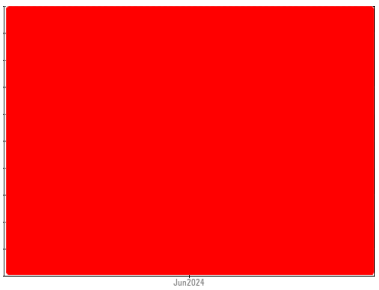
PROBLEM SUMMARY

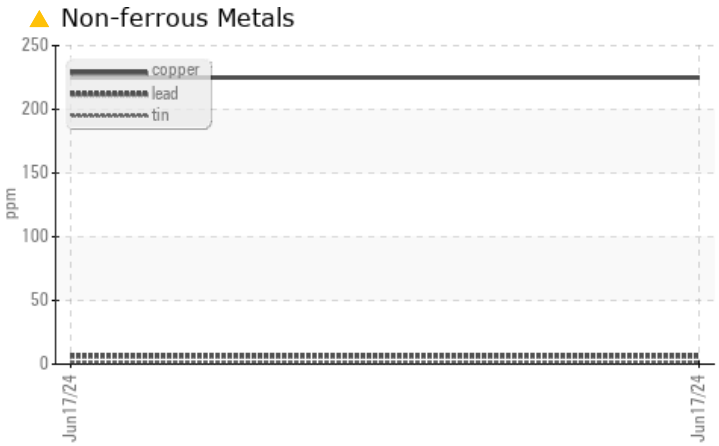
Sample Rating Trend

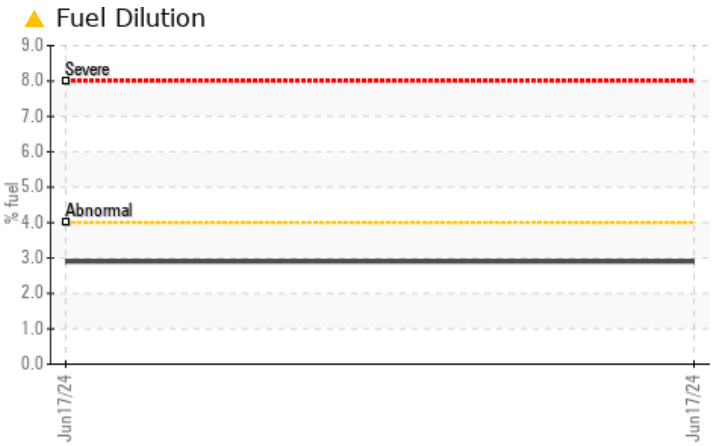


WEAR PARTICLES

Area
[R1230960/Y0604A]
Machine Id
HYUNDAI KMHHT6KDU083116
Component
Gasoline Engine
Fluid
GASOLINE ENGINE OIL SAE 5W20 (--- LTR)

COMPONENT CONDITION SUMMARY





RECOMMENDATION

We advise that you check for visible metal particles in the oil. We recommend that you drain the oil from the component if this has not already been done. An inspection for the source(s) of wear may be warranted at this time. Re-sampling is suggested to confirm test results prior to significant maintenance activities being performed. Please indicate that this is a resample on your Sample Information Form (SIF). Please specify the brand, type, and viscosity of the oil on your next sample. Diagnostician's Note: The filter contained a very high amount of ferrous and non-ferrous wear exhibiting tempering indicating a rapid failure due to a lack of lubrication. The oil condition is on specification.

PROBLEMATIC TEST RESULTS

Sample Status				**SEVERE**	---	---
Silver	ppm	ASTM D5185(m)	>2	▲ **3**	---	---
Copper	ppm	ASTM D5185(m)	>155	▲ **225**	---	---
Ferrous Rubbing	Scale 0-10	ASTM D7684*		▲ **10**		
Ferrous Sliding	Scale 0-10	ASTM D7684*		▲ **8**		
Ferrous Rolling	Scale 0-10	ASTM D7684*		▲ **8**		
Nonferrous Rubbing	Scale 0-10	ASTM D7684*		▲ **5**		
Nonferrous Sliding	Scale 0-10	ASTM D7684*		▲ **6**		
Nonferrous Rolling	Scale 0-10	ASTM D7684*		▲ **5**		
Patch Weight	mg	ASTM D7684*		▲ **10230**	---	---
Fuel	%	ASTM D7593*	>4.0	▲ **2.9**	---	---
White Metal	scalar	Visual*	NONE	▲ **HEAVY**	---	---

Customer Id: JENOSH
Sample No.: WC486642
Lab Number: 02646200
Test Package: INS

To manage this report scan the QR code

To discuss the diagnosis or test data:
Bill Quesnel CLS,OMA II,MLA-III,LLA-I +1 (289)291-4641 x4641
Bill.Quesnel@wearcheck.com

To change component or sample information:
Gloria Gonzalez +1 (289)291-4643 x4643
gloria.gonzalez@wearcheck.com

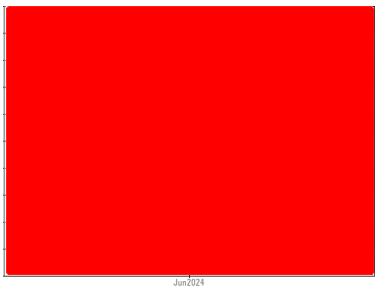
RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Inspect Wear Source	---	---	?	An inspection for the source(s) of wear may be warranted at this time.
Change Fluid	---	---	?	We recommend that you drain the oil from the component if this has not already been done.
Resample	---	---	?	Re-sampling is suggested to confirm test results prior to significant maintenance activities being performed. Please indicate that this is a resample on your Sample Information Form (SIF).
Information Required	---	---	?	Please specify the brand, type, and viscosity of the oil on your next sample.
Check For Visual Metal	---	---	?	We advise that you check for visible metal particles in the oil.

HISTORICAL DIAGNOSIS

OIL ANALYSIS REPORT

Sample Rating Trend



WEAR PARTICLES

Area
[R1230960/Y0604A]
Machine Id
HYUNDAI KMHHT6KDU083116
Component
Gasoline Engine
Fluid
GASOLINE ENGINE OIL SAE 5W20 (--- LTR)

DIAGNOSIS

Recommendation

We advise that you check for visible metal particles in the oil. We recommend that you drain the oil from the component if this has not already been done. An inspection for the source(s) of wear may be warranted at this time. Re-sampling is suggested to confirm test results prior to significant maintenance activities being performed. Please indicate that this is a resample on your Sample Information Form (SIF). Please specify the brand, type, and viscosity of the oil on your next sample. Diagnostician's Note: The filter contained a very high amount of ferrous and non-ferrous wear exhibiting tempering indicating a rapid failure due to a lack of lubrication. The oil condition is on specification.

Wear Particles

Wear particle analysis indicates that the ferrous rolling, patch weight and nonferrous sliding and ferrous sliding and nonferrous rolling particles are severe. Silver, copper ppm levels are abnormal. Wear particle analysis indicates that the ferrous rubbing, nonferrous rubbing particles are abnormal. High concentration of visible metal present. Piston, ring and cylinder wear is indicated. There is a possible bearing failure in progress. High wear metal levels reflect the reported failure.

Contaminants

Light fuel dilution occurring. No other contaminants were detected in the oil.

SAMPLE INFORMATION		method	limit/base	current	history1	history2
Sample Number		Client Info		**WC486642**	---	---
Sample Date		Client Info		**17 Jun 2024**	---	---
Machine Age	kms	Client Info		**103347**	---	---
Oil Age	kms	Client Info		**0**	---	---
Oil Changed		Client Info		**N/A**	---	---
Sample Status				**SEVERE**	---	---

CONTAMINATION		method	limit/base	current	history1	history2
Water		WC Method	>0.2	**NEG**	---	---
Glycol		WC Method		**NEG**	---	---

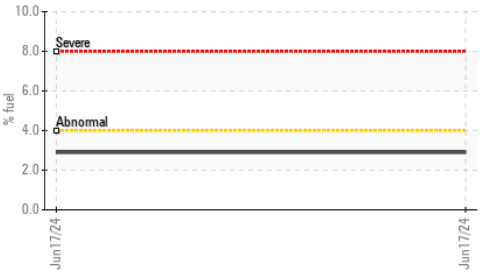
WEAR METALS		method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185(m)	>150	**42**	---	---
Chromium	ppm	ASTM D5185(m)	>20	**<1**	---	---
Nickel	ppm	ASTM D5185(m)	>5	**0**	---	---
Titanium	ppm	ASTM D5185(m)		**<1**	---	---
Silver	ppm	ASTM D5185(m)	>2	▲ **3**	---	---
Aluminum	ppm	ASTM D5185(m)	>40	**2**	---	---
Lead	ppm	ASTM D5185(m)	>50	**6**	---	---
Copper	ppm	ASTM D5185(m)	>155	▲ **225**	---	---
Tin	ppm	ASTM D5185(m)	>10	**2**	---	---
Antimony	ppm	ASTM D5185(m)		**0**	---	---
Vanadium	ppm	ASTM D5185(m)		**0**	---	---
Beryllium	ppm	ASTM D5185(m)		**0**	---	---
Cadmium	ppm	ASTM D5185(m)		**0**	---	---

FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		▲ 10		
Ferrous Sliding	Scale 0-10	ASTM D7684*		▲ 8		
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*		▲ 8		
Ferrous Break-in	Scale 0-10	ASTM D7684*				
Ferrous Spheres	Scale 0-10	ASTM D7684*				
Ferrous Black Oxides	Scale 0-10	ASTM D7684*				
Ferrous Red Oxides	Scale 0-10	ASTM D7684*				
Ferrous Corrosive	Scale 0-10	ASTM D7684*				
Ferrous Other	Scale 0-10	ASTM D7684*				
Nonferrous Rubbing	Scale 0-10	ASTM D7684*		▲ 5		
Nonferrous Sliding	Scale 0-10	ASTM D7684*		▲ 6		
Nonferrous Cutting	Scale 0-10	ASTM D7684*				
Nonferrous Rolling	Scale 0-10	ASTM D7684*		▲ 5		
Nonferrous Other	Scale 0-10	ASTM D7684*				
Sand/Dirt	Scale 0-10	ASTM D7684*		2		
Fibres	Scale 0-10	ASTM D7684*		1		
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*				
Patch Weight	mg	ASTM D7684*		▲ **10230**	---	---

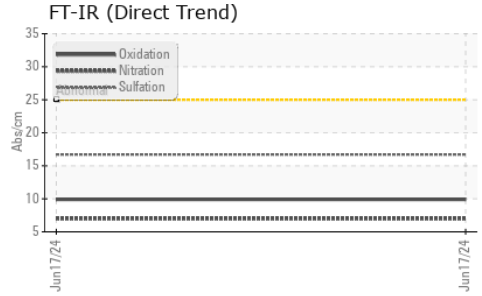
OIL ANALYSIS REPORT

Non-ferrous Metals

Fuel Dilution

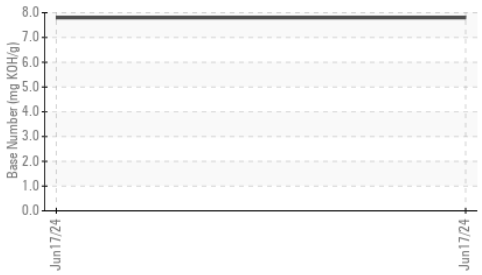


FT-IR (Direct Trend)



Acid Number

Base Number



ADDITIVES		method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185(m)	75	**152**	---	---
Barium	ppm	ASTM D5185(m)	5	**<1**	---	---
Molybdenum	ppm	ASTM D5185(m)	100	**69**	---	---
Manganese	ppm	ASTM D5185(m)		**1**	---	---
Magnesium	ppm	ASTM D5185(m)	12	**491**	---	---
Calcium	ppm	ASTM D5185(m)	2100	**1149**	---	---
Phosphorus	ppm	ASTM D5185(m)	650	**634**	---	---
Zinc	ppm	ASTM D5185(m)	850	**717**	---	---
Sulfur	ppm	ASTM D5185(m)	2500	**2277**	---	---
Lithium	ppm	ASTM D5185(m)		**<1**	---	---

CONTAMINANTS		method	limit/base	current	history1	history2
Silicon	ppm	ASTM D5185(m)	>30	**17**	---	---
Sodium	ppm	ASTM D5185(m)	>50	**3**	---	---
Potassium	ppm	ASTM D5185(m)	>20	**1**	---	---
Fuel	%	ASTM D7593*	>4.0	▲ **2.9**	---	---

INFRA-RED		method	limit/base	current	history1	history2
Soot %	%	ASTM D7844*		**0**	---	---
Nitration	Abs/cm	ASTM D7624*	>20	**7.0**	---	---
Sulfation	Abs/.1mm	ASTM D7415*	>30	**16.7**	---	---

FLUID DEGRADATION		method	limit/base	current	history1	history2
Oxidation	Abs/.1mm	ASTM D7414*	>25	**9.9**	---	---
Acid Number (AN)	mg KOH/g	ASTM D974*		**2.99**	---	---
Base Number (BN)	mg KOH/g	ASTM D2896*		**7.80**	---	---

VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	▲ **HEAVY**	---	---
Yellow Metal	scalar	Visual*	NONE	**NONE**	---	---
Precipitate	scalar	Visual*	NONE	**NONE**	---	---
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**	---	---
Emulsified Water	scalar	Visual*	>0.2	**NEG**	---	---
Free Water	scalar	Visual*		**NEG**	---	---

FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	44	**48.5**	---	---
Visc @ 100°C	cSt	ASTM D7279(m)	7.5	**9.0**	---	---
Viscosity Index (VI)	Scale	ASTM D2270*	136	**168**	---	---

ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : WC486642
Lab Number : 02646200
Unique Number : 5811752
Test Package : INS (Additional Tests: Bottom, FT-IR, FuelDilution, PercentFuel, TAN Man, VI)

Received : 08 Jul 2024
Tested : 11 Jul 2024
Diagnosed : 12 Jul 2024 - Bill Quesnel

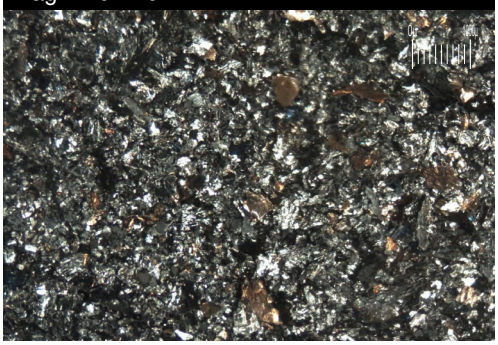
To discuss this sample report, contact Customer Service at 1-800-268-2131.
Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab.
Validity of results and interpretation are based on the sample and information as supplied.

JENISH ENGINEERING LIMITED
1675 baseline Road West
Courtice, ON
CA L1E 2S6
Contact: Gord Jenish
kl@jenish.ca
T: (905)404-9285
F: (905)404-9843

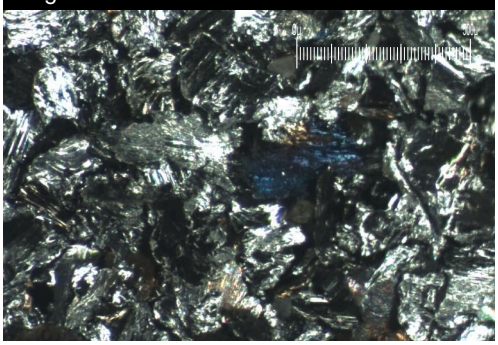
FILTER REPORT

Area
[R1230960/Y0604A]
Machine Id
HYUNDAI KMHHT6KDU083116
Component
Gasoline Engine
Fluid
GASOLINE ENGINE OIL SAE 5W20 (--- LTR)

Magn: 10x Illum: RW



Magn: 60x Illum: RW



FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		10		
Ferrous Sliding	Scale 0-10	ASTM D7684*		8		
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*		8		
Ferrous Break-in	Scale 0-10	ASTM D7684*				
Ferrous Spheres	Scale 0-10	ASTM D7684*				
Ferrous Black Oxides	Scale 0-10	ASTM D7684*				
Ferrous Red Oxides	Scale 0-10	ASTM D7684*				
Ferrous Corrosive	Scale 0-10	ASTM D7684*				
Ferrous Other	Scale 0-10	ASTM D7684*				
Nonferrous Rubbing	Scale 0-10	ASTM D7684*		5		
Nonferrous Sliding	Scale 0-10	ASTM D7684*		6		
Nonferrous Cutting	Scale 0-10	ASTM D7684*				
Nonferrous Rolling	Scale 0-10	ASTM D7684*		5		
Nonferrous Other	Scale 0-10	ASTM D7684*				
Sand/Dirt	Scale 0-10	ASTM D7684*		2		
Fibres	Scale 0-10	ASTM D7684*		1		
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*				
Patch Weight	mg	ASTM D7684*		10230	---	---

WEAR

Wear particle analysis indicates that the ferrous rolling, patch weight and nonferrous sliding and ferrous sliding and nonferrous rolling particles are severe. Silver, copper ppm levels are abnormal. Wear particle analysis indicates that the ferrous rubbing, nonferrous rubbing particles are abnormal. High concentration of visible metal present. Piston, ring and cylinder wear is indicated. There is a possible bearing failure in progress. High wear metal levels reflect the reported failure.

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