LEWIS COUNTY CENTRAL SHOP
Arlie Champ
109 FOREST NAPAVINE RD
Chehalis, WA 98532

FAX: 360-740-2685
PHONE: 360-740-1150
SAMPLE TYPE: OIL
SAMPLE SHIP TIME (days): 2

COMPANY NAME: LEWIS COUNTY CENTRAL SHOP
CUSTOMER EQUIP NUM: 26-105
COMPARTMENT NAME: ENGINE
SERIAL NUMBER: LC440
MANUFACTURER: JOHN DEERE
MODEL: 310SG_DEERE
JOB SITE:
EXT WARR NUMBER:

SHOP JOB NUM: 9566
COMP SERIAL NUM:
COMPARTMENT MODEL:
COMP MANUFACTURER:
SAMPLE LABEL NUM:
FLUID BRAND/WEIGHT: UNION76/15W-40
FLUID TYPE:
EXT WARR EXPIRE DATE:
FUEL CONSUMED:

NC MACHINERY CAT

SOS Services Laboratory
17025 West Valley Highway
Tukwila, WA 98188-5519
800-562-4735

LAB CONTROL NUMBER	SAMPLE DATE	PROCESS DATE	EQUIPMENT METER	METER ON FLUID	FLUID CHANGED	MAKE UP FLUID	MAKE UP FLUID UNITS	FILTER CHANGED
H330-49170-1034	17-Jun-2019	19-Jun-2019	5670.0 HR	192.0 HR	Yes			Yes
No Action Required	THIS SAMPLE APPEARS NORMAL. CONTINUE SAMPLING AT THE NORMAL INTERVAL.							
H330-48225-1137	09-Aug-2018	13-Aug-2018	5478.0 HR	231.0 HR	Yes			Yes
No Action Required	THIS SAMPLE APPEARS NORMAL. CONTINUE SAMPLING AT THE NORMAL INTERVAL.							
H330-47240-1063	24-Aug-2017	28-Aug-2017	5247.0 HR	215.0 HR	Yes			Yes
No Action Required	THIS SAMPLE APPEARS NORMAL. CONTINUE SAMPLING AT THE NORMAL INTERVAL.							
H330-47005-1078	03-Jan-2017	05-Jan-2017	5032 HR	264 HR	Yes			Yes
No Action Required	WEAR METAL READINGS APPEAR NORMAL. OTHER ANALYSIS READINGS APPEAR TO BE ACCEPTABLE. CONTINUE SAMPLING AT THE NORMAL INTERVAL.							

Wear Metals (ppm)	Cu	Fe	Cr	Al	Pb	Sn	Si	Na	K	B	Mo	Ni	Ag	Ti	V	Mn	Cd	Ca	Mg	Zn	P	Ba
H330-49170-1034	3	15	1	2	2	0	3	3	2	121	6	1	0	3	0	0	0	1469	648	1185	1037	0
H330-48225-1137	9	19	0	2	1	0	4	11	0	28	4	1	0	6	0	0	0	1955	193	1147	988	0
H330-47240-1063	1	17	1	3	2	0	3	5	2	71	3	1	0	94	0	0	0	2070	286	1316	1093	0
H330-47005-1078	1	16	0	3	3	0	2	3	0	18	4	1	0	0	0	0	0	2203	23	1116	940	0

Oil Condition / Particle Count (ct/ml)	ST	OXI	NIT	SUL	W	A	F	PFC	V100
H330-49170-1034	15	14	9	23	N	N	N		14.8
H330-48225-1137	17	15	8	20	N	N	N		14.2
H330-47240-1063	14	17	9	21	N	N	N	0.99	14.3
H330-47005-1078	16	15	7	20	N	N	N		14.7

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Ag = Silver, Al = Aluminum, B = Boron, Ca = Calcium, Cr = Chromium, Cu = Copper, Fe = Iron, P = Phosphorus, K = Potassium, Li = Lithium, Mg = Magnesium, Mo = Molybdenum, Na = Sodium, Ni = Nickel, Pb = Lead, Si = Silicon, Sn = Tin, S = Sulphur, V = Vanadium, Zn = Zinc, A = Antifreeze, F = Fuel, W = Water, P = Positive, N = Negative, T = Trace, E = Excessive, NIT = Nitration, OXI = Oxidation, ST = Soot, SUL = Sulfation, ISO = ISO Rating, PFC = Percent Fuel Content, PQI = Particle Quantifying index , NaW = Salt Water, FL Pt = Flash Point, TAN = Total Acid Number, TBN = Total Base Number, H2O = Karl Fisher result, V100 = Viscosity@100C, V40 = Viscosity@40C, PVI = Particle Volume Indicator

S·O·S℠ Fluid Analysis Program — Scheduled Oil Sampling

TO REALIZE THE BENEFITS OF THE DIAGNOSTIC CAPABILITIES OF THE S.O.S. PROGRAM, THE USER SHOULD DO THE FOLLOWING:

1. PROVIDE COMPLETE AND ACCURATE INFORMATION ON THE SAMPLE LABEL.
2. ADHERE TO PROPER SAMPLING PROCEDURES
3. BE ON A REGULAR AND CONTINUOUS SAMPLING PROGRAM.

METALS ARE SHOWN IN PARTS PER MILLION (PPM) AND ARE EVALUATED ACCORDING TO HOURS OR MILES IT HAS BEEN IN USE, AMOUNT OF OIL ADDED, RECENT REPAIRS, TYPE OF OPERATION AND OTHER CONDITIONS WHICH MIGHT AFFECT THE CONCENTRATION.

GENERAL INTERPRETATION OF RESULTS

WEAR ELEMENTS ANALYSIS:

AG . . . . . SILVER: Indicator of bearing wear in EMD diesel engines. (Reported on EMD's only). Bearings - Bushings - Solder
AL . . . . . ALUMINUM: Bearings, thrust washers, fuel pump lifters, dirt entry from clay soils, converter, pump bushings, pistons.
B . . . . . BORON: Supplementary coolant inhibitor and lube oil additive.
BA . . . . . BARIUM: Detergent/Dispersant Additive.
CA . . . . . CALCIUM: Detergent/Dispersant Additive - Salt Water – Road Salt.
CD . . . . . CADMIUM: Coating on Metals.
CR . . . . . CHROME: Piston rings, chrome plated crankshafts, chrome plated exhaust valves, roller & ball bearings.
CU . . . . . COPPER: Bearings, thrust washers, bushings, bronze and brass parts, oil coolers, discs and plates in some transmissions. Engine readings may vary dramatically. If all other metals are within normal levels and no antifreeze is present, please disregard. Always refer to the current evaluation.
FE . . . . . IRON: Rust, gears, shafts, cylinders, valve train components, pistons in some applications.
K . . . . . POTASSIUM: Found in extended or long life coolant and many conventional formulations.
MG . . . . MAGNESIUM: If found in transmission oil can indicate brake component wear. Also, lube oil detergent additive.
MN . . . . MANGANESE: Detergent additive, trace element, additive in gasoline.
MO . . . MOLYBDENUM: Piston ring coating in some engines, additive in some oils.
NA . . . . . SODIUM: Inhibitor leaking from cooling system, oil additive, environmental contaminant (salt water).
NI . . . . . NICKEL: Bearings - Valves Shafts
P . . . PHOSPHORUS: Antiwear Additive
PB . . . . . LEAD: Overlay in main and rod bearings, turbocharger bearings, camshaft bearings, bushings, in some applications.
SI . . . . . SILICON: Contamination from dirt or dust entry. Excessive amounts can greatly accelerate component wear (silicone is used in some grease and as an oil additive).
SN . . . . . TIN: Piston plate coating, overlay of connecting rod and crankshaft main bearing.
TI . . . . . TITANIUM: Turbine Blades - Compressor Discs - Bearing Hubs
V . . . . . VANADIUM: Valves - Coating on Metal
ZN . . . . . ZINC: Lube oil wear and oxidation inhibitor additive.

CONTAMINATION: N=Negative T=Trace P=Positive E=Excessive

WATER: Can promote oil oxidation, rust and impair the oil's ability to lubricate properly. A trace can be normal condensation.
FUEL: Can reduce viscosity, prevents proper lubrication, may lower oil pressure.
GLYCOL: (A positive test could indicate antifreeze in the oil or contamination from outside source. Also, some additives in the new oil may cause the chemical test to turn positive.)

PARTICLE COUNT

- Aids in determining the metallic and non-metallic contamination in non-engine oil.
- Quantifies particles ranging in size from 4 microns and greater to 70 microns and greater.
- Hydraulic system cleanliness is often reported using the ISO standard 11171.

ISO 11171 is a three-digit code that represents the cumulative count in each milliliter of fluid at 4/6/14 microns. The counts at each size are compared with the table to find a contamination class. The code is written as three numbers and a slash, '/', between them. For example: 18/17/14 or 17/16/14. The first number represents the scale class at 4 microns, the second scale class at 6 microns, and the third scale class at 14 microns.

ENGINE OILS

SAE Viscosity	Kinematic Viscosity (cSt @ 100C)
10W	4.1 - ***
15W	5.6 - ***
20W	5.6 - 9.2
20	5.6 - 9.2
30	9.3 - 12.4
40	12.5 - 16.2
50	16.3 - 21.8
5W30	9.3 - 12.4
10W30	9.3 - 12.4
15W40	12.5 - 16.2

GEAR LUBRICANTS

SAE Viscosity	Kinematic Viscosity (cSt @ 100C)
75W	4.1 - 6.9
80W	7.0 - 10.9
85W	11.0 - 13.4
90	13.5 - 23.9
140	24.0 - 40.9
80W90	13.5 - 23.9
85W140	24.0 - 40.9

OIL CONDITION ANALYSIS:

ST . . . . . SOOT: An excellent indicator of combustion efficiency, a by-product of combustion, and found in used engine oils. An insoluble particulate that can plug oil filters and deplete the dispersant additives in the oil.
OXI . . . . . OXIDATION: Helps to determine serviceability of the lubricating oil. Reported in Percent of allowable. Oil oxidizes with age and service, and from improper operating conditions. The results are an increase in viscosity and sludge and varnish deposits.
NIT . . . . . NITRATION: Reaches problem levels only in natural gas engine. Nitrogen compounds are formed, resulting from the combustion process contaminating the oil. High nitrogen causes oil thickening and plugged filters. Nitration in diesel engines is abnormal and is a indication of blow-by.
SUL . . . . . SULFUR PRODUCTS: By-products of diesel fuel combustion that contaminate the oil. These by-products are corrosive and deplete the neutralizing properties of the oil.
TBN . . TOTAL BASE #: The measure of acid-neutralizing capacity an oil contains.
CST . . . CENTISTOKE: Represents oil flow time through a calibrated glass capillary tube at a standard temperature.
VIS . . . . . VISCOSITY: Represents an oil weight classification by grade.

NOTE: Prior to performing any major repairs based on SOS test results, consult your NC Machinery SOS Analyst.
Fax 425-656-4575 or Email jalcott@ncmachinery.com.