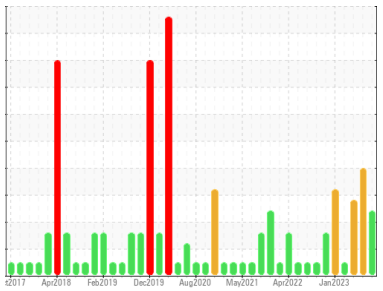
# OIL ANALYSIS REPORT

Sample Rating Trend



WEAR PARTICLES

Area
## ENGINE ROOM FLOOR
Machine Id
## 21-A-6464 PORT MAIN ENGINE LUBE OIL (S/N Maint Plan 22463)
Component
**Port Main Engine**
Fluid
**MOBIL MOBILGARD 412 (22300 LTR)**

## DIAGNOSIS

**Recommendation**
We recommend that you change the oil at the next available stoppage or outage. We recommend an early resample to monitor this condition.

**Wear**
Wear particle analysis indicates that the ferrous cutting particles are abnormal. Cutting wear particles are caused by either hard protuberances (mis-aligned components, etc.), or abrasives entering the system and embedding themselves in softer materials (sand, etc.), and gouging out mating surfaces.

**Contaminants**
Light fuel dilution occurring. No other contaminants were detected in the oil.

**Oil Condition**
The BN result indicates that there is suitable alkalinity remaining in the oil. The oil is no longer serviceable as a result of the abnormal and/or severe wear.

| SAMPLE INFORMATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Sample Number | | Client Info | | **PP** | PP | PP |
| Sample Date | | Client Info | | **27 Nov 2023** | 18 Sep 2023 | 17 Jul 2023 |
| Machine Age | days | Client Info | | **0** | 0 | 0 |
| Oil Age | days | Client Info | | **0** | 0 | 0 |
| Oil Changed | | Client Info | | **N/A** | N/A | N/A |
| Sample Status | | | | **ABNORMAL** | SEVERE | ABNORMAL |

| CONTAMINATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Water | | WC Method | >0.1 | **NEG** | NEG | NEG |
| Glycol | | WC Method | | **NEG** | NEG | NEG |

| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| PQ | | ASTM D8184* | | **0** | 0 | 0 |
| Iron | ppm | ASTM D5185(m) | >25 | **4** | 4 | 4 |
| Chromium | ppm | ASTM D5185(m) | >5 | **0** | 0 | 0 |
| Nickel | ppm | ASTM D5185(m) | >5 | **0** | <1 | <1 |
| Titanium | ppm | ASTM D5185(m) | >3 | **0** | 0 | 0 |
| Silver | ppm | ASTM D5185(m) | >2 | **0** | <1 | 0 |
| Aluminum | ppm | ASTM D5185(m) | >10 | **1** | <1 | 1 |
| Lead | ppm | ASTM D5185(m) | >5 | **0** | <1 | 0 |
| Copper | ppm | ASTM D5185(m) | >5 | **2** | 2 | 2 |
| Tin | ppm | ASTM D5185(m) | >5 | **0** | <1 | <1 |
| Antimony | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Vanadium | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Beryllium | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Cadmium | ppm | ASTM D5185(m) | | **0** | 0 | 0 |

| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Boron | ppm | ASTM D5185(m) | 0 | **1** | 2 | 1 |
| Barium | ppm | ASTM D5185(m) | 0 | **0** | <1 | 0 |
| Molybdenum | ppm | ASTM D5185(m) | 0 | **0** | 0 | <1 |
| Manganese | ppm | ASTM D5185(m) | 0 | **0** | 0 | <1 |
| Magnesium | ppm | ASTM D5185(m) | 18 | **12** | 11 | 11 |
| Calcium | ppm | ASTM D5185(m) | 6350 | **3361** | 3015 | 3082 |
| Phosphorus | ppm | ASTM D5185(m) | 200 | **194** | 178 | 185 |
| Zinc | ppm | ASTM D5185(m) | 380 | **307** | 293 | 295 |
| Sulfur | ppm | ASTM D5185(m) | 6950 | **5300** | 4823 | 4798 |
| Lithium | ppm | ASTM D5185(m) | | **<1** | <1 | <1 |

| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185(m) | >20 | **12** | 12 | 11 |
| Sodium | ppm | ASTM D5185(m) | >75 | **6** | 6 | 6 |
| Potassium | ppm | ASTM D5185(m) | >20 | **<1** | <1 | <1 |
| Fuel | % | ASTM D7593* | >4.0 | ▲ **3.5** | ▲ 9.3 | ▲ 7.8 |

| INFRA-RED | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Soot % | % | ASTM D7844* | >2 | **0** | 0 | 0 |
| Nitration | Abs/cm | ASTM D7624* | >20 | **6.6** | 7.4 | 6.8 |
| Sulfation | Abs/.1mm | ASTM D7415* | >30 | **16.4** | 16.3 | 16.4 |

# OIL ANALYSIS REPORT

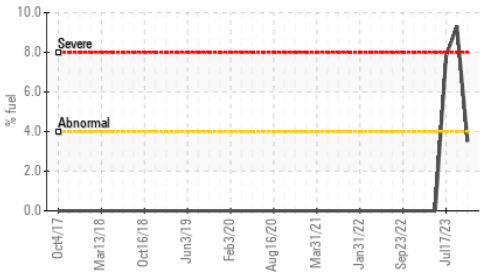
| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Oxidation | Abs/.1mm | ASTM D7414* | >25 | **6.7** | 7.2 | 6.7 |
| Base Number (BN) | mg KOH/g | ASTM D2896* | 15 | **8.29** | 6.44 | 6.95 |

| VISUAL | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Emulsified Water | scalar | Visual* | >0.1 | **NEG** | NEG | NEG |
| Free Water | scalar | Visual* | | **NEG** | NEG | NEG |

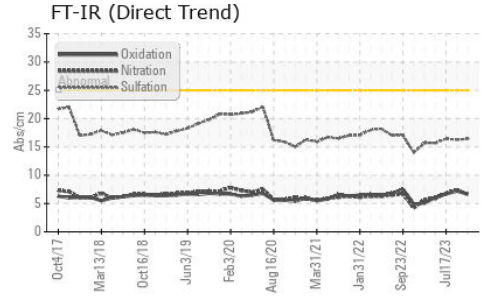
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 100°C | cSt | ASTM D7279(m) | 14.5 | **13.1** | ▲ 10.9 | ▲ 11.4 |

## GRAPHS

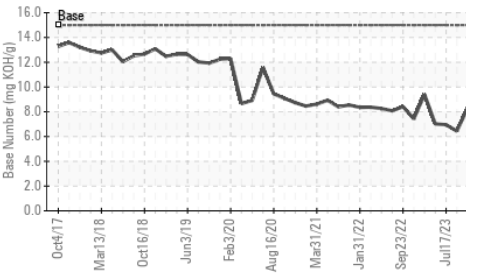
Fuel Dilution



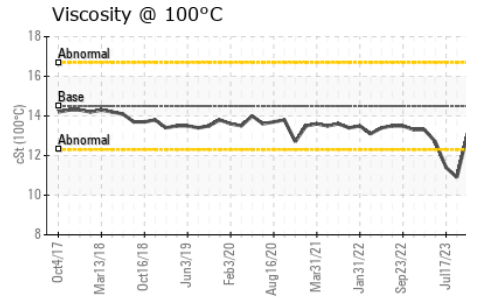

FT-IR (Direct Trend)



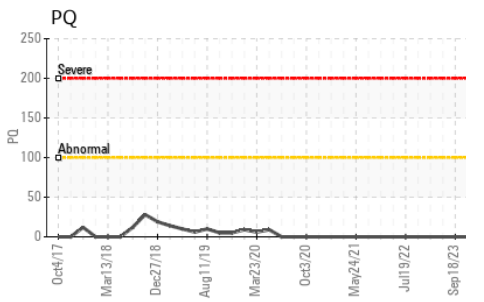

Base Number



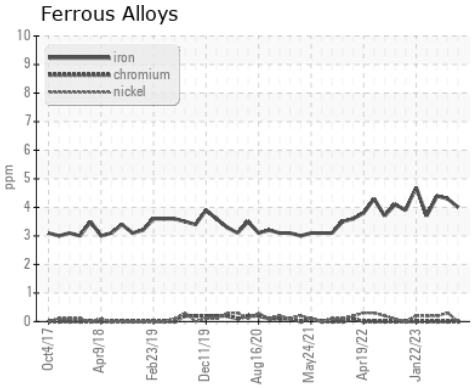

Viscosity @ 100°C



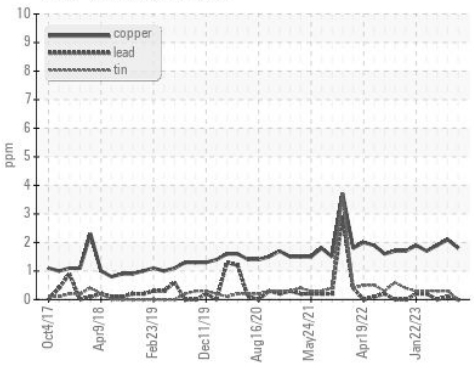

PQ



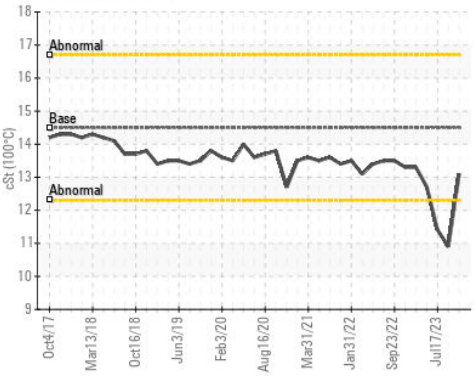

Ferrous Alloys



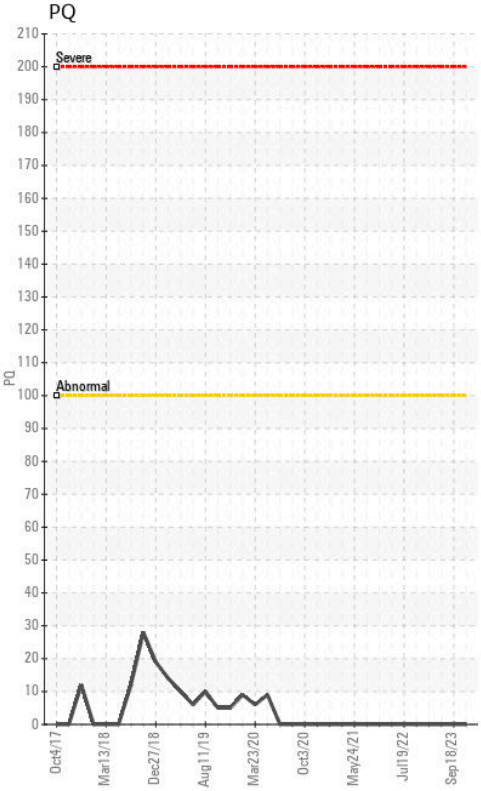

Non-ferrous Metals



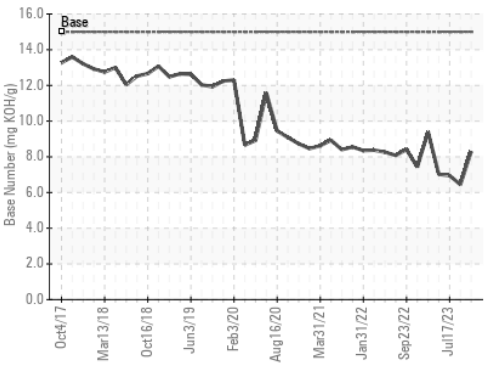

Viscosity @ 100°C




PQ




Base Number




ISO 17025:2017 Accredited Laboratory

**Laboratory** : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
**Sample No.** : PP
**Lab Number** : 02607419
**Unique Number** : 5708505
**Test Package** : MAR 3 ( Additional Tests: PercentFuel )

**Received** : 09 Jan 2024
**Tested** : 11 Jan 2024
**Diagnosed** : 16 Jan 2024 - Kevin Marson

*To discuss this sample report, contact Customer Service at 1-800-268-2131.*
*Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab.*
*Validity of results and interpretation are based on the sample and information as supplied.*

**HUSKY SEA ROSE /AKER SOLUTIONS**
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maintsuper.searose@huskyenergy.ca
T: x:
F: x:

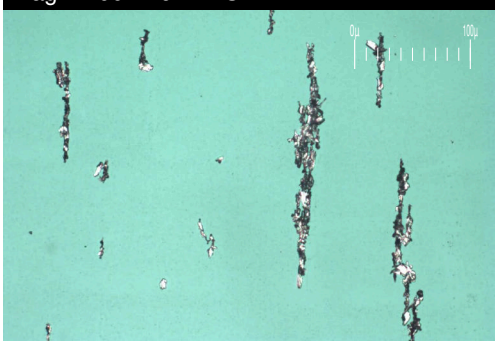
Report Id: SPESTJ [WCAMIS] 02607419 (Generated: 04/14/2024 12:48:15) Rev: 1

Submitted By: ?

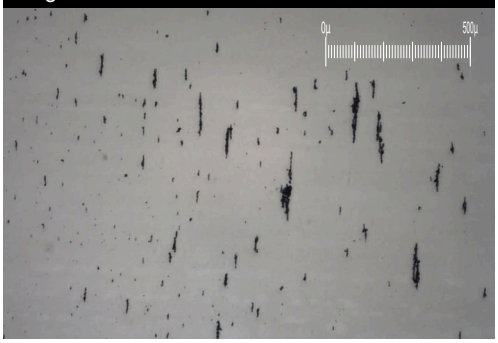
# FERROGRAPHY REPORT

Area
## ENGINE ROOM FLOOR
Machine Id
## 21-A-6464 PORT MAIN ENGINE LUBE OIL (S/N Maint Plan 22463)
Component
**Port Main Engine**
Fluid
**MOBIL MOBILGARD 412 (22300 LTR)**

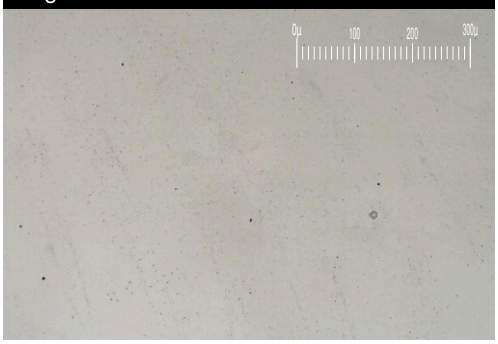
Magn: 200x Illum: BC



Magn: 50x Illum: RW



Magn: 100x Illum: RW

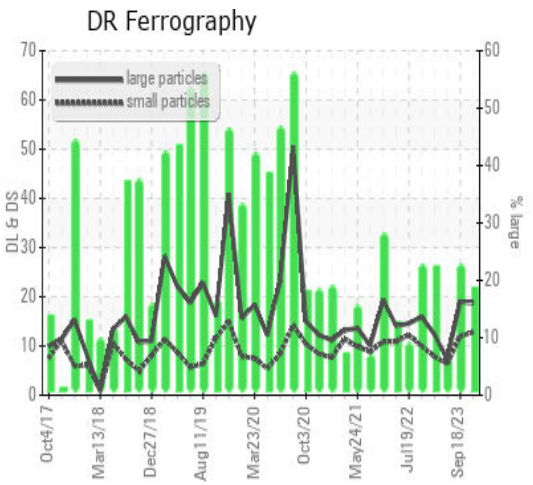


| DR-FERROGRAPHY | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Large Particles | | DR-Ferr* | | **18.7** | 19.0 | 7.3 |
| Small Particles | | DR-Ferr* | | **12.8** | 12.0 | 6.4 |
| Total Particles | | DR-Ferr* | >--- | **31.5** | 31 | 13.7 |
| Large Particles Percentage | % | DR-Ferr* | | **18.7** | 22.6 | 6.6 |
| Severity Index | | DR-Ferr* | | **110** | 133 | 7 |

| FERROGRAPHY | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Ferrous Rubbing | Scale 0-10 | ASTM D7684* | | **3** | 3 | 2 |
| Ferrous Sliding | Scale 0-10 | ASTM D7684* | | | 1 | |
| Ferrous Cutting | Scale 0-10 | ASTM D7684* | | ▲ **1** | ▲ 1 | ▲ 1 |
| Ferrous Rolling | Scale 0-10 | ASTM D7684* | | **1** | 1 | 1 |
| Ferrous Break-in | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Black Oxides | Scale 0-10 | ASTM D7684* | | | | 1 |
| Ferrous Red Oxides | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Corrosive | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Other | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Rubbing | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Sliding | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Cutting | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Rolling | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Other | Scale 0-10 | ASTM D7684* | | | | |
| Carbonaceous Material | Scale 0-10 | ASTM D7684* | | | | |
| Lubricant Degradation | Scale 0-10 | ASTM D7684* | | | | |
| Sand/Dirt | Scale 0-10 | ASTM D7684* | | | 1 | 1 |
| Fibres | Scale 0-10 | ASTM D7684* | | | | |
| Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Other | Scale 0-10 | ASTM D7684* | | **1** | 1 | 1 |

### WEAR

Wear particle analysis indicates that the ferrous cutting particles are abnormal. Cutting wear particles are caused by either hard protuberances (mis-aligned components, etc.), or abrasives entering the system and embedding themselves in softer materials (sand, etc.), and gouging out mating surfaces.



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