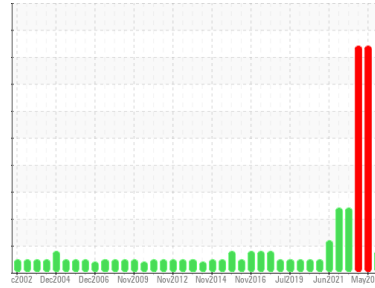




OIL ANALYSIS REPORT

Sample Rating Trend



Area
Huron Wind Project SP-00517
 Machine Id
15411 pad 4
 Component
Wind Turbine Gearbox
 Fluid
CHEVRON PINNACLE WM 320 (--- LTR)

DIAGNOSIS

Recommendation

We recommend an early resample to monitor this condition. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample.

Wear

Copper ppm levels are marginal. All other component wear rates are normal.

Contamination

The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The water content is negligible. The system and fluid cleanliness is acceptable.

Fluid 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		WC0863449	WC0783132	WC0305873
Sample Date	Client Info		13 Dec 2023	10 May 2023	13 Dec 2022
Machine Age	yrs	Client Info	0	0	0
Oil Age	yrs	Client Info	0	0	0
Oil Changed	Client Info		N/A	N/A	N/A
Sample Status			MARGINAL	SEVERE	SEVERE

WEAR METALS

	method	limit/base	current	history1	history2	
PQ	ASTM D8184*	>50	0	0	0	
Iron	ppm	ASTM D5185(m)	>75	3	16	14
Chromium	ppm	ASTM D5185(m)	>5	0	0	0
Nickel	ppm	ASTM D5185(m)	>10	0	<1	<1
Titanium	ppm	ASTM D5185(m)	>10	0	0	0
Silver	ppm	ASTM D5185(m)		0	0	0
Aluminum	ppm	ASTM D5185(m)	>10	<1	<1	<1
Lead	ppm	ASTM D5185(m)	>15	<1	1	1
Copper	ppm	ASTM D5185(m)	>10	▲ 10	● 39	● 36
Tin	ppm	ASTM D5185(m)	>10	0	<1	<1
Antimony	ppm	ASTM D5185(m)	>5	0	0	<1
Vanadium	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)	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	<1	<1
Magnesium	ppm	ASTM D5185(m)	0	<1	<1	<1
Calcium	ppm	ASTM D5185(m)	0	1	0	0
Phosphorus	ppm	ASTM D5185(m)	300	271	297	294
Zinc	ppm	ASTM D5185(m)	0	10	● 52	● 47
Sulfur	ppm	ASTM D5185(m)	8000	7413	6875	7098
Lithium	ppm	ASTM D5185(m)		<1	<1	<1

CONTAMINANTS

	method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185(m)	>10	3	4	2
Sodium	ppm	ASTM D5185(m)	>10	<1	2	2
Potassium	ppm	ASTM D5185(m)	>20	<1	0	1
Water	%	ASTM D6304*	>0.02	0.005	0.008	0.004
ppm Water	ppm	ASTM D6304*	>200	52	82.0	43.8

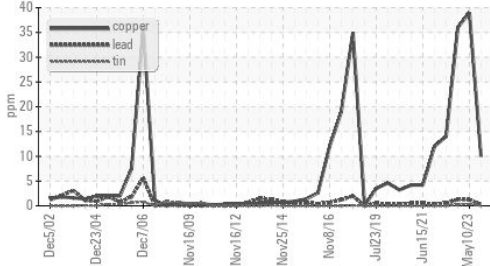
INFRA-RED

	method	limit/base	current	history1	history2	
Soot %	%	ASTM D7844*		0	0	0
Nitration	Abs/cm	ASTM D7624*		1.9	2.0	2.4
Sulfation	Abs/.1mm	ASTM D7415*		28.0	27.4	16.4



OIL ANALYSIS REPORT

Non-ferrous Metals



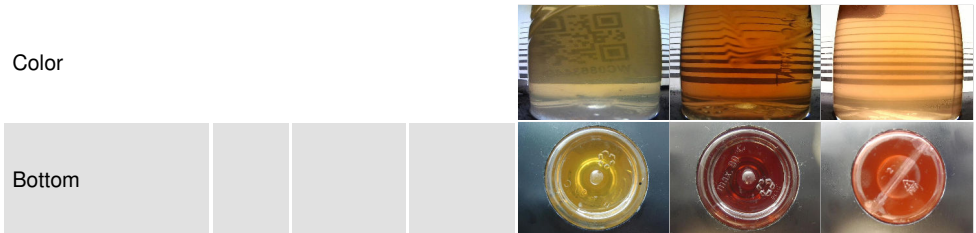
FLUID CLEANLINESS	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647		980	9931	791
Particles >6µm	ASTM D7647	>10000	204	1928	247
Particles >14µm	ASTM D7647	>1300	17	51	22
Particles >21µm	ASTM D7647	>320	6	12	5
Particles >38µm	ASTM D7647	>80	1	1	1
Particles >71µm	ASTM D7647	>20	1	0	1
Oil Cleanliness	ISO 4406 (c)	>--/20/17	17/15/11	20/18/13	17/15/12

FLUID DEGRADATION	method	limit/base	current	history1	history2
Oxidation	Abs./1mm	ASTM D7414*	28.1	28.9	10.1
Acid Number (AN)	mg KOH/g	ASTM D974*	0.85	▲ 1.46	▲ 1.45

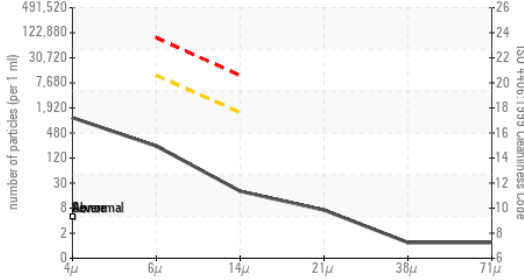
VISUAL	method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE
Precipitate	scalar	Visual*	NONE	NONE	NONE
Silt	scalar	Visual*	NONE	NONE	NONE
Debris	scalar	Visual*	NONE	NONE	NONE
Sand/Dirt	scalar	Visual*	NONE	NONE	NONE
Appearance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

FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	324	329	330
Visc @ 100°C	cSt	ASTM D7279(m)	36.2	35.6	36.2
Viscosity Index (VI)	Scale	ASTM D2270*	158	154	156

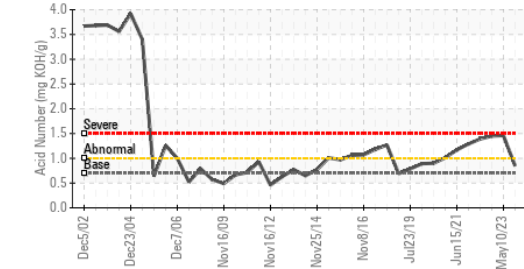
SAMPLE IMAGES



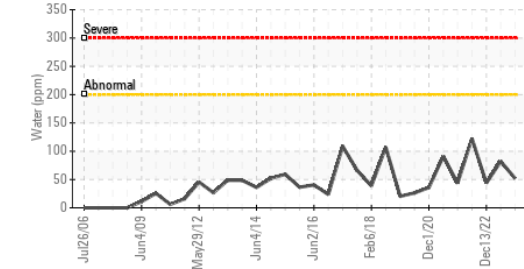
Particle Count



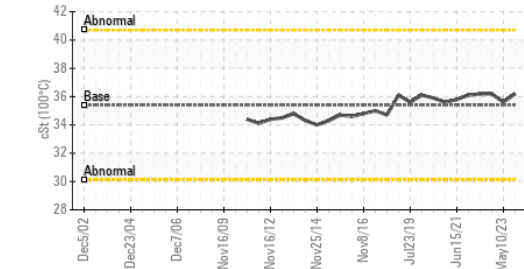
Acid Number



Water (KF)



Viscosity @ 100°C



Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 Vestas American Wind Technology Inc.
Sample No. : WC0863449 **Received** : 12 Jan 2024 1417 NW Everett Street
Lab Number : **02608642** **Diagnosed** : 16 Jan 2024 Portland, OR
Unique Number : 5709728 **Diagnostician** : Kevin Marson US 97209
Test Package : IND 2 (Additional Tests: FT-IR, KF, KV100, PQ, PrtCount, TAN Man, VI) **Contact:** Nicole Philippi
 NiPhi@vestas.com
 T: (503)327-7683
 F: (503)327-0247

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.