

### **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.

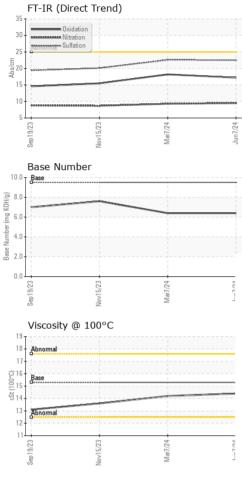
#### Fluid Condition

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

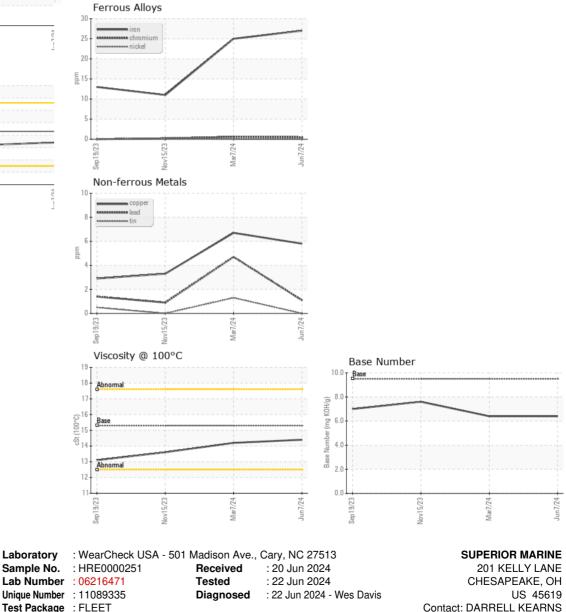
Sample Number         Client Info         HRE0000251         WC0843957         WC0843957           Sample Date         Client Info         07 Jun 2024         07 Mar 2024         15 Nov 2023           Machine Age         hrs         Client Info         38018         35852         33233           Oil 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<>							
Sample Date         Client Info         07 Jun 2024         07 Mar 2024         15 Nov 2023           Machine Age         hrs         Client Info         38018         35852         33233           Oil Age         hrs         Client Info         500         500         500           Oil Changed         Client Info         Changed         Changed <thchanged< th=""> <thchanged< th="">         Chan</thchanged<></thchanged<>	SAMPLE INFORM	1ATION	method	limit/base	current	history1	history2
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
Oil Age         hrs         Client Info         500         500         500           Oil Changed         Client Info         Changed         Chang         Chang         Chang	Sample Date		Client Info		07 Jun 2024	07 Mar 2024	15 Nov 2023
Oli Changed Sample StatusClient InfoChanged NORMALC	Machine Age	hrs	Client Info		38018		33233
Sample Status         NORMAL         NORMAL         NORMAL         NORMAL         NORMAL           CONTAMINATION         method         imil/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         Sol.1         NEG         NEG         NEG           WEAR METALS         method         imit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >75         27         25         11           Chromium         ppm         ASTM D5185m         >2         0         0         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         0           Aluminum         ppm         ASTM D5185m         >15         2         2         2         2           Lead         ppm         ASTM D5185m         >14         0         1         0           Vanadium         ppm         ASTM D5185m         50         40         49         102	Oil Age	hrs	Client Info		500		
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>&gt;2</td> <th>0</th> <td>0</td> <td>&lt;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>&gt;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

T:

F: