IND II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	SEVERE
CONTAMINANTS	SEVERE
OIL CONDITION	NORMAL

Area
BRUCE B/8/43230
Machine Id
8-43230-P4-P OB Brg Drn
Component
Outboard Bearing
Fluid
ESSO NUTO H ISO 46 (--- GAL)

RECOMMENDATION

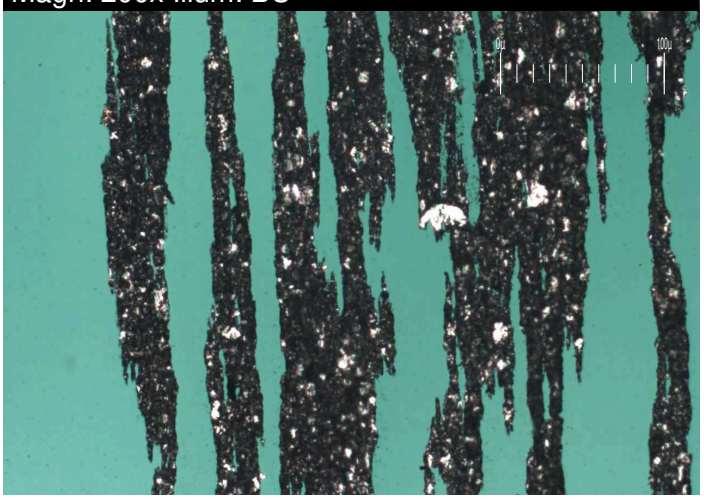
Check seals and/or filters for points of contaminant entry. Check seals and/or filters for points of contaminant entry. We advise that you check all areas where dirt can enter the system. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. Resample in 30-45 days to monitor this situation. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample.

WEAR

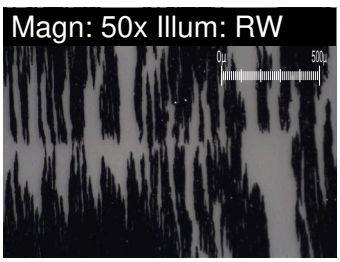
Copper and iron ppm levels are severe. Wear particle analysis indicates that the ferrous rubbing and nonferrous other particles are abnormal. Bearing wear is indicated. The low ferrous density (PQ) index indicates the wear metal levels are due to corrosion.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		WC0744562	WC0744594	WC0744548
Sample Date		Client Info		19 Jul 2023	12 Jun 2023	26 Apr 2023
Machine Age	hrs	Client Info		0	0	0
Oil Age	hrs	Client Info		0	0	0
Filter Age	hrs	Client Info		0	0	0
Oil Changed		Client Info		N/A	N/A	N/A
Filter Changed		Client Info		N/A	N/A	N/A
Sample Status				SEVERE	SEVERE	SEVERE
PQ		ASTM D8184*		6	39	9
Iron	ppm	ASTM D5185(m)	>10	32	65	32
Chromium	ppm	ASTM D5185(m)	>5	<1	5	<1
Nickel	ppm	ASTM D5185(m)	>5	0	0	0
Titanium	ppm	ASTM D5185(m)	>5	0	0	0
Silver	ppm	ASTM D5185(m)		0	<1	0
Aluminum	ppm	ASTM D5185(m)	>5	<1	<1	0
Lead	ppm	ASTM D5185(m)	>5	4	1	3
Copper	ppm	ASTM D5185(m)	>5	13	5	14
Tin	ppm	ASTM D5185(m)	>5	1	<1	1
Vanadium	ppm	ASTM D5185(m)		0	0	0
White Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Large Particles		DR-Ferr*		38.4	83.5	0.9
Small Particles		DR-Ferr*		19.8	61.2	0.5
Total Particles		DR-Ferr*	>---	58.2	144.7	1.4
Large Particles Percentage	%	DR-Ferr*		32	15.4	28.6
Severity Index		DR-Ferr*		714	1862	0
Ferrous Rubbing	Scale 0-10	ASTM D7684*				7
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*				1
Ferrous Rolling	Scale 0-10	ASTM D7684*		4	4	3
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	2	2
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*		1		

Magn: 200x Illum: BC



Magn: 50x Illum: RW



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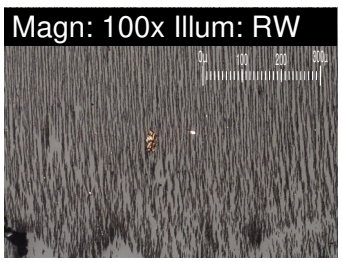


CONTAMINANTS

There is a high amount of silt (particulates < 14 microns in size) present in the oil. Elemental level of silicon (Si) above normal indicating ingress of seal material. The water content is negligible. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code.

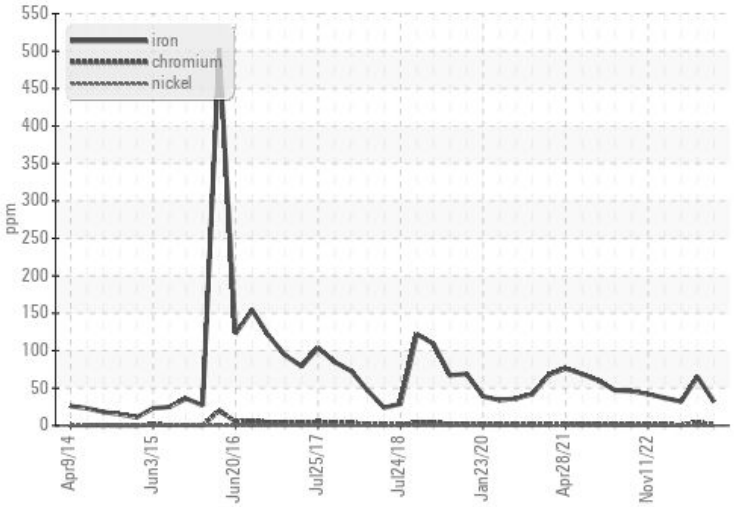
Silicon	ppm	ASTM D5185(m)	>5	**16**	26	17
Potassium	ppm	ASTM D5185(m)	>20	**<1**	0	0
Water	%	ASTM D6304*	>0.005	**0.00**	0.001	0.001
ppm Water	ppm	ASTM D6304*	>50	**0.00**	15	6.8
Particles >4µm		ASTM D7647	>10000	**209723**	161493	280383
Particles >6µm		ASTM D7647	>2500	**57012**	110784	42762
Particles >14µm		ASTM D7647	>160	**429**	1914	414
Particles >21µm		ASTM D7647	>40	**52**	38	51
Particles >38µm		ASTM D7647	>10	**1**	1	0
Particles >71µm		ASTM D7647	>3	**1**	1	0
Oil Cleanliness		ISO 4406 (c)	>20/18/14	**25/23/16**	25/24/18	25/23/16
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*	>0.005	**NEG**	NEG	NEG
Carbonaceous Material	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	2

OIL CONDITION

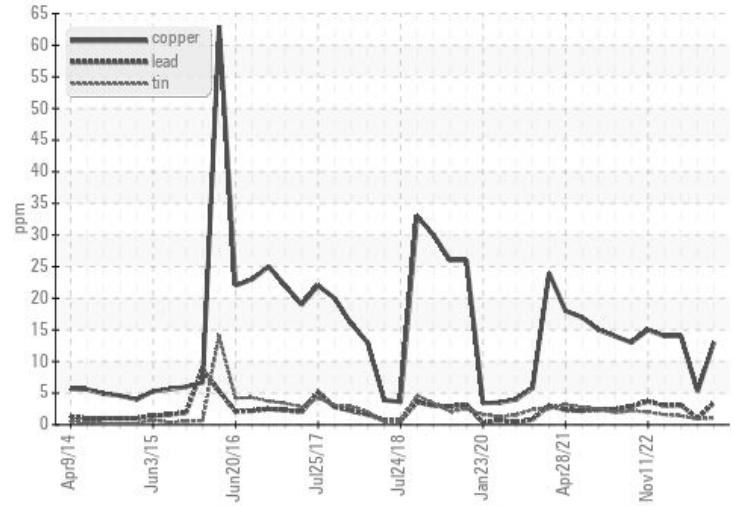
The AN level is acceptable for this fluid. The oil is no longer serviceable as a result of the abnormal and/or severe wear.

Sodium	ppm	ASTM D5185(m)	>5	**0**	<1	0
Boron	ppm	ASTM D5185(m)	0	**<1**	<1	<1
Barium	ppm	ASTM D5185(m)	0	**0**	0	0
Molybdenum	ppm	ASTM D5185(m)	0	**0**	0	0
Manganese	ppm	ASTM D5185(m)		**0**	0	<1
Magnesium	ppm	ASTM D5185(m)	5	**<1**	<1	0
Calcium	ppm	ASTM D5185(m)	50	**53**	54	53
Phosphorus	ppm	ASTM D5185(m)	330	**384**	346	367
Zinc	ppm	ASTM D5185(m)	410	**436**	440	407
Sulfur	ppm	ASTM D5185(m)	2700	**5636**	5767	5440
Acid Number (AN)	mg KOH/g	ASTM D974*	0.45	**0.42**	0.46	0.47
Visc @ 40°C	cSt	ASTM D7279(m)	46	**44.2**	42.8	44.2
Lubricant Degradation	Scale 0-10	ASTM D7684*				

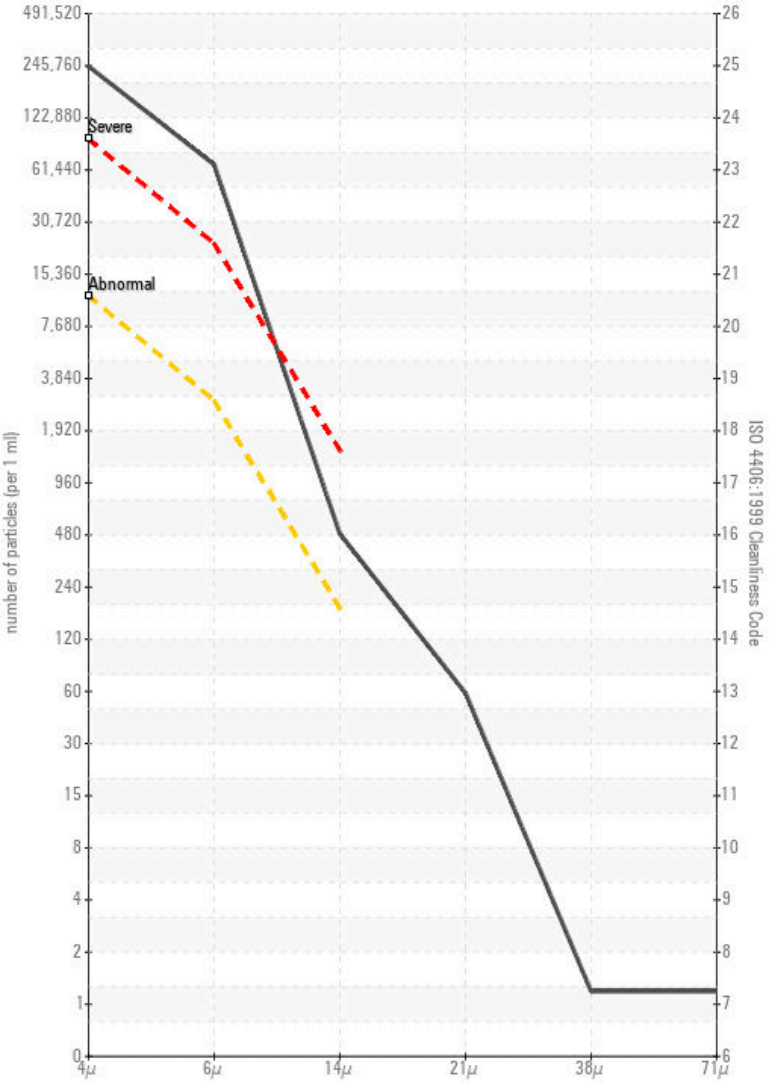
Ferrous Alloys



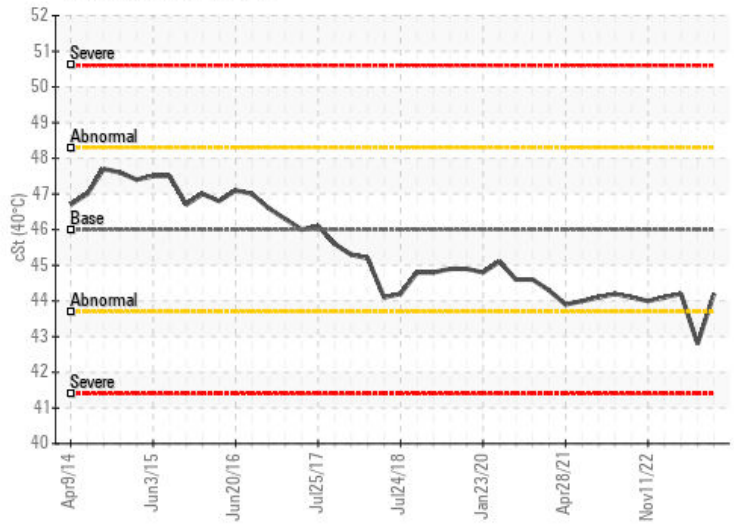
Non-ferrous Metals



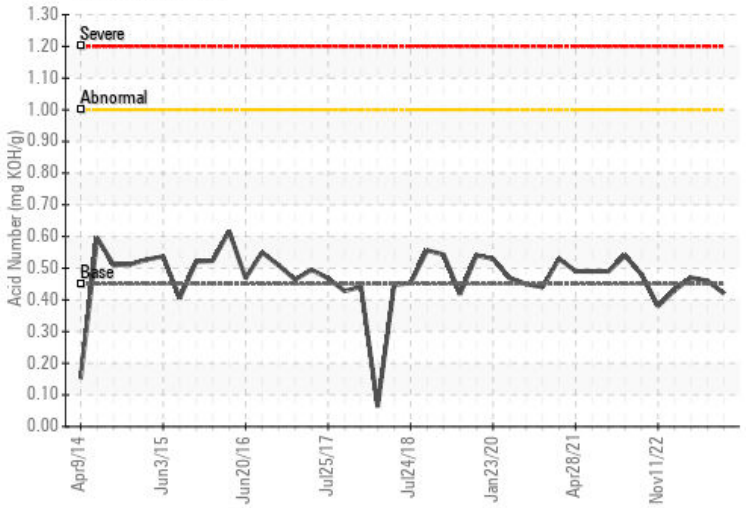
Particle Count



Viscosity @ 40°C



Acid Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: WC0744562	**Recieved**	: 31 Jul 2023
Lab Number	: 02573204	**Diagnosed**	: 03 Aug 2023
Unique Number	: 5618255	**Diagnostician**	: Kevin Marson
Test Package	: IND 2 (Additional Tests: A-FERR, BottomAnalysis, DR-FERR, FILTERPATCH, PQ)		

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.

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