Lubricant Analysis Report

North America: +1-866-341-4396

Overall report severity based on comments.

Account Information	Component Information	Sample Information
Account Number: 0000-000-000 Company Name: ABC COMPANY Contact: JOHN DOE Address: 1234 Anytown, USA Phone Number:	Component ID: 182 AA Secondary ID: Component Type: DIESEL ENGINE Manufacturer: CATERPILLAR Model: 3406C Application: O-T-R TRUCKING Sump Capacity:	Tracking Number: 00000000 Lab Number: 000-000-000 Lab Location: Salt Lake City Data Analyst: AC Sampled: 09-Aug-2019 Submitted: 20-Aug-2019 Received: 20-Aug-2019 Completed: 21-Aug-2019
Filter Information	**Miscellaneous Information**	**Product Information**
Filter Type: FULLFLOW Micron Rating: 15		Product Manufacturer: CONOCO Product Name: GUARDOL ECT ENGINE OIL Viscosity Grade: SAE 15W40

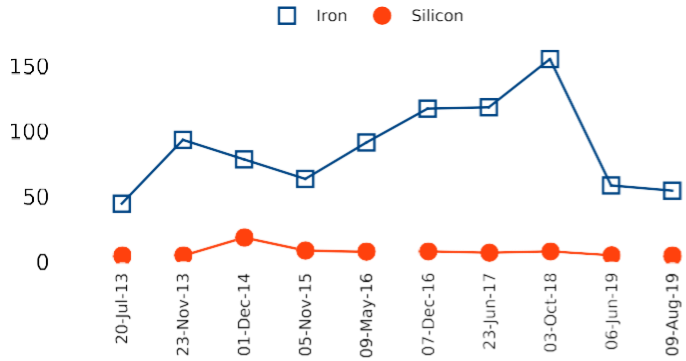
Comments	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MINOR LEVEL. IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Continue to use fluid for 5,000 miles (8,000km) and resample at that time;

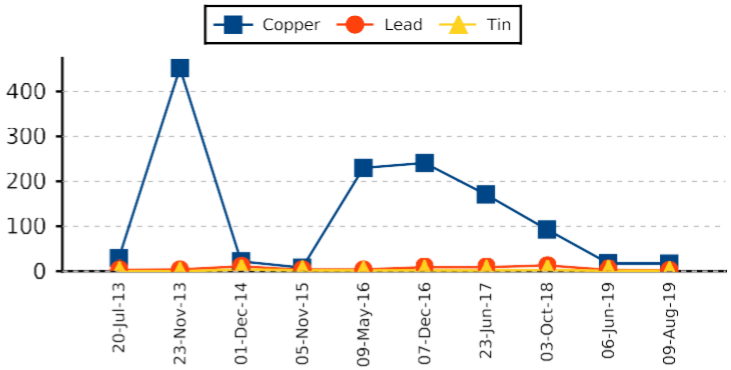
	Wear Metals (ppm)										Contaminant Metals (ppm)			Multi-Source Metals (ppm)						Additive Metals (ppm)				
Sample #	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
1	66	0	0	25	57	6	1	0	0	0	4	4	2	59	14	1	0	0	34	499	1466	0	925	1159
2	38	0	0	7	25	4	0	0	0	0	4	6	2	89	5	1	0	0	60	340	2024	0	1034	1305
3	17	0	0	2	202	1	0	0	0	0	3	3	4	86	1	0	0	0	62	314	1937	0	1002	1257
4	39	0	0	3	37	3	0	0	0	0	9	8	1	27	36	1	0	0	16	695	1465	0	1030	1289
5	45	0	0	4	29	3	0	0	0	0	5	8	8	89	6	1	0	0	51	311	2073	0	1038	1317
6	94	0	0	6	452	4	0	0	0	0	5	10	5	95	4	0	0	0	59	350	2212	0	1151	1462
7	79	1	0	2	22	11	4	0	0	0	19	13	0	32	32	3	0	0	28	651	1624	0	1101	1318
8	64	0	0	2	8	3	2	0	0	0	9	7	0	94	7	1	0	0	60	379	1979	0	1077	1307
9	92	1	0	2	230	4	2	0	0	0	8	8	0	97	5	0	0	0	52	342	1998	0	1029	1300
10	118	1	0	2	241	9	2	0	0	0	8	10	1	93	6	0	0	0	39	324	2019	0	1017	1278
11	119	1	0	3	171	9	2	0	0	0	7	8	4	106	6	0	0	0	51	331	2071	0	1031	1262
12	156	2	0	4	93	13	3	0	0	0	8	8	7	106	7	0	0	0	54	368	2157	0	1104	1327
13	59	0	0	1	18	3	1	0	0	0	5	3	3	94	5	0	0	0	103	414	1870	0	1037	1155
14	55	1	0	1	17	2	1	0	0	0	5	4	0	87	5	0	0	0	103	379	1839	0	1005	1168

	Sample Information							Contaminants			Fluid Properties					
Sample #	Date Sampled	Date Received	Lube Time mi	Unit Time mi	Lube Change	Lube Added gal	Filter Change	Fuel Dilution % Vol	Soot % Vol	Water % Vol	Viscosity 40°C cSt	Viscosity 100 °C cSt	Acid Number mg KOH/g	Base No. D4739 mg KOH/g	Oxidation abs/cm	Nitration abs/0.1 mm
1	22-Nov-2011	23-Nov-2011	26134	867508	Unk		Unk	<1 - Estimate	0.4 - E2412	<.1 - FTIR		14.3		6.17	13	17
2	02-Mar-2012	05-Mar-2012	867508	884077	No		No	<1 - Estimate	0.2 - E2412	<.1 - FTIR		13.8		5.56	13	15
3	01-Nov-2012	02-Nov-2012	8948	899863	No		No	<1 - Estimate	<.1	<.1 - FTIR		14.3		6.30	11	6
4	25-Feb-2013	26-Feb-2013	26060	916975	No		No	0.8 - GC	0.1 - E2412	<.1 - FTIR		13.3		7.34	11	8
5	20-Jul-2013	23-Jul-2013	20038	938529	No	0	No	<1 - Estimate	0.1 - E2412	<.1 - FTIR		14.9		5.57	14	8
6	23-Nov-2013	27-Nov-2013	36814	955312	No	0	No	<1 - Estimate	0.2 - E2412	<.1 - FTIR		14.1		4.65	15	9
7	01-Dec-2014	03-Dec-2014	18436	1996	No	0	No	2.2 - GC	<.1	<.1 - FTIR		13.1		5.80	11	7
8	05-Nov-2015	05-Nov-2015	17624	17820	No	0	No	<1 - Estimate	0.2 - E2412	<.1 - FTIR		14.1		5.82	13	8
9	09-May-2016	19-May-2016	38335	40331	Yes	0	Yes	<1 - Estimate	0.2 - E2412	<.1 - FTIR		15.5		4.94	15	9
10	07-Dec-2016	14-Dec-2016	61704	63700	Yes	0	Yes	<1 - Estimate	0.4 - E2412	<.1 - FTIR		14.7		4.81	19	11
11	23-Jun-2017	12-Jul-2017	69608	71604	No	0	No	<1 - Estimate	0.4 - E2412	<.1 - FTIR		15.0		4.62	16	9
12	03-Oct-2018	09-Oct-2018	92899	94895	No	0	Yes	<1 - Estimate	0.5 - E2412	<.1 - FTIR		14.9		4.31	18	11
13	06-Jun-2019	20-Jun-2019	115764	95267	Yes	0	Yes	<1 - Estimate	0.3 - E2412	<.1 - FTIR		14.0		4.45	13	9
14	09-Aug-2019	20-Aug-2019	21367	116634	Yes	0	Yes	<1 - Estimate	0.3 - E2412	<.1 - FTIR		14.1		5.25	13	9

	Particle Count (particles/mL)										Additional Testing
Sample #	ISO Code Based On 4/6/14	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	Test Method	
1	//										
2	//										
3	//										
4	//										
5	//										
6	//										
7	//										
8	//										
9	//										
10	//										
11	//										
12	//										
13	//										
14	//										

Historical Comments	1	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Cylinder region metals (pistons, rings, liners etc.) are at a MODERATE LEVEL; Molybdenum is slightly high for this lubricant.
	2	Data indicates no abnormal findings. Resample at normal interval.
	3	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Copper is at a MODERATE LEVEL; COPPER is most likely LEACHING into the oil via the OIL COOLER core tubing. This typically DOES NOT REQUIRE MAINTENANCE ACTION unless there is evidence of COOLANT in the oil.
	4	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MINOR LEVEL. IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Flagged additive levels are different than what should be present for the identified lubricant. This may have been topped off with a different lubricant, the fluid may be misidentified, or a different lubricant or formulation may have been in use prior to a recent change.
	5	Data indicates no abnormal findings. Resample at normal interval.
	6	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Copper is at a MODERATE LEVEL; COPPER is most likely LEACHING into the oil via the OIL COOLER core tubing. This typically DOES NOT REQUIRE MAINTENANCE ACTION unless there is evidence of COOLANT in the oil. Iron is at a MINOR LEVEL. IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc.
	7	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MINOR LEVEL. IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. LEAD is at a MINOR LEVEL and may be OVERLAY METAL from MAIN/ROD BEARINGS; FUEL DILUTION is at a MINOR LEVEL. FUEL DILUTION possibly caused by excessive idling; Flagged additive levels are different than what should be present for the identified lubricant. This may have been topped off with a different lubricant, the fluid may be misidentified, or a different lubricant or formulation may have been in use prior to a recent change. Unit hours/miles/kilometers conflicts with time from previous sample;
	8	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MINOR LEVEL. Tin is at a MINOR LEVEL; IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Continue to use fluid for 5,000 miles (8,000km) and resample at that time;
	9	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Copper is at a MODERATE LEVEL; Iron is at a MODERATE LEVEL; Tin is at a MINOR LEVEL; Bushing/thrust metal and/or most of the copper may be coming from lube cooler (as applicable); IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Continue to use fluid for 3,000 miles (5,000km) and resample at that time;
	10	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Suspect most of the copper may be coming from the lubricant cooler and/or EGR cooler (as applicable), COPPER is at a MODERATE LEVEL; Iron is at a MODERATE LEVEL; IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Flagged additive levels are lower than expected for the identified lubricant. This may have been topped off with a different lubricant, the fluid may be misidentifed, or a different lubricant or formulation may have been in use prior to a recent change. Maintenance action indicated at time of submission (fluid/filter change , filtration, etc.) will have corrected the issue this system is exhibiting. No further maintenance action is recommended at this time. Not able to EXTEND OIL DRAIN on this sample. Flagged results are outside of acceptable limits for this lubricant and/or component type. Lubricant and filter change acknowledged.
	11	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MODERATE LEVEL; IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. BEARING/BUSHING METAL is at a MODERATE LEVEL: Continue to use fluid for 3,000 miles (5,000km) and resample at that time;
	12	Suggest monitoring the gauges, vital signs, fault codes and fluid level closely between samples. FLAGGED values are much higher than expected for new/overhauled unit; Suggest checking compression and for engine breather passing oil (blow-by) or similar diagnostics and monitoring engine fault codes. Cylinder region metals (pistons, rings, liners etc.) are at a SIGNIFICANT LEVEL; Bearing metal is at a MINOR LEVEL; Not able to EXTEND OIL DRAIN on this sample. Flagged results are outside of acceptable limits for this lubricant and/or component type. Filter change acknowledged.
	13	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Iron is at a MINOR LEVEL. IRON SOURCES in engines can be cylinder liners, iron pistons, hardened steel camshafts, crankshafts, gears, hardened rocker arms, valve bridges,alloyed steel cam follower rollers, etc. Continue to use fluid for 5,000 miles (8,000km) and resample at that time;


Iron
Silicon
150
100
50
0
20-Jul-13
23-Nov-13
01-Dec-14
05-Nov-15
09-May-16
07-Dec-16
23-Jun-17
03-Oct-18
06-Jun-19
09-Aug-19


Copper
Lead
Tin
400
300
200
100
0
20-Jul-13
23-Nov-13
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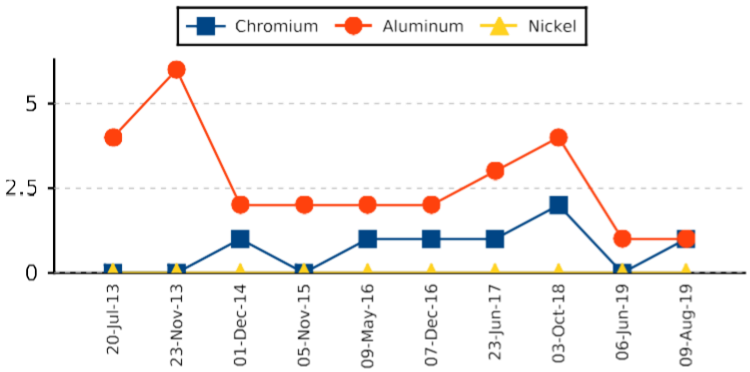
06-Jun-19
09-Aug-19


Chromium
Aluminum
Nickel
5
2.5
0
20-Jul-13
23-Nov-13
01-Dec-14
05-Nov-15
09-May-16
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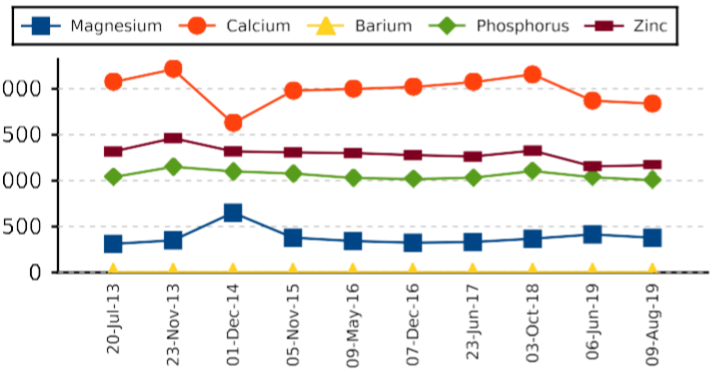
03-Oct-18
06-Jun-19
09-Aug-19


Magnesium
Calcium
Barium
Phosphorus
Zinc
2000
1500
1000
500
0
20-Jul-13
23-Nov-13
01-Dec-14
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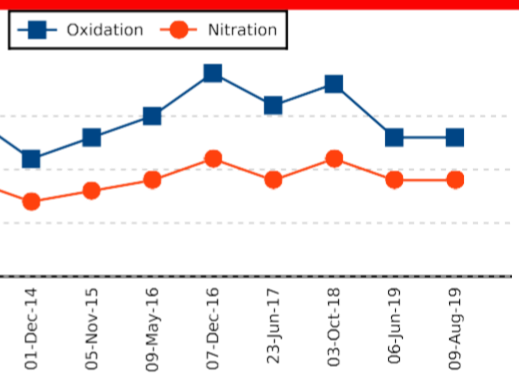
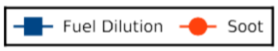
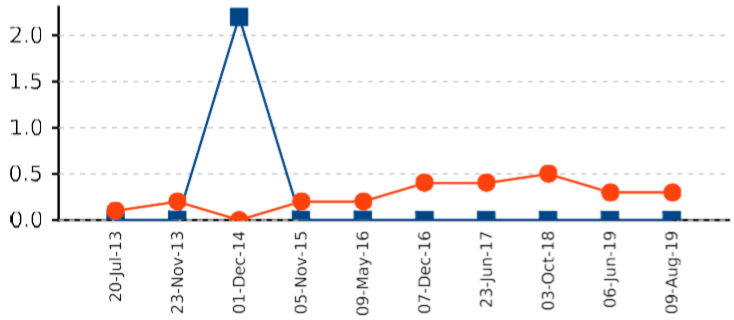
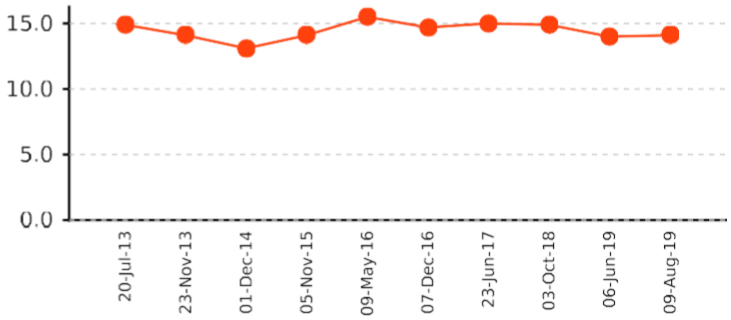
03-Oct-18
06-Jun-19
09-Aug-19


Oxidation
Nitration
15
10
5
0
20-Jul-13
23-Nov-13
01-Dec-14
05-Nov-15
09-May-16
07-Dec-16
23-Jun-17
03-Oct-18
06-Jun-19
09-Aug-19


Fuel Dilution
Soot


2.0
1.5
1.0
0.5
0.0
20-Jul-13
23-Nov-13
01-Dec-14
05-Nov-15
09-May-16
07-Dec-16
23-Jun-17
03-Oct-18
06-Jun-19
09-Aug-19


Viscosity 40°C
Viscosity 100 °C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0.0
20-Jul-13
23-Nov-13
01-Dec-14
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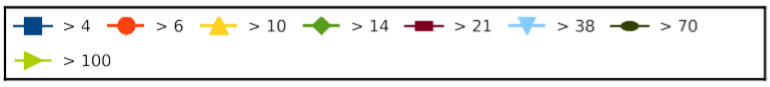
09-Aug-19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> 6
> 10
> 14
> 21
> 38
> 70
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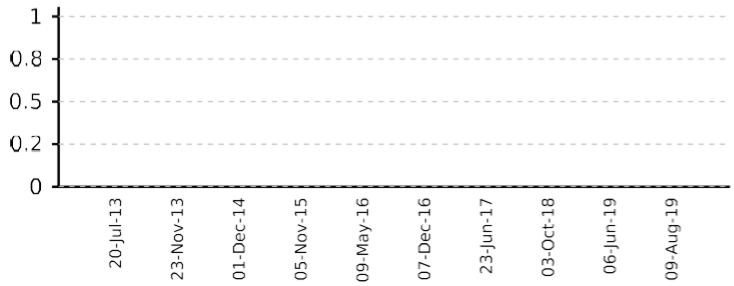
1
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0.5
0.2
0
20-Jul-13
23-Nov-13
01-Dec-14
05-Nov-15
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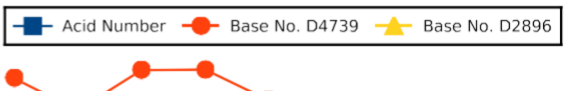
23-Jun-17
03-Oct-18
06-Jun-19
09-Aug-19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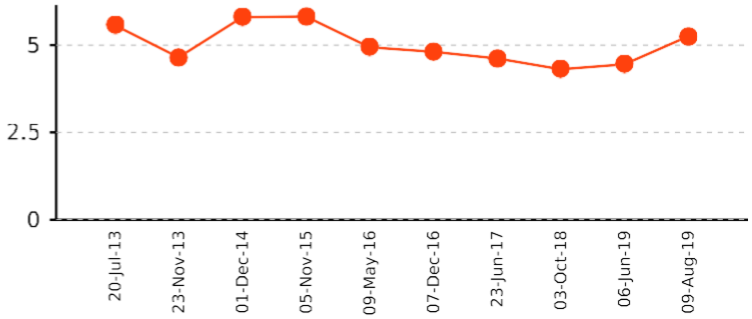
Base No. D2896


5
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0
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01-Dec-14
05-Nov-15
09-May-16
07-Dec-16
23-Jun-17
03-Oct-18
06-Jun-19
09-Aug-19