

GLOBAL TECHNICAL SERVICES

Laboratory Services Division

<u>A ISO 17025 - NABL ACCREDITED LABORATORY WITH GLIMS</u>



Oil Analysis Fundamentals :-

- Lubricant in a machine is like blood in Ē the human body.
- Indicator of equipment's health. ()
- Through early detection, costly failure and Ē downtime can be prevented by fixing the problem before it happens.



Why do Oil Analysis?

- Increases Equipment's Life. P
- Ascertains Oil Quality. P
- Increases Oil Service Life. P
- Increases Equipment's Resale Ē Value.
- Reduces Downtime.
- There are a second to the second seco
- Reduces Maintenance Cost.
- Reduces Production Losses.
- Increases Productivity. (P
- Provides Root Cause Analysis. P







List of Equipments at our Oil Testing Laboratory TESTS

Appearance Water content,wt% Kin Visc at 40degC, cSt Kin Visc at 100degC, cSt Viscosity Index TAN, mgKOH/g TBN, mgKOH/g Soot Content Oxidation Nitration Insoluble (%) Elemental Analysis, ICP Flash Point (PMCC or COC) **Fuel Dilution Glycol Contamination** Foam characteristics Di electric strength. (Transformer Oil) Patch Test Direct Read Ferrography. Analytical Ferrography -Ferrogram Analysis. **Optical Particale Analysis (OPA)** Partical Sizing & Distribution NAS & ISO, Cleanliness Particles Structure and Shape & Concentration .(Morphology)

PROCEDURE

ASTM D 1500 ASTM D 6304 ASTM D 445/IP 71 ASTM D 445/IP 71 IP 226 IP 177 ASTM D 4739/IP 276 FTIR FTIR FTIR ASTM D893 ICP IP 34/36 FTIR FTIR **ASTM D 892** ASTM D 1816 Manufacturer Manufacturer

Manufacturer **ASTM D7596 ASTM D7596** ISO 4406 / NAS 1638

ASTM D7596



Inductively Coupled Plasma Spectrophotometer



LaserNet Fines C Particle Counter and Shape Classifier



Analytical Ferrography

Lubricant in a Machine Is Like

"Blood In The Human Body"

MAINTENANCE STRATEGY	TECHNIQUE NEEDED	HUMAN BODY PARALLEL
Proactive Maintenance Through Oil Analysis	Monitoring and correction of failing root causes, e.g., contamination	Cholesterol and blood pressure monitoring with diet control
Predictive Maintenance	Monitoring of vibration, heat, alignment, wear debris.	Detection of heart disease using ECG or Stress test
Preventive Maintenance	Periodic component replacement.	By-pass or transplant surgery
Breakdown Maintenance	Large maintenance budget.	Heart attack or stroke





The International Organization for Standardization (ISO) has developed a code system called ISO Cleanliness codes, a universal standard for measuring and reporting particulate contamination levels in fluids. ISO 4406:99 is the newest and most commonly used cleanliness code. It is assigned on the basis of the number of particles per unit volume greater than 4, 6 and 14 microns. The numbers are given in this specific order for consistency in comparison. Each code represents a range of solid particles present in a lubricant.

Importance of Code Compliance - High ISO Cleanliness codes indicate high levels of particulate contamination in the oil, which increase wear and shorten the lives of both machinery and lubricants. However, if a company maintains a sophisticated and effective contamination control program, the codes can be used to achieve increased efficiency and reduced downtime.

Typically, new fluids are not clean fluids. Bulk lubricants from blending plants can range from 19/17/15 to 17/14/13, while sealed drum lubricants can have cleanliness codes as high as 22/21/19. In contrast, highly filtered fluids may have a code of 16/14/11 or lower.

Number of Particles per 100ml				
ISO Number	From	Till		
24	8.000.000	16.000.000		
23	4.000.000	8.000.000		
22	2.000.000	4.000.000		
21	1.000.000	2.000.000		
20	500.000	1.000.000		
19	250.000	500.000		
18	130.000	250.000		
17	64.000	130.000		
16	32.000	64.000		
15	16.000	32.000		
14	8.000	16.000		
13	4.000	8.000		
12	2.000	4.000		
11	1.000	2.000		
10	500	1.000		
9	250	500		
8	130	250		
7	64	130		
6	32	64		
5	16	32		
4	8	16		
3	4	8		
2	2	2 4		
1	1	2		



Suggested Oil Cleanliness Standards

ISO VG Classification	Cleanliness Code	Machine / Equipment Description	
	(R ₄ /R ₆ /R ₁₄)		
32	16 / 14 / 11	Hydraulic , Lightly loaded slideways.	
46	16 / 14 / 11	Hydraulic, rotary screw compressors	
68	17 / 14 / 12	Vertical Motors, turbines, journal bearings, pump	
100	18 / 15 / 13	Reciprocating air compressors, angle drives, conveyours	
150	18 / 15 / 13	Gear reducers, screw conveyours, feeders	
220	19 / 16 / 14	Turbine drives, cooling towers drives, heavily loaded slideways	
320	19 / 16 / 14	Gear reducers	
460	19 / 16 / 14	Exhausters, vacuum pumps, large conveyor drives	
630	20 / 18 / 14	Gear drives	



Digital Particle Counter









Machines exhibit widely varying, wear metal production rates. This can be due to machine age, lubrication, contamination, type of service, and operating conditions. For this reason it is very helpful to have historical information on machine wear metals as a guide to defining, conforming and non-conforming elemental data. Table below shows typical ranges of wear metals in lubricating oils from various machines. From the data such as these, alarm levels can be defined, to more easily interpret routine elemental data. This forms a critical part of a pro-active maintenance programme.



Wear Metal Range -

Common Wear I	Common Wear Metal Ranges - Transmissions						
			PPM / 500 HOUR INTERVAL				
Metal Possible Metal Source		Normal	Marginal	Caution	Critical		
Iron	Fe	Gears, Bearings, Spacers	0 - 60	61 - 100	101 - 180	>180	
Chromium	Cr	Bearings	0 - 2	3 - 3	7 - 10	>10	
Lead	Pb	Thrust Washers - Friction Discs	0 - 8	9 - 15	16 - 20	>20	
Copper	Cu	Thrust Washers - Friction Discs	0 - 70	71 - 120	121 - 200	>200	
Tin	Sn	Thrust Washers - Friction Discs	0 - 6	7 - 12	13 - 18	>18	
Aluminium	Al	Dirt, Convertor Stator/Imepller, Casing	0 - 4	5 - 10	11 - 15	>15	
Silicon	Si	Dirt, Defoamants	0 - 20	21 - 30	31 - 40	>40	
Sodium	Na	Salt, Possibly Additives	0 - 30	31 - 50	51 - 80	>80	
Common Wear M	Metal Ra	anges - Bevel/Spur/Helical Type Gears, Axle	es, Differentials, Fir	al Drives, Planetari	es		
				PPM / 500 HO	UR INTERVAL		
Metal		Possible Metal Source	Normal	Marginal	Caution	Critical	
Iron	Fe	Gears, Bearings, Spacers	0 - 100	101 - 150	151 - 300	>300	
Chromium	Cr	Bearings	0 - 4	5 - 10	11 - 15	>15	
Lead	Pb	Thrust Washers	0 - 30	31 - 50	51 - 80	>80	
Copper	Cu	Thrust Washers	0 - 30	31 - 50	51 - 80	>80	
Tin	Sn	Usually Not Present	-	-	-	-	
Aluminium	Al	Dirt, Casing	0 - 10	11 - 20	21 - 30	>30	
Silicon	Si	Dirt, Brake/Clutch Pads	0 - 20	21 - 30	31 - 60	>60	
Sodium	Na	Salt, Possibly Additives	0 - 30	31 - 50	51 - 80	>80	
Common Wear M	Metal Ra	anges - Diesel Engines					
			PPM / 500 HOUR INTERVAL				
Metal		Possible Metal Source	Normal	Marginal	Caution	Critical	
Iron	Fe	Liners, Gears, Tappets, Rings	0 - 60	60 - 80	80-120	>120	
Chromium	Cr	Rings, Cams, Followers	0 - 5	6 - 10	11 - 15	>15	
Lead	Pb	Bearings, Thrust Washers	0 - 15	16 - 25	26 - 40	>40	
Copper	Cu	Bearings, Bushings, Thrust Washers	0 - 15	16 - 25	26 - 45	>45	
Tin	Sn	Bearings	0 - 10	11 - 15	16 - 20	>20	
Aluminium	Al	Pistons, Bearings, Dirt	0 - 6	7 - 15	16 - 20	>20	
Silicon	Si	Dirt, Defoamants	0 - 10	10 - 15	15 - 20	>20	
Sodium	Na	Coolant, Salt, Possibly Additives	0 - 5	6 - 15	16 - 30	>30	
Common Wear	Metal	Ranges - Hydraulics	•				
		PPM / 500 HOUR INTERVAL					
Metal		Possible Metal Source	Normal	Marginal	Caution	Critical	
Iron	Fe	Gear, Valves	0 - 8	9 - 15	16 - 25	>25	
Chromium	Cr	Cylinder Rods	0 - 3	4 - 8	9 - 15	>15	
Lead	Pb	Pump Bearings	0 - 4	5 - 10	11 - 15	>15	
Copper	Cu	Pump Bearings, Pump Wear Plate	0 - 8	9 -15	16 - 25	>25	
Tin	Sn	Usually Not Present	-	-		-	
Aluminium	Al	Dirt, Pump Casing	0 - 3	4 - 8	9 - 15	>15	
Silicon	Si	Dirt	0 - 5	6 - 10	11 - 20	>20	
Sodium	Na	Salt, Possibly Additives	0 - 30	31 - 50	51 - 80	>80	















Be Assured That GTS Has in Depth Experience & Knowledge To Protect Your Equipment -

Can we be your equipment's best friend ?

Yes, we definitely can be. In fact through our work with various industries, plant managers, and other contributing factors, we have developed numerous different test packages for specific equipment. We are open to working with any industry, and you can be rest assured that we have the depth of experience and knowledge in the following industries :-

Conservatively Recommended Oil sampling intervals for different Equipment Categories				
	Hours			
Diesel Engines - Off - Highway	125			
Transmissions, Differentials, Final Drives	250			
Hydraulics - Mobile Equipment	150			
Gas Turbines - Industrial	500			
Steam Turbines	500			
Air / Gas Compressors	500			
Chillers	500			
Gear Boxes - High Speed, Heavy Duty	250			
Gear Boxes - Low Speed, Heavy Duty	750			
Bearings - Journal and Rolling Element	500			
Aviation Reciprocating Engines	25 to 50			
Aviation Gas Turbines	100			
Aviation Gear Boxes	100 to 150			
Aviation Hydraulics	100 to 150			

- Automotive
- Aviation
- o Cement
- Heavy Equipment
- Manufacturing / Industrial
- Marine
- Mining
- OEM
- Oil & Gas
- Power Generation
- Pulp & Paper
- Railways Locomotive
- 0 Steel

So if you are running the following types of equipment, ask us how we specifically help your business run more efficiently -

Engine	Transmission	Bearings
Turbines	Compressors	Hydraulics
Pumps	Gearboxes	Differentials



Check Your Oils Regularly Adopt GTS Oil Analysis Program & Improve Your

Machine Health & Productivity

GTS _ OIL ANALYSIS - $\underline{A \ TOOL \ FOR \ MACHINE \ MAINTENANCE}$

- 1. Oil in a machine is like 'Blood in the human Body'.
- 2. For good mechanical maintenance regular / periodic test on oil condition will reveal machine's internal condition.
- 3. Can oil remain 'As New' all the time when machine is in use ? "NO"

It can get used up and contaminated by :-

- Moisture / water atmosphere / radiator or cooling system leads.
- Dirt / dust (Breathers).
- Machine heat shall lead to additive depletion. The higher the temperature the higher the depletion.
- Wear of internal parts of machines, in usage, may lead to generation of micro wear particles, hence causing degradation of machines.

GTS Laboratory Services Division OIL ANALYSIS PROGRAMME

The oil analysis program is a properly designed and managed oil analysis program. This program offers best investment that an industry can make for their machine reliability. Oil analysis is the perfect tool for proactively monitoring machine condition to ensure that proper lubrication conditions exist. Oil analysis also allows for the optimization of drain intervals, thereby increasing the efficiency of the lubrication program.

Our **"Oil Analysis Program"** is an excellent tool for detecting failures, often in advance of other condition monitoring technologies. We suggest test intervals, appropriate targets and limits, quality assurance for lab methods, and integration with other technologies provided by ISO-17025 and GLIMS (Global Laboratory Information Management Software).

GTS - SAMPLING TECHNIQUES

One key to an effective oil analysis program is to collect valid data. Ineffective sampling techniqu can produce erroneous results, severely diminishing or even eliminating desired objectives.

A productive oil analysis program requires correct sampling procedures, sampling hardware, Sample point location, and properly trained technicians, to collect test samples.



We are at your service for any query.

Do contact us at..



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