DEUTZ®

Motor Trac Fluid Maintenance Program

What Can DEUTZ Motor Trac Do For You?

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

DEUTZ Motor Trac Fluid Analysis is a preventive maintenance tool that gives you an inside look at exactly what's going on inside an engine, gearbox or hydraulic system. It tells you the condition of both the unit and the fluid without disassembly. Imagine being able to see the damage even extremely minute wear particles and debris can do to your equipment. Problems can be found before they become failures and less unscheduled downtime means increased reliability, productivity and profitability.

DEUTZ Motor Trac

Fluid Analysis

Why DEUTZ?

HIGH QUALITY TESTING

You can be confident that the test results you receive through the **DEUTZ Motor Trac Fluid Analysis Program** are accurate, repeatable and traceable to a standard. FRAM testing laboratories are ISO 17025 A2LA accredited – the highest level of quality attainable by a testing laboratory backed by the most stringent accrediting body on the industry. This means that your fluid analysis program is supported by a documented quality system you can depend on to deliver superior testing and customer services.

INNOVATIVE DATA MANAGEMENT SOLUTIONS

DEUTZ Motor Trac Fluid Analysis is fast and accurate. Once your samples have been logged, you can track their progress through the laboratory at **www.trackmysample.com**. Your results are available almost immediately after sample processing is complete. Our online reporting software, HORIZON™, will then show you how to get the most from your testing and analysis through Management Reports that allow you to affect change in your daily maintenance practices by:

- **Keeping sampling schedules on track**
- **Identifying bottlenecks in turnaround time**
- **Tracking unit and fluid performance**
- **Influencing purchasing decisions**

Taking Samples

Regular sampling and testing through the **DEUTZ Motor Trac Fluid Analysis** monitors trends in test data over an extended period of time which provides the information you need to continually maximize asset reliability and ultimately increase your profits.

Equipment manufacturers provide recommendations for preventive maintenance practices but how critical a piece of equipment is to productivity should be a major consideration for determining sampling frequency. High temperatures, dirty operating conditions, short trips with heavy loads, and excessive idle times can also significantly shorten maintenance intervals.

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

- Identify appropriate sampling points.
- Take samples from the same sampling points each time.
- Determine proper sampling intervals and monitor compliance with the HORIZON™ Sample Frequency Report
- Take samples while systems are operating under normal conditions or immediately after shutdown while they are still at operating temperature.
- Identify and implement proper contamination control best practices

Whether you're a seasoned veteran or a first-time sampler, the **DEUTZ Motor Trac Fluid Analysis** puts you on track for well-managed, cost-effective equipment maintenance.

Suggested Sampling Intervals & Methods

	Sampling Interval	Suggested Method & Location
Diesel Engines – Oil	Monthly or at 250 hours	By sample extraction pump through dipstick retaining tube or sampling valve installed in filter return
Diesel Engines – Coolant	Quarterly	By vacuum pump through radiator
Diesel Engines – Fuel	Quarterly	By vacuum pump through gas tank
Hydraulics	250 - 500 hours	By vacuum pump through oil fill port or system reservoir at mid-level
Gearboxes	750 hours	By vacuum pump through oil level plug or dipstick retaining tube

DEUTZ Motor Trac Fluid Analysis Test Kits

DEUTZ Motor Trac Fluid Analysis provides diagnostic testing designed to evaluate lubricant condition, component wear and contamination in a variety of mobile and industrial equipment applications. All testing is provided by an ISO 17025 A2LA accredited laboratory that generates a test report accessible online for each sample submitted. To order DEUTZ MotorTrac Fluid Analysis test kits or sampling supplies, contact your local DEUTZ distributor.

Oil Analysis Test Kits

	Part #308312 Advanced Mobile		Part #308311 Advanced Industrial	
Application	**Engines**	**Non-Engine**	**Engines**	**Non-Engine**
Purpose	Safely optimizes drain intervals		Monitors fluid & system cleanliness	
Test				
24 Metals by ICP	•	•	•	•
Water % by Crackle	•	•	• (if +, then Karl Fischer)	•
Viscosity @ 40°C or 100°C	• (100°C)	• (ISO-40°C) (SAE-100°C)	• (ISO-40°C) (SAE-100°C)	• (100°C)
Fuel Dilution % by FTIR	•			•
Soot % by FTIR	•			•
Base Number	•			•
Acid Number	•	•	•	
Oxidation/Nitration by FTIR	•		•	•
Particle Count				•
Particle Quantifier				•

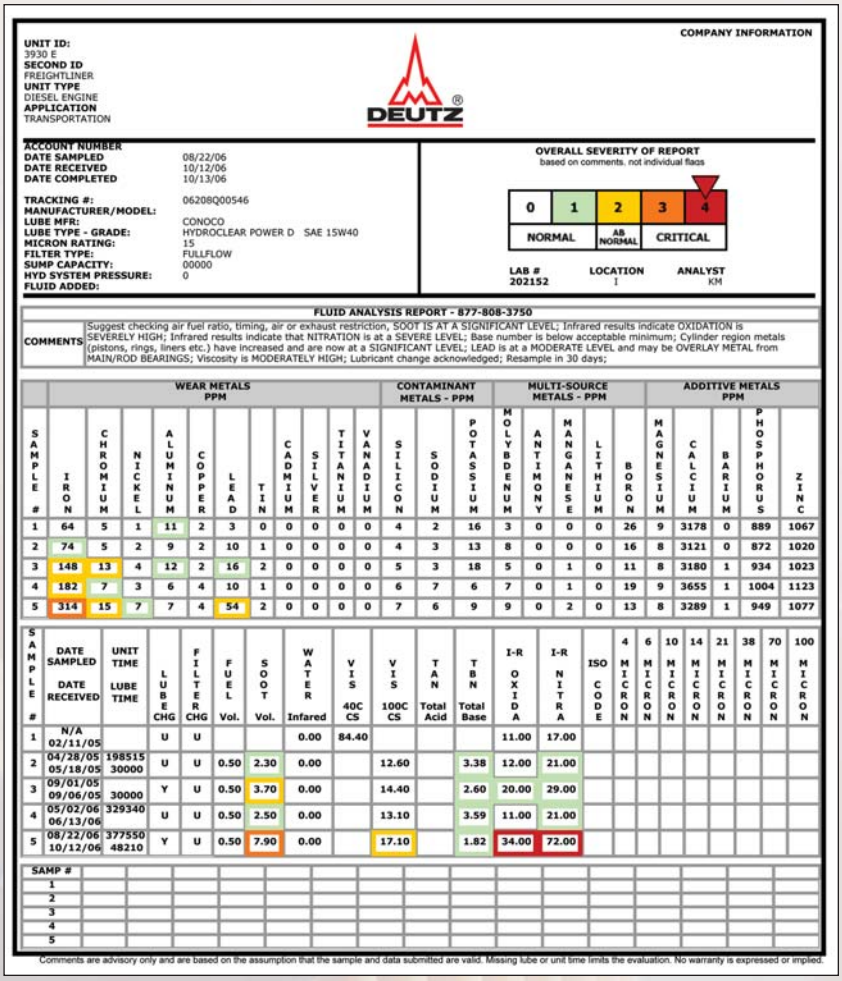
Fuel Analysis Test Kit

Part #308313
24 Metals by ICP
Water & Sediment
Pour Point
Thermal Stability
Bacteria, Fungi & Mold

Coolant Analysis Test Kit

Part #308314
17 Metals by ICP
pH
Glycol %
Freeze Point
Boil Point
Nitrite
SCA Number
Total Dissolved Solids
Specific Conductance
Total Hardness
Visuals (color, oil, fuel, magnetic & non-magnetic precipitate, odor & foam)

How to Read the DEUTZ Motor Trac Fluid Analysis Report



COMPANY INFORMATION

UNIT ID: 3930 E
SECOND ID: FREIGHTLINER
UNIT TYPE: DIESEL ENGINE
APPLICATION: TRANSPORTATION

DEUTZ

ACCOUNT NUMBER
DATE SAMPLED: 08/22/06
DATE RECEIVED: 10/12/06
DATE COMPLETED: 10/13/06

TRACKING #: 06208Q00546
MANUFACTURER/MODEL:
LUBE MFR: CONOCO
LUBE TYPE - GRADE: HYDROCLEAR POWER D SAE 15W40
MICRON RATING: 15
FILTER TYPE: FULLFLOW
SUMP CAPACITY: 00000
HYD SYSTEM PRESSURE: 0
FLUID ADDED:

OVERALL SEVERITY OF REPORT
based on comments, not individual flags

0	1	2	3	4
NORMAL		ABNORMAL		CRITICAL

LAB # 202152 LOCATION I ANALYST KM

FLUID ANALYSIS REPORT - 877-808-3750

COMMENTS: Suggest checking air fuel ratio, timing, air or exhaust restriction, SOOT IS AT A SIGNIFICANT LEVEL; Infrared results indicate OXIDATION is SEVERELY HIGH; Infrared results indicate that NITRATION is at a SEVERE LEVEL; Base number is below acceptable minimum; Cylinder region metals (pistons, rings, liners etc.) have increased and are now at a SIGNIFICANT LEVEL; LEAD is at a MODERATE LEVEL and may be OVERLAY METAL from MAIN/ROD BEARINGS; Viscosity is MODERATELY HIGH; Lubricant change acknowledged; Resample in 30 days;

	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
1	64	5	1	11	2	3	0	0	0	0	0	4	2	16	3	0	0	0	26	9	3178	0	889	1067
2	74	5	2	9	2	10	1	0	0	0	0	4	3	13	8	0	0	0	16	8	3121	0	872	1020
3	148	13	4	12	2	16	2	0	0	0	0	5	3	18	5	0	1	0	11	8	3180	1	934	1023
4	182	7	3	6	4	10	1	0	0	0	0	6	7	6	7	0	1	0	19	9	3655	1	1004	1123
5	314	15	7	7	4	54	2	0	0	0	0	7	6	9	9	0	2	0	13	8	3289	1	949	1077

SAMPLE #	DATE SAMPLED / DATE RECEIVED	UNIT TIME / LUBE TIME	LUBE CHG	FILTER CHG	FUEL Vol.	SOOT Vol.	WATER Infared	VIS 40C CS	VIS 100C CS	TAN Total Acid	TBN Total Base	I-R OXIDA	I-R NITRA	ISO CODE	4 MICRON	6 MICRON	10 MICRON	14 MICRON	21 MICRON	38 MICRON	70 MICRON	100 MICRON
1	N/A 02/11/05		U	U			0.00	84.40				11.00	17.00									
2	04/28/05 05/18/05	198515 30000	U	U	0.50	2.30	0.00		12.60		3.38	12.00	21.00									
3	09/01/05 09/06/05	30000	Y	U	0.50	3.70	0.00		14.40		2.60	20.00	29.00									
4	05/02/06 06/13/06	329340	U	U	0.50	2.50	0.00		13.10		3.59	11.00	21.00									
5	08/22/06 10/12/06	377550 48210	Y	U	0.50	7.90	0.00		17.10		1.82	34.00	72.00									

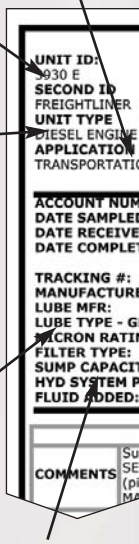
SAMP #																					
1																					
2																					
3																					
4																					
5																					

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.

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 is 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.

Customer Equipment and Sample Information

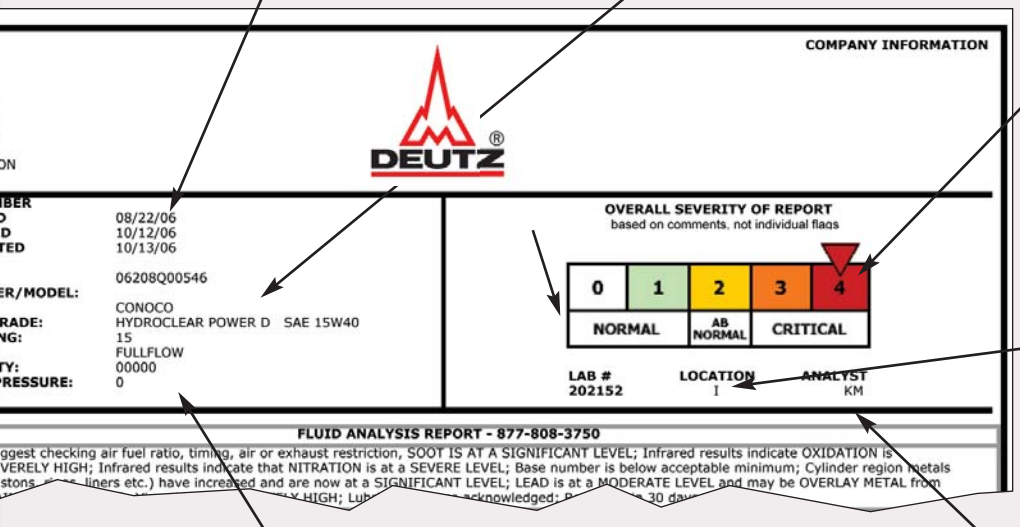
The information submitted with a sample is as important to who is reading the report as it is to the analyst interpreting the test results and making recommendations. **Properly document your equipment and share this knowledge with your laboratory.** Implement a sampling process for every piece of equipment 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.



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

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

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

FLUID ANALYSIS REPORT - 877-808-3750

COMMENTS	Suggest checking air fuel ratio, timing, air or exhaust restriction, SOOT IS AT A SIGNIFICANT LEVEL; Infrared results indicate OXIDATION is SEVERELY HIGH; Infrared results indicate that NITRATION is at a SEVERE LEVEL; Base number is below acceptable minimum; Cylinder region metals (pistons, rings, liners etc.) have increased and are now at a SIGNIFICANT LEVEL; LEAD is at a MODERATE LEVEL and may be OVERLAY METAL from MAIN/ROD BEARINGS; Viscosity is MODERATELY HIGH; Lubricant change acknowledged; Resample in 30 days;

	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
1	64	5	1	11	2	3	0	0	0	0	0	4	2	16	3	0	0	0	26	9	3178	0	889	1067
2	74	5	2	9	2	10	1	0	0	0	0	4	3	13	8	0	0	0	16	8	3121	0	872	1020
3	108	13	4	12	2	16	2	0	0	0	0	5	3	18	5	0	1	0	11	8	3180	1	934	1023
4	182	7	3	6	4	10	1	0	0	0	0	6	7	6	7	0	1	0	19	9	3655	1	1004	1123
5	314	15	7	7	4	54	2	0	0	0	0	7	6	9	9	0	2	0	13	8	3289	1	949	1077

SAMPLE	DATE SAMPLED / DATE RECEIVED	UNIT TIME / LUBE TIME	LUBE CHG	FILTER CHG	FUEL Vol.	SOOT Vol.	WATER Inf.	VIS 40C	VIS 100C CS	TAN Total Acid	TBN Total Bas	I-R OXID	I-R NITRA	ISO CODE	4 MICRON	6 MICRON	10 MICRON	14 MICRON	21 MICRON	38 MICRON	70 MICRO	100 MICRON

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).

	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
1	64	5	1	11	2	3	0	0	0	0	0	4	2	16	3	0	0	0	26	9	3178	0	889	1067
2	74	5	2	9	2	10	1	0	0	0	0	4	3	13	8	0	0	0	16	8	3121	0	872	1020
3	148	13	4	12	2	16	2	0	0	0	0	5	3	18	5	0	1	0	11	8	3180	1	934	1023
4	182	7	3	6	4	10	1	0	0	0	0	6	7	6	7	0	1	0	19	9	3655	1	1004	1123
5	314	15	7	7	4	54	2	0	0	0	0	7	6	9	9	0	2	0	13	8	3289	1	949	1077

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.

SAMPLE #	DATE SAMPLED / DATE RECEIVED	UNIT TIME / LUBE TIME	LUBE CHG	FILTER CHG	FUEL Vol.	SOOT Vol.	WATER Infared	VIS 40C CS	VIS 100C CS	TAN Total Acid	TBN Total Base	I-R OXIDA	I-R NITRA	ISO CODE	4 MICRON	6 MICRON	10 MICRON	14 MICRON	21 MICRON	38 MICRON	70 MICRON	100 MICRON
1	N/A 02/11/05		U	U			0.00	84.40				11.00	17.00									
2	04/28/05 05/18/05	198515 30000	U	U	0.50	2.30	0.00		12.60		3.38	12.00	21.00									
3	09/01/05 09/06/05	30000	Y	U	0.50	3.70	0.00		14.40		2.60	20.00	29.00									
4	05/02/06 06/13/06	329340	U	U	0.50	2.50	0.00		13.10		3.59	11.00	21.00									
5	08/22/06 10/12/06	377550 48210	Y	U	0.50	7.90	0.00		17.10		1.82	34.00	72.00									

SAMP #																					
1																					
2																					
3																					

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 D1744 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, 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.

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.**

Sample Labels

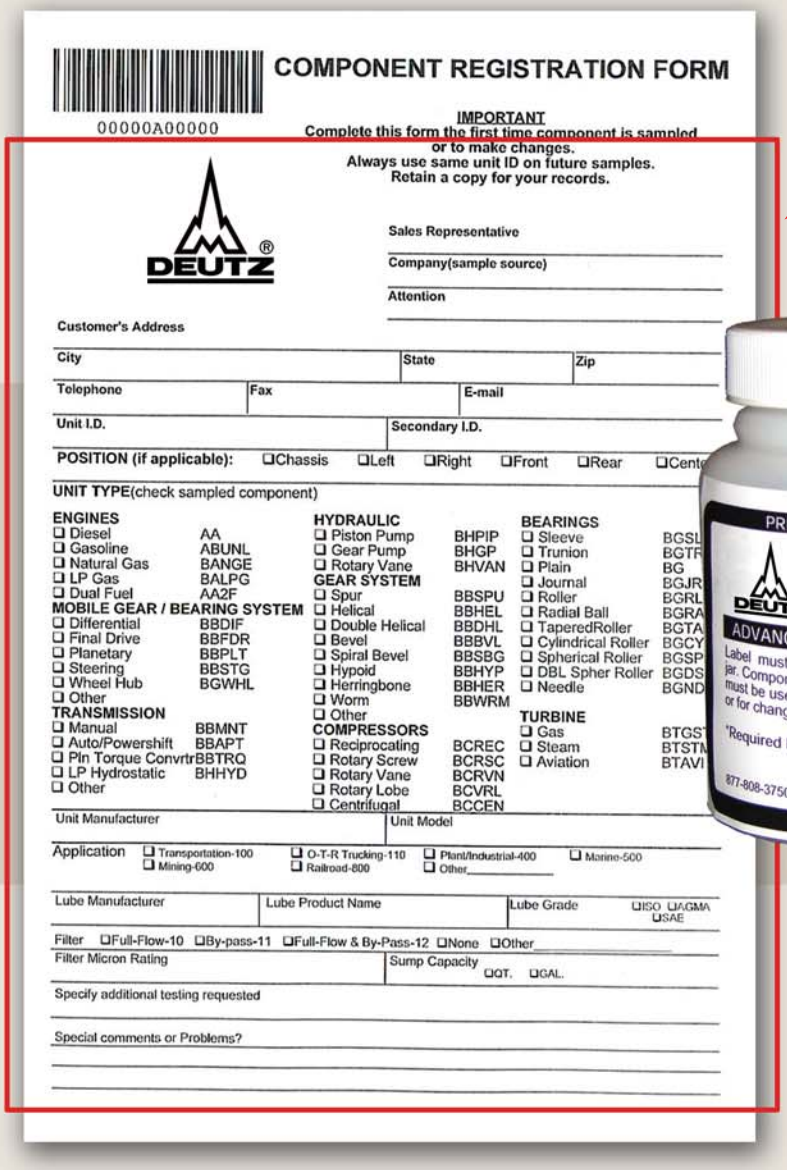
Complete a **sample jar label** for **every** sample submitted to the laboratory. **Be sure to fill out all label information completely and accurately to ensure proper testing and accurate, in-depth analysis.** Once complete, attach the label to the sample bottle. Fill in the unit's ID on the removable tracking number sticker located to the right of the sample label and retain for your records.

STEP 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.

STEP 2

- Fill out the **sample jar label** completely and accurately.
- Include **all** unit and fluid information requested including unite 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**.



COMPONENT REGISTRATION FORM

00000A00000

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.

DEUTZ®

Sales Representative
Company(sample source)
Attention
Customer's Address
City | State | Zip
Telephone | Fax | E-mail
Unit I.D. | Secondary I.D.
POSITION (if applicable): ❑Chassis ❑Left ❑Right ❑Front ❑Rear ❑Cent
UNIT TYPE(check sampled component)

ENGINES
❑ Diesel AA
❑ Gasoline ABUNL
❑ Natural Gas BANGE
❑ LP Gas BALPG
❑ Dual Fuel AA2F

MOBILE GEAR / BEARING SYSTEM
❑ Differential BBDIF
❑ Final Drive BBFDR
❑ Planetary BBPLT
❑ Steering BBSTG
❑ Wheel Hub BGWHL
❑ Other

TRANSMISSION
❑ Manual BBMNT
❑ Auto/Powershift BBAPT
❑ Pin Torque Convrtr BBTRQ
❑ LP Hydrostatic BHHYD
❑ Other

HYDRAULIC
❑ Piston Pump BHPIP
❑ Gear Pump BHGP
❑ Rotary Vane BHVAN

GEAR SYSTEM
❑ Spur BBSPU
❑ Helical BBHEL
❑ Double Helical BBDHL
❑ Bevel BBBVL
❑ Spiral Bevel BBSBG
❑ Hypoid BBHYP
❑ Herringbone BBHER
❑ Worm BBWRM
❑ Other

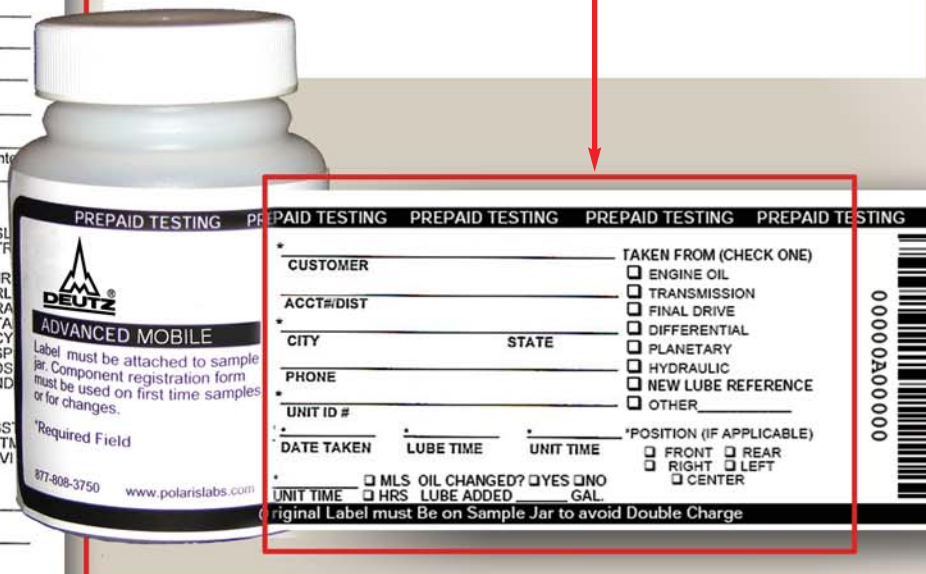
COMPRESSORS
❑ Reciprocating BCREC
❑ Rotary Screw BCRSC
❑ Rotary Vane BCRVN
❑ Rotary Lobe BCVRL
❑ Centrifugal BCCEN

BEARINGS
❑ Sleeve BGSL
❑ Trunion BGTR
❑ Plain BG
❑ Journal BGJR
❑ Roller BGRL
❑ Radial Ball BGRA
❑ TaperedRoller BGTA
❑ Cylindrical Roller BGCY
❑ Spherical Roller BGSP
❑ DBL Spher Roller BGDS
❑ Needle BGND

TURBINE
❑ Gas BTGS
❑ Steam BTSTM
❑ Aviation BTAVI

Unit Manufacturer | Unit Model
Application ❑ Transportation-100 ❑ Mining-600 ❑ O-T-R Trucking-110 ❑ Railroad-800 ❑ Plant/Industrial-400 ❑ Other ❑ Marine-500
Lube Manufacturer | Lube Product Name | Lube Grade ❑ISO ❑AGMA ❑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?

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



DEUTZ®

Shipping Information

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

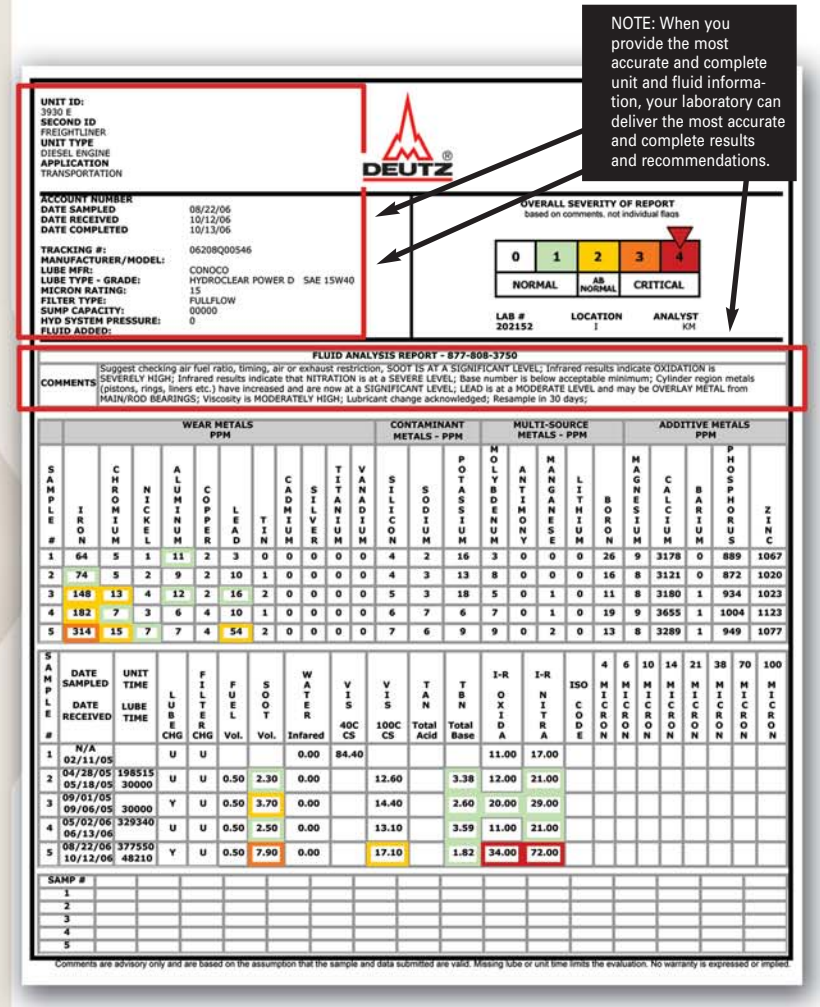
- Complete and attach the return mailer address label to the black shipping container.
- Ship by trackable mail service such as FedEx or UPS.

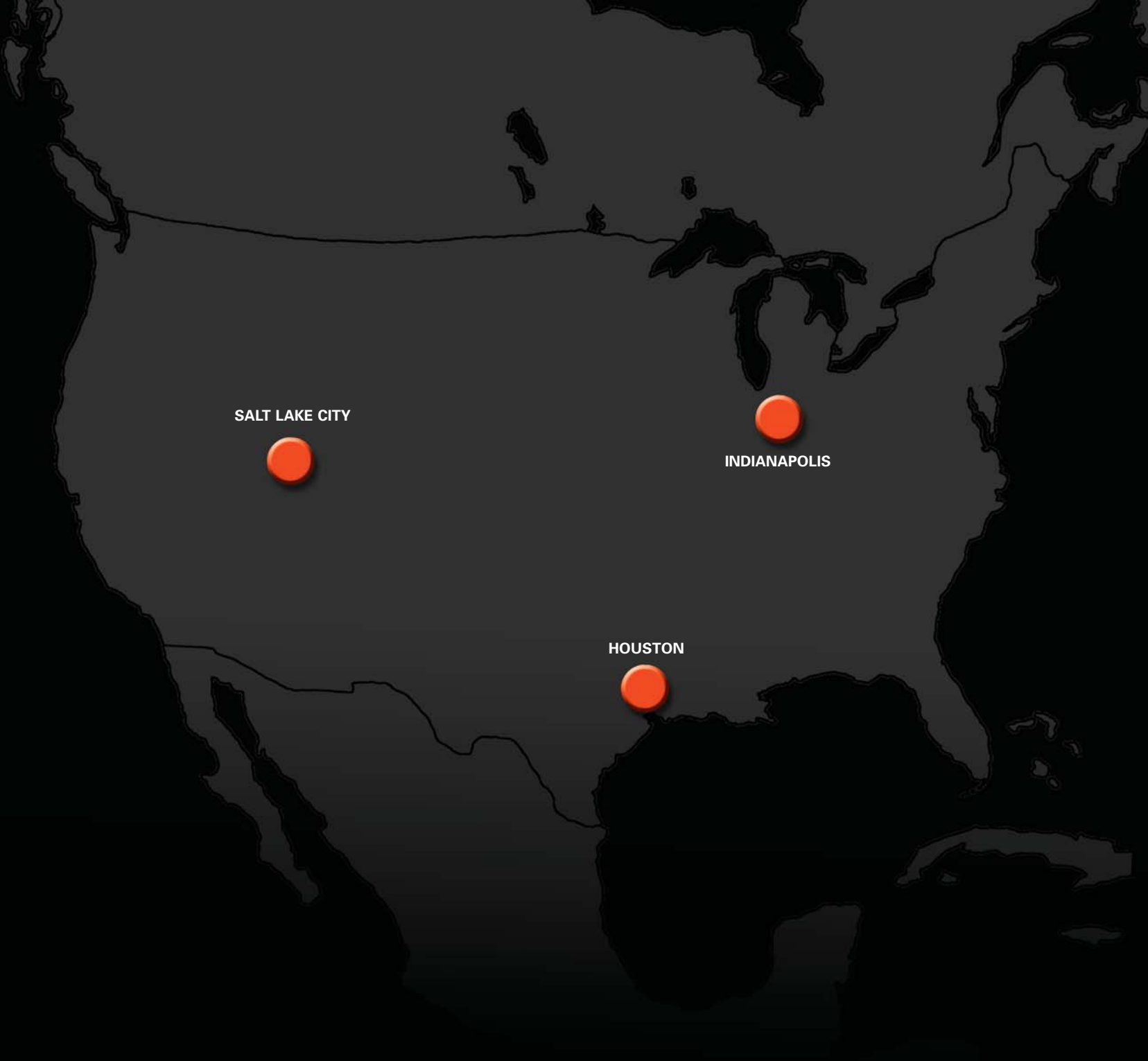
Test Reports and Data Management

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 and summarizing unit problems that could influence future purchasing decisions. And control over an extensive host of personal application settings and preferences gives you the power to put the information you need most in front of you first.

STEP 4

Go to **www.horizonsignup.com**





DEUTZ FLUID ANALYSIS
INDIANAPOLIS
7898 Zionsville Road
Indianapolis, IN 46268
Phone: 866-496-5586

DEUTZ FLUID ANALYSIS
HOUSTON
10910 W. Sam Houston Pkwy. N.
Suite 700
Houston, TX 77064-6314
Phone: 866-496-5586

DEUTZ FLUID ANALYSIS
SALT LAKE CITY
3060 W. California Avenue
Suite B
Salt Lake City, UT 84104
Phone: 866-496-5586

Send your samples to the laboratory location nearest you.