

HYDAC | **INTERNATIONAL** |

Fluid Trending Service



www.hydac-na.com

Introducing **HYDAC'S Fluid Trending Services**

Clean oil is the key to long equipment life, precision operation, lower maintenance costs and decreased downtime. **HYDAC'S** Fluid Trending Services can unlock the door to increased savings by detecting potential problems early, so that service/downtime can be scheduled and catastrophic failures/costs can be avoided.

HYDAC'S Fluid Trending Services provide users of industrial and mobile hydraulic equipment with a complete analytical report including:

- * System status (rated as Normal, Caution or Critical).
- * Graphs of sample and limit data for easy detection of abnormal results.
- * Comments and recommendations (where applicable).
- * Photo of the contamination contained in the current oil sample. Kits including patch photo are available.
- * A report faxed or e-mailed
- * Early warning limits based on industry standards, provided targets or a provided baseline.
- * Current sample data displayed with up to 3 previous sample results.

A Typical Fluid Trending Program

HYDAC'S Fluid Trending Services can be used to implement a preventative maintenance program for each critical piece of equipment. The program should begin with a complete examination of the equipment by the customer to determine system criticality and sensitivity, as well as collecting a baseline sample to compare against.

New Oil/Baseline Samples

A sample of new oil should be sent to the lab for analysis. This sample will act as a baseline for comparison with subsequent sample results.

New oil/Baseline samples should be taken from the tote after filtering, this will provide the most accurate representation of the oil properties before it is used.

Warning limits for TAN must be calculated using the new oil data. An oil product data sheet should also be submitted with this sample.

Below is a listing of commonly cited sampling frequencies. These are given as a starting point only. Sampling frequency should be increased as environment severity and system criticality increases.

Sampling Frequency

<i>Equipment Type</i>	<i>Hours</i>	<i>Equipment Type</i>	<i>Hours</i>
Hydraulics - Industrial	700	Air/Gas Compressors	500
Hydraulics - Mobile	200	Chillers	500
Hydraulics - Aviation	150	Gear Boxes - High Speed/Duty	300
Steam Turbines	500	Gear Boxes - Low Speed/Duty	1000
Transmissions	300	Bearings - Journal and Rolling Element	500

Sampling Information

The Fluid Analysis Sample Form must be filled out as completely and accurately as possible. Accurate laboratory assessment of your sample depends on it. The most important information is:

- Your Company
- Your Name
- Your Email/Fax/contact info
- Unit ID / Name
- Date of Sample
- Type of oil (Manufacturer and Brand)

In the “Comments” section of the Fluid Analysis Sample Form the following should be listed:

- Reason for submitting the sample
- All relevant limits including ISO target for cleanliness
- Critical components
- Any suspected problems

HYDAC’s Fluid Trending Services offer our customers a valuable means of extending equipment life, lowering maintenance costs, and decreasing downtime by improving overall system performance using preventative maintenance strategies. To choose the correct program for you please contact your HYDAC distributor or HYDAC directly at 905-714-9322.

Hydac Sample Kits and Laboratory Reports

Hydac Prepaid Sample Kits



For critical equipment with sensitive components (ie. servo valves etc.) It is recommended to use the Total Conditioning Analysis Kit for each sample. For less critical equipment the Contamination Analysis Kit or the Foundation Analysis kit can be used on a regular basis with the Total Kit used when problems are suspected. For systems using water glycol fluids the Water Glycol Kit should always be used.



Hydac’s Fluid Trending Laboratory Reports

For each sample submitted to the lab, our customers will receive complete analytical lab reports including system status and recommendations.

Understanding Your HYDAC Fluid Trending Laboratory Report

Status and Recommendations

Corrective actions are recommended when applicable. The status of the sample is rated in three categories:

- **Normal** -System is operating within the parameters established by provided limits and/or baseline data.
-System requires no immediate action.
- **Caution** -System is operating outside of caution limits in one or more areas.
-System requires scheduled maintenance.
- **Critical** -System is operating outside of critical limits in one or more areas.
-System requires immediate attention.

Fluid Laboratory Tests

Using a 200-milliliter minimum sample, the following tests can be performed:

Particle Count

Particle contamination is responsible for most of the wear that causes mechanical failure. The amount of damage inflicted depends largely upon particle size. Contamination must be controlled in any system deemed critical to operation or expensive to repair. Accurate particle count trends provided by HYDAC are an effective means of monitoring contamination and wear. The level of contamination is determined automatically by a laser particle counter. The results are shown as the cumulative counts per milliliter of fluid according to ISO 4406. (For water glycol fluids the patch test photo is used to estimate the ISO code). The current sample ISO code is displayed with the target ISO code. The target is based on the cleanliness level required for the most sensitive component in the system. The results are also graphed for easy detection of increased particle contamination. The accompanying chart lists components and target ISO cleanliness levels. When the target ISO code is exceeded, improvement of the system filtration, elimination of the source of ingress or installation of auxiliary off-line filtration may be required (eg. By using HYDAC quality filters, oil care and diagnostic systems)
(100 mL minimum sample volume required)

Most Sensitive System component	Low/Medium Pressure Under 2000 psi (Moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions ¹)		Very High Pressure 3000 psi and over (high pressure with severe conditions ¹)	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3 ⁽²⁾
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (Solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3 ⁽²⁾
Servo Valve	16/14/11	3 ⁽²⁾	16/14/11	3 ⁽²⁾	15/13/10	3 ⁽²⁾
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3 ⁽²⁾	15/13/10	3 ⁽²⁾
Test Stands	15/13/10	3 ⁽²⁾	15/13/10	3 ⁽²⁾	15/13/10	3 ⁽²⁾
Bearings						
Journal Bearings	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Industrial Gearboxes	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Ball Bearings	15/13/10	3 ⁽²⁾	not applicable	not applicable	not applicable	not applicable
Roller Bearings	16/14/11	3 ⁽²⁾	not applicable	not applicable	not applicable	not applicable

1) Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water

2) Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Levels

Water Content

Water is the second most destructive contaminant in hydraulic systems. Water can reduce lubricity, encourage rusting, form sludge, and encourages oxidation, corrosion and cavitation. Trending the water content of your system with HYDAC can help stop the damage water causes to critical system components.

The Karl Fischer Method based on ASTM D 1744 (volumetric) and ASTM D 6304 (coulometric) determines the water content, which is displayed in parts per million (PPM) and percent (%). The critical upper limit is displayed for comparison purposes. (Water glycol fluids normally have upper and lower limits that are set to manufacturers specifications). The results are also graphed for easy identification of abnormal results.

The crackle test method utilizes the difference between evaporation points in water and oil; water boils at a lower temperature than oil, creating bubbles and a crackle sound within the sample at the appropriate temperature. Results are reported as a pass or fail based on the observation of water evaporating (fail, above 500 ppm) or no such observation (pass, under 500 ppm).

In general, water contents of up to 500 ppm are not critical for the operation of hydraulic and lubrication systems. When the water content exceeds approx. 500 ppm the system should be protected against water penetration and measures should be introduced to extract water from the oil (e.g. by using HYDAC Aquamicon® elements for water absorption or by using the thin-layer evaporation unit HYDAC FluidAqua® Mobil (FAM).

(20 mL minimum sample volume required)

Viscosity

Viscosity is an important physical property of hydraulic oils. Large changes in viscosity can cause excess heat generation, cavitation, oil film loss, leakage etc. Changes can also indicate that different fluids have been mixed. Trending oil viscosity with HYDAC can help determine the extent of oil contamination, degradation or when the wrong fluid has been added.

Maintaining the correct viscosity is important for achieving long component service life. Viscosity is reported in centistokes (cSt.) @ 40°Celsius (Hydac Lab method based on ASTM D 445-97).

The data is displayed along with warning limits. Caution limits are calculated at +/-10% new oil viscosity and critical limits at +/- 15% new oil viscosity. (Water glycol fluids can have limits set similarly but the water content should also be monitored as changes in it also affect the viscosity. The manufacturer should be consulted). Graphs showing the viscosity trends along with limits allow for quick recognition of abnormal situations. When large changes in viscosity are detected a partial drain of the affected oil and adding fresh fluid may correct the problem. However in some instances a complete oil change may be required.

The kinematic viscosity of a fluid is determined by measuring the time required for the fluid to flow, under gravity, a known distance through a calibrated capillary viscometer at a constant temperature (40° Celsius) and pressure (atmospheric). The result is given in centistokes (cSt.). (20 mL minimum sample volume required)

Total Acid Number (TAN)

Oxidation is the primary mechanism of oil degradation. The presence of excess heat, wear metals, and water can increase the rate of oxidation. The by-products of oxidation are organic acids, which are detected by the TAN test. Oxidation is the primary mechanism of oil degradation. It causes sludge/varnish problems, loss of lubricity, etc.

TAN results are reported in mg/g KOH (Potassium Hydroxide). Since all hydraulic fluids have some inherent acidic properties any increases in TAN must be compared to the new oil value as a baseline. Typically caution limits are set at +0.6 new oil value and critical limits are set at +1.0 new oil value. Certain application specific fluids may require limits set to manufacturer specifications.

The results are graphed along with the limits to clearly show when oil oxidation has increased above acceptable levels. When the TAN has increased above the critical level, the oil should be changed immediately to prevent damage from occurring to your equipment.

The TAN is determined by the milligrams of potassium hydroxide (KOH) required to neutralize the acidity of one gram of oil using an automatic titrator.

(20 mL minimum sample volume required)

(*not applicable to Contamination Analysis, Foundation Analysis or Water Glycol Kits)

Spectrographic Analysis

Additives can become depleted over the oil's lifetime by various means: washout, use, etc. Wear metals can indicate abnormal wear patterns and can also increase the oxidation rates. Other contaminants can indicate contamination of the oil by incompatible fluids.

Additive, wear metal and contaminant levels are displayed in parts-per-million (PPM). The oil sample is analyzed for seventeen different elements. The results are also graphically displayed for easy detection of increasing or decreasing levels. The manufacturer blends additives into the oil in different forms and quantities. The additive package varies with the oil type. Wear metals indicate wear on particular components of an individual unit. These metals will indicate a wear problem on the microscopic level (<5 microns) before the problem can be detected by conventional means. The existence of a wear problem is determined by absolute values of metals, and more importantly, by a relative increase over previous trending in one or more metals. Contaminants can be an indicator of internal or external contamination. The source and amount can be determined by a comparison with new oil data. Below is a list of additive types, wear metal and contaminant sources.

To determine concentrations of elements, the sample is aspirated into an argon plasma where each element is excited and caused to emit a characteristic wavelength of light. The ICP detects the light, identifies the elements and calculates their concentration. (5 mL minimum sample volume required)

(*not applicable to Contamination Analysis or Water Glycol Kits)

Additives

Additives	Function
Magnesium (Mg)	Dispersant / Detergent
Calcium (Ca)	Dispersant / Detergent
Barium (Ba)	Dispersant / Detergent
Zinc (Zn)	Anti-Wear
Molybdenum (Mo)	Anti-Wear
Phosphorous (P)	Anti-Wear
Wear Metals	Typical Source
Titanium (Ti)	Turbine Components, Bearings, Platings
Chromium (Cr)	Rings, Roller/Taper, Bearings, Rods, Platings
Iron (Fe)	Cylinders, Gears, Rings, Crankshafts, Liners, Bearings, Housings, Rust
Nickel (Ni)	Valves, Shafts, Gears, Rings, Turbine Components
Copper (Cu)	Bearings, Bushings, Bronze, Thrust-Washers, Friction Plates, Oil Cooler
Aluminum (Al)	Pistons, Bearings, Pumps, Blowers, Rotors, Thrust-Washers, Dirt
Lead (Pb)	Bearing Overlays, Grease, Paint, Possible Additive in Gear Oils
Tin (Sn)	Bearings, Bushings, Piston Platings, Solder, Coolers
Contaminants	Typical Source
Sodium (Na)	Coolant, Sea Water, Dirt, Possible Additive
Boron (B)	Coolant, Sea Water, Possible Additive
Silicon (Si)	Dirt, Possible Additive (Anti-Foam)

Conductivity

The presence of pumps and filters create electrical charges within a system. This test determines the ability of the oil to dissipate an electrical charge within that system. A higher conductivity relates to the speed at which the oil can dissipate the charge, low conductivity readings indicate an accumulation of charge and can create a dangerous situation.

Conductivity of a sample is measured in pS/m (picosiemens/meter) using a digital conductivity meter in accordance with ASTM D2624.

(1 Liter of sample required)

Gravimetric

Insoluble contamination can not only plug filters but can also damage functional system components, resulting in wear and eventual system failure. Hydac's Gravimetric solids test, based on a modified ISO 4405 protocol provides a valuable method for determining the contamination level of system fluids, wash fluids used in component cleanliness tests, or the fluids from a component test station.

The gravimetric method determines fluid contamination by weighing suspended solids per unit volume of fluid. The fluid sample is drawn through a membrane filter under vacuum conditions and the insoluble contamination is collected on the surface of the filter.

The increase in mass of the membrane after filtration represents the suspended solids within the sample.

This test can be performed at different filtration sizes. We offer 0.8, 10, 25, 45, 100, 200, 300 and 400 um filter sizes.

(1 Liter of sample required)

Patch Test/Photo

Equipment wear severity also depends on the shape and hardness of the contaminating particles. HYDAC's patch test and contamination photo compliment the particle count test by providing visual evidence of size, amount and identity (if possible) of the particles.

The solid contaminants are physically separated from the oil by vacuum filtering 100 milliliters of fluid through a 0.8-micron membrane filter. The resulting "patch" is examined using an optical microscope. An imaging system is used to capture a digital image of the patch which is attached to the report. The patch can be used to confirm and estimate the ISO 4406 cleanliness code.

(150 mL suggested sample volume)

MPC Varnish Potential Testing

Due to age and oxidization, harmful byproducts can develop within oil. In industrial equipment, the oil may be in service for many years and be at risk of forming these byproducts which can lead to the buildup of harmful varnish or sludge.

When performing the MPC Varnish Potential Test, the hydraulic fluid is filtered through a membrane patch, the resulting patch is then measured with a visible light spectrometer using the CIELAB colour scale (ASTM E308). The measured reading is then used to assign a status in regards to varnish level (0-15 is normal, 15-30 is monitor, 30-40 is abnormal, >40 is Critical).

(100 ml of sample required)

Contamination Analysis Kit									
 FLUID LABORATORY 14 Federal Road Welland, Ontario L3B 3P2 Phone: 905-714-9322 ext.2223 Fax: 905-714-4664 Email: Lab@hydac.ca		CUSTOMER INFORMATION			SYSTEM INFORMATION			FLUID INFORMATION	
				Company: ABC Company	Unit Name/ID: Unit 1	Sample Type: Hydraulic Oil		Manufacturer: Shell	
		Attention: Service Technician	Equip. Type:	Brand: Tellus		Viscosity: ISO VG 46 cSt			
		Address:	Manufacturer:	Sample Point: Sample Port		Date Sampled: 8-Aug-14			
		Phone:	Oil Capacity:	Date Sent: 12-Aug-14		Date Received: 15-Aug-14			
		Fax:	Time on Sys.:	Date Received: 15-Aug-14		Previous File # 22222			
		Email: service@abc.com	Time on Oil:						
		Report by: Email	Filtration:						
			Temp: Press:						
STATUS		COMMENTS / RECOMMENDATIONS							
Critical		Sample contamination is high. Check filtration.							
PARTICLE COUNT (Cumulative Counts / mL)									ISO CODE 4um(c)/6um(c)/14um(c)
File #	Date	>4 um	>6 um	>14 um	>21 um	>38 um	>70 um	Sample	Target
11111	10-Mar-14	53070.00	6333.00	249.00	62.00	9.00	0.00	23/20/15	N/A
22222	8-Apr-14	27813.00	4338.00	144.00	38.00	9.00	0.00	22/19/14	N/A
33333	8-Aug-14	49217.00	22698.00	7175.00	3542.00	200.00	9.00	23/22/20	N/A
									N/A
WATER CONTENT					VISCOSITY @ 40 °C				
File #	Date	Sample		Upper Limit		Lower Limit cSt.	Sample cSt.	Upper Limit	
		ppm	%	ppm	%			cSt.	cSt.
11111	10-Mar-14	56.2	0.00562	500	0.05	39.10	45.22	52.90	
22222	8-Apr-14	25.5	0.00255	500	0.05	39.10	46.17	52.90	
33333	8-Aug-14	63.5	0.00635	500	0.05	39.10	46.30	52.90	
			0.00000	500	0.05	39.10		52.90	
PARTICLE COUNT TRENDS			WATER CONTENT TRENDS			VISCOSITY TRENDS			
PATCH TEST									
File #	Date	Sample Volume	Magnification						
33333	8-Aug-14	100 millilitres	100 x						
Sample Contains:									
Unidentifiable black particles, metal debris.									
Please see photo at right.									
Report Date: 30-Mar-15		Analyst: Heather Walton							
Contamination Analysis Kit					File # 33333				

Foundation Analysis Kit

 FLUID LABORATORY 14 Federal Road Welland, Ontario L3B 3P2 Phone: 905-714-9322 ext.2223 Fax: 905-714-4664 Email: Lab@hydac.ca	CUSTOMER INFORMATION	SYSTEM INFORMATION	FLUID INFORMATION
	Company: ABC Company Attention: Service Technician Address: Phone: Fax: Email: service@abc.com Report by: Email	Unit Name/ID: Unit 1 Equip. Type: Manufacturer: Oil Capacity: Time on Sys.: Time on Oil: Time on Filter: Filtration: Temp: Press:	Sample Type: Gear Oil Manufacturer: Shell Brand: Omala Viscosity: ISO VG 150 cSt Sample Point: Date Sampled: 28-Apr-14 Date Sent: Date Received: 7-May-14 Previous File #: 11111

STATUS	COMMENTS / RECOMMENDATIONS
Critical	Water content appears to be above critical limit of 500 ppm. High water content can cause loss of lubricity, sludge problems and base oil oxidation The high water content might have influenced the particle count

PARTICLE COUNT (Cumulative Counts / mL)								ISO CODE 4um(c)/6um(c)/14um(c)	
File #	Date	>4 um	>6 um	>14 um	>21 um	>38 um	>70 um	Sample	Target
11111	13-Feb-14	27615.00	1609.00	90.00	32.00	8.00	0.00	22/18/14	NA
22222	28-Apr-14	43277.00	6387.00	783.00	180.00	8.00	1.00	23/20/17	NA

WATER CONTENT BY VISUAL CRACKLE TEST					VISCOSITY@40°C		
File #	Date	Sample Pass / Fail	Upper Limit ppm	Upper Limit %	Lower Limit cSt	Sample cSt	Upper Limit cSt
11111	13-Feb-14	Pass	500	0.05	127.50	131.44	172.50
22222	28-Apr-14	Fail	500	0.05	127.50	150.70	172.50
			500	0.05	127.50		172.50
			500	0.05	127.50		172.50

SPECTROGRAPHIC ANALYSIS (PPM)																		
File #	Date	ADDITIVES					WEAR METALS						CONTAMINANTS					
		Mg	Ca	Ba	Zn	Mo	P	Ti	Cr	Fe	Ni	Cu	Al	Pb	Sn	Na	B	Si
11111	13-Feb-14	0.1	0	0	10.7	0	205	0	0	0.6	0	1	0	0.1	0.1	0	0	1
22222	28-Apr-14	0	0.4	0	2.2	0	283	0	0	0.2	0	0.5	0	0.1	0	2.4	0	13.2

Foundation Analysis Kit File # 22222

Total Conditioning Analysis Kit											
 FLUID LABORATORY 14 Federal Road Welland, Ontario L3B 3P2 Phone: 905-714-9322 ext.2223 Fax: 905-714-4664 Email: Lab@hydac.ca			CUSTOMER INFORMATION			SYSTEM INFORMATION			FLUID INFORMATION		
						Company: ABC Company	Unit Name/ID: Unit 1		Sample Type: Hydraulic Oil		
			Attention: Service Technician	Equip. Type:		Manufacturer: Shell					
			Address:	Manufacturer:		Brand: Tellus					
			Phone:	Oil Capacity:		Viscosity: ISO VG 46 cSt					
			Fax:	Time on Sys.:		Sample Point: Sample Port					
			Email: service@abc.com	Time on Oil:		Date Sampled: 9-Oct-14					
			Report by: Email	Time on Filter:		Date Sent: 10-Oct-14					
				Filtration:		Date Received: 11-Oct-14					
				Temp: Press:		Previous File # 33333					

STATUS	COMMENTS / RECOMMENDATIONS
Critical	Sample contamination is above target limits. Check filtration.

PARTICLE COUNT (Cumulative Counts / mL)								ISO CODE 4um(c)/6um(c)/14um(c)	
File #	Date	>4 um	>6 um	>14 um	>21 um	>38 um	>70 um	Sample	Target
11111	14-Nov-13	46138.00	2991.00	174.00	67.00	20.00	2.00	23/19/15	18/16/13
22222	28-May-14	88154.00	30984.00	3702.00	950.00	30.00	3.00	24/22/19	18/16/13
33333	31-Jul-14	101107.00	43267.00	5345.00	1697.00	76.00	4.00	24/23/20	18/16/13
44444	9-Oct-14	98893.00	36463.00	847.00	335.00	26.00	2.00	24/22/17	18/16/13

WATER CONTENT				VISCOSITY@40°C			TAN			
File #	Date	Sample		Upper Limit		Lower Limit	Sample	Upper Limit	Sample	Upper Limit
		ppm	%	ppm	%	cSt.	cSt.	cSt.	mg/g KOH	mg/g KOH
11111	14-Nov-13	165.0	0.01650	500	0.05	39.10	43.76	52.90	0.37	NA
22222	28-May-14	217.4	0.02174	500	0.05	39.10	43.58	52.90	0.68	NA
33333	31-Jul-14	166.1	0.01661	500	0.05	39.10	43.43	52.90	0.34	NA
44444	9-Oct-14	107.6	0.01076	500	0.05	39.10	43.94	52.90	0.33	NA

SPECTROGRAPHIC ANALYSIS (PPM)																		
File #	Date	ADDITIVES						WEAR METALS						CONTAMINANTS				
		Mg	Ca	Ba	Zn	Mo	P	Ti	Cr	Fe	Ni	Cu	Al	Pb	Sn	Na	B	Si
11111	14-Nov-13	0.7	39.8	0.3	387	0	317	0	0.1	0.8	0	3.2	0.1	0.3	0.1	0.8	0.2	1.2
22222	28-May-14	1	38	0	391	0	329	0	0.1	1.6	0	3	0.1	0.2	0.2	0.3	0	0.7
33333	31-Jul-14	1.8	36.1	0	391	0	331	0	0.1	2	0	3.4	0.1	0.5	0.5	4.3	0	1
44444	9-Oct-14	0.7	36.5	0	361	0	310	0	0.1	1.9	0	4.6	0.1	0.5	0.2	0.8	0	0.4

PATCH TEST			
File #	Date	Sample Volume	Magnification
44444	9-Oct-14	100 milliliters	100x

Sample Contains:

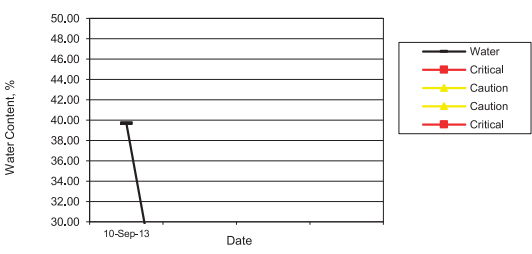
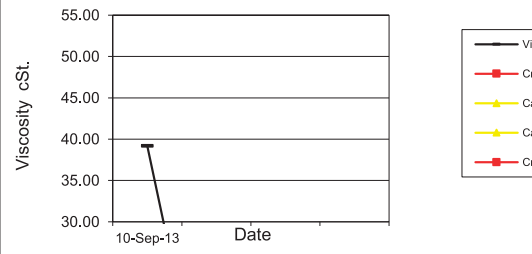

Unidentifiable black and white particles, metal debris.

Please see photo at right.

Report Date: 30-Mar-15 Analyst Heather Walton

Total Conditioning Analysis Kit
File # 44444



Water Glycol Analysis Kit							
HYDAC FLUID LABORATORY 14 Federal Road Welland, Ontario L3B 3P2 Phone: 905-714-9322 ext.223 Fax: 905-714-4664 Email: Lab@hydac.ca		CUSTOMER INFORMATION		SYSTEM INFORMATION		FLUID INFORMATION	
		Company: ABC Company Attention: Service Technician Address: Phone: Fax: Email: service@abc.com Report by: Email		Unit Name/ID: Unit 1 Equip. Type: Manufacturer: Oil Capacity: Time on Sys.: Time on Oil: Time on Filter: Filtration: Temp: Press:		Sample Type: Water Glycol Manufacturer: Brand: Viscosity: Sample Point: Sample Port Date Sampled: 10-Sep-13 Date Sent: 11-Sep-13 Date Received: 11-Sep-13 Previous File #: NA	
STATUS				COMMENTS / RECOMMENDATIONS			
Critical				Sample contamination is above target limits. Check filtration.			
ISO CODE (4um/6um/14um)							
File #	Date	Sample	Target	Note: ISO 4406 cleanliness code is estimated by filtering 100 mL of oil sample through a 0.8 micron filter and comparing the quantity of contaminants to photos in Hydac's Contamination Handbook.			
11111	10-Sep-13	20/18/15	17/15/12				
			17/15/12				
			17/15/12				
WATER CONTENT				VISCOSITY@40°C			
File #	Date	Lower Limit %	Sample %	Upper Limit %	Lower Limit cSt	Sample cSt	Upper Limit cSt
11111	10-Sep-13	NA	39.70	NA	NA	39.20	NA
		NA		NA	NA		NA
		NA		NA	NA		NA
		NA		NA	NA		NA
WATER CONTENT TRENDS				VISCOSITY TRENDS			
 <p>Water Content, % vs Date. Shows a sharp drop from 40.00% to 39.70% on 10-Sep-13. Legend includes Water, Critical, Caution.</p>				 <p>Viscosity cSt vs Date. Shows a sharp drop from 40.00 cSt to 39.20 cSt on 10-Sep-13. Legend includes Viscosity, Critical, Caution.</p>			
PATCH TEST							
File #	Date	Sample Volume	Magnification				
11111	10-Sep-13	100 mL	100x				
Sample Contains:							
Unidentifiable black particles, metal debris.							
Please see photo at right.							
Report Date: 30-Mar-15		Analyst: Ryan Smith					
Water Glycol Analysis Kit				File #		11111	

Fluid Laboratory Services List

HYDAC offers various types of prepaid sample kits to meet your different testing requirements. The purchase price of each kit includes:

- All costs of analysis
- Sample bottle, sampling instructions, fluid analysis sample form, shipping canister
- Computerized data storage, trending report (up to 3 years).

Contamination Analysis Kit without Patch Photo

This kit identifies contamination before it hampers production and shortens component life.

Tests include:

- Particle Count
- Water Content by Karl Fisher
- Viscosity

Kit Type	Colour P/N
Contamination Analysis Kit	Yellow 2552392

Contamination Analysis Kit with Patch Photo

This kit identifies contamination before it hampers production and shortens component life.

Tests include:

- Particle Count
- Water Content by Karl Fisher
- Viscosity
- Patch Test/Photo

Kit Type	Colour P/N
Contamination Analysis Kit	Yellow & Black 2565952

Foundation Analysis Kit

This kit is designed to give a more in-depth analysis than the contamination analysis kit but not as in-depth as the total analysis kit.

Tests include:

- Particle Count
- Water Content by Crackle test
- Viscosity
- Spectrographic Analysis

Kit Type	Colour P/N
Foundation Analysis Kit	Orange 2552394
10 X Foundation Analysis Kits	Orange 2552396

Total Conditioning Analysis Kit without Patch Photo

This kit is designed to include all relevant tests.

Tests include:

- Particle Count
- Water Content by Karl Fisher
- Total Acid Number
- Viscosity
- Spectrographic Analysis

Kit Type	Colour P/N
Total Conditioning Analysis Kit	Blue 2552393
10 X Total Conditioning Analysis Kits	Blue 2552391

Total Conditioning Analysis Kit with Patch Photo

This kit is designed to include all relevant tests.

Tests include:

- Particle Count
- Water Content by Karl Fisher
- Total Acid Number
- Viscosity
- Patch Test/Photo
- Spectrographic Analysis

Kit Type	Colour P/N
Total Conditioning Analysis Kit	Double Banded Blue 2565803
10 X Total Conditioning Analysis Kits	Double Banded Blue 2566093

Water Glycol Analysis Kit

This kit is designed exclusively for water glycol systems. Contamination, water content and viscosity are monitored.

Tests include:

- Water Content by Karl Fisher
- Viscosity
- Patch Test/Photo
- Estimated ISO 4406 cleanliness code

Kit Type	Colour P/N
Water Glycol Analysis Kit	Red 2550327

Particle Count Analysis Kit

This kit is for determination of fluid cleanliness.

Tests include:

- Particle Count

Kit Type	Colour P/N
Particle Count Analysis Kit	Brown 2550032

Gravimetric Analysis Kit

This kit is for determination of fluid cleanliness.

Tests include:

- Patch Test/Weight

Kit Type	Colour P/N
Gravimetric Analysis Kit	Black 2560832

MPC Varnish Potential Analysis Kit

This kit is for determination of fluid potential for developing varnish.

Tests include:

- MPC Varnish Test

Kit Type	Colour P/N
MPC Varnish Potential Analysis Kit	Black 2564909

Conductivity (Electrostatic Discharge) Analysis Kit

This kit is for determination of fluid potential for electrostatic discharge.

Tests include:

- Conductivity

Kit Type	Colour P/N
Conductivity Analysis Kit	Black 2564906

Individual Tests Available

To meet each customer's unique requirements, all HYDAC tests can also be purchased separately.

Individual Tests	P/N
Particle Count	2550032
Water Content by Karl Fisher	2564905
Water Content by Crackle Test	2564907
Viscosity	2550071
Total Acid Number (TAN)	2550072
Spectrographic Analysis	2550073
Patch Test Photo	2550037
Gravimetric Analysis	2553265
Conductivity (Electrostatic Discharge)	2564906

*Note: the laboratory will retain unused portions of samples for a maximum period of one month.

HYDAC INTERNATIONAL

The Single Source for Hydraulic Components

HYDAC Particle Count *ISO Solid Contaminant Code 4406*

Measures the size and quantity of particles in a lubricant. The code reports greater than 4, 6 and 14 microns per milliliter of fluid and is an indicator of cleanliness level and filter efficiency.

HYDAC Gravimetric Analysis

Provides a measure of insoluble contamination by filtering and weighing dry contaminants. Particularly useful for gear oils.

HYDAC Patch Test / Contamination Photo

Gives a visual indication of type and severity of contamination by using a high magnification microscope, it is documented on the lab report by digital photograph.

HYDAC Kinematic Viscosity

Measure of lubricant's resistance to flow at a specific temperature. Test is performed at 40 Celcius and reported in Centistokes. Abnormal viscosity is indicative of a problem such as addition of another fluid, lubricant oxidation and/or additive shear.

HYDAC Water Content *by Karl Fischer*

Quantifies the amount of water in lubricants using Karl Fischer titration. Expressed in parts per million (ppm) and percentage (%). Water seriously damages the lubricant properties of oil and promotes component corrosion.

HYDAC Total Acid Number *(T A N)*

Measures the acidity of a lubricant. It is expressed in mg of potassium hydroxide per gram of oil. It is a trend indicator of oil degradation.

HYDAC ICP Spectroscopy

Measures the concentration of additives, wear metals and other contaminants in a lubricant. Spectroscopy by atomic emission (ICP) can only detect dissolved and small size particles (under 7 micron) and it is expressed in parts per million. (ppm)

www.hydac-na.com

(Fluid Services = <http://www.hydac-na.com/sites/hydac-na/Pages/Fluid-Services-Canada.aspx>)

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