Oil Sample Test Results Summary
Generation 2 Filtration Oil Recyling Technology

Commercial Fishing Vessel
MV Joyful Sound

Generated By:
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Generated: October 31, 2023

Client: Clark & Sons Fishing Ltd.

Completed for:

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Fisheries & Aquaculture Clean Technology Adoption Program (FACTAP)

Progress Report ID#: FACTAP-2022-A034

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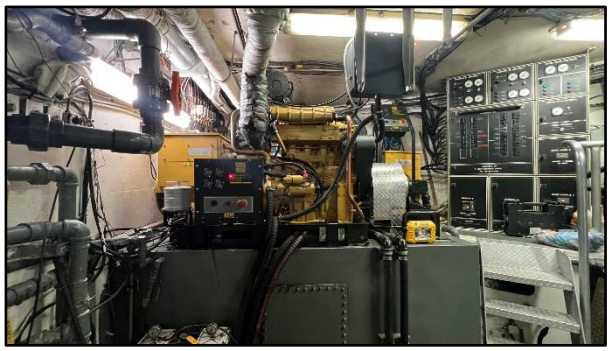
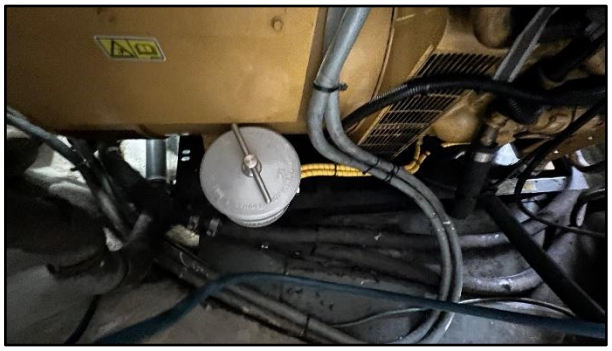
MV Joyful Sound

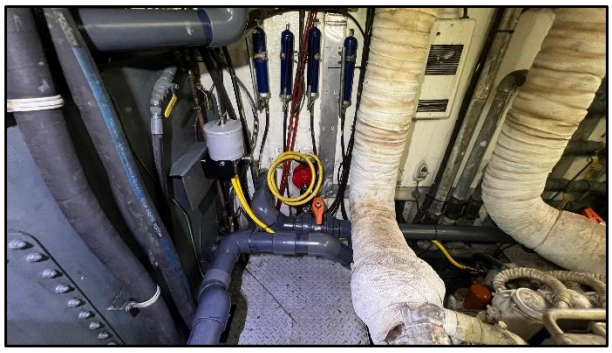
Main Engine



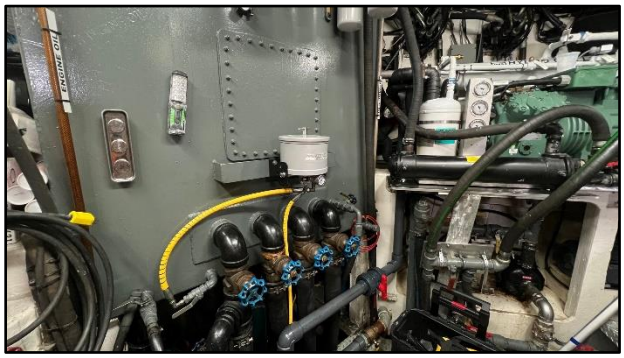
Generator 1



Generator 2



Transmission



Hydraulics

Hydraulic System Power Plant

Introduction

Generation 2 Filtration (G2F) oil recycling technologies are designed to remove ultra-fine contamination down to 1-micron and water from oil, unwanted contamination missed by conventional Original Engine Manufacturers (OEM) existing full-flow oil filters. G2F dramatically reduces particulate load and acid formation, reducing rapid depletion of oil additives, keeping the oil healthy for an extended period, reducing mechanical wear, downtime, operating costs, and environmental impact.

Spent G2F elements can detect common component problems in their infancy stages, such as fuel dilution, accelerated mechanical wear, and coolant leaks, before they become costly and untimely repair ventures - A Proactive Approach to Maintenance - Generation 2 Filtration

The technology was installed on February 21, 2023, on the MV Joyful Sound, a 65-foot commercial fishing vessel owned by Clarke & Sons Fishing Ltd., located in St. John's, NL. Oil samples were taken from all equipment before the G2F oil recycling technology was put into service. If the machinery contained new oil, an oil sample was not required. The main purpose of the oil samples is to verify the G2F technology can prolong oil with operational safety. In addition, the results will also act as a preventive maintenance tool, and will identify the presence of external contamination, and equipment problems, monitoring the overall health of each piece of equipment.

Oil analysis was performed by WearCheck Canada Inc, located in Burlington, Ontario, Canada, a leader in the oil sample analysis industry. The results of these tests are included in this progress report. This report is a summary of the results.

Understanding Oil & Oil Sample Test Results

Laboratories perform tests to determine the health of the oil and the equipment it lubricates. When oil becomes contaminated and unhealthy, there is an increase in the concentration of submicron particles wearing from internal mechanical components. These particles are measured by the laboratory in parts per million (ppm). These elemental wear levels (submicron particles) are reduced not because they are removed from the oil by the oil recycling technology, but instead because the oil is cleaner and there are fewer particles wearing from internal components of the component. Oil additives and wear metals measured by the laboratory are at the submicron level and cannot be removed from the oil by G2F, as oil additives are smaller than 1-micron. Keep in mind, if all rates of mechanical wear are super low, the additive package (rust inhibitors, detergents, emulsifiers, anti-foam agents) and molecular structure of the oil must be intact, as the oil is healthy and performing its lubricating function and does not need to be replaced.

Once the oil is evaluated, the test results are presented in a two (2) page report. Page one (1) contains identification information of the oil and machinery, and test results, while page two (2) contains line graphs comparing the oil tested (black) to abnormal (yellow) or sever (red) levels of wear metals (6) via, as well as viscosity, acid concentration (base number (BN) the higher the

value the weaker the acid, for acid number the lower the number the better), and Particle Quantification (PQ), the measurement in ppm of the total relative concentration of ferrous materials in the oil. With respect to page one (1) of the report, it contains 6 sections. Sections 4, 5 & 6 relate directly to machine and oil health. See an example of oil sample laboratory results (Appendices 1.0 & 1.1).:

1. Summarization – Top right-hand corner provides a quick overview of all tests performed.
2. Customer Name, equipment type & ID (vessel name), component type, fluid brand, weight (cSt) and volume.
3. Recommendations and oil information – an overview of the results with the oil sample ID#, date the sample was taken, machine age, oil age, and when the G2F element or oil was changed.
4. **Wear** – Rates of mechanical wear are determined by the concentration (ppm) of sub-micron ferrous particles suspended in the oil, originating from internal mechanical components. Abnormal limits are provided along with results of current and past tests.
5. **Contamination** – The amount of dirt (soot/engines or silt/hydraulics & transmission) in the oil, and if there is any unwanted contamination such as water or fuel present in the oil. Wear rates are directly proportional related to levels of contamination present in oil The contamination consists of soot in diesel engine oil and the volume of solid particles present per 1 ml of oil for hydraulic or transmission oils. Since hydraulic and transmission oil is not used to lubricate diesel engines, they are referred to as 'non-combustion oils' and are not susceptible to heat or by-products of combustion of diesel fuel. These non-combustion oils can be dramatically extended by factors of 6+ with the removal of ultra-fine particulate and water.
6. **Fluid Condition** – Overall health of the oil, includes additive health, acid and oxidation levels, and viscosity.

Oil Sample Test Results

Laboratory analysis confirmed for all equipment, rates of mechanical wear were normal, and the oil was suitable for further service. Over a 7-month period the customer acquired 1,700 hours on the main propulsion engine. Prior to the installation of G2F the oil in service was tested with 50 hours on it, or with 90% of its OEM lifespan remaining, and the BN tested to have a value of 8.22, indicating a low amount of acid present in the oil. The oil was not changed. After the installation of G2F and running 34 times longer to 1,700 hours on the oil, although there was a 10% increase in acid formation, it is still 1.95 points above the unacceptable level. Only G2F elements were replaced at the prescribed 500 hr intervals, allowing them to run 2 times longer on the oil and main oil filters, while soot levels remained at 0%, all component rates are normal, the oil was suitable for further service. Same results for the genset #1 and genset #2, with 771 hours and 870 hours on the oil, prolonging the oil by a factor of 2 and 3.8, respectively. They acquired 1,012 hours on the transmission oil. OEM oil change recommendation is 1,000 hours. The lab reported wear is normal, and the oil is suitable for further service. With regular G2F element changes, they will prolong the oil with operational safety to 3,000 hours. There was a significant reduction in hydraulic oil contamination. Prior to the installation of G2F the hydraulic oil contained 9,355 particles <4 microns per 1 ml of oil, while new unused oil contains > 5,000, and

after G2F it contained 1,743 particles, accounting for an 81% reduction. Contamination was severe before G2F and later tested abnormal and will improve to normal with continued operation of G2F. Visible metal particles were present in the oil. These are not attributed to oil contamination levels. A possible source could be from an internal component located in the pump or hydraulic system. All rates of mechanical wear were normal and the oil in all cases with the exception of the genset, were suitable for further service (See Appendix 1.2).

Benefits & Conclusion

The Generation 2 Filtration oil recycling technology dramatically reduces contamination in oil, helps to preserve oil additives, while maintaining reduced rates of mechanical wear. The oil sample test results clearly demonstrate diesel engine oil, transmission, and hydraulic oil life can be dramatically prolonged with operational safety by implementing Generation 2 Filtration (G2F). More importantly, there is a notable reduction in rates of mechanical wear when using the G2F oil recycling technology.

Oil analysis confirms G2F oil recycling technology improves equipment reliability and end-users can prolong their lubricating and hydraulic oils with operational safety by a factor of 3+, reducing the consumption, transportation, and storage of oil by up to 71% while reducing primary and secondary production of GHG's, reducing the customers carbon footprint, and associated environmental impact. Diesel engine oil samples confirmed the oil can be safely prolonged 3+ times longer, low rates of mechanical wear, and is still suitable for further service, and contained less than 0.2% soot. G2F will create an annual reduction of diesel engine oil by 716 liters, transmission oil by 80 liters, and hydraulic oil by 400 liters, reducing annual oil maintenance costs by $5,058.25 or by 47%. The project created 21 labor hours, accounting for 11% of the total installation cost of the project (Appendix 1.3).

Table 1.0 – Summary of annual benefits.

Engine Oil Reduction (l) =	**715.50**
Hydraulic Oil Reduction (l) =	**400.00**
Transmission Oil Reduction (l) =	**80.00**
Annual Savings ($) =	**$5,058.25**
Maintenance Cost Reduction (%) =	**47.21%**
Oil Consumption & Waste Oil Reduction (%) =	**71.08%**

The cost-saving calculations are based on the customers average cost of oil in the local market in the fall of 2022. The retail cost in 2023 for a mid to high-grade was 10-20% greater, affording greater cost-savings to customer using the oil recycling technology than presented in this report.

Oil samples analysis is a cost-effective maintenance tool, identifying patterns of mechanical wear, monitoring oil health, and identify equipment problems before they become untimely and costly repair ventures. Used in conjunction with G2F industry can maximize oil change intervals, reduce hazardous waste, reduce wear, and monitor equipment health.

MOB II

WEAR CHECK

OIL ANALYSIS REPORT

1

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
Glen & Jerry Fisheries Ltd.
Machine Id
Fishing Vessel MV Donald`s Legacy

2

Component
Main Engine
Fluid
IRVING IDO PREMIUM PLUS 15W40 (142 LTR)

RECOMMENDATION

Confirm the source of the lubricant being utilized for top-up/fill.
Resample at the next service interval to monitor.

3

WEAR

All component wear rates are normal.

4

CONTAMINATION

There is no indication of any contamination in the oil.

External

5

Internal

FLUID CONDITION

Additive levels indicate the addition of a different brand, or type of oil. The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

6

Severe Limits

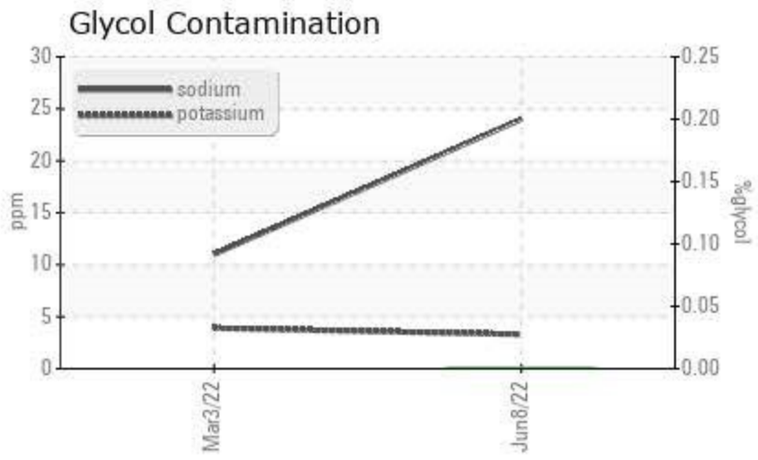
Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number				OF0000392	OF0000385	---
Sample Date				08 Jun 2022	03 Mar 2022	---
Machine Age	hrs			17371	1	---
Oil Age	hrs			922	272	---
Filter Age	hrs			650	272	---
Oil Changed				Not Changd	Not Changd	---
Filter Changed				Not Changd	Changed	---
Sample Status				NORMAL	NORMAL	---
Iron	ppm	ASTM D5185(m)	>75	9	5	---
Chromium	ppm	ASTM D5185(m)	>8	0	0	---
Nickel	ppm	ASTM D5185(m)	>2	<1	<1	---
Titanium	ppm	ASTM D5185(m)	>3	<1	0	---
Silver	ppm	ASTM D5185(m)	>2	0	0	---
Aluminum	ppm	ASTM D5185(m)	>15	<1	<1	---
Lead	ppm	ASTM D5185(m)	>18	<1	0	---
Copper	ppm	ASTM D5185(m)	>80	2	1	---
Tin	ppm	ASTM D5185(m)	>14	0	0	---
Vanadium	ppm	ASTM D5185(m)		0	0	---
Silicon	ppm	ASTM D5185(m)	>20	5	5	---
Potassium	ppm	ASTM D5185(m)	>20	3	4	---
Fuel		WC Method	>4.0	<1.0	<1.0	---
Glycol	%	ASTM D7922		0.0	NEG	---
Soot %	%	ASTM D7844		0	0	---
Nitration	Abs/cm	ASTM D7624	>20	9.9	8.3	---
Sulfation	Abs/.1mm	ASTM D7415	>30	23.5	23.4	---
Emulsified Water	scalar	Visual	>0.1	NEG	NEG	---
Sodium	ppm	ASTM D5185(m)	>75	24	11	---
Boron	ppm	ASTM D5185(m)		62	113	---
Barium	ppm	ASTM D5185(m)		0	0	---
Molybdenum	ppm	ASTM D5185(m)		9	10	---
Manganese	ppm	ASTM D5185(m)		<1	0	---
Magnesium	ppm	ASTM D5185(m)		67	81	---
Calcium	ppm	ASTM D5185(m)		2102	2003	---
Phosphorus	ppm	ASTM D5185(m)		940	1029	---
Zinc	ppm	ASTM D5185(m)		1125	1130	---
Sulfur	ppm	ASTM D5185(m)		3034	2953	---
Oxidation	Abs/.1mm	ASTM D7414	>25	20.4	17.9	---
Base Number (BN)	mg KOH/g	ASTM D2896	10	5.36	7.03	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.3	15.1	14.5	---

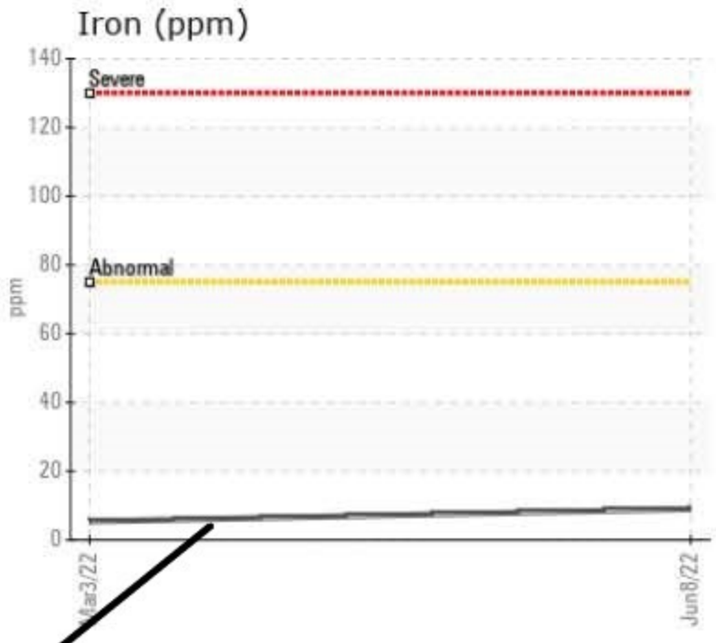
Values when new

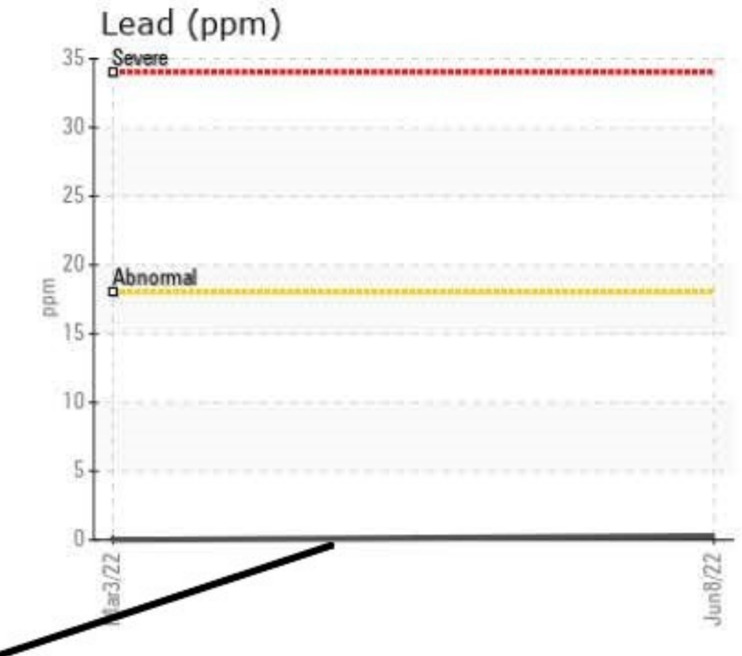
Report Id: FILCON [WCAMIS] 02502095 (Generated: 07/29/2022 08:22:06)

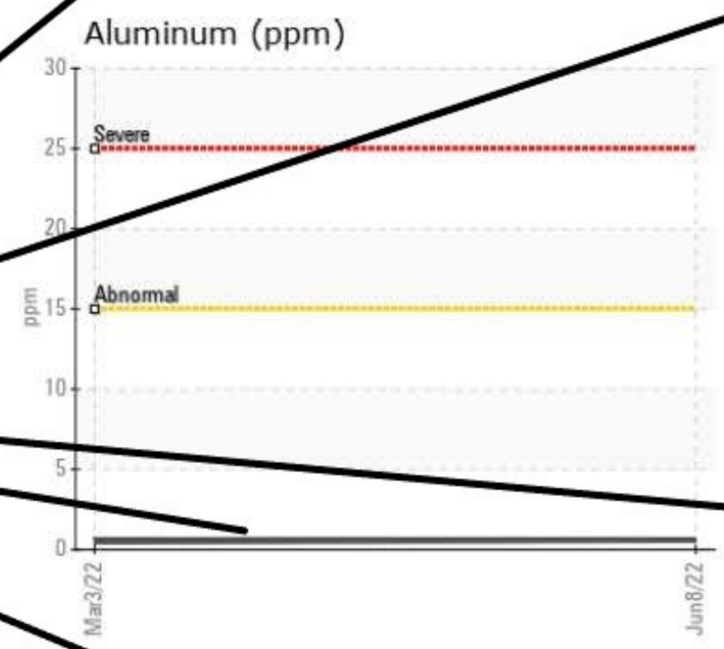
Submitted By: BILL BUTLER

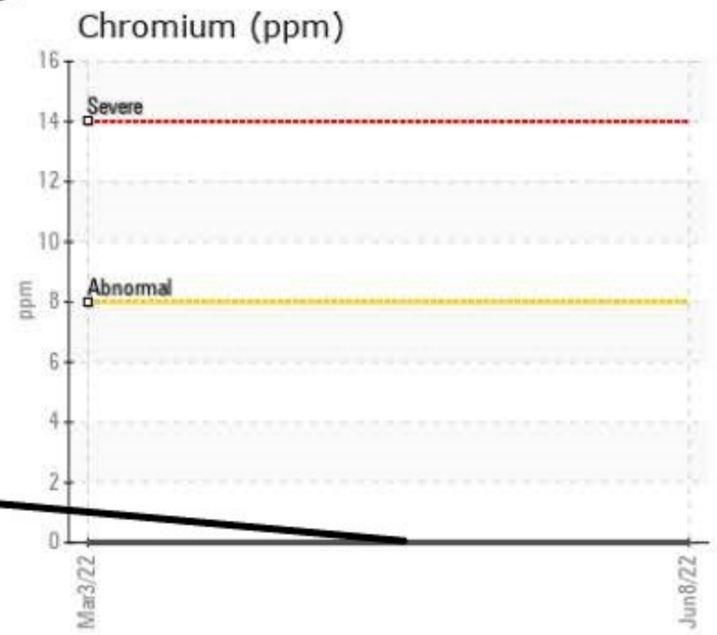
Black lines represents test results

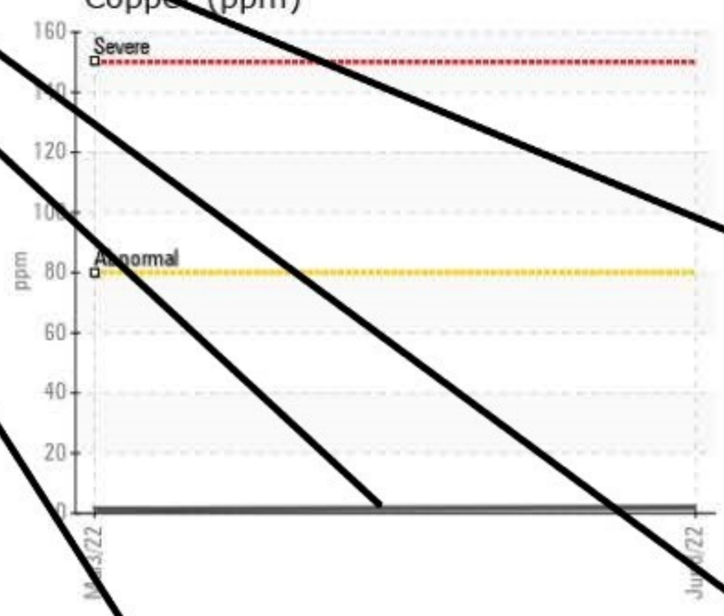


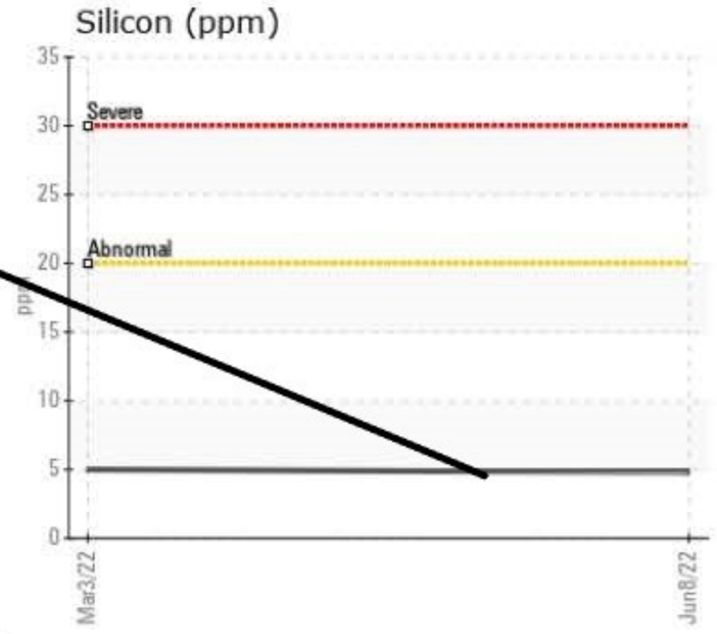


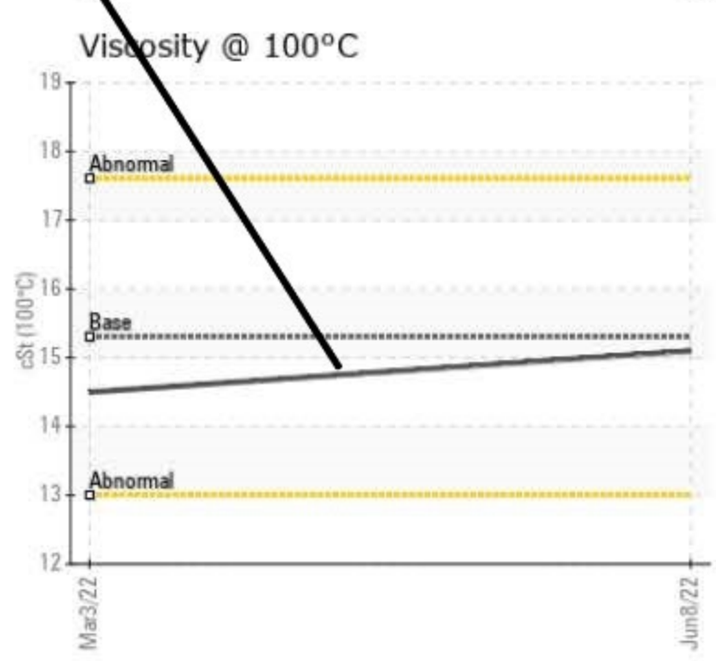


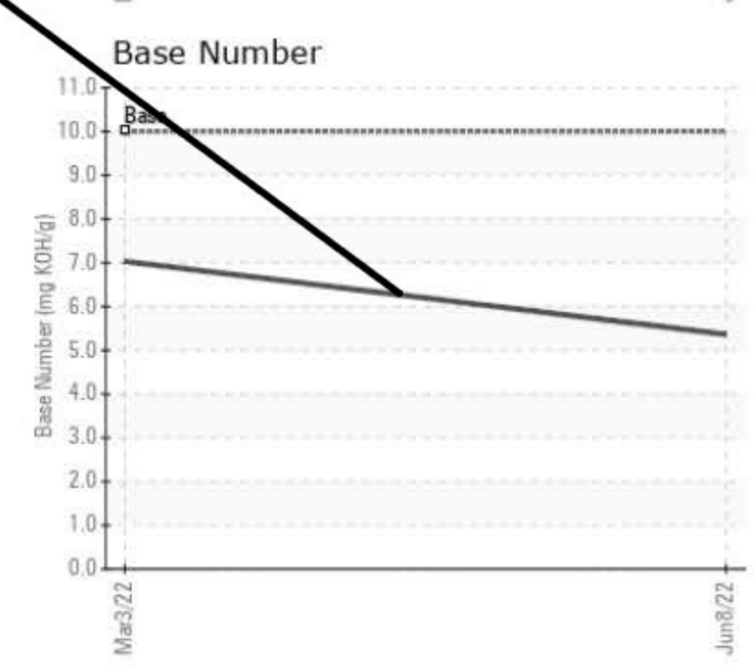












Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0000392 **Received** : 27 Jul 2022
Lab Number : 02502095 **Diagnosed** : 29 Jul 2022
Unique Number : 5435056 **Diagnostician** : Kevin Marson
Test Package : MOB 2 (Additional Tests: Glycol)

To discuss this sample report, contact Customer Service at 1-800-268-2131.
(m) Denotes a modified test method, (e) Denotes a test conducted using an external laboratory.

Oil Filtration Solutions Ltd.
PO BOX 16125
CONCEPTION BAY SOUTH, NL
Canada A1X 2E2
Contact: BILL BUTLER
BBUTLER@OILFILTRATIONSOLUTIONS.COM
T: (709)834-8433
F: (709)834-8435

Report Id: FILCON [WCAMIS] 02502095 (Generated: 07/29/2022 08:22:09)

Submitted By: BILL BUTLER

APPENDIX 1.2 - Summary Of Oil Sample Test Results - MV Joyful Sound

Main Propulsion Engine - MTU, 16V2000M61, 130 liter sump

	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	Soot %	Base Number (BN)	Viscosity (cSt)
Before	February 21, 2023	10,501	50	NORMAL	NORMAL	NORMAL	0.00	8.22	14.40
After	September 23, 2023	12,201	1,700	NORMAL	NORMAL	NORMAL	0.20	7.72	14.00
						Change (%)	0.20%	-6.08%	-2.78%

All component wear rates are normal. There is no contamination in the oil. The BN Result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service (OEM reccomended oil change interval is 500 hrs).
Note: BN of this customers oil new is 10.1. Acceptable BN level is above 50% of new, or 5.05. This oil tested at 7.72 after 1,700 hours on the oil.
RECCOMENDATION: Resample at the next service interval to monitor.

Genset #1 - CAT, C4-4, 15 liter sump

	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	Soot %	Base Number (BN)	Viscosity (cSt)
Before	February 21, 2023	7,378	12	NORMAL	NORMAL	ABNORMAL	0.00	8.64	14.50
After	September 23, 2023	8,242	864	NORMAL	NORMAL	NORMAL	0.00	6.90	14.80
						Change (%)	0.00%	-20.14%	2.07%

All component wear rates are normal. There is no contamination in the oil. The BN Result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service (OEM reccomended oil change interval is 250 hrs).
Note: BN of this customers oil new is 10.1. Acceptable BN level is above 50% of new, or 5.05. This oil tested at 6.90 after 864 hours on the oil.
RECCOMENDATION: Resample at the next service interval to monitor.

Genset #2 - CAT, C4-4, 15 liter sump

	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	Soot %	Base Number (BN)	Viscosity (cSt)
Before	February 21, 2023	8,302	36	NORMAL	NORMAL	NORMAL	0.00	8.36	14.60
After	September 23, 2023	9,032	730	NORMAL	NORMAL	NORMAL	0.00	7.43	14.50
						Change (%)	0.00%	-11.12%	-0.68%

All component wear rates are normal. There is no contamination in the oil. The BN Result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service (OEM reccomended oil change interval is 250 hrs).
Note: BN of this customers oil new is 10.1. Acceptable BN level is above 50% of new, or 5.05. This oil tested at 7.43 after 730 hours on the oil.
RECCOMENDATION: Confirm the source of the lubricant being utilized for top-up/fill. Resample at the next service interval to monitor.

Genset #3 - Volvo Penta, TAMP103A, 40 liter sump.

	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	Soot %	Base Number (BN)	Viscosity (cSt)
Before	February 21, 2023	9,812	24	NORMAL	NORMAL	ABNORMAL	0.00	7.77	13.20
After	September 23, 2023	10,444	632	NORMAL	NORMAL	NORMAL	0.00	7.72	13.80
						Change (%)	0.00%	-0.64%	4.55%

All component wear rates are normal. There is no contamination in the oil. The BN Result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service (OEM reccomended oil change interval is 250 hrs).
Note: BN of this customers oil new is 10.1. Acceptable BN level is above 50% of new, or 5.05. This oil tested at 7.72 after 632 hours on the oil.
RECCOMENDATION: No corrective action is reccomended at this time. Resample at the next service interval to monitor rates of fuel contamination.

Transmission - Twin Disc, 45 liter reservoir

	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	Acid Number (AN)	Viscosity (cSt)
Before	February 21, 2023	10,501	60	NORMAL	NORMAL	NORMAL	1.07	99.33
After	September 23, 2023	12,201	1,760	ABNORMAL	NORMAL	NORMAL	0.76	94.70
						Change (%)	-28.97%	-4.66%

Copper ppm levels are abnormal. Clutch disc wear or oil cooler leaching indicated. There is no contamination in the fluid. Additive levels indicate the addition of a difference brand, or type of fluid. The fluid is no longer serviceable as a result of the abnormal or severe wear (OEM reccomended oil change interval is 1,000 hr). There is a 29% reduction in AN with a 4.66% change in viscosity, the oil is now closer to specifications when new.
RECCOMENDATION: Drain the oil, confirm fluid used for top-up/fill. We recommend an early resample to monitor this condition.

Hydraulic System - 750 liter reservoir

							ISO Particle Count		
	Sample Date	Equip. Hrs	Hours on Oil	Wear	Contamination	Fluid Condition	> 4 µm	> 6 µm	Viscosity (cSt)
Before	February 21, 2023	9,810	600	NORMAL	NORMAL	NORMAL	2,736	399	33.20
After	September 23, 2023	10,444	1,234	NORMAL	NORMAL	NORMAL	659	105	33.20
						Change (%)	-75.91%	-73.68%	0.00%

All component wear rates are normal. The system cleanliness is acceptable for your target ISO 4406 cleanliess code. The system and the fluid cleanliness is acceptable. The condition of the oil is acceptable for the time in service.
There was a significant reduction in ultra-fine contamination, and the oil tested to be 3 ISO grades cleaner than new unused hydraulic oil.
(Reccomended oil change interval when >4 micron particles are > 10,000). Visually inspect element & replace if highly contaminated).
RECCOMENDATION: We advise you check for visible metal particles in the oil. We recommend an early resample to monitor this condition.

NOTES - All sampled indicate all oil have normal rates of mechanical wear prolonging the oil by a factor of 3+ with operational safety.

DIESEL ENGINES: All contamination and wear levels are normal. Oils are suitable for further service.
TRANSMISSION: There is a slight improvement in AN. The oil can be dramatically prolonged to 3,000+ hrs with operational safety.
HYDRAULICS: After G2F there was a 76 % reduction in ultra-fine contamination, oil now tests to be three (3) ISO grade dirtier than new unused oil.

APPENDIX 1.3 - G2F Oil Recycling Technology For Commercial Fishing Vessel - Pricing, Cost-Savings, Waste-oil Reduction

Company Name:	**Clarke & Sons Fishing Ltd.**
Contact:	**Craig Clarke**
Address:	**90 Halls Rd.**
	St. John's, NL A1A 5Y8
Telephone #:	**709.683.5471**
Email:	craigclarke@hotmail.com
Vessel Name:	**MV Joyful Sound**
Proposed Installation Date:	**February 21, 2023**

Legend

OU = Oil Usage

OM = Oil Maintenance

OCI = Engine Manufacturers Reccomended Oil Change Interval

Application	QTY.	Each	Total	Hrs/Install	Total Hrs	OCI (hrs)	Annual Usage (hrs)	# of OCI	Oil Vol. (l)	OU Before (l)	OU After (l)	Reduction/Yr (l)	OM Cost Before	OM Cost After	Savings/Yr
Engine 270-360+ liters of oil	0	$8,027.08	$0.00	8.00	0.00	500	0	0.00	0.00	0.00	0.00	0.00	$0.00	$0.00	$0.00
Engine 180-270 liters of oil	0	$6,069.06	$0.00	7.00	0.00	500	0	0.00	0.00	0.00	0.00	0.00	$0.00	$0.00	$0.00
Engine 90-180 liters of oil	1	$4,147.00	$4,147.00	5.00	5.00	500	3,000	6.00	130.00	780.00	260.00	520.00	$3,780.00	$2,268.00	$1,512.00
Engine 45-90 liters of oil	1	$2,231.02	$2,231.02	3.00	3.00	250	500	2.00	45.00	90.00	22.50	67.50	$625.00	$218.75	$406.25
Engine 1-45 liters of oil	1	$1,746.52	$1,746.52	3.00	3.00	250	1,600	6.40	15.00	96.00	32.00	64.00	$944.00	$448.00	$496.00
Engine 1-45 liters of oil	1	$1,746.52	$1,746.52	3.00	3.00	250	1,600	6.40	15.00	96.00	32.00	64.00	$944.00	$448.00	$496.00
Engine 1-45 liters of oil	0	$1,746.52	$0.00	3.00	0.00	250	0	0.00	0.00	0.00	0.00	0.00	$0.00	$0.00	$0.00
Engine 1-45 liters of oil	0	$1,746.52	$0.00	3.00	0.00	250	0	0.00	0.00	0.00	0.00	0.00	$0.00	$0.00	$0.00
Hydraulics	1	$3,671.00	$3,671.00	4.00	4.00	2,000	500	0.25	2,000.00	500.00	100.00	400.00	$2,365.00	$658.00	$1,707.00
Transmission	1	$2,993.50	$2,993.50	3.00	3.00	1,000	3,000	3.00	40.00	120.00	40.00	80.00	$924.00	$483.00	$441.00
Elements/Oil Sampling Kits	1	$5,412.27	$5,412.27												
Number of Applications =	**6**		**$21,947.83**		**21.00**					**1,682.00**	**486.50**	**1,195.50**	**$9,582.00**	**$4,523.75**	**$5,058.25**

Engine Oil Type/Brand = **Total 15W-40, $99.00/18 liters**

Cost of Engine Oil/litre = **$5.50**

Labor Cost = **$2,520.00**

Labor Cost % of Install cost = **11.48%**

Engine Oil Reduction (l) =	**715.50**
Hydraulic Oil Reduction (l) =	**400.00**
Transmisison Oil Reduction (l) =	**80.00**
Annual Savings ($) =	**$5,058.25**
Maintenance Cost Reduction (%) =	**47.21%**
Waste Oil Reduction (%) =	**71.08%**

MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
Main Engine
Fluid
SHELL ROTELLA T 15W40 (130 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

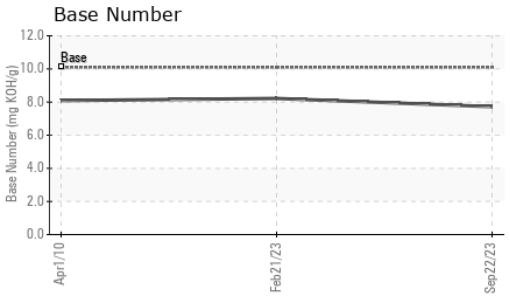
CONTAMINATION

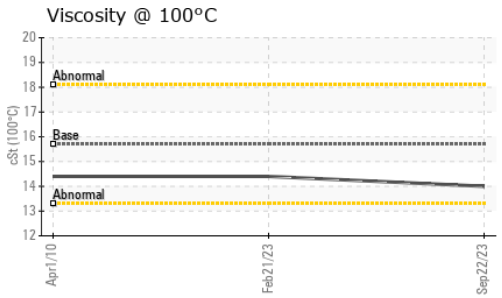
There is no indication of any contamination in the oil.

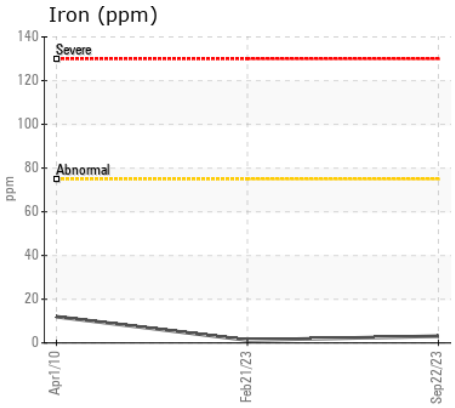
FLUID CONDITION

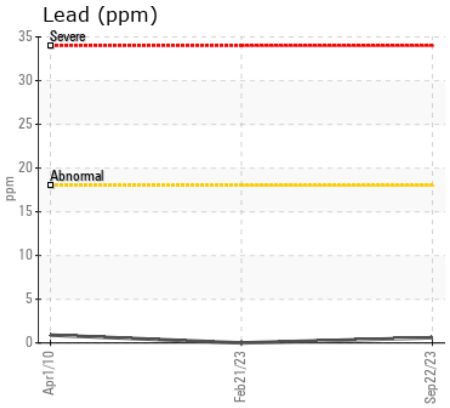
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

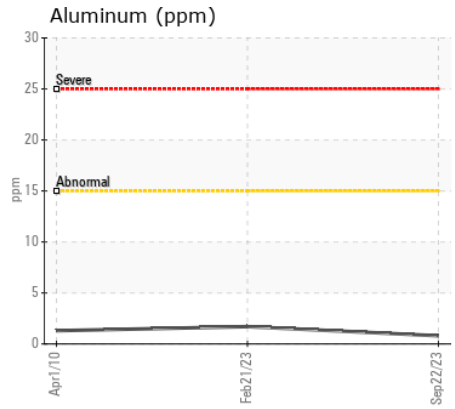
Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0000292	OF0000946	OF0000055
Sample Date		Client Info		22 Sep 2023	21 Feb 2023	01 Apr 2010
Machine Age	hrs	Client Info		12201	10501	21110
Oil Age	hrs	Client Info		1700	50	428
Filter Age	hrs	Client Info		200	50	428
Oil Changed		Client Info		Changed	Not Changd	N/A
Filter Changed		Client Info		Changed	Not Changd	N/A
Sample Status				NORMAL	ATTENTION	NORMAL
Iron	ppm	ASTM D5185(m)	>75	3	1	12
Chromium	ppm	ASTM D5185(m)	>8	0	0	<1
Nickel	ppm	ASTM D5185(m)	>2	0	0	0
Titanium	ppm	ASTM D5185(m)	>3	0	0	<1
Silver	ppm	ASTM D5185(m)	>2	<1	<1	<1
Aluminum	ppm	ASTM D5185(m)	>15	<1	2	1
Lead	ppm	ASTM D5185(m)	>18	<1	0	<1
Copper	ppm	ASTM D5185(m)	>80	1	<1	<1
Tin	ppm	ASTM D5185(m)	>14	0	0	0
Vanadium	ppm	ASTM D5185(m)		0	0	<1
Silicon	ppm	ASTM D5185(m)	>20	2	6	3
Potassium	ppm	ASTM D5185(m)	>20	2	0	2
Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Glycol		WC Method		NEG	NEG	NEG
Soot %	%	ASTM D7844*		0.2	0	0.2
Nitration	Abs/cm	ASTM D7624*	>20	6.6	7.1	10.8
Sulfation	Abs/.1mm	ASTM D7415*	>30	19.9	16.5	24.8
Emulsified Water	scalar	Visual*	>0.1	NEG	NEG	NEG
Sodium	ppm	ASTM D5185(m)	>75	3	3	7
Boron	ppm	ASTM D5185(m)	35	130	▲ 64	28
Barium	ppm	ASTM D5185(m)	0	<1	<1	<1
Molybdenum	ppm	ASTM D5185(m)	0	8	▲ 74	<1
Manganese	ppm	ASTM D5185(m)	0	0	0	<1
Magnesium	ppm	ASTM D5185(m)	10	10	12	11
Calcium	ppm	ASTM D5185(m)	2340	2148	2100	2264
Phosphorus	ppm	ASTM D5185(m)	1110	986	980	1026
Zinc	ppm	ASTM D5185(m)	1210	1135	1117	1184
Sulfur	ppm	ASTM D5185(m)	3890	2939	3048	2732
Oxidation	Abs/.1mm	ASTM D7414*	>25	14.8	11.1	22.4
Base Number (BN)	mg KOH/g	ASTM D2896*	10.1	7.72	8.22	8.09
Visc @ 100°C	cSt	ASTM D7279(m)	15.7	14.0	14.4	14.4

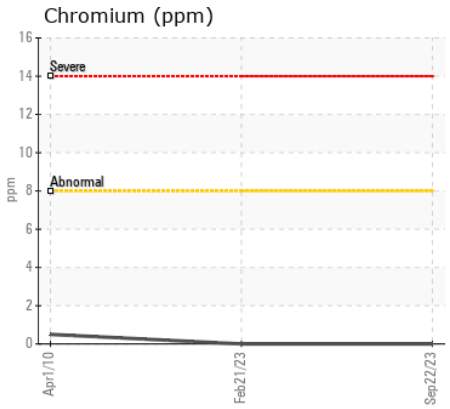


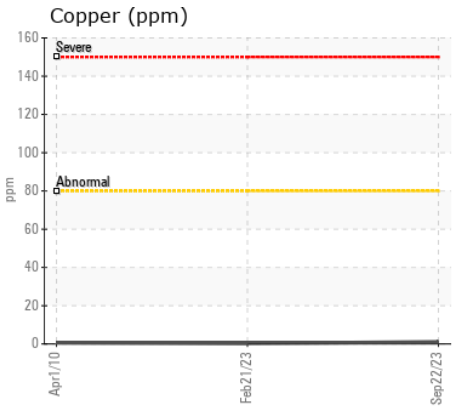


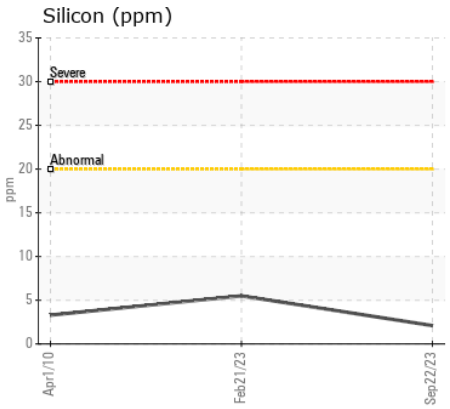


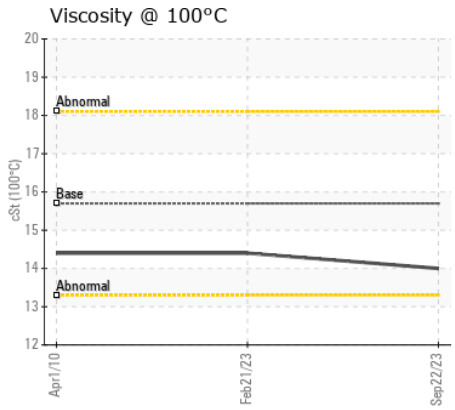


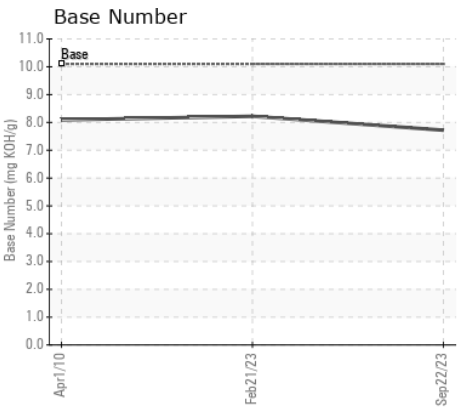












ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000292	**Received**	: 06 Oct 2023
Lab Number	: 02587426	**Diagnosed**	: 13 Oct 2023
Unique Number	: 5656492	**Diagnostician**	: Wes Davis
Test Package	: MOB 2		

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.

Oil Filtration Solutions Ltd.
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CA A1X 2E2
Contact: BILL BUTLER
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T: (709)834-8433
F: (709)834-8435

MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
1 Genset
Fluid
SHELL ROTELLA T 15W40 (15 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

There is no indication of any contamination in the oil.

FLUID CONDITION

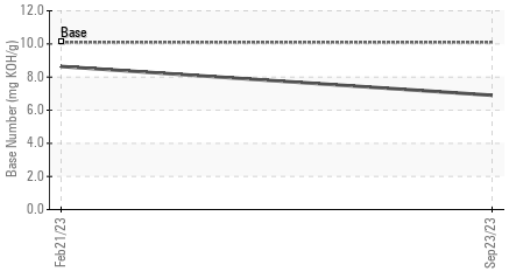
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0000671	OF0000945	---
Sample Date		Client Info		23 Sep 2023	21 Feb 2023	---
Machine Age	hrs	Client Info		8242	7378	---
Oil Age	hrs	Client Info		864	12	---
Filter Age	hrs	Client Info		864	12	---
Oil Changed		Client Info		Changed	Not Changd	---
Filter Changed		Client Info		Changed	Not Changd	---
Sample Status				NORMAL	ATTENTION	---
PQ		ASTM D8184*		0	0	---
Iron	ppm	ASTM D5185(m)	>50	24	<1	---
Chromium	ppm	ASTM D5185(m)	>4	0	0	---
Nickel	ppm	ASTM D5185(m)	>2	<1	0	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)	>5	<1	<1	---
Aluminum	ppm	ASTM D5185(m)	>12	<1	2	---
Lead	ppm	ASTM D5185(m)	>17	<1	<1	---
Copper	ppm	ASTM D5185(m)	>70	24	<1	---
Tin	ppm	ASTM D5185(m)	>15	0	0	---
Vanadium	ppm	ASTM D5185(m)		0	0	---
White Metal	scalar	Visual*	NONE	NONE	---	---
Yellow Metal	scalar	Visual*	NONE	NONE	---	---
Silicon	ppm	ASTM D5185(m)	>25	8	7	---
Potassium	ppm	ASTM D5185(m)	>20	<1	0	---
Fuel		WC Method	>4.0	<1.0	<1.0	---
Glycol		WC Method		NEG	NEG	---
Soot %	%	ASTM D7844*		0	0	---
Nitration	Abs/cm	ASTM D7624*	>20	7.5	7.0	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	19.9	16.6	---
Silt	scalar	Visual*	NONE	NONE	---	---
Debris	scalar	Visual*	NONE	NONE	---	---
Sand/Dirt	scalar	Visual*	NONE	NONE	---	---
Appearance	scalar	Visual*	NORML	NORML	---	---
Odor	scalar	Visual*	NORML	NORML	NORML	---
Emulsified Water	scalar	Visual*	>0.1	NEG	NEG	---
Sodium	ppm	ASTM D5185(m)		2	2	---
Boron	ppm	ASTM D5185(m)	35	82	69	---
Barium	ppm	ASTM D5185(m)	0	<1	<1	---
Molybdenum	ppm	ASTM D5185(m)	0	8	▲ 82	---
Manganese	ppm	ASTM D5185(m)	0	0	0	---
Magnesium	ppm	ASTM D5185(m)	10	11	▲ 69	---
Calcium	ppm	ASTM D5185(m)	2340	2265	2052	---
Phosphorus	ppm	ASTM D5185(m)	1110	886	1003	---
Zinc	ppm	ASTM D5185(m)	1210	1127	1133	---
Sulfur	ppm	ASTM D5185(m)	3890	2646	3058	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	16.1	11.7	---
Base Number (BN)	mg KOH/g	ASTM D2896*	10.1	6.90	8.64	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.7	14.8	14.5	---

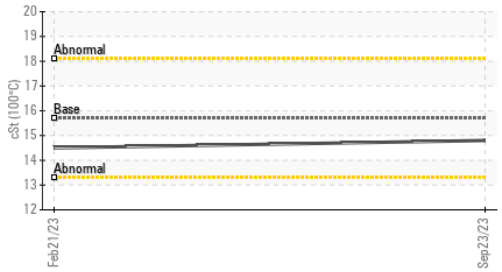
Report Id: FILCON [WCAMIS] 02587424 (Generated: 10/13/2023 08:10:03) Rev: 1

Submitted By: BILL BUTLER

Base Number

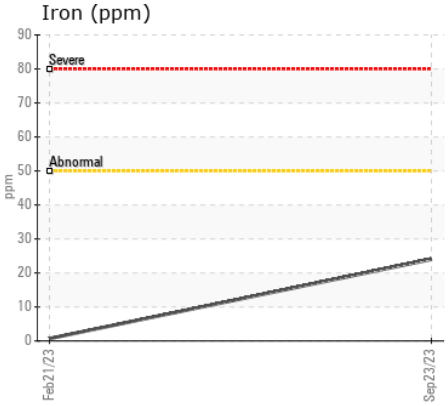


Viscosity @ 100°C

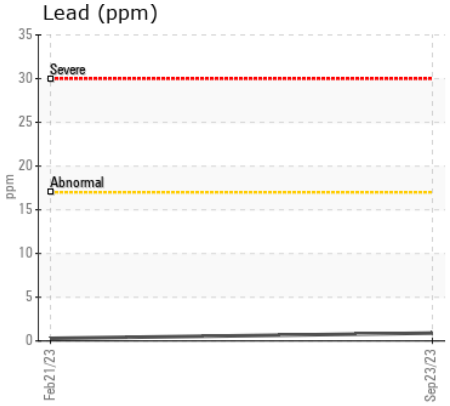


PQ

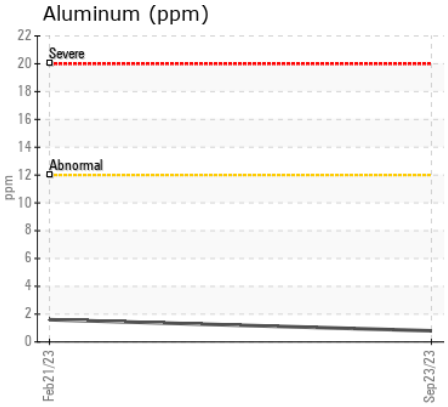
Iron (ppm)



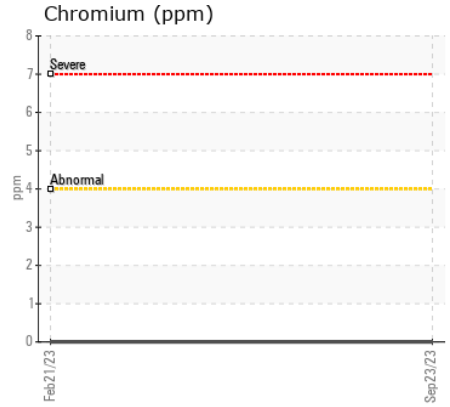
Lead (ppm)



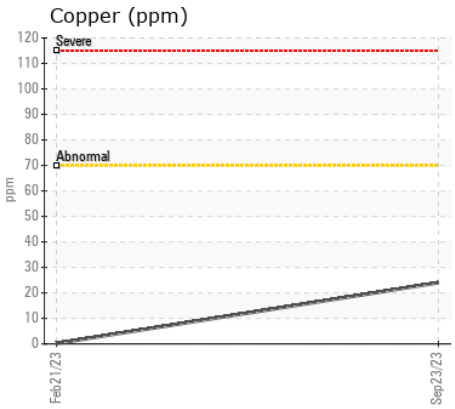
Aluminum (ppm)



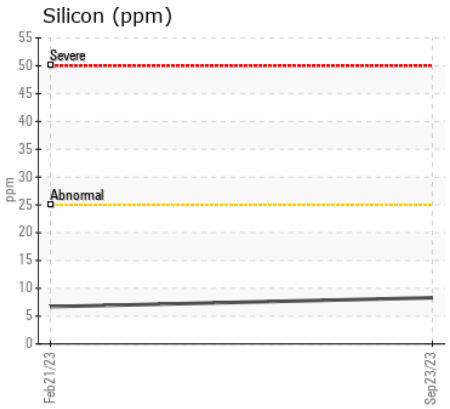
Chromium (ppm)



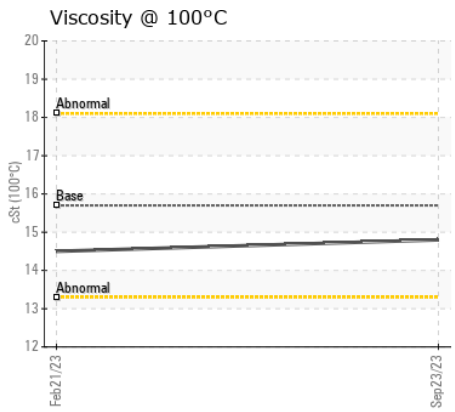
Copper (ppm)



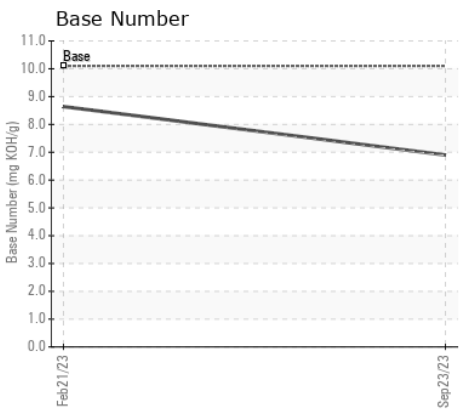
Silicon (ppm)



Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000671	**Received**	: 06 Oct 2023
Lab Number	: 02587424	**Diagnosed**	: 13 Oct 2023
Unique Number	: 5656490	**Diagnostician**	: Wes Davis
Test Package	: MOB 2 (Additional Tests: PQ, Visual)		

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.

Oil Filtration Solutions Ltd.
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MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
2 Genset
Fluid
SHELL ROTELLA T 15W40 (12)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

There is no indication of any contamination in the oil.

FLUID CONDITION

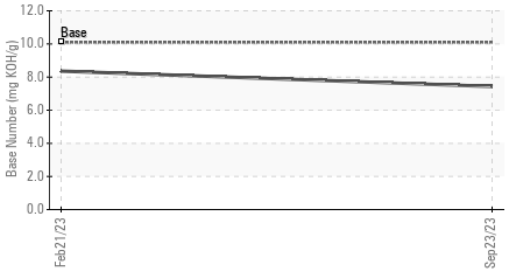
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		**OF0000291**	OF0000947	---
Sample Date		Client Info		**23 Sep 2023**	21 Feb 2023	---
Machine Age	hrs	Client Info		**9032**	8302	---
Oil Age	hrs	Client Info		**730**	36	---
Filter Age	hrs	Client Info		**730**	36	---
Oil Changed		Client Info		**Changed**	Not Changd	---
Filter Changed		Client Info		**Changed**	Not Changd	---
Sample Status				**NORMAL**	NORMAL	---
PQ		ASTM D8184*		**0**	0	---
Iron	ppm	ASTM D5185(m)	>50	**4**	<1	---
Chromium	ppm	ASTM D5185(m)	>4	**0**	0	---
Nickel	ppm	ASTM D5185(m)	>2	**<1**	0	---
Titanium	ppm	ASTM D5185(m)		**0**	0	---
Silver	ppm	ASTM D5185(m)	>5	**<1**	<1	---
Aluminum	ppm	ASTM D5185(m)	>12	**<1**	2	---
Lead	ppm	ASTM D5185(m)	>17	**<1**	0	---
Copper	ppm	ASTM D5185(m)	>70	**1**	<1	---
Tin	ppm	ASTM D5185(m)	>15	**0**	0	---
Vanadium	ppm	ASTM D5185(m)		**0**	0	---
Silicon	ppm	ASTM D5185(m)	>25	**7**	11	---
Potassium	ppm	ASTM D5185(m)	>20	**<1**	<1	---
Fuel		WC Method	>4.0	**<1.0**	<1.0	---
Glycol		WC Method		**NEG**	NEG	---
Soot %	%	ASTM D7844*		**0**	0	---
Nitration	Abs/cm	ASTM D7624*	>20	**6.4**	6.9	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	**19.5**	16.9	---
Emulsified Water	scalar	Visual*	>0.1	**NEG**	NEG	---
Sodium	ppm	ASTM D5185(m)		**4**	2	---
Boron	ppm	ASTM D5185(m)	35	**108**	71	---
Barium	ppm	ASTM D5185(m)	0	**<1**	<1	---
Molybdenum	ppm	ASTM D5185(m)	0	**11**	79	---
Manganese	ppm	ASTM D5185(m)	0	**0**	0	---
Magnesium	ppm	ASTM D5185(m)	10	**11**	13	---
Calcium	ppm	ASTM D5185(m)	2340	**2149**	2113	---
Phosphorus	ppm	ASTM D5185(m)	1110	**952**	1022	---
Zinc	ppm	ASTM D5185(m)	1210	**1118**	1144	---
Sulfur	ppm	ASTM D5185(m)	3890	**2871**	3121	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	**15.1**	11.8	---
Base Number (BN)	mg KOH/g	ASTM D2896*	10.1	**7.43**	8.36	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.7	**14.5**	14.6	---

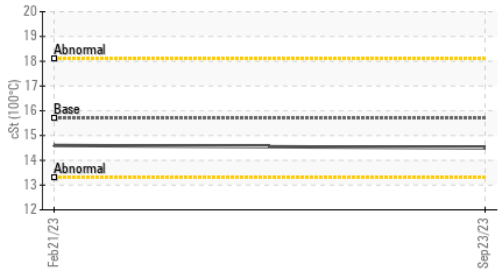
Report Id: FILCON [WCAMIS] 02587422 (Generated: 10/13/2023 08:10:13) Rev: 1

Submitted By: BILL BUTLER

Base Number

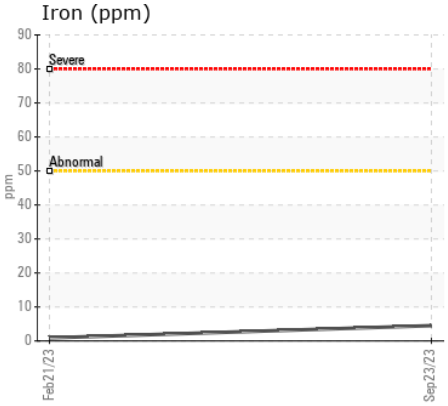


Viscosity @ 100°C

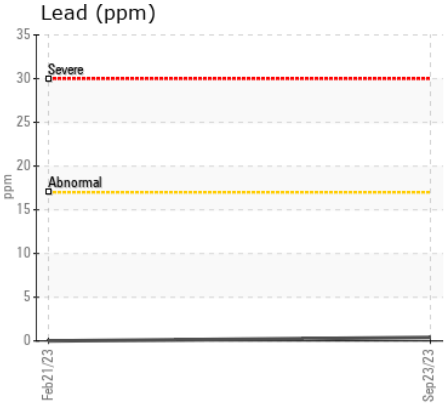


PQ

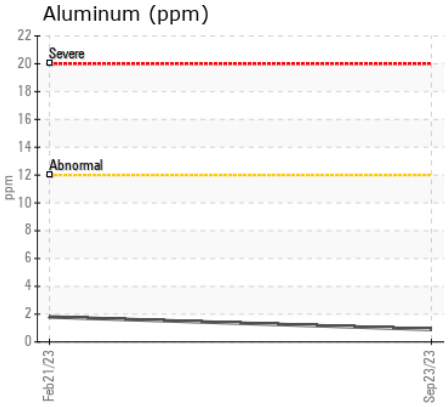
Iron (ppm)



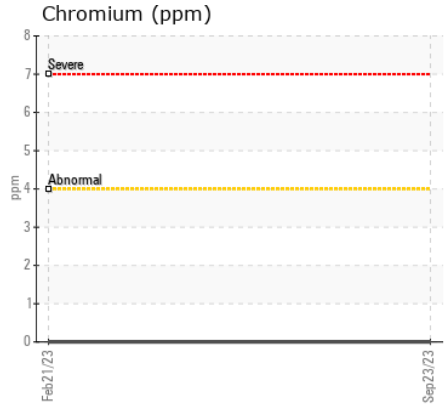
Lead (ppm)



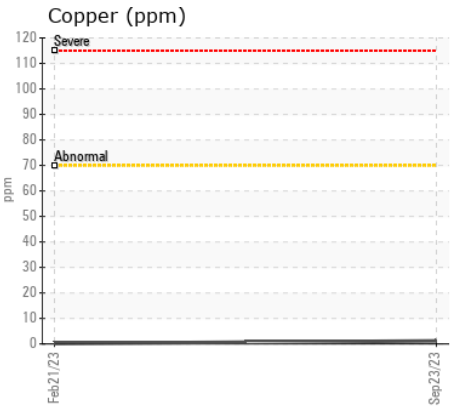
Aluminum (ppm)



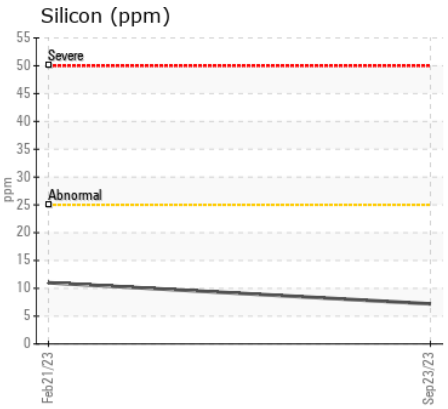
Chromium (ppm)



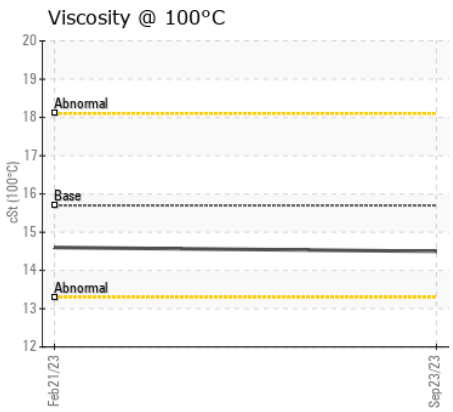
Copper (ppm)



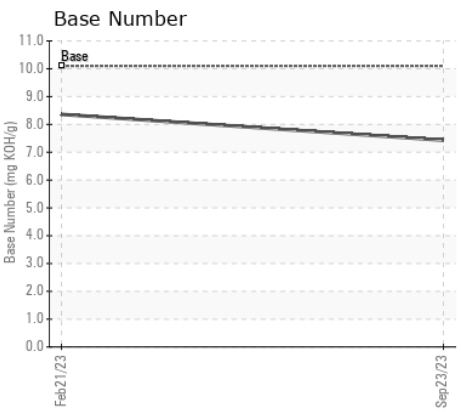
Silicon (ppm)



Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000291	**Received**	: 06 Oct 2023
Lab Number	: 02587422	**Diagnosed**	: 13 Oct 2023
Unique Number	: 5656488	**Diagnostician**	: Wes Davis
Test Package	: MOB 2 (Additional Tests: PQ)		

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.

Oil Filtration Solutions Ltd.
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CA A1X 2E2
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MOB II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
3 Genset
Fluid
SHELL ROTELLA T 15W40 (40 LTR)

RECOMMENDATION

No corrective action is recommended at this time. Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

Fuel content negligible. There is no indication of any contamination in the oil.

FLUID CONDITION

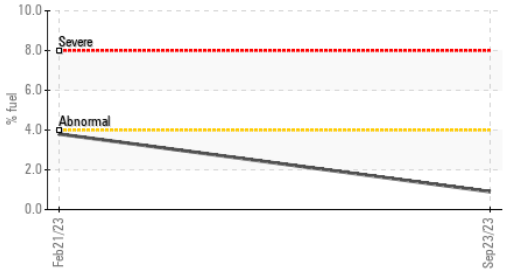
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		**OF0000290**	OF0000948	---
Sample Date		Client Info		**23 Sep 2023**	21 Feb 2023	---
Machine Age	hrs	Client Info		**10444**	9812	---
Oil Age	hrs	Client Info		**632**	24	---
Filter Age	hrs	Client Info		**632**	24	---
Oil Changed		Client Info		**Changed**	Not Changd	---
Filter Changed		Client Info		**Changed**	Not Changd	---
Sample Status				**NORMAL**	MARGINAL	---
PQ		ASTM D8184*		**0**	0	---
Iron	ppm	ASTM D5185(m)	>80	**1**	2	---
Chromium	ppm	ASTM D5185(m)	>6	**0**	0	---
Nickel	ppm	ASTM D5185(m)	>2	**0**	0	---
Titanium	ppm	ASTM D5185(m)	>2	**0**	0	---
Silver	ppm	ASTM D5185(m)	>2	**<1**	<1	---
Aluminum	ppm	ASTM D5185(m)	>20	**2**	2	---
Lead	ppm	ASTM D5185(m)	>95	**<1**	<1	---
Copper	ppm	ASTM D5185(m)	>85	**<1**	2	---
Tin	ppm	ASTM D5185(m)	>9	**0**	0	---
Vanadium	ppm	ASTM D5185(m)		**0**	0	---
Silicon	ppm	ASTM D5185(m)	>25	**4**	11	---
Potassium	ppm	ASTM D5185(m)	>20	**0**	0	---
Fuel	%	ASTM D7593*	>4.0	**0.9**	▲ 3.8	---
Glycol		WC Method		**NEG**	NEG	---
Soot %	%	ASTM D7844*		**0**	0	---
Nitration	Abs/cm	ASTM D7624*	>20	**7.9**	7.2	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	**17.1**	16.8	---
Emulsified Water	scalar	Visual*	>0.1	**NEG**	NEG	---
Sodium	ppm	ASTM D5185(m)		**1**	3	---
Boron	ppm	ASTM D5185(m)	35	**51**	71	---
Barium	ppm	ASTM D5185(m)	0	**<1**	0	---
Molybdenum	ppm	ASTM D5185(m)	0	**79**	75	---
Manganese	ppm	ASTM D5185(m)	0	**0**	0	---
Magnesium	ppm	ASTM D5185(m)	10	**82**	13	---
Calcium	ppm	ASTM D5185(m)	2340	**2095**	2012	---
Phosphorus	ppm	ASTM D5185(m)	1110	**1035**	947	---
Zinc	ppm	ASTM D5185(m)	1210	**1185**	1077	---
Sulfur	ppm	ASTM D5185(m)	3890	**3145**	2895	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	**12.7**	11.8	---
Base Number (BN)	mg KOH/g	ASTM D2896*	10.1	**7.72**	7.77	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.7	**13.8**	13.2	---

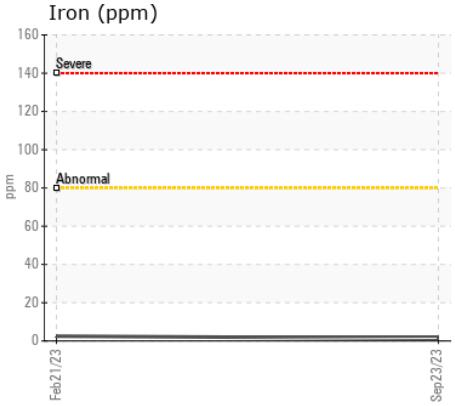
Report Id: FILCON [WCAMIS] 02587420 (Generated: 10/16/2023 10:07:01) Rev: 1

Submitted By: BILL BUTLER

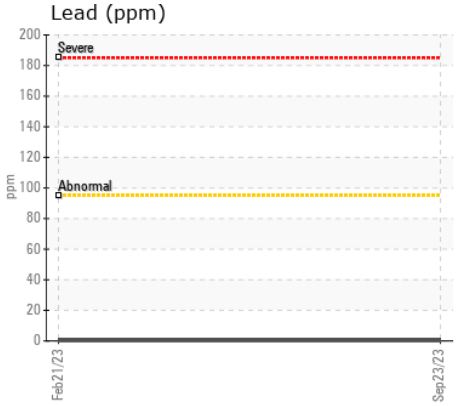
Fuel Dilution



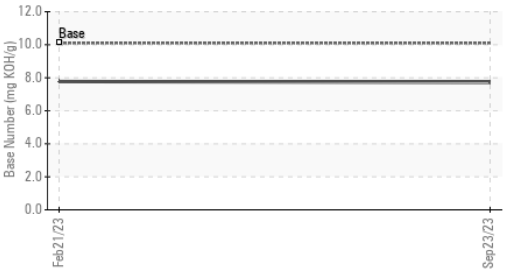
Iron (ppm)



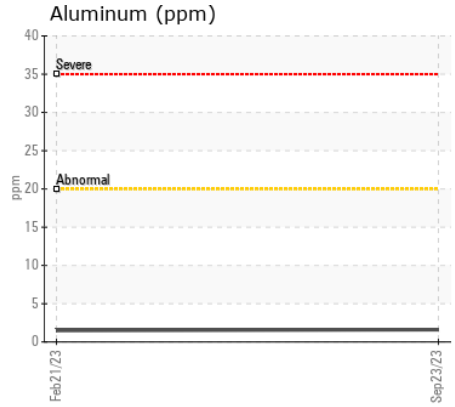
Lead (ppm)



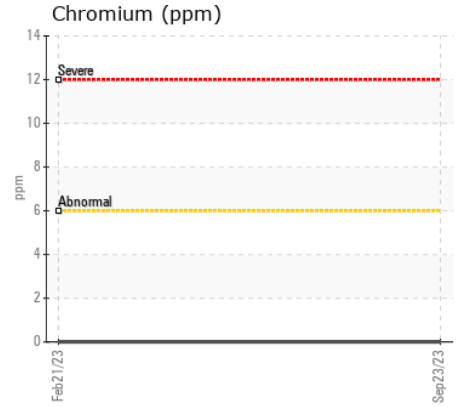
Base Number



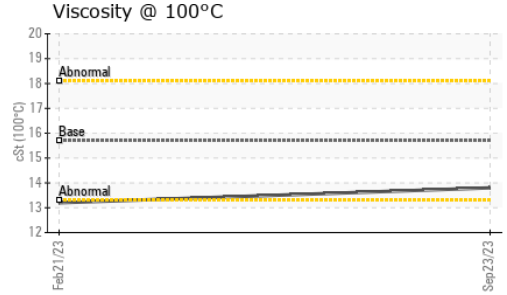
Aluminum (ppm)



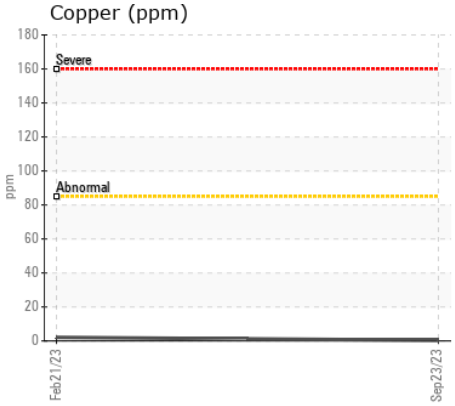
Chromium (ppm)



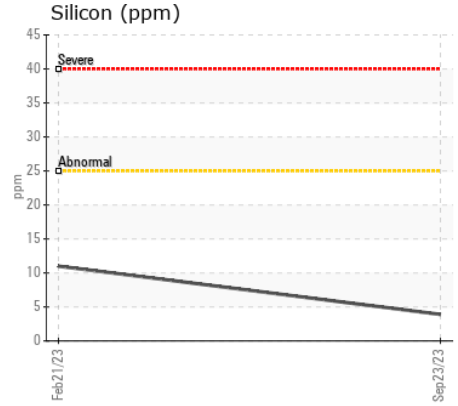
Viscosity @ 100°C



Copper (ppm)

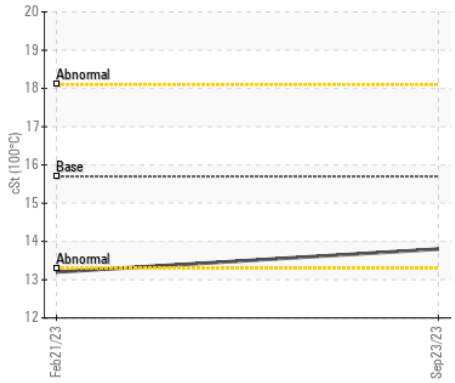


Silicon (ppm)

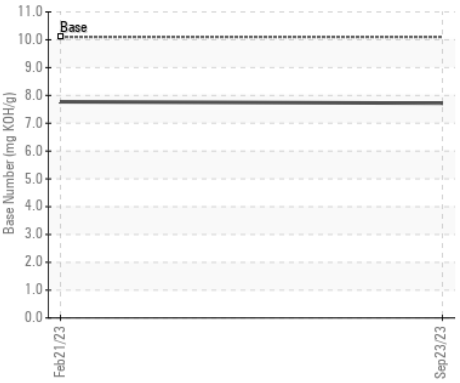


PQ

Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000290	**Received**	: 06 Oct 2023
Lab Number	: 02587420	**Diagnosed**	: 16 Oct 2023
Unique Number	: 5656486	**Diagnostician**	: Kevin Marson
Test Package	: MOB 2 (Additional Tests: FUELDILUTION, PercentFuel, PQ)		

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.

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MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	ABNORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
Transmission
Fluid
SHELL ROTELLA T 30 (40)

RECOMMENDATION

We recommend that you drain the fluid from the component if this has not already been done. Confirm the source of the lubricant being utilized for top-up/fill. We recommend an early resample to monitor this condition.

WEAR

Copper ppm levels are abnormal. Clutch disc wear or oil cooler leaching indicated.

CONTAMINATION

There is no indication of any contamination in the fluid.

FLUID CONDITION

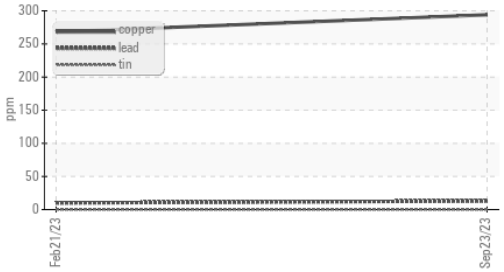
Additive levels indicate the addition of a different brand, or type of fluid. The AN level is acceptable for this fluid. The fluid is no longer serviceable as a result of the abnormal and/or severe wear.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0000672	OF0000944	---
Sample Date		Client Info		23 Sep 2023	21 Feb 2023	---
Machine Age	hrs	Client Info		12201	10501	---
Oil Age	hrs	Client Info		1760	60	---
Filter Age	hrs	Client Info		260	60	---
Oil Changed		Client Info		Not Changd	Not Changd	---
Filter Changed		Client Info		Changed	Not Changd	---
Sample Status				ABNORMAL	NORMAL	---
PQ		ASTM D8184*		0	0	---
Iron	ppm	ASTM D5185(m)	>200	41	19	---
Chromium	ppm	ASTM D5185(m)	>10	0	0	---
Nickel	ppm	ASTM D5185(m)		0	0	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)		<1	<1	---
Aluminum	ppm	ASTM D5185(m)	>50	<1	<1	---
Lead	ppm	ASTM D5185(m)	>50	13	10	---
Copper	ppm	ASTM D5185(m)	>200	▲ 294	268	---
Tin	ppm	ASTM D5185(m)	>10	<1	<1	---
Vanadium	ppm	ASTM D5185(m)		0	0	---
White Metal	scalar	Visual*	NONE	NONE	LIGHT	---
Yellow Metal	scalar	Visual*	NONE	NONE	NONE	---
Silicon	ppm	ASTM D5185(m)	>50	5	6	---
Potassium	ppm	ASTM D5185(m)	>20	<1	1	---
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*	>0.1	NEG	NEG	---
Sodium	ppm	ASTM D5185(m)		3	4	---
Boron	ppm	ASTM D5185(m)	0	23	4	---
Barium	ppm	ASTM D5185(m)		<1	<1	---
Molybdenum	ppm	ASTM D5185(m)	0	59	66	---
Manganese	ppm	ASTM D5185(m)		<1	0	---
Magnesium	ppm	ASTM D5185(m)		44	25	---
Calcium	ppm	ASTM D5185(m)	1890	2542	2678	---
Phosphorus	ppm	ASTM D5185(m)	680	1001	1040	---
Zinc	ppm	ASTM D5185(m)	750	1071	1120	---
Sulfur	ppm	ASTM D5185(m)		3384	3181	---
Acid Number (AN)	mg KOH/g	ASTM D974*		0.76	1.07	---
Visc @ 40°C	cSt	ASTM D7279(m)	97.7	94.7	99.3	---

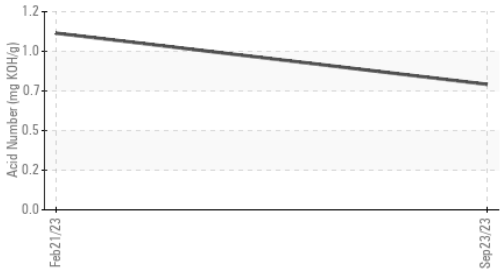
Report Id: FILCON [WCAMIS] 02587695 (Generated: 10/10/2023 11:01:36) Rev: 1

Submitted By: BILL BUTLER

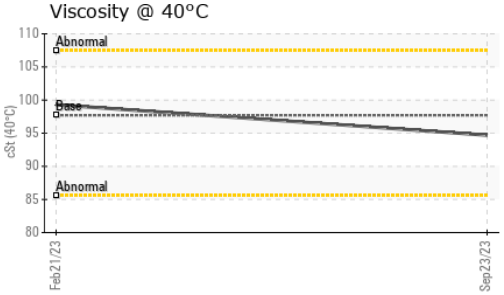
Non-ferrous Metals



Acid Number

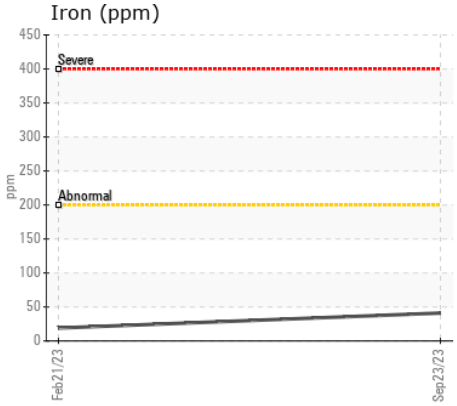


Viscosity @ 40°C

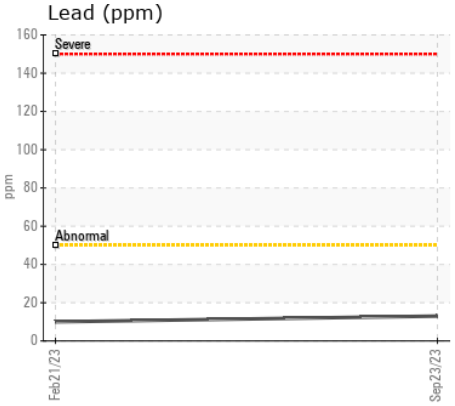


PQ

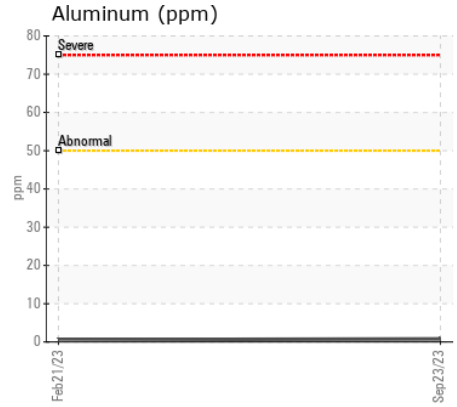
Iron (ppm)



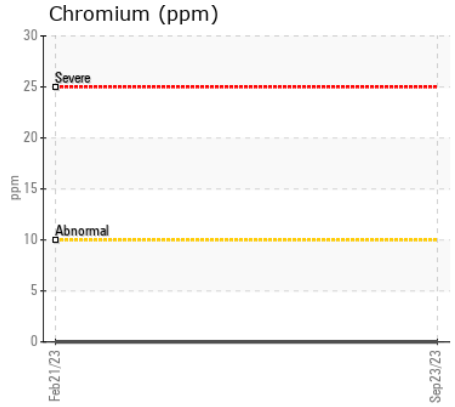
Lead (ppm)



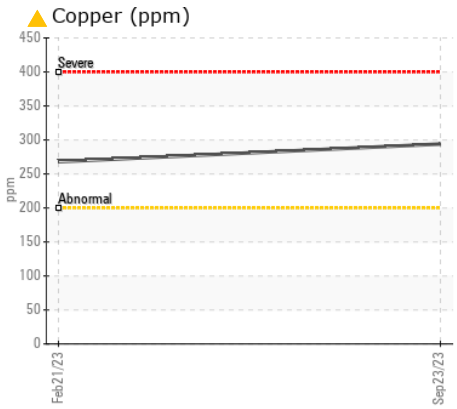
Aluminum (ppm)



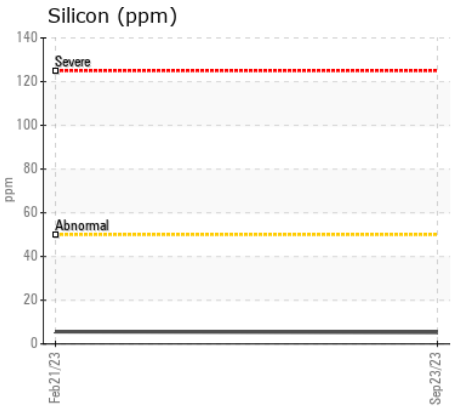
Chromium (ppm)



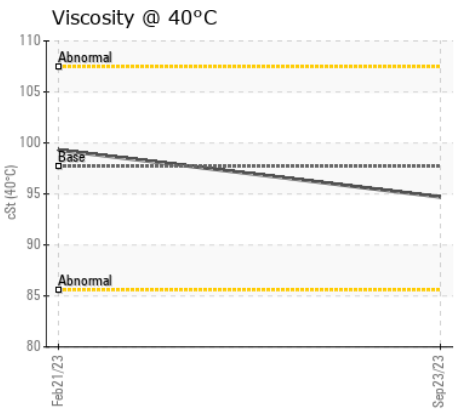
Copper (ppm)



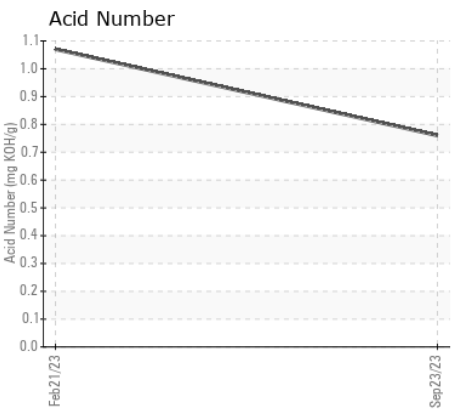
Silicon (ppm)



Viscosity @ 40°C



Acid Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000672	**Received**	: 06 Oct 2023
Lab Number	: 02587695	**Diagnosed**	: 10 Oct 2023
Unique Number	: 5656761	**Diagnostician**	: Kevin Marson
Test Package	: MOB 2 (Additional Tests: PQ)		

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.

Oil Filtration Solutions Ltd.
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MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
CLARKE & SONS FISHING LTD.
Machine Id
FISHING VESSEL MV JOYFUL SOUND
Component
Hydraulic System
Fluid
AW HYDRAULIC OIL ISO 32 (1000 GAL)

RECOMMENDATION

Resample at the next service interval to monitor. Please contact your representative for information regarding the proper sampling kits for your service. NOTE: We recommend using Advanced Oil Monitoring (AOM) kits for this system. The AOM test package includes advanced level testing to determine the suitability of turbine and large industrial compressor oils for continued use.

WEAR

All component wear rates are normal.

CONTAMINATION

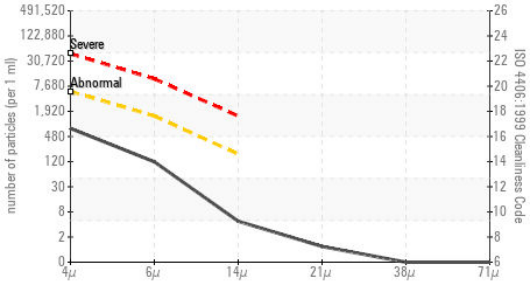
The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The system and fluid cleanliness is acceptable.

FLUID CONDITION

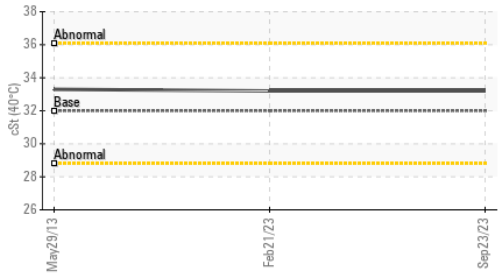
The condition of the oil is acceptable for the time in service (unconfirmed).

Test	UOM	Method	Limit/Abn	Current	History1
Sample Number		Client Info		OF0000670	OF0000942
Sample Date		Client Info		23 Sep 2023	21 Feb 2023
Machine Age	hrs	Client Info		10444	9810
Oil Age	hrs	Client Info		1234	600
Filter Age	hrs	Client Info		376	600
Oil Changed		Client Info		Not Changd	Not Changd
Filter Changed		Client Info		N/A	Not Changd
Sample Status				NORMAL	NORMAL
Iron	ppm	ASTM D5185(m)	>20	<1	<1
Chromium	ppm	ASTM D5185(m)	>10	0	0
Nickel	ppm	ASTM D5185(m)	>10	0	0
Titanium	ppm	ASTM D5185(m)		0	0
Silver	ppm	ASTM D5185(m)		<1	<1
Aluminum	ppm	ASTM D5185(m)	>10	0	0
Lead	ppm	ASTM D5185(m)	>10	<1	1
Copper	ppm	ASTM D5185(m)	>75	6	6
Tin	ppm	ASTM D5185(m)	>10	0	0
Vanadium	ppm	ASTM D5185(m)		0	0
White Metal	scalar	Visual*	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE
Silicon	ppm	ASTM D5185(m)	>20	1	1
Potassium	ppm	ASTM D5185(m)	>20	0	0
Particles >4µm		ASTM D7647	>5000	659	2736
Particles >6µm		ASTM D7647	>1300	105	399
Particles >14µm		ASTM D7647	>160	4	13
Particles >21µm		ASTM D7647	>40	1	3
Particles >38µm		ASTM D7647	>10	0	1
Particles >71µm		ASTM D7647	>3	0	0
Oil Cleanliness		ISO 4406 (c)	>19/17/14	17/14/9	19/16/11
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*	>0.1	NEG	NEG
Sodium	ppm	ASTM D5185(m)		<1	0
Boron	ppm	ASTM D5185(m)	5	<1	<1
Barium	ppm	ASTM D5185(m)	5	<1	<1
Molybdenum	ppm	ASTM D5185(m)	5	0	0
Manganese	ppm	ASTM D5185(m)		0	0
Magnesium	ppm	ASTM D5185(m)	25	<1	<1
Calcium	ppm	ASTM D5185(m)	200	31	34
Phosphorus	ppm	ASTM D5185(m)	300	287	293
Zinc	ppm	ASTM D5185(m)	370	338	339
Sulfur	ppm	ASTM D5185(m)	2500	1773	1780
Visc @ 40°C	cSt	ASTM D7279(m)	32	33.2	33.2

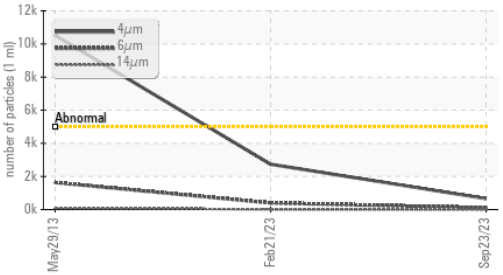
Particle Count



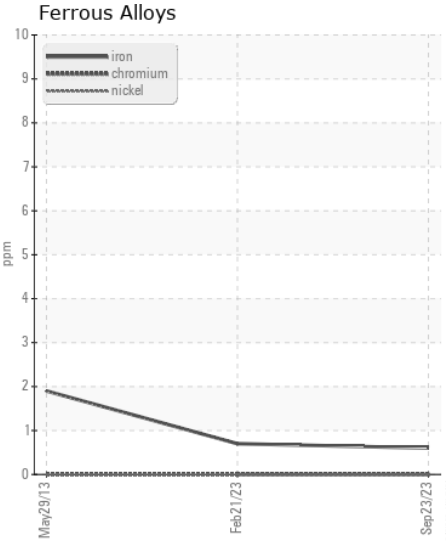
Viscosity @ 40°C



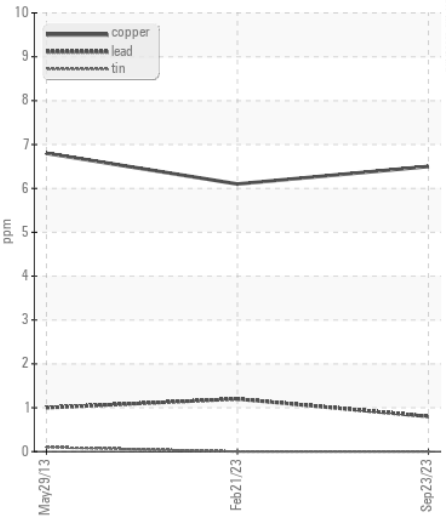
Particle Trend



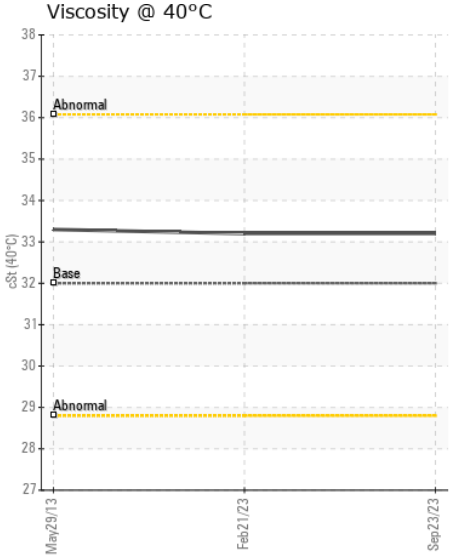
Ferrous Alloys



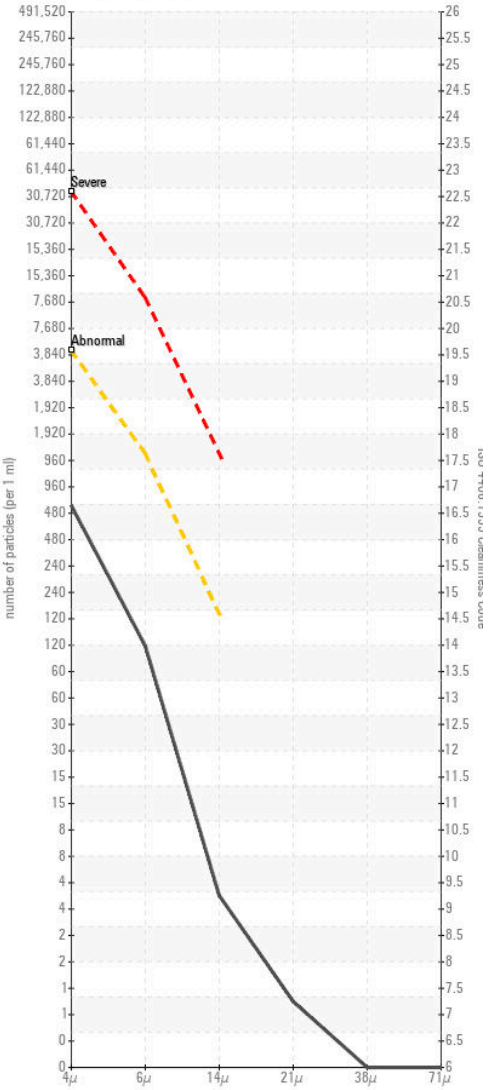
Non-ferrous Metals



Viscosity @ 40°C



Particle Count



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0000670	**Received**	: 06 Oct 2023
Lab Number	: 02587662	**Diagnosed**	: 10 Oct 2023
Unique Number	: 5656728	**Diagnostician**	: Wes Davis
Test Package	: MOB 2		

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.

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