

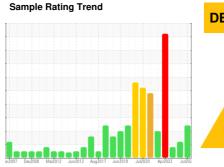
PROBLEM SUMMARY

^{Area} 1430

1430-5652-4003 - Cu/Ni AERATION TANK 2 AGITATOR

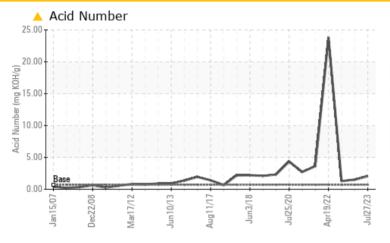
Component Gearbox

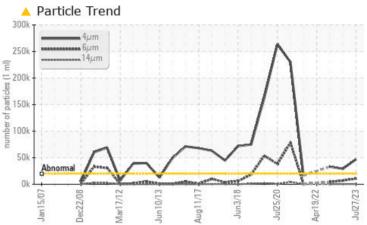
PETRO CANADA ENDURATEX SYNTHETIC EP 220 (100 LTR)





COMPONENT CONDITION SUMMARY





RECOMMENDATION

We recommend that you drain the oil from the component if this has not already been done. We recommend you service the filters on this component. We recommend an early resample to monitor this condition.

PROBLEMATIC TEST RESULTS							
Sample Status				ABNORMAL	ATTENTION	ATTENTION	
Particles >4µm		ASTM D7647	>20000	46726	29160	<u></u> 33018	
Particles >6µm		ASTM D7647	>5000	10665	△ 6914	4483	
Oil Cleanliness		ISO 4406 (c)	>21/19/16	<u>23/21/16</u>	<u>22/20/16</u>	<u>22/19/15</u>	
Acid Number (AN)	ma KOH/a	ASTM D974*	0.7	2.03	1.51	1.28	

Customer Id: INCVOS Sample No.: PC0077337 Lab Number: 02578545 Test Package: IND 3

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

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

RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Change Fluid			?	We recommend that you drain the oil from the component if this has not already been done.
Change Filter			?	We recommend you service the filters on this component.
Resample			?	We recommend an early resample to monitor this condition.

HISTORICAL DIAGNOSIS

04 Feb 2023 Diag: Wes Davis





We recommend you service the filters on this component. Resample at the next service interval to monitor. All component wear rates are normal. There is a light amount of silt (particulates < 14 microns in size) present in the oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.



08 Sep 2022 Diag: Wes Davis

ISO



We recommend you service the filters on this component. Resample at the next service interval to monitor. All component wear rates are normal. There is a light amount of silt (particulates < 14 microns in size) present in the oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.



19 Apr 2022 Diag: Kevin Marson

WEAR



We recommend that you drain the oil from the component if this has not already been done. We recommend an early resample to monitor this condition. Please note that the oil was too thick to perform some of the normal laboratory tests. The iron level is severe. There is no indication of any contamination in the component(unconfirmed). The AN level is slightly above the recommended limit. The oil is no longer serviceable.





OIL ANALYSIS REPORT

DT S



DEGRADATION



Area
1430
Machine Id

1430-5652-4003 - Cu/Ni AERATION TANK 2 AGITATOR

Component

Gearbox

PETRO CANADA ENDURATEX SYNTHETIC EP 220 (100 LTR)

DIAGNOSIS

Recommendation

We recommend that you drain the oil from the component if this has not already been done. We recommend you service the filters on this component. We recommend an early resample to monitor this condition.

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 moderate amount of silt (particulates < 14 microns in size) present in the oil.

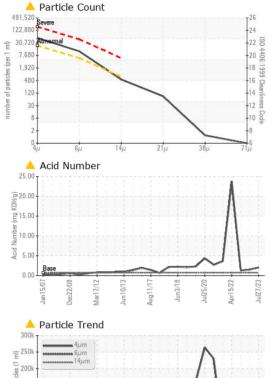
▲ Oil Condition

The AN level is above the recommended limit. The oil is no longer serviceable.

Sample Number Client Info PC0077337 PC0058640 PC0040261 Sample Date Client Info 27 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 04 Feb 2023 08 Sep 2022 08 Jul 2023 08 Jul 2023 08 Sep 2022 08 Jul 2023 08 J	EP 220 (100 LTF	•,	in2007 Dec20	08 Mar2012 Jun2013 /		2022 Jul202	
Client Info	SAMPLE INFORM	ATION	method	limit/base	current	history1	history2
Machine Age days Client Info 0 0 0 Dit Age days Client Info 0 0 0 Dit Changed Callent Info N/A N/A N/A Did IC Anged Client Info N/A N/A N/A ASTM D5185 (m) ASTM D5185 (m) ASTM D5185 (m) 0 0 0 Port ppm ASTM D5185 (m) >200 15 12 31 Chromium ppm ASTM D5185 (m) >15 0 0 0 Circle ppm ASTM D5185 (m) >15 0 0 0 Muminum ppm ASTM D5185 (m) >25 <1 0 0 Muminum ppm ASTM D5185 (m) >20 <1 0 0 Acted ppm ASTM D5185 (m) >20 <1 0 0 Acted ppm ASTM D5185 (m) >20 <1 0 0 Acted <th< td=""><td>Sample Number</td><td></td><td>Client Info</td><td></td><td>PC0077337</td><td>PC0058640</td><td>PC0040261</td></th<>	Sample Number		Client Info		PC0077337	PC0058640	PC0040261
Dit Age	Sample Date		Client Info		27 Jul 2023	04 Feb 2023	08 Sep 2022
Client Info	Machine Age	days	Client Info		0	0	0
MEAR METALS	Oil Age	days	Client Info		0	0	0
WEAR METALS method limit/base current history1 history2 PO ASTM D8184* 0 0 0 0 Chron ppm ASTM D5185(m) >200 15 12 31 Chromium ppm ASTM D5185(m) >15 0 0 0 Chromium ppm ASTM D5185(m) 15 0 0 0 Silver ppm ASTM D5185(m) 15 0 0 0 Aluminum ppm ASTM D5185(m) 25 <1	Oil Changed		Client Info		N/A	N/A	N/A
ASTM D8184*	Sample Status				ABNORMAL	ATTENTION	ATTENTION
Chromium ppm ASTM D5185(m) >200 15 12 31 Chromium ppm ASTM D5185(m) >15 0 0 0 0 0 0 0 0 0	WEAR METALS		method	limit/base	current	history1	history2
Chromium ppm ASTM D5185(m) >15 0 0 0 ASTM D5185(m) >15 0 0 <1	PQ		ASTM D8184*		0	0	0
ASTM D5185(m) D10	ron	ppm	ASTM D5185(m)	>200	15	12	31
Description	Chromium	ppm	ASTM D5185(m)	>15	0	0	0
Silver ppm ASTM D5185(m) 0 0 0 0 0 Aluminum ppm ASTM D5185(m) >25 < 1 0 0 0 Aluminum ppm ASTM D5185(m) >20 < 1 0 2 ASTM D5185(m) >20 < 1 0 2 ASTM D5185(m) >20 0 1 0 0 Antimony ppm ASTM D5185(m) >25 0 0 0 0 Antimony ppm ASTM D5185(m) >5 0 0 0 0 Antimony ppm ASTM D5185(m) >5 0 0 0 0 Antimony ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 5 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 5 0 0 0 0 Analyabdenum ppm ASTM D5185(m) 5 0 0 0 0 Analyabdenum ppm ASTM D5185(m) 5 0 0 0 0 Analyabdenum ppm ASTM D5185(m) 5 2 0 0 1 Phosphorus ppm ASTM D5185(m) 5 2 0 0 1 Phosphorus ppm ASTM D5185(m) 5 2 0 0 1 Phosphorus ppm ASTM D5185(m) 5 2 0 0 1 Phosphorus ppm ASTM D5185(m) 5 2 0 0 1 ASTM D5185(m) 5 2 0 1 ASTM D5185(m) 5 2 0 1 ASTM D5185(m) 5 0 0 0 0 ASTM D5185(m) 5 2 0 1 ASTM D5185(m) 5 2 0 1 ASTM D5185(m) 5 2 0 0 1 ASTM D5185(m) 5 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 0 ASTM D5185(m) 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nickel	ppm	ASTM D5185(m)	>15	0	0	<1
Auditionium Audition Audit	- itanium	ppm	ASTM D5185(m)		0	0	0
December December	Silver	ppm	ASTM D5185(m)		0	0	0
Copper ppm ASTM D5185(m) >200 <1 0 2 Fin ppm ASTM D5185(m) >25 0 0 0 Antimony ppm ASTM D5185(m) >5 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 33 29 30 26 Barium ppm ASTM D5185(m) 5 0 0 0 Manganesium ppm ASTM D5185(m) 5 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 </td <td>Aluminum</td> <td>ppm</td> <td>ASTM D5185(m)</td> <td>>25</td> <td><1</td> <td>0</td> <td>0</td>	Aluminum	ppm	ASTM D5185(m)	>25	<1	0	0
Particles > 4 μm	ead	ppm	ASTM D5185(m)	>100	0	0	<1
Antimony ppm ASTM D5185(m) >5 0 0 0 <1 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 5 0 0 0 Adolybdenum ppm ASTM D5185(m) 5 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 0 0 Alanganese ppm ASTM D5185(m) 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Copper	ppm	ASTM D5185(m)	>200	<1	0	2
Anadium 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) 3 29 30 26 Barium ppm ASTM D5185(m) 5 0 0 0 Molybdenum ppm ASTM D5185(m) 5 0 0 0 Magnesium ppm ASTM D5185(m) 5 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	Γin	ppm	ASTM D5185(m)	>25	0	0	0
Sery	Antimony	ppm	ASTM D5185(m)	>5	0	0	<1
ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 33 29 30 26 Barium ppm ASTM D5185(m) 5 0 0 0 Molybdenum ppm ASTM D5185(m) 0 0 0 Magnesium ppm ASTM D5185(m) <1	/anadium	ppm	ASTM D5185(m)		0	0	0
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Boron ppm ASTM D5185(m) 33 29 30 26 Barium ppm ASTM D5185(m) 5 0 0 0 Molybdenum ppm ASTM D5185(m) 5 0 0 0 Manganese ppm ASTM D5185(m) 5 <1 <1 <1 0 Magnesium ppm ASTM D5185(m) 5 <1 <1 0 0 1 Calcicium ppm ASTM D5185(m) 5 2 0 1 1 2 0 1 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 1 2 4 14 4 2 4 14 4 2 4 14 4 2 4 4 7 8 8 7 8 8 7<	Cadmium	ppm	ASTM D5185(m)		0	0	0
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Molybdenum ppm ASTM D5185(m) 0 0 0 Manganese ppm ASTM D5185(m) <1 <1 <1 Magnesium ppm ASTM D5185(m) 5 <1 <1 0 Calcium ppm ASTM D5185(m) 5 2 0 1 Phosphorus ppm ASTM D5185(m) 437 371 425 414 Zinc ppm ASTM D5185(m) 5 8 7 8 Sulfur ppm ASTM D5185(m) 5000 4520 4645 4773 Lithium ppm ASTM D5185(m) 500 4 4 1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >50 3 3 3 Sodium ppm ASTM D5185(m) >20 <1 <1 <1 <1 FLUID CLEANLINESS method limit/base<	Boron	ppm	ASTM D5185(m)	33	29	30	26
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Magnesium ppm ASTM D5185(m) 5 <1 <1 0 Calcium ppm ASTM D5185(m) 5 2 0 1 Phosphorus ppm ASTM D5185(m) 437 371 425 414 Zinc ppm ASTM D5185(m) 5 8 7 8 Sulfur ppm ASTM D5185(m) 5000 4520 4645 4773 Lithium ppm ASTM D5185(m) 5000 4520 4645 4773 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >50 3 3 3 Goldium ppm ASTM D5185(m) >20 <1 <1 <1 <1 Potassium ppm ASTM D5185(m) >20 <1 <1 <1 <1 Potassium ppm ASTM D5185(m) >20 <1 <1 <1 <1 FLUID C	Molybdenum	ppm	ASTM D5185(m)		0	0	0
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Phosphorus ppm ASTM D5185(m) 437 371 425 414 Zinc ppm ASTM D5185(m) 5 8 7 8 Sulfur ppm ASTM D5185(m) 5000 4520 4645 4773 Lithium ppm ASTM D5185(m) <1 <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Solicon ppm ASTM D5185(m) >50 3 3 3 Solicon ppm ASTM D5185(m) >20 <1 <1 <1 <1 Particles > 4µm ASTM D7647 >200	Magnesium	ppm	ASTM D5185(m)	5	<1	<1	0
Solifur So	Calcium	ppm	ASTM D5185(m)	5	2	0	1
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Solition ppm ASTM D5185(m) >50 3 3 3 3 3 3 3 3 3	Sulfur	ppm	ASTM D5185(m)				
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Potassium ppm ASTM D5185(m) >20 <1 <1 <1 FLUID CLEANLINESS method limit/base current history1 history2 Particles >4μm ASTM D7647 >20000 46726 29160 33018 Particles >6μm ASTM D7647 >5000 10665 6914 4483 Particles >14μm ASTM D7647 >640 475 403 172 Particles >21μm ASTM D7647 >160 74 88 37 Particles >38μm ASTM D7647 >40 1 2 0 Particles >71μm ASTM D7647 >10 0 0 0	_ithium	ppm	ASTM D5185(m)	5000	4520 <1	4645 <1	4773
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Particles >14μm ASTM D7647 >640 475 403 172 Particles >21μm ASTM D7647 >160 74 88 37 Particles >38μm ASTM D7647 >40 1 2 0 Particles >71μm ASTM D7647 >10 0 0 0	CONTAMINANT Silicon Sodium Potassium	ppm S ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	5000 limit/base >50 >20	4520 <1 current 3 <1 <1	4645 <1 history1 3 <1 <1	4773 <1 history2 3 <1 <1
Particles >14μm ASTM D7647 >640 475 403 172 Particles >21μm ASTM D7647 >160 74 88 37 Particles >38μm ASTM D7647 >40 1 2 0 Particles >71μm ASTM D7647 >10 0 0 0	CONTAMINANT Silicon Sodium Potassium FLUID CLEANLI	ppm S ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) method	limit/base >50 limit/base	4520 <1	4645 <1 history1 3 <1 <1 history1	4773 <1 history2 3 <1 <1 history2
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Particles >38μm ASTM D7647 >40 1 2 0 Particles >71μm ASTM D7647 >10 0 0 0	CONTAMINANT CONTAMINANT Collicon Codium Cotassium FLUID CLEANLI Carticles >4µm Carticles >6µm	ppm S ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) method ASTM D7647 ASTM D7647	5000 limit/base >50	4520 <1 current 3 <1 <1 current 46726 10665	4645 <1 history1 3 <1 <1 history1 △ 29160 △ 6914	4773 <1 history2 3 <1 <1 <1 history2 ▲ 33018 4483
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·	CONTAMINANT Silicon Sodium Potassium FLUID CLEANLI Particles >4µm Particles >14µm Particles >14µm Particles >21µm	ppm S ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) method ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	5000 limit/base >50 >20 limit/base >20000 >5000 >640 >160	4520 <1 current 3 <1 <1 current 46726 10665 475 74	4645 <1 history1 3 <1 <1 <1 history1 ▲ 29160 ▲ 6914 403 88	4773 <1 history2 3 <1 <1 <hr/> history2 3 <1 <1 <hr/> 4483 172 37
	CONTAMINANT Silicon Sodium Potassium FLUID CLEANLI Particles >4µm Particles >14µm Particles >21µm Particles >38µm	ppm S ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) Method ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	5000 limit/base >50 >20 limit/base >20000 >5000 >640 >160 >40	4520 <1 current 3 <1 <1 current 46726 10665 475 74 1	4645 <1 history1 3 <1 <1 <1 history1 ▲ 29160 ▲ 6914 403 88 2	4773 <1 history2 3 <1 <1 <1 history2 ▲ 33018 4483 172 37 0

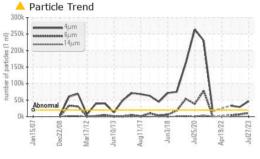


OIL ANALYSIS REPORT



FLUID DEGRAD	ATION	method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D974*	0.7	<u>2.03</u>	1.51	1.28
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	VLITE	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	NONE	NONE	LIGHT
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
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPE	RTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	223	224	225	202
Visc @ 100°C	cSt	ASTM D7279(m)	26.39	26.1	26.0	26.4

148





Scale

ASTM D2270*

method

151

Viscosity Index (VI)

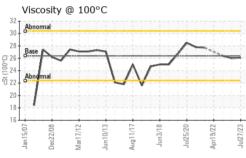
SAMPLE IMAGES

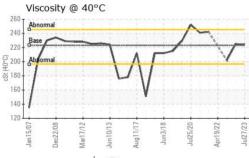


147

165

history2







CALA ISO 17025:2017 Accredited

Laboratory Sample No. Lab Number Unique Number

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 : 02578545

: PC0077337

Received : 5631605

Diagnosed Diagnostician : Kevin Marson Test Package : IND 3 (Additional Tests: KV100, PrtCount, TAN Man, VI)

: 25 Aug 2023 : 28 Aug 2023

Vale - Voisey's Bay Voisey's Bay Mine Site, P.O. Box 7001, Stn. C Happy Valley

Contact/Location: Robert Feltham - INCVOS

Goose Bay, NL CA A0P 1C0 Contact: Robert Feltham

To discuss this sample report, contact Customer Service at 1-800-268-2131.

robert.feltham@vale.com T:

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.

F: x:



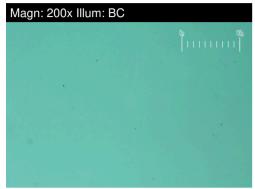
FERROGRAPHY REPORT

Area 1430

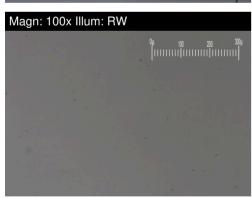
1430-5652-4003 - Cu/Ni AERATION TANK 2 AGITATOR

Gearbox

PETRO CANADA ENDURATEX SYNTHETIC EP 220 (100 LTR)



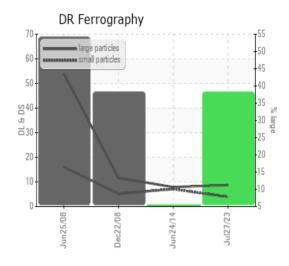




DR-FERROGR	APHY	method	limit/base	current	history1	history2
Large Particles		DR-Ferr*		8.7		
Small Particles		DR-Ferr*		3.9		
Total Particles		DR-Ferr*	>	12.6		
Large Particles Percentage	%	DR-Ferr*		38.1		
Severity Index		DR-Ferr*		42		
FERROGRAPH	łΥ	method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		1		
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*				
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*				
Fibres	Scale 0-10	ASTM D7684*				
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*		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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