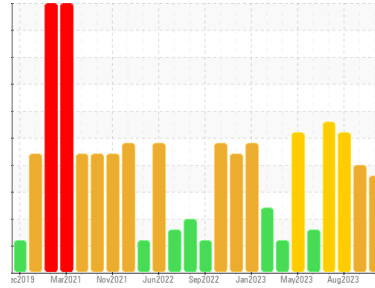




OIL ANALYSIS REPORT

Sample Rating Trend



Area
RIG 1
Machine Id
WHITE STAR 2450 R1-P-02G NKL
Component
Gearbox
Fluid
GEAR OIL ISO 320 (--- GAL)

DIAGNOSIS

Recommendation

We advise that you check all areas where dirt can enter the system. We recommend you service the filters on this component if applicable. 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. Elemental levels of silicon (Si) and aluminum (Al) indicate alumina-silicate (coarse dirt) ingress.

Fluid Condition

The AN level is acceptable for this fluid. The condition of the oil is acceptable for the time in service.

SAMPLE INFORMATION

	method	limit/base	current	history1	history2
Sample Number	Client Info		KL0013142	KL0012898	KL0012533
Sample Date	Client Info		03 Nov 2023	29 Sep 2023	25 Aug 2023
Machine Age	days	Client Info	45233	45196	45161
Oil Age	days	Client Info	0	0	0
Oil Changed	Client Info		N/A	N/A	N/A
Sample Status			ABNORMAL	ABNORMAL	ABNORMAL

CONTAMINATION

	method	limit/base	current	history1	history2
Water	WC Method	>0.2	NEG	NEG	NEG

WEAR METALS

	method	limit/base	current	history1	history2	
Iron	ppm	ASTM D5185m	>200	121	▲ 345	▲ 298
Chromium	ppm	ASTM D5185m	>10	1	3	3
Nickel	ppm	ASTM D5185m	>10	<1	2	1
Titanium	ppm	ASTM D5185m		<1	1	1
Silver	ppm	ASTM D5185m		0	0	0
Aluminum	ppm	ASTM D5185m	>25	▲ 15	▲ 16	▲ 15
Lead	ppm	ASTM D5185m	>50	0	<1	0
Copper	ppm	ASTM D5185m	>200	9	22	20
Tin	ppm	ASTM D5185m	>10	<1	<1	0
Vanadium	ppm	ASTM D5185m		0	0	0
Cadmium	ppm	ASTM D5185m		0	<1	0

ADDITIVES

	method	limit/base	current	history1	history2	
Boron	ppm	ASTM D5185m	50	77	31	39
Barium	ppm	ASTM D5185m	15	32	31	18
Molybdenum	ppm	ASTM D5185m	15	28	70	114
Manganese	ppm	ASTM D5185m		1	3	3
Magnesium	ppm	ASTM D5185m	50	122	53	62
Calcium	ppm	ASTM D5185m	50	292	136	179
Phosphorus	ppm	ASTM D5185m	350	337	235	286
Zinc	ppm	ASTM D5185m	100	149	57	82
Sulfur	ppm	ASTM D5185m	12500	6746	6871	8427

CONTAMINANTS

	method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185m	>50	▲ 55	▲ 87	▲ 76
Sodium	ppm	ASTM D5185m		62	183	91
Potassium	ppm	ASTM D5185m	>20	6	11	10

FLUID CLEANLINESS

	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647		250751	---	13737
Particles >6µm	ASTM D7647	>5000	▲ 132169	---	▲ 7483
Particles >14µm	ASTM D7647	>640	▲ 1179	---	▲ 1274
Particles >21µm	ASTM D7647	>160	67	---	▲ 429
Particles >38µm	ASTM D7647	>40	1	---	▲ 66
Particles >71µm	ASTM D7647	>10	1	---	7
Oil Cleanliness	ISO 4406 (c)	>19/16	▲ 24/17	---	▲ 20/17

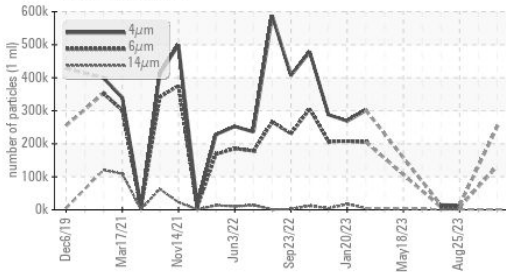
FLUID DEGRADATION

	method	limit/base	current	history1	history2	
Acid Number (AN)	mg KOH/g	ASTM D8045	0.85	0.50	0.48	0.51

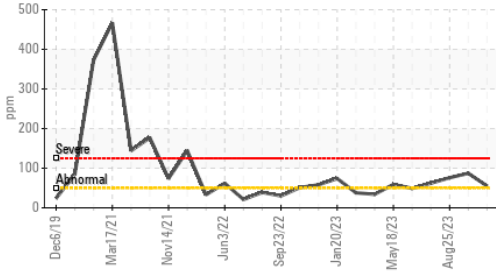


OIL ANALYSIS REPORT

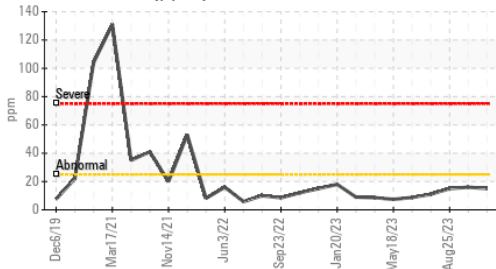
▲ Particle Trend



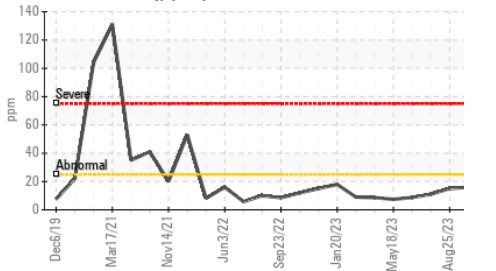
▲ Silicon (ppm)



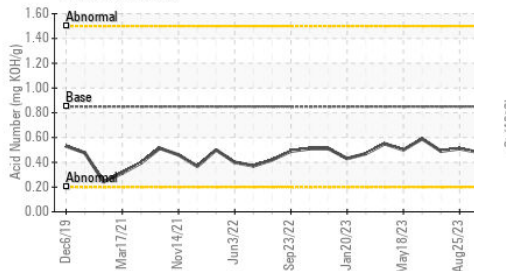
▲ Aluminum (ppm)



▲ Aluminum (ppm)



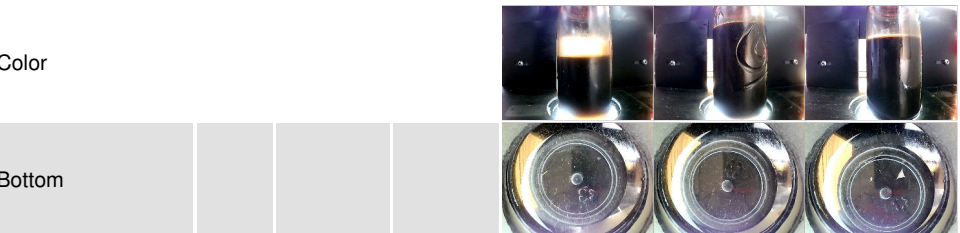
Acid Number



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	▲ MODER	NONE
Debris	scalar	*Visual	NONE	LIGHT	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.2	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG

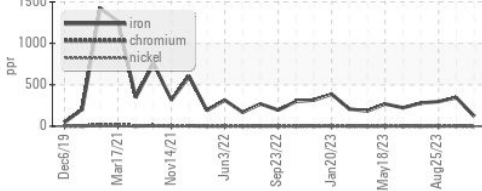
FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D445	320	331	390

SAMPLE IMAGES	method	limit/base	current	history1	history2
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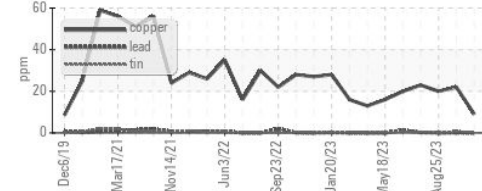


GRAPHS

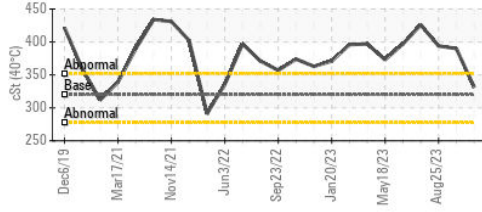
Ferrous Alloys



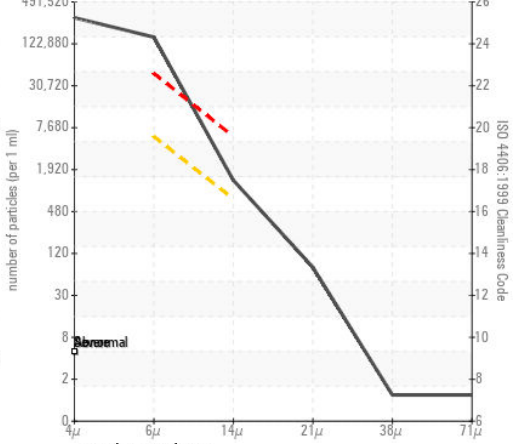
Non-ferrous Metals



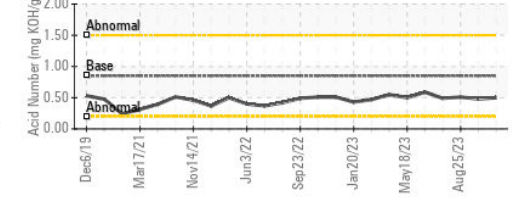
Viscosity @ 40°C



▲ Particle Count



Acid Number



Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : KL0013142 **Received** : 16 Nov 2023
Lab Number : 06010191 **Diagnosed** : 20 Nov 2023
Unique Number : 10749335 **Diagnostician** : Don Baldrige
Test Package : MOB 2 (Additional Tests: PrtCount)

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 ODESSA, TX
 US 79763
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 mcombden@citadelldrilling.com
 T: (780)955-5509
 F:

Certificate L2367
 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)