

18419 EUCLID AVENUE  
CLEVELAND, OH 44112-1016  
(800) 726-5400, FAX (216) 383-9633

CUSTOMER NO.: 18421  
UNIT NO.: 5026  
DESCRIPTION: DIESEL ENGINE  
END USER: LOCOMOTIVE MANAGER  
MONTREAL MAINE & ATLANTIC RR  
DERBY, ME 04463

MAKE: GE  
MODEL:  
OIL BRAND: EXXON  
OIL TYPE: DIOL 17RD 2000  
SERIAL NO.:  
FUEL TYPE: DIESEL

NO. COPIES 2

**SAMPLE DATA**

LAB#	SAMPLE DATE	TIME ON OIL
	RECEIPT DATE	TIME ON UNIT
76657	03/21/2007	10000
ABNORMAL	04/23/2007	500000
10618	12/21/2006	10000
NORMAL	01/15/2007	500000
219571	09/19/2006	10000
NORMAL	10/14/2006	500000
3945	12/24/2005	10000
ABNORMAL	01/06/2006	500000

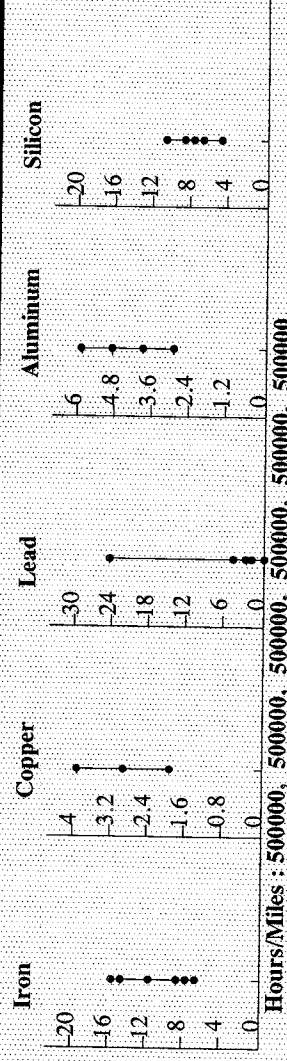
**SPECTROCHEMICAL ANALYSIS (ppm)**

IRON	CHROMIUM	LEAD	COPPER	TIN	ALUMINUM	NICKEL	SILVER	SILICON	BORON	SODIUM	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC	MOLYBDENUM	TITANIUM	VANADIUM	POTASSIUM	FUEL (%VOL)	VIS @ 40 C	VIS @ 100 C	WATER (%VOL)	SOOT/SOLIDS (%WT)	COOLANT
7	0	2	3	0	6	0	0	7	2	7	32	5721	0	0	17	134	0	0	0	<1	N/A	14.82	0	1.0	N/A
8	0	0	3	0	5	0	0	8	2	12	32	5440	0	6	4	123	0	0	0	<1	N/A	15.31	0	0.9	N/A
9	0	3	3	0	5	0	0	9	2	11	38	4867	0	7	9	171	0	0	0	<1	N/A	16.41	0	1.2	N/A
15	1	25	3	0	6	0	0	11	8	284	20	4951	0	10	10	81	0	0	0	N/A	N/A	0.02	1.0	N/A	

**ADDITIONAL TESTS**

LAB#	TBN
76657	10.33
10618	10.96
219571	9.51
3945	8.60

**GRAPHICAL ANALYSIS**



**LAB# ANALYSIS RECOMMENDATIONS**

NOTE: ZINC LEVEL APPEARS TO BE HIGH. RECOMMEND RESAMPLING IN 30 DAYS! \*\*\*RESULTS REPORTED BY FAX\*\*\*

RESULTS OF TEST PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED. ANALYST-MAL

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NOTE: TEST RESULTS INDICATE THE PRESENCE OF WATER. NOTE: BORON AND SODIUM LEVELS APPEAR TO BE HIGH. RECOMMEND INSPECT ENGINE FOR INTERNAL WATER LEAKS. \*\*\*RESULTS REPORTED BY FAX\*\*\*

Key  
A: Abnormal C: Critical

LOCOMOTIVE MANAGER  
MONTREAL MAINE & ATLANTIC RR  
18 B & A AVE  
DERBY, ME 04463

THE FOLLOWING INFORMATION HAS BEEN PROVIDED TO ASSIST IN THE INTERPRETATION OF YOUR OIL ANALYSIS.

**WEAR METALS**

These metals indicate wear on particular components of an individual unit. The particles of these metals will indicate a wear problem on the microscopic level before the problem can be detected by conventional means. The existence of a wear problem is determined not only by absolute values of metals, but more importantly a relative increase or trend in one or more of these metals.

**WEAR METAL SOURCES**

- Iron .....Cylinders, Gears, Rings, Crankshafts, Liners, Bearings, Housings, Rust.
- Chromium .....Rings, Roller/Taper Bearing, Rods, Platings.
- Lead .....Bearing Overlays, additive in gear oil and gasoline.
- Copper .....Bushings, Bearings, Thrust-Washers, Friction Plates, Oil Cooler, additive in oil.
- Tin .....Bearings, Bushings, Pistons, Platings.
- Aluminum .....Pistons, Bearings, Pumps, Blowers, Rotors, Thrust-Washers.
- Nickel .....Valves.
- Silver .....Bearings, Bushings, Platings.
- Manganese .....Trace elements in liners and rings, additive in gasoline.
- Titanium .....Trace element.
- Vanadium .....Trace element.

**CONTAMINANTS**

These elements can be an indicator of both internal and external contamination. The source and amount of contamination can be determined by comparison to a previously normal sample or to a new oil reference. Specific tests for some contaminants can supplement the analysis.

**CONTAMINANT SOURCES**

- Silicon .....Element used to determine the level of airborne dirt and abrasives in the oil (sometimes used as an anti-foam agent).
- Boron .....Present in most permanent anti-freeze systems and cooling system inhibitors (sometimes used as an additive).
- Sodium .....Present in most permanent anti-freeze systems and cooling system inhibitors (sometimes used as an additive).
- Potassium .....Present in most permanent anti-freeze systems and cooling system inhibitors (sometimes used as an additive in gear oil).

**WATER AND SEDIMENT**

Reports percent water and percent insolubles (ASTM D-91).

**GLYCOL**

A specific test for the presence of Glycol (Anti-Freeze) in an oil (ASTM D-2982).

**ADDITIVES**

These elements are blended into the oil in different forms and quantities by the manufacturer. The additive package in an oil will vary depending on the type of oil.

**ADDITIVE FUNCTIONS**

- Magnesium .....Dispersant/Detergent additive.
- Calcium .....Dispersant/Detergent additive.
- Barium .....Dispersant/Detergent additive.
- Phosphorus .....Anti-Wear additive.
- Zinc .....Anti-Wear additive.
- Molybdenum .....Anti-Wear additive.

**FUEL DILUTION**

Unburned fuel in the oil may signal fuel system leaks or incomplete combustion.

**FUEL SOOT**

A result of incomplete combustion, blow-by. High levels may indicate combustion problems or overextended drain intervals.

**VISCOSITY**

The kinematic viscosity (ASTM D-445) determined at 40° C and/or 100° C is a measure of the flow rate of an oil in relation to time. This data is used to assign an SAE grade to an oil.

**ENGINE OIL VISCOSITY CLASSIFICATION CHART**

SAE GRADE	MIN-CSE-100° C	MAX-CSE
10W	4.10	
20	5.60	9.29
30	6.90	12.49
40	12.50	16.29
50	16.30	21.89

**Spectrochemical Analysis**

Determines component wear, airborne dirt, cooling system contamination, and oil additive concentrations. Information is reported in parts per million (PPM).

**Physical Properties**

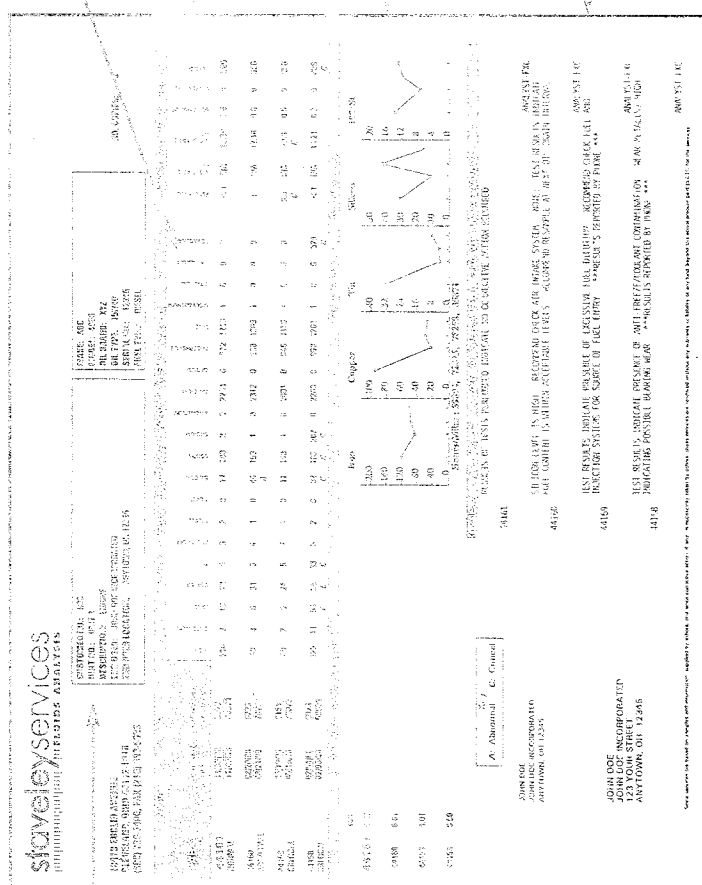
Changes in the physical qualities of the lubricant are determined and classified. These changes and the presence of contaminants affecting the properties of lubricants have a direct bearing on its serviceability.

**Engine Oil Analysis**

This key section gives the customer an "at a look" glance at their oil's wear level for the last six sample factories. For indicated applications the section will contain detailed particle count data.

**Analysis Recommendations**

Our data provides specific information about your equipment. In case of imminent danger to a piece of equipment, the customer is alerted to the emergency by phone or fax.



**Customer Unit Information**

This section of the report lists the identification of the unit sampled, equipment manufacturer, model, oil brand and oil type. This information is supplied by the customer.

**Sample Data**

Indicates date sample was introduced, oil and unit identification, laboratory identification number to trace sample history. In addition, the unit condition of each sample is listed.

**Additional Test Results**

Reporting of additional test results (e.g. TAN, TBN, oxidation and nitration) not part of spectrochemical tests reported in these sections.