



Kidney Loop Filter System System : Las Vegas Paving

Las Vegas Paving

Las Vegas Paving (LVP) is a large aggregate producer and contractor in Nevada. As part of their maintenance program oil and filters are changed at regular 250 –300 hour intervals.

In a meeting with LVP, Filter Technology Australia (FTA) offered a Kidney Loop filter system with the aim being to reduce particulate contamination within the oil, extend oil drains, extend component life, improve the availability of the Genset and reduce waste streams of used oil off site. As part of this testing program it was decided to run FTA's bypass oil system on its own taking samples every 100 hours, on this first run the oil was changed at 1137 hours. As part of the continued testing it was decided to fit FTAs full flow fuel filtration system and run both systems to 1000 hours or better. To understand the result better a sample was taken of the New oil as it entered the engine.

All samples were performed by the local Cat Dealers Lab using the latest technology, Laser Net Fines. This process allows accurate ISO readings on engine oil. The test before FTA filters indicated an ISO of 24/20/15 with 290 hours on the oil this being the normal change period prior to the test. The 4um count was at 83,214ppm, 6um at 8,575ppm, and the 14um at 260ppm..(See attached report Page 2)

The FTA Oil system was installed and the oil was sampled every 100 hours. The oil was changed at 1137 hours with a ISO of 21/19/12 with the 4um count at 17,049ppm, 6um at 2,628ppm and the 14um at 20ppm. With all wear metals, soot, viscosity and TBN all at acceptable levels.(See attached report Page 3)

On the second run the New Oil sample returned an ISO 20/17/13 with the 4um count at 5,142ppm, 6um at 991ppm and the 14um at 58ppm. (See attached report Page 4)

At 962 hours with both FTA's Fuel and Oil systems fitted the oil returned an ISO 20/17/13 the 4um count at 6,008ppm, 6um at 1,016ppm and the 14um at 63ppm. The same ISO Code as the new oil, all wear metals, soot, viscosity and TBN are still well inside acceptable levels (See attached report Page 5)

LVP have purchase both systems and have changed the oil twice in 2000 hours, normally this would have been eight changes this has save LVP \$10,000.00 US dollars in oil and reduce waste oil off site by 1,800 gallons, pay back of the FTA systems in four months.



Sample showing the results of samples done before installing FTA filters.
 Sample A shown in yellow box is the result of the oil at 290 hours show the ISO 24/20/15

Fluid Trend Analysis 06/14/2004 **CASHMAN CAT** 600 Glendale Ave. • Sparks, NV 89431 • 775-332-2477 Normal 1 of 1

Customer Unit ID	Make	Model	Serial	Compartment	WO / Ref #
440	CAT	3516	7RN00440	Engine	LE08380 CARL

Oil Sample Information				Miscellaneous				Infrared Analysis % Allowable				Prior Interpretation Codes						
Control #	Date Taken	Fluid Status	Fluid Add SMR	Fluid Run Time	A/F	Fuel	H2O	Viscosity 100C	Soot	Oxi	Nit	Sul						
E-09520040526	05/25/2004	Sampled	0.0	14303	141	N	N	N	14.8	9	68	17	32	200				
D-07220040601	05/28/2004	Sampled	0.0	14351	189	N	N	N	14.2	13	65	18	29	200				
C-23920040608	06/04/2004	Sampled	0.0	14410	248	N	N	N	14.6	16	66	21	30	200				
B-13820040609	06/07/2004	Sampled	0.0	14425	263	N	N	N	14.2	16	68	22	32	200				
A-06920040614	06/10/2004	Changed	0.0	14452	290	N	N	N	15.5	0	69	0	28	200				

Filter Changed ^A				Wear Metals (Parts per Million)												
Copper	Iron	Chrome	Lead	Alum	Silicon	Molybdm	Sodium	Magnesm	Tin	Zinc	Nickel	Potasum	Calcium	Phospor	Boron	
E-	2	6	0	0	2	5	1	8	30	0	1457	0	9	2902	1379	2
D-	1	3	0	0	1	2	0	7	32	0	1464	0	8	2931	1246	0
C-	2	3	0	0	1	2	0	7	28	0	1343	0	8	2823	1246	1
B-	2	3	0	0	2	3	0	7	40	0	1419	0	8	2783	1208	1
A-	0	2	0	0	2	4	0	5	10	0	1291	0	5	2867	1431	0

Overall Status	Particle Counts (per Milliliter)							Current Sample Interpretation	
	4u	6u	14u	20u	25u	50u	75u	100u	ISO
E- Normal	69449	14365	667	134	88	5	0	0	23/21/17
D- Normal	63954	6207	55	3	5	0	0	0	23/20/13
C- Normal	39733	5147	71	5	2	0	0	0	22/20/13
B- Normal	57644	5543	46	5	3	0	0	0	23/20/13
A- Normal	83214	8575	260	57	46	6	0	0	24/20/15

Custom Tests >>>	Cutting	Sliding	Fatigue	NonMetalic	Total / ml
E-	31	27	101	218	68806
D-	5		2	19	63885
C-	2	17	10	21	39666
B-	8	10	2	15	57587
A-	40	17	25	82	82931



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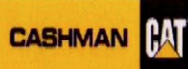
Send Analysis To:
 OMO Equipment
 Attn: Bill Reinler
 P.o. Box 44277
 Rio Rancho, NM 87174-4277

Comments
E-
D-
C-
B-
A-

Thank You for Choosing Cashman Equipment
 This analysis is intended as an aid in predicting mechanical wear.
 No guarantee, expressed or implied, is made against failure of this component. 20

Sample showing the results of samples done before installing FTA filters.
 Sample A shown in yellow box is the result of the oil at 1137 hours show the ISO 21/19/12

Fluid Trend Analysis
10/06/2004



600 Glendale Ave. • Sparks, NV 89431 • 775-332-2477

Normal

1 of 1

Customer Unit ID	Make	Model	Serial	Compartment
440	CAT	3516	7RN00440	Engine

Oil Sample Information				Miscellaneous				Infrared Analysis % Allowable				Prior Interpretation Codes								
Control #	Date Taken	Fluid Status	Fluid Add	SMR	Fluid Run Time	A/F	Fuel H2O	Viscosity 100C	TBN	TAN	Soot	Oxi	Nit	Sul						
E-26420040913	09/10/2004	Sampled	0.0	15680	879	N	N	N	14.5	11.6	0.00	44	70	35	38	200				
D-21220040923	09/17/2004	Sampled	0.0	15755	974	N	N	N	14.0	11.6	0.00	49	75	39	42	200				
C-21320040923	09/22/2004	Sampled	0.0	15799	992	N	N	N	14.6	11.6	0.00	51	76	40	44	200				
B-18720040928	09/27/2004	Sampled	0.0	15858	1077	N	N	N	14.6	10.9	0.00	53	77	41	44	200				
A-15920041005	10/04/2004	Changed	0.0	15944	1137	N	N	N	14.4	10.20	0.00	50	67	37	37	Fluid: CHEVRON 15W40				

Filter Changed ^A														Wear Metals (Parts per Million)								
Copper	Iron	Chrome	Lead	Alum	Silicon	Molybdm	Sodium	Magnesium	Tin	Zinc	Nickel	Potassium	Calcium	Phosphor	Boron							
E-	3	12	0	0	2	2	4	5	8	0	1297	0	5	2824	1166	3						
D-	4	14	1	1	2	3	9	4	10	1	1402	0	5	2834	1180	8						
C-	4	15	1	1	3	3	9	4	8	1	1399	0	4	2837	1172	7						
B-	6	19	0	1	2	3	9	7	9	0	1443	0	4	3091	1248	7						
A-	4	19	0	0	2	4	17	5	8	0	1387	0	4	3095	1156	11						

Overall Status	Particle Counts (per Milliliter)							Current Sample Interpretation		
	4u	6u	14u	20u	25u	50u	75u	100u	ISO	Current Sample is Line "A"
Normal	4246	548	45	3	3	3	0	0	0	19/16/13
Normal	6267	712	20	0	6	0	0	0	0	20/17/12
Normal	9247	1657	86	15	15	2	0	0	0	20/18/14
Normal	6017	1140	37	6	0	0	0	0	0	20/17/12
Normal	17049	2628	20	8	3	0	0	0	0	21/19/12

Custom Tests >>>>	Cutting	Sliding	Fatigue	NonMetallic	Fibers	Total / ml
E-	15	8	2	24	2	4237
D-	4			12		6263
C-	15	9	8	45	6	9265
B-		6	12	8		6042
A-	2			4	8	16937



9000000598 (C)

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Comments
 E-
 D-
 C-
 B- Test not done on previous shift.
 A-

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Sample showing the results of samples done on new oil out of the drum.
 Sample A shown in yellow box is the result of the new oil indicating the oil at ISO 20/17/13

Fluid Trend Analysis 10/12/2004 **CASHMAN CAT** 600 Glendale Ave. • Sparks, NV 89431 • 775-332-2477 **Normal** 1 of 1

Customer Unit ID	Make	Model	Serial	Compartment
BOS15W40	CHEVRON	15W40	CHEV 15W40	Base Oil Sample

Oil Sample Information				Miscellaneous				Infrared Analysis % Allowable				Prior Interpretation Codes			
Control #	Date Taken	Fluid Status	Fluid Add	SMR	Fluid Run Time	A/F	Fuel H2O	Viscosity 100C	TBN	TAN	Soot	Oxi	Nit	Sul	

E-														
D-														
C-														
B-														
A-	19020041012	10/09/2004	Sampled	0.0	0	0	0	N	N	N	15.5	13.00	0.00	0 0 0 0 0

Filter Changed ^	Wear Metals (Parts per Million)															
	Copper	Iron	Chrome	Lead	Alum	Silicon	Molybdm	Sodium	Magnesm	Tin	Zinc	Nickel	Potasum	Calcium	Phospor	Boron

E-																
D-																
C-																
B-																
A-	0	6	0	0	1	5	4	5	10	0	1419	0	6	3041	1395	3

Overall Status	Particle Counts (per Milliliter)								Current Sample Interpretation	Current Sample is Line "A"
	4u	6u	14u	20u	25u	50u	75u	100u		

E-																
D-																
C-																
B-																
A-	Normal	5142	991	58	11	6	0	0	0	20/17/13	Readings Are Normal.					

Custom Tests >>>>	Cutting	Sliding	Fatigue	NonMetallic	Fibers	Total / ml
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E-						
D-						
C-						
B-						
A-	11	8	6	22	2	5131



9000000598 (C)

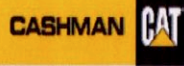
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Comments
E-
D-
C-
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A-

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Report shown below indicates the oil at 962 hours at an ISO 20/17/13
 Sample C indicates all filters were changed at 750 hours both OEM and FTA elements.

Fluid Trend Analysis
 01/23/2005



600 Glendale Ave. • Sparks, NV 89431 • 775-332-2477

Normal

1 of 1

Customer Unit ID	Make	Model	Serial	Compartment
440	CAT	3516	7RN00440	Engine

Oil Sample Information				Miscellaneous				Infrared Analysis % Allowable				Prior Interpretation Codes								
Control #	Date Taken	Fluid Status	Fluid Add SMR	Fluid Run Time	A/F	Fuel	H2O	Viscosity 100C	TBN	TAN	Soot	Oxi	Nit	Sul						
E-16120041124	11/22/2004	Sampled	0.0	16380	368	N	N	N	14.5	11.6	0.00	25	28	32	26	200				
D-18520041220	12/17/2004	Sampled	0.0	16662	650	N	N	N	14.1	12.0	0.00	34	22	33	12	200				
C-20720050104	01/03/2005	Sampled	0.0	16763	751	N	N	N	14.5	10.6	0.00	39	27	40	17	732	801			
B-10720050107	01/05/2005	Sampled	0.0	16798	786	N	N	N	14.6	11.0	0.00	43	39	41	19	200				
A-13720050121	01/20/2005	Sampled	0.0	16974	962	N	N	N	15.1	10.60	0.00	48	30	45	19					

Fluid: CHEVRON 15W40

Filter Changed ^A											Wear Metals (Parts per Million)						
	Copper	Iron	Chrome	Lead	Alum	Silicon	Molybden	Sodium	Magnesium	Tin	Zinc	Nickel	Potassium	Calcium	Phosphorus	Boron	
E-	1	5	0	0	2	2	6	5	7	0	1441	0	6	2990	1205	2	
D-	2	7	0	0	2	2	24	4	7	0	1320	0	5	2799	1142	13	
C-	2	8	0	0	2	2	46	6	9	0	1358	0	5	3120	1270	21	
B-	3	10	0	0	2	2	47	7	17	0	1516	0	4	3201	1189	20	
A-	5	14	0	1	3	2	57	6	9	1	1666	0	5	3196	1261	21	

Overall Status	Particle Counts (per Milliliter)								Current Sample Interpretation		
	4u	6u	14u	20u	25u	50u	75u	100u	ISO	Current Sample is Line "A"	
E- Normal	2693	367	20	5	3	0	0	0	0	19/16/12	Normal Wear Indicated, Continue Sampling At Normal Interval
D- Normal	9334	1715	91	22	5	0	0	0	0	20/18/14	
C- Normal	16886	1761	40	5	6	0	0	0	0	21/18/13	
B- Normal	8890	1022	52	6	3	2	0	0	0	20/17/13	
A- Normal	6008	1016	63	12	15	2	0	0	0	20/17/13	

Custom Tests >>>>	Cutting	Sliding	Fatigue	NonMetallic	Fibers	Total / ml
E-		11	2	13	2	2691
D-	3	4	12	52	8	9404
C-	2	9	4	19	5	16887
B-	4	11	6	24		8871
A-	8	2	8	38	5	5990



9000000598 (C)

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Comments

E-
 D-
 C-
 B- All FTA and OEM filter elements were changed.
 A-

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