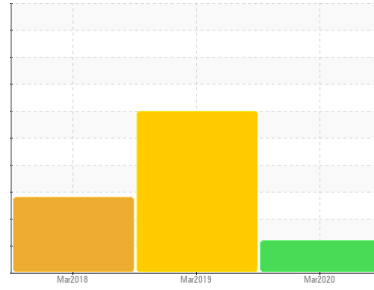




# PROBLEM SUMMARY

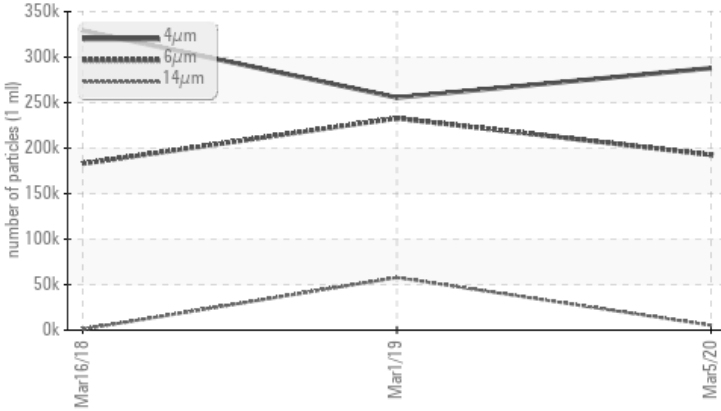
Area  
**TURBINAS**  
 Machine Id  
**HANSEN M-01**  
 Component  
**Wind Turbine Gearbox**  
 Fluid  
**SHELL OMALA HD 320 (340 LTR)**

Sample Rating Trend



## COMPONENT CONDITION SUMMARY

▲ Particle Trend



## RECOMMENDATION

We recommend you service the filters on this component. Resample at the next service interval to monitor.

## PROBLEMATIC TEST RESULTS

Sample Status			ABNORMAL	SEVERE	SEVERE
Particles >6µm	ASTM D7647	>2500	▲ 192625	● 232855	● 182886
Particles >14µm	ASTM D7647	>320	▲ 5274	● 57845	▲ 958
Particles >21µm	ASTM D7647	>80	▲ 124	● 5726	17
Oil Cleanliness	ISO 4406 (c)	>18/15	▲ 25/25/20	● 25/25/23	● 26/25/17

Customer Id: COSSAN  
 Sample No.: WC0358382  
 Lab Number: 04945058  
 Test Package: IND 2



To manage this report scan the QR code

To discuss the diagnosis or test data:  
 Jonathan Hester +1 919-379-4092 x4092  
[jhester@wearcheckusa.com](mailto:jhester@wearcheckusa.com)

To change component or sample information:  
 Customer Service +1 1-800-237-1369  
[customerservice@wearcheck.com](mailto:customerservice@wearcheck.com)

RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Change Filter	---	---	?	We recommend you service the filters on this component.

HISTORICAL DIAGNOSIS

ISO



**01 Mar 2019 Diag: Wes Davis**

We advise that you check all areas where contaminants can enter the system. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. Resample in 30-45 days to monitor this situation. All component wear rates are normal. Particles >14µm are severely high. Particles >21µm are severely high. Particles >6µm are severely high. The water content is negligible. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

view report



ISO



**16 Mar 2018 Diag: Wes Davis**

Check seals and/or filters for points of contaminant entry. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation. All component wear rates are normal. Particles >6µm are severely high. Particles >14µm are abnormally high. Particles >71µm are notably high. The water content is negligible. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

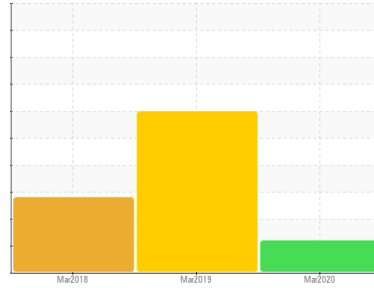
view report





# OIL ANALYSIS REPORT

Sample Rating Trend



ISO



Area  
**TURBINAS**  
 Machine Id  
**HANSEN M-01**  
 Component  
**Wind Turbine Gearbox**  
 Fluid  
**SHELL OMALA HD 320 (340 LTR)**

## DIAGNOSIS

### Recommendation

We recommend you service the filters on this component. Resample at the next service interval to monitor.

### Wear

All component wear rates are normal.

### Contamination

There is a high amount of particulates present in the oil.

### 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		<b>WC0358382</b>	WCI2301023	WCI2307489
Sample Date	Client Info		<b>05 Mar 2020</b>	01 Mar 2019	16 Mar 2018
Machine Age	hrs	Client Info	<b>29965</b>	21498	5926
Oil Age	hrs	Client Info	<b>29965</b>	0	0
Oil Changed	Client Info		<b>Not Chngd</b>	Not Chngd	N/A
Sample Status			<b>ABNORMAL</b>	SEVERE	SEVERE

## WEAR METALS

	method	limit/base	current	history1	history2	
PQ	ASTM D8184	>50	<b>16</b>	19	19	
Iron	ppm	ASTM D5185m	>30	<b>25</b>	17	14
Chromium	ppm	ASTM D5185m	>3	<b>&lt;1</b>	<1	<1
Nickel	ppm	ASTM D5185m	>3	<b>&lt;1</b>	<1	<1
Titanium	ppm	ASTM D5185m	>10	<b>&lt;1</b>	0	0
Silver	ppm	ASTM D5185m		<b>0</b>	0	0
Aluminum	ppm	ASTM D5185m	>30	<b>0</b>	<1	0
Lead	ppm	ASTM D5185m	>15	<b>&lt;1</b>	0	<1
Copper	ppm	ASTM D5185m	>10	<b>&lt;1</b>	<1	<1
Tin	ppm	ASTM D5185m		<b>0</b>	0	0
Antimony	ppm	ASTM D5185m		<b>0</b>	0	0
Vanadium	ppm	ASTM D5185m		<b>0</b>	0	<1
Cadmium	ppm	ASTM D5185m		<b>0</b>	0	0

## ADDITIVES

	method	limit/base	current	history1	history2	
Boron	ppm	ASTM D5185m		<b>&lt;1</b>	<1	<1
Barium	ppm	ASTM D5185m		<b>&lt;1</b>	0	0
Molybdenum	ppm	ASTM D5185m		<b>&lt;1</b>	0	0
Manganese	ppm	ASTM D5185m		<b>&lt;1</b>	<1	<1
Magnesium	ppm	ASTM D5185m		<b>0</b>	0	<1
Calcium	ppm	ASTM D5185m		<b>2</b>	2	5
Phosphorus	ppm	ASTM D5185m		<b>231</b>	235	242
Zinc	ppm	ASTM D5185m		<b>47</b>	22	4
Sulfur	ppm	ASTM D5185m		<b>13934</b>	20886	14734

## CONTAMINANTS

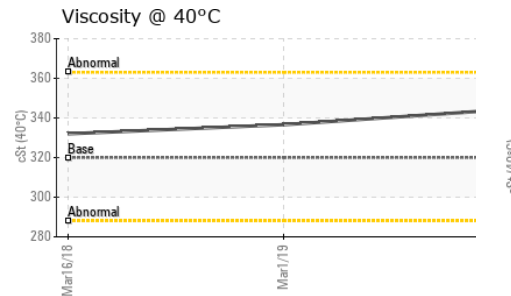
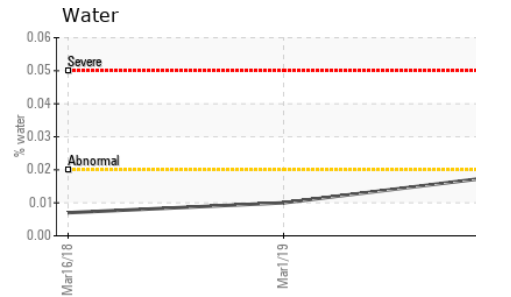
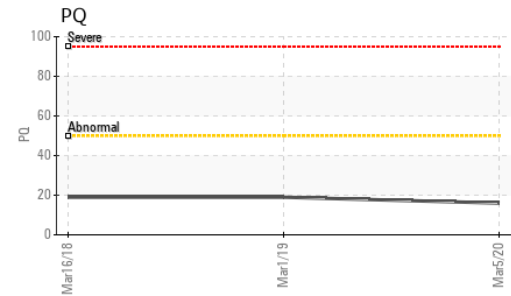
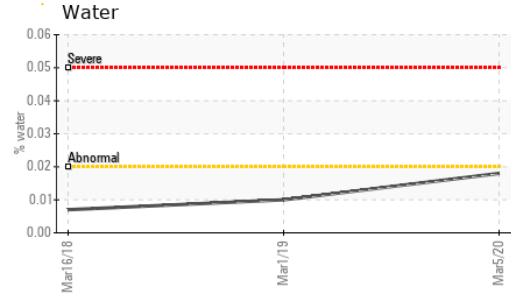
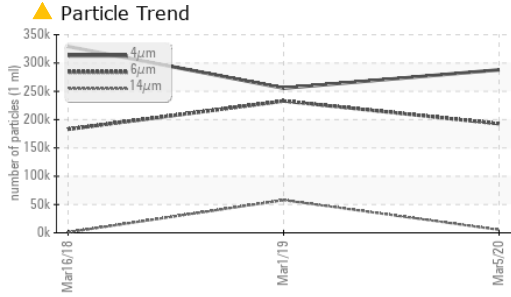
	method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185m	>+15	<b>8</b>	8	5
Sodium	ppm	ASTM D5185m		<b>1</b>	1	1
Potassium	ppm	ASTM D5185m	>20	<b>&lt;1</b>	<1	15
Water	%	ASTM D6304	>0.02	<b>0.018</b>	0.010	0.007
ppm Water	ppm	ASTM D6304	>200	<b>185.1</b>	100	70

## FLUID CLEANLINESS

	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647		<b>287866</b>	255566	329162
Particles >6µm	ASTM D7647	>2500	<b>▲ 192625</b>	232855	182886
Particles >14µm	ASTM D7647	>320	<b>▲ 5274</b>	57845	958
Particles >21µm	ASTM D7647	>80	<b>▲ 124</b>	5726	17
Particles >38µm	ASTM D7647	>20	<b>0</b>	5	7
Particles >71µm	ASTM D7647	>4	<b>0</b>	0	7
Oil Cleanliness	ISO 4406 (c)	>18/15	<b>▲ 25/25/20</b>	25/25/23	26/25/17



# OIL ANALYSIS REPORT

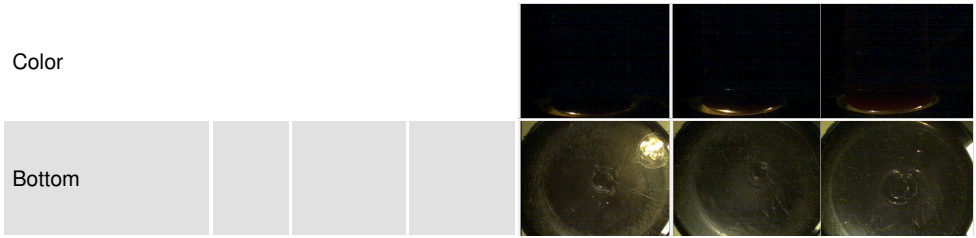


FLUID DEGRADATION		method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D8045		<b>1.036</b>	0.980	0.569

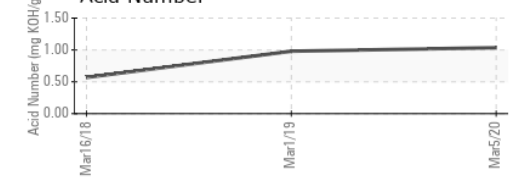
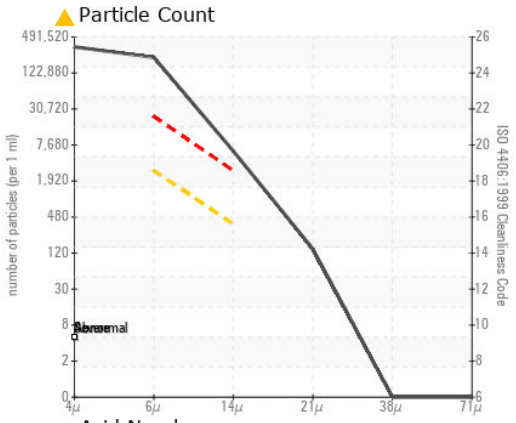
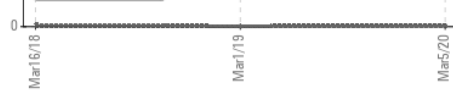
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	<b>NONE</b>	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	<b>NONE</b>	NONE	NONE
Precipitate	scalar	*Visual	NONE	<b>NONE</b>	NONE	NONE
Silt	scalar	*Visual	NONE	<b>NONE</b>	NONE	NONE
Debris	scalar	*Visual	NONE	<b>NONE</b>	LIGHT	NONE
Sand/Dirt	scalar	*Visual	NONE	<b>NONE</b>	NONE	NONE
Appearance	scalar	*Visual	NORML	<b>NORML</b>	NORML	NORML
Odor	scalar	*Visual	NORML	<b>NORML</b>	NORML	NORML
Emulsified Water	scalar	*Visual	>0.02	<b>NEG</b>	NEG	NEG
Free Water	scalar	*Visual		<b>NEG</b>	NEG	NEG

FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D445	320	<b>344</b>	336.6	332.0

SAMPLE IMAGES		method	limit/base	current	history1	history2
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## GRAPHS



**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513  
**Sample No.** : WC0358382 **Received** : 31 Mar 2020  
**Lab Number** : **04945058** **Diagnosed** : 02 Apr 2020  
**Unique Number** : 8975159 **Diagnostician** : Jonathan Hester  
**Test Package** : IND 2 ( Additional Tests: KF, PQ, PrtCount )

**COSTA RICA ENERGY HOLDING SA**  
 SAN JOSE,  
 CR  
 Contact: Service Manager

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:  
F: