IND II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	MARGINAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

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

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

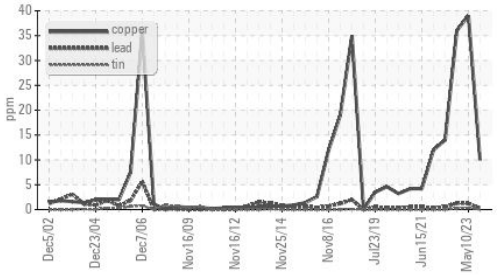
The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The water content is negligible. The system and fluid cleanliness is acceptable.

FLUID CONDITION

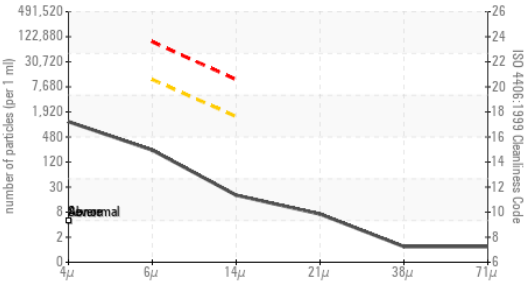
The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	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
Filter Age	yrs	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				MARGINAL	SEVERE	SEVERE
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
Vanadium	ppm	ASTM D5185(m)		0	0	0
White Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Silicon	ppm	ASTM D5185(m)	>10	3	4	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
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
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
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*	>0.02	NEG	NEG	NEG
Sodium	ppm	ASTM D5185(m)	>10	<1	2	2
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
Oxidation	Abs/.1mm	ASTM D7414*		28.1	28.9	10.1
Acid Number (AN)	mg KOH/g	ASTM D974*	0.7	0.85	▲ 1.46	▲ 1.45
Visc @ 40°C	cSt	ASTM D7279(m)	319	324	329	330
Visc @ 100°C	cSt	ASTM D7279(m)	35.4	36.2	35.6	36.2
Viscosity Index (VI)	Scale	ASTM D2270*	156	158	154	156

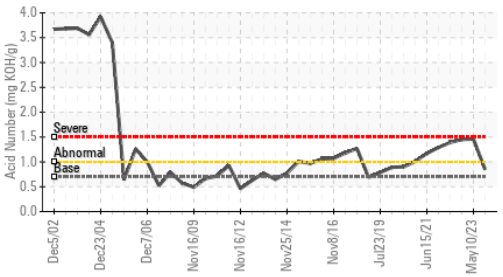
Non-ferrous Metals



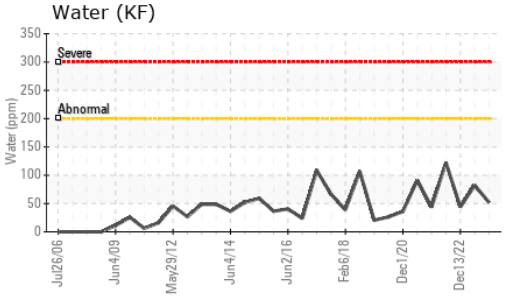
Particle Count



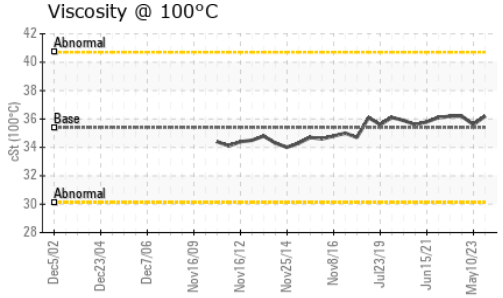
Acid Number



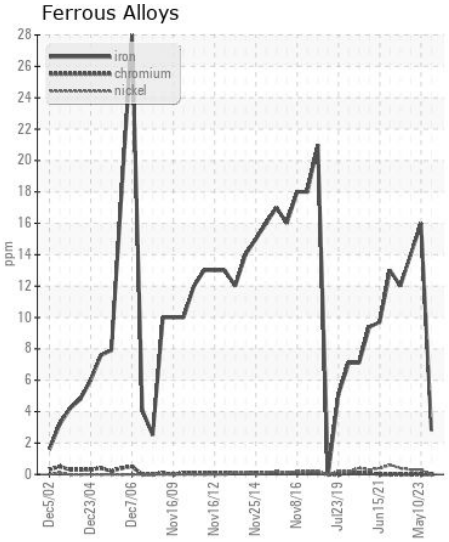
Water (KF)



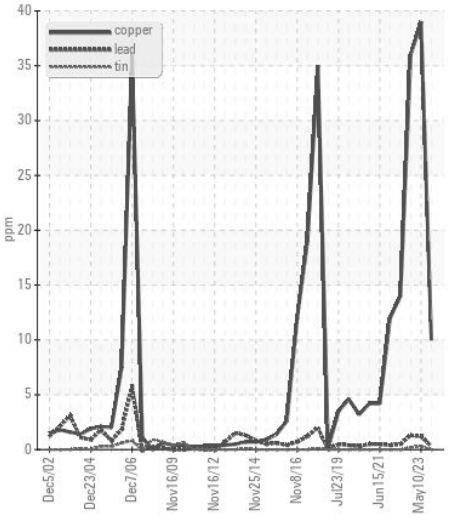
Viscosity @ 100°C



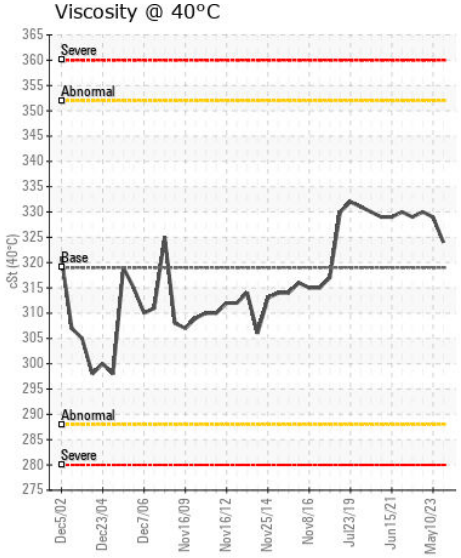
Ferrous Alloys



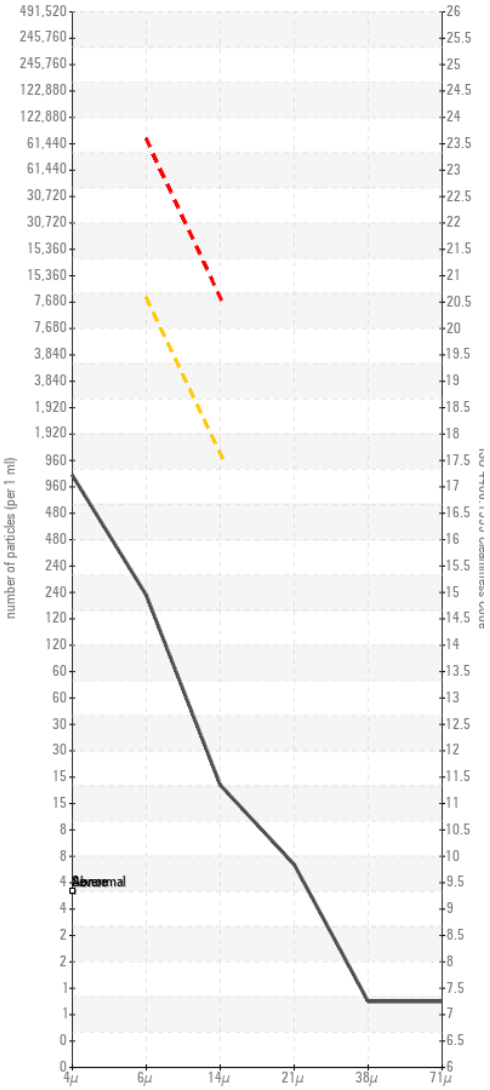
Non-ferrous Metals



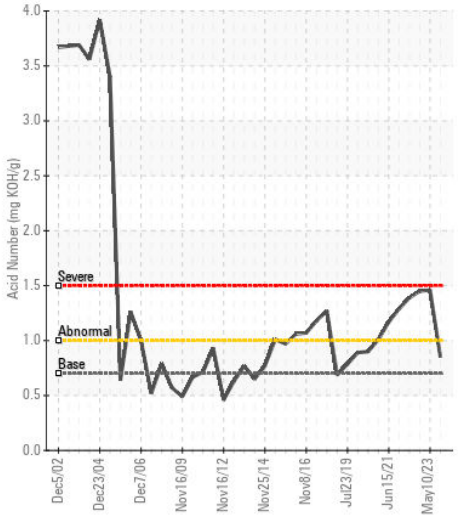
Viscosity @ 40°C



Particle Count



Acid Number



ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 **Vestas American Wind Technology Inc.**
Sample No. : WC0863449 **Recieved** : 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.