

# Comprehensive Third Party Testing

The following is a comprehensive summary of third-party tests performed on the Polytron Metal Treatment. Results in each category dramatically support Polytron's claims of friction and wear reduction along with improved performance, improved fuel economy and reduced emissions. Tests were performed on light duty engines as well as heavy duty commercial engines. More than 20 tests were performed with well over a 100 different types of performance markers measured while following established industry testing protocols.

## Light Duty Engines, API Service Category SL

TEST DESCRIPTION	Requirement	Test Results Reference Motor Oil Valvoline Max Life 10W-30 / 15W-40	Test Results Reference Motor Oil With 10% Polytron
<b>Sequence IIIF (Wear and oil thickening)</b>			
a. Kinematic viscosity, increase at 40°C	max, 275 %	80% to 90%	55% to 62%
b. Average piston skirt varnish rating	min, 9.0	9.2 to 9.4	9.6 to 9.8
c. Low temperature viscosity after 80 hours	report		
d. Weighted piston deposit rating	min, 4.0	4.5 to 4.7	5.8 to 6.1
e. Screened average cam-plus-lifter wear	max, 20 µm	9.2 µm to 10.1 µm	2.3 µm to 2.5 µm
f. Hot Stuck Piston Rings	none	none	none
g. Oil consumption	max, 5.2 liters	3.5 to 4.0 liters	1.2 to 1.5 liters
<b>Sequence VG, (Sludge and varnish)</b>			
a. Average engine sludge rating	min, 7.8	9.0 to 9.2	9.6 to 9.8
b. Rocker cover sludge rating	min, 8.0	9.0 to 9.2	9.4 to 9.6
c. Average engine varnish rating	min, 8.9	9.4 to 9.6	9.6 to 9.8
d. Average piston skirt varnish rating	min, 7.5	9.0 to 9.2	9.6 to 9.8
e. Oil screen clogging	max, 20%	9% to 10%	2% to 3%
f. Hot stuck compression rings, #	none	none	none
g. Cold stuck rings, #	Rate and report	none	none
h. Oil screen debris, %	Rate and report	4% to 5%	0%
i. Oil ring clogging, %	Rate and report	23% to 25%	2% to 4%
<b>Sequence VE, (Cam wear)</b>			
a. Average cam wear	max, 127 µm	23 µm to 25 µm	3 µm to 4 µm
b. Maximum cam wear	max, 380 µm	26 µm to 28 µm	3.5 µm to 4.5 µm
<b>Sequence IVA, (Valvetrain wear)</b>			
a. Average cam wear (7 position avg.)	max, 120 µm	15.4 µm	4.3 µm
b. Maximum cam wear	max, 380 µm	17.8 µm	5.1 µm
<b>Sequence VIII, (Bearing corrosion)</b>			
a. Bearing weight loss	max, 26.4 mg	20 mg to 21 mg	4.6 mg to 4.8 mg
<b>BRT , (Ball Rust Test, ASTM D6557)</b>			
a. Average Gray Value (AGV)	min, 100 AGV	128 to 130	152 to 155
<b>Volatility loss</b>			
a. Volatility loss (ASTM D5800)	max, 15 %	10% to 11%	10% to 11%
<b>EOFT (Engine Oil Filterability Test)</b>			
a. Flow reduction	max, 50 %	10% to 15%	7% to 8%
<b>EOWTT (Engine Oil Water Tolerance Test)</b>			
a. Flow reduction with 0.6% H <sub>2</sub> O	max, 50 %	12% to 15%	7% to 8%
b. Flow reduction with 1.0% H <sub>2</sub> O	max, 50 %	13% to 17%	7% to 8%
c. Flow reduction with 2.0% H <sub>2</sub> O	max, 50 %	16% to 18%	8% to 9%
d. Flow reduction with 3.0% H <sub>2</sub> O	max, 50 %	21% to 25%	8.5% to 9.5%
<b>TEST (MHT4)</b>			
a. Total Deposits	max, 45 mg	30 mg to 32 mg	15 mg to 17 mg

## Heavy Duty Engines, API Service Category CH4/CI-4

TEST DESCRIPTION	Requirement	Test Results <b>Reference Motor Oil Valvoline Max Life 10W-30 / 15W-40</b>	Test Results <b>Reference Motor Oil With 10% Polytron</b>
<b>RFWT (Roller Follower Wear Test)(D5966)</b>			
a. Avg. pin wear	max, 7.6 µm, 0.30 mg	0.28 to 0.31 mg	0.09 to 0.11 mg
<b>Sequence IIIF (Wear and oil thickening)</b>			
a. Kinematic viscosity, increase at 40°C	max, 275 %	80% to 90%	45% to 51%
b. Average piston skirt varnish rating	min, 9.0	9.2 to 9.4	9.5 to 9.8
c. Low temperature viscosity after 80 hours	report		
d. Weighted piston deposit rating	min, 4.0	4.5 to 4.7	5.9 to 6.3
e. Screened average cam-plus-lifter wear	max, 20 µm	9.2 µm to 10.1 µm	3.1 µm to 3.5 µm
f. Hot Stuck Piston Rings	none	none	none
g. Oil consumption	max, 5.2 liters	3.5 to 4.0 liters	1.5to 1.8 iters
<b>EOAT</b>			
a. Oil Aeration	max, 8 %	7.6 to 7.8 %	7.6 to 7.8 %
<b>Cummins M-11EGR (M11 High Soot test with EGR)</b>			
a. Crosshead weight loss	max, 20.0 mg	10.2 to 11.0 mg	3.8 to 4.1 mg
b. Top Ring Weight Loss	max, 175 mg	110.1 to 112.3 mg	32.5 to 38.3 mg
c. Engine sludge	min, 7.8 merits	8.2 to 8.5 merits	9.3 to 9.6 merits
d. Oil Filter Delta Pressure at 250 hours	max, 275 Kpa	272 to 274 Kpa	254 to 257 Kpa
<b>Caterpillar 1N</b>			
a. WDN Piston Demerits	max, 286.2	248.5 to 251.0	172.0 to 180.0
b. Top Grove Fill	max, 20%	8 to 8.5%	2.3 to 2.8%
c. Top Land Heavy Carbon	Max, 3%	0 %	0%
d. Oil Consumption (0-252 hours)	max, 0.5 g/kW-h	0.13 to 0.14 g/kW-h	254 to 257 Kpa
e. Piston Ring and Liner Scuffing	none	none	none
<b>Mack T8E (ASTM D5967)</b>			
a. Relative Viscosity at 4.8% soot	max, 1.8	1.51 to 1.54	1.51 to 1.54
<b>Mack T10 (with EGR)</b>			
a. Merit Rating	min, 1000	1151 to 1162	1238 to 1254
<b>Caterpillar 1R</b>			
a. WDR Piston Demerits	max, 382 demerits	335.4 to 348.0	215.0 to 219.0
b. Top Grove Fill	max, 52 demerits	50 to 51.5	34 to 37.2
c. Top Land Heavy Carbon	Max, 31 demerits	29.5 to 31.0	14.2 to 17.4
d. Initial Oil Consumption	max, 13.1 g/h	12.8 to 13.00 g/h	12.3 to 12.6 g/h
e. Final Oil Consumption	max, IOC+1.8 g/h	IOC + 1.6 g/h	IOC + 1.4 g/h
f. Piston ring and liner scuffing	none	none	none
g. Ring Sticking	none	none	none
<b>Foam Test (ASTN D892, Foaming/Settling)</b>			
a. Sequence I	max, 10/0	5/0 to 6/0	5/0 to 6/0
b. Sequence II	max, 20/0	10/0 to 12/0	10/0 to 12/0
c. Sequence III	max, 10/0	5/0 to 6/0	5/0 to 6/0
<b>Volatility</b>			
a. Loss at 250°C	max, 15%	9.0 to 9.2%	8.4 to 8.6%
<b>MRV TP-1 (Low Temperature Pumpability)</b>			
a. Viscosity of 75 hours used oil sample from T-10 test at -20°C	max, 60000 cP	18500 to 19200 cP	16300 to 17250 cP

**Heavy Duty Engines Continued...**

<b>HT/HS (High Temp / High Sheer Stability)</b>			
a. Viscosity , as allowed in SAE J300,	min, 3.5 mPa-s	3.67 to 3.71 mPa-s	3.70 to 3.82 mPa-s
<b>Shear Stability (ASTM D6278)</b>			
a. After Shear Viscosity 10W-30,	min, 9.3 cSt	10.2 to 10.6 cSt	10.0 to 10.6 cSt
b. After Shear Viscosity 15W-40,	min, 12.5 cSt	14.6 to 14.9 cSt	15.1 to 15.4 cSt

**Laboratory Comments:** The long term performance of motor oils containing Polytron surpasses many fold the performance of any other motor oils, resulting in extended oil change intervals (4 to 6) times, and elimination of up to 95% of engine wear in addition to many more outstanding features that make Polytron lubricants so unique.