

OIL ANALYSIS REPORT

Plymouth & Brockton 11443 Component

Diesel Engine Fluid PETRO CANADA 15W40 (--- GAL)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor.

Wear

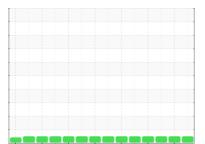
All component wear rates are normal.

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.



Sample Rating Trend

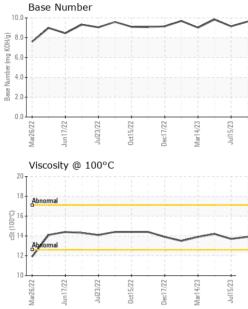


NORMAL

| SAMPLE INFOR | MATION | method | limit/base | current | history1 | history2 |
|---|--|---|--|---|---|---|
| Sample Number | | Client Info | | PCA0090650 | PCA0090675 | PCA0090607 |
| Sample Date | | Client Info | | 25 Aug 2023 | 15 Jul 2023 | 23 Apr 2023 |
| Machine Age | mls | Client Info | | 168138 | 156472 | 131531 |
| Oil Age | mls | Client Info | | 12000 | 24000 | 12000 |
| Oil Changed | | Client Info | | Not Changd | Changed | Not Changd |
| Sample Status | | | | NORMAL | NORMAL | NORMAL |
| CONTAMINAT | ION | method | limit/base | current | history1 | history2 |
| Fuel | | WC Method | >3.0 | <1.0 | <1.0 | <1.0 |
| Glycol | | WC Method | | NEG | NEG | NEG |
| WEAR METAL | S | method | limit/base | current | history1 | history2 |
| Iron | ppm | ASTM D5185m | >165 | 12 | 22 | 25 |
| Chromium | ppm | ASTM D5185m | >5 | <1 | 1 | 1 |
| Nickel | ppm | ASTM D5185m | >4 | 0 | 0 | <1 |
| Titanium | ppm | ASTM D5185m | >2 | 0 | <1 | <1 |
| Silver | ppm | ASTM D5185m | >2 | 0 | 0 | 0 |
| Aluminum | ppm | ASTM D5185m | >20 | 0 | <1 | 0 |
| Lead | ppm | ASTM D5185m | >150 | 0 | 0 | 0 |
| Copper | ppm | ASTM D5185m | >90 | 0 | <1 | <1 |
| Tin | ppm | ASTM D5185m | >5 | 0 | <1 | 0 |
| Vanadium | ppm | ASTM D5185m | | 0 | <1 | 0 |
| Cadmium | ppm | ASTM D5185m | | 0 | 0 | 0 |
| | | | | | | |
| ADDITIVES | | method | limit/base | current | history1 | history2 |
| ADDITIVES Boron | ppm | method ASTM D5185m | limit/base | current 3 | history1 7 | history2 5 |
| Boron Barium | ppm ppm | | limit/base | | | |
| Boron | | ASTM D5185m | limit/base | 3 | 7 | 5 |
| Boron Barium Molybdenum Manganese | ppm | ASTM D5185m ASTM D5185m | limit/base | 3 0 | 7 0 | 5 |
| Boron Barium Molybdenum | ppm ppm | ASTM D5185m ASTM D5185m ASTM D5185m | limit/base | 3 0 63 | 7 0 64 <1 986 | 5 0 72 |
| Boron Barium Molybdenum Manganese Magnesium Calcium | ppm ppm ppm | ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m | limit/base | 3 0 63 0 1077 1316 | 7 0 64 <1 | 5 0 72 <1 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus | ppm ppm ppm ppm | ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m | limit/base | 3 0 63 0 1077 1316 1140 | 7 0 64 <1 986 | 5 0 72 <1 1096 1206 1163 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc | ppm ppm ppm ppm ppm | ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m | limit/base | 3 0 63 0 1077 1316 1140 1497 | 7 0 64 <1 986 1149 1011 1239 | 5 0 72 <1 1096 1206 1163 1422 |
| Boron 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 | limit/base | 3 0 63 0 1077 1316 1140 | 7 0 64 <1 986 1149 1011 | 5 0 72 <1 1096 1206 1163 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc | ppm ppm ppm ppm ppm ppm ppm | ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m | limit/base | 3 0 63 0 1077 1316 1140 1497 | 7 0 64 <1 986 1149 1011 1239 | 5 0 72 <1 1096 1206 1163 1422 |
| Boron 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 | limit/base | 3 0 63 0 1077 1316 1140 1497 4322 | 7 0 64 <1 986 1149 1011 1239 3475 | 5 0 72 <1 1096 1206 1163 1422 3525 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN | ppm 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 | limit/base | 3 0 63 0 1077 1316 1140 1497 4322 current | 7 0 64 <1 986 1149 1011 1239 3475 history1 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium | ppm ppm ppm ppm ppm ppm ppm ppm TS | ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method | limit/base | 3 0 63 0 1077 1316 1140 1497 4322 current 3 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium | ppm ppm ppm ppm ppm ppm ppm ppm TS | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base | 3 0 63 0 1077 1316 1140 1497 4322 current 3 0 0 0 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 0 history1 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 <1 ×1 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium INFRA-RED Soot % | ppm ppm ppm ppm ppm ppm ppm ppm TS ppm ppm | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base >7.5 | 3 0 63 0 1077 1316 1140 1497 4322 <u>current</u> 3 0 0 0 <u>current</u> 1.1 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 history1 2.2 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 <1 history2 2.5 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium INFRA-RED Soot % Nitration | ppm ppm ppm ppm ppm ppm ppm ppm TS ppm ppm ppm | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base >7.5 >20 | 3 0 63 0 1077 1316 1140 1497 4322 current 3 0 0 0 0 current 1.1 7.9 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 history1 2.2 10.7 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 2 1 history2 2.5 10.5 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium INFRA-RED Soot % | ppm ppm ppm ppm ppm ppm ppm ppm TS ppm ppm | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base >7.5 >20 | 3 0 63 0 1077 1316 1140 1497 4322 <u>current</u> 3 0 0 0 <u>current</u> 1.1 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 history1 2.2 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 <1 history2 2.5 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium INFRA-RED Soot % Nitration | ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base >7.5 >20 | 3 0 63 0 1077 1316 1140 1497 4322 current 3 0 0 0 0 current 1.1 7.9 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 history1 2.2 10.7 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 2 1 history2 2.5 10.5 |
| Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINAN Silicon Sodium Potassium INFRA-RED Soot % Nitration Sulfation | ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm | ASTM D5185m ASTM D5185m | limit/base >35 >20 limit/base >7.5 >20 >30 limit/base | 3 0 63 0 1077 1316 1140 1497 4322 <u>current</u> 3 0 0 0 <u>current</u> 1.1 7.9 20.4 | 7 0 64 <1 986 1149 1011 1239 3475 history1 4 2 0 history1 2.2 10.7 23.7 | 5 0 72 <1 1096 1206 1163 1422 3525 history2 4 2 <1 history2 2.5 10.5 23.5 |



OIL ANALYSIS REPORT



| \sim | $\sim\sim$ | VISUAL | | method | limit/base | | urrent | | histo | | | istory2 |
|---|------------------------|---|---|---------------------|------------|-----------------------|------------|------------|---|------------|------------|------------|
| | | White Metal | scalar | *Visual | NONE | | NE | | NONE | | NO | |
| | | Yellow Metal | scalar | *Visual *Visual | NONE | | NE | | NONE | | NO NO | |
| | | Precipitate | scalar | *Visual | | | NE | | | | | |
| | | Silt Debris | scalar scalar | *Visual | NONE | | NE NE | | NONE | | NO NO | |
| | | Sand/Dirt | | *Visual | NONE | | NE | | NONE | | NO | |
| 22 | 23- | Appearance | scalar scalar | *Visual | NORML | | | | NORM | | | RML |
| 0ct15/22 Dec17/22 | Mar14/23 Jul15/23 | Odor | scalar | *Visual | NORML | - | | | NORM | | | RML |
| _ | ~ | Emulsified Water | scalar | *Visual | >0.2 | NE | | | NEG | | NE | |
| | | Free Water | scalar | *Visual | 20.2 | NE | | | NEG | | NE | |
| | | FLUID PROP | | method | limit/base | _ | urrent | | histo | rv1 | | istory2 |
| | | Visc @ 100°C | cSt | ASTM D44 | | 13. | | | 13.7 | | 14. | |
| | \sim | GRAPHS | | | | | | | | | | |
| | | Iron (ppm) | | | | Lear | l (ppm |) | | | | |
| | | 300 Severe | | | | 300 T Severe | і (ррп | '' | | | | |
| 5/22 | Mari 4,23 | 250- | | | | 250 - | | | | | | |
| 0ct15/22 Dec17/22 | Mar1 4/23 Jul1 5/23 | Log Abnormal | | | | 200 Abnon | mal | | | | | |
| | | 100 | | | | 100 | | | | | | |
| | | 50 | | | | 50- | | | | | | |
| | | 22 | 22 | 23 | 23 | 52 | 22 | 22 | 22 | 22 | 23 | 23 |
| | | Mar26/22 Jun17/22 Jul23/22 | Oct15/22 | Mar14/23 | Jul15/23 | Mar26/22 | Jun17/22 | Jul23/22 | 0ct15/22 | Dec17/22 | Mar14/23 | Jul15/23 |
| | | ≥ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ ¬ | | - 2 | - | | mium | | | | 2 | - |
| | | 40 Severe | , | | | ¹² [Sminn | | терп | •, | | | |
| | | 30 | | | | 10 - Severe | | | | | | |
| | | E 20 - Abnormal | | | | 8- 6- Abnon | | | | | | |
| | | | | | | 6 Abnon | | + | | + | | + |
| | | 10- | | | | 2- | | | ~ | | | |
| | | 22 | 22 | 23 | /23 | 52 | 123- | 22 | 22 | 22 - | 23 - | 23 - |
| | | Mar26/22 Jun17/22 Jul23/22 | Oct15/22 | Mar14/23 | Jul15/23 | Mar26/22 | Jun17/22 | Jul23/22 | 0ct15/22 | Dec17/22 | Mar14/23 - | Jul15/23 |
| | | Copper (ppm) | | | | | on (pp | | | 1 | 2 | |
| | | 200 Severe | 0 <mark></mark> | | | ⁸⁰ T | - APP | , | | | | |
| | | 150 | | | | 60 - Severe | | | | | | |
| | | E 100 - Abnormal | | | E | 40 - Abnon | mal | | | | | |
| | | 50 | | | id | | 1 | | | | | |
| | | | | | | 20 | | | | | | |
| | | 127 0 127 0 | /22 | /23 | /23 | 122 | /22 | /22 | /22 | 122 | /23 - | /23- |
| | | Mar26/22 Jun17/22 Jul23/22 | Oct15/22 | Mar14/23 | Jul15/23 | Mar26/22 | Jun17/22 | Jul23/22 | 0ct15/22 | Dec17/22 | Mar14/23 | Jul15/23 |
| | | Viscosity @ 1009 | | | | Base | e Num | | | _ | | |
| | | 20 | | 1 | (B/H | I.08 | - | | \sim | | \sim | \sim |
| | | Q 16 | | | × | 8.0 6.0 | | | | | | |
| | | (0-016 16 14 Abanmal | | | ber (n | 4.0 | | | | | | |
| | | Abrormal | | | e Num | 2.0 | | | | | | |
| | | 10 | | | | 0.0 | | | | | | |
| | | Mar26/22 - Jun17/22 - Jul23/22 - | Oct15/22 . | Mar14/23 | Jul15/23 . | Mar26/22 - | Jun17/22 . | Jul23/22 - | 0ct15/22 - | Dec17/22 - | Mar14/23 - | Jul15/23 - |
| | | Marź Jun1 Jul2 | Oct1 | Mar1 | Jul | Mar2 | ļunļ | Jul | 0ct1 | Dec1 | Mar1 | Jul |
| Laboratory Sample No. Lab Number Unique Number | | : PCA0090650 • : 05951608 er : 10647567 | 501 Madi Received Diagnos Diagnos | iosed : 19 Sep 2023 | | | | | PLYMOUTH & BROCKTON 8 INDUSTRIAL PARK RE PLYMOUTH, MA US 02360 | | | |
| - Denotes te | st methods that | t, contact Customer Sei t are outside of the ISO | : MOB 2 contact Customer Service at 1-800-237-1369. re outside of the ISO 17025 scope of accreditation. fications are based on the simple acceptance decision rule (JCGM 106:2012) | | | | | | Contact: Donald Pelpquir Dpeloquin@P-B.com T: (508)732-6039 F: (508)732-6091 | | | |

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