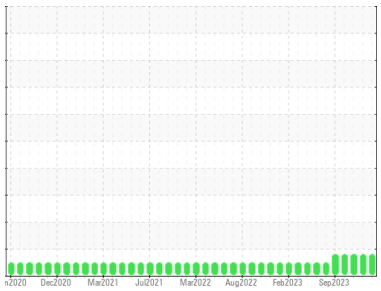
OIL ANALYSIS REPORT

Sample Rating Trend



WEAR

Area
Marathon
Machine Id
[Marathon] Oil - Starboard Main Engine
Component
Starboard Main Engine
Fluid
DIESEL ENGINE OIL SAE 15W40 (150 GAL)

DIAGNOSIS

Recommendation

No corrective action is recommended at this time. Resample at the next service interval to monitor. (Customer Sample Comment: Chris Comuzie)

Wear

The copper level is abnormal. Elemental level of copper (Cu) probably due to leaching of copper from copper components (i.e. cooling core) by the oil additives. All other 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 INFORMATION		method	limit/base	current	history1	history2
Sample Number		Client Info		**WC0846112**	WC0846100	WC0846106
Sample Date		Client Info		**01 Apr 2024**	12 Feb 2024	13 Dec 2023
Machine Age	hrs	Client Info		**6797**	6031	4903
Oil Age	hrs	Client Info		**6797**	6031	4903
Oil Changed		Client Info		**Filtered**	Filtered	Filtered
Sample Status				**ABNORMAL**	ABNORMAL	ABNORMAL

CONTAMINATION		method	limit/base	current	history1	history2
Fuel		WC Method	>4.0	**<1.0**	<1.0	<1.0
Glycol		WC Method		**NEG**	NEG	NEG

WEAR METALS		method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185m	>75	**25**	22	17
Chromium	ppm	ASTM D5185m	>8	**<1**	<1	<1
Nickel	ppm	ASTM D5185m	>2	**0**	0	0
Titanium	ppm	ASTM D5185m	>3	**<1**	<1	<1
Silver	ppm	ASTM D5185m	>2	**0**	0	0
Aluminum	ppm	ASTM D5185m	>15	**2**	2	2
Lead	ppm	ASTM D5185m	>18	**5**	4	4
Copper	ppm	ASTM D5185m	>80	▲ **93**	▲ 96	▲ 122
Tin	ppm	ASTM D5185m	>14	**2**	<1	1
Vanadium	ppm	ASTM D5185m		**0**	0	0
Cadmium	ppm	ASTM D5185m		**0**	0	0

ADDITIVES		method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185m	250	**114**	118	119
Barium	ppm	ASTM D5185m	10	**0**	0	0
Molybdenum	ppm	ASTM D5185m	100	**85**	81	75
Manganese	ppm	ASTM D5185m		**<1**	<1	<1
Magnesium	ppm	ASTM D5185m	450	**697**	644	614
Calcium	ppm	ASTM D5185m	3000	**1604**	1713	1743
Phosphorus	ppm	ASTM D5185m	1150	**802**	770	744
Zinc	ppm	ASTM D5185m	1350	**1017**	990	970
Sulfur	ppm	ASTM D5185m	4250	**2694**	2466	2231

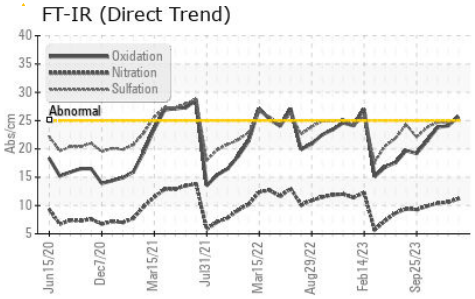
CONTAMINANTS		method	limit/base	current	history1	history2
Silicon	ppm	ASTM D5185m	>20	**4**	4	3
Sodium	ppm	ASTM D5185m	>158	**4**	5	2
Potassium	ppm	ASTM D5185m	>20	**3**	2	<1
Water	%	ASTM D6304	>0.1	**NEG**	NEG	NEG

INFRA-RED		method	limit/base	current	history1	history2
Soot %	%	*ASTM D7844		**0.3**	0.3	0.3
Nitration	Abs/cm	*ASTM D7624	>20	**11.2**	10.6	10.4
Sulfation	Abs/.1mm	*ASTM D7415	>30	**25.2**	24.7	24.7

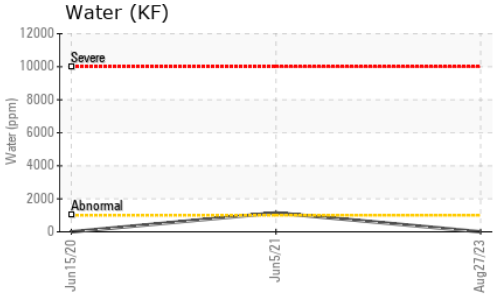
FLUID DEGRADATION		method	limit/base	current	history1	history2
Oxidation	Abs/.1mm	*ASTM D7414	>25	**25.7**	24.1	23.8
Base Number (BN)	mg KOH/g	ASTM D2896	8.5	**6.53**	6.67	7.87

OIL ANALYSIS REPORT

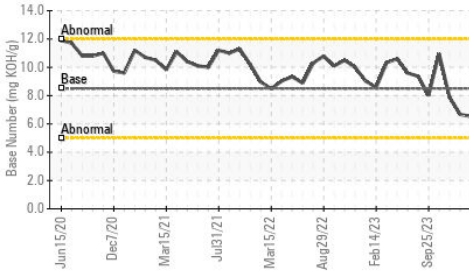
FT-IR (Direct Trend)



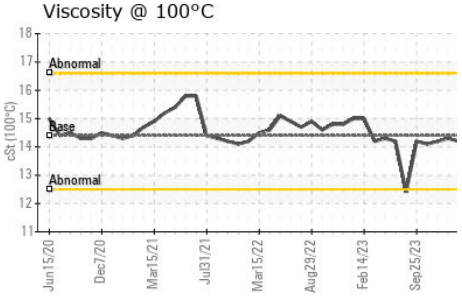
Water (KF)



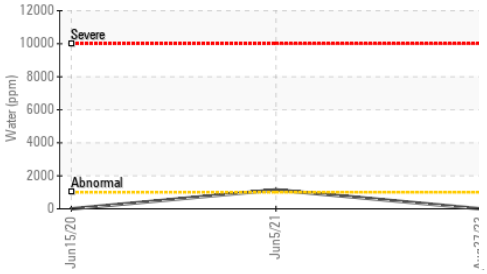
Base Number



Viscosity @ 100°C



Water (KF)

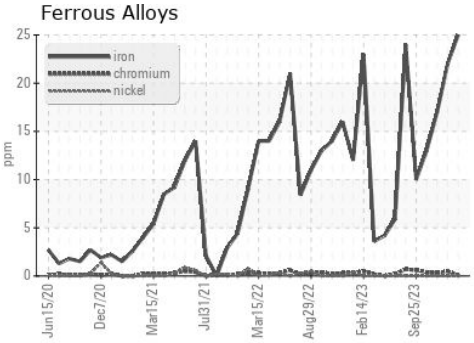


VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	**NONE**	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	**NONE**	NONE	NONE
Precipitate	scalar	*Visual	NONE	**NONE**	NONE	NONE
Silt	scalar	*Visual	NONE	**NONE**	NONE	NONE
Debris	scalar	*Visual	NONE	**NONE**	NONE	NONE
Sand/Dirt	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

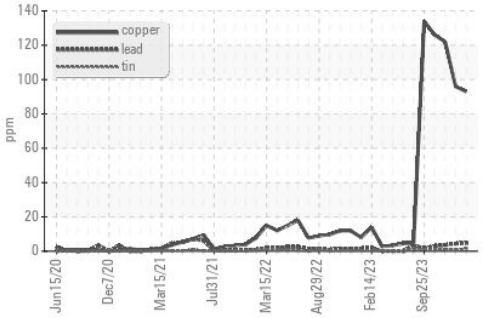
FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	14.4	**14.2**	14.3	14.2

GRAPHS

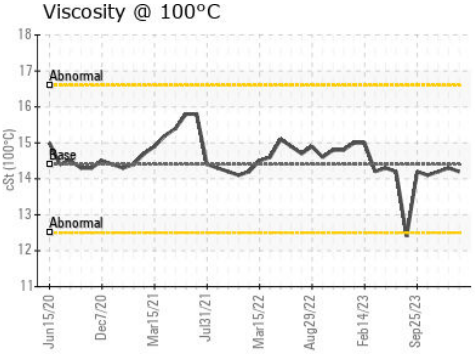
Ferrous Alloys



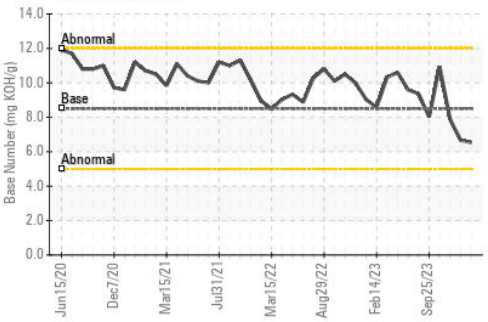
Non-ferrous Metals



Viscosity @ 100°C



Base Number



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0846112
Lab Number : 06157874
Unique Number : 10993297
Test Package : IND 2 (Additional Tests: KF)

Received : 23 Apr 2024
Tested : 25 Apr 2024
Diagnosed : 25 Apr 2024 - Sean Felton

To discuss this sample report, contact Customer Service at 1-800-237-1369.
** - 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)

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Report Id: MARCAT [WUSCAR] 06157874 (Generated: 04/25/2024 20:15:03) Rev: 1

Submitted By: M/V MARATHON