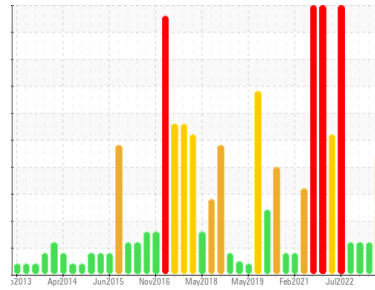




# PROBLEM SUMMARY

Sample Rating Trend



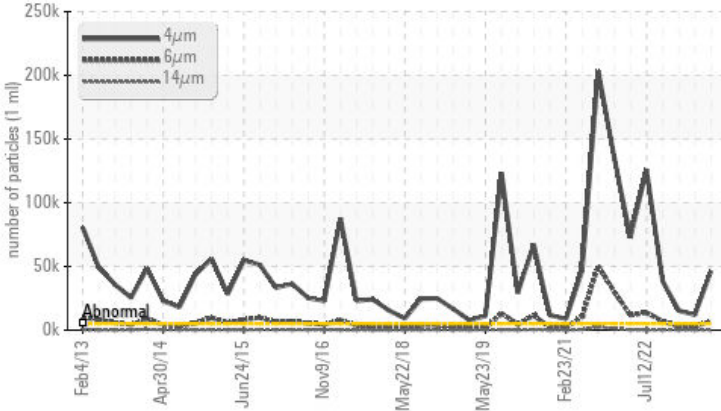
WEAR PARTICLES



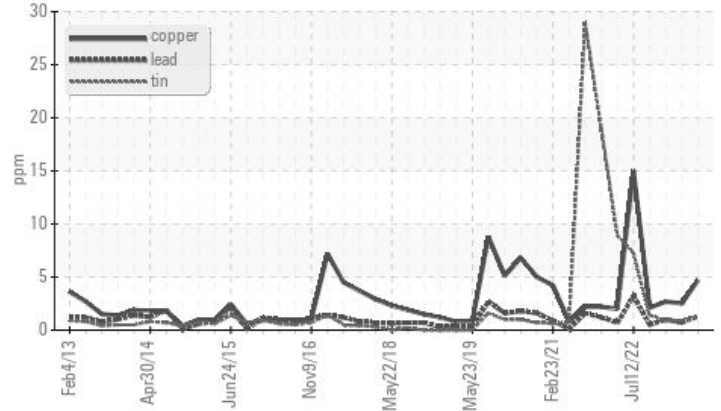
Area  
**BRUCE B/5/43230**  
 Machine Id  
**5-43230-P4-P IB Brg Drn**  
 Component  
**Inboard Bearing**  
 Fluid  
**ESSO NUTO H ISO 46 (--- GAL)**

## COMPONENT CONDITION SUMMARY

Particle Trend



Non-ferrous Metals



## RECOMMENDATION

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.

## PROBLEMATIC TEST RESULTS

Sample Status			SEVERE	ABNORMAL	ABNORMAL	
Copper	ppm	ASTM D5185(m)	>5	▲ 5	2	3
Ferrous Cutting	Scale 0-10	ASTM D7684*		▲▲ 1		
Particles >4µm		ASTM D7647	>5000	● 46369	▲ 12008	▲ 15293
Particles >6µm		ASTM D7647	>1300	▲ 7243	▲ 2305	▲ 3018
Oil Cleanliness		ISO 4406 (c)	>19/17/15	● 23/20/15	▲ 21/18/14	▲ 21/19/15

Customer Id: BRUTIV  
 Sample No.: WC0744591  
 Lab Number: 02602856  
 Test Package: IND 2



To manage this report scan the QR code

To discuss the diagnosis or test data:  
 Kevin Marson +1 (289)291-4644 x4644  
[Kevin.Marson@wearcheck.com](mailto:Kevin.Marson@wearcheck.com)

To change component or sample information:  
 Gloria Gonzalez +1 (289)291-4643 x4643  
[gloria.gonzalez@wearcheck.com](mailto:gloria.gonzalez@wearcheck.com)

## RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Change Filter	---	---	?	We recommend you service the filters on this component.
Resample	---	---	?	Resample in 30-45 days to monitor this situation.
Information Required	---	---	?	NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample.
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 Seals	---	---	?	Check seals and/or filters for points of contaminant entry.

## HISTORICAL DIAGNOSIS

### 08 Aug 2023 Diag: Kevin Marson

ISO



We recommend you service the filters on this component. We recommend an early resample to monitor this condition. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. There is a moderate amount of silt (particulates < 14 microns in size) present in the oil. The water content is negligible. The system cleanliness is above the acceptable limit for the target ISO 4406 cleanliness code. 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



### 18 May 2023 Diag: Kevin Marson

ISO



We recommend you service the filters on this component. We recommend an early resample to monitor this condition. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. There is a moderate amount of silt (particulates < 14 microns in size) present in the oil. The water content is negligible. The system cleanliness is above the acceptable limit for the target ISO 4406 cleanliness code. 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



### 01 Nov 2022 Diag: Kevin Marson

ISO



We recommend you service the filters on this component. We recommend an early resample to monitor this condition. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >4µm are abnormally high. Particles >6µm and oil cleanliness are abnormally high. The water content is negligible. The system cleanliness is above the acceptable limit for the target ISO 4406 cleanliness code. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

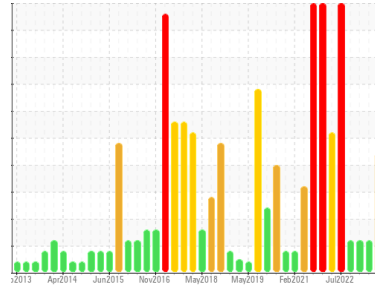
view report





# OIL ANALYSIS REPORT

Sample Rating Trend



WEAR PARTICLES



Area  
**BRUCE B/5/43230**  
 Machine Id  
**5-43230-P4-P IB Brg Drn**  
 Component  
**Inboard Bearing**  
 Fluid  
**ESSO NUTO H ISO 46 (--- GAL)**

## DIAGNOSIS

### Recommendation

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

Copper ppm levels are noted. 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 embedding themselves in softer materials (sand, etc.), and gouging out mating surfaces.

### Contaminants

There is a high amount of silt (particulates < 14 microns in size) present in the oil. The water content is negligible. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code.

### 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		<b>WC0744591</b>	WC0791591	WC0744588
Sample Date	Client Info		<b>28 Nov 2023</b>	08 Aug 2023	18 May 2023
Machine Age	hrs	Client Info	<b>0</b>	0	0
Oil Age	hrs	Client Info	<b>0</b>	0	0
Oil Changed	Client Info		<b>N/A</b>	N/A	N/A
Sample Status			<b>SEVERE</b>	ABNORMAL	ABNORMAL

## WEAR METALS

	method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185(m) >10	<1	<1	<1
Chromium	ppm	ASTM D5185(m) >5	<1	0	0
Nickel	ppm	ASTM D5185(m) >5	<1	<1	<1
Titanium	ppm	ASTM D5185(m) >5	<b>0</b>	0	0
Silver	ppm	ASTM D5185(m)	<1	0	0
Aluminum	ppm	ASTM D5185(m) >5	<1	<1	0
Lead	ppm	ASTM D5185(m) >5	<b>1</b>	<1	1
Copper	ppm	ASTM D5185(m) >5	<b>5</b>	2	3
Tin	ppm	ASTM D5185(m) >5	<b>1</b>	<1	<1
Antimony	ppm	ASTM D5185(m)	<b>0</b>	0	0
Vanadium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Beryllium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Cadmium	ppm	ASTM D5185(m)	<b>0</b>	0	0

## ADDITIVES

	method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185(m) 0	<1	0	<1
Barium	ppm	ASTM D5185(m) 0	<1	0	0
Molybdenum	ppm	ASTM D5185(m) 0	<b>0</b>	0	0
Manganese	ppm	ASTM D5185(m)	<b>0</b>	0	0
Magnesium	ppm	ASTM D5185(m) 5	<b>0</b>	<1	<1
Calcium	ppm	ASTM D5185(m) 50	<b>53</b>	53	53
Phosphorus	ppm	ASTM D5185(m) 330	<b>348</b>	376	368
Zinc	ppm	ASTM D5185(m) 410	<b>442</b>	441	422
Sulfur	ppm	ASTM D5185(m) 2700	<b>5567</b>	5688	5635
Lithium	ppm	ASTM D5185(m)	<1	<1	<1

## CONTAMINANTS

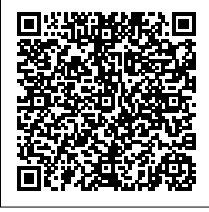
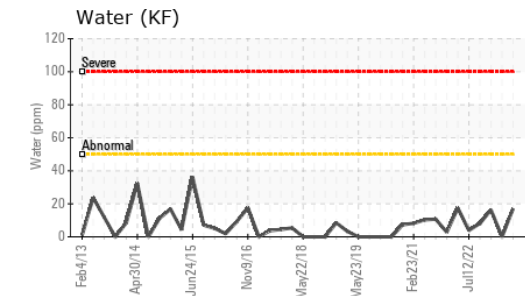
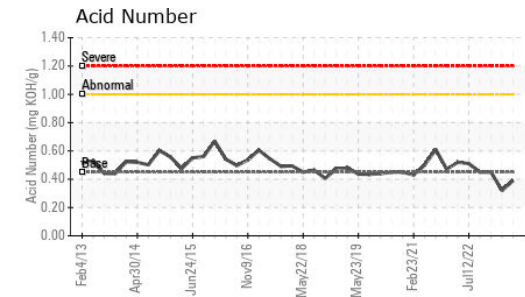
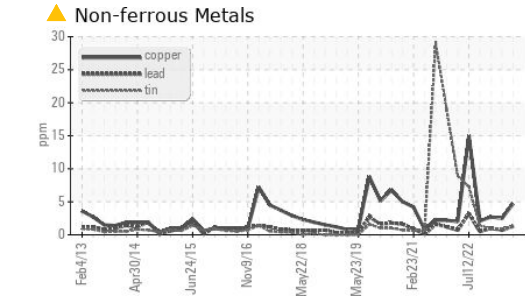
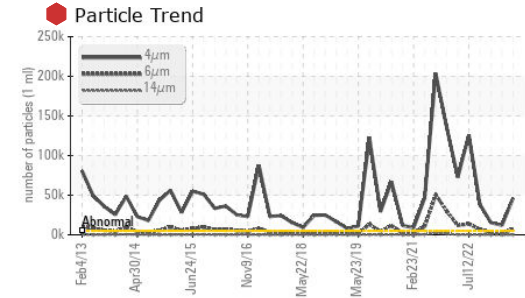
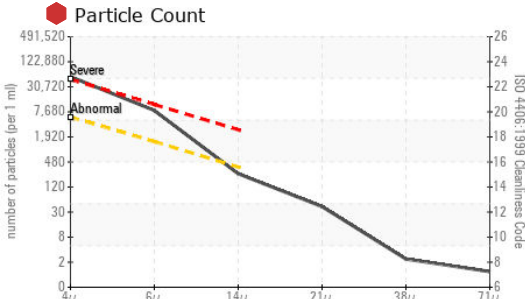
	method	limit/base	current	history1	history2
Silicon	ppm	ASTM D5185(m) >5	<b>5</b>	3	4
Sodium	ppm	ASTM D5185(m) >5	<1	0	0
Potassium	ppm	ASTM D5185(m) >20	<b>0</b>	0	<1
Water	%	ASTM D6304* >0.005	<b>0.002</b>	0.00	0.002
ppm Water	ppm	ASTM D6304* >50	<b>17</b>	0.00	16.3

## FLUID CLEANLINESS

	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647	>5000	<b>46369</b>	12008	15293
Particles >6µm	ASTM D7647	>1300	<b>7243</b>	2305	3018
Particles >14µm	ASTM D7647	>320	<b>221</b>	127	163
Particles >21µm	ASTM D7647	>80	<b>36</b>	25	36
Particles >38µm	ASTM D7647	>20	<b>2</b>	1	4
Particles >71µm	ASTM D7647	>4	<b>1</b>	0	0
Oil Cleanliness	ISO 4406 (c)	>19/17/15	<b>23/20/15</b>	21/18/14	21/19/15



# OIL ANALYSIS REPORT



**Laboratory** : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9  
**Sample No.** : WC0744591 **Received** : 13 Dec 2023  
**Lab Number** : 02602856 **Diagnosed** : 18 Dec 2023  
**Unique Number** : 5695941 **Diagnostician** : Kevin Marson  
**Test Package** : IND 2 ( Additional Tests: A-FERR, DR-FERR, FILTERPATCH )

**Bruce Power - Bruce A PdM**  
 P.O.Box 1540, 177 Tie Road., RM-222 U2 Column 2N11 615'  
 Tiverton, ON  
 CA N0G 2T0  
 Contact: Pierre Adouki  
 pierre.adouki@brucepower.com  
 T: (519)361-2673  
 F:

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.

FLUID DEGRADATION		method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D974*	0.45	<b>0.39</b>	0.32	0.45

VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Precipitate	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Silt	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Debris	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Sand/Dirt	scalar	Visual*	NONE	<b>NONE</b>	NONE	NONE
Appearance	scalar	Visual*	NORML	<b>NORML</b>	NORML	NORML
Odor	scalar	Visual*	NORML	<b>NORML</b>	NORML	NORML
Emulsified Water	scalar	Visual*	>0.005	<b>NEG</b>	NEG	NEG
Free Water	scalar	Visual*		<b>NEG</b>	NEG	NEG

FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	46	<b>44.1</b>	43.5	43.6

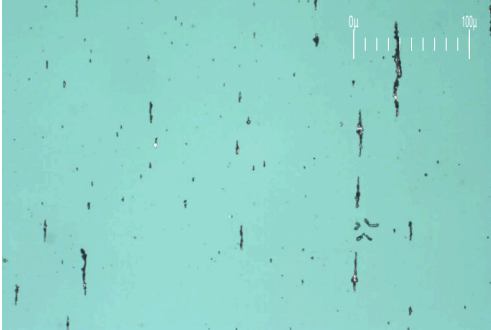
SAMPLE IMAGES		method	limit/base	current	history1	history2
Color						
Bottom						
PrtFilter						



# FERROGRAPHY REPORT

Area  
**BRUCE B/5/43230**  
 Machine Id  
**5-43230-P4-P IB Brg Drn**  
 Component  
**Inboard Bearing**  
 Fluid  
**ESSO NUTO H ISO 46 (--- GAL)**

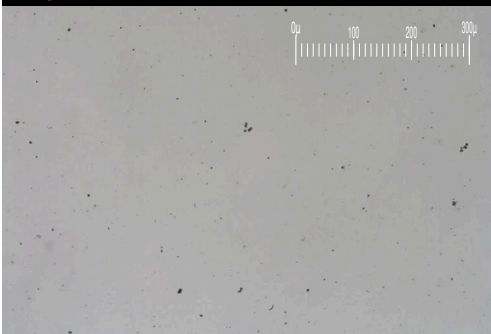
Magn: 200x Illum: BC



Magn: 50x Illum: RW



Magn: 100x Illum: RW



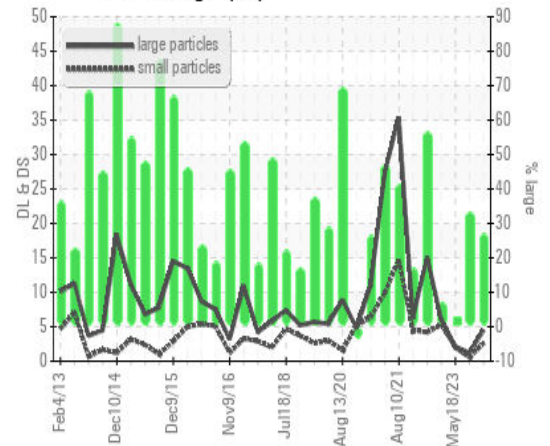
DR-FERROGRAPHY		method	limit/base	current	history1	history2
Large Particles		DR-Ferr*		<b>4.5</b>	1.2	2.1
Small Particles		DR-Ferr*		<b>2.6</b>	0.6	2.0
Total Particles		DR-Ferr*	>---	<b>7.1</b>	1.8	4.1
Large Particles Percentage	%	DR-Ferr*		<b>26.8</b>	33.3	2.4
Severity Index		DR-Ferr*		<b>9</b>	1	0

FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		<b>2</b>	2	2
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*		<b>1</b>		
Ferrous Rolling	Scale 0-10	ASTM D7684*		<b>1</b>	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*				
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*		<b>1</b>	1	
Fibres	Scale 0-10	ASTM D7684*				
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*		<b>1</b>	1	1

## WEAR

Copper ppm levels are noted. 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 embedding themselves in softer materials (sand, etc.), and gouging out mating surfaces.

## DR Ferrography



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