Reading a Sample Report

1

Customer Information:
Specifies the customer and contact information of the company or individual who submitted the sample for analysis.

2

Component Information:
Specifies the component ID for the equipment identification. Also Specifies component type (application, manufacturer, and fluid type) supplied by the customer.

3

Severity Status Levels:
Indicates the status of severity of the submitted fluid sample*

Severity 0 (Normal) = Continue maintainence and sampling at normal intervals.

Severity 1 (Reportable) = Continue maintainence and sampling at normal internals. Observe for trends in future testing.

Severity 2 (Abnormal) = Sampling and maintainence of fluid should be shortened to half internals.

Severity 3 (Critical) = Fluid should be changed, filtered or serviced along with filters.

* These particular statuses are specific to engine oil samples, but often reflect the lab's recommendations for other fluids.

4 **Sample Information:**
Indentifies the location of the dates the sample was recieved and sampled, meter readings on fluid and on component, as well as the Lab/Sample ID.

5 **Analyst's Comments:**
Recommended actions for rectifying any significant changes in the fluid or units condition are listed there. Reviewing these comments prior to looking at the test results will often provide a better road map to the reports information.

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technologies group L.L.C.

3 **Overall Severity of Sample**

0	1	2	3
Normal	Reportable	Abnormal	Critical

1 **Customer Information**

Customer: Petroleum Technologies Group
Attention: James Kraft
Address: 1692 Sample Dr Grand Rapids, MI 49315
Email: customerservice@oil-lab.com

2 **Component Information**

Unit Name: Caddy-40165703
Manufacturer: Cadillac
Unit Type: Engine
Oil Type: Mobil 1 Extended Performance 5W-20

Element Key

Cu Copper	**Fe** Iron	**Cr** Chromium	**Al** Aluminum	**Pb** Lead	**Sn** Tin	**Si** Silicon	**Ca** Calcium	**Mg** Magnesium
Zn Zinc	**P** Phosphorus	**Mo** Molybdenum	**B** Boron	**Ag** Silver	**Ni** Nickel	**Na** Sodium	**K** Potassium	

4 5

Sample Information						ASTM D5185 Metals in Used Lubricating Oils by ICP-AES Results (ppm)																
Lab ID	Quarts/Gal	Hours/Miles	Meter	Date Received	Date Sampled	Cu	Fe	Cr	Al	Pb	Sn	Si	Ca	Mg	Zn	P	Mo	B	Ag	Ni	Na	K
1436733	0	3000	210215		2020-03-11	30	29	0	30	2	0	16	1102	510	830	659	80	32	0	1	1	2
Job ID:			Comments: Copper and tin appear high. This shows excessive metal in th eoil and possible internal wear. The viscosity is slightly low for the listed oil type. We suggest changing the oil at this time. Ensure correct oil is in use. Recommend re-sample this unit at a short interval.																			
1432552	0	[illegible]	204260	2019-09-30	2019-09-28	2	17	1	35	1	0	17	1273	780	898	788	82	56	0	0	3	1
Job ID:			Comments: In Progress																			
1432553	0	0	202759	2019-09-30	2019-08-07	2	15	1	31	1	0	17	1308	740	910	799	78	57	0	0	4	1
Job ID:			Comments: In Progress... [Open sample online for full comment]																			
1417831	0	0	201000	2019-07-11	2019-07-10	2	24	1	38	0	0	20	1594	507	962	876	59	49	0	0	9	0
Job ID:			Comments: Aluminum appears high. This shows possible cylinder wear. Check the engine for excessive crankcase pressure. Check for oil consumption. Change oil and... [Open sample online for full comment]																			

FTIR Analysis										ASTM D445 Viscosity CSt (C)		Particle Count (ISO 4402, 4406; particles per 1mL)							
Lab ID	Oxidation A/cm	Nitration A/cm	Sulfation A/cm	Water %	Antifreeze Pos/Neg	Fuel %	Soot %	TBN mg KOH/g	TAN mg KOH/g	100c	40c	ISO Class Code	4µ	6µ	10µ	14µ	25µ	50µ	100µ
1436733	6	15	12	0.1	No	1.2	0.5			10.5	0		0	0	0	0	0	0	0
1432552	5	17	14	0.1	No	0	0.2			7.7	0								
1432553	5	16	13	0.1	No	0	0.2			8	0								
1417831	7	17	13	0.1	No	0	0.2			9.1	0								

Petroleum Technologies Group
James Kraft
1692 Sample Dr Grand Rapids, MI 49315

Petroleum Technologies | P.O. Box 8725 | Grand Rapids, MI 49518 | 616/698-9399 Fax 616/698-9395

Lubricating Oil Analysis Report

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Reading a Sample Report

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

ASTM D5185 Metals in Used Lubricating Oils by ICP-AES Results (ppm)																
Cu	Fe	Cr	Al	Pb	Sn	Si	Ca	Mg	Zn	P	Mo	B	Ag	Ni	Na	K
2	17	1	35	1	0	17	1273	780	898	788	82	56	0	0	3	1

Wear Metals: Combinations of these metals can identify components within the machine that are wearing. Knowing what metal a unit is made of influences the recommendations and determine the value of elemental analysis.

Contaminant Metals: Knowledge of the enviromental conditions under which a unit operates can explain varying levels of contaminant metals. Excessive levels of dust and/or dirt can be abrasive and accelerate wear.

Additive Metals: Knowledge of the enviromental conditions under which a unit operates can explain varying levels of contaminant metals. Excessive levels of dust and/or dirt can be abrasive and accelerate wear.

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

Water in oil decreases lubricity, prevents additives from working and furthers ozidation. Its presence can be determined by FTIR and is reported in % of volume. Water by Karl Fischer determines the amount of water present by PPM.

Acid and Base Numbers are measured to determine if the lubrican is becoming acidic. A lubricant that becomes too acidic can cause corrosion to internal components. Note that the acid and base numbers do not begin at zero. They are also known as TAN and TBN

FTIR Analysis									
Lab ID	Oxidation A/cm	Nitration A/cm	Sulfation A/cm	Water %	Antifreeze Pos/Neg	Fuel %	Soot %	TBN mg KOH/g	TAN mg KOH/g

Nitration is a major concern in engine oils, specifically natural gas engine oils. Atmospheric nitrogen and oxygen react due to the heat produced and form nitrous oxides (NOx), which in turn react with the lubricant and produce organic nitrates, or are picked up as insoluble or soluble nitrous compounds. This causes the viscosity of the oil to increase.

Oxidation of oil is caused by the presence of air (oxygen) and heat. Carboxylic acids are formed when atmospheric oxygen reacts with the hydrocarbons in the lubricant. Such acids are weak, but they gradually gain a concentration highenough to cause serious corrosion of machinery parts. This is an inevitable activity that requires monitoring.

Sulfation occurs when oxygen, water and sulfur in the base oil or diesel fuel react due to heat, they can form sulfurous compounds, such as sulfur-based acids. These compounds are often discharged via exhaust. However, some compounds may remain and enter into the engine cavity. When the sulfur-based acids react with the base stock of the oil or with the additives in the oil, sulfation occurs.

Particle Count (ISO 4402, 4406; particles per 1mL)							
ISO Class Code	4µ	6µ	10µ	14µ	25µ	50µ	100µ

ASTM D445 Viscosity CST (C)	
100c	40c

ISO Code in an index number that represents a range of particles within a specific micron range. Each class designates a range of measured particles per one mL of sample. This test is valuable in determining large particle wear in filtered systems. This section is only used when a particle count is specified.

Viscosity measures a lubricants resistance to flow at temperature and is considered its most important physical property. Depending on the product, it is tested at 40°c or 100°c and reported in Centistrokes.