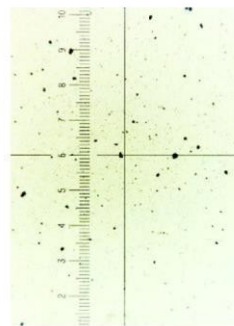
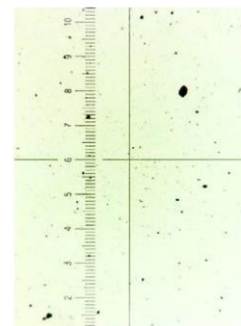


# FA-ST Patch Test Analysis Kit

## How Clean is your Oil?



ISO 21/19/16 NAS 10



ISO 20/18/15 NAS 9

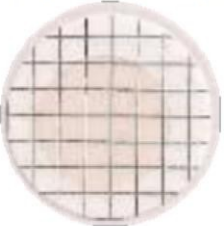

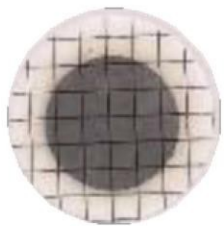



The FA-ST Portable Contamination Analysis Kit is an essential tool for identifying and monitoring the types and levels of particulate contamination that can enter a fluid. The Patch Analysis Test kits allows for fluids such as oils, diesel fuel and coolants to be tested, but also substances like grease can be analysed with a simple Patch Test. Patch testing allows for instant visual analysis to be carried out on site without the need to send samples to laboratories. This can be a vital tool allowing timely decisions to be made about the current state of the fluid. The FA-ST Patch test kit allows our users to identify major types of system wear including **bright & black metals, fibres, silica, plastics, elastomers and more** for a very affordable price.

**Please note: Petroleum Ether or other solvents are not supplied in this kit and will have to be purchased from a specialist supplier.**

A sample of the test fluid is passed through a filter membrane via the vacuum pump, dried, and mounted in a membrane holder ready for visual assessment. Comparator charts are supplied with the kit to help establish and identify approximate ISO / NAS cleanliness levels of samples. The kit is supplied complete with everything required for taking samples, processing them and is simple to assemble and use. Estimate the overall contaminants in mg. dirt / 100ml oil by viewing the discoloration with the naked eye and comparing with the charts. Remember, you are looking at the overall density of the contaminants, not just the actual colour. Give an estimated ISO or NAS code by viewing under a 50/ 100 pocket microscope (other variations of microscopes can be purchased separately) and comparing with the supplied charts. You can also identify many different contaminants using the reference charts provided.

## Example Patch Reports

<p>New Oil from IBC</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Naked eye view      Magnified view</p>	<p><b>Comment</b> The overall contamination (naked eye view) is estimated at <b>1.5 mg/100ml</b>. This is a reasonable result but is just above recommendations for this type of system.</p> <p>Hard particles are estimated at <b>ISO 17/15/12, NAS 6</b>. This is just within recommended limits but note that some <u>fibres</u>, worn metal particles and resinous solids are present. (Oxidation products) There are also a number of black <u>carbon</u>, metal and miscellaneous particles suggesting airborne and existing IBC contamination possibly due to less than ideal storage and transfer practices.</p>
<p>Machine 1</p> <div style="display: flex; justify-content: space-around;">   </div> <p>Naked eye view      Magnified view</p>	<p><b>Comment</b> The overall contamination (naked eye view) is estimated at <b>5 mg/100ml</b>. This is a poor result and well above recommendations for this type of system.</p> <p>Hard particles are estimated at <b>ISO 21/19/16, NAS 9</b>. This is well outside recommended limits. Note that some long <u>fibres</u>, worn metal particles and resinous solids are present. (Oxidation products) There are also a number miscellaneous contaminants plus black carbon particles suggesting possible 'cracking' of molecules, possibly by filter sparks. It is possible evidence of potential deposit formation.</p>

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## Patch Kit Contents

Ref	Part No.	Description	Qty	Ecommerce
A	AP606	Carry Case	1	<a href="#">Buy Now</a>
B	IMCC-1	Instruction Manual & Charts	1	N/A
C	PETG100-38	100ml Clear Plastic Sample Bottle	12	<a href="#">Buy Now</a>
D	VSPG38	38mm Vacuum Sample Pump	2	<a href="#">Buy Now</a>
E	MAG38P	Magclamp Pump Stand	1	<a href="#">Buy Now</a>
F	TTSC50	Plastic 50ml Test Tube with Cap	2	<a href="#">Buy Now</a>
G	F1500	Funnel & Patch Holder	2	<a href="#">Buy Now</a>
H	SPK500	Spill Kit Granules	1	<a href="#">Buy Now</a>
I	PPWNG500	500ml Kautex Waste Bottle	1	<a href="#">Buy Now</a>
J	WB250ML	250ml Wash Bottle	1	<a href="#">Buy Now</a>
K	ST6/5	15 Metre Coil of Standard Sample Tube	1	<a href="#">Buy Now</a>
L	PPEL-4	PPE Gloves	4	N/A
M	LAX50-4	LAX50 Lint Free Wipes	4	<a href="#">Buy Now</a>
M1	TMBPW-25	Dirteeze Trademate Wipes (25 pack)	1	<a href="#">Buy Now</a>
N	AAWG02500	0.8µ Micron Membrane Patch (box 25)	2	<a href="#">Buy Now</a>
N1	SMWP02500	5µ Micron Membrane Patch for Grease (box 25)	1	<a href="#">Buy Now</a>
O	TCP15	Tube Cutter	1	<a href="#">Buy Now</a>
P	ECP50	Chemical Spill Mat	1	<a href="#">Buy Now</a>
Q	M60MIC100	Pocket Microscope 60-100 mag	1	<a href="#">Buy Now</a>
R	RPC1	Reference Patch Card	1	N/A
S	PHC40-75	Patch Holder Cards	1	N/A
T	PMC1780	Tweezers	1	<a href="#">Buy Now</a>
V	MP1-MP2	Marker Pens	1	N/A
W	SBWBCB	Plastic Card Holder (Not Shown)	3	N/A
X	MMPHONE	Mini Microscope for Smart Phone Camera	1	<a href="#">Buy Now</a>
Y	MSCASLE	Small Portable Digital Scales	1	N/A
Z	WTS-5	Wooden Spatulas (Pack of 10)	1	N/A

## Instructions of use – Oils & Fluids

**Ensure correct PPE equipment is used for handling oil samples and any chemicals used in these tests.**

Take a representative sample – preferably from the oil or tank reservoir mid-point. This is because flow lines can create ‘dynamic carry over’ and contaminants remain in the oil flow rather than travel into the sample bottle. If taking a sample from a drain port or “minimess” type sample point, then allow about a half litre of oil to flow out of the sample valve or tube before taking the actual sample. Rinse the sample bottle with the oil several times (empty and then re-fill to ensure any existing dust etc. from the bottle is removed). You need a minimum of 25ml of oil for the analysis. Analyse the oil as soon as possible after taking the sample.

1. If required dilute the oil with an equal amount of Petroleum Ether (using wash bottle J) in the test tubes (F). So, 25ml of oil and 20-25ml of petroleum ether. This should be grade 60-80°C. (Not included in kit so needs to be procured separately). Not all fluids need to be diluted as it depends on the viscosity.
2. If testing glycol or oil/ water emulsions, then petroleum ether should NOT be used for dilution.
3. Distilled Water can replace the petroleum ether if further dilution is needed to allow the solution through the membrane patch.
4. Tighten the lid or fit a stopper on the test tube (F) before mixing the oil and petroleum ether thoroughly.
5. Insert 25mm diameter x 0.8µm membrane patch (N) into sample equipment patch holder (G) ensuring the round support ring is fully in place. Grid lines on patch should be on top. Assemble the funnel tightly onto the patch holder (G).
6. Fit the assembly into the vacuum pump top (D) and tighten the black screw top sealing the patch holder onto the vacuum pump inlet. Confirm that the waste bottle (C) and funnel assembly (G) are sealed to the vacuum pump (D).
7. Pour the oil/ether/(water) mix into sample equipment (G).
8. Using the vacuum hand pump (D), suck the oil/petroleum ether mixture through the membrane patch (N) by pulling on the vacuum pump handle (D). Continue until it all has passed through the membrane into the waste bottle and monitor how much of the oil/pet ether mix has passed through and record it. Take care not to over pump and damage the membrane patch.
9. If the membrane patch (N) becomes blocked with contaminants, then record how much oil/ether mix has passed through before blockage. (By %)
10. With the suction pump (D) still creating a vacuum, rinse the membrane (N) with a small amount of neat petroleum ether to remove any oil residue.
11. Separate the funnel from the patch support (G) and rinse the outer edge of membrane with a small amount of petroleum ether to remove oil residue.
12. Using the tweezers (T) if needed, remove, and then allow the membrane patch (N) to dry.
13. Place the membrane patch on a patch card (S). Write details such as date, oil type, volume, machine description, quantity of oil passed through membrane (i.e. 100% etc.) on the front or back of the card (S) and cover with a laminating plastic pouch (U).
14. Using a heated Laminator, if available, seal the patch and card support.

## Instructions of use - Grease

**Ensure correct PPE equipment is used for handling oil samples and any chemicals used in these tests.**

### **Sampling**

Obtaining a sample of grease, is a relatively simple task. This can be achieved by using a hard material spatula or something similar. Always ensure the spatula is free from contaminants or moisture, the easiest way to do this is to wipe the sampling item with one of our LAX60 lint free wipes. This ensures no fibres are on the sampling tool.

When the grease has been sampled, protect the grease from foreign bodies spoiling the sample. Place in a suitable container e.g. sampling bottle or resealable poly bag. This is very critical otherwise false results will be obtained.

### **Analysing Grease Samples - Obtaining correct weights**

Obtaining the correct weight of the grease is a critical part of the procedure. Too much grease and it will simply 'blind' the 5µm patch and only partial results will be obtained. Too little and the grease may report back as good, when in fact the grease is fouled. To allow for accurate analysis of the grease to be carried out then 0.1g of grease should be used. Plus, or minus 10% will allow for a satisfactory result.

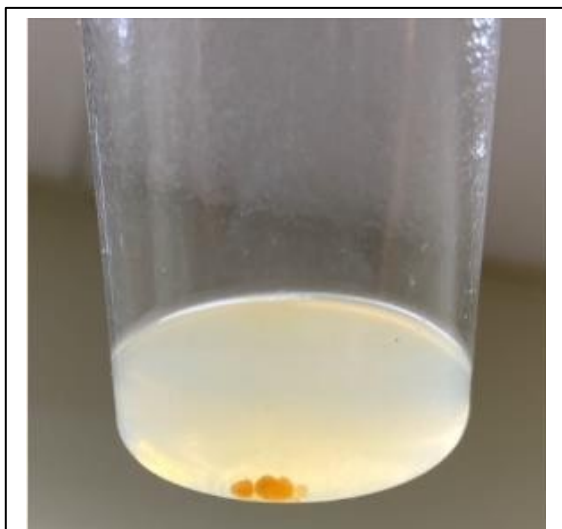
### **Transfer of Sample**

The transfer of the grease to a sample bottle is a straightforward process. Simply wipe the spatula holding the grease on the inside of the bottle. Ensure as much of the sample is transferred to the bottle as possible.

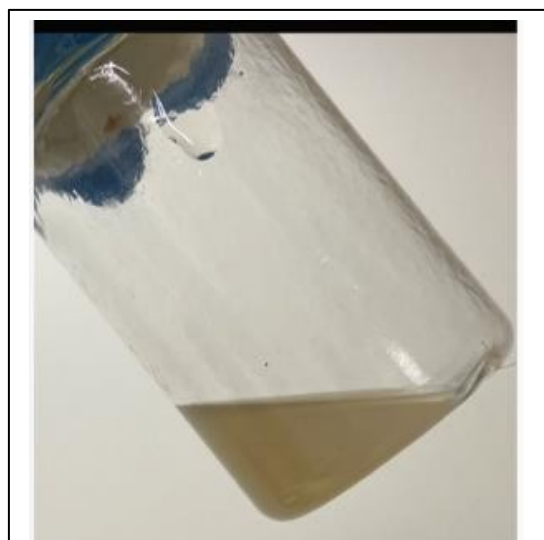
### **Sample dilution**

Measure out 10ml of Petroleum Ether and add to the sample bottle containing the grease. Shake vigorously until all the grease has been absorbed into the fluid.

**Do Not Proceed** unless the grease is absorbed, or the patch will blind, and results are unobtainable requiring resampling.



*Grease sample requires further dilution.*



*Grease sample fully diluted.*

## Instructions of use – Grease Continued

Once completed the process is then the same as fluid analysis but using the supplied 5µm membrane patches.

- Insert 25mm diameter x 5µm membrane patch (N) into sample equipment patch holder (G) ensuring the round support ring is fully in place. Grid lines on patch should be on top. Assemble the funnel tightly onto the patch holder (G).
- Fit the assembly into the vacuum pump top (D) and tighten the black screw top sealing the patch holder onto the vacuum pump inlet. Confirm that the waste bottle (C) and funnel assembly (G) are sealed to the vacuum pump (D).
- Pour the oil/ether/(water) mix into sample equipment (G).
- Using the vacuum hand pump (D), suck the oil/petroleum ether mixture through the membrane patch (N) by pulling on the vacuum pump handle (D). Continue until it all has passed through the membrane into the waste bottle and monitor how much of the oil/pet ether mix has passed through and record it. Take care not to over pump and damage the membrane patch.
- If the membrane patch (N) becomes blocked with contaminants, then record how much oil/ether mix has passed through before blockage. (By %)
- With suction pump (D) still creating a vacuum, rinse the membrane (N) with a small amount of neat petroleum ether to remove any oil residue.
- Separate the funnel from the patch support (G) and rinse the outer edge of membrane with a small amount of petroleum ether to remove oil residue.
- Using the tweezers (T) if needed, remove, and then allow the membrane patch (N) to dry.
- Place the membrane patch on a patch card (S). Write details such as date, oil type, volume, machine description, quantity of oil passed through membrane (i.e. 100% etc.) on the front or back of the card (S) and cover with a laminating plastic pouch (U).
- Using a heated Laminator, if available, seal the patch and card support.

### Note -

Even if you use a 25mm patch and only 25ml of oil, you still express the overall contamination level as mg. contamination / 100 ml. oil. This is because the area of the 25mm membrane actually exposed to the oil sample is roughly 25% of the area exposed to a 47mm membrane, which uses 100ml of oil as per the standard laboratory test.

### CAUTION

Petroleum ether is flammable.

Always store in a cool place.

Ensure adequate ventilation.

Upon completion of sampling tests, make sure to tighten the petroleum ether bottle cap.

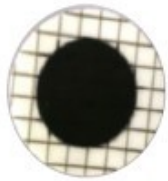
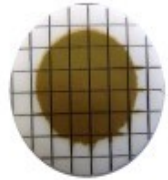




**FULL TRAINING ON HOW TO USE THE PORTABLE PATCH TEST KIT IS AVAILABLE UPON REQUEST**

## Patch Analysis

- Estimate the overall contaminants in mg. dirt / 100ml oil by viewing the discoloration with the naked eye and comparing with the charts. Remember, you are looking at the overall density of the contaminants, not just the colour. (See separate sheets.)
- Give an estimated ISO or NAS code by viewing under a microscope (Q) and compare with the supplied charts (B). For reference the grid lines on the patches are 100µ micron wide.
- You can also identify many different contaminants using the reference charts provided (B).

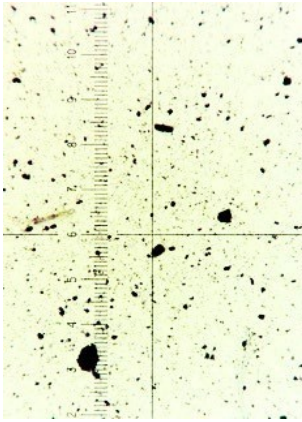
### Example Patches

Gravimetric patch test examples using 0.8µ x 25mm diameter membrane patches. This involves drawing a quantity of oil through a 0.8µm membrane. This detects more contaminants than the ISO 4406 or NAS 1638 methods, including oil oxidation products which are responsible for varnish formation. This reference chart provides a simple comparison test for field checks of the condition of hydraulic fluids.

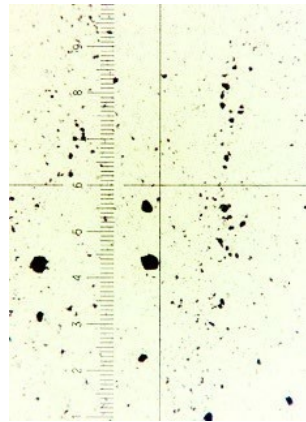
Conventional Hydraulics Patch Test Examples		<p><b>&gt;10mg /100ml of oil contamination</b>                      An example of high contamination level that is critical to hydraulic equipment.  <span style="background-color: red; color: white; padding: 2px;">Warning Level- Extreme</span></p>
		<p><b>&gt;4mg /100ml of oil contamination</b>                      An example of high contamination level that requires immediate cleaning or filtering.  <span style="background-color: magenta; color: white; padding: 2px;">Warning Level- Bad</span></p>
		<p><b>&gt;2mg /100ml of oil contamination</b>                      An example of contamination level that could benefit from cleaning or filtering.  <span style="background-color: yellow; color: black; padding: 2px;">Warning Level- Marginal</span></p>
		<p><b>&lt;1mg /100ml of oil contamination</b>                      An example of oil contamination level to which the oil has to be cleaned or filtered.  <span style="background-color: green; color: white; padding: 2px;">Warning Level- Good</span></p>
Servo Valve Controls		<p><b>&gt;2mg /100ml of oil contamination</b>                      An example of high contamination level that requires immediate cleaning or filtering.  <span style="background-color: magenta; color: white; padding: 2px;">Warning Level- Bad</span></p>
		<p><b>0.5mg /100ml of oil contamination</b>                      An example of oil contamination level to which the oil has to be cleaned or filtered.  <span style="background-color: green; color: white; padding: 2px;">Warning Level- Good</span></p>

**For reference, the grid lines in the membrane patches are approx. 100µ wide**

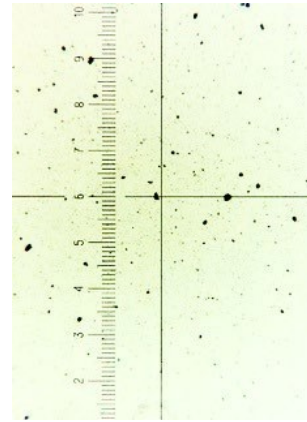
Reference Comparison Charts ISO / NAS Grades & Particle Identification guides. 100 x magnification.  
These guides are used to estimate the ISO / NAS contamination grades of oil samples.



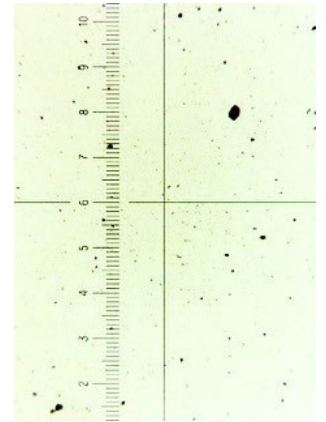
**ISO 23/21/18 NAS 12**



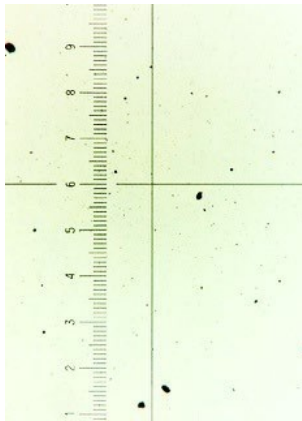
**ISO 22/20/17 NAS 11**



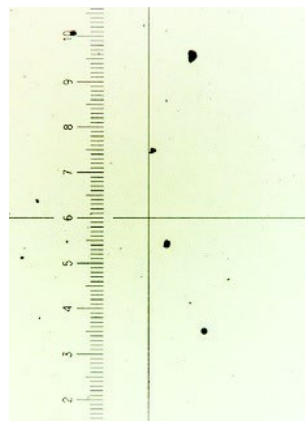
**ISO 21/19/16 NAS 10**



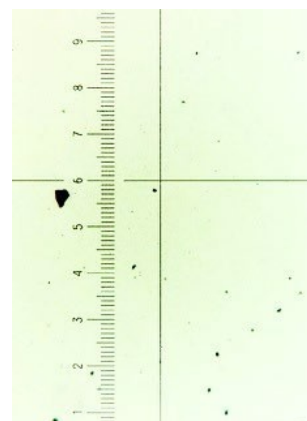
**ISO 20/18/15 NAS 9**



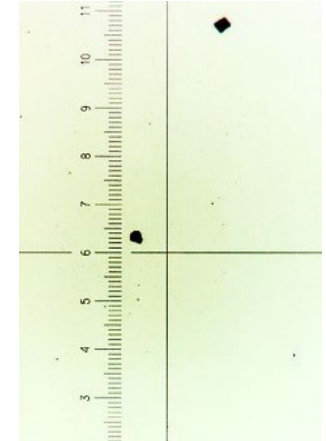
**ISO 19/17/14 NAS 8**



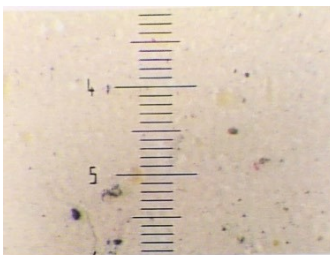
**ISO 18/16/13 NAS 7  
ISO 16/14/11 NAS 5**



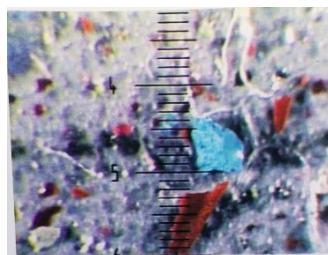
**ISO 17/15/12 NAS 6**



**Gel residue**



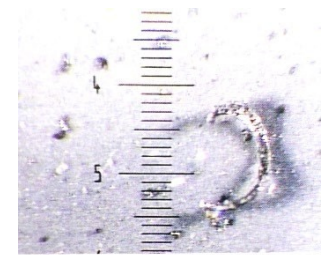
**Coloured particles**



**Rust & white particles**



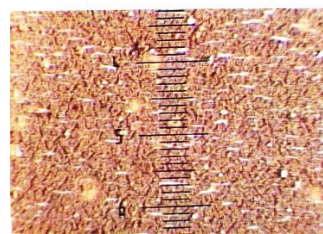
**Metal Swarf**



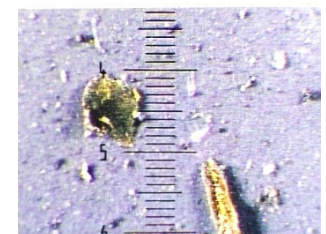
**Silicates**



**Fibres**



**Oil ageing Products**



**Bronze, brass & copper**



## Recommended Oil Cleanliness Levels

Recommended Oil Cleanliness Levels		NAS Class	ISO Code	Condition
<b>Application</b>	<b>Oil Cleanliness Required with ISO 4406</b>	4	15/13/10	<b>Good</b>
		5	16/14/11	
		6	17/15/12	
Systems with high dirt sensitivity and high availability requirements such as servo valve technology	< 18/13/10	7	18/16/13	<b>Acceptable</b>
		8	19/17/14	<b>Marginal</b>
		9	20/18/15	<b>Bad</b>
Systems with proportional valves and pressure >160 bar	<19/14/11	10	21/19/16	<b>Bad</b>
		11	22/20/17	<b>Extreme</b>
		12	23/21/18	<b>Extreme</b>
Vane pumps, piston pumps, piston engines	< 18/16/13	<b>Contamination levels mg / 100 ml oil</b>		<b>Condition</b>
Modern industrial hydraulic systems, directional valves, pressure valves	< 20/16/13	<1.5 mg / 100 ml oil		Good
		>2- <4 mg /100 ml oil		Warning
Industrial hydraulic systems with large tolerances and low dirt sensitivity	< 21/17/14	>4-<6 mg / 100 ml oil		Bad
		>6 mg / 100 ml oil		Extreme



## Oil & Fuel Sampling



www.FA-ST.co.uk  
Filtration Analysis Services Technology Ltd  
How clean is your oil ?

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:

Phone +44(0)1246268900  
Email: Visit:

