effective oil testing program for continued condition assessment—helping you to extend the life of your apparatus and optimize operations over the long haul.

Doble Survey

Be in the know about available transformer oils and their quality. Doble has been a leader in the testing of new transformer oils for specification requirements for many decades. The Doble Survey, produced annually, provides the test data and information you need to evaluate transformer oil refined worldwide. Tests include those in Doble's own Transformer Oil Purchase Specification (TOPS) and ASTM D 3487 tests. Know the facts about the oils you purchase.

Apparatus owners can also join the Doble Oil Committee for the same fee and learn what is going on in technical societies about transformer oil and about Doble's own research on electrical insulating oils and more.

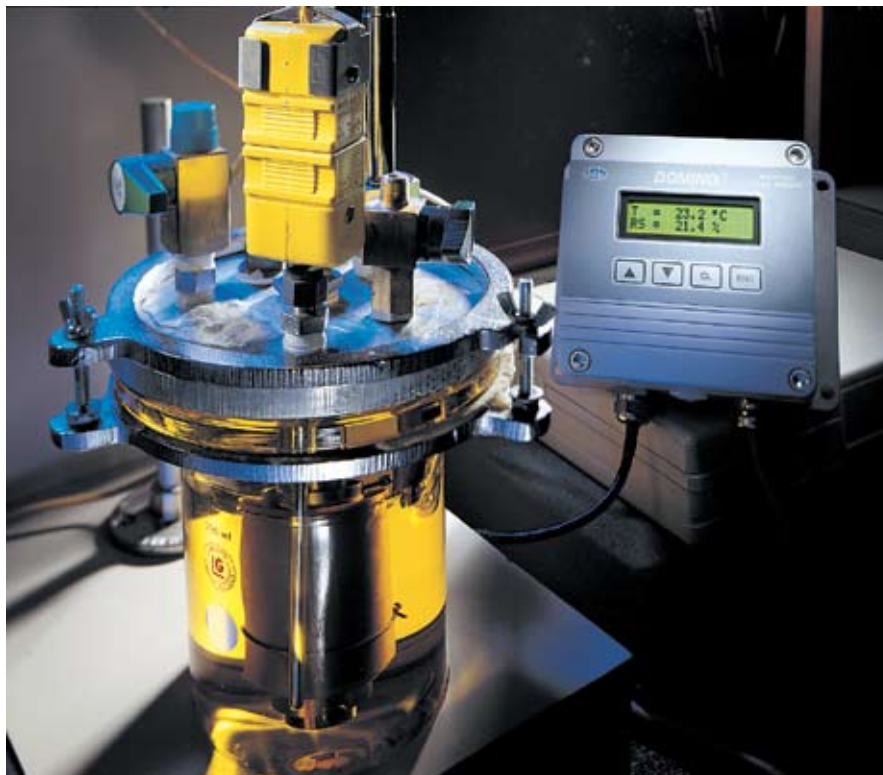
www.doble.com



High Voltage Laboratory

The Doble High Voltage Laboratory is equipped to test materials, parts, components, and apparatus for electrical characteristics. All tests can be performed as received or after thermal or voltage-endurance aging, and under a variety of conditions. Examples of AC and DC tests and measurements include dielectric constant, resistivity, power factor, dielectric breakdown strength, high potential tests, ramp to failure, and partial discharge measurements.

- We test apparatus with different waveforms including lightning and switching impulses, power frequency and D.C.
- Doble can help with specifications for compliance testing, problem detection, endurance testing, research on dielectric behavior, failure analysis, and partial discharge detection.
- Accelerated aging and thermal cycling tests on cables and life endurance testing on stator winding coils are also routinely performed.



CONDITION ASSESSMENT OF ELECTRICAL APPARATUS— SOME TYPICAL TESTS

Oil Quality Testing

Color (ASTM D 1500) Insulating liquids darken with the presence of oxidation byproducts and foreign materials.

Dielectric Breakdown Voltage (ASTM D877 / 1816) A low value indicates the presence of contaminants such as water, dirt or other conducting particles in the insulating liquid.

Interfacial Tension (ASTM D 971) Monitors the progression of oxidation and detects contaminants such as soaps, paints, varnishes and byproducts of insulation aging.

Acidity / Neutralization Number (ASTM D 974) Monitors the progression of oxidation by detecting acidic compounds which accelerates deterioration of the solid insulation and are precursors to sludge formation.

Visual (ASTM D 1524) Visual inspection identifies foreign material in the insulating liquid, which may lower its dielectric strength.

Power Factor @ 25° C (ASTM D 924) High power factor indicates the presence of contaminants like carbon, metal, soaps and byproducts of oxidation.

Water Content (ASTM D 1533) Reporting results in percent relative saturation for more effective interpretation of results. Excessive moisture is one of the primary causes of low insulating liquid dielectric breakdown strength. High water content may be detrimental to the transformer under a variety of conditions.

Specific Gravity (ASTM D 1298) Helps identify different types of insulating liquids, by determining the ratio of the weights of equal volumes of oil and water at the same temperatures.

Paper Quality Testing

Degree of Polymerization of Paper (ASTM D 4243) This test provides a measure of paper aging, and correlates with important physical properties like

resistance to tearing and bursting. This is a critical factor in estimating the real aging of the main transformer insulation.

Diagnostic Testing

Dissolved Gas Analysis (ASTM D 3612) The single most important test you can perform to head-off potential transformer failures. Monitors gas generation in transformers for advance notice of developing faults. It's a good way to detect thermal and electrical problems before failure occurs.

Furanic Compounds (ASTM D 5837) Since the paper is the most important dielectric component of the transformer, having the ability to assess its condition is a must. When the cellulose breaks down, furanic compounds are generated.

Metals-In-Oil Metals such as copper, iron, zinc, and lead can be detected and can be indicators of incipient-fault conditions, potential bearing wear from pumps or other wear metals from vibration of components.

Data

All test data is stored in our custom-designed relational database. Reports are created in Windows® Excel for easy electronic transmittal via email. Reports can also be supplied in TOA format. Let Doble help you to customize a Condition Assessment Program

For more information, contact one of three laboratory facilities:



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