

PROBLEM SUMMARY

Sample Rating Trend

972009 Mar2010 Oct2011 Anr2013 Sac-2014 Caracter Caracter

ADDITIVES

ADDITIVES

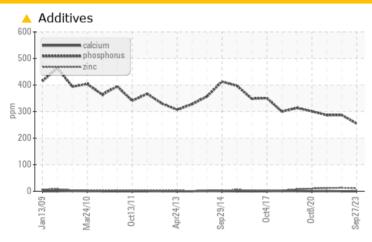
Saugeen Shores SP-17701 Machine IV ECW #4

Component

Wind Turbine Gearbox

MOBIL MOBILGEAR SHC XMP 320 (260 LTR)

COMPONENT CONDITION SUMMARY



RECOMMENDATION

The oil is near the end of it's useful service life, recommend schedule an oil change. Resample at the next service interval to monitor.

PROBLEMATIC T	EST RE	SULTS				
Sample Status				ABNORMAL	ABNORMAL	ABNORMAL
Phosphorus	ppm	ASTM D5185(m)	485	<u>^</u> 255	<u>\$\times\$</u> 287	<u>^</u> 287

Customer Id: VESTAS Sample No.: WC0835235 Lab Number: 02590757 Test Package: IND 2



To manage this report scan the QR code

To discuss the diagnosis or test data: Bill Quesnel CLS,OMA II,MLA-III,LLA-I +1 (289)291-4641 x4641

Bill.Quesnel@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
Service/change Fluid			?	The oil is near the end of it's useful service life, recommend schedule an oil change.

HISTORICAL DIAGNOSIS

27 Sep 2022 Diag: Kevin Marson

ADDITIVES



The oil is near the end of it's useful service life, recommend schedule an oil change. The filter change at the time of sampling has been noted. We recommend an early resample to monitor this condition. All component wear rates are normal. Particles >6µm and oil cleanliness are abnormally high. The water content is negligible. The system cleanliness is above the acceptable limit for the target ISO 4406 cleanliness code. Phosphorus ppm levels are abnormally low. The AN level is acceptable for this fluid.



05 Oct 2021 Diag: Bill Quesnel

ADDITIVES



The oil is near the end of it's useful service life, recommend schedule an oil change. Resample at the next service interval to monitor. All component wear rates are normal. The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The water content is negligible. The system and fluid cleanliness is acceptable. Phosphorus ppm levels are abnormally low. The AN level is acceptable for this fluid.



08 Oct 2020 Diag: Bill Quesnel

NORMAL



Resample at the next service interval to monitor. All component wear rates are normal. The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The water content is negligible. The system and fluid cleanliness is acceptable. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.





OIL ANALYSIS REPORT

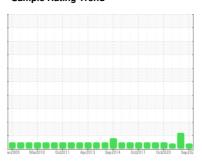
Sample Rating Trend

ADDITIVES

Saugeen Shores SP-17701 **ECW #4**

Wind Turbine Gearbox

MOBIL MOBILGEAR SHC XMP 320 (260 LTR)





DIAGNOSIS

Recommendation

The oil is near the end of it's useful service life. recommend schedule an oil change. Resample at the next service interval to monitor.

All 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.

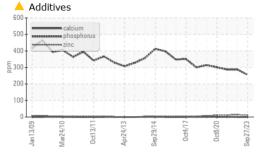
Fluid Condition

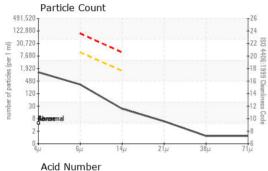
Phosphorus ppm levels are abnormally low. The AN level is acceptable for this fluid.

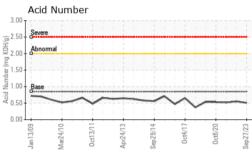
Copper ppm ASTM D5185(m) >5 2 2 2 2 Tin ppm ASTM D5185(m) >10 0 0 0 Antimony ppm ASTM D5185(m) >5 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 ADDITIVES method limit/base current history1 history2 Boron ppm ASTM D5185(m) 0 0 0 Barium ppm ASTM D5185(m) 0 0 0 Molybdenum ppm ASTM D5185(m) 0 0 0 0 Magnesium ppm ASTM D5185(m) 0 0 0 0 Calcium ppm ASTM D5185(m) 0 0 0 <1	m2009 Mar/2010 0-cz2011 Apr/2013 Sap/2014 0-cz2017 0-cz2020 Sap/202							
Sample Date Client Info 27 Sep 2023 27 Sep 2022 05 Oct 2021	SAMPLE INFORM	IATION	method	limit/base	current	history1	history2	
Machine Age yrs Client Info 15 14 0 Oil Age yrs Client Info 15 14 0 Oil Changed Client Info Not Changd Not Changd N/A Asmple Status Method Ilmit/base current history1 history2 PQ ASTM D5185m >50 0 0 0 0 Iron ppm ASTM D5185m >75 70 70 55 Chromium ppm ASTM D5185m >5 <1 <1 <1 <1 Nickel ppm ASTM D5185m >10 <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	Sample Number		Client Info		WC0835235	WC0577983	WC0546451	
Oil Age yrs Client Info 15 14 0 Oil Changed Client Info Not Changd NA Changd NA Changd NA Changd NA Changd NA ABNORMAL	Sample Date		Client Info		27 Sep 2023	27 Sep 2022	05 Oct 2021	
Oil Changed Client Info Not Changd ABNORMAL ABNORMAL	Machine Age	yrs	Client Info		15	14	0	
Sample Status method limit/base current history1 history2 PQ ASTM D8184* >50 0 0 0 Iron ppm ASTM D8185(m) >75 70 70 55 Chromium ppm ASTM D8185(m) >5 <1	Oil Age	yrs	Client Info		15	14	0	
WEAR METALS method limit/base current history1 history2 PQ ASTM D8184* >50 0 0 0 Iron ppm ASTM D8185(m) >75 70 70 55 Chromium ppm ASTM D8185(m) >5 <1	Oil Changed		Client Info		Not Changd	Not Changd	N/A	
PQ ASTM D8184* >50 0 0 0 Iron ppm ASTM D6185(m) >75 70 70 55 Chromium ppm ASTM D6185(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 <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 <1 <1 <1 </td <td>Sample Status</td> <td></td> <td></td> <td></td> <th>ABNORMAL</th> <td>ABNORMAL</td> <td>ABNORMAL</td>	Sample Status				ABNORMAL	ABNORMAL	ABNORMAL	
Irron	WEAR METALS		method	limit/base	current	history1	history2	
Chromium ppm ASTM D5185(m) >5 <1 <1 <1 Nickel ppm ASTM D5185(m) >10 <1 <1 <1 Tittanium ppm ASTM D5185(m) >10 0 0 0 Silver ppm ASTM D5185(m) >10 0 0 0 Aluminum ppm ASTM D5185(m) >10 0 0 0 Aluminum ppm ASTM D5185(m) >10 0 0 0 Copper ppm ASTM D5185(m) >10 0 0 0 Copper ppm ASTM D5185(m) >10 0 0 0 Vanadium ppm ASTM D5185(m) >5 2 2 2 2 Vanadium ppm ASTM D5185(m) 0 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0	PQ		ASTM D8184*	>50	0	0	0	
Nickel	Iron	ppm	ASTM D5185(m)	>75	70	70	55	
Titanium	Chromium	ppm	ASTM D5185(m)	>5	<1	<1	<1	
Silver	Nickel	ppm	ASTM D5185(m)	>10	<1	<1	<1	
Aluminum ppm ASTM D5185(m) >10 0 0 <1 Lead ppm ASTM D5185(m) >15 0 0 0 Copper ppm ASTM D5185(m) >5 2 2 2 2 Tin ppm ASTM D5185(m) >10 0 0 0 Antimony ppm ASTM D5185(m) >5 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 0 Boron ppm ASTM D5185(m) 0 <1 <1 <1 Barium ppm ASTM D5185(m) 0 <1 <1 <1 Manganesium ppm ASTM D5185(m) 0 0 <1 <1 Magnesium ppm ASTM D5185(m) 0 <th< td=""><td>Titanium</td><td>ppm</td><td>ASTM D5185(m)</td><td>>10</td><th>0</th><td>0</td><td>0</td></th<>	Titanium	ppm	ASTM D5185(m)	>10	0	0	0	
Lead ppm ASTM D5185(m) >15 0 0 0 Copper ppm ASTM D5185(m) >5 2 2 2 Tin ppm ASTM D5185(m) >10 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) 0 <1	Silver	ppm	ASTM D5185(m)		<1	0	0	
Lead ppm ASTM D5185(m) >15 0 0 0 Copper ppm ASTM D5185(m) >5 2 2 2 2 Tin ppm ASTM D5185(m) >10 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 Boron ppm ASTM D5185(m) 0 0 0 0 Barium ppm ASTM D5185(m) 0 0 0 0 Manganese ppm ASTM D5185(m) 0 0 0 1 1 Magnesium ppm ASTM D5185(m) 0 0 0 1 1 Phosphorus ppm ASTM D5185(m)	Aluminum	ppm	ASTM D5185(m)	>10	0	0	<1	
Copper ppm ASTM D5185(m) >5 2 2 2 2 Tin ppm ASTM D5185(m) >10 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) 0 0 0 0 Barium ppm ASTM D5185(m) 0 0 0 0 0 Barium ppm ASTM D5185(m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Lead		ASTM D5185(m)	>15	0	0	0	
Antimony ppm ASTM D5185(m) >5 0 0 0 Vanadium ppm ASTM D5185(m) 0 0 0 Beryllium ppm ASTM D5185(m) 0 0 0 Cadmium ppm ASTM D5185(m) 0 0 0 Boron ppm ASTM D5185(m) 0 0 0 0 Barium ppm ASTM D5185(m) 0 0 0 0 Molybdenum ppm ASTM D5185(m) 0 0 0 0 Magnesium ppm ASTM D5185(m) 0 0 0 0 Calcium ppm ASTM D5185(m) 0 0 0 -1 -1 Phosphorus ppm ASTM D5185(m) 485 255 287 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 0 1 -1 -1	Copper	ppm	ASTM D5185(m)	>5	2	2	2	
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 Magnesium ppm ASTM D5185(m) 0 0 0 0 Calcium ppm ASTM D5185(m) 0 0 0 <1 1 Phosphorus ppm ASTM D5185(m) 485 255 287 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 <	Tin	ppm	ASTM D5185(m)	>10	0	0	0	
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 0 <1 <1 Magnesium ppm ASTM D5185(m) 0 0 0 <1 <1 Magnesium ppm ASTM D5185(m) 0 0 0 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <th< td=""><td>Antimony</td><td>ppm</td><td>ASTM D5185(m)</td><td>>5</td><th>0</th><td>0</td><td>0</td></th<>	Antimony	ppm	ASTM D5185(m)	>5	0	0	0	
Beryllium	Vanadium		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	Beryllium		()		0	0	0	
Boron	Cadmium	ppm	ASTM D5185(m)		0	0	0	
Barium ppm ASTM D5185(m) 0 0 0 Molybdenum ppm ASTM D5185(m) 0 0 0 Manganese ppm ASTM D5185(m) 0 <1	ADDITIVES		method	limit/base	current	history1	history2	
Molybdenum ppm ASTM D5185(m) 0 0 0 0 Manganese ppm ASTM D5185(m) 0 0 0 0 Magnesium ppm ASTM D5185(m) 0 0 0 0 Calcium ppm ASTM D5185(m) 0 0 0 <1 Phosphorus ppm ASTM D5185(m) 485 255 287 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1 <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1	Boron	ppm	ASTM D5185(m)	0	<1	<1	<1	
Manganese ppm ASTM D5185(m) 0 <1 <1 Magnesium ppm ASTM D5185(m) 0 0 0 Calcium ppm ASTM D5185(m) 0 0 <1	Barium	ppm	ASTM D5185(m)		0	0	0	
Magnesium ppm ASTM D5185(m) 0 0 0 Calcium ppm ASTM D5185(m) 0 0 <1 Phosphorus ppm ASTM D5185(m) 485 255 287 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1 <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1 0 0 Potassium ppm ASTM D5185(m) >20 0 0 <1 Water % ASTM D6304* >0.02 0.005 0.006 0.007 ppm Water ppm ASTM D6304* >200 50.0 67.8	Molybdenum	ppm	ASTM D5185(m)	0	0	0	0	
Calcium ppm ASTM D5185(m) 0 0 0 <1 Phosphorus ppm ASTM D5185(m) 485 ▲ 255 ▲ 287 ▲ 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1	Manganese	ppm	ASTM D5185(m)		0	<1	<1	
Phosphorus ppm ASTM D5185(m) 485 ▲ 255 ▲ 287 ▲ 287 Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1	Magnesium	ppm	ASTM D5185(m)		0	0	0	
Zinc ppm ASTM D5185(m) 0 11 13 12 Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1 0 0 Potassium ppm ASTM D5185(m) >20 0 0 <1 Water % ASTM D6304* >0.02 0.005 0.006 0.007 ppm ASTM D6304* >200 50.0 67.8 71.6 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	Calcium	ppm	ASTM D5185(m)	0	0	0	<1	
Sulfur ppm ASTM D5185(m) 3389 3674 3540 Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1	Phosphorus	ppm	ASTM D5185(m)	485	255	287	<u> </u>	
Lithium ppm ASTM D5185(m) <1 <1 <1 CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1	Zinc	ppm	ASTM D5185(m)	0	11	13	12	
CONTAMINANTS method limit/base current history1 history2 Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1	Sulfur		ASTM D5185(m)		3389	3674	3540	
Silicon ppm ASTM D5185(m) >40 5 6 3 Sodium ppm ASTM D5185(m) >10 <1 0 0 Potassium ppm ASTM D5185(m) >20 0 0 <1 Water % ASTM D6304* >0.02 0.005 0.006 0.007 ppm Water ppm ASTM D6304* >200 50.0 67.8 71.6 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	Lithium	ppm	ASTM D5185(m)		<1	<1	<1	
Sodium ppm ASTM D5185(m) >10 <1	CONTAMINANTS		method	limit/base	current	history1	history2	
Sodium ppm ASTM D5185(m) >10 <1 0 0 Potassium ppm ASTM D5185(m) >20 0 0 <1	Silicon	ppm	ASTM D5185(m)	>40	5	6	3	
Water % ASTM D6304* >0.02 0.005 0.006 0.007 ppm Water ppm ASTM D6304* >200 50.0 67.8 71.6 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	Sodium	ppm		>10	<1	0	0	
ppm Water ppm ASTM D6304* >200 50.0 67.8 71.6 INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	Potassium	ppm	ASTM D5185(m)	>20	0	0	<1	
INFRA-RED method limit/base current history1 history2 Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	Water	%	ASTM D6304*	>0.02	0.005	0.006	0.007	
Soot % % ASTM D7844* 0 0 0 Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2	ppm Water	ppm	ASTM D6304*	>200	50.0	67.8	71.6	
Nitration Abs/cm ASTM D7624* 2.2 2.3 2.2								
	INFRA-RED		method	limit/base	current	history1	history2	
		%		limit/base				
	Soot %		ASTM D7844*	limit/base	0	0	0	

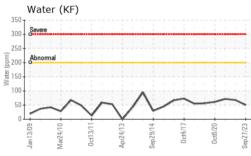


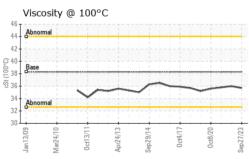
OIL ANALYSIS REPORT







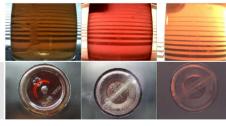




FLUID CLEANLIN	ESS	method	limit/base	current	history1	history2
Particles >4µm		ASTM D7647		1138	83416	1808
Particles >6µm		ASTM D7647	>10000	290	△ 30142	395
Particles >14µm		ASTM D7647	>1300	20	836	30
Particles >21µm		ASTM D7647	>320	5	153	9
Particles >38µm		ASTM D7647	>80	1	3	0
Particles >71µm		ASTM D7647	>20	1	0	0
Oil Cleanliness		ISO 4406 (c)	>/20/17	17/15/11	<u>4</u> 24/22/17	18/16/12
FLUID DEGRADA	TION	method	limit/base	current	history1	history2
Oxidation	Abs/.1mm	ASTM D7414*		55.0	54.2	54.1
Acid Number (AN)	mg KOH/g	ASTM D974*	0.85	0.51	0.55	0.52
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*	>0.02	NEG	NEG	NEG
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPERT	IES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	335	312	313	312
Visc @ 100°C	cSt	ASTM D7279(m)	38.3	35.7	36.0	35.8
Viscosity Index (VI)	Scale	ASTM D2270*	164	161	162	161
SAMPLE IMAGES	6	method	limit/base	current	history1	history2



Bottom





CALA ISO 17025:2017

Accredited

Laboratory Sample No. Lab Number **Unique Number**

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 Vestas American Wind Technology Inc. : WC0835235

: 5659823

Received : 02590757

Diagnosed Diagnostician : Bill Quesnel

: 20 Oct 2023 : 23 Oct 2023

Test Package : IND 2 (Additional Tests: FT-IR, KF, KV100, PQ, TAN Man, VI)

1417 NW Everett Street Portland, OR US 97209 Contact: Nicole Philippi

NiPhi@vestas.com

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.

T: (503)327-7683 F: (503)327-0247