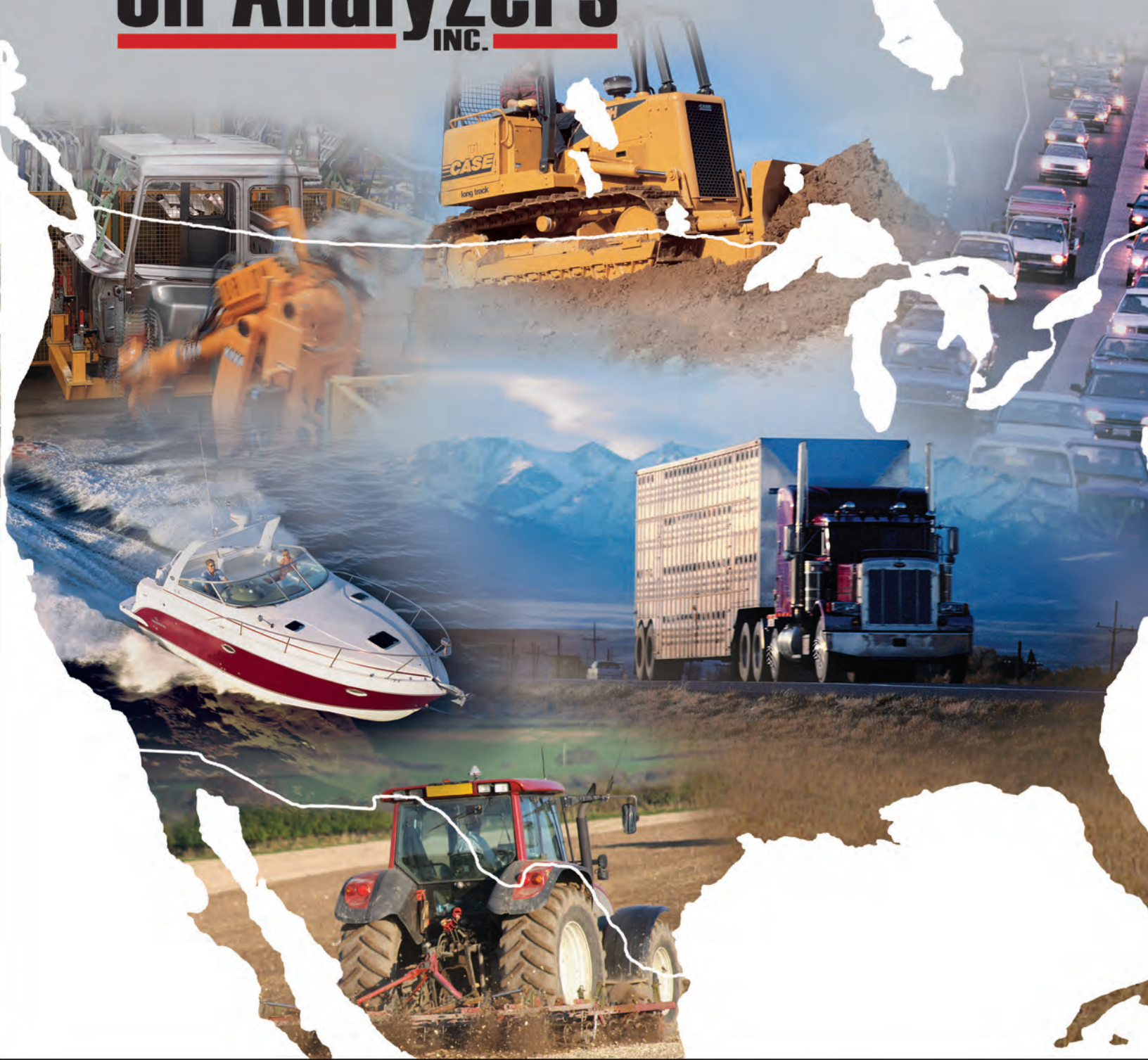


# Oil Analyzers INC.



Fluid Analysis Program



## What Can the OIL ANALYZERS Fluid Analysis Program Do For You?

Imagine being able to see exactly what's happening inside an engine, gearbox or hydraulic system. **OIL ANALYZERS Fluid Analysis** is a preventive maintenance tool that provides a picture of both the fluid condition and the internal condition of a component or system without disassembly. OIL ANALYZERS Fluid Analysis will:

### Extend oil drain intervals

Monitoring the condition of the oil optimizes drain intervals so that you get the most out of the fluid you're paying for. Fewer oil changes minimize maintenance costs and maximize uptime.

### Extend equipment life

Monitoring system cleanliness and filtration efficiency allows you to keep your equipment longer and significantly reduce replacement costs.

### Identify minor problems before they become major failures

State-of-the-art fluid analysis identifies dirt, wear particles, fuel dilution, and coolant — contaminants that can cause catastrophic failure or significantly shorten equipment life.

### Maximize asset reliability

Testing and analysis ensures that units are up, running and making money.

### Increase resale value

Analysis results provide valuable sampling history documentation that easily justifies higher equipment resale values.

# Why OIL ANALYZERS?



## HIGH-QUALITY TESTING

The **OIL ANALYZERS Fluid Analysis Program** utilizes independent ISO 17025 A2LA accredited testing laboratories. This is the highest level of quality attainable by a testing laboratory 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 standard and that your fluid analysis program is supported by a documented quality system you can depend on to deliver superior testing and customer services.

## INNOVATIVE INFORMATION TECHNOLOGY SOLUTIONS

The **OIL ANALYZERS Fluid Analysis Program's** online reporting software shows you how to get the most from your information. Using **HORIZON** online you receive results fast — almost immediately after sample processing is complete. The software's management reports can then take your fluid analysis program to the next level by helping you manage your data and your program efficiently and effectively.

## Taking Samples

**OIL ANALYZERS Fluid Analysis** will show you how 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 increase company profits. Comparing a component’s most recent samples to its historical data is instrumental in identifying trends that can pinpoint potential problems.

Although an equipment manufacturer’s recommendations provide a good starting point for developing preventative maintenance practices, sampling intervals can easily vary. How critical a piece of equipment is to production is a major consideration for determining sampling frequency, as are environmental factors such as hot, dirty operating conditions, short trips with heavy loads and excessive idle times.

Fluid analysis is most effective when samples are representative of typical operating conditions. Dirt, system debris, water and light fuels tend to separate from the lubricants and coolants when system temperatures cool. For optimum results, consider the following best practices:

- Take samples while systems are operating under normal conditions or immediately after shutdown while they are still at operating temperature.
- Take samples at regularly scheduled intervals.
- Take samples from the same sampling point each time.

Whether you’re a seasoned veteran or a first-time sampler, a well-designed, quality fluid analysis program puts you on track for well-managed, cost-effective equipment maintenance programming.



## Suggested Sampling Intervals & Methods

COMPONENT	INTERVAL	SUGGESTED METHOD & LOCATION
<b>MOTOR VEHICLES</b>		
Gas Engines	125 Hours/7,500 miles	By vacuum pump through dipstick retaining tube or sampling valve installed in filter return
Diesel Engines	250 Hours/15,000 miles	
Gears, Differentials & Final Drives	250 hours	By vacuum pump through oil level plug or dipstick retaining tube
Planetaries	250 hours	By vacuum pump through oil fill port of system reservoir at mid-level
Cooling System	1,000 hours	By vacuum pump through radiator cap or fill port of system reservoir at mid-level
<b>INDUSTRIAL EQUIPMENT</b>		
Hydraulics	250-500 hours	By vacuum pump through oil fill port of system reservoir at mid-level
Gas Turbines	Monthly or every 500 hours	Through sample valve installed upstream of the filter on the return line or out of the system reservoir
Steam Turbines	Bi-monthly or monthly/quarterly	Through sample valve installed upstream of the filter on the return line or out of the system reservoir
Gas/Air Compressors	Monthly or at 500 hours/quarterly	Through sample valve installed upstream of the filter on the return line or out of the system reservoir



## Sampling with a Vacuum Pump

A vacuum pump is used to take samples from a dipstick or non-pressurized system. The pump is attached to the sample jar, a tube is inserted into the pump and then into the dipstick retaining tube or oil fill port. Activating the pump handle, the sample jar should be filled about 3/4 full or to its shoulder.

When sampling engines:

- Measure length or depth of fill port tube, reservoir or dipstick.
- Add six (6) inches and mark the measurement on the tubing.
- Cut the tubing 12 inches beyond this mark.
- Insert tubing onto top of vacuum pump and tighten lock ring.
- Remove sample jar lid and attach jar to bottom of vacuum pump and tighten securely.
- Insert tubing into fill port, reservoir or dipstick retaining tube only to the mark on the tubing. To avoid drawing settled debris into the sample, do not allow contact between tubing and bottom of reservoir.
- Push and pull vacuum pump plunger until sample jar is 3/4 full.
- When sample reaches shoulder of jar, unscrew jar from pump, replace jar lid and tighten securely.
- Unscrew pump locking ring, remove tubing and drain excess oil back into reservoir.
- Discard tubing after each sample to avoid cross contamination.
- Complete sample jar label and affix to sample jar.



## OIL ANALYZERS Fluid Analysis Test Packages

OIL ANALYZERS Fluid Analysis provides diagnostic testing designed to evaluate lubricant condition, component wear and contamination in mobile and industrial applications with a test report provided by an independent laboratory for each sample submitted. Refer to the chart below to determine which combination of tests each component will receive.

Oil Kit		
Test Packages		
Applications	Engines	Non-Engines
<b>Purpose</b>	Monitors wear & contamination	
24 Metals by ICP	•	•
% Fuel Dilution	•	
% Soot	•	
Water % by Crackle	•	•
Viscosity @ 40°C	•	• (if ISO grade fluid)
Viscosity @ 100°C	•	• (if SAE grade fluid)
Oxidation/Nitration By FTIR	•	•
Total Base Number	•	
Total Acid Number		•

To order OIL ANALYZERS Fluid Analysis kits, visit [www.oaitesting.com](http://www.oaitesting.com) or call OIL ANALYZERS at **800-777-7094**. For product information, if you have questions regarding the OIL ANALYZERS fluid analysis program, or for help in understanding your test reports, call **877-458-3315**.





**Coolant Kit**

- 17 Metals by ICP
- pH
- Glycol %  
(Ethylene or Propylene Glycol)
- Freeze Point
- Boil Point
- Nitrite
- SCA Number
- Total Dissolved Solids
- Specific Conductance
- Total Hardness
- Visuals (color, oil, fuel, magnetic precipitate, non-magnetic precipitate, odor & foam)

**Basic Fuel Kit**

- 24 Metals by ICP
- Viscosity @ 40°C
- Calculated Cetane Index
- Distillation
- API Gravity

**Basic Winter Fuel Kit**

- Cloud Point
- Pour Point

**Premium Winter Fuel Kit**

- Cloud Point
- Pour Point
- Cold Filter Plug Point

**Basic Fuel Kit Fuel Contamination**

- Water & Sediment
- Aerobic Bacteria

\* Cold Filter Plug Point can be added to any fuel test package.

**Sampling Equipment and Supplies**

- Vacuum Pump
- Plastic Tubing (100 ft. roll)
- Plastic Tubing (56")




**To order OIL ANALYZERS Fluid Analysis kits, visit [www.oaitesting.com](http://www.oaitesting.com) or call 800-777-7094.**

## Component Registration Forms

A **Component Registration Form** is included with every sample kit. Fill it out only when sampling a component for the first time or to notify the laboratory of a change in component and/or fluid information already registered with the laboratory. **Complete, up-to-date information ensures that you receive the proper testing and an accurate analysis of the results.**

### STEP 1


- Fill out the **Component Registration Form** completely and accurately.
- Use this form **only** for first-time samples or changes in unit **or** oil information previously submitted.
- Include it in the black mailer with the sample jar.



### COMPONENT REGISTRATION FORM

00000P00000

**IMPORTANT**  
Complete this form the first time component is sampled or to make changes.  
Always use same unit ID on future samples.  
Retain a copy for your records.



**Petrolance Sales Rep**

Company Name \_\_\_\_\_

Contact Name \_\_\_\_\_

Company Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_ E-mail \_\_\_\_\_

Unit I.D. \_\_\_\_\_ Secondary I.D. (if needed) \_\_\_\_\_

**POSITION (check if applicable):**   Left   Right   Front   Rear   Center

**UNIT TYPE (check sampled component)**

<b>Engines:</b> <input type="checkbox"/> Diesel <input type="checkbox"/> Gasoline <input type="checkbox"/> Natural Gas <input type="checkbox"/> Dual Fuel <input type="checkbox"/> LP Gas  <b>Transmissions:</b> <input type="checkbox"/> Manual <input type="checkbox"/> Auto/Powershift <input type="checkbox"/> Torque Converter <input type="checkbox"/> Hydrostatic <input type="checkbox"/> Other	<b>Gears:</b> <input type="checkbox"/> Differential <input type="checkbox"/> Final Drive <input type="checkbox"/> Planetary <input type="checkbox"/> Steering <input type="checkbox"/> Wheel Hub <input type="checkbox"/> Indust. Parallel Shaft <input type="checkbox"/> Indust. Rt Angle/Bevel <input type="checkbox"/> Industrial Worm Drive  <b>Turbines:</b> <input type="checkbox"/> Steam turbine <input type="checkbox"/> Gas turbine	<input type="checkbox"/> BBDIF <input type="checkbox"/> BBFDR <input type="checkbox"/> BBPLT <input type="checkbox"/> BBSTG <input type="checkbox"/> BGWHL <input type="checkbox"/> BB <input type="checkbox"/> BBBVL <input type="checkbox"/> BGWRM  <input type="checkbox"/> BTSTM <input type="checkbox"/> BTGSTM	<b>Hydraulics:</b> <input type="checkbox"/> Piston pump <input type="checkbox"/> Gear pump <input type="checkbox"/> Vane pump <input type="checkbox"/> Other  <b>Compressors:</b> <input type="checkbox"/> Reciprocating <input type="checkbox"/> Rotary Screw <input type="checkbox"/> Centrifugal <input type="checkbox"/> Other  <b>Bearings:</b> <input type="checkbox"/> Plain <input type="checkbox"/> Anti-Friction	<input type="checkbox"/> BHPJP <input type="checkbox"/> BHGP <input type="checkbox"/> BHHVP  <input type="checkbox"/> BCREC <input type="checkbox"/> BCRCSC <input type="checkbox"/> BCCEN  <input type="checkbox"/> BGPLN <input type="checkbox"/> BGAFB
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Unit Manufacturer \_\_\_\_\_ Unit Model \_\_\_\_\_

Industry/Service:    O-T-R Trucking-110    Mining-600    Food & beverage-410  
 Pickup/Delivery-120    Quarry-288    Power generation-290  
 City/Highway Transit-130    Off-Highway-200    Plastics-475  
 Waste Handling/Landfill-230    Construction-220    General manufacturing-400  
 Agricultural-280    Marine-500    Primary Metals-443  
 Cement-451    Natural gas transmission-320    Paper-440  
 Other \_\_\_\_\_

Lubricant Manufacturer \_\_\_\_\_ Lubricant Name \_\_\_\_\_ Viscosity Grade \_\_\_\_\_ QISO   QAGMA  
SAE

Filter   Full-Flow-10   By-pass-11   Full-Flow & By-Pass-12   None   Other \_\_\_\_\_

Filter Micron Rating \_\_\_\_\_ Sump Capacity   QT   GAL \_\_\_\_\_

Specify additional testing requested \_\_\_\_\_

Special comments or Problems? \_\_\_\_\_

## Sample Labels

Complete a **sample jar label** for **every** sample submitted to the laboratory. **Be sure to fill out all label information completely and accurately to ensure proper testing and accurate, in-depth analysis.** Once complete, attach the label to the sample bottle. 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 2

- 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.
- Track sample processing at [www.trackmysample.com](http://www.trackmysample.com).

**NOTE: When you provide accurate and complete unit and oil information, your laboratory can deliver accurate and complete results and recommendations.**



PREPAID TESTING   PREPAID TESTING   PREPAID TESTING   PREPAID TESTING

**Oil Analyzers INC.**  
**ADVANCED INDUSTRIAL**  
Label must be attached to sample jar. Component registration form must be used on first time samples or for changes.

CUSTOMER \_\_\_\_\_    TAKEN FROM (CHECK ONE)  
 ENGINE OIL  
 TRANSMISSION  
 FINAL DRIVE  
 DIFFERENTIAL  
 PLANETARY  
 HYDRAULIC  
 NEW LUBE REFERENCE  
 OTHER

ACCT#/DIST \_\_\_\_\_   CITY \_\_\_\_\_   STATE \_\_\_\_\_

PHONE \_\_\_\_\_   UNIT ID # \_\_\_\_\_

DATE TAKEN \_\_\_\_\_   LUBE TIME \_\_\_\_\_   UNIT TIME \_\_\_\_\_   \*POSITION (IF APPLICABLE)  
 FRONT    REAR  
 RIGHT    LEFT  
 CENTER

MLS OIL CHANGED?  YES  NO    QNT    GAL

Original Label must be on Sample Jar to avoid Double Charge



## Shipping Information

Salt Lake City

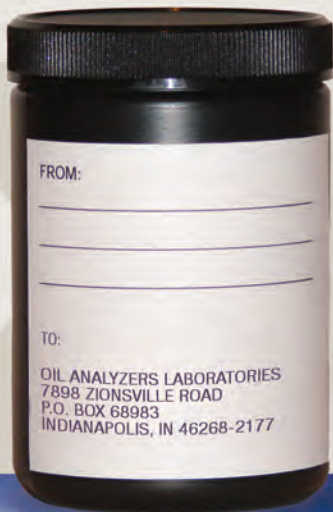
Indianapolis

Houston

Complete the mailer return address label for the laboratory nearest you and attach it to the shipping container, affix the appropriate postage and mail. Use a trackable shipping service for sending samples to the laboratory.

### STEP 3

- Complete and attach the return mailer address label to the black shipping container.
- Ship by trackable mail service such as FedEx or UPS.



## Test Reports and Data Management

Your **FREE**, online reporting option — **HORIZON** — is fast, bringing you test results almost immediately after processing is complete.

**HORIZON** Management Reports allow you to affect positive changes in your daily maintenance practices by:

- Keeping sampling schedules on track
- Identifying bottlenecks in turnaround time that are costing you money
- Summarizing unit problems that could influence future purchasing decisions

Control over an extensive host of personal application settings and preferences also gives you the power to put the information you need most in front of you first.

### STEP 4

Go to [www.horizonsignup.com](http://www.horizonsignup.com)

NOTE: When you provide accurate and complete unit and fluid information, your laboratory can deliver accurate and complete results and recommendations.

Oil Analyzers INC.																											
UNIT ID: R205 A-1100 SECOND ID: 08/07/07 #2 OILWELL P199A200/18-6266 UNIT TYPE: FLUID APPLICATION: ON-SHORE DRILLING						ACCOUNT NUMBER: [blank] DATE SAMPLED: 07/30/07 DATE RECEIVED: 08/07/07 DATE COMPLETED: 08/08/07						OVERALL SEVERITY OF REPORT based on comments, not individual findings <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>ABNORMAL</td> <td>CRITICAL</td> <td></td> <td></td> </tr> </table> LAB # 536200 LOCATION H ANALYST KH						0	1	2	3	4	NORMAL	ABNORMAL	CRITICAL		
0	1	2	3	4																							
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TRACKING #: [blank] MANUFACTURER/MODEL: OIL WELL A-1100 LUBE INFO: 76 LUBRICANTS LUBE TYPE - GRADE: GL 5 SAE 85W140 MICROB RATING: 000 FILTER TYPE: [blank] SUMP CAPACITY: 00000 HYD SYSTEM PRESSURE: 00000 FLUID ADDED: [blank]																											
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WEAR METALS PPM			CONTAMINANT METALS - PPM			MULTI-SOURCE METALS - PPM			ADDITIVE METALS PPM																		
SAMP #	DATE SAMPLED	UNIT TIME	ALUMINUM	IRON	COPPER	SILICON	WATER	VANADIUM	POSSIBLY	MOLYBDENUM	MANGANESE	MAGNESIUM	PHOSPHORUS														
#	DATE	LUBE TIME	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM														
1	03/20/06	U	998	6	4	143	60	4	1	0	0	23	0														
2	06/20/07	U	172	1	0	35	23	1	0	0	10	0	137														
3	07/30/07	U	262	4	1	91	32	1	0	0	3	0	280														
4	08/07/07	U																									
SAMP #	DATE SAMPLED	UNIT TIME	CHG	CHG	Vol.	Vol.	Hot Plate	40C CS	100C CS	Total Acid	Total Base	I-R	ISO														
1	03/20/06	U	U	U	U	U	0.00	25.00	1.11																		
2	06/20/07	U	U	U	U	U	0.20	27.30	1.12																		
3	07/30/07	U	U	U	U	U	0.20	24.00	0.95																		
4	08/07/07	U	U	U	U	U																					

Comments are advisory only and are based on the assumption that the sample and data submitted are valid. Missing lube or unit time limits the evaluation. No warranty is expressed or implied.



## Diesel & Gasoline Engine Oil Guidelines

(for physical properties, contaminants & degradation)

	Normal	Abnormal	Excessive
Glycol	0	Trace	Trace
Water	<0.05%	0.05%	>1.0%
Fuel Dilution	<1.0%	2.0%	3.0%
Viscosity	in grade	+ or – one SAE/ISO viscosity grade change	+ or – two SAE/ISO viscosity grade change
Solids	<1.5%	2.0%	>4.0%
Soot (diesel only)	<2.0%	3.0%	>4.0%
Oxidation	Expressed as absorption units per cm		50.0 synthetic 30.0 petroleum
Nitration	Expressed as absorption units per cm		50.0 synthetic 30.0 petroleum
Total Base Number	Change oil when TBN strength diminishes to <2		
Total Acid Number (industrial)	1-3	3-4	>4

## SAE Engine & Gear Oil Viscosity Grade @ 100°C (Automotive Fluids)

SAE Engine Oil Grade @ 100°	Min cSt.	Max cSt.
20	5.6	>9.3
30	9.3	>12.5
40	12.5	>16.3
50	16.3	>21.9
60	21.9	>26.0
SAE Gear Oil	Min cSt.	Max cSt.
90	13.5	>24.0
140	24.0	>41.0
250	41.0	No Req.

## ISO Viscosity Grade @ 40°C (Industrial Fluids)

ISO Viscosity Grade @ 40°C	Min cSt.	Max cSt.
2	1.98	2.42
3	2.88	3.52
5	4.14	5.06
7	6.12	7.48
10	9.00	11.0
15	13.5	16.5
22	19.8	24.2
32	28.8	35.2
46 (AGMA 1)	41.4	50.6
68 (AGMA 2)	61.2	74.8
100 (AGMA 3)	90.0	110
150 (AGMA 4)	135	165
220 (AGMA 5)	198	242
320 (AGMA 6)	288	352
460 (AGMA 7)	414	506
680 (AGMA 8)	612	748
1000 (AGMA 8A)	900	1100
1500	1350	1650



# How to Read the OIL ANALYZERS Fluid Analysis Report

<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>																																																																																																										
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<table border="1"> <thead> <tr> <th rowspan="2">SAMP #</th> <th rowspan="2">DATE SAMPLED</th> <th rowspan="2">UNIT TIME</th> <th rowspan="2">LUBE TIME</th> <th colspan="2">FILT</th> <th rowspan="2">SOOT</th> <th rowspan="2">WATER</th> <th rowspan="2">VIS</th> <th rowspan="2">VIS</th> <th rowspan="2">TAN</th> <th rowspan="2">TBN</th> <th rowspan="2">I-R</th> <th rowspan="2">I-R</th> <th rowspan="2">ISO</th> <th rowspan="2">MIC</th> <th rowspan="2">MIC</th> <th rowspan="2">MIC</th> <th rowspan="2">MIC</th> <th rowspan="2">MIC</th> <th rowspan="2">MIC</th> </tr> <tr> <th>CHG</th> <th>CHG</th> <th>Vol.</th> <th>Vol.</th> <th>Hot Plate</th> <th>40C CS</th> <th>100C CS</th> <th>Total Acid</th> <th>Total Base</th> <th>A</th> <th>A</th> <th>CODE</th> <th>NON</th> <th>NON</th> <th>NON</th> <th>NON</th> <th>NON</th> <th>NON</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>03/20/06</td> <td></td> <td></td> <td>U</td> <td>U</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>25.00</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>06/20/07</td> <td></td> <td></td> <td>U</td> <td>U</td> <td></td> <td>0.20</td> <td></td> <td></td> <td>27.30</td> <td>1.12</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>07/30/07</td> <td></td> <td></td> <td>U</td> <td>U</td> <td></td> <td>0.20</td> <td></td> <td></td> <td>24.00</td> <td>0.95</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				SAMP #	DATE SAMPLED	UNIT TIME	LUBE TIME	FILT		SOOT	WATER	VIS	VIS	TAN	TBN	I-R	I-R	ISO	MIC	MIC	MIC	MIC	MIC	MIC	CHG	CHG	Vol.	Vol.	Hot Plate	40C CS	100C CS	Total Acid	Total Base	A	A	CODE	NON	NON	NON	NON	NON	NON	1	03/20/06			U	U						25.00											2	06/20/07			U	U		0.20			27.30	1.12											3	07/30/07			U	U		0.20			24.00	0.95										
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**Application** identifies in what type of environment the equipment operates and is useful in determining exposure to possible contaminants.

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

**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.

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

**Filter Types** and their **Micron Ratings** are important in analyzing particle count — the higher the micron rating, the higher the particle count results.

Accurate, thorough and complete fluid and equipment information allows for more in-depth analysis and can eliminate confusion when interpreting results.

<b>UNIT ID:</b> R205 A-1100 <b>SECOND ID</b> #2 OILWELL <b>UNIT TYPE</b> PUMP <b>APPLICATION</b> ON-SHORE D
<b>ACCOUNT N</b> <b>DATE SAMPL</b> <b>DATE RECEI</b> <b>DATE COMP</b>
<b>TRACKING #</b> <b>MANUFACTU</b> <b>LUBE MFR:</b> <b>LUBE TYPE -</b> <b>MICRON RA</b> <b>FILTER TYPI</b> <b>SUMP CAPA</b> <b>HYD SYSTEM</b> <b>FLUID ADDE</b>
<b>COMMENTS</b>

## Customer Equipment and Sample Information

The information submitted with a sample is as important to who is reading the report as it is to the analyst interpreting the test results and making recommendations. **Properly document your equipment and share this knowledge with your laboratory.** Implement a sampling process for every piece of equipment in your oil analysis program that can be followed consistently each time the unit is sampled. Accurate, thorough and complete lube and equipment information not only allows for in-depth analysis, but can eliminate confusion and the difficulties that can occur when interpreting results.

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**.

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

**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.

**Oil Analyzers INC.**

COMPANY INFORMATION

07/30/13  
 08/07/13  
 08/08/13

OVERALL SEVERITY OF REPORT  
 based on comments, not individual flags

0	1	2	3	4
NORMAL	ABNORMAL	CRITICAL		

LAB # 536200 LOCATION H ANALYST KM

FLUID ANALYSIS REPORT

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; Barium is at a MODERATE LEVEL; Barium is common in engine oil.

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

**Lube Time** is how long the oil has been used. **Unit Time** is the age of the equipment and **Lube Added** is how much oil has been added since the last sample was taken.

**Data Analysts Initials**

## 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	
<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

FLUID ANALYSIS REPORT		WEAR METALS PPM										CONTAMINANT METALS - PPM				MULTI-SOURCE METALS - PPM				ADDITIVE METALS PPM				
SAMP LE #	I R O N	C H R O M I U M	N I C K E L	A L U M I N U M	C O P P E R	L E A D	T I N	C A D M I U M	S I L I C A	T I T A N I U M	V A N A D I U M	S I L I C O N	S O D I U M	P O T A S S I U M	M O L Y B D E N U M	A N T I M O N Y	M A N G A N E S E	L I T H I U M	B O R O N	M A G N E S I U M	C A L C I U M	B A R I U M	P H O S P H O R U S	Z I N C
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
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
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

Laboratory will request additional unit and lube information if incomplete on sample label



# 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 (ZDDP).

SAMP #	WEAR METALS PPM										CONTAMINANT METALS - PPM			MULTI-SOURCE METALS - PPM				ADDITIVE METALS PPM						
	IRON	CHROMIUM	NICKEL	ALUMINUM	COPPER	LEAD	CADMIUM	SILVER	TITANIUM	VANADIUM	SILICON	SODIUM	POTASSIUM	MOLYBDENUM	ANTIMONY	MANGANESE	LITHIUM	BORON	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC	
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
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
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

# 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** in the lab — oldest first. They are also assigned a **Lab Number** for easy internal tracking. Important to also note is whether or not the **Lube** has been **Changed** since the last sample was taken.

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

SAMP #	DATE SAMPLED	UNIT TIME	LUBE CHG	FILTRER CHG	FUEL Vol.	SOOT Vol.	WATER Hot Plate	VIS 40C CS	VIS 100C CS	TAN Total Acid	TBN Total Base	I-R OXID A	I-R INT R A	ISO CODE	4 MICRONS	6 MICRONS	10 MICRONS	14 MICRONS	21 MICRONS	38 MICRONS	70 MICRONS	100 MICRONS	
	DATE RECEIVED	LUBE TIME																					
1	03/20/06	03/27/06	U	U			0.00	25.00	1.11														
2	06/20/07	06/27/07	U	U			0.20	27.30	1.12														
3	07/30/07	08/07/07	U	U			0.20	24.00	0.95														

**Fuel** and **Soot** are reported in % of volume. High fuel dilution decreases unit load capacity. Excessive soot is a sign of reduced combustion efficiency. (only on engine oil samples)

**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 ASTM D 1744 determines the **amount** of water present. These results appear in the Special Testing section of your report.

The **ISO Code** is an index number that represents a range of particles within a specific micron range, (e.g. 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.

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**Send your samples to the  
laboratory location  
nearest you.**

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**To order OIL ANALYZERS  
Fluid Analysis kits,**

**[www.oilanalysis.us](http://www.oilanalysis.us)**

