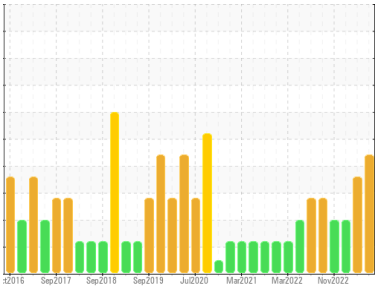
# PROBLEM SUMMARY

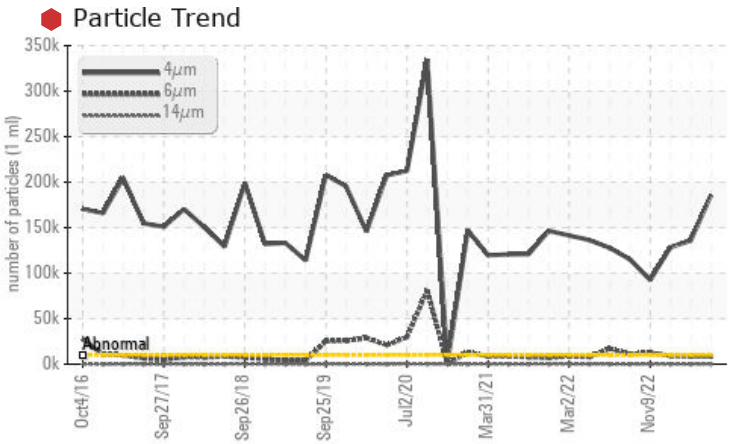
Sample Rating Trend



**WATER**

Area
**BRUCE B/0B/54300**
Machine Id
**0B-54300-EPG2-CP1-OIL**
Component
**Compressor**
Fluid
**ESSO NUTO H ISO 150 (--- GAL)**

## COMPONENT CONDITION SUMMARY




## RECOMMENDATION

We advise that you check for the source of water entry. Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We advise that you follow the water drain-off procedure for this component. We advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this oil. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.

## PROBLEMATIC TEST RESULTS

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample Status | | | | **SEVERE** | SEVERE | SEVERE |
| Particles >4µm | | ASTM D7647 | >10000 | **185709** | 135917 | 128400 |
| Particles >6µm | | ASTM D7647 | >2500 | **8324** | 8656 | 9080 |
| Oil Cleanliness | | ISO 4406 (c) | >20/18/15 | **25/20/12** | 24/20/14 | 24/20/13 |
| Appearance | scalar | Visual* | NORML | **WGOIL** | NORML | NORML |
| Free Water | scalar | Visual* | | **1%** | NEG | NEG |


**Customer Id:** BRUTIV
**Sample No.:** WC0642783
**Lab Number:** 02577211
**Test Package:** IND 2

*To manage this report scan the QR code*

*To discuss the diagnosis or test data:*
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gloria.gonzalez@wearcheck.com

## RECOMMENDED ACTIONS

| Action | Status | Date | Done By | Description |
|---|---|---|---|---|
| Change Filter | --- | --- | ? | We recommend you service the filters on this component. |
| Water Drain-off | --- | --- | ? | We advise that you follow the water drain-off procedure for this component. |
| Resample | --- | --- | ? | Resample in 30-45 days to monitor this situation. |
| Check Breathers | --- | --- | ? | The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. |
| Check Water Access | --- | --- | ? | We advise that you check for the source of water entry. |
| Check Seals | --- | --- | ? | Check seals and/or filters for points of contaminant entry. |
| Filter Fluid | --- | --- | ? | We advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this oil. |

## HISTORICAL DIAGNOSIS

WEAR PARTICLES

**26 Apr 2023 Diag: Kevin Marson**

Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation. No other corrective action is recommended at this time. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample.Wear particle analysis indicates that the ferrous cutting particles are marginal. All other component wear rates are normal. Cutting wear particles are caused by either hard protuberances (mis-aligned components, etc.), or abrasives entering the system and embeding themselves in softer materials (sand, etc.), and gouging out mating surfaces. There is a high amount of silt (particulates < 14 microns in size) present in the oil. The water content is negligible. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

view report

ISO

**01 Feb 2023 Diag: Kevin Marson**

Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >4µm and oil cleanliness are severely high. Particles >6µm are abnormally high. The water content is negligible. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

view report

ISO

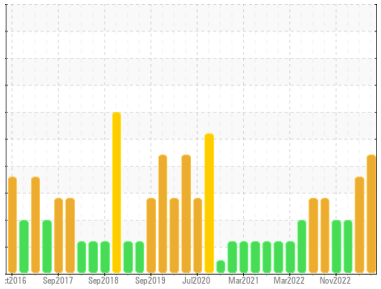
**09 Nov 2022 Diag: Kevin Marson**

Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >4µm and oil cleanliness are severely high. Particles >6µm are abnormally high. The water content is negligible. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

view report

# OIL ANALYSIS REPORT

Sample Rating Trend



WATER

Area
**BRUCE B/0B/54300**
Machine Id
**0B-54300-EPG2-CP1-OIL**
Component
**Compressor**
Fluid
**ESSO NUTO H ISO 150 (--- GAL)**

## DIAGNOSIS

**Recommendation**

We advise that you check for the source of water entry. Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We advise that you follow the water drain-off procedure for this component. We advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this oil. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.

**Wear**

All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system.

**Contaminants**

There is a high amount of silt (particulates < 14 microns in size) present in the oil. Free water present.

**Oil Condition**

The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

| SAMPLE INFORMATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Sample Number | | Client Info | | **WC0642783** | WC0642777 | WC0548158 |
| Sample Date | | Client Info | | **11 Aug 2023** | 26 Apr 2023 | 01 Feb 2023 |
| Machine Age | hrs | Client Info | | **0** | 0 | 0 |
| Oil Age | hrs | Client Info | | **0** | 0 | 0 |
| Oil Changed | | Client Info | | **N/A** | N/A | N/A |
| Sample Status | | | | **SEVERE** | SEVERE | SEVERE |

| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Iron | ppm | ASTM D5185(m) | >50 | **6** | 5 | 5 |
| Chromium | ppm | ASTM D5185(m) | >10 | **0** | 0 | 0 |
| Nickel | ppm | ASTM D5185(m) | | **<1** | <1 | 0 |
| Titanium | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Silver | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Aluminum | ppm | ASTM D5185(m) | >25 | **5** | 4 | 4 |
| Lead | ppm | ASTM D5185(m) | >25 | **1** | <1 | <1 |
| Copper | ppm | ASTM D5185(m) | >50 | **2** | 2 | 2 |
| Tin | ppm | ASTM D5185(m) | >15 | **0** | 0 | 0 |
| 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) | | **1** | 1 | 1 |

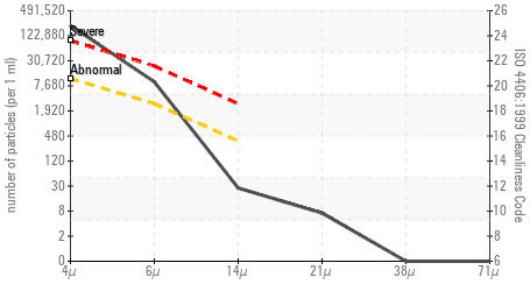
| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Boron | ppm | ASTM D5185(m) | | **0** | 0 | <1 |
| Barium | ppm | ASTM D5185(m) | | **2** | 2 | 2 |
| Molybdenum | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Manganese | ppm | ASTM D5185(m) | | **0** | 0 | 0 |
| Magnesium | ppm | ASTM D5185(m) | | **<1** | <1 | <1 |
| Calcium | ppm | ASTM D5185(m) | | **41** | 42 | 43 |
| Phosphorus | ppm | ASTM D5185(m) | | **368** | 367 | 367 |
| Zinc | ppm | ASTM D5185(m) | | **424** | 414 | 418 |
| Sulfur | ppm | ASTM D5185(m) | | **3349** | 3335 | 3334 |
| Lithium | ppm | ASTM D5185(m) | | **<1** | <1 | <1 |

| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185(m) | >25 | **3** | 2 | 2 |
| Sodium | ppm | ASTM D5185(m) | | **0** | 0 | <1 |
| Potassium | ppm | ASTM D5185(m) | >20 | **0** | 0 | 0 |
| Water | % | ASTM D6304* | >0.1 | **0.022** | 0.002 | 0.001 |
| ppm Water | ppm | ASTM D6304* | >1000 | **223.0** | 24.9 | 1.0 |

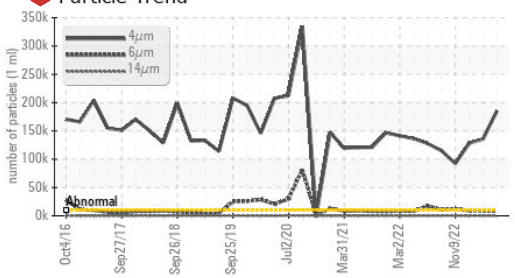
| FLUID CLEANLINESS | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|
| Particles >4µm | ASTM D7647 | >10000 | **185709** | 135917 | 128400 |
| Particles >6µm | ASTM D7647 | >2500 | **8324** | 8656 | 9080 |
| Particles >14µm | ASTM D7647 | >320 | **24** | 82 | 44 |
| Particles >21µm | ASTM D7647 | >80 | **6** | 13 | 7 |
| Particles >38µm | ASTM D7647 | >20 | **0** | 0 | 0 |
| Particles >71µm | ASTM D7647 | >4 | **0** | 0 | 0 |
| Oil Cleanliness | ISO 4406 (c) | >20/18/15 | **25/20/12** | 24/20/14 | 24/20/13 |

# OIL ANALYSIS REPORT

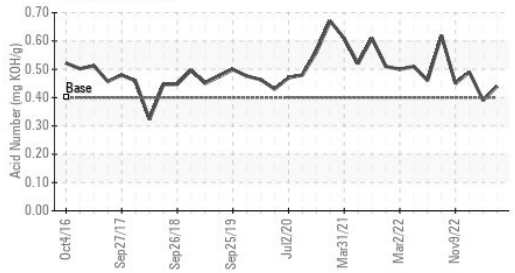
Particle Count



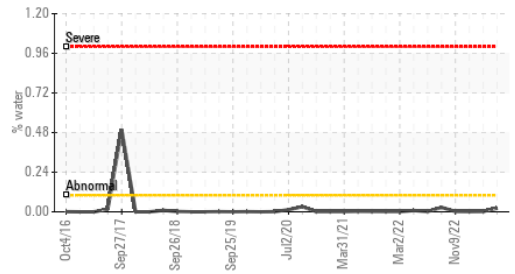

Particle Trend



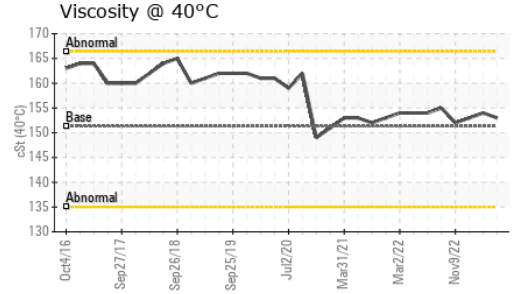

Acid Number




Water



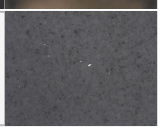

Viscosity @ 40°C




| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Acid Number (AN) | mg KOH/g | ASTM D974* | .40 | **0.44** | 0.39 | 0.49 |

| 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 | **VLITE** | NONE | NONE |
| Sand/Dirt | scalar | Visual* | NONE | **NONE** | NONE | NONE |
| Appearance | scalar | Visual* | NORML | ▲ **WGOIL** | NORML | NORML |
| Odor | scalar | Visual* | NORML | **NORML** | NORML | NORML |
| Emulsified Water | scalar | Visual* | >0.1 | **.2%** | NEG | NEG |
| Free Water | scalar | Visual* | | ▲ **1%** | NEG | NEG |

| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 40°C | cSt | ASTM D7279(m) | 151.3 | **153** | 154 | 153 |

| SAMPLE IMAGES | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|
| Color | | |  | | |
| Bottom | | |  | | |
| PrtFilter | | | *no image* | *no image* |  |

ISO 17025:2017 Accredited Laboratory

**Laboratory** : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
**Sample No.** : WC0642783 **Received** : 21 Aug 2023
**Lab Number** : 02577211 **Diagnosed** : 23 Aug 2023
**Unique Number** : 5630271 **Diagnostician** : Kevin Marson
**Test Package** : IND 2 ( Additional Tests: A-FERR, DR-FERR, FILTERPATCH )

*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.*


**Bruce Power - Bruce A PdM**
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Tiverton, ON
CA N0G 2T0
Contact: Pierre Adouki
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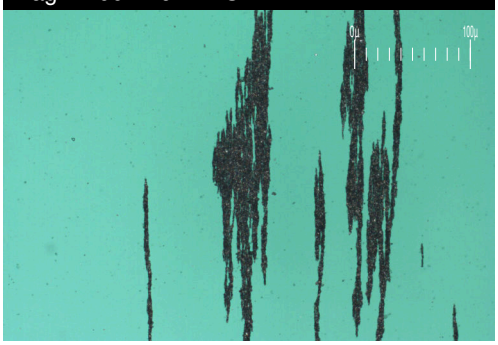
T: (519)361-2673
F:

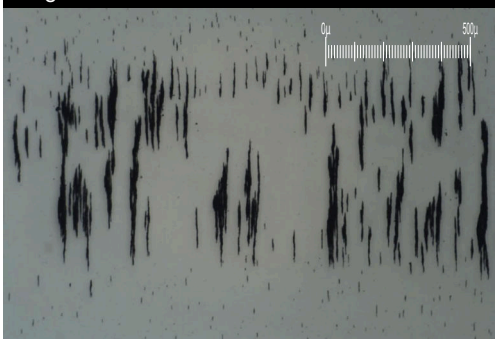
# FERROGRAPHY REPORT

Area
**BRUCE B/0B/54300**
Machine Id
**0B-54300-EPG2-CP1-OIL**
Component
**Compressor**
Fluid
**ESSO NUTO H ISO 150 (--- GAL)**

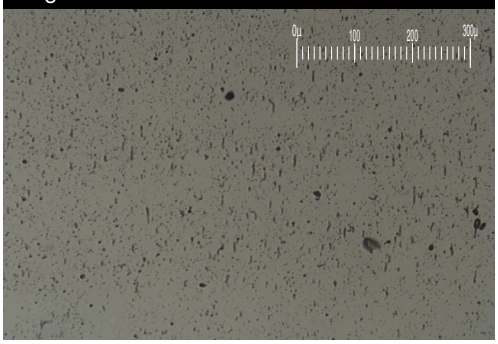
Magn: 200x Illum: BC



Magn: 50x Illum: RW



Magn: 100x Illum: RW

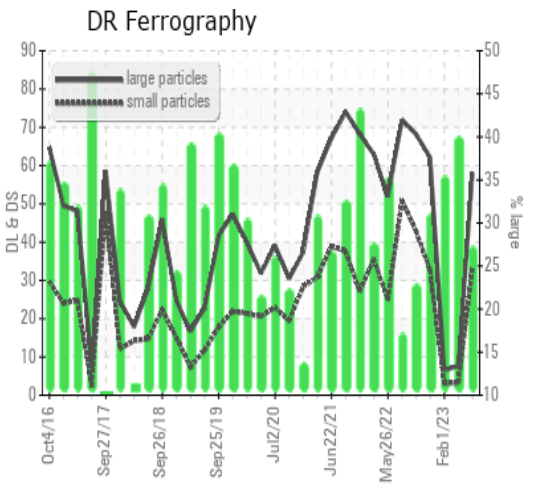


| DR-FERROGRAPHY | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Large Particles | | DR-Ferr* | | **58.0** | 7.7 | 6.5 |
| Small Particles | | DR-Ferr* | | **33.2** | 3.3 | 3.1 |
| Total Particles | | DR-Ferr* | >--- | **91.2** | 11 | 9.6 |
| Large Particles Percentage | % | DR-Ferr* | | **27.2** | 40 | 35.4 |
| Severity Index | | DR-Ferr* | | **1438** | 34 | 22 |

| FERROGRAPHY | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Ferrous Rubbing | Scale 0-10 | ASTM D7684* | | **3** | 3 | 4 |
| Ferrous Sliding | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Cutting | Scale 0-10 | ASTM D7684* | | | 1 | |
| Ferrous Rolling | Scale 0-10 | ASTM D7684* | | **1** | 1 | 2 |
| Ferrous Break-in | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Black Oxides | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Red Oxides | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Corrosive | Scale 0-10 | ASTM D7684* | | **2** | 1 | 1 |
| 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 | 1 |
| Fibres | Scale 0-10 | ASTM D7684* | | | | |
| Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Other | Scale 0-10 | ASTM D7684* | | **2** | 2 | 1 |

## WEAR

All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system.



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