



OIL ANALYSIS REPORT

| | |
|-----------------|-----------|
| WEAR | ATTENTION |
| CONTAMINATION | ABNORMAL |
| FLUID CONDITION | NORMAL |

Machine Id
LIEBHERR 31222
Component
Diesel Engine
Fluid
LIEBHERR MOTOROIL 10W-40 LOW ASH (20 QTS)

RECOMMENDATION

We advise that you check the air filter, air induction system, and any areas where dirt may enter the component. Oil and filter change at the time of sampling has been noted. Resample at the next service interval to monitor.

| Test | UOM | Method | Limit/Abn | Current | History1 | History2 |
|----------------|-----|-------------|-----------|--------------------|-------------|-------------|
| Sample Number | | Client Info | | WC0924613 | WC0786557 | WC0756520 |
| Sample Date | | Client Info | | 30 Apr 2024 | 05 Apr 2023 | 29 Nov 2022 |
| Machine Age | hrs | Client Info | | 17247 | 16791 | 16487 |
| Oil Age | hrs | Client Info | | 1000 | 750 | 500 |
| Filter Age | hrs | Client Info | | 1000 | 750 | 500 |
| Oil Changed | | Client Info | | Changed | Changed | Changed |
| Filter Changed | | Client Info | | Changed | Changed | Changed |
| Sample Status | | | | ABNORMAL | SEVERE | SEVERE |

WEAR

All component wear rates are normal.

| | | | | | | |
|--------------|--------|-------------|------|--------------|-------|-------|
| Iron | ppm | ASTM D5185m | >100 | 75 | ▲ 269 | ▲ 196 |
| Chromium | ppm | ASTM D5185m | >20 | 6 | 15 | 11 |
| Nickel | ppm | ASTM D5185m | >4 | <1 | 5 | 4 |
| Titanium | ppm | ASTM D5185m | | <1 | 2 | 1 |
| Silver | ppm | ASTM D5185m | >3 | 0 | 0 | 0 |
| Aluminum | ppm | ASTM D5185m | >20 | 26 | ● 57 | ● 42 |
| Lead | ppm | ASTM D5185m | >40 | 2 | 2 | 2 |
| Copper | ppm | ASTM D5185m | >330 | 30 | 9 | 12 |
| Tin | ppm | ASTM D5185m | >15 | 1 | <1 | 1 |
| Vanadium | ppm | ASTM D5185m | | <1 | 0 | 0 |
| White Metal | scalar | *Visual | NONE | NONE | NONE | NONE |
| Yellow Metal | scalar | *Visual | NONE | NONE | NONE | NONE |

CONTAMINATION

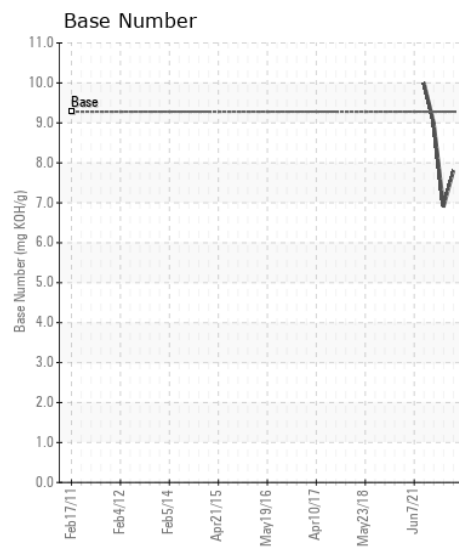
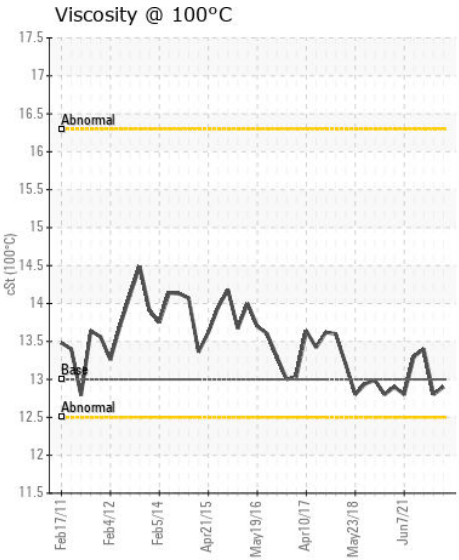
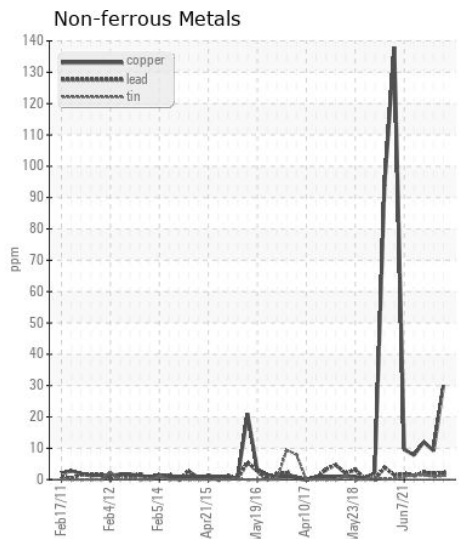
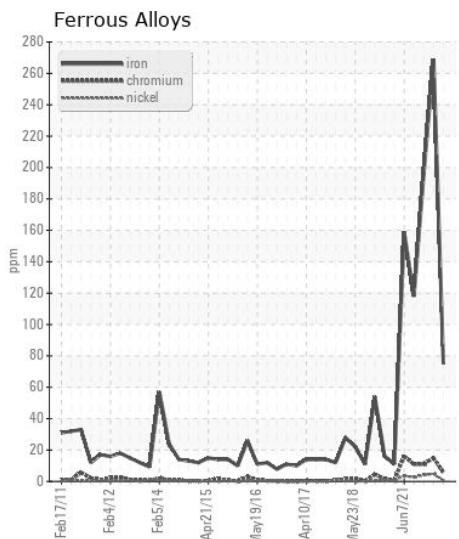
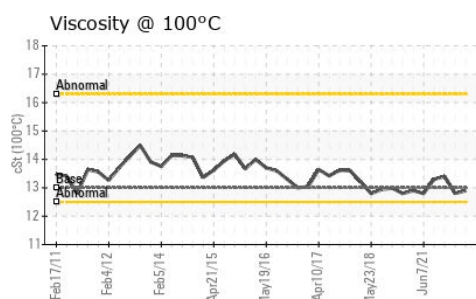
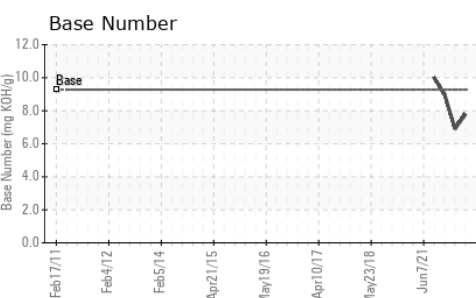
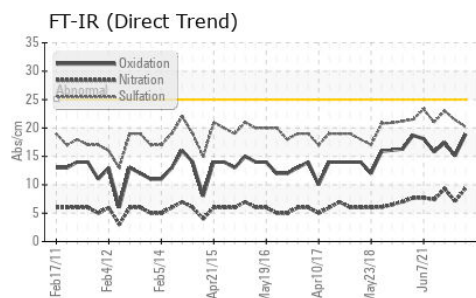
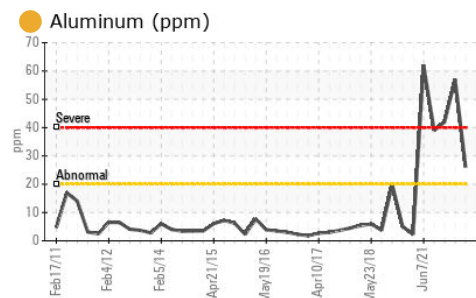
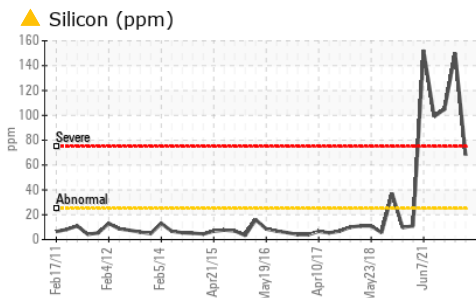
Elemental levels of silicon (Si) and aluminum (Al) indicate alumina-silicate (coarse dirt) ingress.

| | | | | | | |
|------------------|----------|-------------|-------|----------------|-------|-------|
| Silicon | ppm | ASTM D5185m | >25 | ▲ 68 | ▲ 150 | ▲ 105 |
| Potassium | ppm | ASTM D5185m | >20 | 31 | 11 | 19 |
| Fuel | | WC Method | >5 | <1.0 | <1.0 | <1.0 |
| Water | | WC Method | >0.2 | NEG | NEG | NEG |
| Glycol | | WC Method | | NEG | 0.0 | 0.0 |
| Soot % | % | *ASTM D7844 | >3 | 0.3 | 0.5 | 0.9 |
| Nitration | Abs/cm | *ASTM D7624 | >20 | 9.4 | 7.1 | 9.3 |
| Sulfation | Abs/.1mm | *ASTM D7415 | >30 | 20.2 | 21.4 | 23.0 |
| 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 | >0.2 | NEG | NEG | NEG |

FLUID CONDITION

The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is acceptable for the time in service.

| | | | | | | |
|------------------|----------|-------------|------|-------------|------|------|
| Sodium | ppm | ASTM D5185m | | 33 | 15 | 20 |
| Boron | ppm | ASTM D5185m | 169 | 161 | 305 | 161 |
| Barium | ppm | ASTM D5185m | 0 | 0 | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | 2 | 17 | 80 | 79 |
| Manganese | ppm | ASTM D5185m | <1 | 2 | 3 | 2 |
| Magnesium | ppm | ASTM D5185m | 724 | 800 | 406 | 722 |
| Calcium | ppm | ASTM D5185m | 1323 | 1358 | 1341 | 1420 |
| Phosphorus | ppm | ASTM D5185m | 678 | 873 | 912 | 1020 |
| Zinc | ppm | ASTM D5185m | 776 | 1016 | 1126 | 1221 |
| Sulfur | ppm | ASTM D5185m | 2859 | 4119 | 2895 | 3568 |
| Oxidation | Abs/.1mm | *ASTM D7414 | >25 | 18.9 | 15.1 | 17.4 |
| Base Number (BN) | mg KOH/g | ASTM D2896 | 9.28 | 7.8 | 6.9 | 9.0 |
| Visc @ 100°C | cSt | ASTM D445 | 13.0 | 12.9 | 12.8 | 13.4 |



Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0924613 **Received** : 13 May 2024
Lab Number : 06176759 **Tested** : 14 May 2024
Unique Number : 11022812 **Diagnosed** : 14 May 2024 - Sean Felton
Test Package : CONST (Additional Tests: TBN)

SULLIVAN EASTERN INC-LIEBHERR
 2860 C SLATER RD
 MORRISVILLE, NC
 US 27560
 Contact: CHRIS CALTON

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)