

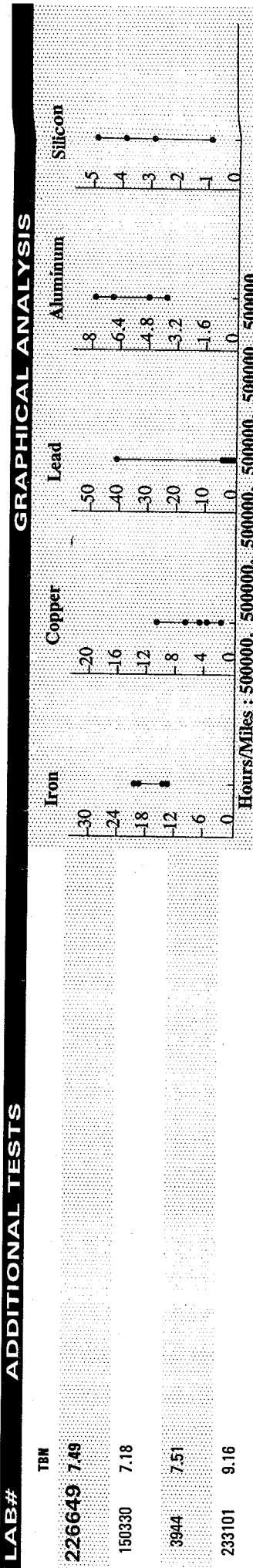
18419 EUCLID AVENUE  
CLEVELAND, OH 44112-1016  
(800) 726-5400, FAX (216) 383-9633

CUSTOMER NO.: 18421  
UNIT NO.: 5023  
DESCRIPTION: C30-7 LOCOMOTIVE ENGINE  
END USER: LOCOMOTIVE MANAGER  
MONTREAL MAINE & ATLANTIC RR  
END USER LOCATION: DERBY, ME 04463

MAKE: GE  
MODEL  
OIL BRAND: EXXON  
OIL TYPE: DIOL 17RD 40  
SERIAL NO.:  
FUEL TYPE: DIESEL

NO. COPIES 2

LAB#	SAMPLE DATA		SPECTROCHEMICAL ANALYSIS (ppm)																				PHYSICAL PROPERTIES								
	SAMPLE DATE	TIME ON OIL	RECEIPT DATE	TIME ON UNIT	IRON	CHROMIUM	LEAD	COPPER	TIN	ALUMINUM	NICKEL	SILVER	SILICON	BORON	SODIUM	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC	MOLYBDENUM	TITANIUM	VANADIUM	POTASSIUM	FUEL	VIS @ 40 C	VIS @ 100 C	WATER (%VOL)	SOOT/SOLIDS (%WT)	COOLANT	
226649	10/07/2006	10000	10/21/2006	500000	15	1	4	4	0	5	0	0	4	1	0	22	4797	0	8	13	A	81	0	0	0	<1	N/A	16.72	0	1.7	N/A
150330	07/05/2006	10000	07/14/2006	500000	14	1	5	5	0	4	0	0	1	1	0	22	4881	3	7	14	A	102	0	0	0	<1	N/A	16.79	0	1.8	N/A
3944	12/24/2005	10000	01/06/2006	500000	20	1	3	7	0	8	0	0	5	1	13	27	5307	0	4	3	A	106	0	0	0	<1	N/A	17.13	0	1.9	N/A
233101	10/03/2005	10000	10/14/2005	500000	21	0	2	2	0	5	0	0	5	1	4	21	5605	0	0	6	A	21	0	0	0	<1	N/A	15.62	0	1.7	N/A



**LAB#** 226649  
NOTE: ZINC LEVEL APPEARS TO BE HIGH. RECOMMEND RESAMPLING IN 30 DAYS! \*\*\*RESULTS REPORTED BY FAX\*\*\*

**LAB#** 150330  
NOTE: ZINC LEVEL APPEARS TO BE HIGH. TEST RESULTS INDICATE LUBE OIL FILTER(S) SHOULD BE CHANGED. RECOMMEND RESAMPLING IN 30 DAYS! \*\*\*RESULTS REPORTED BY FAX\*\*\*

**LAB#** 3944  
NOTE: VISCOSITY APPEARS TO BE HIGH. TEST RESULTS INDICATE LUBE OIL FILTER(S) SHOULD BE CHANGED. RECOMMEND RESAMPLING IN 30 DAYS! \*\*\*RESULTS REPORTED BY FAX\*\*\*

**LAB#** 233101  
RESULTS OF TEST PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED.

ANALYST: MAL  
ANALYST: MAL  
ANALYST: MAL

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-cst-100° C	MAX-cst
10W	4.10	
20	5.60	9.29
30	9.30	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 evaluated. These changes and the presence of contaminants affecting the properties of lubricants have a direct bearing on its serviceability.

**Graphical Analysis**

This key section gives the customer an "at a look" glance at their units wear trend for the last six sample histories. For industrial applications, this 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.

**staveley services**  
INDUSTRIAL FLUIDS ANALYSIS

ANALYST: JDC  
UNIT NO: 12345  
OIL BRAND: XYZ  
RESERVOIR: ENGINE  
COP USER: JOHN DOE, INCORPORATED  
COP USER LOCATION: AFTTOWN, OH 12345  
FUEL TYPE: DIESEL

DATE: 08/15/98  
TIME: 10:30 AM  
LAB: 12345

ITEM	UNIT	TEST RESULT	UNIT	TEST RESULT	UNIT	TEST RESULT	UNIT	TEST RESULT	UNIT	TEST RESULT	
44161	PPM	100	44162	PPM	200	44163	PPM	150	44164	PPM	300
44165	PPM	50	44166	PPM	100	44167	PPM	75	44168	PPM	150
44169	PPM	20	44170	PPM	40	44171	PPM	30	44172	PPM	60
44173	PPM	10	44174	PPM	20	44175	PPM	15	44176	PPM	30

RESULTS OF TESTS PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED.

ANALYST: JDC  
UNIT NO: 12345  
OIL BRAND: XYZ  
RESERVOIR: ENGINE  
COP USER: JOHN DOE, INCORPORATED  
COP USER LOCATION: AFTTOWN, OH 12345  
FUEL TYPE: DIESEL

ANALYST: JDC  
UNIT NO: 12345  
OIL BRAND: XYZ  
RESERVOIR: ENGINE  
COP USER: JOHN DOE, INCORPORATED  
COP USER LOCATION: AFTTOWN, OH 12345  
FUEL TYPE: DIESEL

ANALYST: JDC  
UNIT NO: 12345  
OIL BRAND: XYZ  
RESERVOIR: ENGINE  
COP USER: JOHN DOE, INCORPORATED  
COP USER LOCATION: AFTTOWN, OH 12345  
FUEL TYPE: DIESEL

**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 data sample was taken/tested, oil and hours/mile. Laboratory identification number to track 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

