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Filtration Analysis Services Technology Ltd

How clean is your oil ?

# Coolant Analysis Service

## How Clean is your Oil?



Certificate Number 22484

# FA-ST Coolant Analysis Service



To have oils in Coolants analysed by FA-ST in our independent laboratory, then all you need is one of our PRE-PAID coolant sampling & analysis kits. This kit comes with everything needed to extract samples and sent them in to our independent ISO accredited laboratory. Once received the at the lab we will e-mail a PDF report 2-3 days after receipt of the sample. The report will have details on critical factors such as Wear levels, Contamination and Chemical make-up of the coolant and our laboratory technicians' comments and recommended actions if required.



**COOLKIT1 - FA-ST Coolant Analysis Kit**

## Why have Coolants Analysed?

With engines operating at high temperatures and with finer tolerances then cooling systems play a more important role than ever before. Even though coolant make-up today is more advanced than ever over 40% of premature engine failures can be traced back to cooling system performance. If cooling systems are not performing correctly then engines will run at higher temperatures, causing oils to potentially oxidise and loose it lubricity allowing increased wear to components.

## Detect & Identify contamination

Contaminates entering a coolants can cause coolants to become less effective in transferring heat allowing damage to occur to components decreasing component life spans. All coolants sent into our independent laboratory will be tested for the levels of glycol, whether normal or long-life coolant glycol preforms a vital factor if the levels of glycol are in correct for the cooling system it is used in then issues will begin to occur. Also an assessment of and solids and sediment whether organic or inorganic will be carried out. Finally to assess contamination levels then a visual inspection is carried out by the technicians. This will assess the general appearance and colour of the coolant as visual indicators can give a good indication of the condition of the coolant.

## Coolant Chemical Make-up Analysis

The Chemical Make-up of a coolant is another important factor for ensuring the coolant is fit for use. When we analyse coolants then we will carry out several tests to ensure it is performing to the highest possible level. The pH of a coolant will be determined as high or low pH levels can have detrimental effects on the coolant as should these levels become to out of spec then the coolant itself can become an issue as like any strong acid or alkali it will cause damage to components and seal and potentially enter the oil causing even further issues. Further assessments carried out on the chemical make-up of the coolant include an assessment of coolant foaming that can cause sluggish operation, also assets is the resistivity of the coolant, nitrite levels to determine that the coolant can provide the required iron protection, rust build up in the coolant and also see if the coolant has and rust prevent inhibitors in the coolant blend.

## Wear analysis of Coolants

When looking at wear factors in a cooling system our lab only assesses the Ferrous Wear Index. This provides a good understanding of rust build up and ferrous metals that are in the coolant pointing to system corrosion or inhibitor depletion.





# Contents

<b>Coolant Wear Testing</b> .....	<b>3</b>
Ferrous Wear / PQ Index .....	3
<b>Coolant Contamination Testing</b> .....	<b>3</b>
Glycol Vol.....	3
Solids Vol .....	3
Sediment.....	3
Appearance & Colour .....	4
<b>Coolant Chemical Make-Up Testing</b> .....	<b>4</b>
Foaming .....	4
pH .....	4
Resistivity.....	4
Rust .....	4
Nitrite.....	5
Rust Prevent .....	5



Certificate Number 22484



# Coolant Wear Testing

## Ferrous Wear / PQ Index

### Using the 51FW meter

As the ICP analysis only covers particles up to 15 micron without becoming blocked then a method of detecting larger particles is required. This is carried out via the ferrous wear Index (FW Idx). Ferrous particles are selected for this as in most common equipment ferrous metal tend to represent the most common metals in components, also the FW Idx can be quickly, and cost effectively measured.

No matter the test, trending is always the most useful method for identifying impending issues, however one additional correlation may be made between ferrous content and iron by elemental spectroscopy. If the iron by elemental spectroscopy is elevated, but ferrous wear concentration remains low, it may be surmised that the wear particles are small (<10 microns) and therefore from normal wear modes. When results from both tests are elevated, then the wear mode is likely transitioning from normal to abnormal; and if iron by elemental spectroscopy is low or consistent, but ferrous wear concentration is elevated or increasing, then the wear particles are likely large (>10 microns) and considered to be due to abnormal or severe wear modes.

**Pros:** Provides a count on total number of magnetic particles irrelevant of size.  
When used in correlation with ICP analysis allows users to see if normal or abnormal wear is occurring.

**Cons:** Not all methods of calculating the FW Idx are the same.

# Coolant Contamination Testing

## Glycol Vol

### Showing the concentration of Glycol of the sample, given as a percentage.

Glycol levels in a coolants are an important factor as it prevents the water in the coolant freezing and also has good heat transfer properties. Water has a freezing point of 0°C and pure ethylene Glycol freezes at -12.9°C, however dependant on the concentration of Glycol mixed with water these can change quite dramatically. The below table shows the percentage mixture of glycol and water and the point at which the solution freezes.

Glycol %	Water %	Freezing point
10%	90%	-3.4°C
30%	70%	-13.7°C
60%	40%	-52.8°C

As well as allowing the coolant to operate at low temperatures the glycol within a coolant also has good heat transfer properties and tends to discourage algae growth in the heat transfer equipment.

**Typical Values of Flagging Limits** Glycol level will vary depending on glycol type, application, and the pressure, elevation, and temperature at which the system operates.

## Solids Vol

### Measured in Parts Per Million (PPM)

Total Dissolved Solids examines the combined content of all inorganic and organic substances contained in Coolant.

## Sediment

### Measured on 0 (No) – 1 (Yes) scale.

Sediments that entre a cooling system has the tendency to blog filters, carburettors, and injectors



Certificate Number 22484



## Appearance & Colour

### Measured on a 0 – 3 scale

The Appearance and colour of a coolant can provide information on the coolants condition. This test is done visually by one of the laboratory technicians, the test includes colour to see whether the coolant is in good clean condition.

**Appearance scale:** 0 – Clear / 1 – Cloudy/hazy / 2 – Very Cloudy / 3 – Opaque

**Colour scale:** 0 – Colourless / 1 – Turquoise / 2 – Blue / 3 – Other

## Coolant Chemical Make-Up Testing

### Foaming

#### Measured on 0-3 scale

Foaming of a coolant can be a serious problem in systems, foaming can result from excessive agitation, improper fluid levels, air leaks, contamination, or cavitation's - the pitting or wearing away of a solid surface because of the collapse of a vapor bubble. Foaming can cause sluggish hydraulic operation, air binding in oil pumps and tank or sump overflow.

**Foaming Scale:** 0 – None / 1 – Slight / 2 – Moderate / 3 – Heavy

### pH

#### Measured on the pH scale

pH is a measure of the coolant's acidity or alkalinity. Whereas a coolant's neutralization number is related to the quantity of acid- or base-forming materials in a solution, pH indicates their intensity. Coolant pH range should remain between 7.5 and 11 to provide adequate corrosion protection. Lower levels of pH can allow for corrosion to build up within a system, whereas higher levels can lead to damage occurring on gaskets and other softer metal components.

#### Typical Values or Flagging Limits

**Conventional Coolant** Between 8.5 – 11 Long

**Life Coolant** Between 7 – 9

### Resistivity

#### Measured in micro-Siemens per centimetre ( $\mu\text{S}/\text{cm}$ )

The resistivity of a liquid is a measure of its 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 a low concentration of conductive contaminants.

**Typical Values or Flagging Limits**, 6600 Reportable, 7500 Unacceptable, 8000 Severe

**Function or Effect** ( $\mu\text{S}/\text{cm}$ ) Measure of the coolants ability to resist carrying an electrical charge. High conductivity can reduce to effectiveness of inhibitors and lead to cooling system corrosion.

### Rust

#### Measured on 0-1 scale

Rust builds up in cooling systems and can lead to the system not performing to the highest levels, we test coolants for any potential rust build up in systems.

**Rust Scale:** 0 – None / 1 - Yes



Certificate Number 22484



## Nitrite

**Measured in Milligrams Per Litre, the unit is  $\text{mg l}^{-1}$**

Nitrite is an inhibitor for cast iron, steel and liner cavitation's protection. Excessive levels can lead to solder corrosion, precipitate formation and water pump failure. Nitrite is the Primary inhibitor for iron protection, used to prevent cavitation of wet sleeve liners. Rapid depletion of Nitrite and an increase in glycolate indicates general overheating of the coolant system or localized hot spot. Rapid depletion of Nitrite without increase in Glycolates indicates Nitrite oxidation by a positive stray current.

## Rust Prevent

**Measured on 0-1 scale**

Coolant corrosion inhibitors help decrease the corrosion rate of metals within your equipment and help maintain other coolant properties. The coolant manufacturers will determine the type of coolant corrosion inhibitors utilized in their product.



Certificate Number 22484



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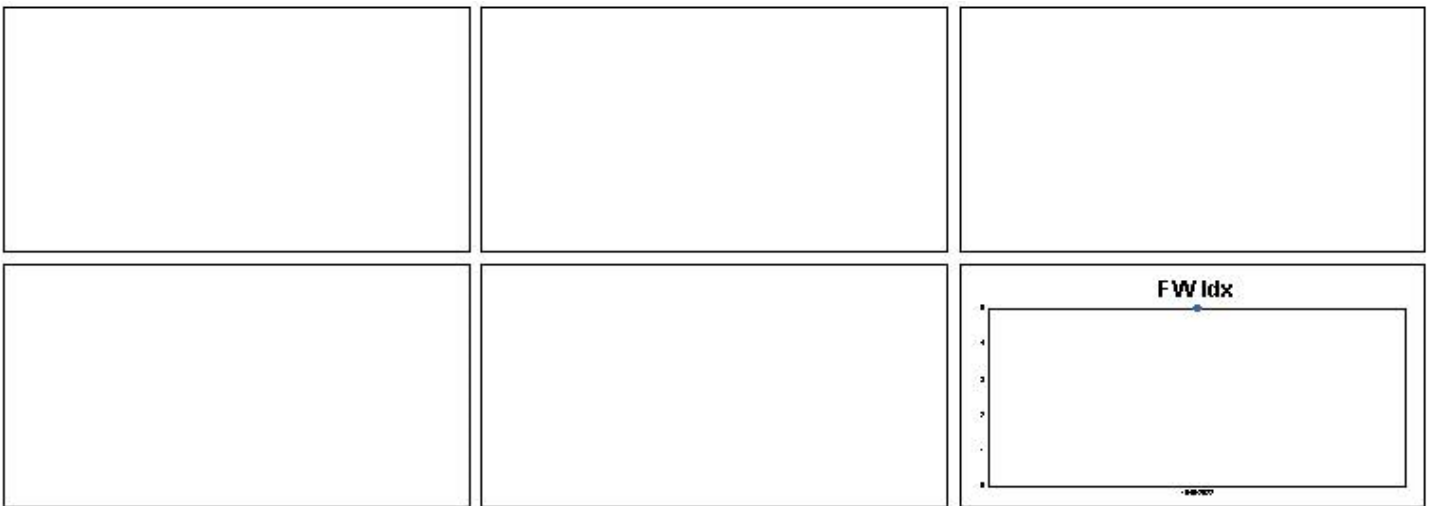
<b>Sample Num:</b> ****30	<b>Sample Date:</b> 01/01/2022	<b>Database:</b> FAST
<b>Area:</b>	FA-ST Database	
<b>Equipment:</b>	FA-ST Coolant	
<b>Point:</b>	Coolant	
<b>Comments:</b>	COOLANT COLOUR GREEN, THE COOLANT COLOUR LOOKS NORMAL AND THE COOLANT IS IN OK CONDITION. FREEZING POINT IS -34°C. HEAVY FOAMING FOUND IN THE SHAKEN SAMPLE, WE WOULD EXPECT TO SEE VERY LITTLE. A LITTLE FINE NON-FERROUS SEDIMENT WAS FOUND. A FEW SMALL RUST PARTICLES WERE PRESENT. GLYCOL CONTENT SEEMS LOW AT 39%, LAB RECOMMETS TO AIM FOR 50%.	

<b>Sample Num</b>	<b>****30</b>	<b>Sample Number is Very important, use this if contacting FA-ST so we can find your sample</b>
Sample Date	01/01/2022	Date Sample is taken
Unit Usage	400	Total Equipment Usage
Oil Usage		Equipment usage since previous sample
Oil Added		Amount of fluid added

Wear		
FW Idx	<b>35</b>	Total Magnetic Metal Index
		A Ferrous Wear (FW Idx) is also carried out to identify magnetic particles in the oil. The ICP will only detect particles up to 15 in size. The FW Idx will provide a total count on magnetic particles irrelevant of size

Contamination		
Glycol Vol	<b>39</b>	Percentage
Solids Vol	1677	Parts Per Million (PPM)
Sediment	<b>1</b>	Number Scale (1-3)
Appearance	2	Number Scale (1-3)
Colour (Visual)	1	Number Scale (1-3)
		The Glycol Test determines the percentage of Glycol to Distilled water
		Total Dissolved Solids examines the combined content of all inorganic and organic substances contained in Coolant.
		Appearance and Colour observation.

Chemistry		
Foaming	<b>3</b>	Number Scale (1-3)
pH	8.8	pH Scale
Resistivity	2620	Number Scale (1-3)
Rust	<b>1</b>	Number Scale (1-3)
Nitrite	0	Milligrams Per Litre
Rust Prevention	0	Number Scale (1-3)
		Foaming Measurement for shaken sample
		PH Test for acidity and alkalinity
		Measurement for any rust in Coolant
		To test for Inhibitor levels to protect against corrosion







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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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