



**ACCURACY**  
THROUGH EXPERIENCE

**LABORATORY  
SERVICES**

For the Electrical  
Power Industry

**MS** MORGAN®  
SCHAFFER | Accuracy is  
Everything.

**We did it first.  
We still do it best.**

**More than 50 years  
of DGA expertise.**



## **Accuracy Matters**

Accurate dielectric fluid testing provides the confidence that comes from knowing that potential problems with your oil-filled equipment will be detected in their infancy.

Morgan Schaffer specializes in the analysis of dielectric fluids and provides a complete range of testing, analysis and diagnostic services.

Our laboratories provide an exceptional level of accuracy to help you safeguard your assets and ensure:

- Valid identification of changes in condition
- Cost-efficient, condition-based maintenance
- Early detection of impending failures

## **The definitive industry reference for dependable test results**

- Trustworthy gas extraction methods
- Internal specifications that meet or exceed ASTM standards
- Comprehensive quality assurance programs
- Skilled and experienced personnel

**Morgan Schaffer Laboratory Services:  
Results you can trust.**

# Service Matters

Morgan Schaffer labs are committed to building lasting relationships with our clients by providing:



Fast turnaround times -  
rush service available



Competitive pricing and  
volume discounts



Responsive customer  
support



Flexibility (delivery schedules,  
specialized tests, etc.)



Capacity to process thousands  
of samples annually



Data interpretation  
support

## Key Laboratory Services

- Dissolved Gas Analysis
- ASTM Package
- Moisture Content
- PCB Analysis
- Power Factor 25 °C and 100 °C
- Furan Content
- Oxidation Inhibitor Content
- DBDS Content
- Corrosive Sulfur
- Metals in Oil
- Particle Count
- Methanol/Ethanol

## MS Oil LIMS: Web-Based Collaboration Tool

Morgan Schaffer processes oil samples from across the globe via MS Oil LIMS. This web-based tool links the entire oil analysis process and facilitates collaboration between asset managers and laboratory personnel by providing:

- Improved efficiency by posting test results online, in real-time
- E-mail notifications as soon as test results are available
- Automatically generated test reports, trends and other results in easy to read and print format
- Easy data upload to Morgan Schaffer's *Inside View*

## Exceptional Customer Satisfaction

A recent survey\* of our clients revealed that:

- The majority are **"very satisfied"** with our services, **rating us 9 out of 10 or higher!**
- **96%** of respondents are **"very likely"** both to buy laboratory services from us again and to recommend our services to others.

\*Conducted by SOM, February 2014.

# Experience Matters

50 years of service to the electrical industry.

## Experience

- Morgan Schaffer is the pioneer of DGA in North America.
- Dr. James E. Morgan developed the first gas extraction method, published in ASTM D-3612 (referred to as “Method A”).
- Our clients include utilities, OEMs, substation maintenance companies, industrial accounts and other labs.
- Morgan Schaffer provides definitive benchmark testing for conflicting test results.
- Our team of chemists and lab technicians provides expert test results.

**The most trusted name in dielectric oil analysis.**

## Morgan Schaffer produces the world’s only commercial oil standards

Even our competitors depend on Morgan Schaffer’s *True North* gas-in-oil standard and *Atlantis* moisture-in-oil standard to calibrate their laboratory equipment!

## Inside View insulating oil diagnostic software

Inside View, the most comprehensive DGA and dielectric oil diagnostic software on the market, integrates data from any brand of online monitor or portable analyzer and oil testing lab.



**Sound decisions require sound data.**



# Accuracy in everything we do.

**Morgan Schaffer's commitment is not limited to our laboratory services. We also ensure excellence in all of our activities:**

- On-time delivery
- Superior technical support
- Responsiveness and customer service
- Repair services
- Quality assurance across the board

**Contact us today for a quote!**

## Head Office

8300 Saint Patrick Street  
Suite 150  
LaSalle, Quebec, Canada H8N 2H1  
**Tel:** 1.514.739.1967  
**Toll-Free:** 1.855.861.1967  
**Fax:** 1.514.739.0434  
**E-mail:** sales@morganschaffer.com

## Morgan Schaffer USA

101 Henderson Drive  
Sharon Hill, Pennsylvania, USA 19079  
**Tel:** 1.215.279.5915  
**Toll-Free:** 1.855.861.1967  
**E-mail:** sales@morganschaffer.com

## Accreditations

Morgan Schaffer is ISO/IEC 17025:2005 accredited in Canada by the Canadian Standards Council for the tests listed on its scope of accreditation. Morgan Schaffer USA accreditation is forthcoming.  
Morgan Schaffer is ISO 9001:2008 certified.

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**[www.morganschaffer.com](http://www.morganschaffer.com)**

# LABORATORY SERVICES



| List of Tests   |  |
|---|--|
| Test Name / ASTM Number   | Description  |
| <b>Dissolved Gas Analysis (DGA)</b><br>ASTM D3612-A   | Key gases detected: H <sub>2</sub> (Hydrogen), O <sub>2</sub> (Oxygen), N <sub>2</sub> (Nitrogen), CH <sub>4</sub> (Methane), CO (Carbon Monoxide), CO <sub>2</sub> (Carbon Dioxide), C <sub>2</sub> H <sub>4</sub> (Ethylene), C <sub>2</sub> H <sub>6</sub> (Ethane), C <sub>2</sub> H <sub>2</sub> (Acetylene). DGA test performed as per ASTM D3612-A. |
| <b>Moisture Content</b><br>ASTM D1533   | Moisture reduces the insulation capacity of the oil. Excessive moisture accelerates the decomposition of the paper insulation. Moisture in Oil content test performed as per ASTM D1533.   |
| <b>Furan Content</b><br>ASTM D5837  | Furanic compounds are produced as the paper insulation deteriorates. Measuring the concentration of those compounds gives an indication of the condition of the paper insulation. Furan content test performed as per ASTM D5837.  |
| <b>ASTM Package:</b><br>- ASTM D1524<br>- ASTM D877/D1816<br>- ASTM D974<br>- ASTM D971<br>- ASTM D1298<br>- ASTM D1500 | Physical, electrical and chemical tests, including visual examination, dielectric breakdown, acidity, interfacial tension, density and color. All tests performed as per their respective ASTM test methods.   |
| <b>Oxidation Inhibitor</b><br>ASTM D4768  | Oxidation occurs and the inhibitor is consumed. Controlling the inhibitor content extends the life of the oil by preventing sludge formation. Oxidation Inhibitor test performed as per ASTM D4768.  |
| <b>Power Factor 25 °C and 100 °C</b><br>ASTM D924   | Dissipation Factor is key to determining the presence of contaminants that cause power losses in the oil. Power Factor at 25 °C and 100 °C as per ASTM D924.   |
| <b>PCB Analysis</b><br>ASTM D4059   | Morgan Schaffer performs Polychlorinated Biphenyl content analysis under accreditation by the SCC. Results are recognized worldwide as being equivalent to any accredited laboratory that is a signatory to ILAC. PCB Analysis performed as per ASTM D4059.  |
| <b>Metals In Oil</b><br>ASTM D7151  | High-energy faults can generate various types of metal particles. Establishing the concentration of these metal particles will help narrow down the list of components involved in the fault. Metals Analysis performed as per ASTM D7151.   |
| <b>Corrosive Sulfur</b><br>ASTM D1275-B   | Corrosive sulfur can lead to catastrophic failure of transformers by corroding copper or other metals. This test determines whether the oil is corrosive or non-corrosive. Corrosive Sulfur test performed as per ASTM D1275-B.  |
| <b>DBDS Content</b>   | DBDS acts as an antioxidant to prevent sludge formation.   |
| <b>Particle Count</b><br>ASTM D6786   | Particles can reduce the dielectric properties of the insulating oil, depending on the size, concentration and nature of the particles. The particle count can determine the general degree of contamination of the oil and is performed as per ASTM D6786.  |
| <b>Methanol/Ethanol Content</b>   | Recent studies have found that methanol and ethanol are produced as paper insulation deteriorates. Measuring the concentration of these by-products provides an indication of the condition of the paper insulation.   |
| <b>Flash Point (D92)</b>  | The Flash Point is the minimum temperature at which heated oil generates enough vapor to form a flammable mixture with air. Flash Point test is performed as per ASTM D92.   |
| <b>Sediments and Soluble Sludge (D1698)</b>   | Sediment may deposit on transformer parts and interfere with heat transfer by hindering oil circulation and heat dissipation. Sediments and soluble sludge test is performed as per ASTM D1698.  |

| List of Tests                         |   |
|---------------------------------------|---|
| Test Name / ASTM Number               | Description   |
| Viscosity (D445)                      | The viscosity of oil used as a coolant influences heat transfer rates. Oil viscosity is also important for moving parts in tap changers and circuit breakers or for equipment subject to cold temperatures. Viscosity is measured as per ASTM D445.   |
| Pour Point (D97)                      | The Pour Point is an indicator of the lowest temperature at which insulating oil can be used. The Pour Point test is performed as per ASTM D97.   |
| Oxidation Stability (D2440)           | The oxidation process of insulating oil creates acids and sludge that attack materials within the transformer. The oxidation stability test is an indicator of how long the oil will withstand the oxidation. This test is performed as per ASTM D2440.   |
| Metal Breaker                         | Metals Analysis performed as per ASTM D7151.  |
| Degree of Polymerization (D4243)      | The tensile strength of the paper used in a transformer is proportional to its degree of polymerization. The degree of polymerization can be used to estimate remaining paper life. This test is performed as per ASTM D4243.   |
| Resistivity (D1169)                   | Resistivity of oil is the measurement of its electrical insulation properties. High resistivity indicates a low level of conductive contaminants. Resistivity is measured as per ASTM D1169.  |
| Silicon in Oil                        | Silicon oil contamination causes foaming in transformers that use forced oil cooling systems. It is generally recommended to test oil returned to storage or for regeneration for silicon cross-contamination.  |
| Moisture in Pressboard (D3277)        | Moisture has an adverse effect on the dielectric strength, dielectric loss, dc resistivity and aging characteristics of oil-impregnated cellulosic insulating materials. This test is performed as per ASTM D3277.  |
| Passivator (IEC60666)                 | Passivators are used to deactivate metal surfaces and make these surfaces less reactive to corrosive sulfur found in mineral oils. Passivator test is performed as per IEC 60666.   |
| Boiling Point (D86)                   | Boiling point measurement evaluates the volatility of oil and its tendency to form a mixture with air to produce potentially explosive vapors. Boiling Point test is performed as per ASTM D86.   |
| Covered Copper Deposition (IEC 62535) | Failures due to corrosive sulfur may be related to the formation of copper sulfide deposits in and on the surface of winding cellulosic paper. The growth of copper sulfide on bare copper may cause the presence of conductive particulates in the oil, which can act as nuclei for electrical discharge and may lead to a fault. This test is performed as per IEC 62535. |

### Head Office

8300 Saint-Patrick Street, Suite 150  
LaSalle, Quebec, Canada H8N 2H1

Tel: 1.514.739.1967  
Toll-Free: 1.855.861.1967  
Fax: +1 514.739.0434

E-mail: [sales@morganschaffer.com](mailto:sales@morganschaffer.com)

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101 Henderson Drive  
Sharon Hill, Pennsylvania, USA 19079

Tel: 1.215.279.5915  
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