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staveleyservices
FLUIDS ANALYSIS

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

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

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

NO. COPIES 1

SAMPLE DATA / SPECTROCHEMICAL ANALYSIS (ppm) / PHYSICAL PROPERTIES

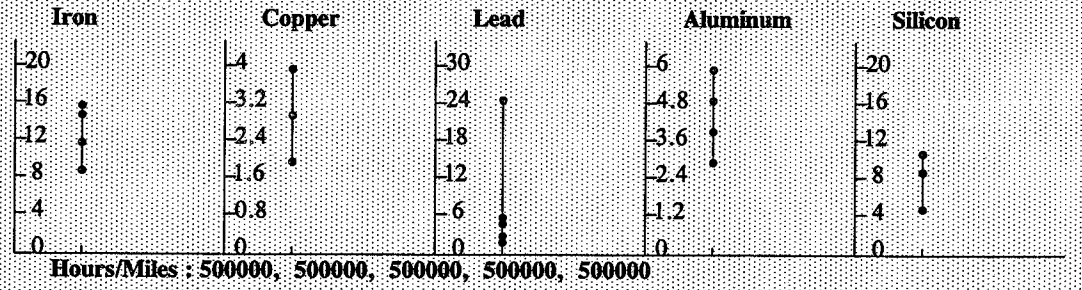
LAB#	SAMPLE DATE / RECEIPT DATE	TIME ON OIL / TIME ON UNIT	IRON	CHROMIUM	LEAD	COPPER	TIN	ALUMINUM	NICKEL	SILVER	SILICON	BORON	SODIUM	MAGNESIUM	CALCIUM	BARIUM	PHOSPHORUS	ZINC	MOLYBDENUM	TITANIUM	VANADIUM	POTASSIUM	FUEL (%VOL)	VIS @ 40 C cSt	VIS @ 100 C cSt	WATER (%VOL)	SOOT/SOLIDS (%WT)	COOLANT
219571 NORMAL	09/19/2006 10/14/2006	10000 500000	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
3945 ABNORMAL	12/24/2005 01/06/2006	10000 500000	15	1	25	3	0	6	0	0	11	8 A	284 A	20	4951	0	10	10	81	0	0	0	N/A	N/A	N/A	0.02 A	1.0	N/A
220562 NORMAL	09/07/2005 09/29/2005	10000 500000	12	1	2	2	0	3	0	0	5	1	5	12	4810	0	4	5	113	0	0	0	<1	N/A	15.20	0	1.1	N/A
141806 NORMAL	06/02/2005 06/22/2005	10000 500000	16	0	5	4	0	4	0	0	9	8	3	32	5782	0	4	2	112	0	0	0	<1	N/A	16.85	0	0.7	N/A

LAB# ADDITIONAL TESTS

LAB#	TBN
219571	9.51
3945	8.60
220562	10.05
141806	9.53

Key
A: Abnormal *C:* Critical

GRAPHICAL ANALYSIS



LAB# ANALYSIS RECOMMENDATIONS

219571 RESULTS OF TEST PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED.

ANALYST-MAL

3945 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***

ANALYST-JJL

220562 RESULTS OF TEST PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED.

ANALYST-MAL

141806 RESULTS OF TEST PERFORMED INDICATE NO CORRECTIVE ACTION REQUIRED.

ANALYST-MAL

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

MMA-0001433

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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 .....Dispersent/Detergent additive.
Calcium .....Dispersent/Detergent additive.
Barium .....Dispersent/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

Customer Unit Information

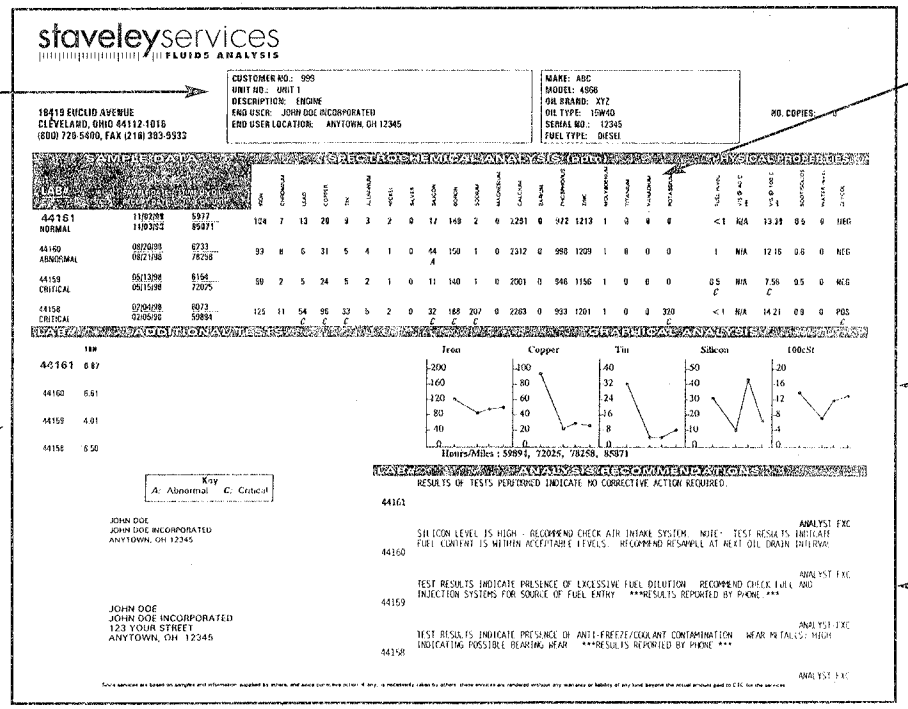
This section of the report lists the identification of the unit sampled, equipment manufacturer, model, oil brand and oil type. This information is supplied by the customer.

Sample Data

Indicates data sample was taken/tested, oil and unit 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



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 unit's 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.

MMA-0001434