

OIL ANALYSIS REPORT

Sample Rating Trend

NORMAL

Machine Id

CATERPILLAR RH BEYMER

Starboard Main Engine

KENDALL SUPER-D XA 15W40 (--- GAL)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor.

Wear

All component wear rates are normal.

Contamination

Elevated aluminum (Al) and/or lead (Pb) and potassium (K) levels in your metals analysis are likely a result of solder flux release into the lubricant and is common on new equipment/components. There is no indication of any contamination in the oil.

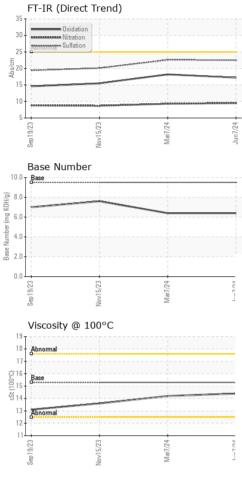
Fluid Condition

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

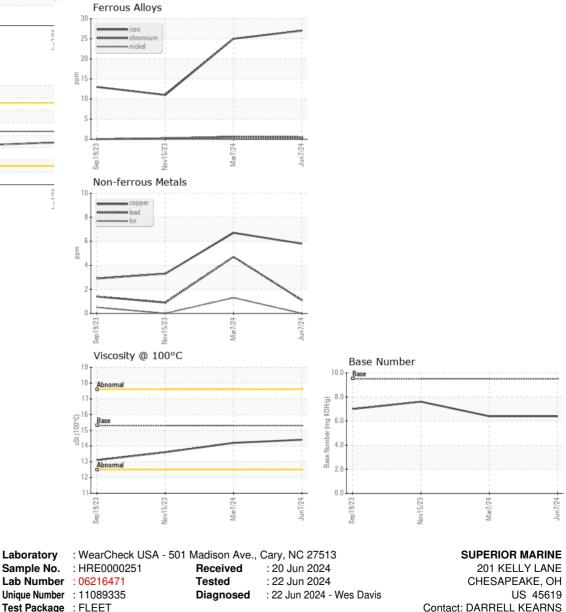
Sample Number Client Info HRE0000251 WC0843957 WC0843957 Sample Date Client Info 07 Jun 2024 07 Mar 2024 15 Nov 2023 Machine Age hrs Client Info 38018 35852 33233 Oil Age Client Info Sample Status 07 Mar 2024 15 Nov 2023 Sample Status Client Info Changed Changed Changed CONTAMINATION method Imit/base current history1 history2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 <1.0 Water WC Method >0.1 NEG NEG NEG NEG Water ppm ASTM 051555 >2 7 2.5 11 Kron ppm ASTM 051555 >2 0 <1 0 Nickel ppm ASTM 051555 >18 1 5 <1 0 Auminum ppm ASTM 051555 >18 1 <1 1 <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>							
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Machine Age hrs Client Info 38018 35852 33233 Oil Age hrs Client Info 500 500 500 Oil Age hrs Client Info 500 500 500 Sample Status Info NORMAL NORMAL NORMAL NORMAL CONTAMINATION method infit/base current history1 History2 Fuel WC Method >4.0 <1.0 <1.0 <1.0 Water WC Method >0.1 NEG NEG NEG Glycol WC Method >0.1 NEG NEG NEG WEAR METALS method imit/base current history1 history2 Iron ppm ASTM 05165m >8 <1 <1 <1 <1 <1 Nickel ppm ASTM 05165m >2 0 <1 0 <1 0 Aluminum ppm ASTM 05165m >14 0 1 <	Sample Number		Client Info		HRE0000251		WC0843977
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Oli Changed Sample StatusClient InfoChanged NORMALC	Machine Age	hrs	Client Info		38018		33233
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CONTAMINATION method imit/base current history1 history2 Fuel WC Method >4.0 <1.0	Oil Changed		Client Info		•	Changed	Changed
Fuel WC Method >4.0 <1.0	Sample Status				NORMAL	NORMAL	NORMAL
Water WC Method >0.1 NEG NEG NEG Glycol WC Method Imil/base current history1 history2 Iron ppm ASTM D5185m >75 27 25 11 Chromium ppm ASTM D5185m >8 <1 <1 <1 Nickel ppm ASTM D5185m >2 0 0 <1 Silver ppm ASTM D5185m >2 0 <1 0 Aluminum ppm ASTM D5185m >15 2 2 2 2 Lead ppm ASTM D5185m >18 1 5 <1 Copper ppm ASTM D5185m >18 1 <1 <1 Cadmium ppm ASTM D5185m >18 0 1 0 ADDITIVES method Imit/base current history1 history2 Barium ppm ASTM D5185m 100 0 1	CONTAMINATION	١	method	limit/base	current	history1	history2
Glycol WC Method NEG NEG NEG WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >75 27 25 11 Chromium ppm ASTM D5185m >2 0 0 <1	Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
WEAR METALS method limit/base current history1 history2 Iron ppm ASTM D5185m >75 27 25 11 Chromium ppm ASTM D5185m >75 27 25 11 Nickel ppm ASTM D5185m >2 0 0 <1	Water		WC Method	>0.1	NEG	NEG	NEG
Iron ppm ASTM D5185m >75 27 25 11 Chromium ppm ASTM D5185m >8 <1	Glycol		WC Method		NEG	NEG	NEG
Chromium ppm ASTM D5185m >8 <1 <1 <1 Nickel ppm ASTM D5185m >2 0 0 <1	WEAR METALS		method	limit/base	current	history1	history2
Nickel ppm ASTM D5185m >2 0 0 <1 Titanium ppm ASTM D5185m >3 71 49 55 Silver ppm ASTM D5185m >2 0 <1	Iron	ppm	ASTM D5185m	>75	27	25	11
Titanium ppm ASTM D5185m >3 71 49 55 Silver ppm ASTM D5185m >2 0 <1	Chromium	ppm	ASTM D5185m	>8	<1	<1	<1
Silver ppm ASTM D5185m >2 0 <1 0 Aluminum ppm ASTM D5185m >15 2 2 2 Lead ppm ASTM D5185m >18 1 5 <1 Copper ppm ASTM D5185m >80 6 7 3 Tin ppm ASTM D5185m >14 0 1 0 Vanadium ppm ASTM D5185m >14 0 1 0 Vanadium ppm ASTM D5185m >14 0 1 0 1 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 0 0 13 28 36 Magnesium ppm ASTM D5185m 100 968 2130 1930 Phosphorus ppm ASTM D5185m 100 <td>Nickel</td> <td>ppm</td> <td>ASTM D5185m</td> <td>>2</td> <th>0</th> <td>0</td> <td><1</td>	Nickel	ppm	ASTM D5185m	>2	0	0	<1
Aluminum ppm ASTM D5185m >15 2 2 2 Lead ppm ASTM D5185m >18 1 5 <1	Titanium	ppm	ASTM D5185m	>3	71	49	55
Lead ppm ASTM D5185m >18 1 5 <1 Copper ppm ASTM D5185m >80 6 7 3 Tin ppm ASTM D5185m >14 0 1 0 Vanadium ppm ASTM D5185m >14 0 1 <1	Silver	ppm	ASTM D5185m	>2	0	<1	0
Copper ppm ASTM D5185m >80 6 7 3 Tin ppm ASTM D5185m >14 0 1 0 Vanadium ppm ASTM D5185m >14 0 1 0 Cadmium ppm ASTM D5185m 0 <1	Aluminum	ppm	ASTM D5185m	>15	2	2	2
Tin ppm ASTM D5185m >14 0 1 0 Vanadium ppm ASTM D5185m 0 <1 <1 Cadmium ppm ASTM D5185m 0 <1 <1 <1 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 50 40 <13 28 36 Magnesium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1000 990 1003 1171 Sulfur ppm ASTM D5185m>20	Lead	ppm	ASTM D5185m	>18	1	5	<1
Vanadium ppm ASTM D5185m <1 1 <1 Cadmium ppm ASTM D5185m 0 <1 <1 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 20 0 0 41 <1 Magnesium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 20 4 <th< td=""><td>Copper</td><td>ppm</td><td>ASTM D5185m</td><td>>80</td><th>6</th><td>7</td><td>3</td></th<>	Copper	ppm	ASTM D5185m	>80	6	7	3
Cadmium ppm ASTM D5185m 0 <1 <1 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 20 40 41 <1 Magnesium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 1000 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 20 4	Tin	ppm	ASTM D5185m	>14	0	1	0
ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 0 0 9 Molybdenum ppm ASTM D5185m 13 28 36 Magnesium ppm ASTM D5185m 0 <1	Vanadium	ppm	ASTM D5185m		<1	1	<1
Boron ppm ASTM D5185m 50 40 49 102 Barium ppm ASTM D5185m 0 0 9 Molybdenum ppm ASTM D5185m 13 28 36 Manganese ppm ASTM D5185m 0 <1	Cadmium	ppm	ASTM D5185m		0	<1	<1
Barium ppm ASTM D5185m 0 0 9 Molybdenum ppm ASTM D5185m 13 28 36 Manganese ppm ASTM D5185m 0 <1 <1 Magnesium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1000 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m<>20 4 3 4 Sodium ppm ASTM D5185m<>20 6 3 4	ADDITIVES		method	limit/base	current	history1	history2
Molybdenum ppm ASTM D5185m 13 28 36 Manganese ppm ASTM D5185m 0 <1	Boron	ppm	ASTM D5185m	50	40	49	102
Manganese ppm ASTM D5185m 0 <1 <1 Magnesium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1900 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 6 3 <1	Barium	ppm	ASTM D5185m		0	0	9
Magnesium ppm ASTM D5185m 270 357 305 285 Calcium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1000 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 4 3 4 Potassium ppm ASTM D5185m >20 6 3 4 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.4 0.4 0.2 Nitration Abs/.1mm *ASTM D7415 >30	Molybdenum	ppm	ASTM D5185m		13	28	36
Calcium ppm ASTM D5185m 1900 1968 2130 1930 Phosphorus ppm ASTM D5185m 1000 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 6 3 <1	Manganese	ppm	ASTM D5185m		0	<1	<1
Phosphorus ppm ASTM D5185m 1000 990 1003 1019 Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 6 3 <1 Potassium ppm ASTM D5185m >20 6 3 4 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/mm< *ASTM D7624 >20 9.5 <td>Magnesium</td> <td>ppm</td> <td>ASTM D5185m</td> <td>270</td> <th>357</th> <td>305</td> <td></td>	Magnesium	ppm	ASTM D5185m	270	357	305	
Zinc ppm ASTM D5185m 1260 1267 1290 1171 Sulfur ppm ASTM D5185m 3400 3608 4452 4011 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >20 6 3 <1	Calcium	ppm	ASTM D5185m	1900	1968	2130	1930
SulfurppmASTM D5185m3400360844524011CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>20434SodiumppmASTM D5185m>7563<1	Phosphorus	ppm	ASTM D5185m	1000	990	1003	1019
CONTAMINANTSmethodlimit/basecurrenthistory1history2SiliconppmASTM D5185m>20434SodiumppmASTM D5185m>7563<1	Zinc	ppm	ASTM D5185m	1260	1267	1290	1171
Silicon ppm ASTM D5185m >20 4 3 4 Sodium ppm ASTM D5185m >75 6 3 <1 Potassium ppm ASTM D5185m >20 6 3 <1 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.4 0.4 0.2 Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7624 >20 9.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Sulfur	ppm	ASTM D5185m	3400	3608	4452	4011
Sodium ppm ASTM D5185m >75 6 3 <1 Potassium ppm ASTM D5185m >20 6 3 4 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.4 0.4 0.2 Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	CONTAMINANTS		method	limit/base	current	history1	history2
Potassium ppm ASTM D5185m >20 6 3 4 INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.4 0.4 0.2 Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Silicon	ppm	ASTM D5185m	>20	4		4
INFRA-RED method limit/base current history1 history2 Soot % % *ASTM D7844 0.4 0.2 Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Sodium	ppm	ASTM D5185m	>75	6	3	<1
Soot % % *ASTM D7844 0.4 0.2 Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Potassium	ppm	ASTM D5185m	>20	6	3	4
Nitration Abs/cm *ASTM D7624 >20 9.5 9.3 8.7 Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	INFRA-RED		method	limit/base	current	history1	history2
Sulfation Abs/.1mm *ASTM D7415 >30 22.5 22.6 20.1 FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Soot %	%	*ASTM D7844		0.4	0.4	0.2
FLUID DEGRADATION method limit/base current history1 history2 Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Nitration	Abs/cm	*ASTM D7624	>20	9.5	9.3	8.7
Oxidation Abs/.1mm *ASTM D7414 >25 17.2 18.2 15.5	Sulfation	Abs/.1mm	*ASTM D7415	>30	22.5	22.6	20.1
	FLUID DEGRADA	TION	method	limit/base	current	history1	history2
	Oxidation	Abs/.1mm	*ASTM D7414	>25	17.2	18.2	15.5
	Base Number (BN)	mg KOH/g	ASTM D2896	9.5	6.4	6.4	7.6



OIL ANALYSIS REPORT



VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG
FLUID PROPER	ΓIES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	15.3	14.4	14.2	13.6
GRAPHS						





Unique Number : 11089335 Test Package : FLEET Certificate 12367 To discuss this sample report, contact Customer Service at 1-800-237-1369. darrellkearns@superiormarineinc.com * - Denotes test methods that are outside of the ISO 17025 scope of accreditation. Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

Contact/Location: DARRELL KEARNS - SUPCHEOH

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F: