GEHL

VitalTRAC™ Fluid Analysis Program

VitalTRAC™

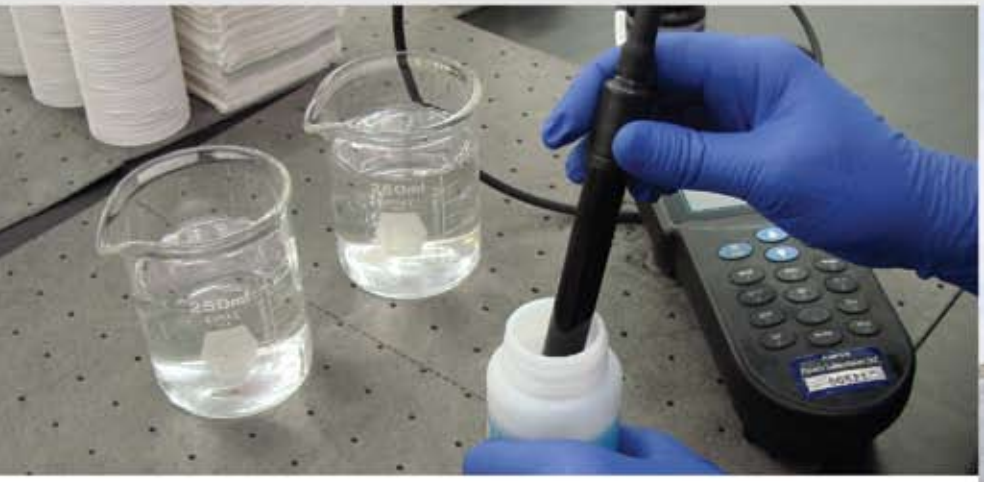
The **GEHL VitalTRAC**™ program is a diagnostic, preventive maintenance tool that uses fluid analysis to monitor and evaluate lubricant and equipment condition in all types of mobile applications. Routine testing and analysis can show you how the condition of the lubricants can affect equipment performance and reliability, the vitals of your business.

What can the Gehl VitalTRAC™ program do for you?

- **Extend oil change intervals**
- **Extend equipment life**
- **Identify minor problems before they become major failures**
- **Increase resale value**
- **Maximize asset reliability**

The **GEHL VitalTRAC**™ program gives you an inside look at 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 detect the damage even extremely minute particles and contaminants can do to your equipment. Problems can be found before they become failures, and less unscheduled downtime means increased reliability, productivity and profitability.



High Quality Testing

With the **Gehl VitalTRAC**™ program, you can be confident you're testing with a laboratory that knows your equipment well. The **Gehl VitalTRAC**™ program testing laboratories are ISO 17025 A2LA accredited – the highest level of quality attainable by a testing laboratory, backed by the most stringent accrediting body in the industry. This means that your fluid analysis program is supported by a documented quality system, which you can depend on to deliver superior testing and customer service.

Innovative Data Management Solutions

The **GEHL VitalTRAC**™ program is fast and accurate. After 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

The **GEHL VitalTRAC**™ program shows 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 equipment reliability and, ultimately, increase profits.

Along with preventive maintenance practices recommended by Gehl Company, how critical a piece of equipment is to productivity should also be a major consideration for determining sampling frequency. High temperatures, dirty operating conditions, short trips with heavy loads, and excessive idle times can significantly shorten optimum 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.**

Suggested Sampling Intervals and Methods

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

Gehl VitalTRAC™ Test Packages

The **GEHL VitalTRAC**™ program provides diagnostic testing designed to evaluate lubricant condition, component wear and contamination in a variety of mobile equipment applications. All testing is provided by an independent ISO 17025 A2LA-accredited laboratory that generates reports accessible online for each sample submitted. To order **Gehl VitalTRAC™** program test kits or sampling supplies, contact your local Gehl dealer.

Gehl Oil Analysis Test Packages				
	Hydraulic Oil Analysis Part #: 272806		Engine Oil Analysis Part #: 272809	
Tests	**Engines**	**Non-Engine**	**Engines**	**Non-Engine**
Elemental Metals by ICP	■	■	■	■
Water % by Crackle (if positive, Karl Fischer)	■	■	■	■
Viscosity at 40°C or 100°C	■	■	■	■
Fuel Dilution % by FTIR	■		■	
Soot % by FTIR	■		■	
Oxidation/Nitration by FTIR			■	■
Total Acid Number		■		■
Total Base Number	■		■	
ISO Particle Count		■		
Particle Quantifier	■			

Gehl Coolant Analysis Package – Part #: 272812	
Tests	**Coolant Analysis**
Visuals (color, oil, fuel, magnetic precipitate, non-magnetic precipitate, odor & foam)	■
Elemental Metals by ICP	■
pH	■
Glycol % (Ethylene or Propylene Glycol)	■
Freeze Point	■
Boil Point	■
Nitrate	■
SCA Number	■
Total Dissolved Solids	■
Specific Conductance	■
Total Hardness	■

Gehl Fuel Analysis Package – Part #: 272811	
Tests	**Fuel Analysis**
Elemental Metals by ICP	■
Water and Sediment	■
Pour Point	■
Thermal Stability	■
Bacteria, Fungi, Mold	■

How to read the Gehl VitalTRAC™ Analysis Report

COMPANY INFORMATION

UNIT ID
9604 RFD
SECOND ID

UNIT TYPE
FINAL DRIVE
APPLICATION
TRANSPORTATION

VitalTRAC™

ACCOUNT NUMBER
DATE SAMPLED 05/24/08
DATE RECEIVED 06/02/08
DATE COMPLETED 06/03/08

TRACKING #
MANUFACTURER/MODEL GEHL GE353-12
LUBE MFR OEM
LUBE TYPE - GRADE SAE 90
MICRON RATING 0
FILTER TYPE
SUMP CAPACITY 0.00
HYD SYSTEM PRESSURE 0
FLUID ADDED

OVERALL SEVERITY OF REPORT
based on comments, not individual flags
ACTION SUGGESTED

0	1	2	3	4
NORMAL		ABNORMAL		CRITICAL

LAB # 811923 LOCATION I ANALYST KRM

FLUID ANALYSIS REPORT - 866-946-1176

COMMENTS: Check for possible source of ABRASIVES entry (such as faulty filter elements, housings, seals, breathers, fill points, etc). Abrasives (Silicon)are at a SIGNIFICANT level; Gear and/or bearing metal is at a MINOR LEVEL; Aluminum is most likely in the form of alumina/silica (Dirt); Please provide missing lube type (PRODUCT NAME); Lubricant change acknowledged;

	WEAR METALS PPM										CONTAMINANT METALS - PPM			MULTI-SOURCE METALS - PPM						ADDITIVE METALS PPM				
SAMPLE #	IRON	CHROMIUM	NICKEL	ALUMINUM	COPPER	LEAD	TIN	CADMIUM	SILVER	VANADIUM	SILICON	SODIUM	POTASSIUM	TITANIUM	MOLYBDENUM	ANTIMONY	MANGANESE	LITHIUM	BORON	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC
1	3280	35	21	153	11	2	1	0	0	0	977	27	47	18	4	0	35	0	4	90	308	22	504	73
2	1008	8	5	33	3	0	0	0	0	0	177	5	13	4	0	0	8	0	207	26	615	3	1309	263
3	444	3	2	14	1	0	0	0	0	0	73	2	5	1	1	0	3	0	222	9	215	0	1247	81

SAMPLE #	DATE SAMPLED / DATE RECEIVED	UNIT TIME / LUBE TIME	LUBE CHG	FILTER CHG	FUEL GC	SOOT Vol.	WATER Hot Plate	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	03/16/07 03/20/07	1851 1851	Y	U			0.10		21.8	.59		4	5									
2	10/17/07 10/24/07	2108 257	Y	U			<.1		12.5	1.13		3	5									
3	05/24/08 06/02/08	2361 253	Y	U			<.1		13.7	1.21		4	5									

SAMP #																					
1																					
2																					
3																					

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

Equipment ID is each **customer's** opportunity to 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 significant impact on how results are interpreted.

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

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

Information submitted with a sample is as important to who will receive the report as it is to the analyst who will interpret the test results and make recommendations. **Properly document your equipment and share this knowledge with the laboratory.** Implement a sampling process for every piece of equipment in your Fluid Analysis program that can be followed consistently each time the unit is sampled.

Note 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 identify metallurgies involved, as well as the OEM's standard maintenance guidelines and possible wear patterns to expect.

Severity Status Levels:

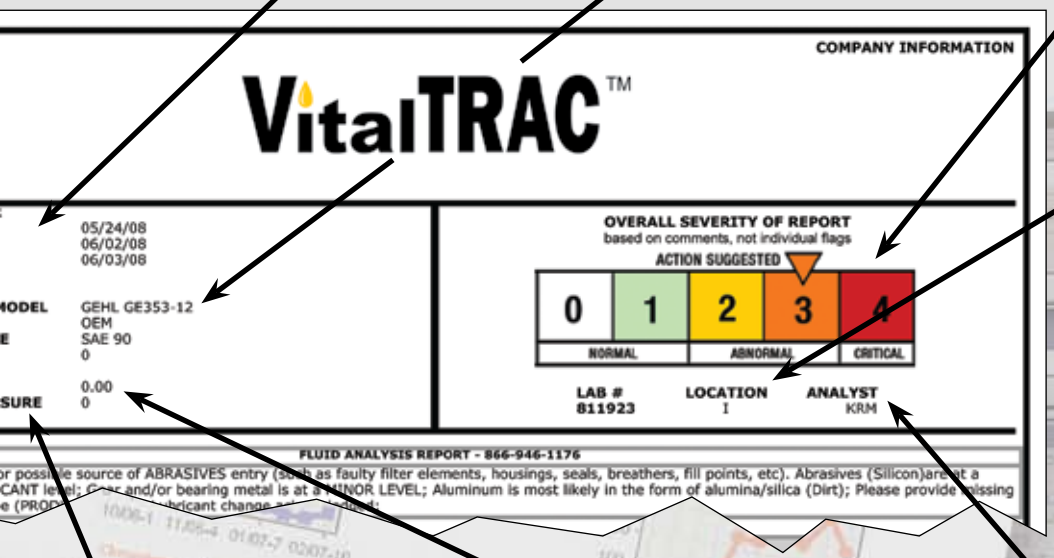
0 - Normal.

1 - One or more items have violated initial flagging points but 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**, an **S** for **Salt Lake City** and an **E** for **Edmonton**. The **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.

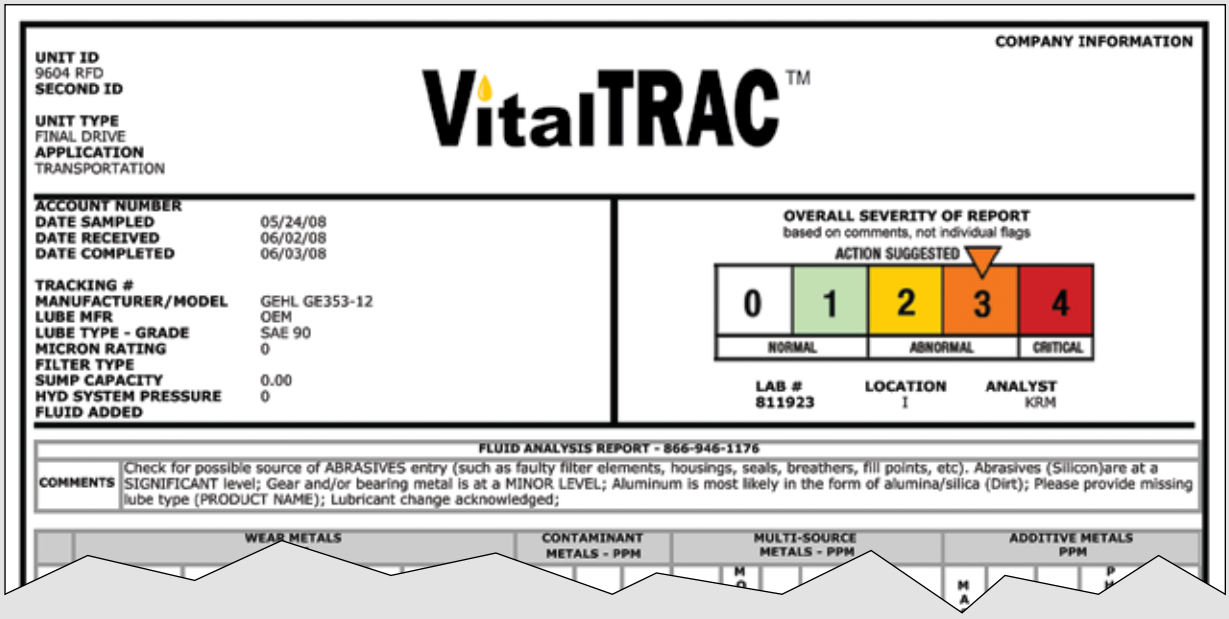
Data Analyst's Initials

Filter Types and their **Micron Ratings** are important in analyzing particle counts – 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.

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 the 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.



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VitalTRAC™

ACCOUNT NUMBER	
DATE SAMPLED	05/24/08
DATE RECEIVED	06/02/08
DATE COMPLETED	06/03/08
TRACKING #	
MANUFACTURER/MODEL	GEHL GE353-12
LUBE MFR	OEM
LUBE TYPE - GRADE	SAE 90
MICRON RATING	0
FILTER TYPE	
SUMP CAPACITY	0.00
HYD SYSTEM PRESSURE	0
FLUID ADDED	

OVERALL SEVERITY OF REPORT
based on comments, not individual flags

ACTION SUGGESTED

0	1	2	3	4
NORMAL		ABNORMAL		CRITICAL

LAB #	LOCATION	ANALYST
811923	I	KRM

FLUID ANALYSIS REPORT - 866-946-1176

COMMENTS	Check for possible source of ABRASIVES entry (such as faulty filter elements, housings, seals, breathers, fill points, etc). Abrasives (Silicon)are at a SIGNIFICANT level; Gear and/or bearing metal is at a MINOR LEVEL; Aluminum is most likely in the form of alumina/silica (Dirt); Please provide missing lube type (PRODUCT NAME); Lubricant change acknowledged;

WEAR METALS	CONTAMINANT METALS - PPM	MULTI-SOURCE METALS - PPM	ADDITIVE METALS PPM

The laboratory will request additional unit and lube information if sample label is incomplete.

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 metals 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.

Multi-Source and **Additive 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	VANADIUM	SILICON	SODIUM	POTASSIUM	TITANIUM	MOLYBDENUM	ANTIMONY	MANGANESE	LITHIUM	BORON	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC
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2	1008	8	5	33	3	0	0	0	0	0	177	5	13	4	0	0	8	0	207	26	615	3	1309	263
3	444	3	2	14	1	0	0	0	0	0	73	2	5	1	1	0	3	0	222	9	215	0	1247	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-colored areas of the report.

Samples are listed by **Date Received** in the lab – oldest first. The order in which samples are listed can be changed under the Setting tab in HORIZON. They are also assigned a **Lab Number** for easy internal tracking. Also important to 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 its most important physical property. Depending on lube grade, it is tested at 40 and/or 100 degrees Celcius and reported in Centistokes.

SAMPLE #	DATE SAMPLED / DATE RECEIVED	UNIT TIME / LUBE TIME	LUBE CHG	FILTER CHG	FUEL GC	SOOT Vol.	WATER Hot Plate	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	03/16/07 / 03/20/07	1851 / 1851	Y	U			0.10		21.8	.59		4	5									
2	10/17/07 / 10/24/07	2108 / 257	Y	U			<.1		12.5	1.13		3	5									
3	05/24/08 / 06/02/08	2361 / 253	Y	U			<.1		13.7	1.21		4	5									

SAMP #
1
2
3

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.

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 test and is reported in % of volume. Water by Karl Fischer ASTM D1744 test 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.

VitalTRAC™

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 oil 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.

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.** When 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.

ACCOUNT REGISTRATION FORM

I would like to receive my reports via: ❑ E-mail ❑ Fax 00000A00000 www.trackmysample.com

I would like my report comments in: ❑ English (Default) ❑ Spanish ❑ French ❑ Dutch

Customer (sample source)
Distributor/ Sales Rep
Attention
Telephone
Email Address | Fax Number
Customer's Address | City
State/Province | Postal Code | Country

GEHL

COMPONENT REGISTRATION FORM

Mandatory for first time component sampling or to make changes. Always use same unit ID on future samples.

*Account Number (If not available Account Registration Form must be completed)
DGEHLT
Complete Equipment Serial # | Equipment Manufacturer/ Model #
POSITION (if applicable): ❑Chassis ❑Left ❑Right ❑Front ❑Rear ❑Center
UNIT TYPE(check sampled component)

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

MOBILE GEAR / BEARING SYSTEM
❑ Differential BBDIF
❑ Final Drive BBFDR
❑ Planetary BBPLT
❑ Steering BBSTG
❑ Wheel Hub BGWHL
❑ Power Take-Off BBPTO
❑ Other

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

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

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

TURBINES
❑ Gas BTGST
❑ Steam BTSTM
❑ Aviation BTAVI
❑ Other

BEARINGS
❑ Sleeve BGSL
❑ Trunion BGTR
❑ Plain BGPL
❑ Journal BGJR
❑ Roller BGRL
❑ Radial Ball BGRA
❑ Tapered Roller BGTA
❑ Cylindrical Roller BGCY
❑ Spherical Roller BGSP
❑ Double Sphere BGDS
❑ Needle BGND
❑ Other

COMPRESSORS
❑ Reciprocating BCRE
❑ Rotary Screw BCRS
❑ Rotary Vane BCRV
❑ Centrifugal BCCEN
❑ Refrigeration BR
❑ Other

Unit Manufacturer | Unit Model
Application ❑ Transportation-100 ❑ Waste Handling-230 ❑ On-Shore Drilling-340 ❑ Marine-500 ❑ O-T-R Trucking-110 ❑ Agriculture-280 ❑ Off-Shore Drilling-350 ❑ Mining-600 ❑ Off-Highway-200 ❑ Power Generation-290 ❑ Plant/Industrial-400 ❑ Railroad-800 ❑ Construction-220 ❑ Gas/Oil Field-300 ❑ Utility-490 ❑ Other
Lube Manufacturer | Lube Product Name | Lube Grade ❑ SAE ❑ ISO ❑ AGMA
Filter ❑ Full-Flow-10 ❑ By-pass-11 ❑ Kidney Loop - 16 ❑ None ❑ Other
Filter Micron Rating | Sump Capacity
Specify additional testing requested
Special comments or problems?

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

PREPAID TESTING PREPAID TESTING PREPAID TESTING PREPAID TESTING PREPAID TESTING

GEHL

ADVANCED ENGINE-OIL

ACCT# DGEHLT

*Required Field
PART # 272809
866-946-1176 www.gehl.com

CUSTOMER
DISTRIBUTOR/ SALES REP
CITY STATE/PROV
PHONE
COMPLETE EQUIPMENT SERIAL #
DATE TAKEN LUBE TIME UNIT TIME
LUBE CHANGED? ❑YES ❑NO
FILTER CHANGED? ❑YES ❑NO LUBE ADDED

❑ NEW LUBE REFERENCE
* SAMPLE POINT (CHECK ONE):
❑ ENGINE OIL
❑ TRANSMISSION
❑ FINAL DRIVE
❑ DIFFERENTIAL
❑ PLANETARY
❑ HYDRAULIC
❑ TURBINE ❑ COMPRESSOR
❑ BEARING ❑ GEAR
❑ OTHER
*POSITION (IF APPLICABLE)
❑ CHASSIS ❑ CENTER
❑ LEFT ❑ RIGHT
❑ FRONT/HEAD ❑ REAR/TAIL

ORIGINAL LABEL MUST BE ON SAMPLE JAR TO AVOID DOUBLE CHARGE

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.

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 mail service for shipping samples to the laboratory.

STEP 3

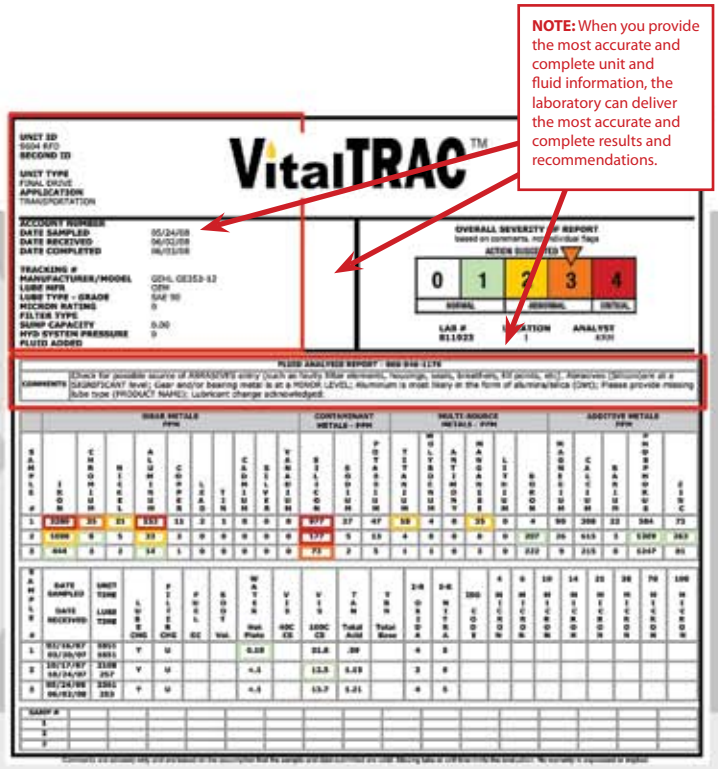
- Complete and attach the return mailer address label to the black shipping container.
- Ship by trackable mail service such as FedEx or UPS.

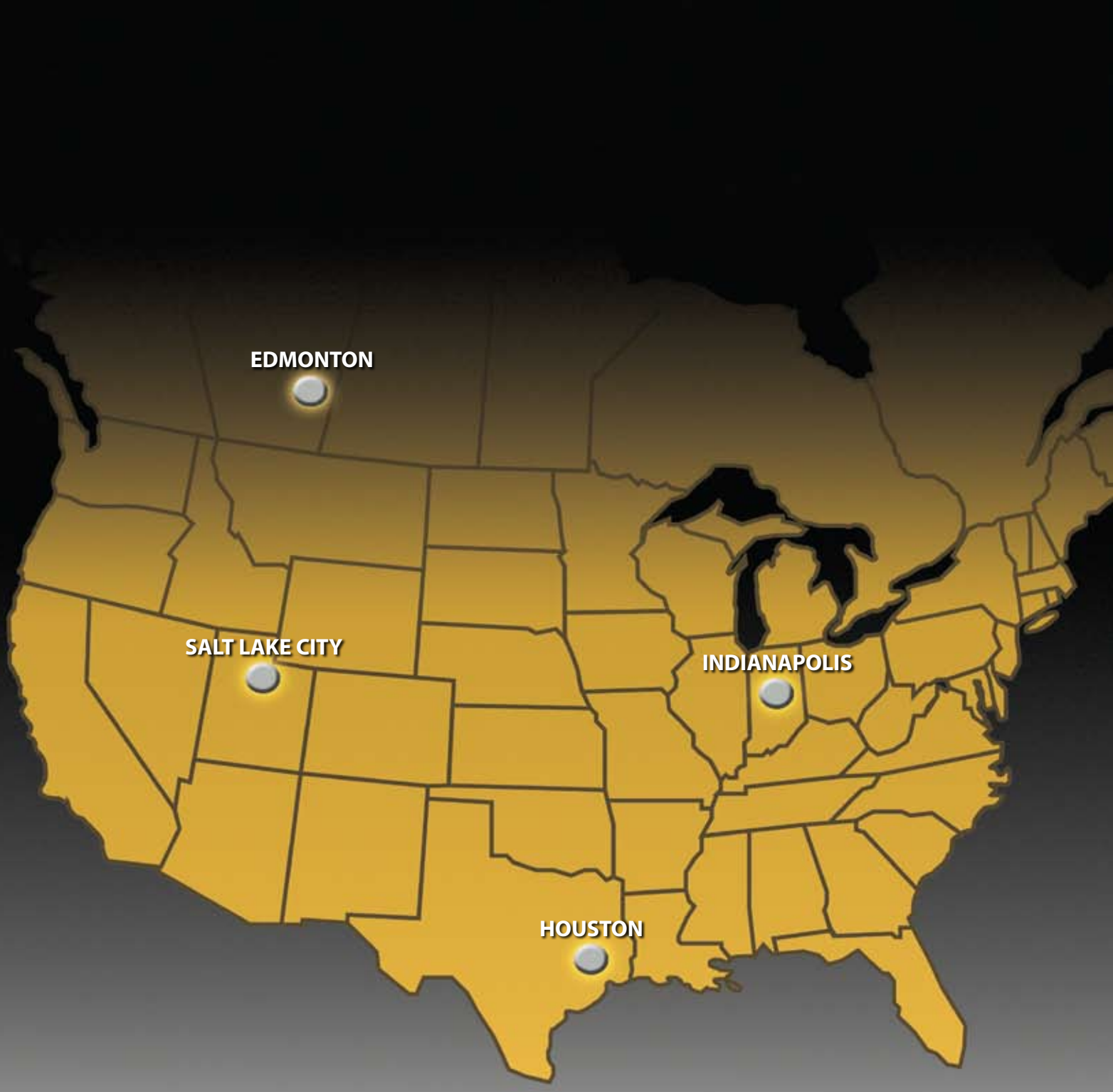
Test Reports and Data Management

Managing your fluid analysis reports allows 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.

STEP 4

- Get test results almost immediately – ***FREE***.
- Keep sampling schedules on track.
- Identify bottlenecks in sample turnaround time.
- Influence future purchasing decisions.
- Affect positive changes in your daily maintenance practices.





VitalTRAC™ Fluid Analysis Program

INDIANAPOLIS
7898 Zionsville Road
Indianapolis, IN 46268

HOUSTON
10910 W. Sam Houston Pkwy. N.
Suite 700
Houston, TX 77064-6314

SALT LAKE CITY
3060 W. California Avenue
Suite B
Salt Lake City, UT 84104

EDMONTON
5140 75th Street
Edmonton, AB T6E 6W2
Canada

GEHL®

PO Box 179
One Gehl Way
West Bend, WI 53095

262-334-9461
866-946-1176
gehl.com

GVT-450-04/10 Part# 918370

FSC