

# The Basics of Oil Analysis



What is it?

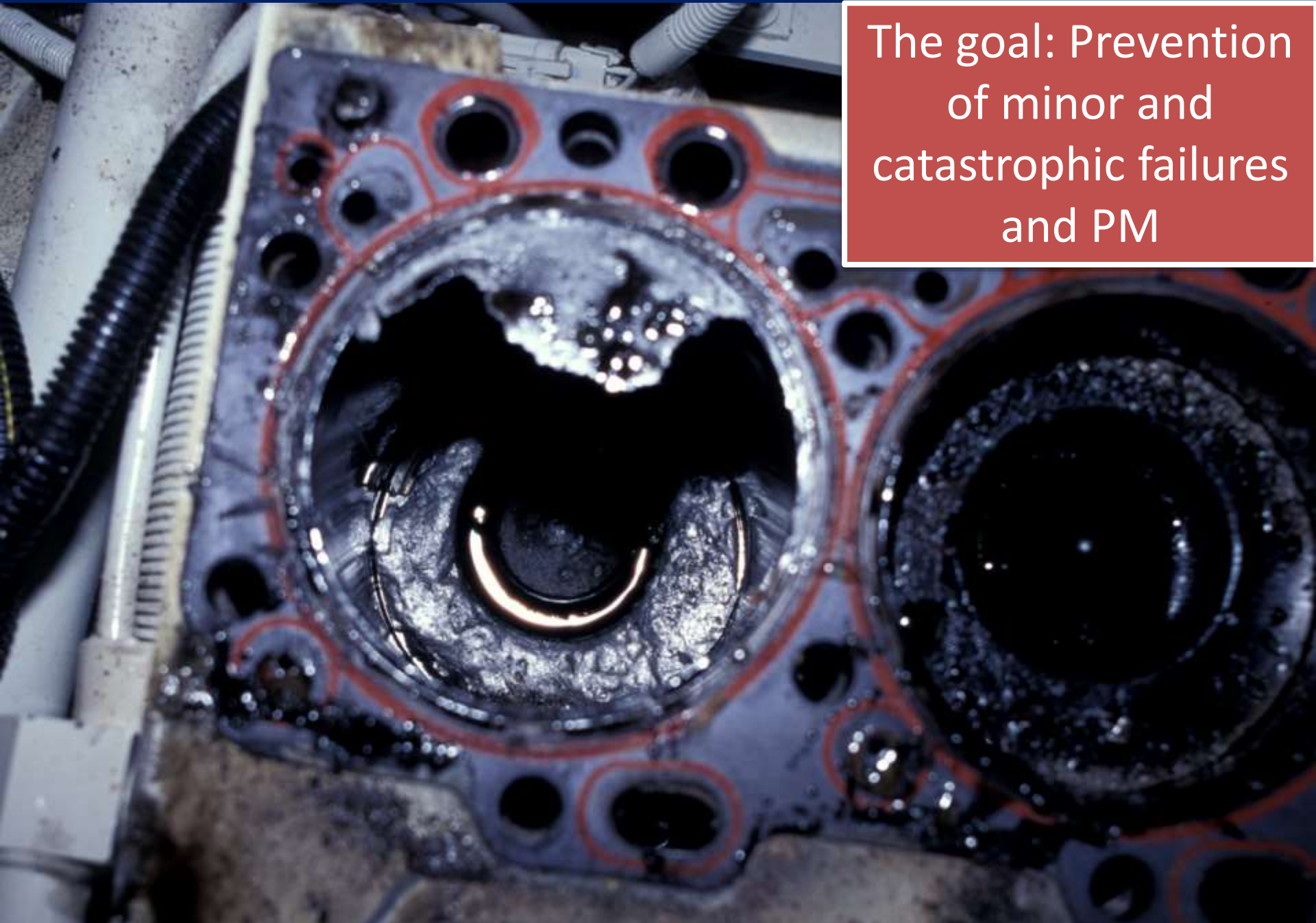
Oil or fluid analysis,  
tribology: The study of  
interfacing surfaces

Machinery blood test  
or DNA

The mechanic's crystal  
ball



The goal: Prevention  
of minor and  
catastrophic failures  
and PM



Applicable to nearly every onboard fluid, crankcase, transmission, hydraulic and coolant.





Why do it?

Enables predictive,  
condition-based  
maintenance (PM)



This presentation...



The Goal of Lab Analysis:

Predictive, proactive  
service





The refrain from many brokers and sellers...  
“One oil sample report is worthless, don’t bother”

True or False?

Single Sample vs. Trend Analysis







Don't pollute.

For regular analysis programs, include reference sample



The value of oil analysis is, however, virtually worthless if...



# Lubricant Analysis Report

877-808-3750



Overall report severity based on comments

Account Information	Component Information	Sample Information
Account Number: ONLINE Company Name: Contact: Address:  Phone Number:	Component ID: 1ZJ01206-PDR1 TRANSMISSION Secondary ID: TWIN DISC Component Type: MARINE TRANSMISSION Manufacturer: CATERPILLAR Model: <b>Missing Information</b> Application: MARINE Sump Capacity: 0 gal	Tracking Number: 11137R01247 Lab Number: I-168975 Lab Location: Indianapolis Data Analyst: EAD Sampled: 25-May-2011 Received: 31-May-2011 Completed: 01-Jun-2011
Filter Information	Miscellaneous Information	Product Information
Filter Type: <b>Missing Information</b> Micron Rating: <b>Missing Information</b>	Miscellaneous:	Product Manufacturer: CAT Product Name: CATERPILLAR SPECIAL APP. Viscosity Grade: <b>Missing Information</b>
Comments	We suggest that an Analytical Ferrogram be performed to clarify the type or wear and/or contamination that is present; LUBRICANT CHANGE is suggested if not done at sampling time. Dishing/Thrust metal is at a SIGNIFICANT LEVEL; Aluminum is at a MODERATE LEVEL; ALUMINUM source in GFAR SYSTEMS may be RUSHING/THRUST metal ALUMINA SILICA (Dirt), HOUSING metal or contamination from ALUMINUM COMPLEX GREASE; in order to properly compare data to the right standards, we need manufacturer and model of the unit, and the manufacturer, type and grade of the lubricant; Unit and/or lube TIME missing;	

Sample #	Wear Metals (ppm)								Contaminant Metals (ppm)		Multi-Source Metals (ppm)				Additive Metals (ppm)									
	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Ti	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorous	Zinc
1	53	0	0	8	163	190	1	0	0	0	11	1	0	0	0	0	0	0	9	28	2416	0	952	1069

Sample #	Sample Information						Contaminants				Fluid Properties					
	Date Sampled	Date Received	Lube Time	Unit Time	Lube Change	Lube Added	Filter Change	Fuel Dilution	Soot	Water	Viscosity 40°C	Viscosity 100°C	Acid Number	Base Number	Oxidation	Nitration
							% Vol	% vol	g Vol	cSt	cSt	mg KOH/g	mg KOH/g	abs/cm	abs/cm	
1	25-May-2011	31-May-2011		unk	Unk	Unk			<.1 - Hotplate		11.0	1.94				

Sample #	Particle Count (particles/mL)								Test Method	Particle Counter
	ISO Code based On 4.6/14	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 30 µm	> 70 µm		
1	//									30

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

Historical Comments

## Wear Metals;

24 different metals can be identified by Inductively coupled plasma or ICP analysis







Lead  
Tin  
Copper

If  
copper  
shows  
up...

# Cylinder Region Wear

Iron (cylinder)

Chrome (ring)

Aluminum (piston)



Often the result of...

Abrasives entering the  
air intake

Cracked or broken  
rings (accompanied by  
soot and fuel)

Nickel from valve  
plating





Iron: Camshafts,  
crankshafts...



Silicon and  
Aluminum  
Oxide = Dirt

Sodium =  
Seawater,  
Lube Additive

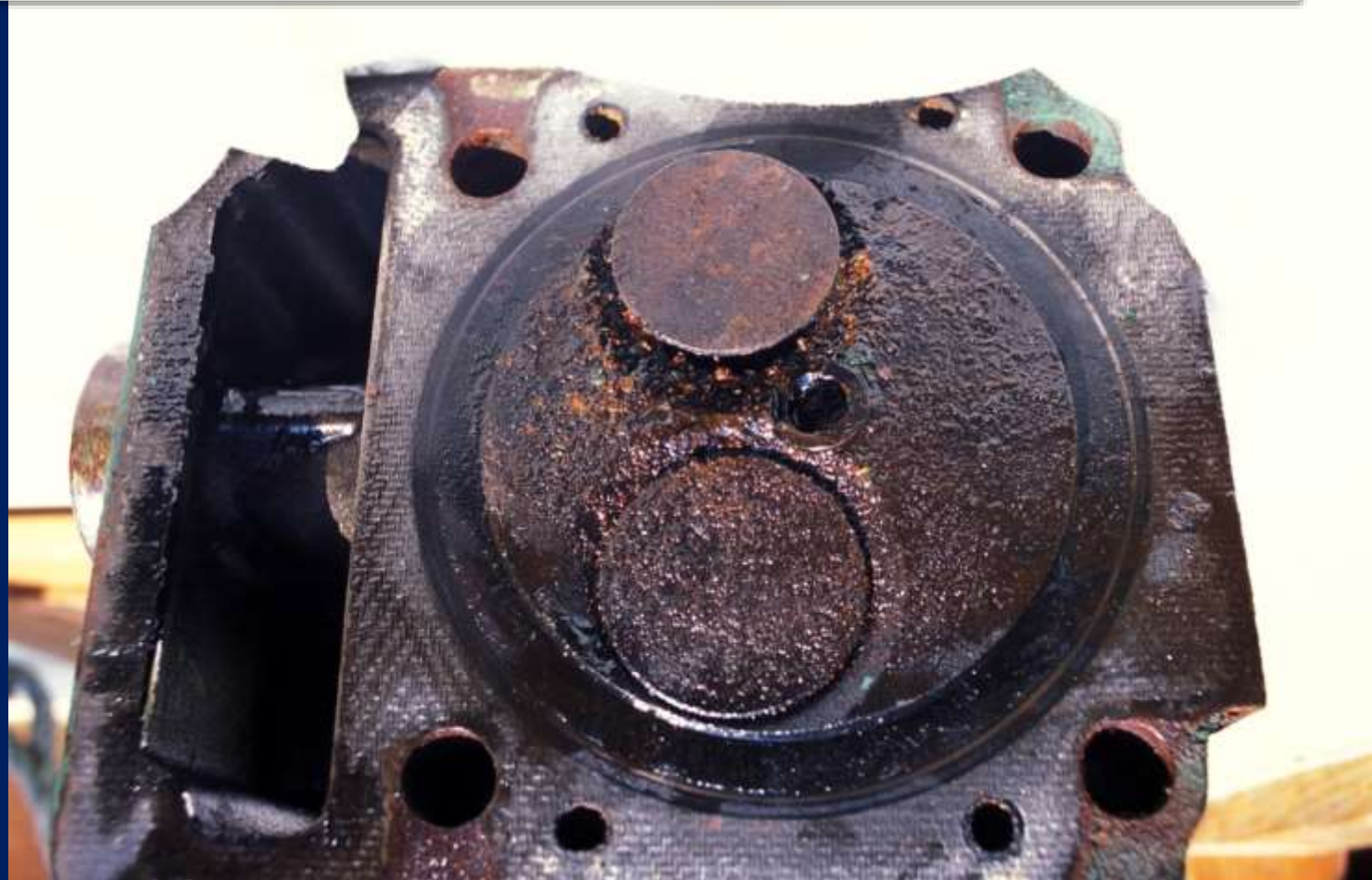
Potassium =  
Coolant





The vast majority of wear problems are related to contaminants...

Abrasives, coolant, water, acids, oxidation by-products





Coolant: One of  
the more  
destructive  
contaminants







Along with soot

- Abrasive
- Over-Fueling
- Restricted air intake
- Over-prop
- Excess BP

Multi-source Metals: Antimony, manganese, lithium

Additives: Magnesium (detergent), phosphorous & zinc/ZDDP (anti-wear)

These performance features contribute to

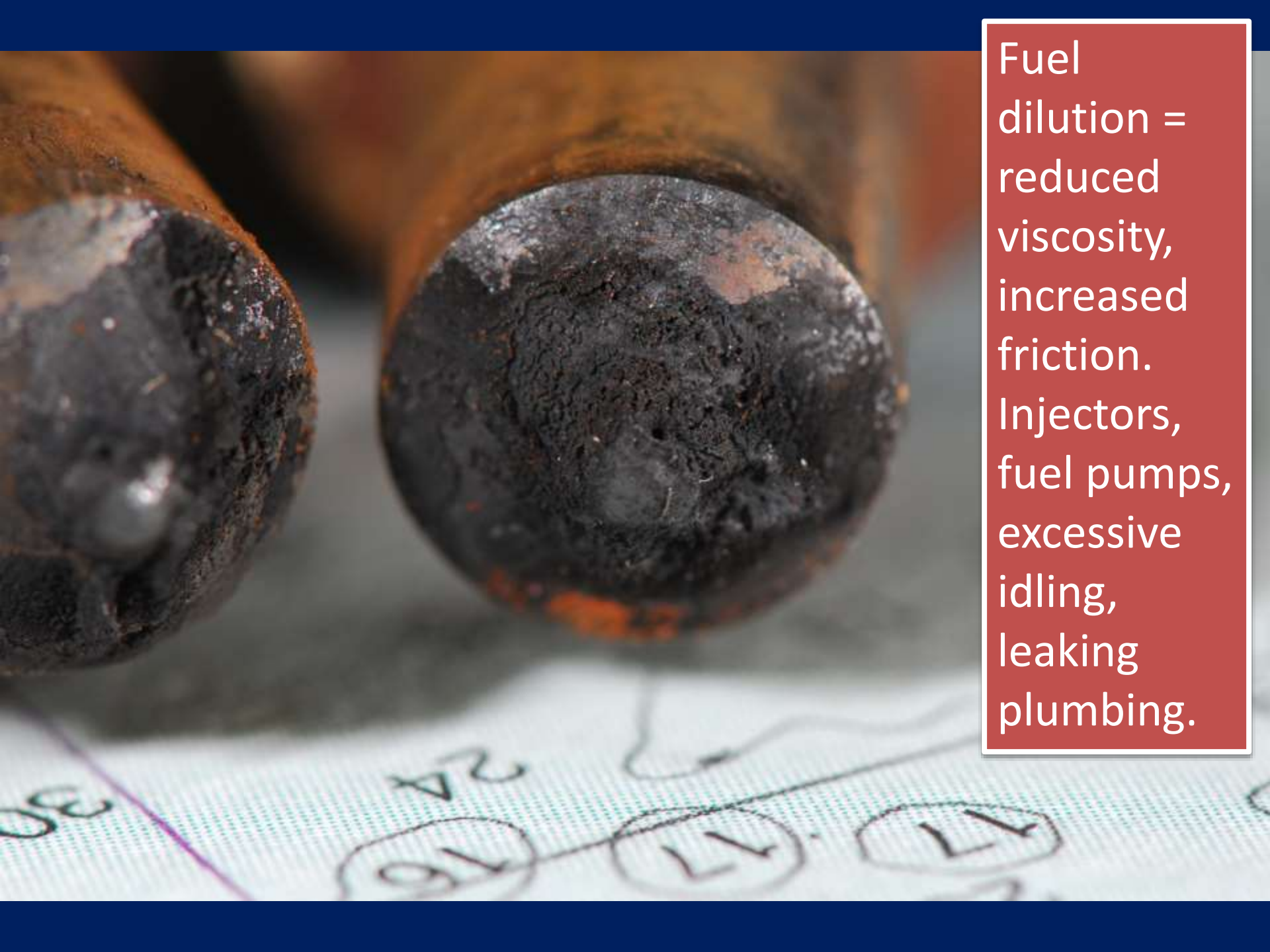
- Longer maintenance intervals
- Maximum engine life
- Lower operating costs

ROTELLA T SAE 15W-40 for diesel engines exceeds the requirements of API CI-4, CH-4, CG-4, CF-4, and CF; Caterpillar; Cummins CES 20078, 20077, 20076, and 20071; DDC/MTU 2000/4000; Detroit Diesel; John Deere; Dodge; Ford; GM; International; Mack EO-N Premium Plus, EO-N, EO-M Plus and EO-M, Volvo VDS 2 and Global DHD-1. It also exceeds API SL, SJ and SH for gasoline engines

**WARNING**

- CONTINUOUS CONTACT WITH USED MOTOR OIL HAS CAUSED SKIN CANCER IN LABORATORY ANIMALS
- AVOID EXCESSIVE CONTACT
- WASH SKIN WITH SOAP AND WATER
- LAUNDRY SOILED CLOTHES AND DISCARD OIL-SOAKED SHOES





Fuel dilution = reduced viscosity, increased friction. Injectors, fuel pumps, excessive idling, leaking plumbing.



Glycol  
Contamination:  
Increased  
viscosity, oil  
starvation,  
consumes  
additives,  
hastens  
oxidation

## Increased Oxidation:

Raises acidity/reduces base number (TBN 50% and 25% triggers)

Oxidation rate doubles with every 18° F increase in temp.

Ideal oil temp 180° F - 220° F





Sludge: Excessive under loading and cool running. ID with centrifuge and in filters.





Varnish, lacquer or  
resid, high  
temperatures or  
localized hot spots  
such as turbos.  
Caramelizing.  
Burnt or sulfurous  
smell.



Causes for sludge and varnish can be identified using analysis. Can lead to oil starvation and abrasion.

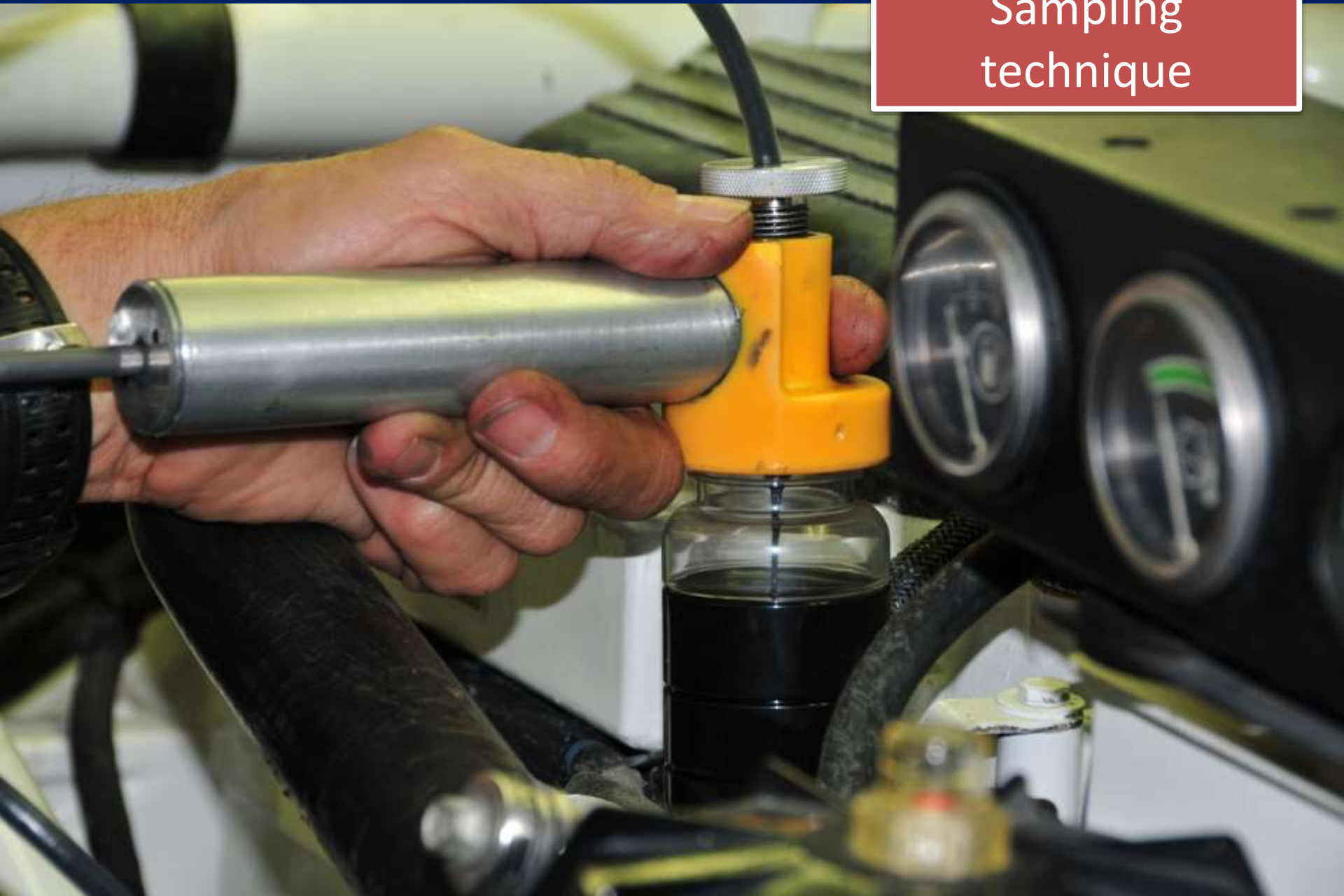


Open and inspect  
filters and screens.  
Contents can be  
analyzed by a lab.

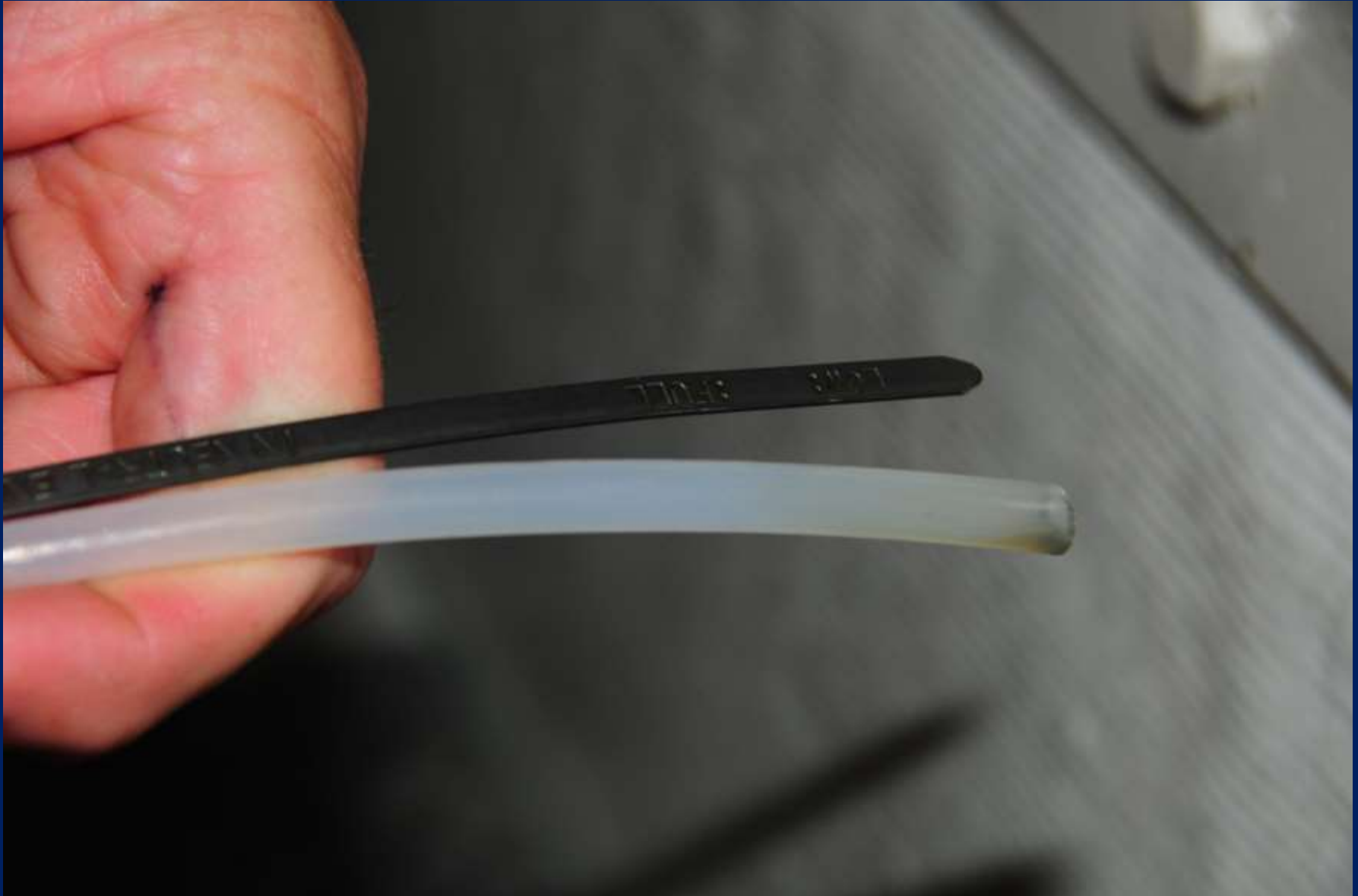




# Sampling technique



# Avoid the Drag...



## Absolute cleanliness and avoidance of cross contamination

- Do not re-use tube
- Clean pump after each sample
- Keep track of samples





Even better...

Sampling valves



Clearly label all  
containers



# Your average engine dealer oil analysis report

COMPANY NAME  
CUSTOMER/EQUIP NUM  
COMPARTMENT NAME ENGINE MARINE PORT  
SERIAL NUMBER  
MANUFACTURER CATERPILLAR  
MODEL C12  
JOB SHEET  
EXT WARR NUMBER

SHOP ORD NUM  
COMPARIAL NUM  
COMPARTMENT MODEL  
COMP MANUFACTURER  
SAMPLE LABEL NUM  
ELECTRIC HAND WEIGHT 150-40  
FLUID TYPE  
EXT WARR EXPIRE DATE

**KELLY TRACTOR**



Fluid Analysis Lab  
8255 NW 58 Street  
Miami, FL 33166-3493  
(305) 592-5374 ext 1139/1304  
www.kellytractor.com

SAMPLE TYPE: OIL

LAB CONTROL NUMBER	SAMPLE DATE	PROCESS DATE	EQUIPMENT METER	METER ON FLUID	FLUID CHANGED	MAKE UP FLUID	MAKE UP FLUID UNITS	FILTER CHANGED
D260-42028-0001	1/19/12	1/20/12	544 HR	13 HR	No			No
Wear Compartment:		ALUMINUM IS ELEVATED AND IS SOURCED TO MAIN AND ROD BEARINGS. ALL OTHER READINGS ARE NORMAL. RESAMPLE IN 25 HOURS TO MONITOR. NOTE: SAMPLE TESTED NEGATIVE FOR SALT WATER.						

Wear Metals (ppm)	Cu	Fe	Cr	Al	Pb	Ba	Si	Na	K	Mg	Mn	Ag	Ca	Mg	Zn	P
D260-42028-0001	16	52	2	11	0	0	2	4	3	16	2	3	362	267	276	187

Oil Condition / Particle Count (1/ml)	BT	OX	WT	SUL	W	A	F	V100
D260-42028-0001	6	19	9	21	5	5	5	15.8

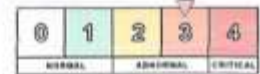
Ag = Silver, Al = Aluminum, B = Boron, Ca = Calcium, Cr = Chromium, Cu = Copper, Fe = Iron, P = Phosphorus, K = Potassium, Mg = Magnesium, Mn = Manganese, Na = Sodium, Ni = Nickel, Pb = Lead, Si = Silicon, Sn = Tin, V = Vanadium, Zn = Zinc, A = Antifreeze, F = Fuel, W = Water, P = Positive, N = Negative, T = Trace, S = Sulfate, BT = Soot, OX = Oxidation, WT = Water, SUL = Sulfation, ISO = ISO Rating, PFC = Percent Fuel Content, PQI = Particle Quantifying Index, NaCl = Salt Water, FL Pt = Flash Point, TAN = Total Acid Number, TBN = Total Base Number, HD = Karl Fisher result, V100 = Viscosity@100C, V40 = Viscosity@40C

Notice: This analysis is intended as an aid in predicting mechanical wear. No guarantee, expressed or implied, is made against failure of this piece of equipment or a component thereof.



# Aftermarket Analysis Report

- Detail, interpretation and readability
- Chain of custody for warranty issues



Overall report severity based on comments.

Account Information	Component Information	Sample Information
Account Number: ONLINE-1263-0000 Company Name: LAURENCE HALL Contact: LAURENCE HALL Address: 102 YACHT HARBOR DRIVE PALM COAST, FL 32137 US Phone Number:	Component ID: STBD TRANSMISSION Secondary ID: Component Type: HYDROSTATIC TRANSMISSION Manufacturer: NEWAGE Model: PRM 750D Application: MARINE Sump Capacity: 3	Tracking Number: 11019J01987 Lab Number: A-022770 Lab Location: Atlanta Data Analyst: KMS Sampled: 18-Jun-2011 Received: 22-Jun-2011 Completed: 24-Jun-2011
Filter Information	Miscellaneous Information	Product Information
Filter Type: NONE Micron Rating: 0	Miscellaneous:	Product Manufacturer: SHELL Product Name: ROTELLA Viscosity Grade: SAE 30
Comments	Check for source of water contamination (SEALS, BREATHERS, FILL PORTS). Water is at a SIGNIFICANT LEVEL. Lubricant change is suggested if not done at sampling time; Particle count precluded or invalid due to water contamination; Iron is at a MINOR LEVEL; IRON in hydraulic systems could possibly be pistons/rods (if piston pump), gears or bearings (if gear pump), or fluid conductors such as piping, tubing or steel fittings; Copper is at a MINOR LEVEL; COPPER sources in hydraulic systems can be from BUSHING/THRUST metal, LUBE COOLER metal (as applicable), PISTON SHOE metal (as applicable); Flagged additive levels are different than what should be present for the lubricant that is identified for this unit. (This does not imply that the lubricant does not meet proper API, SAE, or ISO classifications.); Unit hours/miles/kilometers conflicts with time from previous sample;	

Sample #	Wear Metals (ppm)										Contaminant Metals (ppm)		Multi-Source Metals (ppm)				Additive Metals (ppm)							
	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorous	Zinc
1	55	0	0	1	76	0	0	0	0	0	7	2	0	0	121	0	0	0	64	13	2785	0	1220	1254
2	91	0	0	1	112	0	0	0	0	5	3	4	0	110	0	0	0	151	6	2081	0	956	1143	

Sample #	Sample Information							Contaminants				Fluid Properties				
	Date Sampled	Date Received	Lube Time	Unit Time	Lube Change	Lube Added	Filter Change	Fuel Dilution % Vol	Soot % Vol	Water % Vol	Viscosity 40°C cSt	Viscosity 100 °C cSt	Acid Number mg KOH/g	Base Number mg KOH/g	Oxidation abs/cm³hrs/cm³	Nitration
1	11-Nov-2007	19-Nov-2007	25	1332	Yes	1	Unit				<.1 - Hotplate	12.0	2.29			
2	18-Jun-2011	22-Jun-2011	90	1232	No		No				0.1 - Hotplate	11.1	2.20			

Sample #	Particle Count (particles/ml)									Additional Testing		
	ISO Code Based On 4/6/14	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	Test Method		
1												
2	26 / 25 / 19	8047	31194	28206	2817	309	21	2	0	Laser		

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

# Jar label and component registration form. Garbage in...

## How to Use the POLARIS Integrated Sample Label & CRF

1. Fill out  
Component  
Registration  
Form for first  
time samples or  
changes.

2. Fill out sample  
label information  
accurately and  
completely. For  
the most in-depth  
analysis, include  
ALL unit, fluid and  
customer  
information. Retain  
tracking number  
stub for  
your records.

3. Select mailing  
label for the  
laboratory  
closest to you.

All **customer and equipment** information must be accurate and complete, including name, account number, address, phone. More in-depth analysis is possible when the analyst knows the time on both the unit and the fluid and whether the fluid has been changed or "sweetened" since last sampled. Asterisks denote required fields.

POLARIS LABORATORIES  
3000 W. GARDEN GROVE ROAD  
SUITE 100  
CORTONA, INDIANAPOLIS, IN 46204-4001

POLARIS LABORATORIES  
7815 TOWNHILL ROAD  
PALESTINE, INDIANAPOLIS, IN 46207

POLARIS LABORATORIES  
5950 CALVERT BLVD, SUITE 200  
PALESTINE, INDIANAPOLIS, IN 46204

POLARIS LABORATORIES  
8100 W. 10TH AVENUE  
MARIETTA, GA 30067

Place Tracking Number Stub in  
Mailing Label  
www.trackmysample.com

Upon completing all necessary information on the integrated label, place the sample label on the sample bottle. Place the sample bottle inside the black mailer and place the appropriate address label for the laboratory location of your choice on the mailer. **Always use a trackable shipping service when sending samples to the laboratory.**

A **barcode and unique tracking number** is pre-printed on the sample label and appears on the Component Registration Form. Fill in the Unit ID on the removable tracking number sticker and retain for your records. Reference this number when contacting the laboratory with questions or comments or to obtain sample status at [www.trackmysample.com](http://www.trackmysample.com).

To ensure proper testing and accurate analysis always provide the laboratory with **detailed equipment information**. The type of unit—compressor, gearbox, engine, etc., influences flagging parameters. Different metallurgies require different lubrication and have great impact on how results are interpreted, as do application (operating environment) lube type, grade and manufacturer and filter type and micron rating.

Use the form's **Special Comments or Problems** section when providing information not listed on the Component Registration Form or sample label.

For further information visit [www.polarislabs.com](http://www.polarislabs.com) or call 877-808-3750

Overall report severity based on comments.

Account Information	Component Information	Sample Information
Account Number: ONLINE-1390-0000 Company Name: WILLIAM BRUBAKER Contact: Address: 63A MARINERS POINT LANE HARTFIELD, VA 23071 US Phone Number: 703-795-0085	Component ID: ENGINA MUSTANG E Secondary ID: SYNTHETIC ENGINA 5W20 Component Type: UNLEADED GASOLINE ENGINE Manufacturer: <i>Missing Information</i> Model: <i>Missing Information</i> Application: TRANSPORTATION Sump Capacity: 6 qt	Tracking Number: 13218U06397 Lab Number: 1-547081 Lab Location: Indianapolis Data Analyst: AC Sampled: 07-Aug-2013 Received: 12-Aug-2013 Completed: 13-Aug-2013
Filter Information	Miscellaneous Information	Product Information
Filter Type: FULLFLOW Micron Rating: 15		Product Manufacturer: AMSOIL Product Name: Viscosity Grade: SAE 5W20
Comments	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Copper is at a MINOR LEVEL. Please provide COMPONENT MANUFACTURER and MODEL to compare data to the correct standards for this component. Please provide missing FLUID PRODUCT NAME to compare data to the correct standards.	

Sample #	Wear Metals (ppm)							Contaminant Metals (ppm)		Multi-Source Metals (ppm)				Additive Metals (ppm)										
	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorous	Zinc
1	31	0	1	1	83	0	0	0	0	0	12	8	2	0	79	0	6	0	51	11	2418	0	665	799

Sample #	Sample Information						Contaminants			Fluid Properties						
	Date Sampled	Date Received	Lube Time	Unit Time	Lube Change	Lube Added	Filter Change	Fuel Dilution	Soot	Water	Viscosity 40°C	Viscosity 100 °C	Acid Number	Base Number	Oxidation	Nitration
1	07-Aug-2013	12-Aug-2013	31650	6300	Unk	0	Unk	<1 - Estimate	<1	<1 - FTIR	cSt	cSt	mg KOH/g	mg KOH/g	abs/cm	abs/0.1 mm

Sample #	Particle Count (particles/mL)									Additional Testing		
	ISO Code Based On 4/6/14	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	Test Method		
1	#											

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

Historical Comments

Lube time  
31650  
Unit time 6300

Review all information on reports

Seemingly small errors can have a huge impact on the results

Incorrect or missing information...



Overall report severity based on comments.

After corrections  
(same sample)...

Account Information	Component Information	Sample Information
Account Number: ONLINE-1390-0000 Company Name: WILLIAM BRUBAKER Contact: Address: 63A MARINERS POINT LANE HARTFIELD, VA 23071 US Phone Number: 703-795-0085	Component ID: ENGINE MUSTANG E Secondary ID: SYNTHETIC ENGINE OIL 5W20 Component Type: UNLEADED GASOLINE ENGINE Manufacturer: FORD Model: 4.6L Application: TRANSPORTATION Sump Capacity: 6 qt	Tracking Number: 13218U06397 Lab Number: I-547081 Lab Location: Indianapolis Data Analyst: RNM Sampled: 07-Aug-2013 Received: 12-Aug-2013 Completed: 13-Aug-2013
Filter Information	Miscellaneous Information	Product Information
Filter Type: FULLFLOW Micron Rating: 15		Product Manufacturer: AMSOIL Product Name: ALM SIGNATURE SERIES SYN MOTOR Viscosity Grade: SAE 5W20
Comments:	LUBRICANT and FILTER CHANGE is suggested if not done at sampling time. Base number is below acceptable minimum; Copper is at a MODERATE LEVEL; Most of the COPPER may be from fuel lines or similar tubing; Flagged additive levels are lower than expected for the lubricant that is identified. (This does not imply that the lubricant does not meet proper API, SAE or ISO classifications.); Sample information has been added or tests have been rerun or additional testing was added and the report has been regenerated;	

Sample #	Wear Metals (ppm)							Contaminant Metals (ppm)				Multi-Source Metals (ppm)				Additive Metals (ppm)							
	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorous
1	31	0	1	3	83	0	0	0	0	12	8	2	0	79	0	6	0	51	11	2418	0	665	799

Sample #	Sample Information							Contaminants			Fluid Properties					
	Date Sampled	Date Received	Lube Time	Unit Time	Lube Change	Lube Added	Filter Change	Fuel Dilution	Soot	Water	Viscosity 40°C	Viscosity 100°C	Acid Number	Base Number	Oxidation	Nitration
1	07-Aug-2013	12-Aug-2013	6300	31650	UNK	0	UNK	<1 - Estimate	<.1	<.1 - FTIR	cSt	cSt	mg KOH/g	mg KOH/g	abs/cm	abs/0.1 mm

Sample #	Particle Count (particles/mL)										Additional Testing	
	ISO Code	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	Test Method	TBN	
1	//											

Comments are advisory only and are based on the assumption that the sample and data submitted are valid. Missing fluid or component information limits the evaluation. No warranty is

Historical Comments

TBN 2.5 The most common cause of oil "death" in engines without problems

Trend analysis for multiple samples with same lab

Value of reference samples

Account Information	Component Information	Sample Information
Account Number: ONLINE-1263-0000 Company Name: LAURENCE HALL Contact: LAURENCE HALL Address: 102 YACHT HARBOR DRIVE PALM COAST, FL 32137 US Phone Number:	Component ID: STBD TRANSMISSION Secondary ID: Component Type: HYDROSTATIC TRANSMISSION Manufacturer: NEWAGE Model: PRM 750D Application: MARINE Sump Capacity: 3	Tracking Number: 11019J01987 Lab Number: A-022770 Lab Location: Atlanta Data Analyst: KMS Sampled: 18-Jun-2011 Received: 22-Jun-2011 Completed: 24-Jun-2011
Filter Information	Miscellaneous Information	Product Information
Filter Type: NONE Micron Rating: 0	Miscellaneous:	Product Manufacturer: SHELL Product Name: ROTELLA Viscosity Grade: SAE 30
Comments	Check for source of water contamination (SEALS, BREATHERS, FILL PORTS): Water is at a SIGNIFICANT LEVEL; Lubricant change is suggested if not done at sampling time; Particle count precluded or invalid due to water contamination; Iron is at a MINOR LEVEL; IRON in hydraulic systems could possibly be pistons/rods (if piston pump), gears or bearings (if gear pump), or fluid conductors such as piping, tubing or steel fittings; Copper is at a MINOR LEVEL; COPPER sources in hydraulic systems can be from BUSHING/THRUST metal, LUBE COOLER metal (as applicable), PISTON SHOE metal (as applicable); Flagged additive levels are different than what should be present for the lubricant that is identified for this unit. (This does not imply that the lubricant does not meet proper API, SAE, or ISO classifications.); Unit hours/miles/kilometers conflicts with time from previous sample;	

Sample #	Wear Metals (ppm)										Contaminant Metals (ppm)		Multi-Source Metals (ppm)				Additive Metals (ppm)							
	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorous	Zinc
1	55	0	0	1	76	0	0	0	0	0	7	2	0	0	121	0	0	0	64	13	2785	0	1220	1294
2	91	0	0	1	112	0	0	0	0	5	3	4	0	110	0	0	0	151	6	3081	0	956	1145	

Sample #	Sample Information								Contaminants			Fluid Properties					
	Date Sampled	Date Received	Lube Time	Unit Time	Lube Change	Lube Added	Filter Change	Fuel Dilution	Sect	Water	Viscosity 40°C	Viscosity 100 °C	Acid Number	Base Number	Oxidation	Nitration	
1	11-Nov-2007	19-Nov-2007	25	1352	Yes	1	Unk	% Vol	% Vol	% Vol	cSt	cSt	mg KOH/g	mg KOH/g	abs/cm	abs/cm	
2	18-Jun-2011	22-Jun-2011	90	1232	No					<.1 - Hotplate		12.0	2.29				
										0.1 - Hotplate		11.1	2.20				

Sample #	ISO Code Based On 4/6/14	Particle Count (particles/mL)								Test Method
		> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	
1										
2	26 / 25 / 19	4098	2339	28206	2817	309	21	2	0	Laser

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

# Most labs provide guidance on interpretation of reports, some offer training

## Technical Bulletin

A POLARIS Laboratories Publication



Vol. 1, No. 2

### How to Read the POLARIS Oil Analysis Report

Reading an oil analysis report can be an overwhelming and sometimes seemingly impossible task without an understanding of the basic fundamentals for interpreting laboratory results and recommendations. Referring to the report descriptions and explanations below will help you better understand your results and, ultimately, better manage a productive, cost-saving reliability program.



#### 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. **Know your equipment and share this information with your laboratory.** 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.

**Severity Status Levels:**

- 8 - Normal
- 7 - At least one or more items have violated initial flagging points yet are still considered minor.
- 6 - A trend is developing.
- 5 - Sample maintenance and/or diagnostics are recommended.
- 4 - Filter is critical if maintenance not performed.
- 3 - Occasionally, a test result can violate the SA excessive level. But, if there is no supporting data or a clear indicator of what is actually happening within the unit, maintenance action may not be recommended. Customer may be asked to investigate all possible contamination sources, shorten sampling intervals, or simply monitor the situation very closely.

Make note of the difference between the Date Sampled and the Date Received by the lab. Turnaround times may point to storing samples too long before making or mail service problems.

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

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

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

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

Lube Manufacturer, Type and Grade identifies 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.

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

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.

The laboratory at which testing was completed is denoted by an I for Indianapolis and an H for Houston. The following Lab # is assigned to the sample soon entry for processing and should be the reference number used when notifying the lab with questions or concerns.

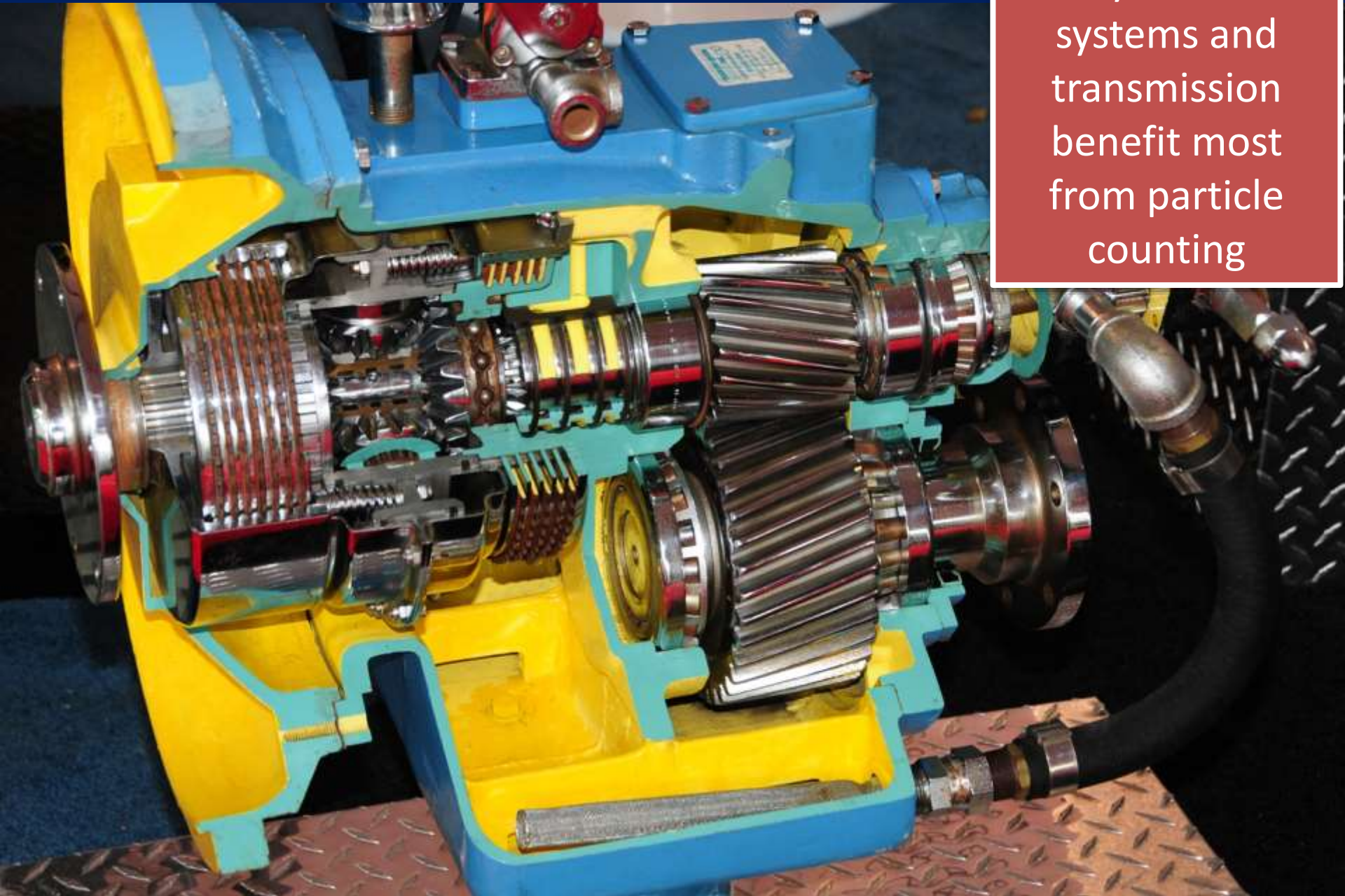
Customer Account Number

Data Analyst Initials

UNIT ID:	01234		POLARIS HORIZON		MFL		NEW REPORT	
SECOND ID:	NEWEST PART NUMBER							
UNIT TYPE:	CENTRIFUGAL		EXHAUST					
APPLICATION:	LUBE FLUID		MIR					
LUBE TYPE:	HC1124	SUMP CAPACITY:	0000	LUBE TIME:	01/20/2005	SEVERITY:	8	
GRADE:	150-63	HYD SYS PRES:	0000	DATE REC.:	01/20/2005	ACCOUNT No.:		
FILTER TYPE:	None	MICRON RATING:	000	DATE COMP.:	01/20/2005	Loc Lab No.:	73010	IA



Hydraulic systems and transmission benefit most from particle counting





Catching  
problems  
like this...



And this...





## Keys to oil analysis success

- Accurate sampling and equip. data
- Report interpretation



[www.stevedmarine.com](http://www.stevedmarine.com)



Thank You

Poet  
TRANS

WATER RESISTANT  
Kernan  
Baltimore, MD  
21201  
706-880-8  
333  
333

STBD  
TRANS

Barcode



IF1 L8

used oil to conserve resources. Return  
bottle is recyclable.

API SERVICE  
SJ, SH  
ILSAC GF-2





s Don't pollute.



# MARINE TRANSMISSION LUBRICANT

OIL SERVICE CLASS - USE S.A.E.- API SERVICE CLASS CD ENGINE OIL CERTIFIED BY VENDOR TO, PASS TO-2 OIL TEST.

ALSO APPROVED ARE S.A.E.-API SERVICE CLASS CC ENGINE OIL, MIL-L-2104B, AND TRANSMISSION FLUID TYPE C-3.

VISCOSITY - BASE SELECTION ON SUMP OIL TEMP, CONDITIONS TABULATED BELOW:

START UP	STEADY OPERATION	VISCOSITY
32°F MIN. (0°C)	150°-185°F (65°-85°C)	S.A.E. N° 30
32°F MIN. (0°C)	175°-210°F (80°-100°C)	S.A.E. N° 40

STEADY OPERATION BELOW 150°F (65°C) OR ABOVE 210°F (100°C) IS NOT RECOMMENDED.

## TWIN DISC

INTERNATIONAL S.A.  
B-1400 NIVELLES-BELGIUM

B 2411

MODEL N° 70-050  
B.O.M. N°



RATIO





M E  
CAT

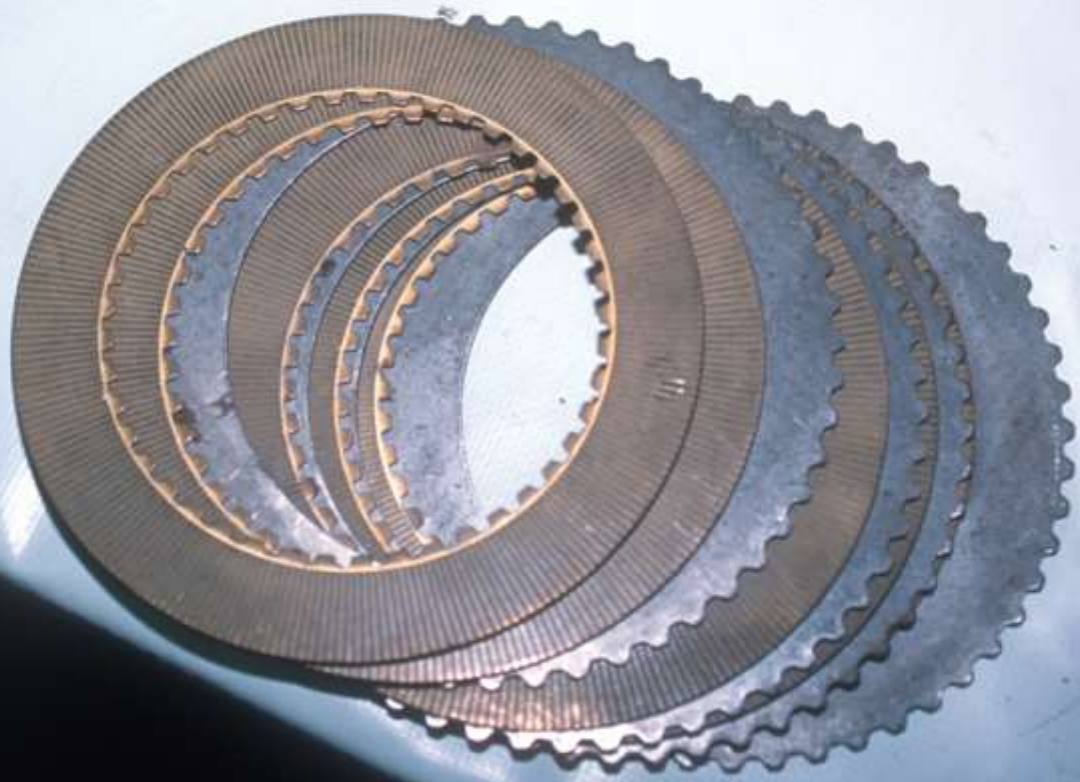
150  
00121100

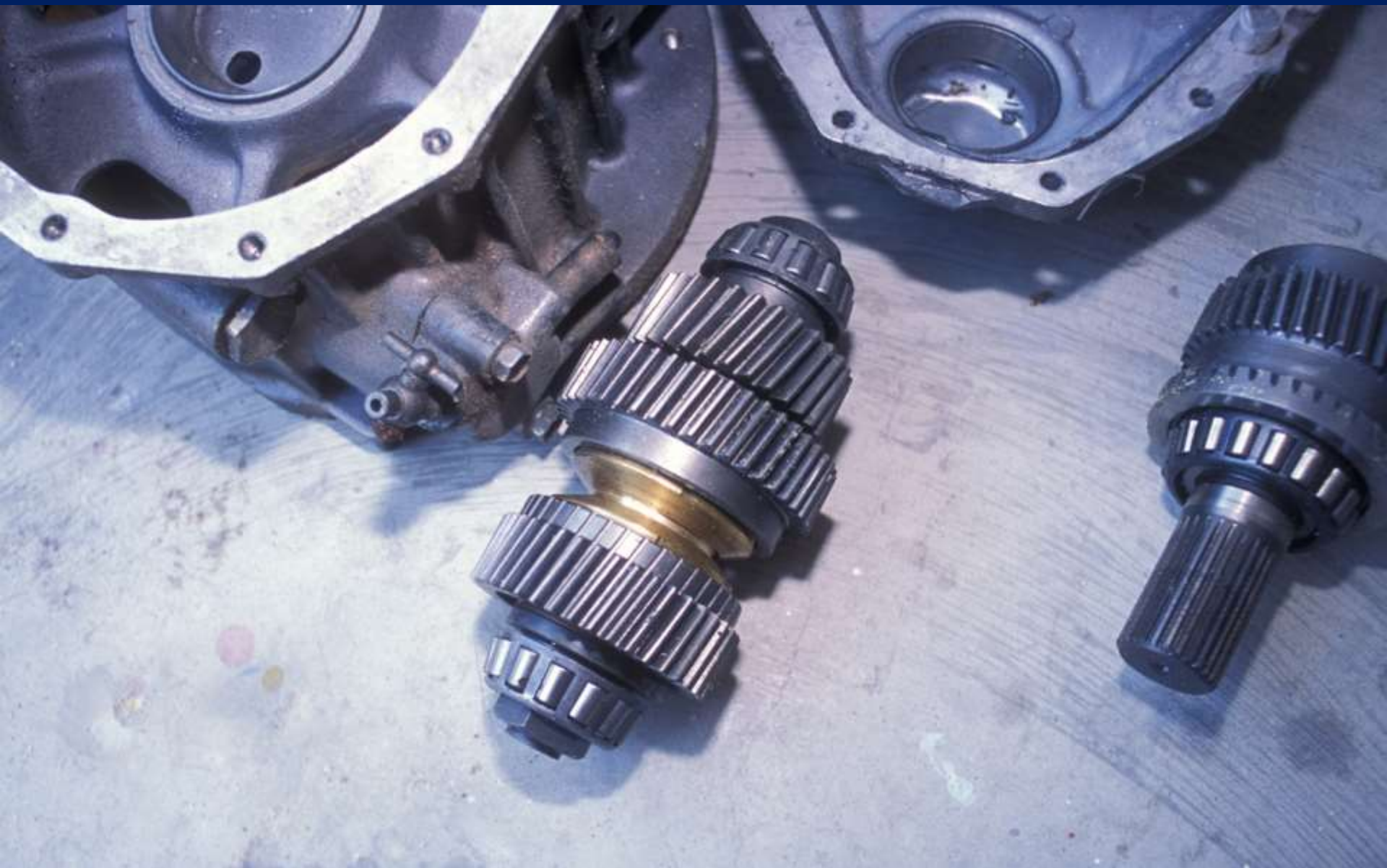




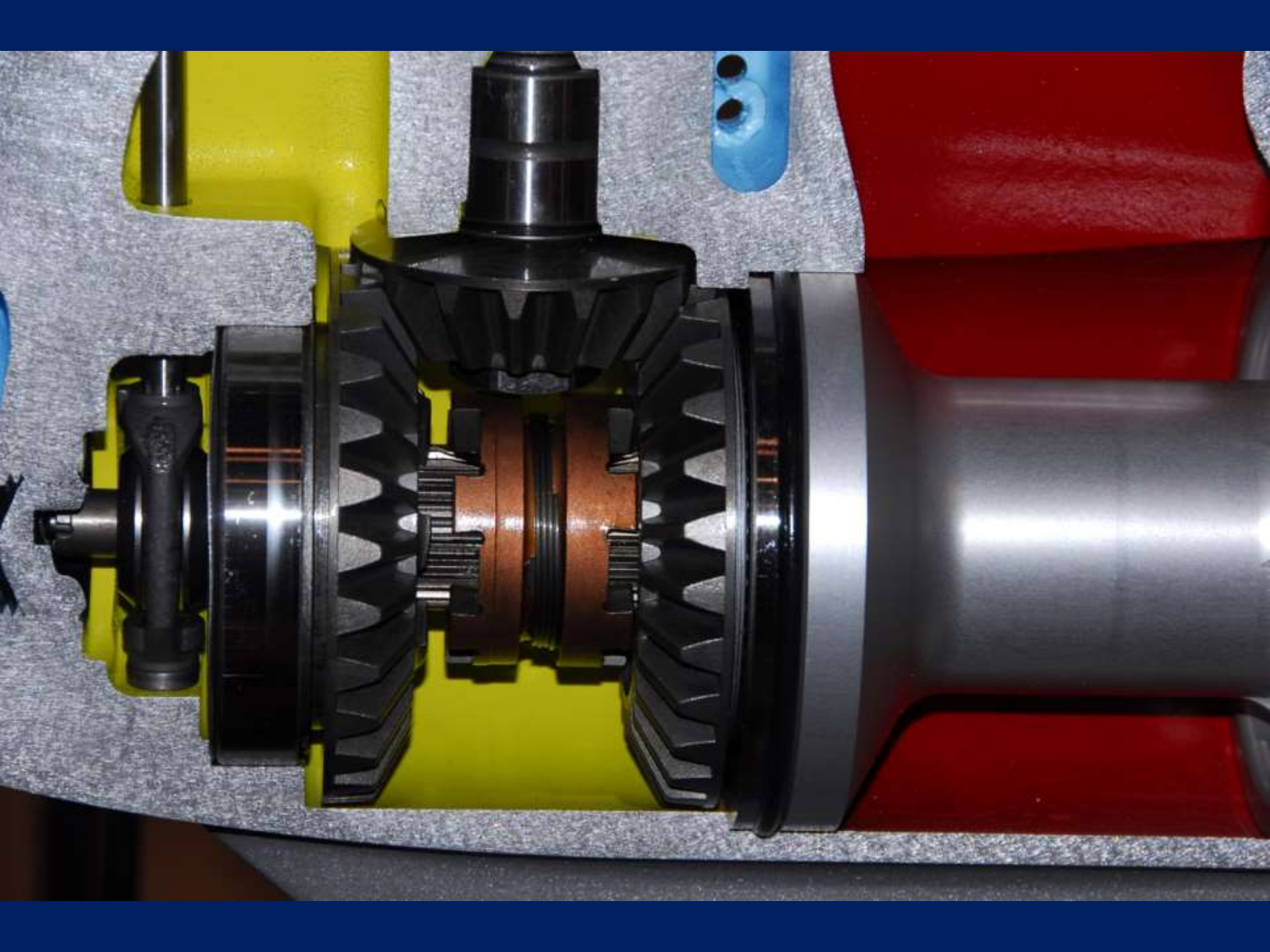


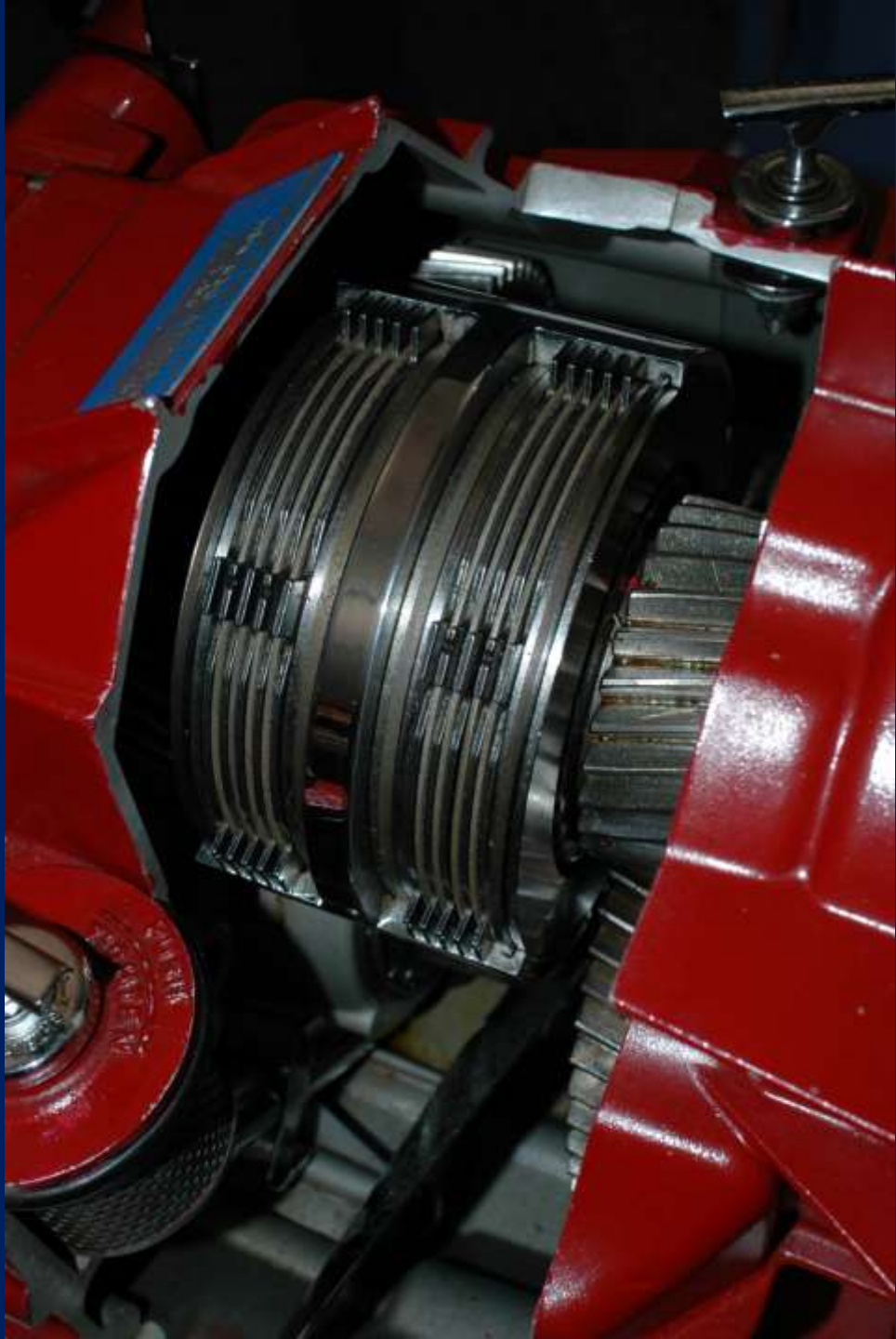


















**Analysis Request Form**  
(To be retained by client)

KIT REF 11433622

Date Sample Mailed	8 MAY 13	Machine ID	ACRYT 1116
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www.yachtsamples.com



**Analysis Request Form**  
(To be retained by client)

KIT REF 11433622

**CUSTOMER DETAILS** (Return Address)

Yacht Name	LADAGIU	Contact 1	
Management Company		Contact 2	
Address		Tel No.	
Country		Email	
		Postcode	

**EQUIPMENT DETAILS** (If or first sample complete all details - for subsequent samples complete Unique No field only)

Unique No (See previous report for this number)	06201532865
Machine ID*	MTU GM SP1135 60
Unique designation used to identify the machine - must be consistent for trending	
Model*	MTU GM SP1135 60
Make*	MTU

**SYSTEM SAMPLED**

Main Engine	ACRYT	Fuel Separator	
Auxiliary Engine		Bow Thruster	
Auxiliary Hydraulics		Stabilisers	
Gearbox System		Steering Gear	
Engine Coolant		Stern Tube System	
Fuel		Air Compressors	
Other (Please State)		Other (Please State)	

**LUBE OIL DETAILS**

Brand	?	Grade	15/40
Unit Age (Hrs)	1887 HRS	Oil Age (Hrs)	9 HRS
Was oil changed at time of sampling?		Yes	No
Was oil topped up?		Yes	No X

**SAMPLE DETAILS**

Sample Date	8 MAY 13	Reason for Sampling	Routine	Special
Comments				
Customer Name		Customer Site		

