

# **OIL ANALYSIS REPORT**

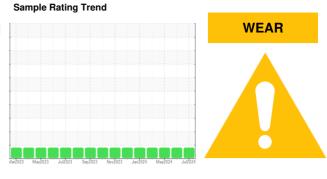
Area

# Huntington [Huntington] Oil - Port Reduction Gear

Port Reduction Gear

Fluid

**DIESEL ENGINE OIL SAE 40 (24 GAL)** 



## DIAGNOSIS

### Recommendation

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

#### Wear

The copper level is abnormal. All other component wear rates are normal.

#### Contamination

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

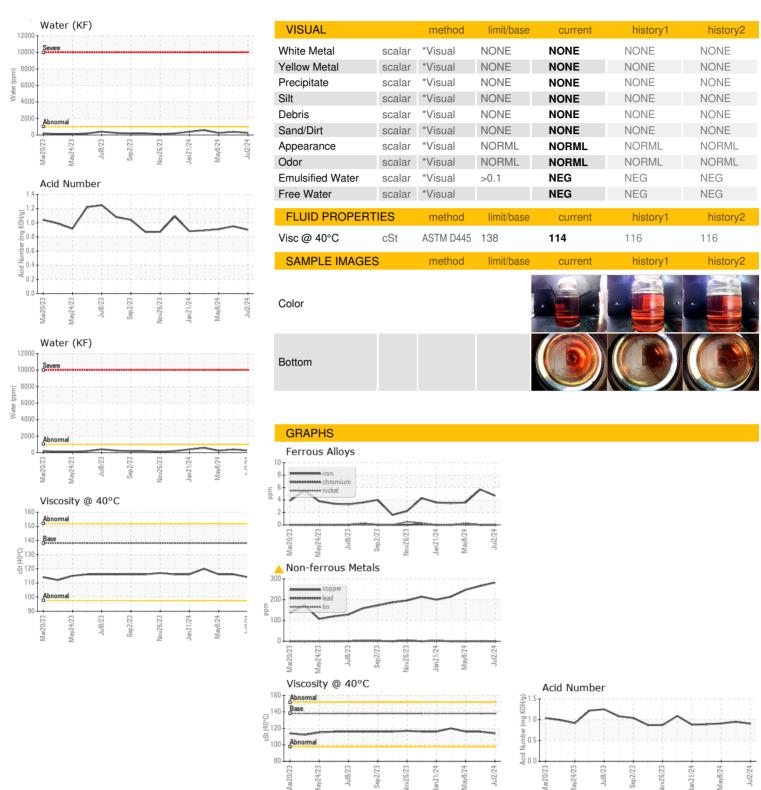
#### **Fluid Condition**

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

Sample Date         Client Info         02 Jul 2024         09 Jun 2024         08 May 2024           Machine Age         hrs         Client Info         23118         22633         22033           Oil Age         hrs         Client Info         0         0         0           Oil Changed         Client Info         Not Changd         N/A         Not Changd           Sample Status         Not Changd         ABNORMAL         A	SAMPLE INFORM	MATION	method	limit/base	current	history1	history2
Machine Age         hrs         Client Info         23118         22633         22033           Oil Age         hrs         Client Info         0         0         0         0           Oil Changed         Client Info         Not Changd         N/A         Not Changd           Sample Status         Depth ASTM D5185m         ABNORMAL         ABNORMAL         ABNORMAL         ABNORMAL           WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         150         5         6         4           Chromium         ppm         ASTM D5185m         >10         0         0         <1           Nickel         ppm         ASTM D5185m         >10         0         0         <1           Oilver         ppm         ASTM D5185m         >10         0         <1         0           Aluminum         ppm         ASTM D5185m         >25         <1         2         0           Cabed         ppm         ASTM D5185m         >50         282         266         247           Tin         ppm         ASTM D5185m         >50         282         266	Sample Number		Client Info		WC0874584	WC0898317	WC0874557
Oil Age         hrs         Client Info         Not Changd ABNORMAL         N/A         Not Changd ABNORMAL           Sample Status         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >150         5         6         4           Chromium         ppm         ASTM D5185m         >10         0         0         <1           Nickel         ppm         ASTM D5185m         >10         0         0         <1           Silver         ppm         ASTM D5185m         >10         0         0         0           Silver         ppm         ASTM D5185m         0         <1         0           Quantinum         ppm         ASTM D5185m         0         <1         0           Lead         ppm         ASTM D5185m         >25         <1         2         0           Lead         ppm         ASTM D5185m         >10         0         <1         0           Copper         ppm         ASTM D5185m         >10         0         <1         0           Vanadium         ppm         ASTM D5185m         0         0         <1         0	Sample Date		Client Info		02 Jul 2024	09 Jun 2024	08 May 2024
Dil Changed   Cilient Info   Not Changed   ABNORMAL   ABNORMAL	Machine Age	hrs	Client Info		23118	22633	22033
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >150         5         6         4           Chromium         ppm         ASTM D5185m         >10         0         0         <1	Oil Age	hrs	Client Info		0	0	0
WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >150         5         6         4           Chromium         ppm         ASTM D5185m         >10         0         0         <1	Oil Changed		Client Info		Not Changd	N/A	Not Changd
Iron	Sample Status				ABNORMAL	ABNORMAL	ABNORMAL
Chromium         ppm         ASTM D5185m         >10         0         0         <1	WEAR METALS		method	limit/base	current	history1	history2
Nickel	Iron	ppm	ASTM D5185m	>150	5	6	4
Description   Description	Chromium	ppm	ASTM D5185m	>10	0	0	<1
Silver	Nickel	ppm	ASTM D5185m	>10	0	0	0
Aluminum         ppm         ASTM D5185m         >25         <1         2         0           Lead         ppm         ASTM D5185m         >100         0         <1	Titanium	ppm	ASTM D5185m		0	0	0
Lead         ppm         ASTM D5185m         >100         0         <1         0           Copper         ppm         ASTM D5185m         >50         ▲ 282         ▲ 266         ▲ 247           Tin         ppm         ASTM D5185m         >10         0         <1         0           Vanadium         ppm         ASTM D5185m         0         0         0         0           Cadmium         ppm         ASTM D5185m         0         0         0         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         8         9         7           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1350         92	Silver	ppm	ASTM D5185m		0	<1	0
Copper         ppm         ASTM D5185m         >50         ▲ 282         ▲ 266         ▲ 247           Tin         ppm         ASTM D5185m         >10         0         <1	Aluminum	ppm	ASTM D5185m	>25	<1	2	0
Tin	Lead	ppm	ASTM D5185m	>100	0	<1	0
Vanadium         ppm         ASTM D5185m         0         0         0           Cadmium         ppm         ASTM D5185m         0         <1         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         8         9         7           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         100         93         100         96           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         250         3         4	Copper	ppm	ASTM D5185m	>50	<u>^</u> 282	<u>^</u> 266	<u>4</u> 247
Cadmium         ppm         ASTM D5185m         0         <1         0           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         8         9         7           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         100         93         100         96           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current	Tin	ppm	ASTM D5185m	>10	0	<1	0
ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         8         9         7           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         100         93         100         96           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m	Vanadium	ppm	ASTM D5185m		0	0	0
Boron         ppm         ASTM D5185m         250         8         9         7           Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         0         <1         <1           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >20	Cadmium	ppm	ASTM D5185m		0	<1	0
Barium         ppm         ASTM D5185m         10         0         0         0           Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         0         <1         <1           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1	ADDITIVES		method	limit/base	current	history1	history2
Molybdenum         ppm         ASTM D5185m         100         93         100         96           Manganese         ppm         ASTM D5185m         0         <1         <1           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >10							
Manganese         ppm         ASTM D5185m         0         <1         <1           Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/	Boron	ppm	ASTM D5185m	250	-	9	7
Magnesium         ppm         ASTM D5185m         450         168         190         199           Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.01         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237	Boron Barium	• • •			-		
Calcium         ppm         ASTM D5185m         3000         2110         2318         2250           Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2		ppm	ASTM D5185m	10	0	0	0
Phosphorus         ppm         ASTM D5185m         1150         855         921         903           Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium	ppm	ASTM D5185m ASTM D5185m	10	0 93	0 100	0 96
Zinc         ppm         ASTM D5185m         1350         923         1038         968           Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m	100	0 93 0	0 100 <1	0 96 <1
Sulfur         ppm         ASTM D5185m         4250         3097         3471         3262           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450	0 93 0 168	0 100 <1 190	0 96 <1 199
CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450 3000	0 93 0 168 2110	0 100 <1 190 2318	0 96 <1 199 2250
Silicon         ppm         ASTM D5185m         >50         3         4         0           Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450 3000 1150	0 93 0 168 2110 855	0 100 <1 190 2318 921	0 96 <1 199 2250 903
Sodium         ppm         ASTM D5185m         >216         6         6         5           Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450 3000 1150 1350	0 93 0 168 2110 855 923	0 100 <1 190 2318 921 1038	0 96 <1 199 2250 903 968
Potassium         ppm         ASTM D5185m         >20         1         4         0           Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450 3000 1150 1350 4250	0 93 0 168 2110 855 923 3097	0 100 <1 190 2318 921 1038 3471	0 96 <1 199 2250 903 968 3262
Water         %         ASTM D6304         >0.1         0.024         0.038         0.023           ppm Water         ppm         ASTM D6304         >1000         248         384         237           FLUID DEGRADATION         method         limit/base         current         history1         history2	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	10 100 450 3000 1150 1350 4250	0 93 0 168 2110 855 923 3097	0 100 <1 190 2318 921 1038 3471 history1	0 96 <1 199 2250 903 968 3262 history2
ppm Water ppm ASTM D6304 >1000 <b>248</b> 384 237  FLUID DEGRADATION method limit/base current history1 history2	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	10 100 450 3000 1150 1350 4250 limit/base >50	0 93 0 168 2110 855 923 3097 current	0 100 <1 190 2318 921 1038 3471 history1	0 96 <1 199 2250 903 968 3262 history2
FLUID DEGRADATION method limit/base current history1 history2	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm	ASTM D5185m	10 100 450 3000 1150 1350 4250 limit/base >50 >216	0 93 0 168 2110 855 923 3097 current 3 6	0 100 <1 190 2318 921 1038 3471 history1 4	0 96 <1 199 2250 903 968 3262 history2 0 5
	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm	ASTM D5185m	10 100 450 3000 1150 1350 4250 limit/base >50 >216 >20	0 93 0 168 2110 855 923 3097 current 3 6	0 100 <1 190 2318 921 1038 3471 history1 4 6	0 96 <1 199 2250 903 968 3262 history2 0 5
Acid Number (AN) mg KOH/g ASTM D8045 0.90 0.95 0.909	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm	ASTM D5185m	10 100 450 3000 1150 1350 4250 limit/base >50 >216 >20 >0.1	0 93 0 168 2110 855 923 3097 current 3 6 1	0 100 <1 190 2318 921 1038 3471 history1 4 6 4 0.038	0 96 <1 199 2250 903 968 3262 history2 0 5 0 0.023
	Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water ppm Water	ppm	ASTM D5185m ASTM D6304	10 100 450 3000 1150 1350 4250 limit/base >50 >216 >20 >0.1 >1000	0 93 0 168 2110 855 923 3097 current 3 6 1 0.024 248	0 100 <1 190 2318 921 1038 3471 history1 4 6 4 0.038 384	0 96 <1 199 2250 903 968 3262 history2 0 5 0 0.023 237



## **OIL ANALYSIS REPORT**







Certificate 12367

Laboratory Sample No.

: WearCheck USA - 501 Madison Ave., Cary, NC 27513

: WC0874584 Lab Number : 06236085 Unique Number : 11124919

Received **Tested** 

: 16 Jul 2024 Diagnosed : 17 Jul 2024 - Don Baldridge

: 15 Jul 2024

Test Package : IND 2 ( Additional Tests: KF ) To discuss this sample report, contact Customer Service at 1-800-237-1369.

 $^st$  - Denotes test methods that are outside of the ISO 17025 scope of accreditation. Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

MARATHON PETROLEUM CO.

101 12TH ST CATLETTSBURG, KY US 41169

Contact: CORY GUMBERT cagumbert@marathonpetroleum.com

T: (606)585-3950 F: x: