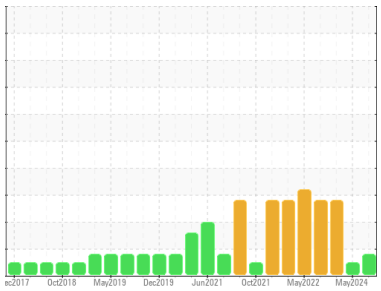
# OIL ANALYSIS REPORT

Sample Rating Trend




**WEAR**

Machine Id
## MANNS X6
Component
**Starboard Main Engine**
Fluid
**{not provided} (23 GAL)**

## DIAGNOSIS

**Recommendation**
Oil and filter change at the time of sampling has been noted. No corrective action is recommended at this time. Resample at the next service interval to monitor.

**Wear**
The copper level is abnormal. All other component wear rates are normal.

**Contamination**
The amount and size of particulates present in the system are acceptable. 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 | | **KL0013499** | KL0013502 | KL0008977 |
| Sample Date | | Client Info | | **14 May 2024** | 01 May 2024 | 08 Jan 2023 |
| Machine Age | hrs | Client Info | | **15550** | 14973 | 13003 |
| Oil Age | hrs | Client Info | | **580** | 500 | 429 |
| Oil Changed | | Client Info | | **Changed** | N/A | Changed |
| Sample Status | | | | **ABNORMAL** | --- | ABNORMAL |

| CONTAMINATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Fuel | | WC Method | >4.0 | **<1.0** | <1.0 | <1.0 |
| Water | | WC Method | >0.1 | **NEG** | NEG | NEG |

| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Iron | ppm | ASTM D5185m | >75 | **7** | 7 | 5 |
| Chromium | ppm | ASTM D5185m | >8 | **1** | <1 | <1 |
| Nickel | ppm | ASTM D5185m | >2 | **<1** | <1 | <1 |
| Titanium | ppm | ASTM D5185m | >3 | **<1** | <1 | <1 |
| Silver | ppm | ASTM D5185m | >2 | **<1** | <1 | 0 |
| Aluminum | ppm | ASTM D5185m | >15 | **2** | 2 | <1 |
| Lead | ppm | ASTM D5185m | >18 | **1** | <1 | 3 |
| Copper | ppm | ASTM D5185m | >80 | ▲ **267** | ▲ 194 | ▲ 129 |
| Tin | ppm | ASTM D5185m | >14 | **1** | 1 | <1 |
| Vanadium | ppm | ASTM D5185m | | **<1** | <1 | 0 |
| Cadmium | ppm | ASTM D5185m | | **<1** | <1 | 0 |

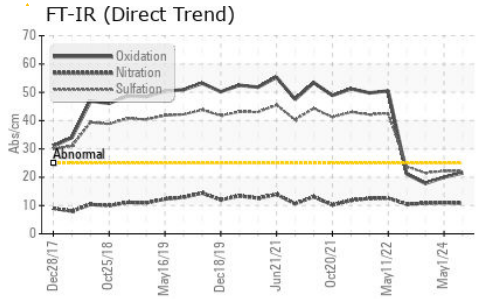
| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Boron | ppm | ASTM D5185m | | **29** | 19 | 37 |
| Barium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | | **88** | 63 | 16 |
| Manganese | ppm | ASTM D5185m | | **<1** | <1 | <1 |
| Magnesium | ppm | ASTM D5185m | | **1492** | 1064 | 840 |
| Calcium | ppm | ASTM D5185m | | **1169** | 887 | 1415 |
| Phosphorus | ppm | ASTM D5185m | | **1305** | 974 | 829 |
| Zinc | ppm | ASTM D5185m | | **1629** | 1202 | 1043 |
| Sulfur | ppm | ASTM D5185m | | **4345** | 3563 | 3422 |

| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185m | >20 | **6** | 4 | 3 |
| Sodium | ppm | ASTM D5185m | >75 | **7** | 7 | 5 |
| Potassium | ppm | ASTM D5185m | >20 | **2** | 2 | 3 |
| Glycol | % | *ASTM D2982 | | **NEG** | NEG | NEG |

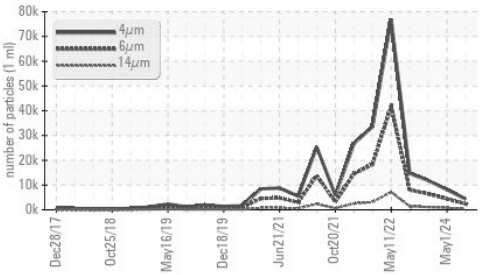
| INFRA-RED | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Soot % | % | *ASTM D7844 | | **0.2** | 0.3 | 0.2 |
| Nitration | Abs/cm | *ASTM D7624 | >20 | **10.8** | 11.0 | 10.8 |
| Sulfation | Abs/.1mm | *ASTM D7415 | >30 | **22.2** | 22.2 | 21.5 |

# OIL ANALYSIS REPORT

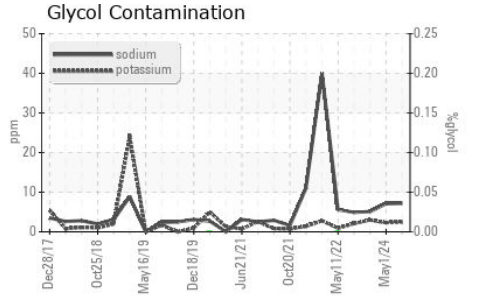
FT-IR (Direct Trend)



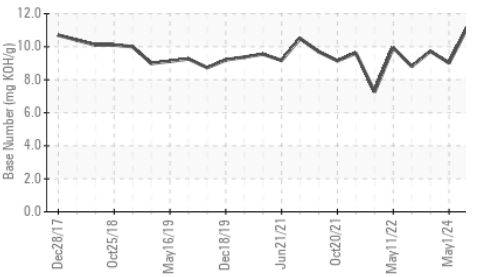

Particle Trend



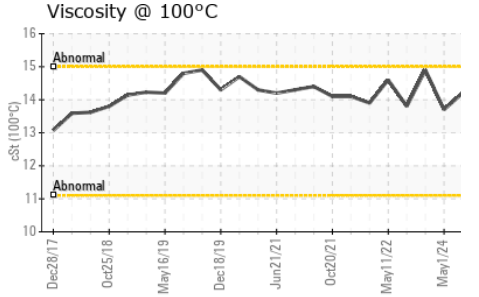

Glycol Contamination




Base Number




Viscosity @ 100°C




| FLUID CLEANLINESS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Particles >4µm | | ASTM D7647 | | **4332** | 8117 | 11797 |
| Particles >6µm | | ASTM D7647 | >5000 | **2360** | 4422 | 6426 |
| Particles >14µm | | ASTM D7647 | >640 | **402** | 753 | 1094 |
| Particles >21µm | | ASTM D7647 | >160 | **135** | 253 | 368 |
| Particles >38µm | | ASTM D7647 | >40 | **21** | 39 | 57 |
| Particles >71µm | | ASTM D7647 | >10 | **2** | 4 | 6 |
| Oil Cleanliness | | ISO 4406 (c) | >19/16 | **18/16** | 19/17 | 20/17 |

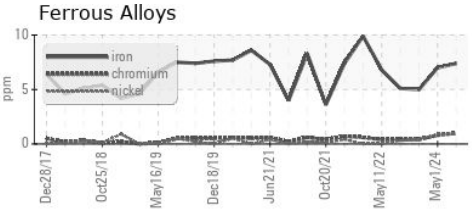
| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Oxidation | Abs/.1mm | *ASTM D7414 | >25 | **21.5** | 20.0 | 17.8 |
| Base Number (BN) | mg KOH/g | ASTM D2896 | | **11.19** | 9.01 | 9.73 |

| 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** | 0.2% | NEG |
| Free Water | scalar | *Visual | | **NEG** | NEG | NEG |

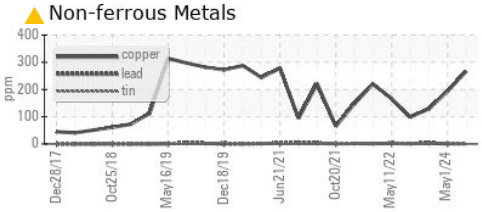
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 100°C | cSt | ASTM D445 | | **14.2** | 13.7 | 14.9 |

## GRAPHS

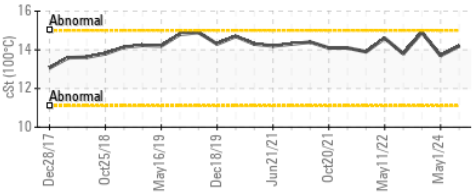
Ferrous Alloys



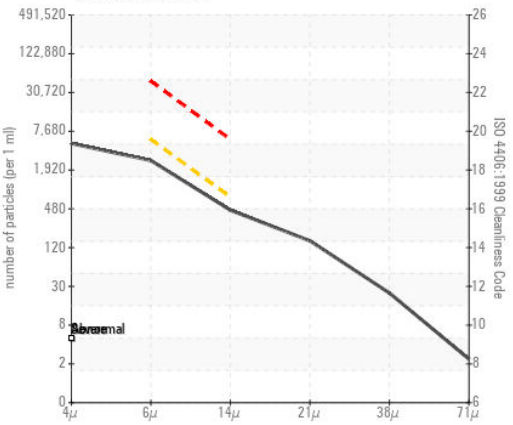

Non-ferrous Metals



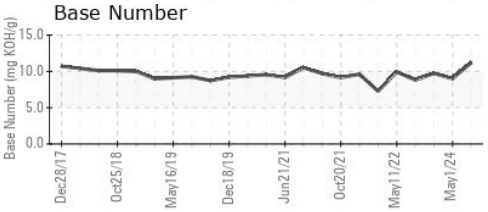

Viscosity @ 100°C




Particle Count




Base Number




Certificate L2367

**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513
**Sample No.** : KL0013499 **Received** : 17 May 2024
**Lab Number** : 06183442 **Tested** : 21 May 2024
**Unique Number** : 11034768 **Diagnosed** : 21 May 2024 - Don Baldridge
**Test Package** : MOB 2 ( Additional Tests: Glycol, PrtCount )

*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)*

**EXPEDITIONS**
658 FRONT ST, SUITE 127
LAHAINA, HI
US 96761
Contact: BILL CALDWELL
bill@go-lanai.com
T: (800)695-2624
F: (808)661-0544