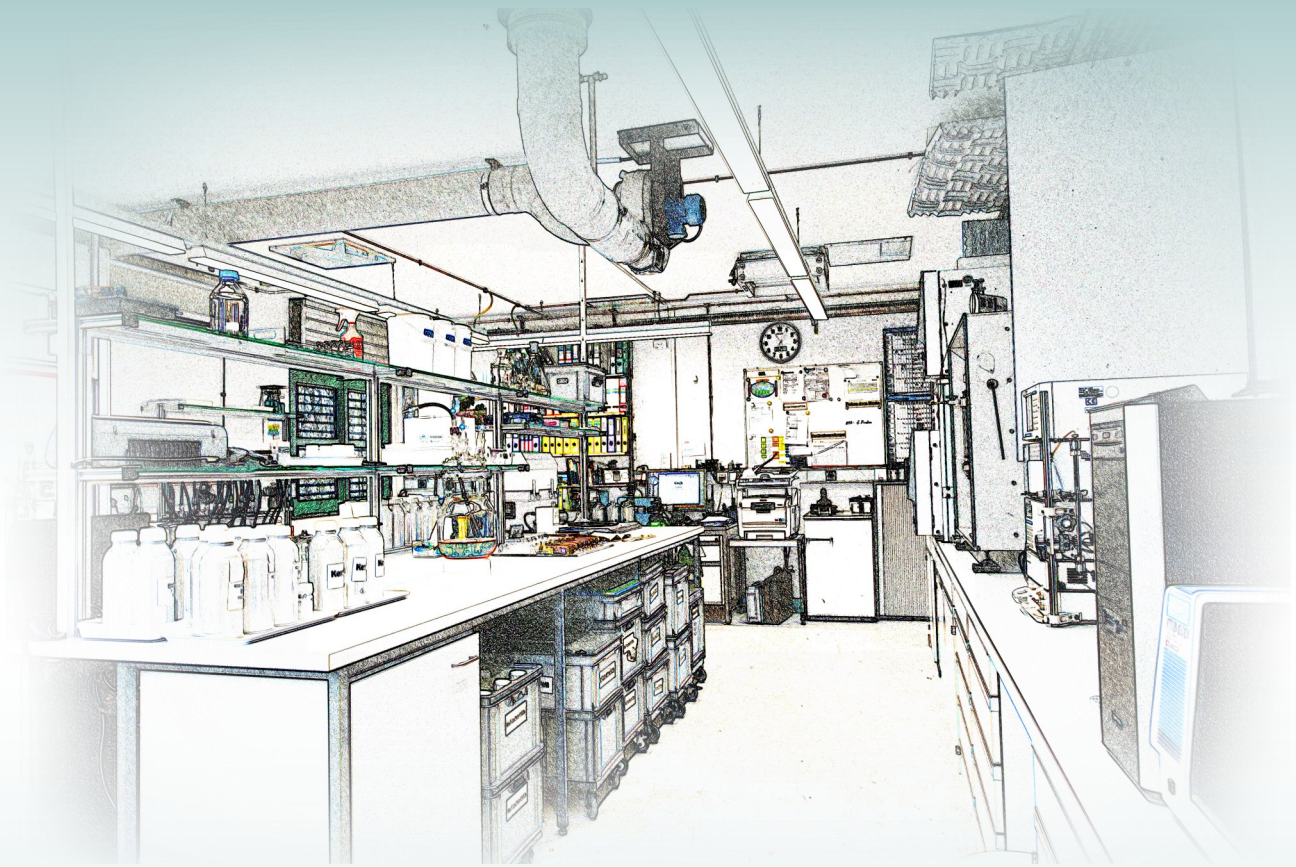
FKH



High Voltage Testing and Engineering Commission

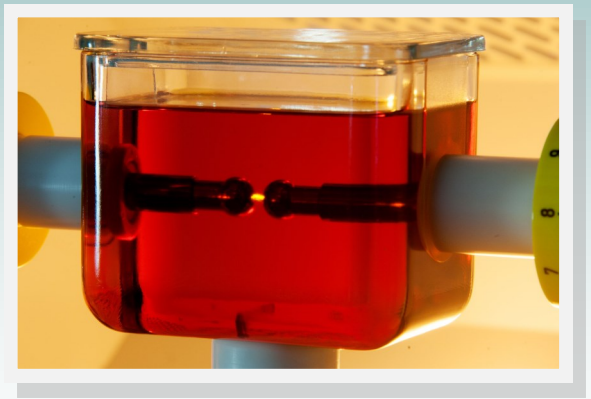
Fachkommission für Hochspannungsfragen

Insulating oil analyses

Analyses of insulating liquids play a key part in assessing the condition of electrical grid equipment. The FKH Insulating Oil Laboratory offers a wide range of services, including accurate analyses with reliable interpretation by experts. Our location in the centre of Switzerland enables us to serve our customers close to their premises. The Insulating Oil Laboratory works in accordance with international standards and is accredited as per ISO 17025 (Swiss Testing STS 581) and certified as per ISO 9001.
Drawing on more than 81 years of experience in testing high-voltage equipment, FKH can provide professional support for more extensive diagnosis in case of critical results.

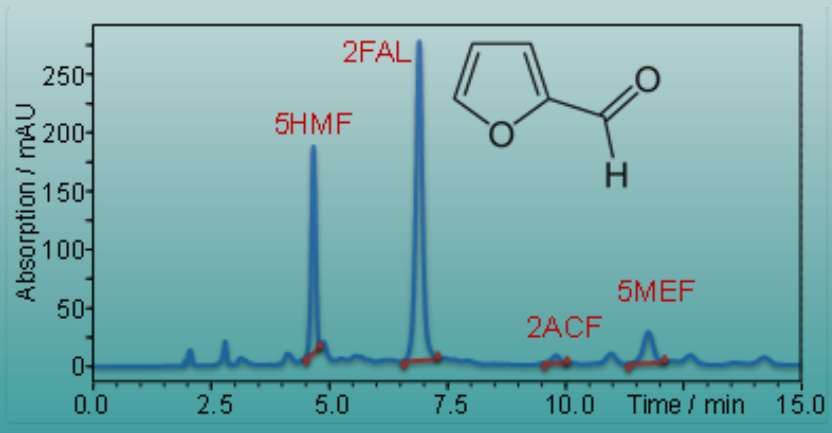
Dielectric-chemical analysis

Dielectric-chemical analysis as per IEC 60422 determines the ageing condition of the oil-paper insulation system on the basis of key parameters for the insulating oil. The breakdown voltage makes it possible to state the oil's insulating capability at the time in question. The neutralisation number (acidity) and the interfacial tension are highly sensitive indicators of the oxidation state of the insulating oil and the ageing of the entire oil-paper insulating system. They are early indicators of sludge precipitation. Increased water content causes a drastic deterioration in the oil's insulating properties and accelerates the ageing of paper and pressboard. The dissipation factor (tangent delta) is a sensitive indicator for measuring the formation of conductive ageing products and contamination of the oil. The colour number and appearance are simple but informative indicators of oil ageing. The inhibitor content allows an estimation of the ageing dynamic so that re-inhibition can be initiated promptly.

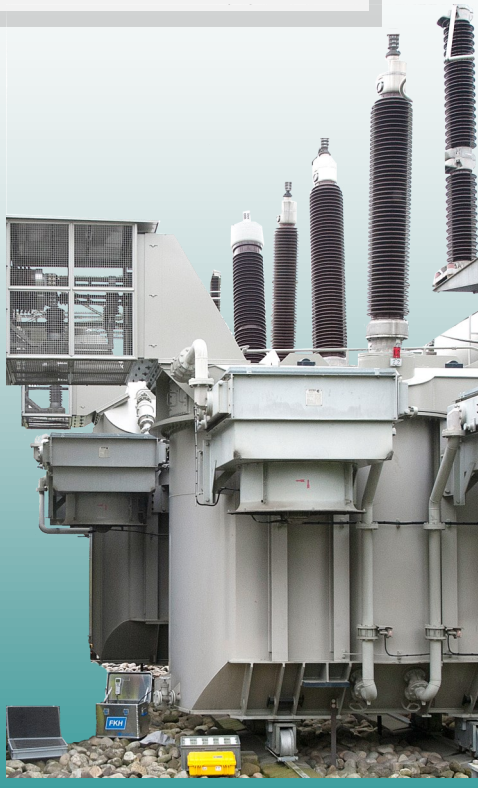


Furan analysis

Various furan derivatives are formed during the thermal ageing of solid insulation (cellulose). Analysis of the furans dissolved in the oil allows an assessment of the mechanical stability of the solid insulation (paper, pressboard).



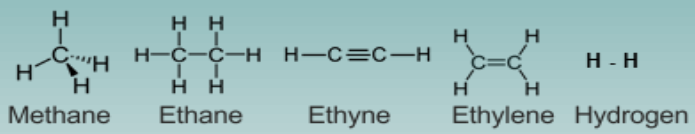
HPLC chromatogram with furan derivatives



Sampling by FKH

Decomposition gas analysis

Determination of the gases dissolved in the oil (IEC 60567 and 60599) allows statements regarding impending faults, in particular local thermal overload of the insulation system or partial discharges. For maximum accuracy, we use a headspace GC system.



Oxidation stability

During the oxidation stability test as per IEC 61125, the quality of the oil is verified with an accelerated ageing test and its prospective behaviour over its service lifetime is estimated.

Special tests

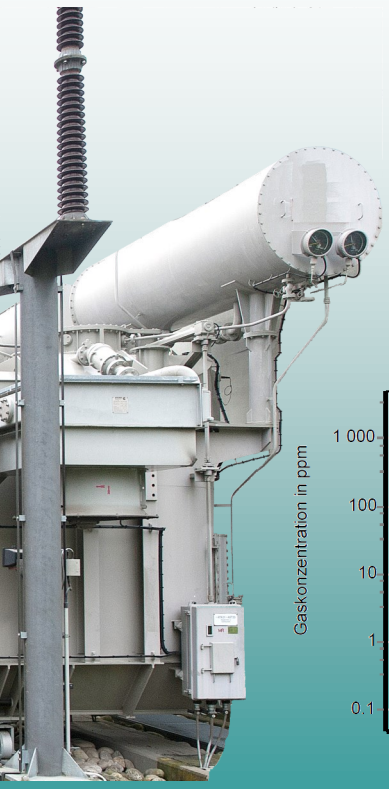
Our laboratory carries out special tests in accordance with customers' requests. These include, for example, extended ageing tests, material compatibility tests, partial discharge tests and breakdown tests (also possible for solid insulating materials).

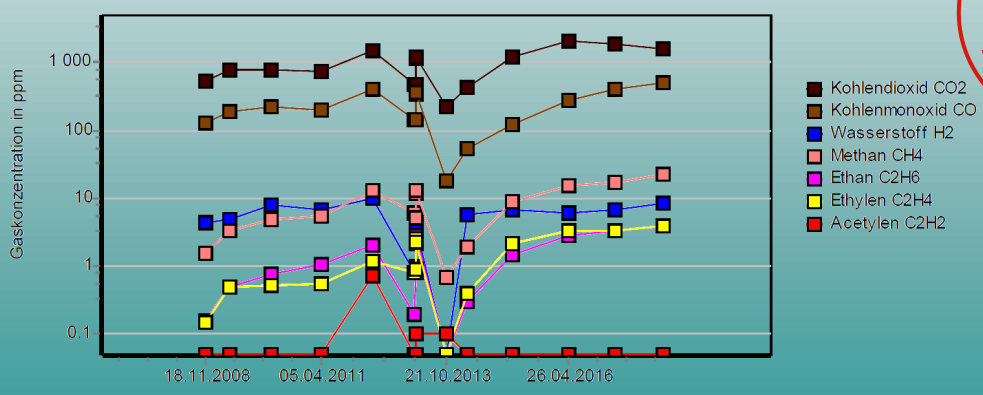
Emergency service

In case of an incident such as a Buchholz alarm, an FKH employee will usually take a sample within a few hours, for analysis either on site or in the laboratory.

Analytical report

Our analytical report includes a comparison with previous measurement results, an individual assessment and a recommendation for practical action regarding the electrical equipment that was tested. Reports are drawn up by experts. In case of critical findings, the customer is notified and advised immediately.





Development of decomposition gas

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Types of insulating oil analysis	Components
Dielectric-chemical analysis	Colour number, appearance, water content, acid value, interfacial tension, dissipation factor and breakdown voltage as per IEC 60422, Individual measurements from the dielectric-chemical analysis
Decomposition gas analysis	Gas chromatographic analysis with headspace system as per IEC 60567 and 60599
Furan analysis	HPLC (High-performance liquid chromatography) analysis with separation of individual furan derivatives as per IEC 61198
Determination of the inhibitor content	Analysis of the infrared spectrum with FTIR (Fourier transform infrared spectrometry) as per IEC 60666
Oxidation stability test	Accelerated ageing as per IEC 61125
Buchholz gas analysis	Gas chromatographic analysis
Determination of PCBs (polychlorinated biphenyls)	Colour reaction test (colorimetry)
Corrosive sulphur test	Ageing test as per DIN EN 62535
Special analyses	By agreement with the customer

FKH

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