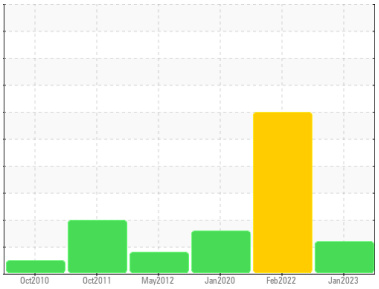
DIAMOND WTG ENGINEERING & SERVICES, INC.
a group company of MITSUBISHI HEAVY INDUSTRIES, LTD.

# PROBLEM SUMMARY

Sample Rating Trend




**VISUAL METAL**

Machine Id
**C-01**
Component
**Wind Turbine Gearbox**
Fluid
**ROYAL PURPLE SYNFILM GT 320 (65 GAL)**

## COMPONENT CONDITION SUMMARY

No relevant graphs to display

## RECOMMENDATION

We suspect abnormal contamination may be due to sampling method. Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil. We advise that you inspect for the source(s) of wear. Resample at the next service interval to monitor.

## PROBLEMATIC TEST RESULTS

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample Status | | | | **ABNORMAL** | SEVERE | ABNORMAL |
| White Metal | scalar | *Visual | NONE | ▲ **MODER** | LIGHT | NONE |

**Customer Id:** MITWHI
**Sample No.:** MHI020588
**Lab Number:** 05819583
**Test Package:** IND 2

*To manage this report scan the QR code*

*To discuss the diagnosis or test data:*
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angela.borella@wearcheckusa.com

*To change component or sample information:*
Customer Service +1 1-800-237-1369
customerservice@wearcheck.com

## RECOMMENDED ACTIONS

| Action | Status | Date | Done By | Description |
|---|---|---|---|---|
| Inspect Wear Source | --- | --- | ? | We advise that you inspect for the source(s) of wear. |
| Change Filter | --- | --- | ? | Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil. |
| Resample | --- | --- | ? | Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil. |

## HISTORICAL DIAGNOSIS

**13 Feb 2022 Diag: Angela Borella**

ISO

Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil.All component wear rates are normal. There is a high amount of particulates present in the oil. The AN level is acceptable for this fluid.

view report

**21 Jan 2020 Diag: Don Baldridge**

ISO

Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil.All component wear rates are normal. There is a high amount of particulates present in the oil. The AN level is acceptable for this fluid.

view report

**01 May 2012 Diag: Don Baldridge**

SEDIMENT

We were unable to perform a particle count due to a high concentration of particles present in this sample. We recommend you service the filters on this component if applicable. Resample at the next service interval to monitor.All component wear rates are normal. There is a high amount of visible silt present in the sample. The condition of oil is suitable for further service.

view report

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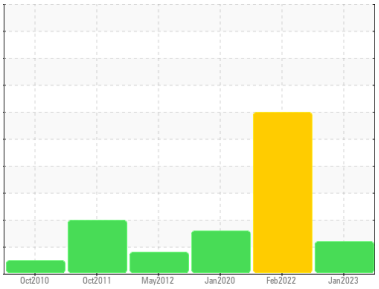
# OIL ANALYSIS REPORT

Sample Rating Trend




**VISUAL METAL**

Machine Id
**C-01**
Component
**Wind Turbine Gearbox**
Fluid
**ROYAL PURPLE SYNFILM GT 320 (65 GAL)**

## DIAGNOSIS

**Recommendation**
We suspect abnormal contamination may be due to sampling method. Replace filter element and resample at later date. In case already attempted and cleanliness was not improved then proceed to replace oil. We advise that you inspect for the source(s) of wear. Resample at the next service interval to monitor.

**Wear**
Moderate concentration of visible metal present. All component wear rates are normal.

**Contamination**
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 acceptable for the time in service.

| SAMPLE INFORMATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Sample Number | | Client Info | | **MHI020588** | MHI023710 | MHI009826 |
| Sample Date | | Client Info | | **12 Jan 2023** | 13 Feb 2022 | 21 Jan 2020 |
| Machine Age | hrs | Client Info | | **0** | 0 | 0 |
| Oil Age | hrs | Client Info | | **129927** | 0 | 0 |
| Oil Changed | | Client Info | | **Not Changd** | N/A | N/A |
| Sample Status | | | | **ABNORMAL** | SEVERE | ABNORMAL |

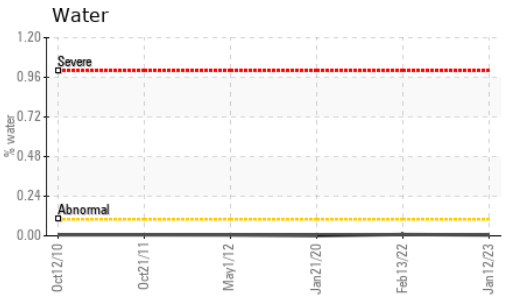
| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| PQ | | ASTM D8184 | >200 | **16** | 92 | 43 |
| Iron | ppm | ASTM D5185m | >200 | **12** | 34 | 25 |
| Chromium | ppm | ASTM D5185m | >3 | **0** | <1 | <1 |
| Nickel | ppm | ASTM D5185m | >3 | **0** | 0 | <1 |
| 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 | **5** | 6 | 7 |
| Tin | ppm | ASTM D5185m | >10 | **0** | 0 | <1 |
| Antimony | ppm | ASTM D5185m | >5 | **---** | 0 | 0 |
| Vanadium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Cadmium | ppm | ASTM D5185m | | **0** | 0 | 0 |

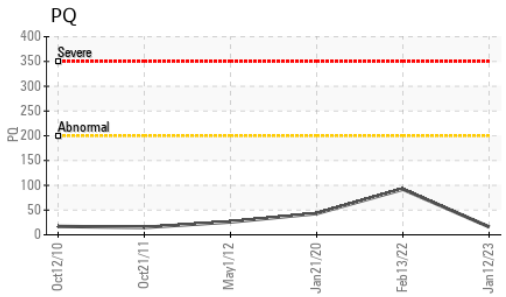
| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Boron | ppm | ASTM D5185m | | **0** | <1 | <1 |
| Barium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | | **2** | 3 | 4 |
| Manganese | ppm | ASTM D5185m | | **<1** | <1 | 0 |
| Magnesium | ppm | ASTM D5185m | 90 | **1** | 0 | <1 |
| Calcium | ppm | ASTM D5185m | | **0** | 0 | <1 |
| Phosphorus | ppm | ASTM D5185m | | **193** | 224 | 269 |
| Zinc | ppm | ASTM D5185m | | **0** | 0 | 10 |
| Sulfur | ppm | ASTM D5185m | | **7743** | 5719 | 3659 |

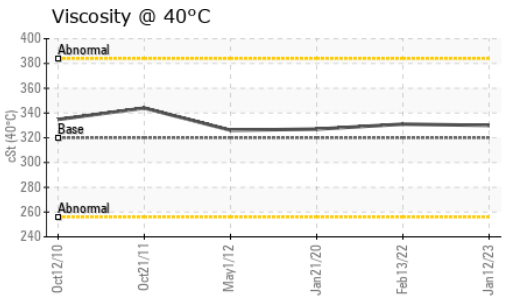
| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185m | >+30 | **<1** | 1 | 5 |
| Sodium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Potassium | ppm | ASTM D5185m | >20 | **0** | 0 | 0 |
| Water | % | ASTM D6304 | >0.1 | **0.005** | 0.008 | 0.001 |
| ppm Water | ppm | ASTM D6304 | >1000 | **56.3** | 85.4 | 0.00 |

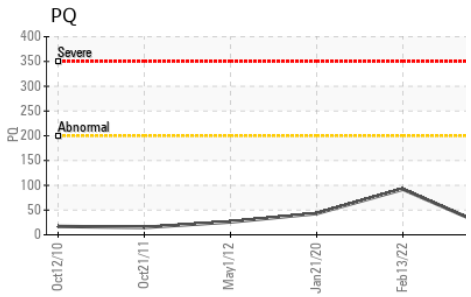
| FLUID CLEANLINESS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Particles >4µm | | ASTM D7647 | | **---** | 635851 | 170147 |
| Particles >6µm | | ASTM D7647 | >5000 | **---** | ⬢ 488820 | ▲ 132180 |
| Particles >14µm | | ASTM D7647 | >640 | **---** | ⬢ 107934 | ▲ 27363 |
| Particles >21µm | | ASTM D7647 | >160 | **---** | ⬢ 19823 | ▲ 4678 |
| Particles >38µm | | ASTM D7647 | >40 | **---** | 29 | ▲ 29 |
| Particles >71µm | | ASTM D7647 | >10 | **---** | 0 | 2 |
| Oil Cleanliness | | ISO 4406 (c) | >--/19/16 | **---** | ⬢ 26/26/24 | ▲ 25/24/22 |

# OIL ANALYSIS REPORT



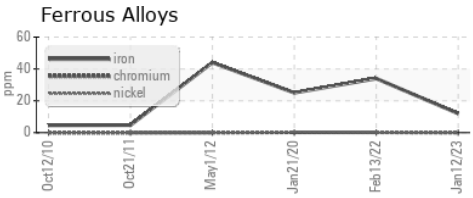

| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Acid Number (AN) | mg KOH/g | ASTM D8045 | 0.25 | **0.74** | 0.77 | 0.885 |

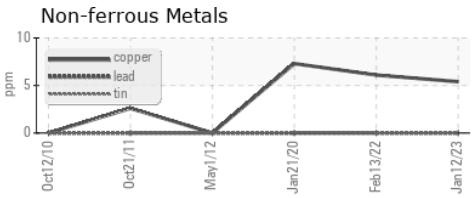
| VISUAL | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| White Metal | scalar | *Visual | NONE | ▲ **MODER** | LIGHT | NONE |
| Yellow Metal | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Precipitate | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Silt | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Debris | scalar | *Visual | NONE | **NONE** | VLITE | 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 |

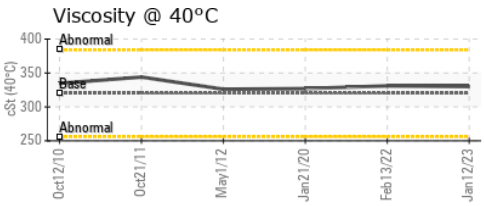
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 40°C | cSt | ASTM D445 | 320 | **330** | 331 | 327 |

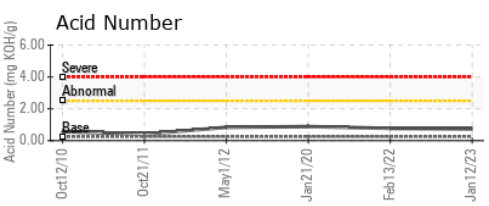
| SAMPLE IMAGES | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|
| Color | | | | | |
| Bottom | | | | | |

## GRAPHS




Certificate L2367

**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513
**Sample No.** : MHI020588 **Received** : 13 Apr 2023
**Lab Number** : 05819583 **Diagnosed** : 17 Apr 2023
**Unique Number** : 10427666 **Diagnostician** : Angela Borella
**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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