



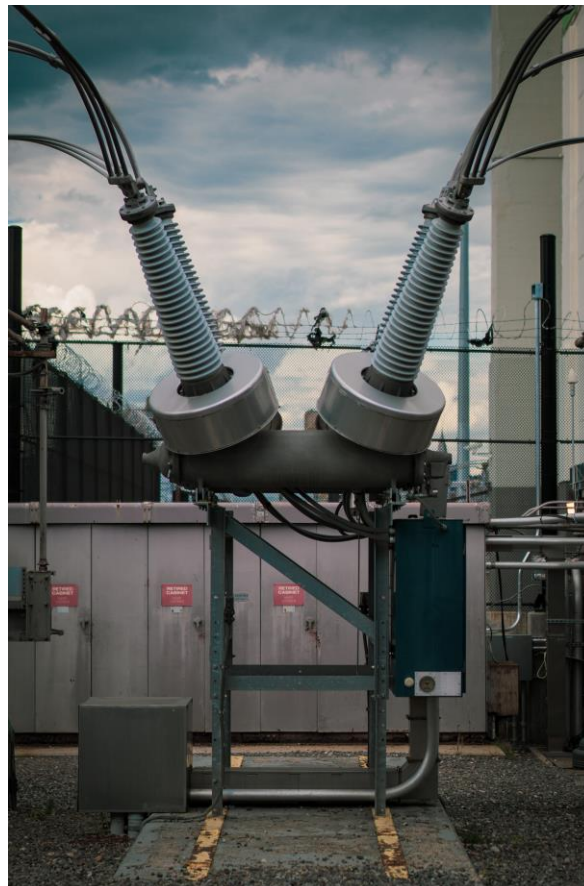
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Filtration Analysis Services Technology Ltd

How clean is your oil ?

Transformer Analysis Service

How Clean is your Oil?





FA-ST Transformer Oil Analysis Service

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FA-ST Transformer Oil Analysis Overview

Test	Summary	Ecommerce
Routine, DGA, PCB & Furfuraldehyde	This is the most conclusive test carried out by FA-ST on transformer oils. Covering a wide range of aspects from aging oils to paper insulation breakdown this is the testing for anyone wanting a truly detailed understanding of issues within your system.	Buy Now
Routine, DGA & PCB	This is a popular test carried out on transformers. These tests will identify issues within the transformer for a cost-effective price. Factors such as high acidity levels that can lead to tank corrosion and degradation of oils and other factors are identified.	Buy Now
Routine & DGA	These tests provide details of general working condition of the transformer. They are able to measure the amount of fault gases within the system that can lead to issues such as sparking, overheating and arching as well as identify potential component breakdown.	Buy Now
Polychlorinated Biphenyls (PCB) Analysis	In years gone by PCBs were an accepted transformer insulation fluid in many mineral oil transformers. PCBs enter new systems via cross contamination from old equipment used in these tanks. To allow the oils to be reused PCB content must be reduced to below 10mg/kg.	Buy Now
Furfuraldehyde Analysis	Transformers that are well maintained and have no serious defect life span can be dependent on the condition of the paper insulation. Furfuraldehyde is a degradation product that can affect the paper causing it to become brittle and resulting in the transformer reaching the end of usable life.	Buy Now
Routine Transformer Analysis	The Routine analysis is carried out in order to take a basic assessment of the condition of the transformer and oil in use. This analysis is ideal for anyone would like a basic understanding of their transformer and would like potential issues identified before taking actions/further expensive analysis is carried out. To provide you with this information the routine transformer oil test suite covers: Visual inspection, Acidity levels, Fibre Estimation, Electrical Strength, Water Content & Resistivity	Buy Now
Dissolved Gas Analysis (DGA) Only	Widely accepted as the earliest detection of incipient faults in transformers and tap selector units. DGA analysis will help provide insight into thermal and electrical stress on oils within the transformer.	Buy Now
Transformer Water Content Only	Water build-up in transformer oils is a well understood problem that can limit the operation of the transformer. Problems with the insulation capabilities of the oils, effect the dielectric properties and also lead to aging of the oil are all issues to consider when looking at water levels in the oil.	Buy Now

Transformer oil analysis testing suite

Water Content

Water build-up in transformer oils is a well understood problem that can limit the operation of the transformer. Problems with the insulation capabilities of the oils, effect the dielectric properties and also lead to aging of the oil are all issues to consider when looking at water levels in the oil.

When having samples analysed with FA-ST for water content the laboratory carries these tests out to a UKAS accredited test

Please see example below:

Parameter	Method	Test Limits (In accordance with BS EN 604223:2013)			Result
		Good	Fair	Poor	
Water Content (mg/kg)	DIHM ELE003 based on IEC 60814	<30	30-40	>40	19

Dissolved Gas Analysis (DGA)

Dissolved Gas Analysis is widely accepted as the most reliable tool for the earliest detection of incipient faults in transformers and tap selector units. Hydrocarbon (mineral-based) oils and silicones are used as insulation fluids in transformers because of their high dielectric strength, heat transfer properties and chemical stability. Under normal operating conditions very little decomposition of the dielectric fluid occurs. However, when a thermal or electrical fault develops, dielectric fluid and solid insulation will partially decompose. The low molecular weight decomposition gases include hydrogen, methane, ethane, ethane, acetylene, carbon monoxide and carbon dioxide. These fault gases are soluble in the dielectric fluid. Analysis of the quantity of each of the fault gases present in the fluid allows identification of fault processes such as corona, sparking, overheating, and arcing.

When having samples analysed with FA-ST for dissolved gases the laboratory carries these tests out to ASTM D3612 Method C

Please see example below:

Dissolved Gas Analysis Results			
to ASTM D3612 Method C			
Gas	Result (ppm)	Gas	Result (ppm)
Hydrogen H ₂	2112	Methane CH ₄	3584
Oxygen O ₂	19300	Ethylene C ₂ H ₄	2945
Nitrogen N ₂	60600	Ethane C ₂ H ₆	884
Carbon Monoxide CO	179	Acetylene C ₂ H ₂	4480
Carbon Dioxide CO ₂	2143		
		Total Gas Content %	10.4
Comments			
High Gas Levels			

Routine Transformer Analysis

This selection tests are carried out in order monitor the health and overall condition of the oil.

Visual inspection is carried out to gauge if sudden deterioration of the oil occurs well the sample is being analysed, it also is useful as a cross check that the current sample matches any previous samples indicting factors such as oil changes.

Acidity levels are also monitored as high levels can cause tank corrosion and degradation of the paper insulations.

Fibre Estimation an estimation of the fibre content in an oil sample is made by passing polarised light through the oil, clearly showing the fibres and any sediment which is present in the oil. The fibres are classed as being long (greater than 5mm), medium (2 to 5 mm) or short (less than 2 mm), and the number of fibres present is classed as few (1 to 5) or many (more than 10). Sediment is classed as being light, medium, or heavy. The presence of fibres in an oil sample, especially in combination with high water content, may result in a poor electric strength measurement. This is because wet fibres are drawn into the electrical field and cause arcing to occur. Fibres (& moisture) can easily be picked up during sampling and as such, it is important to ensure that sampling is correctly carried out.

Electrical Strength measures the ability of an insulating fluid to withstand electric stress (voltage) without failure.

Water Content monitoring insulation capabilities, dielectric properties and monitor oil aging.

Resistivity measuring the electrical insulating properties under conditions comparable to those of the test. High resistivity reflects low content of free ions and ion-forming particles and normally indicates low concentration of conductive contaminants.

When having samples analysed with FA-ST for routine analysis the laboratory carries these tests out to a UKAS accredited test

Please see example below:

Physical Properties (*UKAS accredited test)		Test Limits (In accordance with BS EN 60422:2013)			Result
Parameter	Method	Good	Fair	Poor	
Dielectric Breakdown (kV)*	DIHN ELE003 based on IEC 601565	>40	30-40	<30	35
Acidity (mgKOH/g)*	DIHN ELE003 based on IEC 62021-2	<0.15	0.15-0.30	>0.30	0.01
Water Content (mg/kg)*	DIHN ELE003 based on IEC 60814	<30	30-40	>40	25
Colour	DIHN ELE003	Not Dark		Dark	PALE STRAW
Appearance	DIHN ELE003	Clear		Dark or Turbid	CLEAR
Fibres (per litre)	DIHN ELE003	N/A	N/A	N/A	<100
Comments					
The Oil Condition is fair due to the electrical strength. Fine and coarse particles in the sample.					

Furfuraldehyde Analysis

Provided the oil inside a transformer has been well maintained and there is no serious defect, the life of a transformer often depends upon the state of the paper insulation on the windings. It has been shown that in oil, as the paper degrades and becomes weaker, furfuraldehyde is one of the many degradation products. It has also been shown that a linear relationship exists between the logarithm of the mass of furfuraldehyde produced and the resulting degree of polymerization (DP) or strength of the paper. When the DP falls to approximately 250, the paper insulation is very brittle, and the transformer can be considered to have reached the end of its service life. Therefore, by measuring the furfuraldehyde concentration in the oil, the remaining service life of the transformer can be estimated.

When having samples analysed with FA-ST for furfuraldehyde the laboratory carries these tests out to a BS EN61198 standard

Please see example below:

Component	Method	Limit	Result	Comments
Furfuraldehyde (mg/kg)	BS EN61198	0.10 max per annum	0.01	In Spec

Polychlorinated Biphenyls (PCB) Analysis

In the past, PCB's were insulating liquids used for their non-flammable properties, mainly in transformers where a fire would be unacceptable, and as the dielectric fluid in capacitors. Unfortunately, the mineral oil used in transformers, switchgear etc. has become cross-contaminated over the years by PCB fluid being placed in dirty mineral oil tanks, by using oil conditioning equipment for both mineral and PCB liquids and by capacitors leaking into mineral oil systems.

PCB's are fairly non-biodegradable and do tend to collect in food chains and as a result, legislation has been brought in to prevent widespread contamination. Liquids containing over 50mg/kg (or 50 ppm by weight) must be classed as injurious substances and disposal must be by high temperature incineration, which is expensive. In fact, oil suppliers have agreed not to supply oil containing more than 10mg/kg and by the same token, any oil taken away over 10mg/kg is expensive to dispose of even though it may not be as high as 50/mg/kg. We use capillary column chromatography to determine the PCB concentration in oil. Identifying the three main types of PCB i.e. 1242, 1254 and 1260 and reports the total PCB content present.

When having samples analysed with FA-ST for PCB analysis the laboratory carries these tests out to a BS EN61198 standard

Please see example below:

O/R	Sample Details	POLYCHLORINATED BIPHENYL (PCB) (mg/kg)			
		Aroclor 1260	1254 Aroclor	1242* Total	Total PCB Content
22/*****	Customer Sample	N.D	N.D	N.D	N.D
22/*****	Customer Sample	N.D	N.D	N.D	N.D

1.* Aroclor 1242 is not accredited

2.N.D. denotes None Detected, i.e. is less than 5 mg/kg for Aroclor 1254 & 1260 and less than 10 mg/kg for Aroclor 1242



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Oil & Fuel Sampling

With our wide range of sample bottles and containers our customers can take a wide range of samples including oils, diesel fuel, coolants, glycols and a selection of chemicals and other fluids. Supplying our customers with:

- Vacuum Sampling Pumps
- Sample Bottles
- Sample Tubing
- Complete Oil & Fuel Sampling Kits



Oil Analysis

FA-ST provide a comprehensive range of oil testing allowing you to determine the cleanliness, contamination, chemistry and identify wear particles in lubrication oils, diesel fuel, coolants, and greases etc. at our independent oil analysis laboratory.

With the support of the FA-ST oil analysis program you can consistently monitor the quality of the fluids used on your machinery & equipment, detect potential component failure, reduce maintenance costs and help decide the correct oil change intervals.



Oil Filtration

FA-ST have an extensive range of oil filtration equipment especially designed to remove particulate, water and magnetic particles from oils, diesel fuel, coolants & glycols. Working with some of the industries leading businesses we aim to bring you the finest filtration equipment on the market including:

- Oil, Diesel & Glycol Filtration Systems
- Filter Cartridges for a wide range of fluids
- Magnetic Pre-Filters
- Bypass Filter Systems



How Clean is your Oil?

For all your oil sampling, filtration & Analysis needs contact FA-ST:



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