

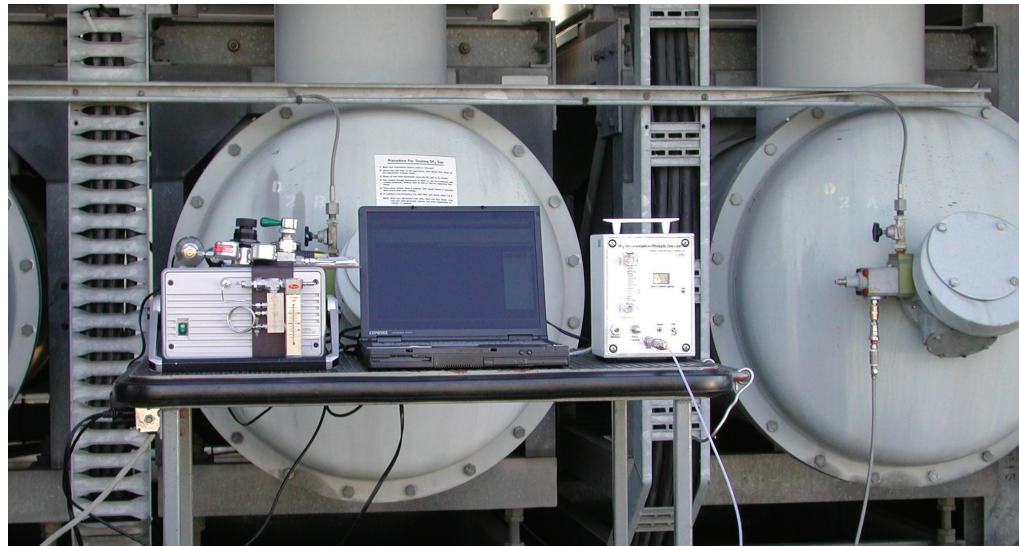
# APPLIED CHEMISTRY

Powertech  
The Power of Trust. The Future of Energy.

## CHEMICAL ANALYSIS



Transformer dissolved gas analysis



Field assessment of sulphur hexafluoride gas

### Analysis of fluids and solids used in electrical equipment

*Electric utilities must maximize utilization of their substation assets while maintaining reliability. One way to do this is by ensuring that aging equipment such as power transformers, circuit breakers, load tap changers, cables, bushings, and other electrical equipment operate efficiently and reliably. Central to managing this equipment is the analysis of the insulating fluids and solids for effective diagnostics, condition evaluation, and life extension.*

Powertech's Applied Chemistry Department has more than forty years' experience in testing, consultation, and applied research in the chemistry of insulating fluids, gases, and solids used in electrical equipment.

Powertech is equipped with analytical instrumentation for chemical assessment, diagnostics, and material evaluation including the analysis of soils and water for regulatory compliance. The materials and polymers testing lab houses advanced thermal analysis, rheology, spectrometric, chromatographic, and mechanical testing instrumentation. Expertise is also available to evaluate and solve complex problems related to fuels, lubricants, and coolants. To assist utilities in complying with regulations relating to PCB contamination, Powertech has extensive experience in analysis,

on-line removal, and destruction with oil reclamation.

Powertech's long history of testing enables it to provide knowledgeable consulting services. The company's in-house developed expert system, called Equipment Health Rating (EHR), uses industry standards and statistical analysis of lab test results, field inspections, and electrical tests to present historical information on the performance of equipment.

Experience gained in testing and consulting, in turn, drives the Applied Chemistry Department's research activities to advance the state-of-knowledge. The department collaborates on projects for EPRI, CEATI, and BC Hydro, as well as other electric utilities and universities.



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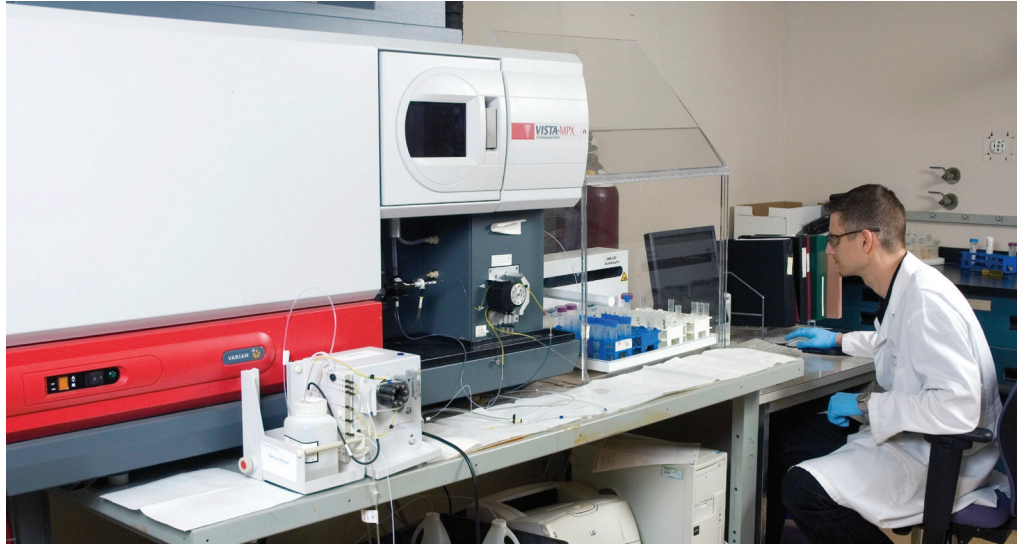
**07** Equipment Health Rating



## CAPABILITIES



Transformer oil quality testing



Metals analysis by inductively coupled plasma spectroscopy (ICP)

**The lab has the capabilities for both basic testing and in-depth investigative studies with modern high-end instrumentation.**

*Powertech's Applied Chemistry Department is equipped with state-of-the-art instruments for chemical, material, and polymer analyses focusing on insulating oils and gases, lubricants, fuels and coolants.*

For insulating fluids analysis, Powertech can perform industry standard tests as well as sophisticated analyses to evaluate the quality of insulating oils. The lab offers comprehensive test packages including commissioning tests, fault diagnosis, and forensic analysis.

Powertech is a leader in monitoring degradation of solid insulation in oil-filled transformers. Using high-performance chromatography and mass spectroscopy, staff experts perform analyses of compounds to determine the extent of degradation.

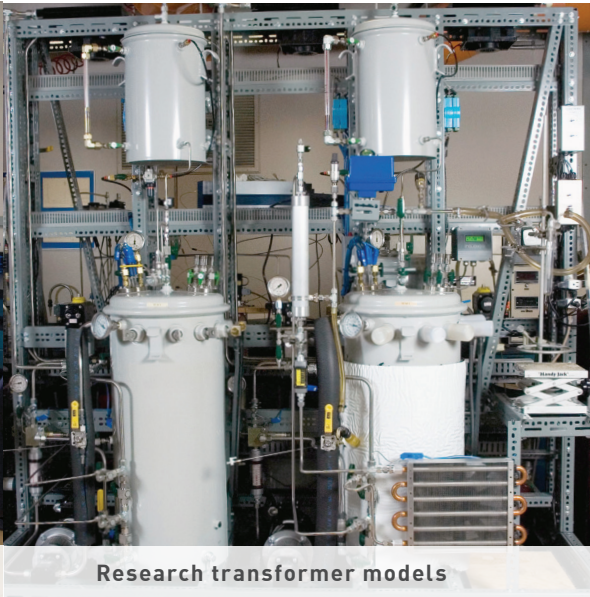
Consulting capabilities are available for fault diagnosis and maintenance of oil-filled equipment.

A Powertech-developed expert system called Equipment Health Rating (EHR) uses statistical analysis and industry standard criteria to present historical information on equipment to indicate performance and condition.

As experts in insulating fluids analysis, diagnostics, and research, Applied Chemistry staff provide comprehensive training courses for utility engineers, field personnel, and apprentices.

Unlike other chemical testing labs, Powertech also has the capabilities for cross-disciplinary analyses—with in-house electrical, mechanical, and materials testing facilities.

## SERVICES

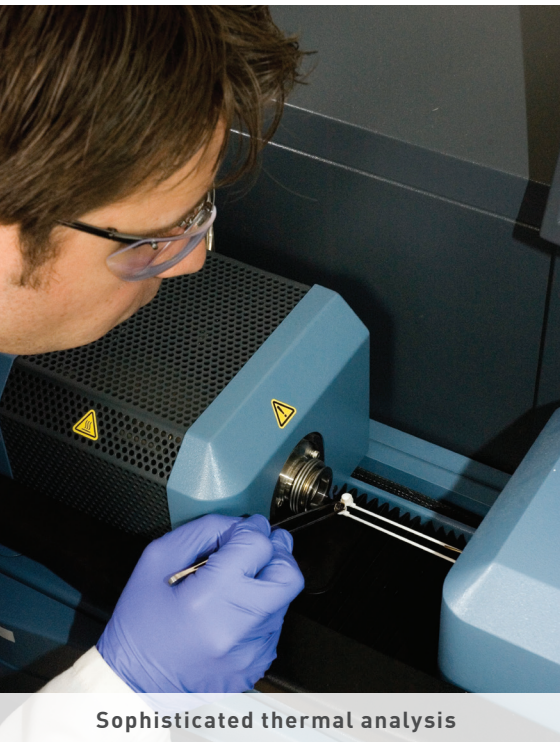


Research transformer models



SF<sub>6</sub> gas cylinder purity analysis

Powertech's Applied Chemistry Department provides testing, consultation, and applied research to the power industry for the purposes of diagnostics, condition assessment, and life extension.



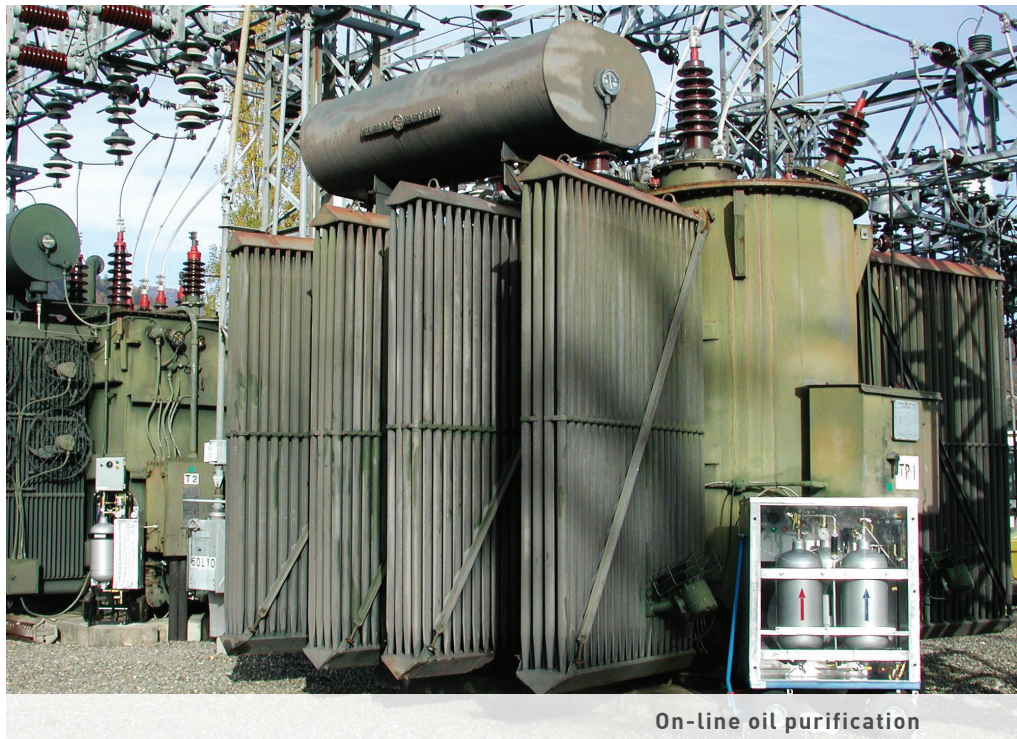
Sophisticated thermal analysis

- **Insulating Fluids**—dissolved gas analysis, oil quality tests, analysis of furans in oil and insulating paper, PCB monitoring, and analysis of SF<sub>6</sub> gas.
- **Fuels and Lubricants**—routine testing for lubricants, hydraulic fluids, and liquid fuels using industry-recognized procedures or complex analyses with in-house-developed techniques.
- **Polymers and Materials**—material identification, thermal characterization of materials, compositional and purity testing, analysis of tensile and shear strength, and determination of standard material characteristics.
- **Training**—courses on insulating fluids analysis and diagnostics for insulating oils and SF<sub>6</sub>.
- **Environmental Services**—analytical testing of soils and water, lead in paint, effluent monitoring, evaluation of environmental technologies, and life-cycle assessment.
- **Asbestos**—analysis of particles and fibres in building materials, paint, soil, other materials and from workplace air monitoring samples.
- **Research and Development**—expertise to prevent transformer and other equipment failures, with focus on life extension, on-line monitoring and fault diagnosis.
- **Weathering Chamber**—Accelerated aging tests under simulated conditions for heat, rain/ acid rain, fog/salt fog, Ultraviolet A and B exposure, sunlight, and voltage up to 40 kV.

## ON-LINE OIL TREATMENT



On-line PCB decontamination



On-line oil purification

*Powertech offers on-line oil treatment technologies that restore oil quality without requiring equipment outages. These systems are attached directly to in-service equipment and operate by flowing the oil in a by-pass mode. The technologies are modular, and depending on the need, different cartridges can be installed on one unit for decontamination of specific contaminants.*

### Restoring oil quality without equipment outages.

- **Online Decontamination of Transformer Oil**—uses extraction cartridges with proprietary absorbent technology to selectively remove contaminants and PCBs from the oil of in-service oil-filled equipment. The technology offers utilities the opportunity to significantly reduce the costs associated with contaminant removal and disposal.
- **On-line Oil Purification Unit**—removes all oil and paper decomposition products (acids, polar components, furans, moisture, particulate matter, and corrosive sulphur) from transformer oil, cost-effectively restoring in-service oil quality to near new.
- **On-line Oil Dehydration Unit**—removes moisture and particulate matter from transformer oil.
- **Online Bucket Truck Hydraulic Dehydration Unit**—restores the dielectric properties of the hydraulic oil in bucket trucks by removing moisture and particulate matter.
- **Online Load Tap Changer Oil Purification Unit**—removes not only particulate matter and moisture from LTCs but also precursors to contact coking, and refurbishes in-service aged oil to the quality of new oil.

# EQUIPMENT HEALTH RATING

Powertech's Equipment Health Rating (EHR) software is designed to assist in assessing and diagnosing the health of power equipment such as transformers.

The program calculates Condition Indexes for equipment components and accessories. These indexes are based on nameplate information, known problems, results of tests and inspections, operating and maintenance history, and years in service. IEEE, IEC, and other standards criteria (e.g., Duval Triangle) are used in the assessment. Test and inspection information includes lab tests (DGA, oil quality, furans, and others), field tests (Doble, Megger, winding insulation), internal inspections (leads, windings), and external inspections (bushings, radiators).

With this information, the software provides a rating of equipment health. The program allows experts to review and accept the ratings, provide diagnostics, and make recommendations on intervention.



The results can be used to develop a quick overview of equipment health and to make comparisons within a substation or the entire utility for asset management purposes.

The software allows for easy compilation of various data, including historical and from on-line monitors, and helps utility engineers make quick and accurate decisions.

# SELECTED CLIENTS



# THE POWERTECH ADVANTAGE

Powertech Labs Inc. is one of the largest testing and research laboratories in North America, situated in beautiful British Columbia, Canada. Our 11-acre facility offers 15 different testing labs for a one-stop-shop approach to managing utility generation, transmission and distribution power systems.

Powertech is home to a broad range of scientists, engineers, and technical specialists, with capabilities in electrical testing, cable condition assessment, mechanical and materials engineering, software technologies, power system studies, chemical analysis, gas systems engineering, and smart utility services. These skilled researchers have decades of collective and real-world experience and often work in cross-departmental teams to investigate, diagnose and solve complex problems.

As an independent, third-party testing facility, we adhere to the **highest** laboratory (**ISO 17025**), quality (**ISO 9001**) and environmental

(**ISO 14001**) management standards. Many of our scientists and engineers chair or participate in various standards committees within their fields of expertise. Additionally we have the capabilities to derive and develop **non-standard testing** methods and setups required to test product prototypes and perform forensic analysis.

Outside of the utilities industry, Powertech provides routine **testing** capabilities, product **development**, research and **consulting** services to support an array of industrial-type operations, electrical equipment manufacturers and automotive original equipment manufacturers.

