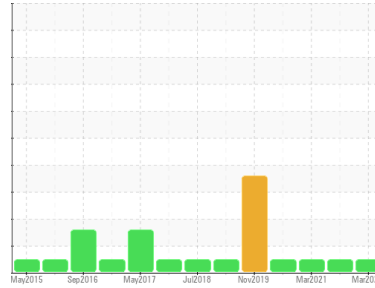




OIL ANALYSIS REPORT

Sample Rating Trend



NORMAL



Area
13
Machine Id
WTG-1304 (S/N EH806A-003-LM0051)
Component
Wind Turbine Gearbox
Fluid
SHELL OMALA 320 (340 LTR)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor. Analytical Ferrography: Sample results suggest this unit is operating normally, with typical amounts of ferrous rubbing wear and contamination. The only non-standard debris is a single reworked wear particle - this appears to be an anomaly and from an unassociated issue such as opening a port more than a current wear issue.

Wear

All component wear rates are normal.

Contaminants

The amount and size of particulates present in the system are acceptable. There is no indication of any contamination in the oil.

Oil Condition

The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

SAMPLE INFORMATION

	method	limit/base	current	history1	history2
Sample Number	Client Info		WC0804452	WC05504500	WC0547197
Sample Date	Client Info		04 Mar 2023	07 Feb 2022	04 Mar 2021
Machine Age	mths	Client Info	101	0	120
Oil Age	mths	Client Info	101	0	65
Oil Changed	Client Info		Not Chngd	N/A	Not Chngd
Sample Status			NORMAL	NORMAL	NORMAL

WEAR METALS

	method	limit/base	current	history1	history2	
PQ	ASTM D8184	>50	14	17	23	
Iron	ppm	ASTM D5185m	>65	32	29	30
Chromium	ppm	ASTM D5185m	>3	<1	<1	<1
Nickel	ppm	ASTM D5185m	>3	<1	0	0
Titanium	ppm	ASTM D5185m	>10	0	0	0
Silver	ppm	ASTM D5185m		0	<1	0
Aluminum	ppm	ASTM D5185m	>10	<1	0	0
Lead	ppm	ASTM D5185m	>5	<1	1	0
Copper	ppm	ASTM D5185m	>10	0	<1	<1
Tin	ppm	ASTM D5185m	>10	<1	0	0
Antimony	ppm	ASTM D5185m	>5	---	---	0
Vanadium	ppm	ASTM D5185m		0	0	0
Cadmium	ppm	ASTM D5185m		0	0	<1

ADDITIVES

	method	limit/base	current	history1	history2	
Boron	ppm	ASTM D5185m	5.5	4	0	6
Barium	ppm	ASTM D5185m	0.4	0	0	0
Molybdenum	ppm	ASTM D5185m	0.5	0	0	0
Manganese	ppm	ASTM D5185m		<1	<1	<1
Magnesium	ppm	ASTM D5185m	23	0	0	0
Calcium	ppm	ASTM D5185m	13	4	3	2
Phosphorus	ppm	ASTM D5185m	450	346	386	276
Zinc	ppm	ASTM D5185m	9.9	36	38	29
Sulfur	ppm	ASTM D5185m	8181	6014	4672	3548

CONTAMINANTS

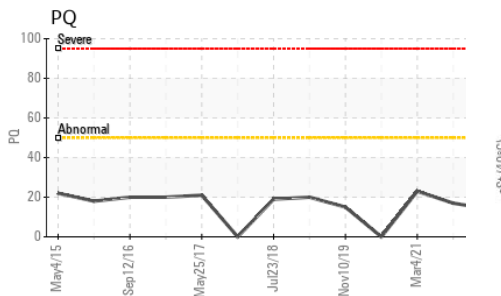
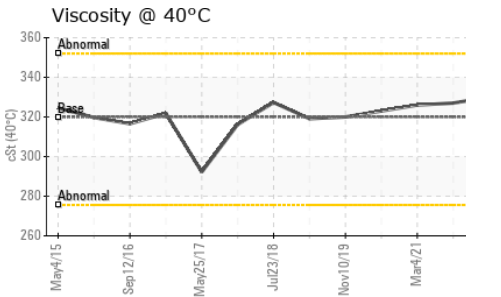
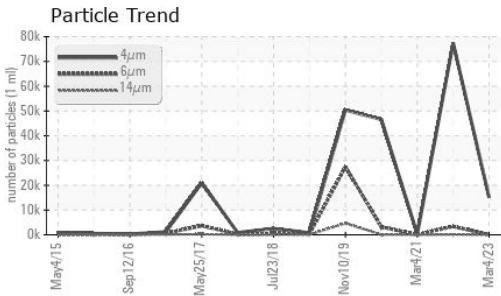
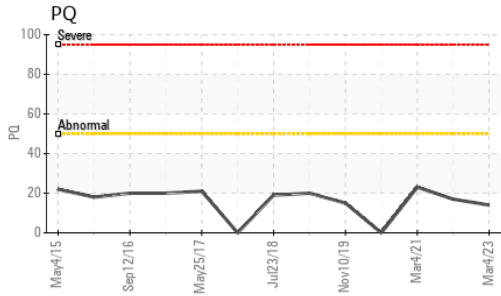
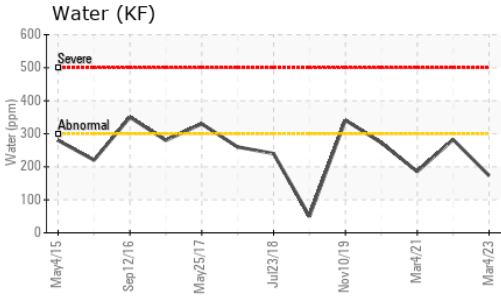
	method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185m	>15	<1	<1	0
Sodium	ppm	ASTM D5185m		6	3	5
Potassium	ppm	ASTM D5185m	>20	1	0	5
Water	%	ASTM D6304	>0.03	0.017	0.028	0.018
ppm Water	ppm	ASTM D6304	>300	173.1	282.4	185.7

FLUID CLEANLINESS

	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647		15144	77438	316
Particles >6µm	ASTM D7647	>5000	63	3413	47
Particles >14µm	ASTM D7647	>640	4	160	7
Particles >21µm	ASTM D7647	>160	1	4	4
Particles >38µm	ASTM D7647	>40	0	0	0
Particles >71µm	ASTM D7647	>10	0	0	0
Oil Cleanliness	ISO 4406 (c)	>--/19/16	21/13/9	23/19/14	15/13/10



OIL ANALYSIS REPORT



FLUID DEGRADATION		method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D8045		1.47	1.55	1.345

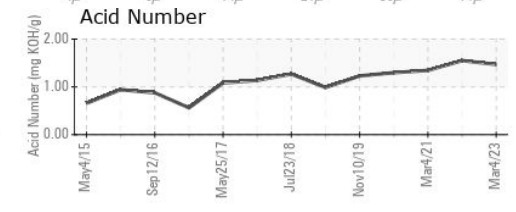
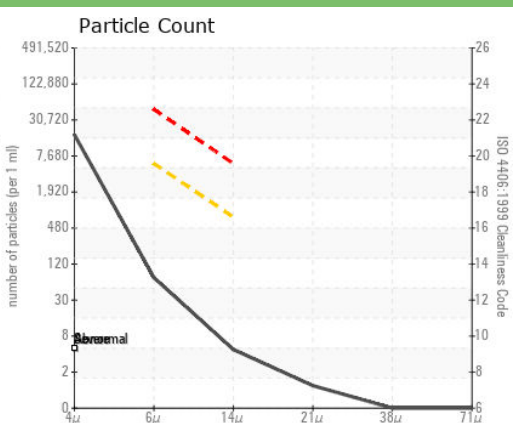
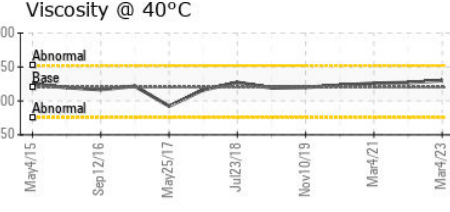
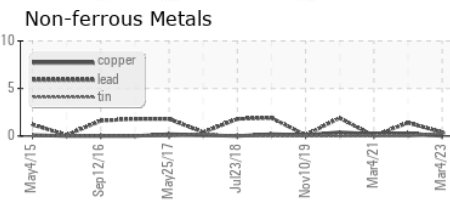
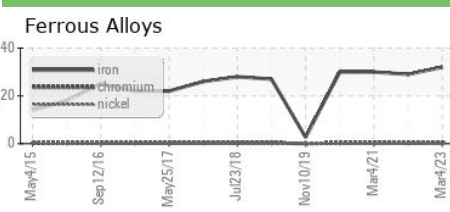
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.03	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG

FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D445	320	330	327	326

SAMPLE IMAGES		method	limit/base	current	history1	history2
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GRAPHS



Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0804452
Lab Number : 05857851
Unique Number : 10492316
Test Package : IND 3 (Additional Tests: KF, PrtCount)

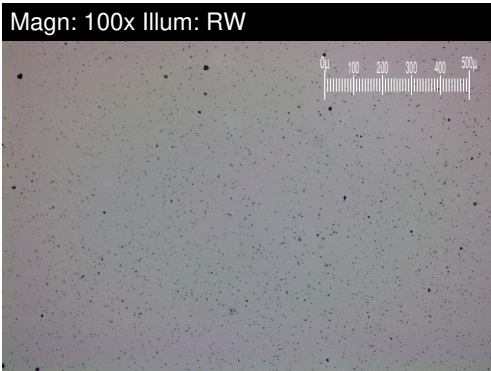
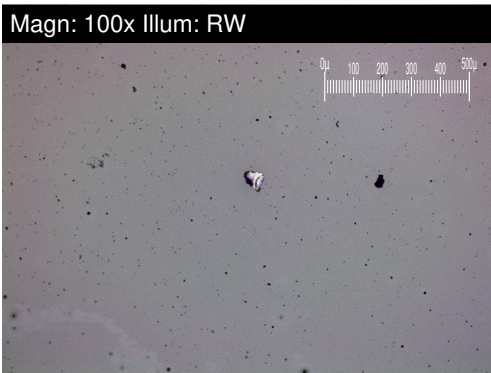
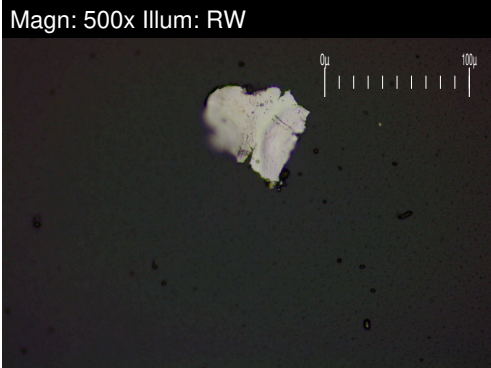
ENERGIA EOLICA
 STA ANA KM25 CARRETERA AL SUR, A 1KM DEL CRUCE
 FRANCISCO MORAZAN, ZZ
 HN
 Contact: SANTOS DEL CID
 sdelcid@dennci.com

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)

T: x:
 F: x:

FERROGRAPHY REPORT

Area
13
 Machine Id
WTG-1304 (S/N EH806A-003-LM0051)
 Component
Wind Turbine Gearbox
 Fluid
SHELL OMALA 320 (340 LTR)

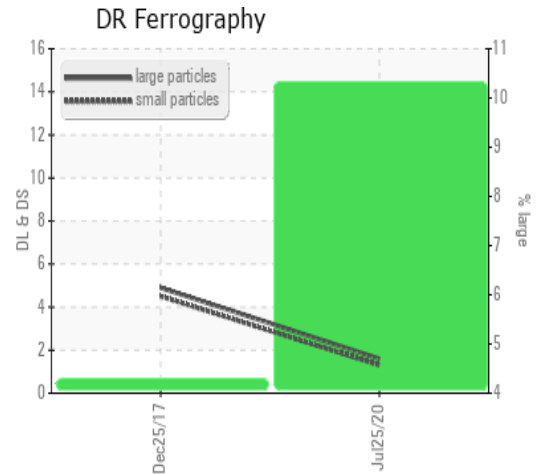


DR-FERROGRAPHY		method	limit/base	current	history1	history2
Large Particles		*DR-Ferr	>30	---	---	---
Small Particles		*DR-Ferr	>30	---	---	---
Total Particles		*DR-Ferr	>45.0	---	---	---
Large Particles Percentage	%	*DR-Ferr		---	---	---
Severity Index		*DR-Ferr		---	---	---

FERROGRAPHY		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		█ 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				
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.



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