



Summary Report for **CAPE SARINA [9490612]** dated **14-Feb-2024**

COMPANY NAME	UNION MARITIME LTD
VESSEL NAME	CAPE SARINA
IMO NUMBER	9490612
SAMPLE RECEIVED	08-Feb-2024
REPORT RELEASED	18-Mar-2024
PORT SAMPLES LANDED	Indonesia

TOTAL NUMBER OF SAMPLES	6
NORMAL	2
CAUTION	0
CRITICAL	4

SNo	Machinery	Oil Condition	Remarks
1	AUXILIARY ENGINE 1 (CRANKCASE & CYLINDERS)	Critical	High KV@40°C,High Soot/Insoluble,High Vanadium (V)
2	STERN TUBE (SEAL STAND PIPE DRAIN POINT #2)	Critical	High KV@40°C,High AN,High PQ Index/2ml,High Iron (Fe)
3	STERN TUBE (SEAL STAND PIPE DRAIN POINT #3)	Critical	High AN,High Iron (Fe)
4	STERN TUBE (SEAL STAND PIPE DRAIN POINT #4)	Critical	High AN,High Iron (Fe)
5	AUXILIARY ENGINE 2 (CRANKCASE & CYLINDERS)	Normal	
6	STERN TUBE (BEARINGS & SEALS)	Normal	

TOTAL NUMBER OF SAMPLES – TO DATE (Yearly)	37
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Lubricant Condition

Critical

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	YANMAR
Vessel Name	CAPE SARINA	Equipment Model	6N18AL-UV
IMO Number	9490612	Machinery Unit	AUXILIARY ENGINE 1
Report Date	14-Feb-2024	Equipment S/N	7321 FSK
Product Name	GULFSEA POWER 3030	Sample Location	FILTER

Sample Information	11	12	13	14	15	
Sample No	23032466	23071057	23116144	24000320	24509183	
Bottle No	60066155	60116158	60227961	60227840	60237079	
Date Received	30-Mar-23	19-Jul-23	27-Nov-23	02-Jan-24	08-Feb-24	
Sampled Date	21-Mar-23	15-Jun-23	02-Oct-23	19-Dec-23	02-Feb-24	
Port of Origin	Richards Bay	Kamsar	Mundra	Singapore	Indonesia	
Oil on Label	GS 3030	GS 3030	GS 3030	GS 3030	GS 3030	
Fuel In Use (Sulphur)(%)	3.0500	3.0500	2.7500	2.7500	3.0500	
Total Machine Hours	56971	58754	60687	61909	62560	
Lubricant Hours	2248	2254				
Lubricant Condition	Normal	Normal	Normal	Critical	Critical	
Results						
Analysis						
KV@40°C [mm²/s]	113.7	105.1	110.8	125.8	129.5	
KV@100°C [mm²/s]	12.79	12.26	12.48	13.82	14.89	
Viscosity Index [-]	106	108	104	108	117	
Water [%wt]	0.06	0.08	0.18	0.09	0.10	
BN [mgKOH/g]	28.1	28.4	26.7	23.1	21.3	
Flash Point [°C]	Pass	Pass	Pass	Pass	Pass	
Soot/Insoluble [%wt]	0.80	0.40	0.70	2.1	2.3	
PQ Index/2ml	<10	<10	<10	<10	<10	
Wear Elements [ppm]						
Aluminium (Al)	4	2	3	7	<1	
Chromium (Cr)	1	1	1	2	2	
Copper (Cu)	1	<1	1	2	5	
Iron (Fe)	11	5	13	20	38	
Lead (Pb)	<1	<1	<1	<1	<1	
Tin (Sn)	<1	<1	<1	2	<1	
Cont. Elements [ppm]						
Sodium (Na)	13	6	12	16	24	
Silicon (Si)	13	18	18	11	<1	
Molybdenum (Mo)	1	<1	<1	1	<1	
Nickel (Ni)	15	6	14	38	58	
Silver (Ag)	<1	<1	<1	<1	<1	
Vanadium (V)	48	21	60	241	299	
Barium (Ba)	<1	<1	<1	<1	<1	
Lithium (Li)	<1	<1	<1	<1	<1	

Recommendations :

Excessive blow-by or partly or unburned fuel might have caused the viscosity and soot increase. The oil is not suitable for further use provided the landed used oil sample is representative for the application.

Elemental analysis is provided for your reference. Your attention is drawn to the level of elemental analysis. The cause of the results should be investigated.

Please check injectors and injection viscosity to achieve an optimal spray cone in the combustion chamber. Efficient purification of the oil shall be ensured with reduced purifier throughput at 93°C to 98°C, daily five times for the entire sump. In case the lubricant condition cannot be maintained in line with the OEM's recommendations e.g. due to low oil consumption, it might be necessary to freshen the sump with new oil from time to time to be in line with the OEM's specific lube oil consumption.



Lubricant Condition

Critical

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	KEMEL
Vessel Name	CAPE SARINA	Equipment Model	DX-750
IMO Number	9490612	Machinery Unit	STERN TUBE
Report Date	14-Feb-2024	Equipment S/N	X-38961
Product Name	GULFSEA SUPERBEAR 3006	Sample Location	SEAL STAND PIPE DRAIN POINT #2

Sample Information				1	2	
Sample No				24000325	24509186	
Bottle No				60273105	60237076	
Date Received				02-Jan-24	08-Feb-24	
Sampled Date				19-Dec-23	02-Feb-24	
Port of Origin				Singapore	Indonesia	
Oil on Label				HYDROX BIO 100	HYDROX BIO 100	
Fuel In Use (Sulphur)(%)						
Total Machine Hours				82496	83114	
Lubricant Hours						
Lubricant Condition				Critical	Critical	
Results						
Analysis						
KV@40°C [mm²/s]				138.6	128.5	
Water [%wt]				0.30	0.40	
Oxidation [Abs/0.1mm]				3.84	3.12	
AN [mgKOH/g]				10.3	7.92	
PQ Index/2ml				13	67	
Wear Elemental Analysis [ppm]						
Aluminium (Al)				3	<1	
Silver (Ag)				<1	<1	
Chromium (Cr)				1	<1	
Copper (Cu)				38	26	
Iron (Fe)				588	1111	
Lead (Pb)				<1	3	
Tin (Sn)				6	9	
Nickel (Ni)				1	1	
Cont. Elements [ppm]						
Boron (B)				<1	1	
Sodium (Na)				44	50	
Magnesium (Mg)				7	5	
Silicon (Si)				7	<1	
Manganese (Mn)				3	3	
Potassium (K)				<1	<1	
Barium (Ba)				1	<1	
Additive Elements [ppm]						
Calcium (Ca)				121	113	

Recommendations :

Please note the increase in Viscosity & Acid number. Oil oxidation reaction, oil quality degradation, hydrolysis, mix up with another oil grade etc. are the typical reasons for viscosity & acid number increase. Apart from degrading the oil quality, increased acidity can create issues on seal lips. Presence of lube oil additive metal presence in this sample is indicative of other oil grade mix up which might have been caused either by the inadequate flushing during the transition or during top up. The oil is not suitable for further use provided the landed used oil sample is representative for the application. PQ Index and Elemental Fe results shows the severe wear condition in the system. Higher PQ Index & Fe results indicates the presence of ferromagnetic particles in the oil which might have been caused by the abrasive wear on ferrous components in the system. Ensure correct grade is used for top-up. Please investigate the contamination sources of water ingress & ferromagnetic particles in the lube oil and take appropriate corrective measures.



Lubricant Condition

Critical

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	KEMEL
Vessel Name	CAPE SARINA	Equipment Model	DX-750
IMO Number	9490612	Machinery Unit	STERN TUBE
Report Date	14-Feb-2024	Equipment S/N	X-38961
Product Name	GULFSEA SUPERBEAR 3006	Sample Location	SEAL STAND PIPE DRAIN POINT #3

Sample Information				1	2	
Sample No				24000326	24509187	
Bottle No				60273104	60237077	
Date Received				02-Jan-24	08-Feb-24	
Sampled Date				19-Dec-23	02-Feb-24	
Port of Origin				Singapore	Indonesia	
Oil on Label				HYDROX BIO 100	HYDROX BIO 100	
Fuel In Use (Sulphur)(%)						
Total Machine Hours					83114	
Lubricant Hours						
Lubricant Condition				Critical	Critical	
Results						
Analysis						
KV@40°C [mm²/s]				137.5	114.8	
Water [%wt]				0.28	0.15	
Oxidation [Abs/0.1mm]				3.70	2.36	
AN [mgKOH/g]				10.4	5.04	
PQ Index/2ml				<10	<10	
Wear Elemental Analysis [ppm]						
Aluminium (Al)				3	<1	
Silver (Ag)				<1	<1	
Chromium (Cr)				<1	<1	
Copper (Cu)				39	17	
Iron (Fe)				145	218	
Lead (Pb)				<1	1	
Tin (Sn)				5	4	
Nickel (Ni)				1	<1	
Cont. Elements [ppm]						
Boron (B)				<1	<1	
Sodium (Na)				30	39	
Magnesium (Mg)				5	2	
Silicon (Si)				4	<1	
Manganese (Mn)				1	1	
Potassium (K)				<1	<1	
Barium (Ba)				<1	<1	
Additive Elements [ppm]						
Calcium (Ca)				112	98	

Recommendations :

Please note the increase in Acid number. Oil oxidation reaction, Hydrolysis, mix-up with another oil grade etc are the typical reasons for Acid number increase. Apart from degrading the oil quality, increased acidity can create issues on seal lips. Presence of lube oil additive metal presence in this sample is indicative of other oil grade mix up which might have been caused either by the inadequate flushing during the transition or during top up. The oil is not suitable for further use provided the landed used oil sample is representative for the application.

Elemental analysis shows significant wear rate of Iron. High Fe and low PQ results indicates corrosive wear (rust) on the ferrous components.

Ensure correct grade is used for top-up. Wear source of Iron shall be identified and appropriate corrective measures taken.



Lubricant Condition

Critical

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	KEMEL
Vessel Name	CAPE SARINA	Equipment Model	DX-750
IMO Number	9490612	Machinery Unit	STERN TUBE
Report Date	14-Feb-2024	Equipment S/N	X-38961
Product Name	GULFSEA SUPERBEAR 3006	Sample Location	SEAL STAND PIPE DRAIN POINT #4

Sample Information				1	2	
Sample No				24000327	24509188	
Bottle No				60273106	60237078	
Date Received				02-Jan-24	08-Feb-24	
Sampled Date				19-Dec-23	02-Feb-24	
Port of Origin				Singapore	Indonesia	
Oil on Label				HYDROX BIO 100	HYDROX BIO 100	
Fuel In Use (Sulphur)(%)						
Total Machine Hours				82496	83114	
Lubricant Hours						
Lubricant Condition				Critical	Critical	
Results						
Analysis						
KV@40°C [mm²/s]				146.9	114.9	
Water [%wt]				0.05	0.17	
Oxidation [Abs/0.1mm]				3.54	2.16	
AN [mgKOH/g]				9.62	5.01	
PQ Index/2ml				<10	<10	
Wear Elemental Analysis [ppm]						
Aluminium (Al)				3	<1	
Silver (Ag)				<1	<1	
Chromium (Cr)				1	<1	
Copper (Cu)				145	18	
Iron (Fe)				123	221	
Lead (Pb)				<1	<1	
Tin (Sn)				6	4	
Nickel (Ni)				1	<1	
Cont. Elements [ppm]						
Boron (B)				<1	<1	
Sodium (Na)				34	38	
Magnesium (Mg)				7	2	
Silicon (Si)				9	<1	
Manganese (Mn)				1	1	
Potassium (K)				<1	<1	
Barium (Ba)				1	<1	
Additive Elements [ppm]						
Calcium (Ca)				116	98	

Recommendations :

Please note the increase in Acid number. Oil oxidation reaction, Hydrolysis, mix-up with another oil grade etc are the typical reasons for Acid number increase. Apart from degrading the oil quality, increased acidity can create issues on seal lips. Presence of lube oil additive metal presence in this sample is indicative of other oil grade mix up which might have been caused either by the inadequate flushing during the transition or during top up. The oil is not suitable for further use provided the landed used oil sample is representative for the application.

Elemental analysis shows significant wear rate of Iron. High Fe and low PQ results indicates corrosive wear (rust) on the ferrous components.

Ensure correct grade is used for top-up. Wear source of Iron shall be identified and appropriate corrective measures taken.



Lubricant Condition

Normal

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	YANMAR
Vessel Name	CAPE SARINA	Equipment Model	6N18AL-UV
IMO Number	9490612	Machinery Unit	AUXILIARY ENGINE 2
Report Date	14-Feb-2024	Equipment S/N	7322 FSK
Product Name	GULFSEA POWER 3030	Sample Location	FILTER

Sample Information	12	13	14	15	16
Sample No	23071058	23545871	23116145	24000321	24509184
Bottle No	60116159	60243445	60227960	60227841	60237080
Date Received	19-Jul-23	16-Aug-23	27-Nov-23	02-Jan-24	08-Feb-24
Sampled Date	15-Jun-23	08-Aug-23	02-Oct-23	19-Dec-23	02-Feb-24
Port of Origin	Kamsar	Singapore	Mundra	Singapore	Indonesia
Oil on Label	GS 3030	GS 3030	GS 3030	GS 3030	GS 3030
Fuel In Use (Sulphur)(%)	3.0500	3.0500	2.7500	2.7500	3.0500
Total Machine Hours	53870		55105	56247	57221
Lubricant Hours	1520				404
Lubricant Condition	Critical	Normal	Normal	Critical	Normal
Results					
Analysis					
KV@40°C [mm²/s]	129.8	103.1	104.9	123.6	106.6
KV@100°C [mm²/s]	13.68	12.05	11.85	13.69	11.97
Viscosity Index [-]	101	108	102	108	102
Water [%wt]	0.16	0.05	0.15	0.10	0.10
BN [mgKOH/g]	18.6	28.4	28.9	22.7	28.0
Flash Point [°C]	Pass	Pass	Pass	Pass	Pass
Soot/Insoluble [%wt]	3.6	0.70	0.60	2.1	1.1
PQ Index/2ml	<10	<10	<10	<10	<10
Wear Elements [ppm]					
Aluminium (Al)	10	3	2	7	<1
Chromium (Cr)	4	1	<1	2	<1
Copper (Cu)	20	2	1	3	<1
Iron (Fe)	29	7	7	27	15
Lead (Pb)	2	<1	<1	<1	<1
Tin (Sn)	2	<1	<1	2	<1
Cont. Elements [ppm]					
Sodium (Na)	40	13	6	17	6
Silicon (Si)	10	23	17	13	<1
Molybdenum (Mo)	5	1	<1	1	<1
Nickel (Ni)	53	8	6	41	15
Silver (Ag)	<1	<1	<1	<1	<1
Vanadium (V)	180	27	26	275	66
Barium (Ba)	<1	<1	<1	<1	<1
Lithium (Li)	<1	<1	<1	<1	<1

Recommendations :

The oil is fit for further use provided the landed used oil sample is representative for the application.
Wear rate is normal; no abnormalities are evident.
No action required.



Lubricant Condition

Normal

Equipment Information

Company Name	UNION MARITIME LTD	Equipment Make	KEMEL
Vessel Name	CAPE SARINA	Equipment Model	DX-750
IMO Number	9490612	Machinery Unit	STERN TUBE
Report Date	14-Feb-2024	Equipment S/N	X-38961
Product Name	GULFSEA SUPERBEAR 3006	Sample Location	POINT #1

Sample Information	9	10	11	12	13
Sample No	23032470	23071061	23116148	24000324	24509185
Bottle No	60066352	60116165	60227966	60227845	60237075
Date Received	30-Mar-23	19-Jul-23	27-Nov-23	02-Jan-24	08-Feb-24
Sampled Date	21-Mar-23	15-Jun-23	02-Oct-23	19-Dec-23	02-Feb-24
Port of Origin	Richards Bay	Kamsar	Mundra	Singapore	Indonesia
Oil on Label	GS BD 100	GS BD 100	GS BD 100	HYDROX BIO 100	HYDROX BIO 100
Fuel In Use (Sulphur)(%)					
Total Machine Hours		79269		82496	83114
Lubricant Hours					
Lubricant Condition	Normal	Normal	Critical	Critical	Normal
Results					
Analysis					
KV@40°C [mm²/s]	109.8	106.6	127.8	137.1	113.4
Water [%wt]	<0.05	<0.05	<0.05	0.24	0.15
Oxidation [Abs/0.1mm]	2.01	3.01	0.43	3.24	2.01
AN [mgKOH/g]	3.52	3.32	8.27	10.2	4.98
PQ Index/2ml	<10	<10	<10	<10	<10
Wear Elemental Analysis [ppm]					
Aluminium (Al)	1	<1	1	3	<1
Silver (Ag)	<1	<1	<1	<1	<1
Chromium (Cr)	<1	<1	<1	<1	<1
Copper (Cu)	10	10	33	38	17
Iron (Fe)	39	35	95	124	219
Lead (Pb)	<1	<1	1	<1	<1
Tin (Sn)	1	2	4	5	4
Nickel (Ni)	1	1	1	1	1
Cont. Elements [ppm]					
Boron (B)	<1	<1	<1	<1	<1
Sodium (Na)	15	17	21	22	38
Magnesium (Mg)	3	23	4	16	2
Silicon (Si)	5	5	4	4	<1
Manganese (Mn)	<1	<1	1	1	1
Potassium (K)	<1	<1	<1	<1	<1
Barium (Ba)	<1	<1	<1	<1	<1
Additive Elements [ppm]					
Calcium (Ca)	199	99	191	104	93

Recommendations :

Viscosity result is within the normal limit. Please note the increase in Acid number. Oil oxidation reaction, Hydrolysis, mix-up with another oil grade etc are the typical reasons for Acid number increase. Apart from degrading the oil quality, increased acidity can create issues on seal lips. Presence of lube oil additive metal presence in this sample is indicative of other oil grade mix up which might have been caused either by the inadequate flushing during the transition or during top up.

Elemental analysis shows significant wear rate of Iron. High Fe and low PQ results indicates corrosive wear (rust) on the ferrous components.

Ensure correct grade is used for top-up. Wear source of Iron shall be identified and appropriate corrective measures taken.



Parameters Explanation – UOA

Analysis	
KV@40°C [mm²/s]	A measure of the resistance of a liquid to flow at 40°C. Commonly referred to as the 'thickness of an oil'.
KV@100°C [mm²/s]	A measure of the resistance of a liquid to flow at 100°C. Commonly referred to as the 'thickness of an oil'.
Viscosity Index [-]	A measure of an oil's resistance to change in viscosity (thickness or resistance to flow) with temperature variations
BN [mgKOH/g]	A measure of the reserve alkalinity of an engine oil and its ability to neutralise harmful acids.
AN [mgKOH/g]	Tests the acidity of the oil. Certain oils have an inherent acidity level related to their additive chemistry. Increasing acidity may be indicative of the presence of organic acids derived from oil oxidation.
Oxidation [Abs/0.1mm]	A measure of the extent of oxidation that has occurred in an oil sample
Flash Point [°C] Pass/Fail	Primarily a test for fuel dilution in engine oils. A decrease in flash point is generally an indication of fuel ingress which has contaminated the lubricant.
Soot/Insoluble [%wt]	A test for the total solids contamination in a lubricant such as combustion soot, dirt, oxidation products and metal wear debris.
Water [%wt]	The percentage (by weight) of the total amount of water contamination.
PQ Index/2ml	A quantitative assessment of the amount of ferrous wear debris in the sample.
ISO Code	It is used to communicate particulate contamination in oil.
Wear Elemental [ppm]	
Aluminium (Al)	Pistons, bearings, housings, fuel derivative
Chromium (Cr)	Piston rings
Copper (Cu)	Bearings, gears, oil coolers, pipe-work, piston-rod glands
Iron (Fe)	Cylinder liners, crankshafts, piston rings, gears
Lead (Pb)	Bearings
Tin (Sn)	Bearings
Cont. Elements [ppm]	
Sodium (Na)	Salt water, coolant derivative, fuel derivative
Silicon (Si)	Dust, dirt, fuel derivative, lubricant derivative
Molybdenum (Mo)	Piston rings
Nickel (Ni)	Bearings, valves, gears, fuel derivative
Silver (Ag)	Bearings
Vanadium (V)	Fuel derivative
Additive Elements [ppm]	
Barium (Ba)	Lubricant derivative
Boron (B)	Lubricant derivative
Lithium (Li)	Lubricant derivative
Zinc (Zn)	Lubricant derivative
Phosphorus (P)	Lubricant derivative
Calcium (Ca)	Lubricant derivative