Oil Sample Test Results Summary
Generation 2 Filtration Oil Recyling Technology

Commercial Fishing Vessel
MV Covenant II

Generated By:
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Client: Heddersen Fishing Enterprise Ltd.

Completed for:

Jason Frenette, Senior Advisor/Analyst, Department of Fisheries & Oceans, Gov. of Canada.

Fisheries & Aquaculture Clean Technology Adoption Program (FACTAP)

Progress Report ID#: FACTAP-2023-A015

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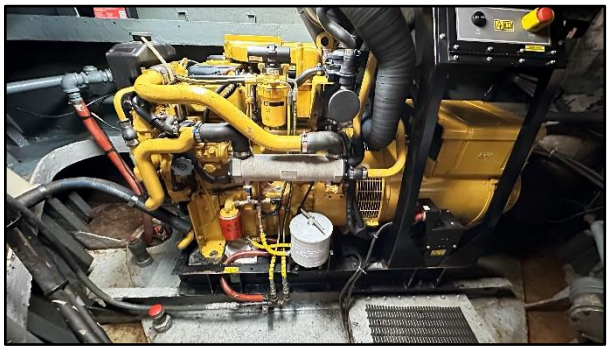
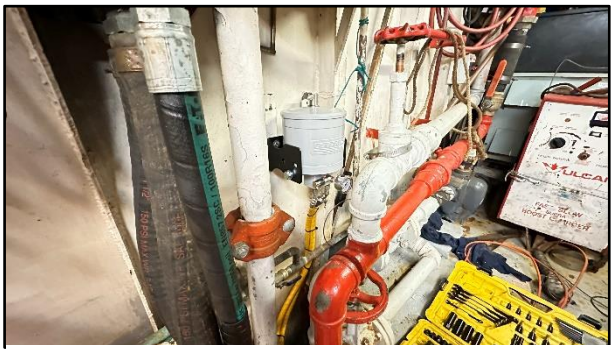
G2F Installations – MV Covenant II

MV Covenant II

Main Propulsion Engine



Generator 1



Transmission

Hydraulics (left & Generator 2 right)

Hydraulics (left) & Generator 2 (right)

Introduction

The Oil Recycling Technologies (ORT) 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. The ORT dramatically lessens 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 ORT 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 January 8, 2024, on the MV Covenant II, a steel hauled 65-foot commercial fishing vessel owned by Hedderson Fishing Enterprises Ltd, located in St. John's, NL. Oil samples were taken from all equipment before the ORT was put into service, to determine a baes line. If the machinery contained new oil, an oil sample was not required. The main purpose of the oil samples is to verify the ORT 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 the ORT, 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 & 2).:

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 ORT 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 1,975 hours on the main propulsion engine. OEM recommended oil change interval on the engine is 500 hours. With installation of the ORT the customer was permitted to run 1,975 hours with operational safety, or 3.95 times longer with reduced mechanical wear. The reported 'all component rates were normal…there is no indication of any contamination in the oil…the condition of the oil is suitable for further service (Appendix 2). Both generators have an OEM recommended oil change interval of 250 hours. With the installation of the ORT, they ran 2.4 times longer or 600 hours on the oil in generator #1 (Appendix 3), while accumulating 1,013 hours and running 4 times on the oil in generator in #2 (Appendix 4). All diesel engine reports indicate rates of mechanical wear are normal, and the oil is suitable for further service. There was a significant reduction in hydraulic oil contamination. Prior to the installation of the ORT the hydraulic oil contained 161,230 particles <4 microns per 1 ml of hydraulic oil with a recommendation to replace the oil (new unused oil contains > 5,000). After use of the ORT it contained just 1,061 particles, accounting for a 99.34% reduction in ultra-fine contamination missed by the existing filtration systems. Contamination was severe before the ORT and later tested to be 2 ISO

cleanliness grades cleaner than the ISO grade of new unused hydraulic oil, the ROI was immediate. With bi-annual element changes, this oil will maintain its health and will not be replaced (Appendix 5). The Transmission oil is recommended to be replaced every 1,000 hours. With the ORT the oil with 1,975 hours of use, or 1.975 times longer, tested with super low rates of mechanical wear, no contamination was present in the fluid, and "the condition of the fluid is suitable for further service", affording additional savings (Appendix 6).

Benefits & Conclusion

The ORT 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 the ORT. More importantly, there is a notable reduction in rates of mechanical wear when using the technology.

Oil analysis confirms the ORT improves equipment reliability and end-users can prolong their diesel engine oil and transmission oil with operational safety by a factor of 3+, and hydraulic oil indefinitely, reducing the consumption, transportation, and storage of oil by up to 77% while reducing primary and secondary production of GHG's, reducing the customers carbon footprint, and associated environmental impact. Use of the ORT will create an annual reduction of diesel engine oil by 765 liters, transmission oil by 58 liters, and hydraulic oil by 450 liters, reducing annual oil maintenance costs by $7,138.42 or by 58% (Appendix 7).

Table 1.0 – Summary of Annual Benefits.

Engine Oil Reduction (l) =	**765.00**
Hydraulic Oil Reduction (l) =	**450.00**
Transmission Oil Reduction (l) =	**58.33**
Annual Savings ($) =	**$7,138.42**
Maintenance Cost Reduction (%) =	**58.04%**
Oil Consumption & Waste Oil Reduction (%) =	**77.28%**

The cost-saving calculations are based on the customers average cost of oil in the local market in the fall of 2023. The retail cost in 2024 for a mid to high-grade was 10-15% greater, affording greater cost-savings to customer using the oil recycling technology than presented in this report.

Implementation of the ORT reduces oil consumption and waste oil production by 1,273 liters, reducing their annual carbon footprint by 3.6 metric tonnes (1,000 liters of waste oil is equivalent to 2.83 metric tonnes of CO_2).

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 the ORT, 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

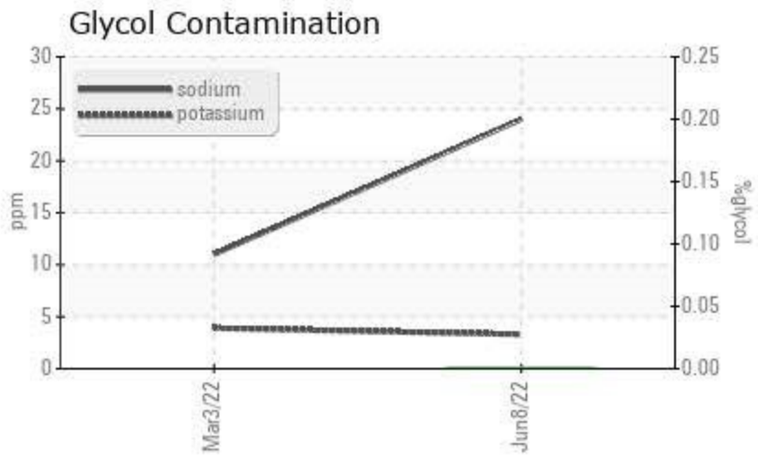
Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number				OF0000392	OF0000385	---
Sample Date				08 Jun 2022	03 Mar 2022	---
Machine Age	hrs			17371	1	---
Oil Age	hrs			922	272	---
Filter Age	hrs			650	272	---
Oil Changed				Not Changd	Not Changd	---
Filter Changed				Not Changd	Changed	---
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	---

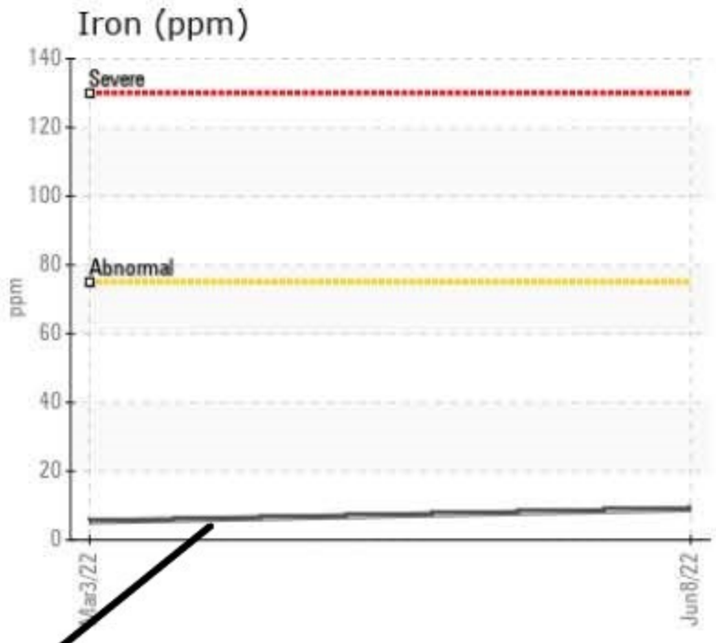
Values when new

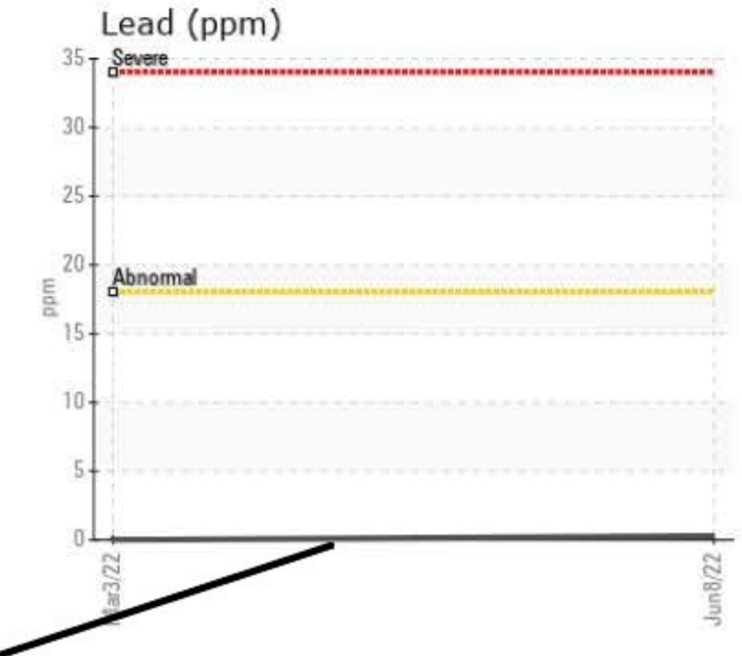
Report Id: FILCON [WCAMIS] 02502095 (Generated: 07/29/2022 08:22:06)

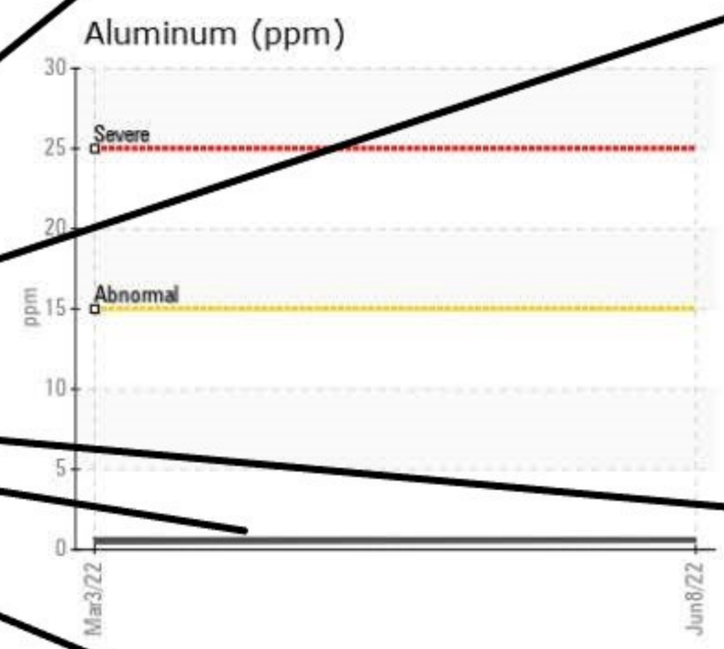
Submitted By: BILL BUTLER

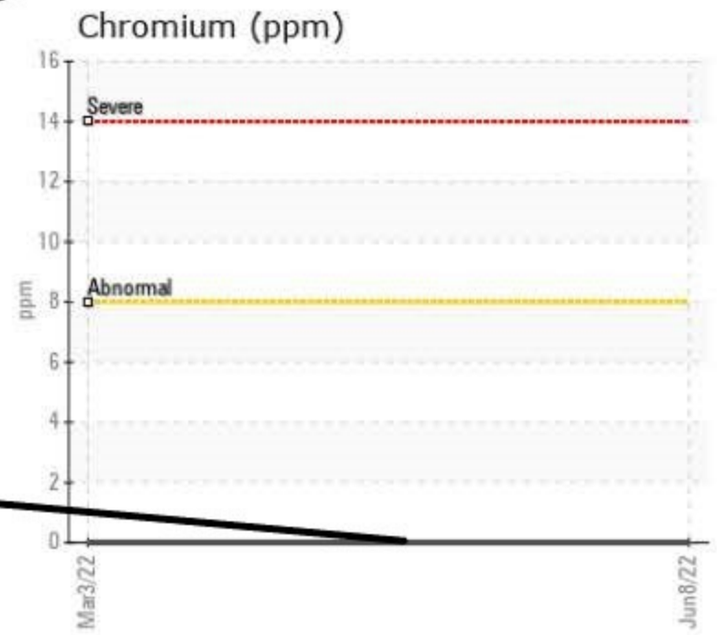
Black lines represents test results

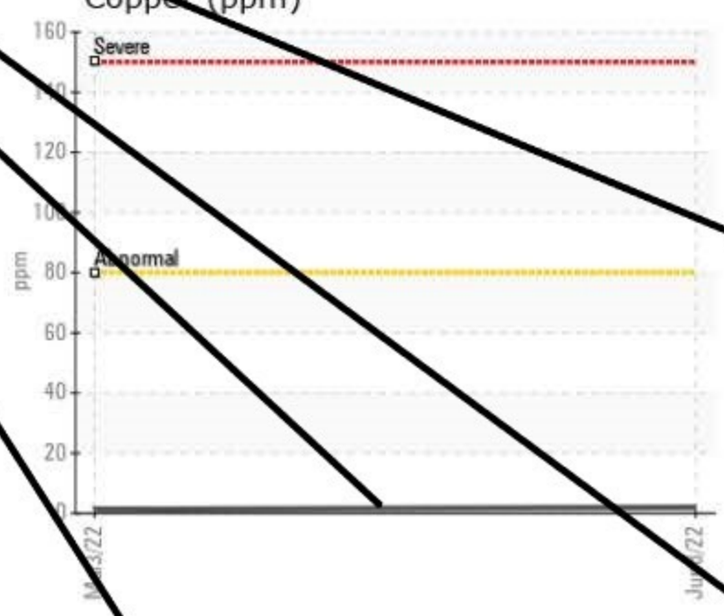


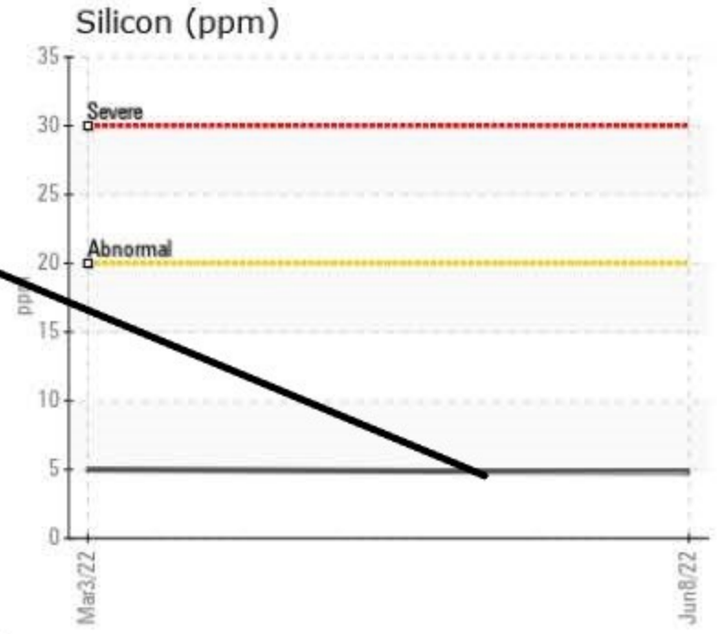


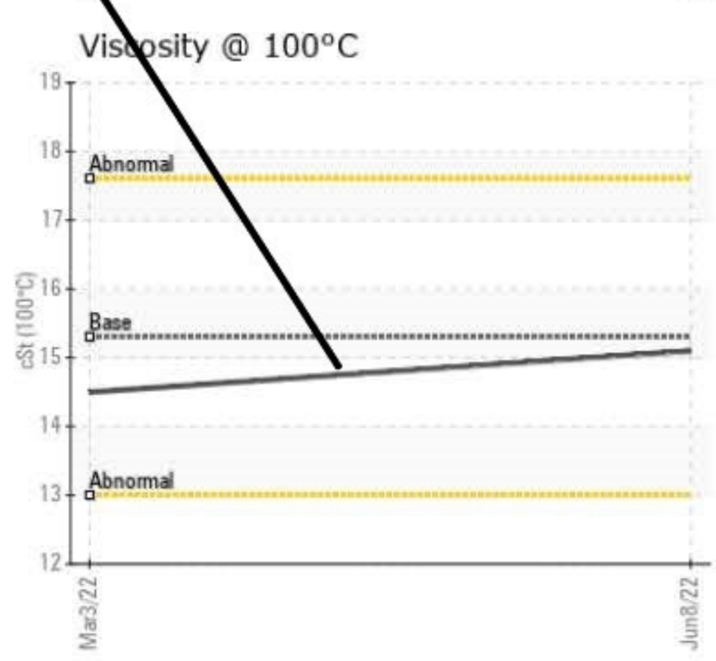


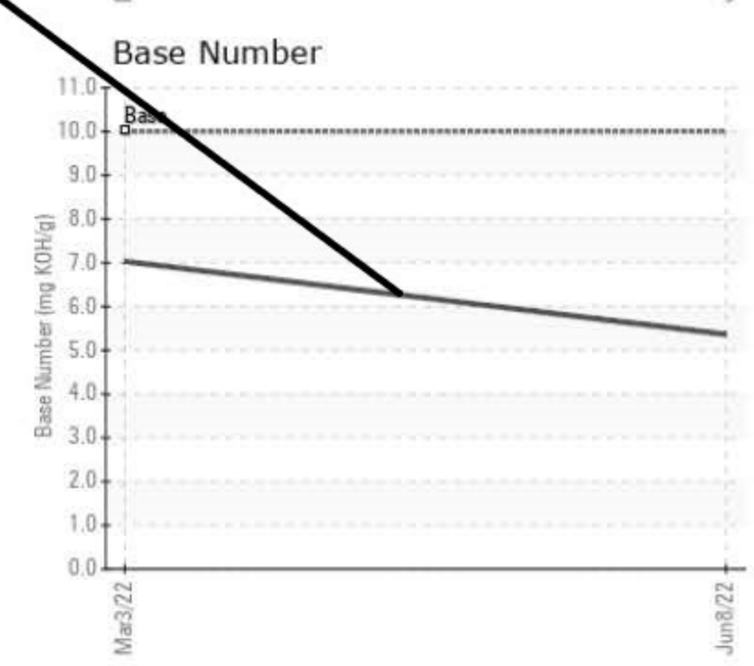












Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0000392 **Received** : 27 Jul 2022
Lab Number : 02502095 **Diagnosed** : 29 Jul 2022
Unique Number : 5435056 **Diagnostician** : Kevin Marson
Test Package : MOB 2 (Additional Tests: Glycol)

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

MOB II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
HEDDERSON FISHING ENTERPRISES LTD
Machine Id
65FT FISHING VESSEL MV Covenant II
Component
Main Engine
Fluid
PETRO CANADA DURON HP 15W40 (84 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

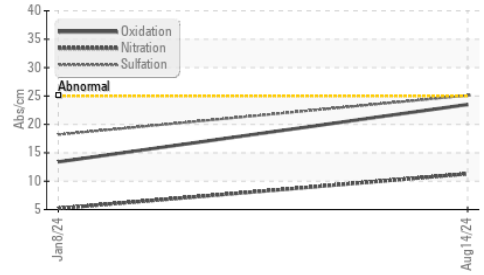
There is no indication of any contamination in the oil.

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		**OF0001036**	OF0000768	---
Sample Date		Client Info		**14 Aug 2024**	08 Jan 2024	---
Machine Age	hrs	Client Info		**20620**	18845	---
Oil Age	hrs	Client Info		**1975**	1126	---
Filter Age	hrs	Client Info		**475**	1126	---
Oil Changed		Client Info		**Changed**	Changed	---
Filter Changed		Client Info		**Changed**	Changed	---
Sample Status				**NORMAL**	NORMAL	---
Iron	ppm	ASTM D5185(m)	>75	**25**	3	---
Chromium	ppm	ASTM D5185(m)	>8	**<1**	0	---
Nickel	ppm	ASTM D5185(m)	>2	**<1**	<1	---
Titanium	ppm	ASTM D5185(m)	>3	**0**	0	---
Silver	ppm	ASTM D5185(m)	>2	**0**	0	---
Aluminum	ppm	ASTM D5185(m)	>15	**1**	2	---
Lead	ppm	ASTM D5185(m)	>18	**<1**	<1	---
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	**4**	2	---
Potassium	ppm	ASTM D5185(m)	>20	**2**	6	---
Fuel		WC Method	>4.0	**<1.0**	<1.0	---
Water		WC Method	>0.1	**NEG**	NEG	---
Glycol		WC Method		**NEG**	0.0	---
Soot %	%	ASTM D7844*		**0.5**	0	---
Nitration	Abs/cm	ASTM D7624*	>20	**11.3**	5.2	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	**25.1**	18.2	---
Emulsified Water	scalar	Visual*	>0.1	**NEG**	NEG	---
Sodium	ppm	ASTM D5185(m)	>75	**11**	111	---
Boron	ppm	ASTM D5185(m)	0	**4**	<1	---
Barium	ppm	ASTM D5185(m)	0	**0**	0	---
Molybdenum	ppm	ASTM D5185(m)	60	**65**	58	---
Manganese	ppm	ASTM D5185(m)	0	**<1**	0	---
Magnesium	ppm	ASTM D5185(m)	1010	**1055**	968	---
Calcium	ppm	ASTM D5185(m)	1070	**1259**	1024	---
Phosphorus	ppm	ASTM D5185(m)	1150	**1072**	1014	---
Zinc	ppm	ASTM D5185(m)	1270	**1302**	1151	---
Sulfur	ppm	ASTM D5185(m)	2060	**2505**	2730	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	**23.5**	13.4	---
Base Number (BN)	mg KOH/g	ASTM D2896*	9.8	**8.39**	9.45	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.6	**15.1**	14.7	---

FT-IR (Direct Trend)



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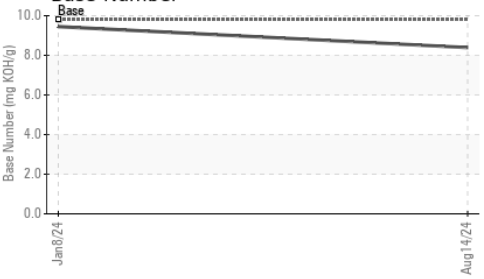
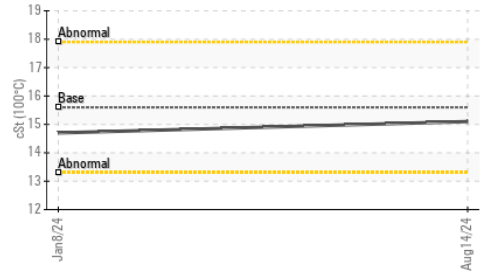
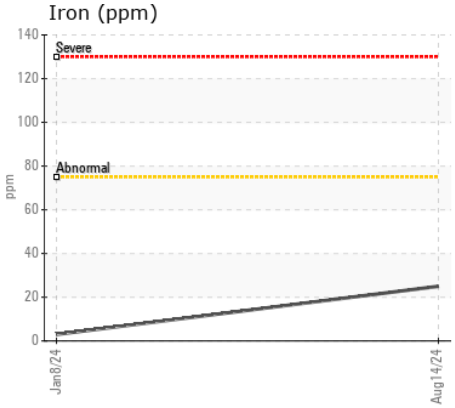


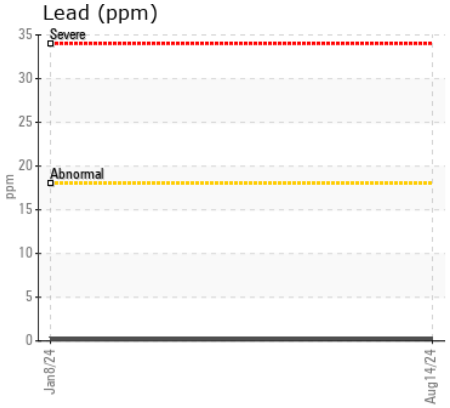
Viscosity @ 100°C



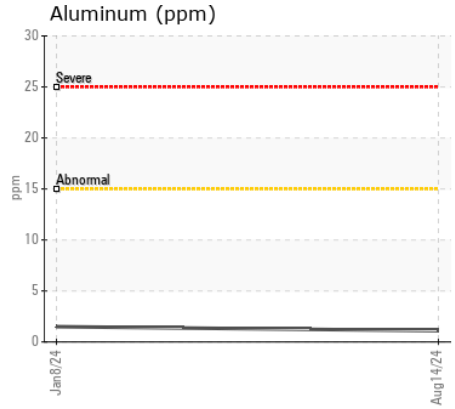
Iron (ppm)



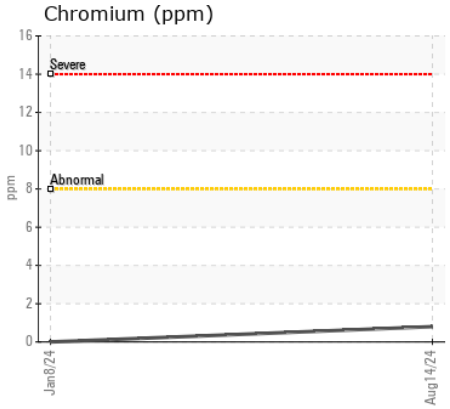
Lead (ppm)



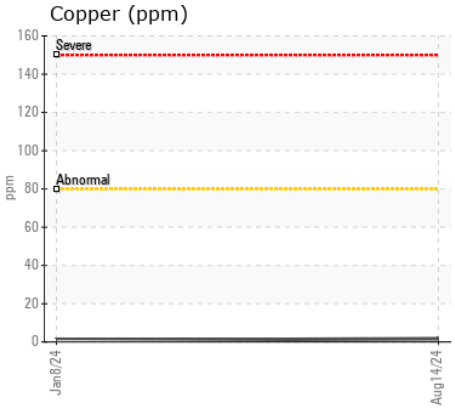
Aluminum (ppm)



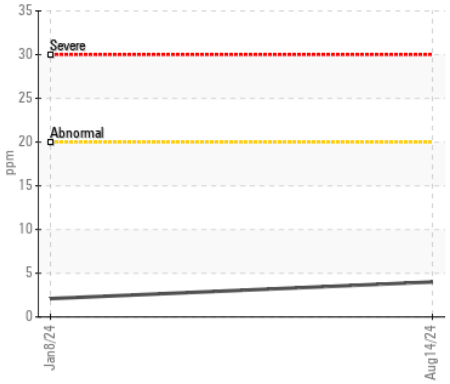
Chromium (ppm)



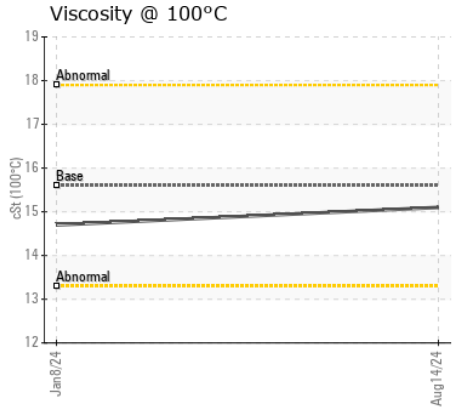
Copper (ppm)



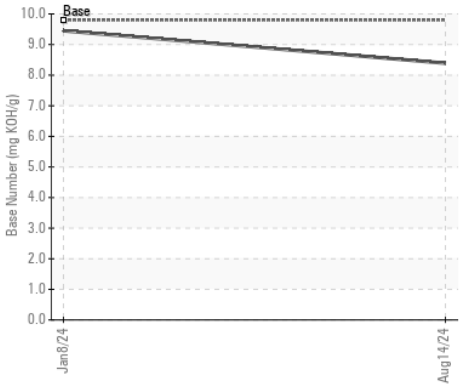
Silicon (ppm)



Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory	: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9		
Sample No.	: OF0001036	**Received**	: 11 Sep 2024
Lab Number	: 02659858	**Tested**	: 11 Sep 2024
Unique Number	: 5841424	**Diagnosed**	: 11 Sep 2024 - 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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MOB II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
HEDDERSON FISHING ENTERPRISES LTD
Machine Id
65FT FISHING VESSEL MV Covenant II
Component
Genset
Fluid
PETRO CANADA DURON HP 15W40 (20 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

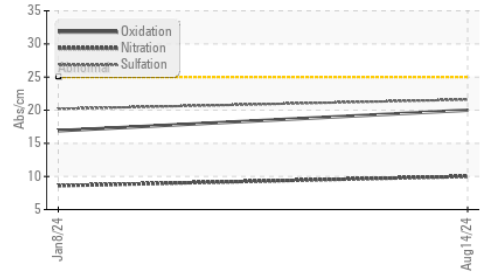
There is no indication of any contamination in the oil.

FLUID CONDITION

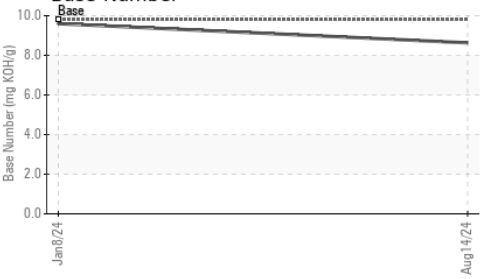
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0001037	OF0000766	---
Sample Date		Client Info		14 Aug 2024	08 Jan 2024	---
Machine Age	hrs	Client Info		20016	6715	---
Oil Age	hrs	Client Info		600	300	---
Filter Age	hrs	Client Info		600	300	---
Oil Changed		Client Info		Not Changd	Changed	---
Filter Changed		Client Info		Changed	Changed	---
Sample Status				NORMAL	NORMAL	---
PQ		ASTM D8184*		0	0	---
Iron	ppm	ASTM D5185(m)	>50	13	46	---
Chromium	ppm	ASTM D5185(m)	>4	<1	<1	---
Nickel	ppm	ASTM D5185(m)	>2	<1	<1	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)	>5	0	0	---
Aluminum	ppm	ASTM D5185(m)	>12	1	5	---
Lead	ppm	ASTM D5185(m)	>17	4	3	---
Copper	ppm	ASTM D5185(m)	>70	160	139	---
Tin	ppm	ASTM D5185(m)	>15	0	<1	---
Vanadium	ppm	ASTM D5185(m)		0	0	---
White Metal	scalar	Visual*	NONE	NONE	NONE	---
Yellow Metal	scalar	Visual*	NONE	NONE	VLITE	---
Silicon	ppm	ASTM D5185(m)	>25	10	5	---
Potassium	ppm	ASTM D5185(m)	>20	<1	<1	---
Fuel		WC Method	>4.0	<1.0	<1.0	---
Water		WC Method	>0.1	NEG	NEG	---
Glycol		WC Method		NEG	NEG	---
Soot %	%	ASTM D7844*		0	0.1	---
Nitration	Abs/cm	ASTM D7624*	>20	10.0	8.6	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	21.6	20.2	---
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	3	---
Boron	ppm	ASTM D5185(m)	0	1	<1	---
Barium	ppm	ASTM D5185(m)	0	<1	0	---
Molybdenum	ppm	ASTM D5185(m)	60	51	60	---
Manganese	ppm	ASTM D5185(m)	0	<1	0	---
Magnesium	ppm	ASTM D5185(m)	1010	977	999	---
Calcium	ppm	ASTM D5185(m)	1070	1032	1090	---
Phosphorus	ppm	ASTM D5185(m)	1150	936	941	---
Zinc	ppm	ASTM D5185(m)	1270	1213	1218	---
Sulfur	ppm	ASTM D5185(m)	2060	2020	2178	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	20.0	16.9	---
Base Number (BN)	mg KOH/g	ASTM D2896*	9.8	8.63	9.60	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.6	13.8	14.6	---

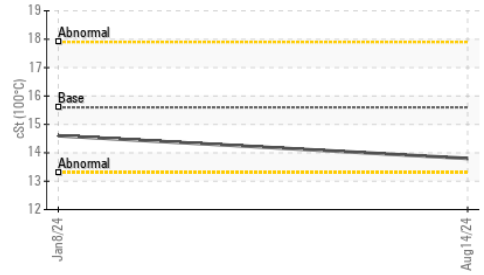
FT-IR (Direct Trend)



Base Number

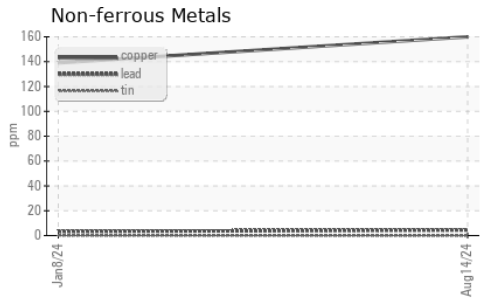


Viscosity @ 100°C

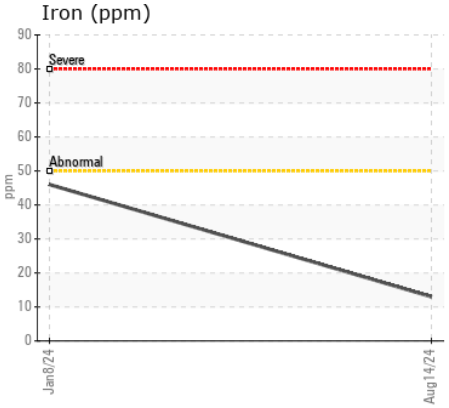


PQ

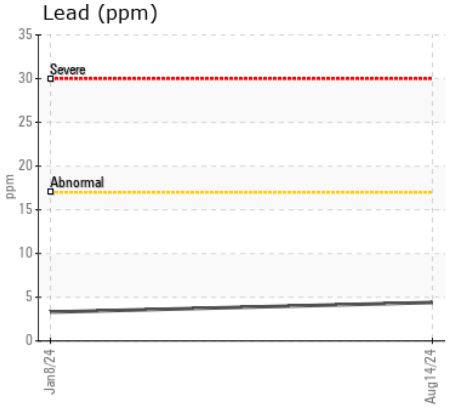
Non-ferrous Metals



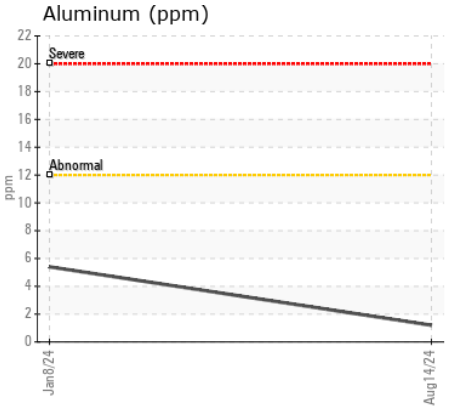
Iron (ppm)



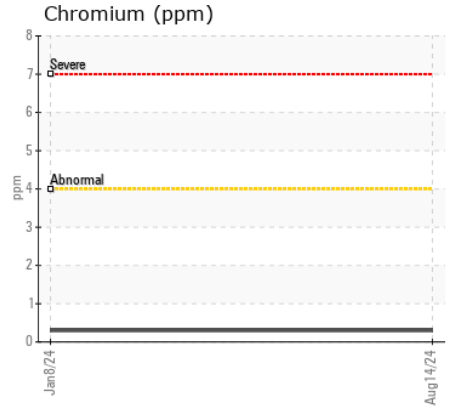
Lead (ppm)



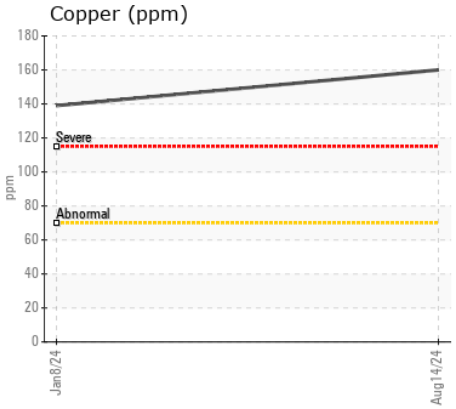
Aluminum (ppm)



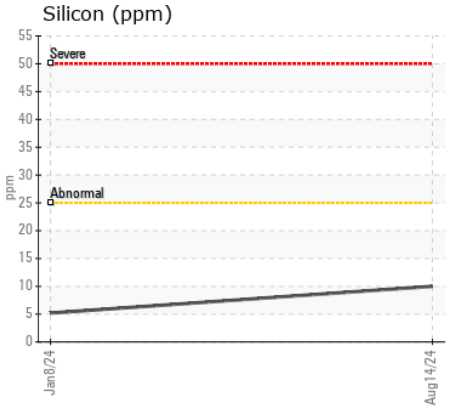
Chromium (ppm)



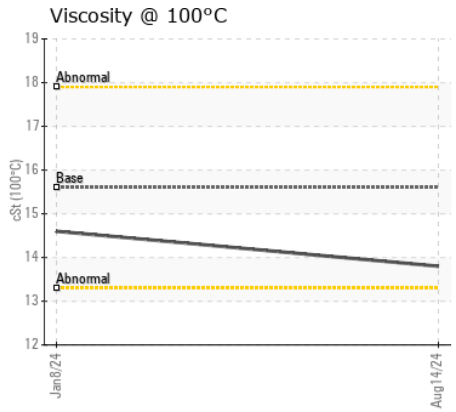
Copper (ppm)



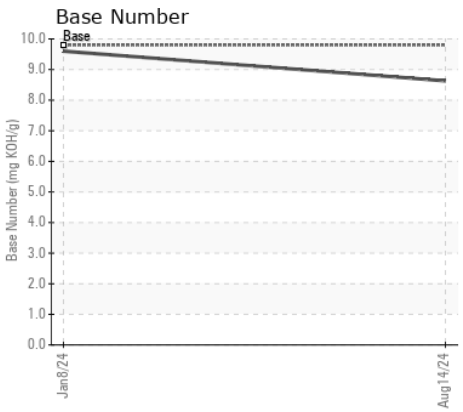
Silicon (ppm)



Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0001037 **Received** : 11 Sep 2024
Lab Number : 02659857 **Tested** : 11 Sep 2024
Unique Number : 5841423 **Diagnosed** : 12 Sep 2024 - Bill Quesnel
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.

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MOB II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
HEDDERSON FISHING ENTERPRISES LTD
Machine Id
65FT FISHING VESSEL MV Covenant II
Component
Auxiliary Diesel Engine
Fluid
PETRO CANADA DURON HP 15W40 (25 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

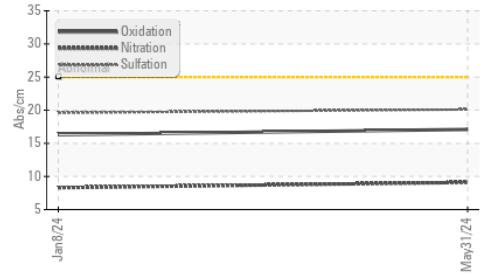
There is no indication of any contamination in the oil.

FLUID CONDITION

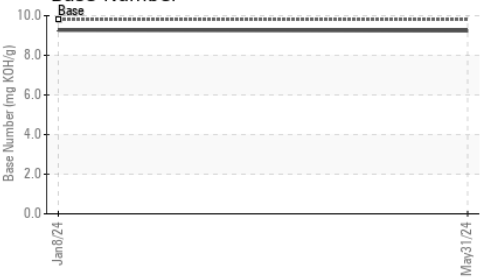
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0001035	OF0000767	---
Sample Date		Client Info		31 May 2024	08 Jan 2024	---
Machine Age	hrs	Client Info		20730	19717	---
Oil Age	hrs	Client Info		1013	300	---
Filter Age	hrs	Client Info		500	300	---
Oil Changed		Client Info		Changed	Changed	---
Filter Changed		Client Info		Changed	Changed	---
Sample Status				NORMAL	NORMAL	---
Iron	ppm	ASTM D5185(m)	>250	28	13	---
Chromium	ppm	ASTM D5185(m)	>10	<1	<1	---
Nickel	ppm	ASTM D5185(m)	>5	<1	<1	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)	>3	0	0	---
Aluminum	ppm	ASTM D5185(m)	>35	2	2	---
Lead	ppm	ASTM D5185(m)	>100	2	4	---
Copper	ppm	ASTM D5185(m)	>60	102	177	---
Tin	ppm	ASTM D5185(m)	>5	0	<1	---
Vanadium	ppm	ASTM D5185(m)		0	0	---
White Metal	scalar	Visual*	NONE	NONE	---	---
Yellow Metal	scalar	Visual*	NONE	NONE	---	---
Silicon	ppm	ASTM D5185(m)	>35	7	9	---
Potassium	ppm	ASTM D5185(m)	>20	<1	<1	---
Fuel		WC Method	>5	<1.0	<1.0	---
Water		WC Method	>0.2	NEG	NEG	---
Glycol		WC Method		NEG	0.0	---
Soot %	%	ASTM D7844*	>3	0	0	---
Nitration	Abs/cm	ASTM D7624*	>20	9.1	8.3	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	20.1	19.6	---
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*	>0.2	NEG	NEG	---
Sodium	ppm	ASTM D5185(m)		3	2	---
Boron	ppm	ASTM D5185(m)	0	<1	<1	---
Barium	ppm	ASTM D5185(m)	0	0	0	---
Molybdenum	ppm	ASTM D5185(m)	60	60	46	---
Manganese	ppm	ASTM D5185(m)	0	<1	0	---
Magnesium	ppm	ASTM D5185(m)	1010	988	974	---
Calcium	ppm	ASTM D5185(m)	1070	1061	1051	---
Phosphorus	ppm	ASTM D5185(m)	1150	934	974	---
Zinc	ppm	ASTM D5185(m)	1270	1221	1184	---
Sulfur	ppm	ASTM D5185(m)	2060	2025	2369	---
Oxidation	Abs/.1mm	ASTM D7414*	>25	17.1	16.3	---
Base Number (BN)	mg KOH/g	ASTM D2896*	9.8	9.24	9.27	---
Visc @ 100°C	cSt	ASTM D7279(m)	15.6	14.3	13.6	---

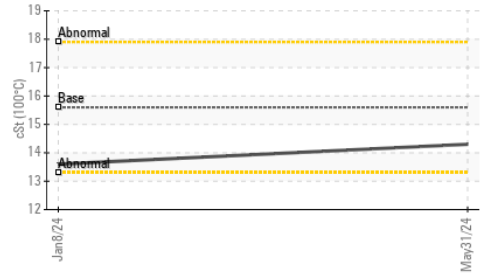
FT-IR (Direct Trend)



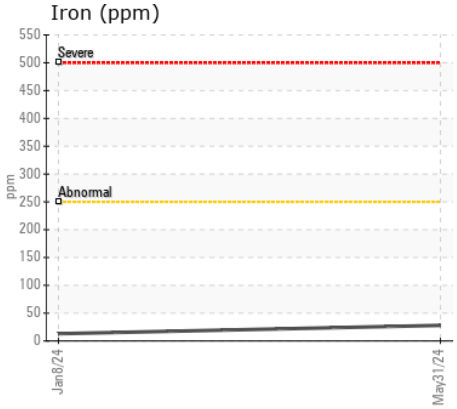
Base Number



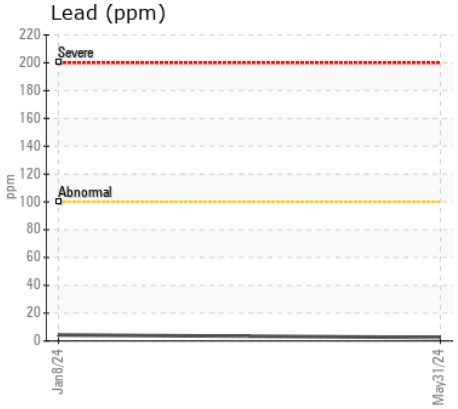
Viscosity @ 100°C



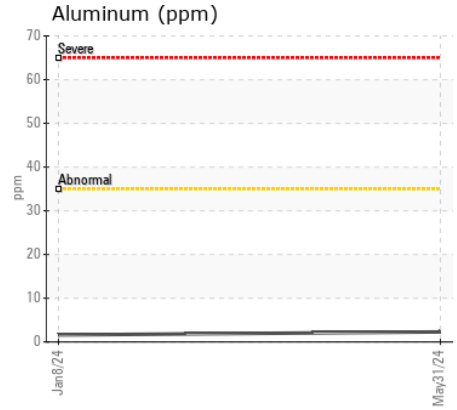
Iron (ppm)



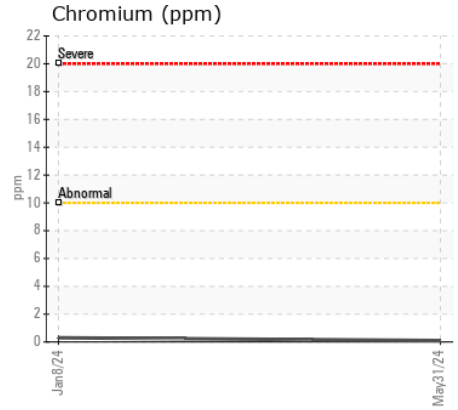
Lead (ppm)



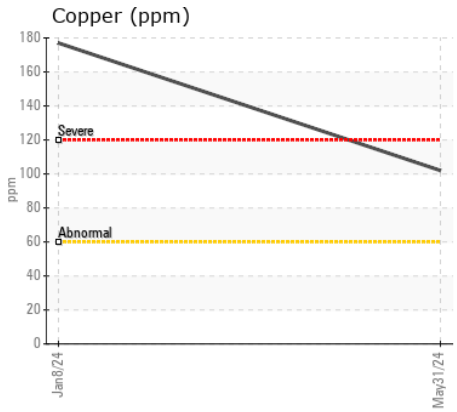
Aluminum (ppm)



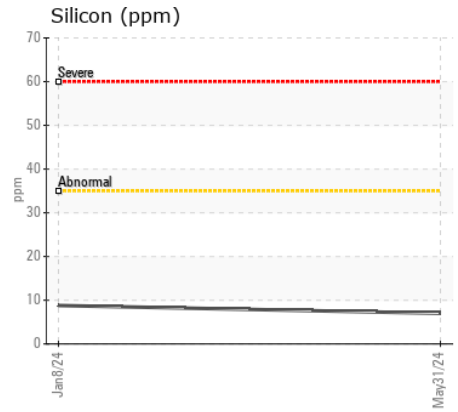
Chromium (ppm)



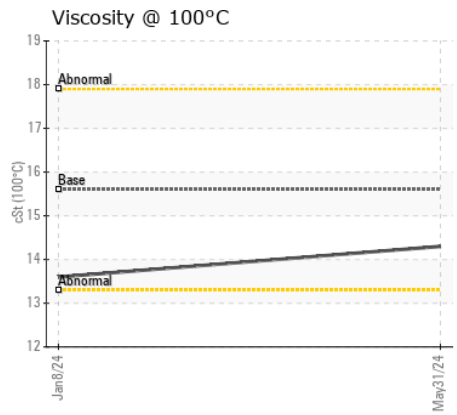
Copper (ppm)



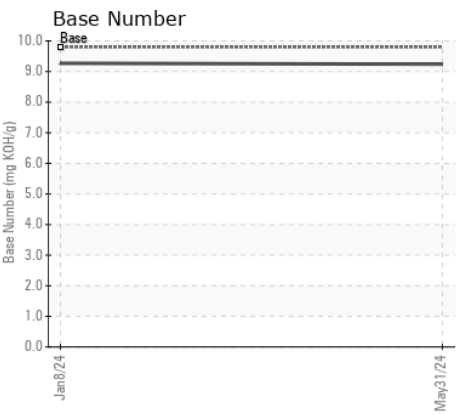
Silicon (ppm)



Viscosity @ 100°C



Base Number



ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0001035 **Received** : 11 Sep 2024
Lab Number : 02659854 **Tested** : 11 Sep 2024
Unique Number : 5841420 **Diagnosed** : 12 Sep 2024 - Bill Quesnel
Test Package : MOB 2 (Additional Tests: 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.

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MOB II WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
HEDDERSON FISHING ENTERPRISES LTD
Machine Id
65FT FISHING VESSEL MV Covenant II
Component
Hydraulic System
Fluid
AW HYDRAULIC OIL ISO 32 (2000 LTR)

RECOMMENDATION

Resample at the next service interval to monitor.

WEAR

All component wear rates are normal.

CONTAMINATION

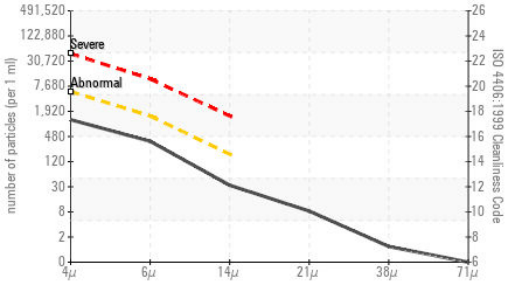
The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The system and fluid cleanliness is acceptable.

FLUID CONDITION

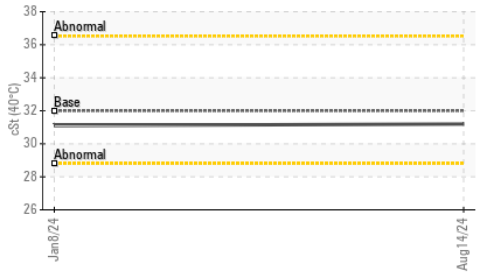
The condition of the oil is acceptable for the time in service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0001039	OF0001033	---
Sample Date		Client Info		14 Aug 2024	08 Jan 2024	---
Machine Age	hrs	Client Info		20802	18845	---
Oil Age	hrs	Client Info		0	18845	---
Filter Age	hrs	Client Info		0	6000	---
Oil Changed		Client Info		Not Changd	Not Changd	---
Filter Changed		Client Info		Changed	N/A	---
Sample Status				NORMAL	SEVERE	---
Iron	ppm	ASTM D5185(m)	>20	4	9	---
Chromium	ppm	ASTM D5185(m)	>10	0	0	---
Nickel	ppm	ASTM D5185(m)	>10	<1	0	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)		0	0	---
Aluminum	ppm	ASTM D5185(m)	>10	<1	<1	---
Lead	ppm	ASTM D5185(m)	>10	0	<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	0	1	---
Potassium	ppm	ASTM D5185(m)	>20	<1	1	---
Water		WC Method	>0.1	NEG	NEG	---
Particles >4µm		ASTM D7647	>5000	1061	▲ 161230	---
Particles >6µm		ASTM D7647	>1300	324	▲ 103129	---
Particles >14µm		ASTM D7647	>160	29	▲ 6063	---
Particles >21µm		ASTM D7647	>40	7	▲ 495	---
Particles >38µm		ASTM D7647	>10	1	10	---
Particles >71µm		ASTM D7647	>3	0	1	---
Oil Cleanliness		ISO 4406 (c)	>19/17/14	17/16/12	▲ 25/24/20	---
Silt	scalar	Visual*	NONE	NONE	NONE	---
Debris	scalar	Visual*	NONE	NONE	VLITE	---
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	8	---
Boron	ppm	ASTM D5185(m)	5	1	<1	---
Barium	ppm	ASTM D5185(m)	5	10	13	---
Molybdenum	ppm	ASTM D5185(m)	5	0	0	---
Manganese	ppm	ASTM D5185(m)		0	0	---
Magnesium	ppm	ASTM D5185(m)	25	2	3	---
Calcium	ppm	ASTM D5185(m)	200	53	58	---
Phosphorus	ppm	ASTM D5185(m)	300	302	301	---
Zinc	ppm	ASTM D5185(m)	370	383	371	---
Sulfur	ppm	ASTM D5185(m)	2500	2599	3087	---
Visc @ 40°C	cSt	ASTM D7279(m)	32	31.2	31.1	---

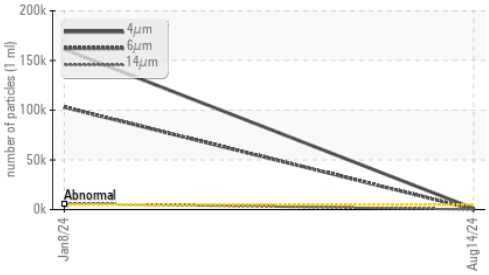
Particle Count



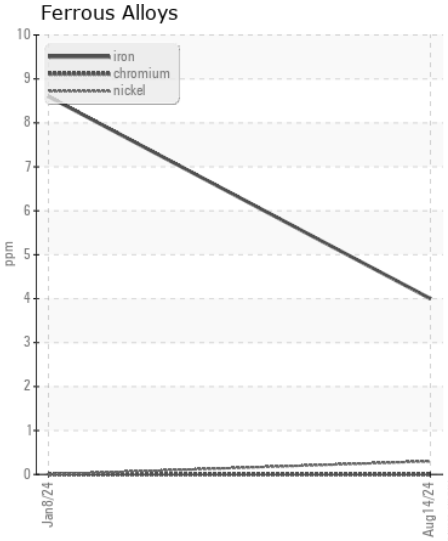
Viscosity @ 40°C



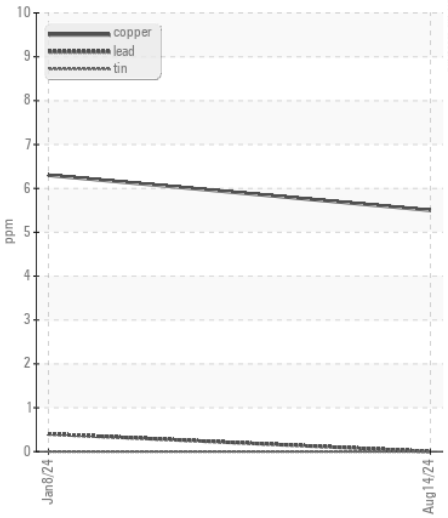
Particle Trend



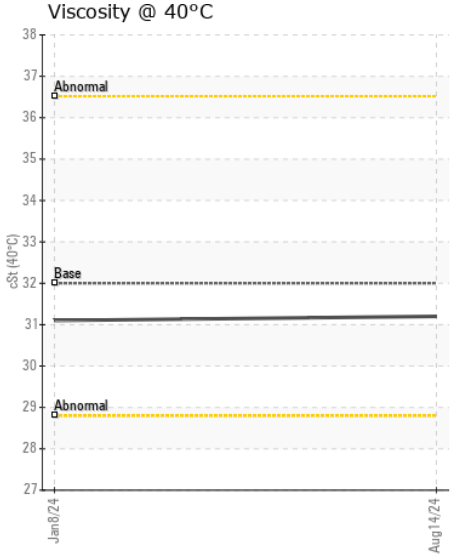
Ferrous Alloys



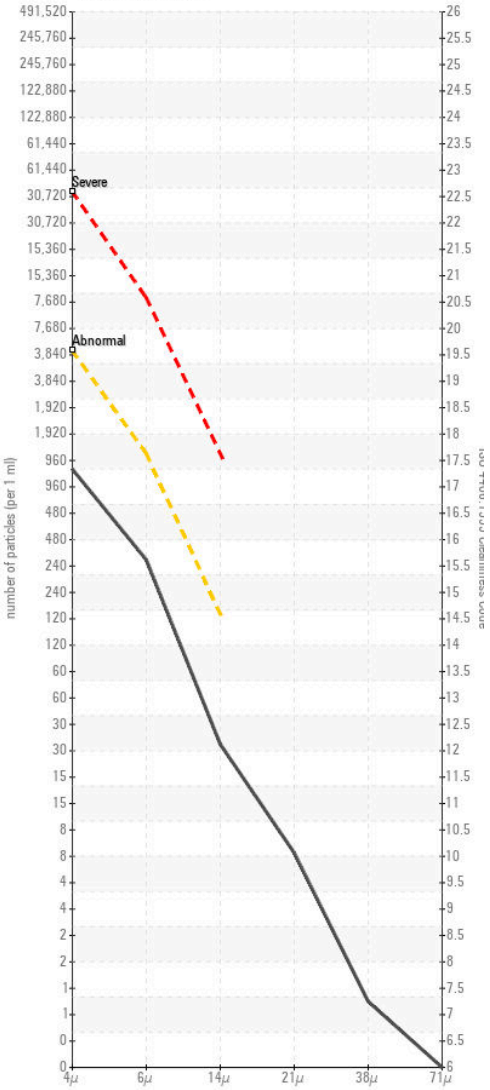
Non-ferrous Metals



Viscosity @ 40°C



Particle Count



ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0001039
Lab Number : 02659884
Unique Number : 5841450
Test Package : MOB 2

Received : 11 Sep 2024
Tested : 12 Sep 2024
Diagnosed : 12 Sep 2024 - Wes Davis

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

MOB II

WEAR CHECK

OIL ANALYSIS REPORT

WEAR	NORMAL
CONTAMINATION	NORMAL
FLUID CONDITION	NORMAL

Area
HEDDERSON FISHING ENTERPRISES LTD
Machine Id
65FT FISHING VESSEL MV Covenant II
Component
Transmission
Fluid
PETRO CANADA DURON MOTOR OIL SAE 30 (25 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 fluid.

FLUID CONDITION

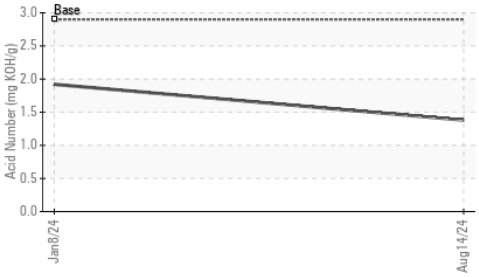
The AN level is acceptable for this fluid. The condition of the fluid is suitable for further service.

Test	UOM	Method	Limit/Abn	Current	History1	History2
Sample Number		Client Info		OF0001038	OF0001034	---
Sample Date		Client Info		14 Aug 2024	08 Jan 2024	---
Machine Age	hrs	Client Info		20802	18845	---
Oil Age	hrs	Client Info		1975	2153	---
Filter Age	hrs	Client Info		475	2153	---
Oil Changed		Client Info		Not Changd	Changed	---
Filter Changed		Client Info		Changed	Changed	---
Sample Status				NORMAL	NORMAL	---
PQ		ASTM D8184*		0	4	---
Iron	ppm	ASTM D5185(m)	>200	14	29	---
Chromium	ppm	ASTM D5185(m)	>10	0	0	---
Nickel	ppm	ASTM D5185(m)		<1	0	---
Titanium	ppm	ASTM D5185(m)		0	0	---
Silver	ppm	ASTM D5185(m)		0	0	---
Aluminum	ppm	ASTM D5185(m)	>50	<1	1	---
Lead	ppm	ASTM D5185(m)	>50	<1	2	---
Copper	ppm	ASTM D5185(m)	>200	3	4	---
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)	>50	7	10	---
Potassium	ppm	ASTM D5185(m)	>20	<1	<1	---
Water		WC Method	>0.1	NEG	NEG	---
Silt	scalar	Visual*	NONE	NONE	NONE	---
Debris	scalar	Visual*	NONE	NONE	VLITE	---
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)		2	<1	---
Boron	ppm	ASTM D5185(m)	1.0	3	<1	---
Barium	ppm	ASTM D5185(m)	1.0	0	0	---
Molybdenum	ppm	ASTM D5185(m)	1.0	<1	0	---
Manganese	ppm	ASTM D5185(m)	1	<1	0	---
Magnesium	ppm	ASTM D5185(m)	15	904	917	---
Calcium	ppm	ASTM D5185(m)	2540	982	1029	---
Phosphorus	ppm	ASTM D5185(m)	1000	1108	1137	---
Zinc	ppm	ASTM D5185(m)	1110	1251	1258	---
Sulfur	ppm	ASTM D5185(m)	3700	2907	2889	---
Acid Number (AN)	mg KOH/g	ASTM D974*	2.9	1.38	1.92	---
Visc @ 40°C	cSt	ASTM D7279(m)	83.2	83.5	75.2	---

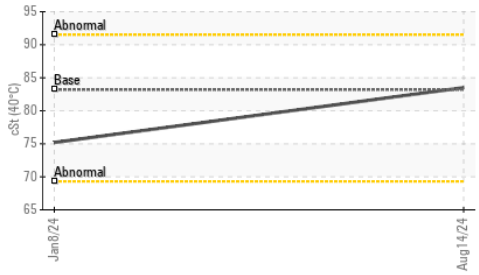
Report Id: FILCON [WCAMIS] 02659895 (Generated: 09/11/2024 17:15:27) Rev: 1

Submitted By: BILL BUTLER

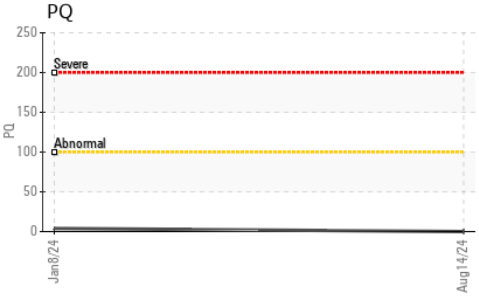
Acid Number



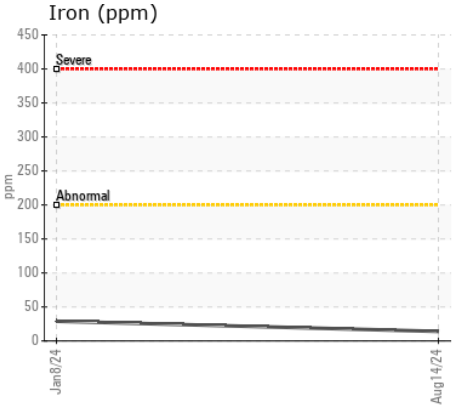
Viscosity @ 40°C



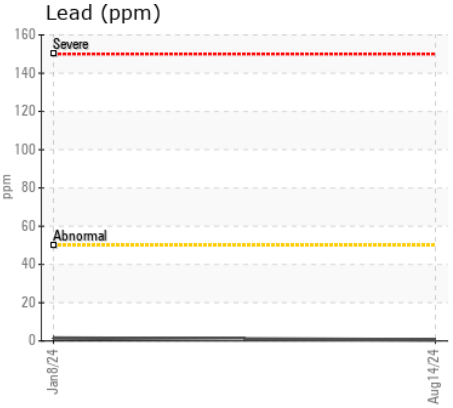
PQ



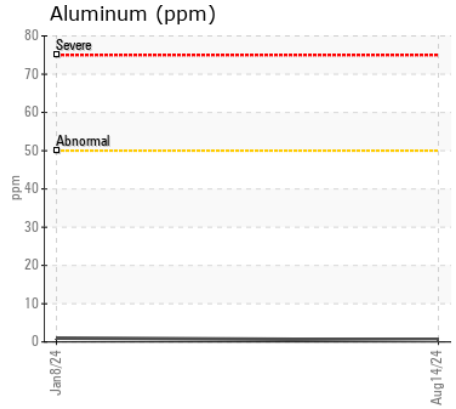
Iron (ppm)



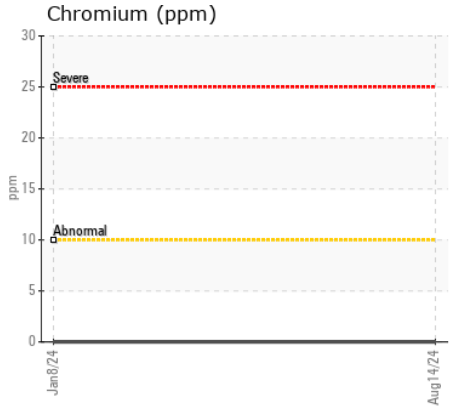
Lead (ppm)



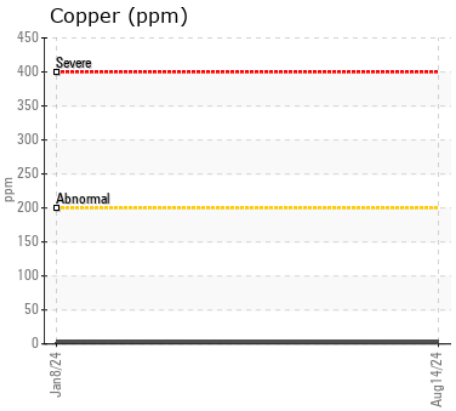
Aluminum (ppm)



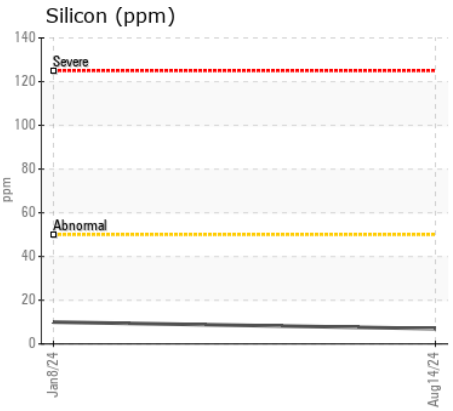
Chromium (ppm)



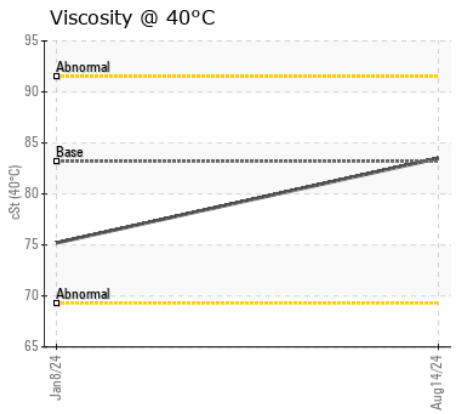
Copper (ppm)



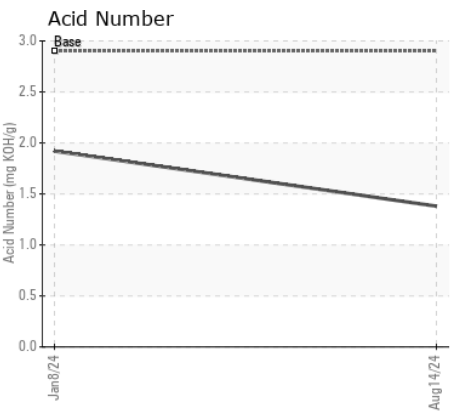
Silicon (ppm)



Viscosity @ 40°C



Acid Number



ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : OF0001038 **Received** : 11 Sep 2024
Lab Number : 02659895 **Tested** : 11 Sep 2024
Unique Number : 5841461 **Diagnosed** : 11 Sep 2024 - 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.
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F: (709)834-8435

G2F Oil Recycling Technology For Commercial Fishing Vessel - Investment Cost, Cost-Savings & Waste-Oil Reduction

Company Name:	**Hedderson Fishing Enterprise**
Contact:	**Newell Hedderson**
Address:	**P.O. Box 820**
	Pouch Cove, NL A0A 2L0
Telephone #:	**709.770.3288**
Email:	newellhedderson@gmail.com
Vessel Name:	**MV Covenant II**
Installation Date:	**January 8, 2024**

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 45-90 liters of oil	1	$2,344.02	$2,344.02	3.00	3.00	250	3,500	14.00	50.00	700.00	175.00	525.00	$5,600.00	$2,477.33	$3,122.67
Engine 1-45 liters of oil	1	$1,860.02	$1,860.02	3.00	3.00	250	2,000	8.00	25.00	200.00	66.67	133.33	$1,620.00	$726.67	$893.33
Engine 1-45 liters of oil	1	$1,860.02	$1,860.02	3.00	3.00	250	2,000	8.00	20.00	160.00	53.33	106.67	$1,400.00	$653.33	$746.67
Hydraulics 800+ liters	1	$3,817.47	$3,817.47	4.00	4.00	2,000	500	0.25	2,000.00	500.00	50.00	450.00	$2,865.00	$778.00	$2,087.00
Transmission	1	$3,144.97	$3,144.97	3.00	3.00	1,000	3,500	3.50	25.00	87.50	29.17	58.33	$813.75	$525.00	$288.75
Elements/Oil Sampling Kits	1	$4,142.00	$4,142.00												
Number of Applications =	**5**		**$17,168.50**		**16.00**					**1,647.50**	**374.17**	**1,273.33**	**$12,298.75**	**$5,160.33**	**$7,138.42**

Engine Oil Type/Brand = **Shell Rotella 15W-30, $99.00/18 liters**
Cost of Oil/litre = **$5.50**
Labor Cost = **$2,560.00**
Labor Cost % of Install cost = **14.91%**
Waste Oil Reduction (l) = **1,273**
CO2 Reduction (tonnes) = **3.6**

FUNDING BREAKDOWN	
Total Cost to Install -	**$17,168.50**
Applicant Contribution (25%) -	**$4,292.13**
DFO Contribution (75%) -	**$12,876.38**

OU = Oil Usage
OM = Oil Maintenance
OCI = Engine Manufacturers Recommended Oil Change Interval