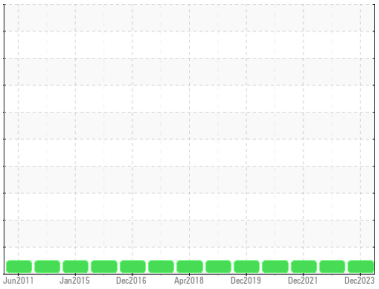
DIAMOND WTG ENGINEERING & SERVICES, INC.
a group company of MITSUBISHI HEAVY INDUSTRIES, LTD.

# OIL ANALYSIS REPORT

Sample Rating Trend




NORMAL

Machine Id
## D101 (S/N 6412-10)
Component
**Wind Turbine Gearbox**
Fluid
**MOBIL MOBILGEAR SHC XMP 320 (74 GAL)**

## DIAGNOSIS

**Recommendation**
Resample at the next service interval to monitor.

**Wear**
All 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 AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

| SAMPLE INFORMATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Sample Number | | Client Info | | **MHI026361** | MHI025215 | MHI017528 |
| Sample Date | | Client Info | | **20 Dec 2023** | 22 Dec 2022 | 21 Dec 2021 |
| Machine Age | hrs | Client Info | | **0** | 0 | 0 |
| Oil Age | hrs | Client Info | | **2361** | 38852 | 33073 |
| Oil Changed | | Client Info | | **N/A** | Not Changd | Not Changd |
| Sample Status | | | | **NORMAL** | NORMAL | NORMAL |

| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| PQ | | ASTM D8184 | >200 | **14** | 6 | 17 |
| Iron | ppm | ASTM D5185m | >200 | **9** | 11 | 12 |
| Chromium | ppm | ASTM D5185m | >3 | **0** | 0 | 0 |
| Nickel | ppm | ASTM D5185m | >3 | **0** | 0 | 0 |
| Titanium | ppm | ASTM D5185m | >10 | **0** | 0 | 0 |
| Silver | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Aluminum | ppm | ASTM D5185m | >30 | **0** | 0 | 0 |
| Lead | ppm | ASTM D5185m | >15 | **0** | 0 | 0 |
| Copper | ppm | ASTM D5185m | >75 | **7** | 4 | 2 |
| Tin | ppm | ASTM D5185m | >10 | **0** | 0 | <1 |
| Antimony | ppm | ASTM D5185m | >5 | **---** | --- | 0 |
| 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 | 0 | **0** | 0 | 2 |
| Barium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | 0 | **0** | 0 | 0 |
| Manganese | ppm | ASTM D5185m | | **0** | <1 | <1 |
| Magnesium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Calcium | ppm | ASTM D5185m | 0 | **0** | 0 | 0 |
| Phosphorus | ppm | ASTM D5185m | 485 | **388** | 402 | 492 |
| Zinc | ppm | ASTM D5185m | 0 | **17** | 13 | 4 |
| Sulfur | ppm | ASTM D5185m | | **3975** | 4616 | 4111 |

| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185m | >+30 | **0** | 0 | <1 |
| Sodium | ppm | ASTM D5185m | >15 | **0** | 0 | 0 |
| Potassium | ppm | ASTM D5185m | >20 | **0** | 0 | 0 |
| Water | % | ASTM D6304 | >0.1 | **0.004** | 0.011 | 0.003 |
| ppm Water | ppm | ASTM D6304 | >1000 | **43** | 119.5 | 37.2 |

| FLUID CLEANLINESS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Particles >4µm | | ASTM D7647 | | **198** | 4232 | 509 |
| Particles >6µm | | ASTM D7647 | >5000 | **54** | 649 | 154 |
| Particles >14µm | | ASTM D7647 | >640 | **6** | 16 | 13 |
| Particles >21µm | | ASTM D7647 | >160 | **2** | 3 | 3 |
| Particles >38µm | | ASTM D7647 | >40 | **0** | 0 | 0 |
| Particles >71µm | | ASTM D7647 | >10 | **0** | 0 | 0 |
| Oil Cleanliness | | ISO 4406 (c) | >--/19/16 | **15/13/10** | 19/17/11 | 16/14/11 |

# OIL ANALYSIS REPORT

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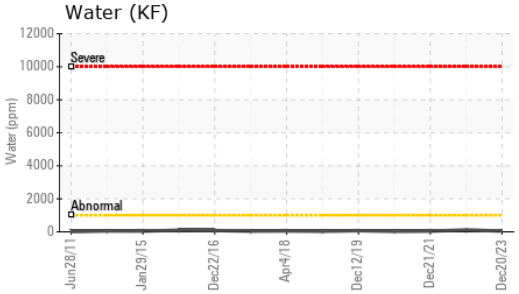
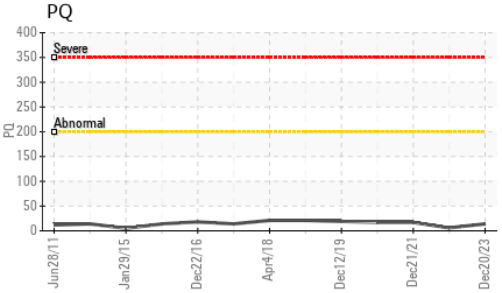
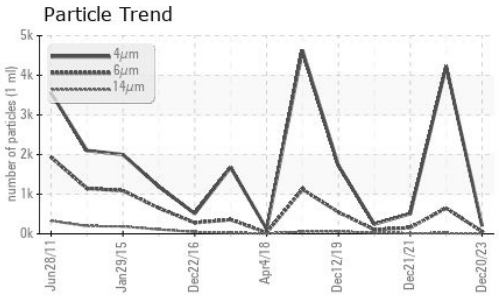
Water (KF)



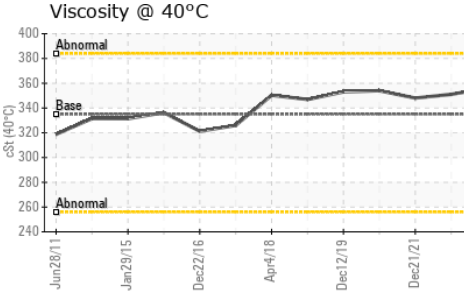

PQ



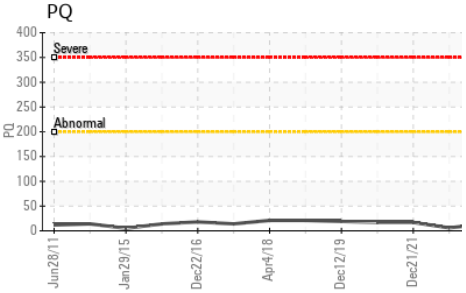

Particle Trend




Viscosity @ 40°C




PQ

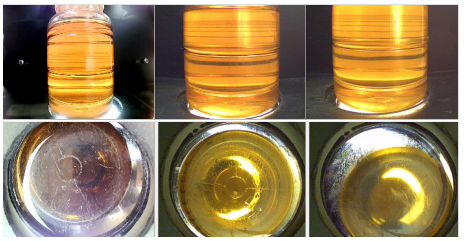



| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Acid Number (AN) | mg KOH/g | ASTM D8045 | 0.85 | **1.37** | 1.32 | 1.31 |

| 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 |

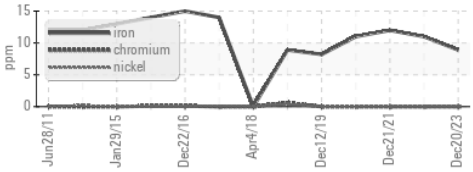
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 40°C | cSt | ASTM D445 | 335 | **356** | 351 | 348 |

| SAMPLE IMAGES | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|
| Color | | | | | |
| Bottom | | | | | |

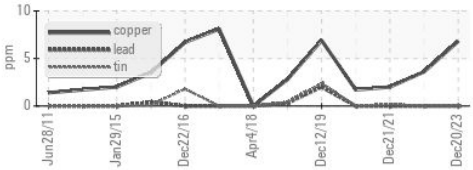


## GRAPHS

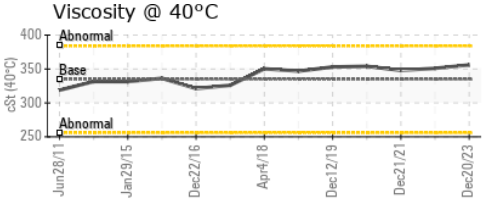
Ferrous Alloys



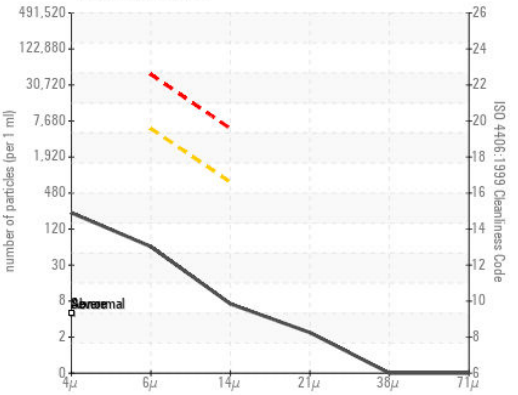

Non-ferrous Metals



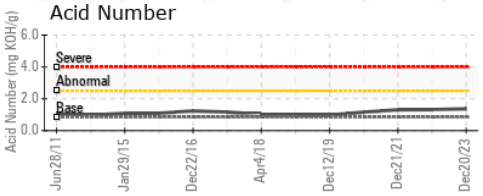

Viscosity @ 40°C




Particle Count




Acid Number




Certificate L2367

**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513
**Sample No.** : MHI026361 **Recieved** : 08 Jan 2024
**Lab Number** : 06054892 **Diagnosed** : 10 Jan 2024
**Unique Number** : 10820841 **Diagnostician** : Jonathan Hester
**Test Package** : IND 2 ( Additional Tests: KF, PQ, 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)*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