

OIL ANALYSIS REPORT

Sample Rating Trend



KENWORTH 008

Component Diesel Engine Fluid

DIESEL ENGINE OIL SAE 15W40 (--- GAL)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor.

Wear

All component wear rates are normal.

Contamination

There is no indication of any contamination in the oil.

Fluid Condition

The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

SAMPLE INFORM	IATION	method	limit/base	current	history1	history2
Sample Number		Client Info		RW0004422	RW0004418	RW0004408
Sample Date		Client Info		12 Aug 2023	23 Jun 2023	13 May 2023
Machine Age	hrs	Client Info		2150	1846	1583
Oil Age	hrs	Client Info		304	263	350
Oil Changed		Client Info		Changed	Changed	Changed
Sample Status				NORMAL	NORMAL	NORMAL
CONTAMINATION	٧	method	limit/base	current	history1	history2
Fuel		WC Method	>3.0	<1.0	<1.0	<1.0
Glycol		WC Method		NEG	NEG	NEG
WEAR METALS		method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185m	>90	10	8	14
Chromium	ppm	ASTM D5185m	>20	<1	<1	<1
Nickel	ppm	ASTM D5185m	>2	<1	0	0
Titanium	ppm	ASTM D5185m	>2	0	0	0
Silver	ppm	ASTM D5185m	>2	<1	0	<1
Aluminum	ppm	ASTM D5185m	>20	3	2	3
Lead	ppm	ASTM D5185m	>40	0	0	<1
Copper	ppm	ASTM D5185m	>330	0	<1	0
Tin	ppm	ASTM D5185m	>15	<1	<1	<1
Vanadium	ppm	ASTM D5185m		0	0	0
Cadmium	ppm	ASTM D5185m		0	0	0
ADDITIVES		method				history2
ADDITIVES Boron	ppm	method ASTM D5185m	limit/base 250	current 8	history1 9	history2 12
ADDITIVES Boron Barium	ppm ppm	method ASTM D5185m ASTM D5185m	limit/base 250 10	current 8 0	history1 9 0	history2 12 0
ADDITIVES Boron Barium Molybdenum	ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100	current 8 0 69	history1 9 0 65	history2 12 0 63
ADDITIVES Boron Barium Molybdenum Manganese	ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100	current 8 0 69 <1	history1 9 0 65 <1	history2 12 0 63 <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450	current 8 0 69 <1 1025	history1 9 0 65 <1 961	history2 12 0 63 <1 978
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000	current 8 0 69 <1 1025 1293	history1 9 0 65 <1 961 1199	history2 12 0 63 <1 978 1095
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150	Current 8 0 69 <1 1025 1293 1127	history1 9 0 65 <1 961 1199 1088	history2 12 0 63 <1 978 1095 1039
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350	current 8 0 69 <1 1025 1293 1127 1434	history1 9 0 65 <1 961 1199 1088 1350	history2 12 0 63 <1 978 1095 1039 1307
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250	current 8 0 69 <1 1025 1293 1127 1434 4044	history1 9 0 65 <1 961 1199 1088 1350 3972	history2 12 0 63 <1 978 1095 1039 1307 3846
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base	Current 8 0 69 <1 1025 1293 1127 1434 4044 Current	history1 9 0 65 <1 961 1199 1088 1350 3972 history1	history2 12 0 63 <1 978 1095 1039 1307 3846 history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base >25	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base >25 >158	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm 1 ppm 2 ppm 2 ppm 2 ppm 2 ppm 2 ppm 3 ppm 4 ppm 4 ppm 2 ppm 1 ppm 1	method ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 25 >25 >158 >20	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 2 4 2 4	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 <1 7
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 20 <u>limit/base</u> >20 <u>limit/base</u>	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 4 2 8 current	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 2 4 history1	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 <1 7 <1 7 history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot %	ppm	method ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base >25 >158 >20 limit/base >6	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 2 4 0.3	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 0.3
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 25 >25 >158 >20 <u>limit/base</u> >6 >20	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5 6.8	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 0.3 6.8	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 <1.07 0.3 7.3
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m	limit/base 250 10 100 450 3000 1150 1350 4250 20 25 >25 >158 >20 limit/base >6 >20 >20 >30	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5 6.8 18.7	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 2 4 0.3 6.8 19.4	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 0.3 7.3 18.9
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D7844 *ASTM D7624 *ASTM D7415 Method	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base >25 >158 >20 limit/base >6 >20 >30	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5 6.8 18.7	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 0.3 6.8 19.4 history1	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <10 0.3 7.3 18.9 history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA Oxidation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D7844 *ASTM D7844 *ASTM D7624 *ASTM D7415 method *ASTM D7414	limit/base 250 10 100 450 3000 1150 1350 4250 20 25 >25 >20 limit/base >6 >20 limit/base >30 limit/base	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5 6.8 18.7 current 13.4	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 0.3 6.8 19.4 history1 14.2	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <11 7 ol.3 7.3 18.9 history2 13.6
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA Oxidation Base Number (BN)	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185m ASTM D7844 *ASTM D7844 *ASTM D7415 method *ASTM D7414 *ASTM D7414	limit/base 250 10 100 450 3000 1150 1350 4250 limit/base >25 >158 >20 limit/base >6 >20 >30 limit/base >20 >30 limit/base >25 >30	current 8 0 69 <1 1025 1293 1127 1434 4044 current 4 2 8 current 0.5 6.8 18.7 current 13.4 10.39	history1 9 0 65 <1 961 1199 1088 1350 3972 history1 4 2 4 2 4 0.3 6.8 19.4 history1 14.2 10.06	history2 12 0 63 <1 978 1095 1039 1307 3846 history2 7 <1 7 <1 7 <1 7 <1.3 1.3.6 9.91



OIL ANALYSIS REPORT

VISUAL



	White Metal	scalar scalar	*Visual *Visual	NONE		NONE	NONE	
	Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE	
	Silt	scalar	*Visual	NONE	NONE	NONE	NONE	
	Debris	scalar	*Visual	NONE	NONE	NONE	NONE	
3 53	Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE	
lec10/2 lay13/2 un23/2	Appearance	scalar	^Visual	NORML	NORML	NORML	NORML	
	Emulsified Water	scalar	*Visual			NEG	NEG	
3	Free Water	scalar	*Visual	20.L	NEG	NEG	NEG	
······	FLUID PROPERT	TIES	method	limit/base	current	history1	history2	
	Visc @ 100°C	cSt	ASTM D445	14.4	12.9	13.2	12.9	
	GRAPHS							
	250 _T			10	Lead (ppm)			
3/23 -	200 Severe				30 - Severe			
Dec1 May1 Jun2	<u>ع</u> 150-				50			
	100 - Abnormal			4	HO - Abnormal			
	50				0			
	18/22 - 20/22 -	10/22 -	13/23 -	12/23 -	20/22	t7/22 -	13/23 -	
	Juni Augá	Dec	May	Aug	Aug	Deci	May' Jun'	
	Aluminum (ppm)			5	Chromium (pj	pm)		
	40 - Severe			4	HO - Severe			
	5.0- Abroma			ud a	30			
				2				
		-		_				
	un18/22 ug20/22 0ct7/22	ec10/22	ay 13/23 un 23/23	ug 12/23	un 18/22 ug 20/22	0ct7/22 ec10/22	ay 13/23 un 23/23 ug 12/23	
	ے۔ Copper (ppm)		M T	A	Silicon (ppm)	Q	M J A	
	400 Severe			3	Severe	1		
	300-			6	50			
	툡 200 -			udd dd	Abnompal			
	100-			2	20			
		722	/23	/23	22	22+	23	
	Jun 18, Aug 20, Oct7,	Dec10	May13, Jun23,	Aug12	Jun 18, Aug 20,	0ct7, Dec10	May13 Jun23 Aug12	
	Viscosity @ 100°C				Base Number			
	Abnormal		1	(B/HO	Abnormal			
	D Base			B10	.0 Base			
	전 Abnorma			Imper	Abnormal			
	12			Base				
	8/22	0/22 +	3/23 +	2/23	8/22 H	0/22 +	3/23 + 3/23 + 2/23 +	
	Jun1 Aug2 Oct	Dec1	May1 Jun2	Aug1	Jun1 Aug2	Dec1	May1 Jun2 Aug1	
Laboratory Sample No. Lab Number Unique Numbr	: WearCheck USA - 5 : RW0004422	501 Madis Received Diagnose Diagnosti	on Ave., Ca : 28 / ed : 29 / cian : We	ry, NC 2751 Aug 2023 Aug 2023 s Davis	3 НА	LLACK CON	FRACTING, INC. 4223 W POLK HART, MI US 49420	
Certificate L2367 Test Packag	e : MOB 2				Contact:	DAN HALLACH	KARL BUTCHER	
o discuss this sample repor - Denotes test methods that	t, contact Customer Servi t are outside of the ISO 1	ice at 1-80 7025 scop	00-237-1369 De of accreo). litation.	shop@hallackcontracting.com T: (231)873-5081 <i>ile (JCGM 106:2012)</i> F: (231)873-2889			



Report Id: HALHAR [WUSCAR] 05936821 (Generated: 08/29/2023 14:58:10) Rev: 1

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