

Solutions . . . to keep it running®



*Improve reliability & uptime. Reduce maintenance costs.  
Preserve capital asset value.*

## **LabTec<sup>SM</sup> Fluid Analysis Program**

Independent ISO 17025 A2LA Accredited Testing Services  
Provided by POLARIS Laboratories, LLC

Today's highly competitive marketplace poses unprecedented challenges for commercial and industrial users of petroleum products. To help meet these challenges, Southwestern Petroleum Corporation is proud to offer the SWEPCO LabTec<sup>SM</sup> Fluid Analysis Program.

The SWEPCO LabTec<sup>SM</sup> Fluid Analysis Program is a diagnostic, preventive maintenance tool invaluable to the monitoring and evaluation of lubricant and equipment conditions in a wide variety of applications.

***What Can SWEPCO LabTec<sup>SM</sup> Fluid Analysis Do for You?***

- Extend oil drain intervals
- Extend equipment life
- Identify minor problems before they become major failures
- Maximize asset reliability

Imagine being able to see exactly what's happening inside an engine, a transmission or a gearbox. Imagine being able to see the damage even extremely minute wear particles and debris can do by simply floating around in the oil circulating within a system. Problems can be found before they become failures and less unscheduled downtime means increased production and profitability.

Regular sampling and TREND analysis - monitoring test data over an extended period of time - will provide the information you need to continually maximize asset reliability and, ultimately, decrease lubrication related costs. Whether you're a seasoned veteran or a first-time sampler, fluid analysis puts you on track for well-managed, cost-effective equipment maintenance.

**High Quality Testing**

All testing is performed by an ISO 17025 A2LA accredited laboratory. This is the highest level of quality attainable by a testing laboratory and it is backed by the most stringent accrediting body in the industry. You can be confident that the results you receive are accurate, repeatable and traceable to a recognized industry standard. Beyond that, your fluid analysis program is supported by a documented quality system. You can depend on SWEPCO to deliver superior testing and customer service.

## ***Step I: Establish Your SWEPCO LabTec<sup>SM</sup> Account***

Southwestern Petroleum, in partnership with POLARIS Laboratories, has developed a simple process for establishing and maintaining your customized fluid analysis program. For initial account set-up, simply complete a SWEPCO LabTec<sup>SM</sup> Account Set-Up Form (along with your first SWEPCO LabTec<sup>SM</sup> Sampling Equipment & Supplies Order Form as explained in Step 2) and fax both forms to SWEPCO at 1-800-736-5823. Forms are available from your SWEPCO Field Service Representative or by calling 1-800-359-5823. You will then be assigned a username and password for your account that will allow you online access to your reports and information.

### ***Customer Service Contact information***

SWEPCO LabTec<sup>SM</sup> Laboratories  
Phone 1-888-758-8812  
Fax 317-808-3751  
[custserv@polarislabs.com](mailto:custserv@polarislabs.com)



### ***Laboratory Shipping Addresses***

SWEPCO LabTec<sup>SM</sup> Laboratories  
7898 Zionsville Road  
P.O. Box 68983  
Indianapolis, IN 46268

SWEPCO LabTec<sup>SM</sup> Laboratories  
10910 W. Sam Houston Parkway North  
Suite 700  
Houston, TX 77064

SWEPCO LabTec<sup>SM</sup> Laboratories  
3060 W. California Avenue, Suite B  
P. O. Box 30820  
Salt Lake City, UT 84130-0820

SWEPCO LabTec<sup>SM</sup> Laboratories  
5140 75th Street  
Edmonton, Alberta T6E 6W2  
Canada

Additional information about the SWEPCO LabTec<sup>SM</sup> Fluid Analysis Program is available by calling 1-800-359-5823.



## ***Step 2: Choose Test Packages & Sampling Supplies***

Order the Test Packages and Sampling Supplies that meet your maintenance program's objectives using SWEPCO's LabTec<sup>SM</sup> Fluid Analysis Program Order Form. Test packages are available for oils, diesel fuels, engine coolants and metal-working fluids. When ordering sampling supplies, consider these points:

### ***Select the Right Equipment***

SWEPCO's LabTec<sup>SM</sup> Fluid Analysis Program is best used to monitor your most critical equipment, equipment with large fluid volumes or wherever extending fluid life can provide cost savings. Auxiliary equipment, very small units and idle machines may not be good candidates for fluid analysis.

### ***Determine Sampling Intervals***

Original equipment manufacturers' drain recommendations provide a good starting point for setting oil sampling intervals. However, you may want to consider more frequent sampling for equipment that is critical to production or equipment that is subjected to challenging environments, such as hot, dirty operating conditions, short trips with heavy loads or excessive idle times.

### ***Determine Proper Sampling Points***

In a re-circulating lube system, the sampling point is selected based on your fluid analysis objectives. If you are interested in fluid cleanliness and providing maximum equipment protection, locate your sampling point after the supply-line filters and before the fluid enters the lubricated component. If you are trying to identify abnormal operating conditions or component wear, the best sampling point is from the return line upstream of any filtration. Critical systems could have multiple sampling points.

## ***Sampling Supplies***



Test Package Kits come with all consumable supplies needed for the number of pre-paid tests ordered, including Sample Bottles, Shipping Containers and Labeling Sheets that include bar-coded component registration forms, prepaid bar-coded sample labels, tracking labels and shipping container labels.



***Needle  
Probe  
Valve***

***Push  
Button  
Valve***



***Vacuum  
Pump***

Needle Probe Valves accept disposable cap/tube/needle assemblies that save time and prevent sample contamination. Push Button Valves are fast, safe and do not require tubing to obtain samples. Both valves are available in several sizes for systems with 5 to 750 psi. Vacuum Pumps extract samples from non-pressurized systems. The pump is attached to a sample jar. Clean tubing is attached to the pump and inserted into a dipstick tube or a reservoir to draw the sample. See SWEPCO's LabTec<sup>SM</sup> Fluid Analysis Program Order Form for a complete listing of all sampling equipment and supplies.

**Test Package SO1** provides comprehensive testing for all engine, gear box, transmission, hydraulic, turbine, compressor and general industrial oils. **SO2** adds detailed partial analysis for determining cleanliness of the oil. **Test Packages SF1 and SF2** are for analysis of diesel fuel characteristics. **Test Package SC1** is for analysis of ethylene or propylene glycol engine coolants. And **SM1** is for testing of metalworking fluids.

<b>SWEPCO LabTec<sup>SM</sup></b> <b>Test Packages</b>	<b>SO1</b> Advanced Oil Analysis	<b>SO2</b> Advanced Oil Analysis With Particle Count	<b>SF1</b> Basic Diesel Fuel	<b>SF2</b> Advanced Diesel Fuel	<b>SC1</b> Basic Engine Coolant	<b>SM1</b> Basic Metalworking Fluid
11 Wear Metals by ICP	■	■	■	■		■
3 Contaminant Metals by ICP	■	■	■	■		■
5 Additive Metals by ICP	■	■	■	■		■
5 Multi-Source Metals by ICP	■	■	■	■		■
Water Content - % Volume by Crackle/FTIR (if free water detected - will run by Karl Fischer)	■	■				
Water Content % by Karl Fischer	■ ***	■ ***				■
Viscosity @ 40C			■	■		■
Viscosity @ 100C	■	■				
Fuel Dilution - % Volume by FTIR	■ **	■ **				
Soot - % Volume by FTIR/Wilks	■ **	■ **				
Oxidation by FTIR	■	■				
Nitration by FTIR	■	■				
Total Acid Number	■	■				
Glycol (if positive, reported in Comments section)	■ **	■ **				
Particle Quantifier/Particle Count (with ISO rating)*		■ *				
Calculated Cetane Index			■	■		
Distillation			■	■		
API Gravity			■	■		
Water & Sediment				■		
Bacteria, Fungi, Mold				■		
Lubricity F-LC				■		
Cold Filter Plug Point F-CF				■		
Sulfur Content				■		
pH					■	
Glycol % (Ethylene or Propylene Glycol)					■	
Freeze Point					■	
Boil Point					■	
Nitrite					■	
Total Dissolved Solids					■	
Specific Conductance					■	
Visuals (color, oil, fuel, magnetic precipitate, non-magnetic precipitate, odor & foam)					■	
Chlorine by XRF						■
Sulfur by XRF						■
Fat - % Volume by FTIR						■

\* Partial Quantifier is run for engines and unfiltered gear boxes; Laser Optical ISO Particle Count is run on all other components. \*\* Run only for diesel and gasoline engines. \*\*\* Run if free water detected in non-engine applications.



# It's simple ...

## Step 3: Registering Components

Components must be registered and given a Unit ID number before samples are processed. Component Registration Forms are included with every sample kit for this purpose. Fill one out only when sampling a component for the first time or to notify the laboratory of a change in component and/or oil information that has already been registered.

- Fill out the Component Registration Form completely and accurately
- Include it in the black mailer with the sample jar
- Use this form only for first-time samples or changes in unit or oil information previously submitted
- As an alternate, you can log on to your account to enter component information and establish unit ID numbers or submit a spreadsheet or other listing with the required information

**Component  
Registration  
Form**

## Step 4: Drawing Samples

All samples should be taken from the same pre-determined locations and at the same interval each time.

- Take samples while equipment is operating or immediately after shutdown while the system is still at operating temperature so wear metals and contaminants don't have an opportunity to settle
- Always use a new sample bottle
- When sampling oil that is still in service by drawing the sample from valves, be sure to clean the valve before drawing the sample and dispose of the first ounce of oil drawn
- When using a vacuum pump, always flush the pump and replace tubing between samples



**Vacuum Pump  
& Tubing**

# everything is supplied

## Step 5: Preparing Sample Labels

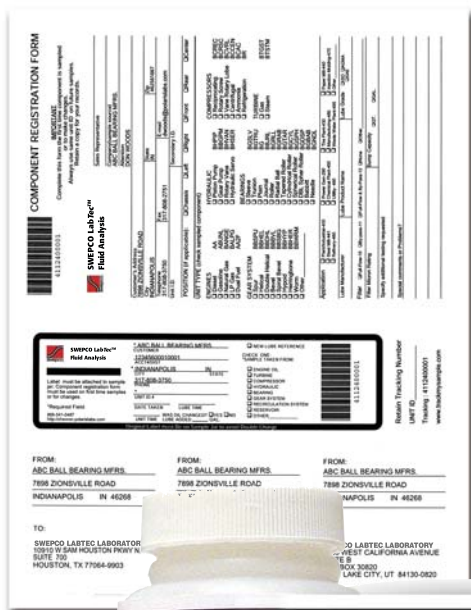
Sample jar labels are included with every sample kit. Complete a sample jar label for every sample submitted to the laboratory. Be sure the information is complete and accurate to insure proper testing and accurate analysis.

- Fill out the sample jar label completely and accurately
- Include all unit and fluid information requested including unit ID, type of component and position, time on both the fluid and the unit and whether or not fluid has been added or changed
- Fill in the unit's ID on the removable tracking number sticker located to the right of the sample label and retain for your records

## Step 6: Mailing Samples

As soon as samples are drawn and labeled, they should be mailed to the lab nearest you. Return labels for all labs are included in every sample kit.

- Complete and attach the return address label for the closest lab to the black shipping container
- Put the labeled sample jar in shipping container
- Include Component Registration Form (if the sample is from a component that has not been registered yet or a component that has had changes in unit or oil information)
- Ship by trackable mail service such as FedEx or UPS
- As soon as it is received by the lab, it is logged in and you are able to track testing progress at [www.trackmysample.com](http://www.trackmysample.com)



The image shows two sample jar labels. The top label is a 'COMPONENT REGISTRATION FORM' with fields for 'UNIT ID', 'COMPONENT', 'POSITION', 'DATE TAKEN', 'LUBE TIME', 'OIL CHANGED?', 'YES/NO', 'GAL', and 'LABORATORY'. The bottom label is a 'LabTec Fluid Analysis' label with fields for 'CUSTOMER', 'ACCT#/DIST', 'CITY', 'STATE', 'PHONE', 'UNIT ID #', 'DATE TAKEN', 'LUBE TIME', 'OIL CHANGED?', 'YES/NO', 'GAL', and 'LABORATORY'. Both labels include a barcode and a tracking number.

Sample Jar Labels




The image shows a screenshot of the 'WELCOME TO TRACKMYSAMPLE.COM' website. It features a search bar for 'TRACKING NUMBER' and a 'Find Result' button. Below the search bar, there are links for 'MANAGE YOUR REPORTS ONLINE - FREE USING HORIZON!', 'NEW ACCOUNTS', and 'FORGOT PASSWORD'. A sidebar on the right contains the text 'Retain Tracking Number', 'UNIT ID', 'Tracking : 4112400001', and 'www.trackmysample.com'.

Online Sample Tracking at [www.trackmysample.com](http://www.trackmysample.com)



Shipping Containers

# How To Read SWEPCO's

<b>UNIT ID:</b> R205 A-1100 <b>SECOND ID:</b> #2 OILWELL P199A200/16-6266 <b>UNIT TYPE:</b> PUMP <b>APPLICATION:</b> ON-SHORE DRILLING				<b>COMPANY INFORMATION</b>											
<b>ACCOUNT NUMBER:</b> DATE SAMPLED: 07/30/07 DATE RECEIVED: 08/07/07 DATE COMPLETED: 08/08/07		<b>OVERALL SEVERITY OF REPORT</b> based on comments, not individual flags													
<b>TRACKING #:</b> <b>MANUFACTURER/MODEL:</b> OILWELL A-1100 <b>LUBE HFR:</b> SWEPCO <b>LUBE TYPE - GRADE:</b> 212 SAE 80W140 <b>MICRON RATING:</b> 000 <b>FILTER TYPE:</b> <b>SUMP CAPACITY:</b> 00000 <b>HYD SYSTEM PRESSURE:</b> 00000 <b>FLUID ADDIT:</b>		<table border="1"> <tr> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>NORMAL</td> <td>AS NORMAL</td> <td>CRITICAL</td> <td></td> <td></td> </tr> </table>				0	1	2	3	4	NORMAL	AS NORMAL	CRITICAL		
0	1	2	3	4											
NORMAL	AS NORMAL	CRITICAL													
<b>LAB #</b> 536200 <b>LOCATION</b> H <b>ANALYST</b> KH															

FLUID ANALYSIS REPORT - 888-758-8817																			
<b>COMMENTS:</b> Check for possible source of ABRASIVES entry (such as faulty filter elements, filter housing, breathers, fill points etc.). Abrasives (Silicon) are at a SEVERE LEVEL. Lubricant change is suggested if not done at sampling time. Water is at a MODERATE LEVEL. Gear and/or bearing metal is at a MODERATE LEVEL. Aluminum is most likely in the form of alumina/silica (Dirt). Potassium is at a MINOR LEVEL. BARIUM IS COMMONLY FOUND IN DRILLING MUD. Unit and/or lube TIME missing: N/A																			
WEAR METALS - PPM					CONTAMINANT METALS - PPM					MULTI-SOURCE METALS - PPM					ADDITIVE METALS - PPM				
SAMP	CHROMIUM	ALUMINUM	COPPER	IRON	SILICON	ANTHRACENE	BARBITURIC ACID	BENZENE	BIPHENYL	BOLENE	CALCIUM	CARBON	CELESTINE	CHLORINE	COBALT	COPPER	DIETHYLZINC		
3	262	4	1	91	32	1	0	0	3	0	280	41	24	1	0	2	0	6	
2	172	1	0	35	23	1	0	0	10	0	137	21	8	0	0	1	0	6	
1	598	6	4	143	60	4	1	0	23	0	431	38	39	1	0	5	0	3	

SAMP	DATE SAMPLED	UNIT	LF	BL	SE	RE	CRG	Vol.	Hot	40C	Vis
#	TIME	TYPE	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME
3	07/30/07	U	U	U	U	U	U	U	U	U	U
2	08/07/07	U	U	U	U	U	U	U	U	U	U
1	08/27/06	U	U	U	U	U	U	U	U	U	U

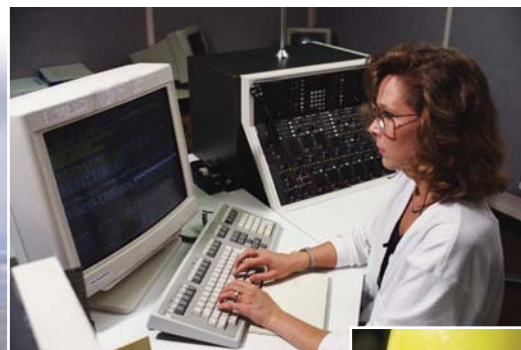
SAMP		DATE		UNIT		LF		BL		SE		RE		CRG		Vol.		Hot		40C		Vis	
#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME	#	TIME
3	07/30/07	08/07/07	08/27/06	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

**Reports are available online, complete with graphical trend analysis**

## Step 7: Retrieving Test Reports

Your sample reports will be available online almost immediately after processing is complete or they can be emailed or faxed. Additional management reports allow you to affect positive changes in your daily maintenance practices by graphically monitoring trends, keeping sampling schedules on track, identifying bottlenecks in turnaround time and summarizing unit problems that could influence future purchasing decisions. And you have control over an extensive range of personal application settings and preferences that give you the power to put the information you need most in front of you first.

- Track sample processing at [www.trackmysample.com](http://www.trackmysample.com)
- Get test results online almost Immediately after testing at [www.eoilreports.com](http://www.eoilreports.com)
- Keep sampling schedules on track
- Identify bottlenecks in sample turnaround time
- Identify problem units that may need replacement
- Affect positive change in your daily maintenance practices



# LabTec<sup>SM</sup> Fluid Analysis Reports

**Unit Type** should give as much detail as possible. **What kind** of compressor, gearbox, engine, etc., influences flagging parameters and depth of analysis. Different metallurgies require different lubrication and have great impact on how results are interpreted.

**Manufacturer** and **Model** can also identify metallurgies involved as well as the OEM's standard maintenance guidelines and possible wear patterns to expect.

**Lube Manufacturer, Type** and **Grade** identify a lube's properties and its viscosity and is critical in determining if the right lube is being used.

**Fluid Added** is how much oil has been added since the last sample was taken.

**Application** identifies in what type of environment the equipment operates and is useful in determining exposure to possible contaminants.

**Second ID** is each customer's opportunity to uniquely identify units being tested and their location.


Make note of the difference between the **Date Sampled** and the **Date Received** by the lab. Turnaround issues may point to storing samples too long before shipping or shipping service problems. Also noted is testing **Date Completed**.

**Severity** is represented on a sliding scale and is color-coded so that critical units are more apparent at first glance. Overall severity is based on report Comments—not individually flagged results.

## Severity Status Levels:

**0- Normal.**

- 1- At least one or more items have violated initial flagging points yet are still considered minor.
- 2- A trend is developing.
- 3- Simple maintenance and/or diagnostics are recommended.
- 4- Failure is eminent if maintenance is not performed.

<b>UNIT ID:</b> R205 A-1100 <b>SECOND ID</b> #2 OILWELL P199A200/16-6266 <b>UNIT TYPE</b> PUMP <b>APPLICATION</b> ON-SHORE DRILLING				<b>COMPANY INFORMATION</b>											
<b>ACCOUNT NUMBER</b> <b>DATE SAMPLED</b> 07/30/07 <b>DATE RECEIVED</b> 08/07/07 <b>DATE COMPLETED</b> 08/08/07		<b>OVERALL SEVERITY OF REPORT</b> based on comments, not individual flags													
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0	1	2	3	4											
NORMAL	AB NORMAL	CRITICAL													
		<b>LAB #</b> 536200	<b>LOCATION</b> H	<b>ANALYST</b> KM											

**Filter Type** and **Micron Rating** are important in analyzing particle count—the higher the micron rating, the higher the particle count results.

**Sump Capacity** identifies the total volume of oil (in gallons) in which wear metals are suspended and is critical to trending wear metal concentrations.

The laboratory at which testing was completed is denoted by an **I** for **Indianapolis**, an **S** for **Salt Lake City** or an **H** for **Houston**. The **Lab #** is assigned to the sample upon entry for processing and should be the reference number used when contacting the lab with questions or concerns.

**Data Analyst Initials**

*NOTE: Accurate and complete lube and equipment information allows for in-depth analysis and recommendations and can eliminate difficulties that can occur when interpreting results. The laboratory will request additional unit and lube information if the sample label is incomplete. FAILURE TO SUPPLY ALL INFORMATION WILL RESULT IN DELAYED AND/OR INCOMPLETE REPORTING.*

# How To Read SWEPCO's

## Recommendations

A data analyst's job is to explain and, if necessary, recommend actions for rectifying significant changes in the lubricant or the unit's condition. Reviewing comments before looking at the actual test results will provide a road map to the report's most important information. Any actions that need to be taken are listed first in order of severity. Justifications for recommending those actions immediately follow.

FLUID ANALYSIS REPORT - 888-758-8812	
COMMENTS	Check for possible source of ABRASIVES entry (such as faulty filter elements, filter housing, breathers, fill points etc.). Abrasives (Silicon) are at a SEVERE LEVEL; Lubricant change is suggested if not done at sampling time; Water is at a MODERATE LEVEL; Gear and/or bearing metal is at a MODERATE LEVEL; Aluminum is most likely in the form of alumina/silica (Dirt); Potassium is at a MINOR LEVEL; BARIUM IS COMMONLY FOUND IN DRILLING MUD; Unit and/or lube TIME missing; N/A

**91**  
Highlighted numbers denote test results the analyst has flagged because they exceed preset warning parameters and warrant closer examination or require action. Individual results are flagged by severity color to better explain the overall severity assigned to the sample.

	WEAR METALS PPM											CONTAMINANT METALS - PPM			MULTI-SOURCE METALS - PPM					ADDITIVE METALS PPM				
SAMPLE #	IRON	CHROMIUM	NICKEL	ALUMINUM	COPPER	LEAD	TIN	CADMIUM	SILVER	TITANIUM	VANADIUM	SILICON	SODIUM	POTASSIUM	MOLYBDENUM	ANTIMONY	MANGANESE	LITHIUM	BORON	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC
3	262	4	1	91	32	1	0	0	0	3	0	280	41	24	1	0	2	0	6	54	295	139	656	81
2	172	1	0	35	23	1	0	0	0	10	0	137	21	8	0	0	1	0	6	46	208	91	716	102
1	598	6	4	143	60	4	1	0	0	23	0	431	38	39	1	0	5	0	3	47	188	118	649	40

## Elemental Analysis

Elemental Analysis, or Spectroscopy, identifies the type and amount of wear particles, contamination and oil additives. Determining metal content can alert you to the type and severity of wear occurring in the unit. Measurements are expressed in parts per million (ppm).

Combinations of these **Wear Metals** can identify components within the machine that are wearing. Knowing what metal a unit is made of can greatly influence an analyst's recommendations and determine the value of elemental analysis.

Knowledge of the environmental conditions under which a unit operates can explain varying levels of **Contaminant Metals**. Excessive levels of dust and dirt can be abrasive and accelerate wear.

**Additive and Multi-Source Metals** may turn up in test results for a variety of reasons. Molybdenum, antimony and boron are additives in some oils. Magnesium, calcium and barium are often used in detergent/dispersant additives. Phosphorous is used as an extreme pressure additive in gear oils. Phosphorous, along with zinc, are used in anti-wear additives (ZDP).

	WEAR METALS PPM					CONTAMINANT METALS - PPM					MULTI-SOURCE METALS - PPM					ADDITIVE METALS PPM				
SAMPLE #	IRON	CHROMIUM	NICKEL	ALUMINUM	COPPER	SILICON	SODIUM	POTASSIUM	MOLYBDENUM	ANTIMONY	MANGANESE	LITHIUM	BORON	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC		
3	262	4	1	91	32	280	41	24	1	0	2	0	6	54	295	139	656	81		
2	172	1	0	35	23	137	21	8	0	0	1	0	6	46	208	91	716	102		
1	598	6	4	143	60	431	38	39	1	0	5	0	3	47	188	118	649	40		

**Iron (Fe)**  
Definition: Iron is a wear metal detected with Elemental Analysis by ICP (inductively-coupled plasma), which detects up to 24 metals, measuring less than 5µ in size, that can be present in used oil due to wear, contamination or additives. Wear Metals include iron, chromium, nickel, aluminum, copper, lead, tin, cadmium, silver, titanium and vanadium. Contaminant Metals include silicon, sodium, and potassium. Multi-Source Metals include molybdenum, antimony, manganese, and lithium. Additive Metals include boron, magnesium, calcium, barium, phosphorous and zinc. Elemental Analysis is instrumental in determining the type and severity of wear occurring within a unit.

Standard Test Method Used  
ASTM D6708

Reporting Measurement  
ppm

Amount of Sample Needed  
2 mL

Test Limitation

Possible Sources  
Reciprocating Compressors  
Shafts, Pistons, Crosshead, Packing Glands, Gears, Housing, Casting, Valves  
Rotary Compressors  
Gears, Shafts, Bearings, Casting  
Turbines / Centrifugal Compressors  
Shafts, Gears, Bearings, Valves  
Hydraulics  
Rods, Cylinder, Gears, Shafts, Pistons  
Reciprocating Engines  
Cylinder Liners, Rings, Gears, Crankshaft, Camshaft, Rods, Valve Train, Oil Pump Gear,

When reviewing your reports online, you can click on the metal heading to display a **pop-up box** with the definition, the ASTM test method used, how the results are reported, the amount of sample needed to perform the test, possible sources for the element and an illustration of the test equipment used.

When reviewing your reports online, you can click on the metal heading to display a **pop-up box** with the definition, the ASTM test method used, how the results are reported, the amount of sample needed to perform the test, possible sources for the element and an illustration of the test equipment.

# LabTec<sup>SM</sup> Fluid Analysis Reports

## Test Data

Test results are listed according to age of the sample-oldest to most recent, top to bottom-so that trends are apparent. Significant changes are flagged and printed in the gray areas of the report.

Samples are listed by **Date Received** and are sequenced with the newest samples at the top of the list.

**Viscosity** measures a lubricant's resistance to flow at temperature and is considered its most important physical property. Depending on lube grade, it is tested at 40 and/or 100 degrees Centigrade and reported in Centistokes.

**Oxidation** measures the breakdown of a lubricant due to age and operation at high temperatures. Oxidation prevents additives from working and therefore promotes increased acid content, as well as increased viscosity. **Nitration** is an indication of excessive "blow-by" from cylinder walls and/or compression rings and indicates the presence of nitric acid, which speeds up oxidation. Too much disparity between oxidation and nitration can indicate air to fuel ratio problems. As oxidation/nitration increases, TAN will also increase and TBN will begin to decrease.

The **ISO Code** is an index number that represents a range of particles within a specific micron range, i.e., 4, 6, 14. Each class designates a range of measured particles per one ml of sample. The particle count is a cumulative range between 4 and 6 microns. This test is valuable in determining large particle wear in filtered systems.

S A M P L E  #	DATE SAMPLED  DATE RECEIVED	UNIT TIME  LUBE TIME	L F U I B L E T E R  CHG	F U E L  Vol.	S O O T  Vol.	W A T E R  Hot Plate	V I S  40C CS	V I S  100C CS	T A N  Total Acid	T B N  Total Base	I-R O X I D  A	I-R N I T R A	ISO  C O D E	4	6	10	14	21	38	70	100
														M	M	M	M	M	M	M	M
3	07/30/07 08/07/07		U U			0.20		24.00	0.95												
2	06/20/07 06/27/07		U U			0.20		27.30	1.12												
1	03/20/06 03/27/06		U U			0.00		25.00	1.11												

**Fuel** and **Soot** are reported in % of volume. High fuel dilution decreases unit load capacity. Excessive soot is a sign of reduced combustion efficiency.

**Water** in oil decreases lubricity, prevents additives from working and furthers oxidation. Its presence can be determined by crackle or FTIR and is reported in % of volume. Water by Karl Fischer determines the amount of water present. These results appear in the Special Testing section of your report.

**Total Acid Number** is the amount of acid present in the lubricant. Numbers higher than that of new lube indicate oxidation or some type of contamination. **Total Base Number** measures the lube's alkalinity, or ability to neutralize acid. When TAN and TBN approach the same number, the lube should be changed or "sweetened" meaning more lube could be added.

**Acid Number**

**DEFINITION**  
Acid Number is the amount of acid present. Numbers higher than that of new lubricant is an indication of oxidation or contamination of some kind.

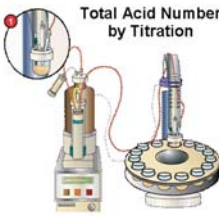
**STANDARD TEST METHOD USED**  
ASTM D664

**REPORTING MEASUREMENT**  
mg KOH/g

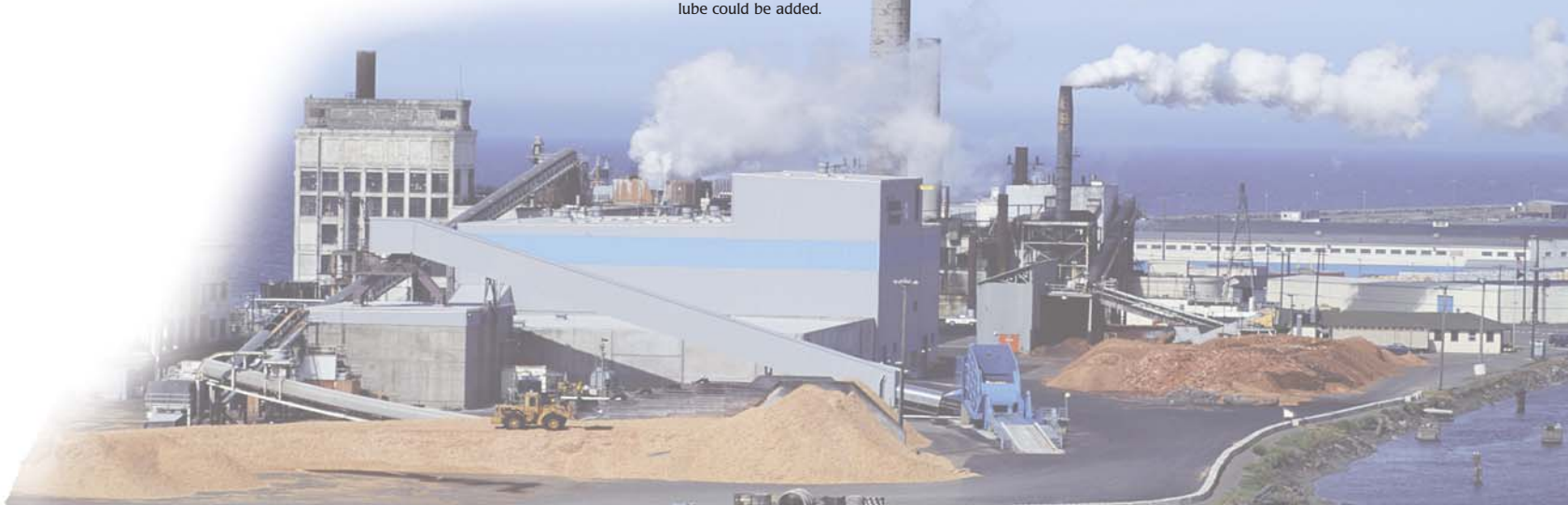
**AMOUNT OF SAMPLE NEEDED**  
4g

**TEST LIMITATION**

**Total Acid Number by Titration**



When reviewing your reports online, you can click on the test heading to display a **pop-up box** with the definition, the ASTM test method used, how the results are reported, the amount of sample needed to perform the test and an illustration of the test equipment.



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technologically  
advanced lubricants.

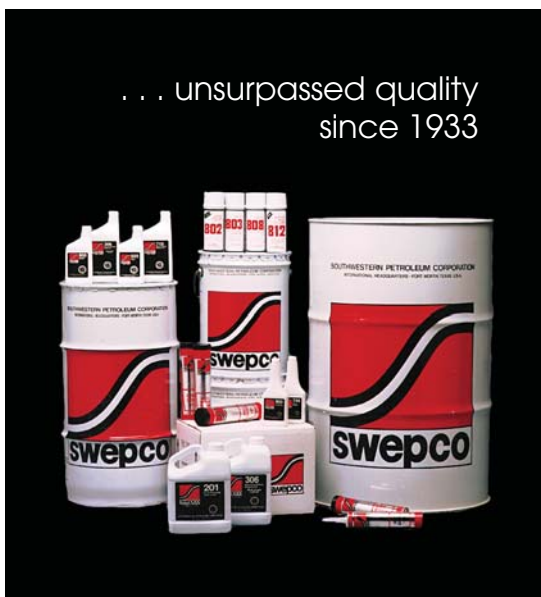
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The source of SWEPCO Quality is ingredients ... from the very finest raw materials like high performance base stocks that don't thicken excessively at low temperatures or thin out at high temperatures ... to proprietary synergistic additive chemis-

try like **LUBIUM®** and **DIMONYL®** ... to the purest grade of "technical fine" Molybdenum Disulfide ... to exclusive services like SWEPCO's **LabTec<sup>SM</sup> Fluid Analysis Program**, **Cost Improvement Analysis** and **Energy Star® Partner Program** that help you project and document the profit enhancing impact of SWEPCO Lubricants on your operation. Our goal is producing the world's most

technologically advanced lubricants ... lubricants that yield **ultimate protection** for our Customers. SWEPCO Products are specifically designed to lower your *total* cost of lubrication by extending lubrication cycles, reducing lubricant consumption, cutting energy costs, reducing both scheduled and unscheduled maintenance down-

time, reducing lubrication labor, prolonging equipment life, reducing waste oil disposal costs and reducing parts replacement costs. Let your SWEPCO Field Service Representative show you how SWEPCO Lubricants can help you *keep it running*.



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