

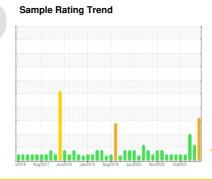
# **PROBLEM SUMMARY**

Cranes [450185704]

Crane - Fwd Slewing Gearbox #1 (S/N Sample Tag MA-04003-S7)

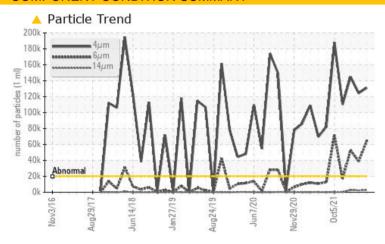
Component Gearbox

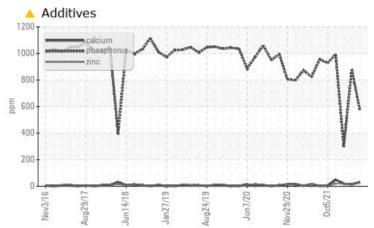
PETRO CANADA GEARLUBE TOS 80W90 (33 LTR)





# **COMPONENT CONDITION SUMMARY**





# RECOMMENDATION

We recommend you service the filters on this component. Confirm the source of the lubricant being utilized for top-up/fill. We recommend an early resample to monitor this condition.

PROBLEMATIC TEST RESULTS									
Sample Status			ABNORMAL	ABNORMAL	ABNORMAL				
Boron	ppm	ASTM D5185(m)	240	<u>^</u> 80	179	<u> </u>			
Calcium	ppm	ASTM D5185(m)	6	<b>29</b>	15	18			
Phosphorus	ppm	ASTM D5185(m)	1000	<u></u> 573	879	<u>^</u> 299			
Zinc	ppm	ASTM D5185(m)	3	<u> </u>	12	20			
Sulfur	ppm	ASTM D5185(m)	19400	<u> </u>	20330	<u>▲</u> 10141			
Particles >14µm		ASTM D7647	>640	<u> </u>	<u>\$\text{2366}\$</u>	<u>^</u> 2611			
Particles >21µm		ASTM D7647	>160	<u> </u>	<u>442</u>	<b>476</b>			
Oil Cleanliness		ISO 4406 (c)	>21/19/16	<b>4</b> 24/23/18	<b>24/22/18</b>	24/23/19			

Customer Id: TERHAM Sample No.: PC Lab Number: 02582279

Test Package: MAR 2

To manage this report scan the QR code

To discuss the diagnosis or test data: Kevin Marson +1 (289)291-4644 x4644 Kevin.Marson@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
Change Filter			?	We recommend you service the filters on this component.
Resample			?	We recommend an early resample to monitor this condition.
Check Fluid Source			?	Confirm the source of the lubricant being utilized for top-up/fill.

# HISTORICAL DIAGNOSIS

## 02 May 2023 Diag: Kevin Marson

ISO



We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. We recommend an early resample to monitor this condition. All component wear rates are normal. There is a moderate amount of particulates (2 to 100 microns in size) present in the oil. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.



#### ADDITIVES



# 29 Nov 2021 Diag: Kevin Marson

We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. Confirm the source of the lubricant being utilized for top-up/fill. We recommend an early resample to monitor this condition. The fluid was specified as PETRO CANADA GEARLUBE TOS 80W90, however, a fluid match indicates that this fluid is ISO 220 Gear Oil. Please confirm the oil type and grade on your next sample. All component wear rates are normal. Particles >14µm are abnormally high. Particles >21µm are abnormally high. Additive levels indicate the addition of a different brand, or type of oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.



#### 27 Nov 2021 Diag: Kevin Marson

NORMAL



Confirm the source of the lubricant being utilized for top-up/fill. Resample at the next service interval to monitor.All component wear rates are normal. The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The system and fluid cleanliness is acceptable. Additive levels indicate the addition of a different brand, or type of oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.





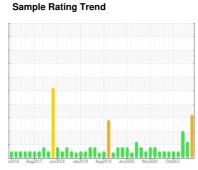
# **OIL ANALYSIS REPORT**

# Cranes [450185704]

Crane - Fwd Slewing Gearbox #1 (S/N Sample Tag MA-04003-S7)

Gearbox

PETRO CANADA GEARLUBE TOS 80W90 (33 LTR)





# **DIAGNOSIS**

## Recommendation

We recommend you service the filters on this component. Confirm the source of the lubricant being utilized for top-up/fill. We recommend an early resample to monitor this condition.

All component wear rates are normal.

## Contamination

There is a moderate amount of silt (particulates < 14 microns in size) present in the oil.

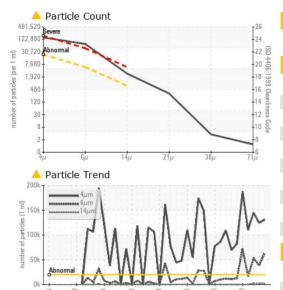
## ▲ Fluid Condition

Additive levels indicate the addition of a different brand, or type of oil. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable

SAMPLE INFORMATION method   Imit/base   current   history1   history2	23 LIK)  v2016 Aug2017 Jun2018 Jan2019 Aug2019 Jun2020 Nev2020 Oct2021							
Sample Date   Client Info   0	SAMPLE INFORM	IATION	method	limit/base	current	history1	history2	
Machine Age	Sample Number		Client Info		PC	PC0053015	PC0040132	
Dil Changed	Sample Date		Client Info		13 Aug 2023	02 May 2023	29 Nov 2021	
Client Info	Machine Age	hrs	Client Info		0	0	0	
ABNORMAL   ABNORMAL	Oil Age	hrs	Client Info		0	0	0	
WEAR METALS         method         limit/base         current         history1         history2           PCQ         ASTM D8184*         0         0         0         0           Chron         ppm         ASTM D51856m         >150         17         13         9           Chromium         ppm         ASTM D51856m         >10         <1	Oil Changed		Client Info		N/A	N/A	N/A	
PQ ASTM D8184* 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Sample Status				ABNORMAL	ABNORMAL	ABNORMAL	
Chromium   ppm   ASTM D5185(m)   >150   17   13   9	WEAR METALS	3	method	limit/base	current	history1	history2	
Chromium         ppm         ASTM D5185(m)         >10         <1         0         0           Vickel         ppm         ASTM D5185(m)         >10         0         <1         <1           Siliver         ppm         ASTM D5185(m)         0         0         0         0           ALUMINIUM         ppm         ASTM D5185(m)         >5         <1         <1         <1           Lead         ppm         ASTM D5185(m)         >65         0         0         <1           Lead         ppm         ASTM D5185(m)         >65         0         0         <1           Lead         ppm         ASTM D5185(m)         >88         0         <1         <1           Lead         ppm         ASTM D5185(m)         >88         0         <1         <1           Actiniony         ppm         ASTM D5185(m)         >8         0         <1         <1           Arithmony         ppm         ASTM D5185(m)         0         0         0         0           Actinion         ppm         ASTM D5185(m)         0         0         0         0           Actinion         ppm         ASTM D5185(m)         0         0	PQ		ASTM D8184*		0	0	0	
ASTM D5185(m)   D	ron	ppm	ASTM D5185(m)	>150	17	13	9	
Description	Chromium	ppm	ASTM D5185(m)	>10	<1	0	0	
Silver   ppm   ASTM D5185(m)   D	Nickel	ppm	ASTM D5185(m)	>10	0	<1	<1	
ASIM D5185(m) >5	Titanium	ppm	ASTM D5185(m)		0	0	0	
Dead	Silver	ppm	ASTM D5185(m)		0	0	0	
December   Part   P	Aluminum	ppm		>5	<1	<1	<1	
Filin			ASTM D5185(m)	>65	0	0	<1	
Fin	Copper	ppm	ASTM D5185(m)	>80	<1	<1	<1	
Antimony ppm ASTM D5185(m) >5 0 <1 <1 <1	Γin		ASTM D5185(m)	>8		<1	0	
Vanadium         ppm         ASTM D5185(m)         0         0         0           Beryllium         ppm         ASTM D5185(m)         0         0         0           Cadmium         ppm         ASTM D5185(m)         240         80         179         14           Barium         ppm         ASTM D5185(m)         240         80         179         14           Barium         ppm         ASTM D5185(m)         2         4         0         179         144           Barium         ppm         ASTM D5185(m)         2.40         80         179         144           Barium         ppm         ASTM D5185(m)         0.0         0         0            Wolcybdenum         ppm         ASTM D5185(m)         0.0         0         0         0           Wanganese         ppm         ASTM D5185(m)         2         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1				>5	0	<1	<1	
December   December			. ,		0	0	0	
Cadmium         ppm         ASTM D5185(m)         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185(m)         240         ♣ 80         179         ▲ 14           Barium         ppm         ASTM D5185(m)         1         <1			( /		0	0		
Soron   ppm   ASTM D5185(m)   240   ▲ 80   179   ▲ 14						0	0	
Sarium	ADDITIVES		method	limit/base	current	history1	history2	
Molybdenum         ppm         ASTM D5185(m)         0.0         0         0         0           Manganese         ppm         ASTM D5185(m)         < 1         <1         <1         <1           Magnesium         ppm         ASTM D5185(m)         2         <1         <1         0           Calcium         ppm         ASTM D5185(m)         6         △ 29         15         18           Phosphorus         ppm         ASTM D5185(m)         1000         ▲ 573         879         △ 299           Zinc         ppm         ASTM D5185(m)         1000         ▲ 573         879         △ 299           Zinc         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           Cinc         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           CONTAMINANTS         method         limit/base         current         history1         history2           Gilicon         ppm         ASTM D5185(m)         >20         3         1         3           FUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >4µm <t< td=""><td>Boron</td><td>ppm</td><td>ASTM D5185(m)</td><td>240</td><th><u> </u></th><td>179</td><td><u> </u></td></t<>	Boron	ppm	ASTM D5185(m)	240	<u> </u>	179	<u> </u>	
Manganese         ppm         ASTM D5185(m)         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <1         <0          Magnesium         ppm         ASTM D5185(m)         2         <1         <1         <1         <0          <21         <1         <0          <21         <1         <0          <29         15         18          <299         15         18          <299         12         299         20          <299         12         20          <20          <3         299         12         20          <20         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3         <3	Barium	ppm	ASTM D5185(m)	1	<1	0	<1	
Magnesium         ppm         ASTM D5185(m)         2         <1         <1         0           Calcium         ppm         ASTM D5185(m)         6         ▲ 29         15         18           Phosphorus         ppm         ASTM D5185(m)         1000         ▲ 5773         879         ▲ 299           Zinc         ppm         ASTM D5185(m)         3         ▲ 29         12         20           Sulfur         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           Lithium         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185(m)         >20         3         3         1           Column         ppm         ASTM D5185(m)         >20         3         1         <1           Potassium         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >6µm         ASTM	Molybdenum	ppm	ASTM D5185(m)	0.0	0	0	0	
Magnesium         ppm         ASTM D5185(m)         2         <1         <1         0           Calcium         ppm         ASTM D5185(m)         6         Δ 29         15         18           Phosphorus         ppm         ASTM D5185(m)         1000         Δ 573         879         Δ 299           Zinc         ppm         ASTM D5185(m)         3         Δ 29         12         20           Sulfur         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           Lithium         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185(m)         >20         3         3         1           Column         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles > 4µm         ASTM D7647         >20000         131043         124316         144839           Particles > 51µm         ASTM	Manganese	ppm	ASTM D5185(m)		<1	<1	<1	
Calcium         ppm         ASTM D5185(m)         6         4 29         15         18           Phosphorus         ppm         ASTM D5185(m)         1000         4 573         879         4 299           Zinc         ppm         ASTM D5185(m)         3         4 29         12         20           Bulfur         ppm         ASTM D5185(m)         19400         4 12306         20330         4 10141           Lithium         ppm         ASTM D5185(m)         < 1         <1         <1           CONTAMINANTS         method         limit/base         current         history1         history2           Bilicon         ppm         ASTM D5185(m)         >20         3         3         1           Codium         ppm         ASTM D5185(m)         >20         3         1         <1           Potassium         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >4µm         ASTM D7647         >20000         131043         124316         144839           Particles >14µm         ASTM D7647         >640			ASTM D5185(m)	2	<1	<1	0	
Phosphorus         ppm         ASTM D5185(m)         1 000         ▲ 573         879         ▲ 299           Zinc         ppm         ASTM D5185(m)         3         ▲ 29         12         20           Sulfur         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           Lithium         ppm         ASTM D5185(m)         < 1         <1         <1           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185(m)         >20         3         3         1           Godium         ppm         ASTM D5185(m)         >20         3         1         <1           Potassium         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >4µm         ASTM D7647         >20000         131043         124316         144839           Particles >6µm         ASTM D7647         >640         2443         2366         2611           Particles >21µm         ASTM D7647         >40	-		ASTM D5185(m)	6	<u>^</u> 29	15	18	
20	Phosphorus			1000	<b>▲</b> 573	879	<u>^</u> 299	
Sulfur         ppm         ASTM D5185(m)         19400         ▲ 12306         20330         ▲ 10141           Lithium         ppm         ASTM D5185(m)         < 1         <1         <1           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185(m)         >20         3         3         1           Podassium         ppm         ASTM D5185(m)         >20         3         1         3           PLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >4μm         ASTM D7647         >20000         131043         124316         144839           Particles >6μm         ASTM D7647         >5000         64118         38555         52823           Particles >14μm         ASTM D7647         >640         2443         2366         2611           Particles >21μm         ASTM D7647         >40         273         442         476           Particles >71μm         ASTM D7647         >40         3         1         7           Particles >71μm         ASTM D7647         >10         1         0         0	Zinc		ASTM D5185(m)	3	<u>^</u> 29	12	20	
CONTAMINANTS   method   limit/base   current   history1   history2	Sulfur		ASTM D5185(m)	19400	<b>12306</b>	20330	<u> </u>	
Soliticon   ppm   ASTM D5185(m)   >20   3   3   1     <1   Solition   ppm   ASTM D5185(m)   2   1   <1   <1   <1   <1   <1   <1	ithium		. ,		<1	<1	<1	
Bodium         ppm         ASTM D5185(m)         2         1         <1           Potassium         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS method limit/base current         history1         history2           Particles >4μm         ASTM D7647         >20000         131043         124316         144839           Particles >6μm         ASTM D7647         >5000         64118         38555         52823           Particles >14μm         ASTM D7647         >640         2443         2366         2611           Particles >21μm         ASTM D7647         >160         273         442         476           Particles >38μm         ASTM D7647         >40         3         1         7           Particles >71μm         ASTM D7647         >10         1         0         0	CONTAMINANT	S	method	limit/base	current	history1	history2	
Potassium         ppm         ASTM D5185(m)         >20         3         1         3           FLUID CLEANLINESS method limit/base current         history1         history2           Particles >4μm         ASTM D7647         >20000         131043         124316         144839           Particles >6μm         ASTM D7647         >5000         64118         38555         52823           Particles >14μm         ASTM D7647         >640         2443         2366         2611           Particles >21μm         ASTM D7647         >160         273         442         476           Particles >38μm         ASTM D7647         >40         3         1         7           Particles >71μm         ASTM D7647         >10         1         0         0	Silicon	ppm	ASTM D5185(m)	>20	3	3	1	
FLUID CLEANLINESS         method         limit/base         current         history1         history2           Particles >4μm         ASTM D7647         >20000         131043         124316         144839           Particles >6μm         ASTM D7647         >5000         64118         38555         52823           Particles >14μm         ASTM D7647         >640         2443         2366         2611           Particles >21μm         ASTM D7647         >160         273         442         476           Particles >38μm         ASTM D7647         >40         3         1         7           Particles >71μm         ASTM D7647         >10         1         0         0	Sodium	ppm	ASTM D5185(m)		2	1	<1	
Particles >4μm       ASTM D7647       >20000       131043       124316       144839         Particles >6μm       ASTM D7647       >5000       64118       38555       52823         Particles >14μm       ASTM D7647       >640       2443       2366       2611         Particles >21μm       ASTM D7647       >160       273       442       476         Particles >38μm       ASTM D7647       >40       3       1       7         Particles >71μm       ASTM D7647       >10       1       0       0	Potassium	ppm	ASTM D5185(m)	>20	3	1	3	
Particles >6μm       ASTM D7647       >5000       64118       38555       52823         Particles >14μm       ASTM D7647       >640       2443       2366       2611         Particles >21μm       ASTM D7647       >160       273       442       476         Particles >38μm       ASTM D7647       >40       3       1       7         Particles >71μm       ASTM D7647       >10       1       0       0	FLUID CLEANLI	INESS	method	limit/base	current	history1	history2	
Particles >6μm       ASTM D7647       >5000       64118       38555       52823         Particles >14μm       ASTM D7647       >640       2443       2366       2611         Particles >21μm       ASTM D7647       >160       273       442       476         Particles >38μm       ASTM D7647       >40       3       1       7         Particles >71μm       ASTM D7647       >10       1       0       0	Particles >4µm		ASTM D7647	>20000	131043	124316	144839	
Particles >14μm       ASTM D7647       >640       ▲ 2443       ▲ 2366       ▲ 2611         Particles >21μm       ASTM D7647       >160       ▲ 273       ▲ 442       ▲ 476         Particles >38μm       ASTM D7647       >40       3       1       7         Particles >71μm       ASTM D7647       >10       1       0       0	·			>5000	64118	38555	52823	
Particles >21μm       ASTM D7647       >160       ▲ 273       ▲ 442       ▲ 476         Particles >38μm       ASTM D7647       >40       3       1       7         Particles >71μm       ASTM D7647       >10       1       0       0								
Particles >38μm       ASTM D7647 >40       3       1       7         Particles >71μm       ASTM D7647 >10       1       0       0								
Particles >71μm ASTM D7647 >10 <b>1</b> 0								
·								



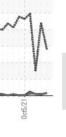
# **OIL ANALYSIS REPORT**



FLUID DEGRAI	NOITAC	method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D974*	1.5	0.80	1.32	0.55
VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE	NONE
Precipitate	scalar	Visual*	NONE	NONE	NONE	NONE
Silt	scalar	Visual*	NONE	NONE	NONE	NONE
Debris	scalar	Visual*	NONE	VLITE	NONE	NONE
Sand/Dirt	scalar	Visual*	NONE	NONE	NONE	NONE
Appearance	scalar	Visual*	NORML	NORML	NORML	NORML
Odor	scalar	Visual*	NORML	NORML	NORML	NORML
<b>Emulsified Water</b>	scalar	Visual*	>0.2	NEG	NEG	NEG
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPE	RTIES	method	limit/base	current	history1	history2

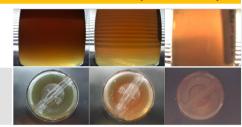
1200	Addi	itives						
1000 -			um sphorus	1-		V	4	M
800-	*******	eeeeee ZITIC	W				1	Y 1 A
E 600-			V					- 1/1
400-			June .					W.
200 -								
0-								
	Nov3/16	9/17	4/18	Jan27/19	4/19	Jun7/20	9/20	15/21
	Nov	Aug29/17	Jun14/18	Jan2	Aug24/19	Jun	Nov29/20	0ct5

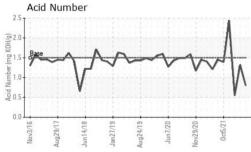
FLUID PROPERTIES		method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	140.3	180	152	205
Visc @ 100°C	cSt	ASTM D7279(m)	15.05	16.8	15.6	17.6
Viscosity Index (VI)	Scale	ASTM D2270*	109	98	105	92
SAMPLE IMAGES		method	limit/base	current	history1	history2

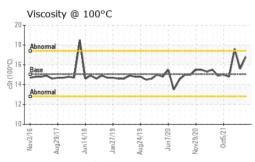














**CALA** ISO 17025:2017 Accredited Laboratory

Laboratory Sample No. Lab Number : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 : PC

: 02582279 Unique Number : 5643344

Received Diagnosed

: 13 Sep 2023 : 15 Sep 2023

Diagnostician : Kevin Marson Test Package : MAR 2 ( Additional Tests: KV100, PQ, PrtCount, VI )

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.

St. John's, NL CA A1C 1B6 Contact: Josh Hynes joshynes@suncor.com T: (709)778-3575 F: (709)724-2835

**Suncor - Terra Nova Projects** 

Scotia Centre, 235 Water Strret

Validity of results and interpretation are based on the sample and information as supplied.