

Here's the ranking list:

For those folks who are interested in this real world test data, below is the "Load Carrying Capacity/Film Strength" ranking list from all the real world motor oil "Wear Testing" I've performed so far on new oils, at a representative operational temperature of 230°F. The list includes modern API certified low zinc oils, traditional high zinc High Performance/Racing oils, Diesel oils, low zinc oils with zinc additives added in, and Break-In oils.

Lower ranked oils are not necessarily "bad", they simply don't provide as much wear protection capability as higher ranked oils. If you have been running a low ranked oil in your engine without issue, that doesn't mean you have a great oil, it only means that your engine's wear protection needs have not exceeded that oil's capability. And as long as your engine's needs don't exceed that oil's capability, you will never have a problem. But, if unexpected circumstances come up that make your engine's needs exceed that oil's capability, such as an overheating condition, an oiling condition, a loading condition, some parts heading south, or whatever, your engine can end up junk. But, if you'd been using an oil with a much higher capability, it could still provide enough extra protection to save your engine. So, each person has to decide for themselves, which motor oil provides the wear protection capability they are comfortable with, for any given engine build.

All oil bottles involved in the testing were thoroughly shaken before the samples were taken. This ensured that all the additive package components were distributed uniformly throughout all the oil in the bottle, and not settled to the bottom.

Test result differences between oils of less than 10% are not significant, and oils within that range can be considered approximately equivalent.

An oil's "wear protection" capability that was tested here, and an oil's "friction reduction" capability, are two entirely different things. While this test data provides excellent information about an oil's ability to prevent wear, it says nothing about an oil's ability to reduce friction. So, the data here will not provide any information regarding differences in HP potential.

The ppm quantities of zinc, phos, moly and in some cases titanium, shown in the list, are directly from the Lab Reports that came back from the Professional Lab "ALS Tribology" in Sparks, Nevada. Some oils have more zinc than phos, while other oils have more phos than zinc. It just depends on the particular oil's formulation. Either way, the numbers are correct and are NOT typos.

NOTE: The higher the psi value, the BETTER the wear protection. And this applies to ANY engine, including High Performance flat tappet engines.

That psi value is determined by the testing "load" being applied (which of course, is the EXACT SAME for every oil tested), over the "area" of the wear scar that is created on the test specimen, as the test is being performed. So, the result is "pounds" of force being applied over the wear scar "area", which is in square inches. Or in other words, pounds per square inch, which of course is just shortened to "psi". The better an oil's wear protection capability, the smaller the wear scar will be on the test specimen, and the higher the resulting psi value will be.

Oil categories for gasoline engines:

- Over 90,000 psi = OUTSTANDING wear protection

- 75,000 to 90,000 psi = GOOD wear protection
- 60,000 to 75,000 psi = MODEST wear protection
- Below 60,000 psi = UNDESIRABLE wear protection

1. 5W30 Pennzoil Ultra, API SM synthetic = 115,612 psi

I have not been able to find this oil with the latest API SN certification. The bottle says, "No leading synthetic oil provides better wear protection". For once, a product's hype turns out to be true. And this oil provides MORE THAN TWICE as much wear protection as the lowest ranked oil on this list.

zinc = 806 ppm

phos = 812 ppm

moly = 66 ppm

2. 10W30 Lucas Racing Only synthetic = 106,505 psi

zinc = 2642 ppm

phos = 3489 ppm

moly = 1764 ppm

NOTE: This oil is suitable for short term racing use only, and is not suitable for street use.

3. 5W30 Mobil 1, API SN synthetic = 105,875 psi

zinc = 801 ppm

phos = 842 ppm

moly = 112 ppm

4. 0W30 Amsoil Signature Series 25,000 miles, API SN synthetic = 105,008 psi

zinc = 824 ppm

phos = 960 ppm

moly = 161 ppm

5. 10W30 Valvoline NSL (Not Street Legal) Conventional Racing Oil = 103,846 psi

zinc = 1669 ppm

phos = 1518 ppm

moly = 784 ppm

NOTE: This oil is suitable for short term racing use only, and is not suitable for street use.

6. 5W50 Motorcraft, API SN synthetic = 103,517 psi

zinc = 606 ppm

phos = 742 ppm

moly = 28 ppm

7. 10W30 Valvoline VR1 Conventional Racing Oil (silver bottle) = 103,505 psi

zinc = 1472 ppm

phos = 1544 ppm

moly = 3 ppm

8. 10W30 Valvoline VR1 Synthetic Racing Oil, API SL (black bottle) = 101,139 psi

zinc = 1180 ppm  
phos = 1112 ppm  
moly = 162 ppm

9. 5W30 Chevron Supreme, API SN conventional = 100,011 psi  
This oil only cost \$4.29 per quart at an Auto Parts Store when I bought it.

zinc = 1018 ppm  
phos = 728 ppm  
moly = 161 ppm

10. 5W20 Castrol Edge with Titanium, API SN synthetic = 99,983 psi

zinc = 1042 ppm  
phos = 857 ppm  
moly = 100 ppm  
titanium = 49 ppm

11. 5W30 Pennzoil Platinum, API SN synthetic = 99,949 psi

zinc = TBD  
phos = TBD  
moly = TBD

12. 20W50 Castrol GTX ,API SN conventional = 96,514 psi

zinc = 610 ppm  
phos = 754 ppm  
moly = 94 ppm

13. 30 wt Red Line Race Oil synthetic = 96,470 psi

zinc = 2207 ppm  
phos = 2052 ppm  
moly = 1235 ppm

NOTE: This oil is suitable for short term racing use only, and is not suitable for street use.

14. 0W20 Mobil 1 Advanced Fuel Economy, API SN synthetic = 96,364 psi

zinc = 742 ppm  
phos = 677 ppm  
moly = 81 ppm

15. 5W30 Quaker State Ultimate Durability, API SN synthetic = 95,920 psi

zinc = 877 ppm  
phos = 921 ppm  
moly = 72 ppm

16. 5W30 Castrol Edge with Titanium, API SN synthetic = 95,717 psi

zinc = 818 ppm  
phos = 883 ppm  
moly = 90 ppm  
titanium = 44 ppm

17. 10W30 Joe Gibbs XP3 NASCAR Racing Oil synthetic = 95,543 psi

zinc = 743 ppm  
phos = 802 ppm

moly = 1125 ppm

NOTE: This oil is suitable for short term racing use only, and is not suitable for street use.

18. 5W20 Castrol GTX, API SN conventional = 95,543 psi

zinc = TBD

phos = TBD

moly = TBD

NOTE: Oil numbers 17 and 18 were tested weeks apart, but due to the similarities in their wear scar sizes, their averages ended up the same.

19. 5W30 Castrol GTX ,API SN conventional = 95,392 psi

zinc = 830 ppm

phos = 791 ppm

moly = 1 ppm

20. 10W30 Amsoil Z-Rod Oil synthetic = 95,360 psi

zinc = 1431 ppm

phos = 1441 ppm

moly = 52 ppm

21. 5W30 Havoline, API SN conventional = 95,098 psi

zinc = TBD

phos = TBD

moly = TBD

22. 5W30 Valvoline SynPower, API SN synthetic = 94,942 psi

zinc = 969 ppm

phos = 761 ppm

moly = 0 ppm

23. 5W30 Valvoline Premium Conventional, API SN = 94,744 psi

zinc = TBD

phos = TBD

moly = TBD

24. 5W20 Mobil 1, API SN synthetic = 94,663 psi

zinc = 764 ppm

phos = 698 ppm

moly = 76 ppm

25. 5W20 Valvoline SynPower, API SN synthetic = 94,460 psi

zinc = 1045 ppm

phos = 742 ppm

moly = 0 ppm

26. 5W30 Lucas, API SN conventional = 92,073 psi

zinc = 992 ppm

phos = 760 ppm

moly = 0 ppm

27. 5W30 O'Reilly (house brand), API SN conventional = 91,433 psi

This oil only cost \$3.99 per quart at an Auto Parts Store when I bought it.

zinc = 863 ppm

phos = 816 ppm

moly = 0 ppm

28. 5W30 Maxima RS530 Synthetic Racing Oil = 91,162 psi

zinc = 2162 ppm

phos = 2294 ppm

moly = 181 ppm

29. 5W30 Red Line, API SN synthetic = 91,028 psi

zinc = TBD

phos = TBD

moly = TBD

30. 5W20 Royal Purple API SN synthetic = 90,434 psi

zinc = 964 ppm

phos = 892 ppm

moly = 0 ppm

31. 10W30 Quaker State Defy, API SL semi-synthetic = 90,226 psi

zinc = 1221 ppm

phos = 955 ppm

moly = 99 ppm

32. 10W60 Castrol TWS Motorsport, API SJ conventional = 90,163 psi

This oil is manufactured in Europe and is sold in the US for BMW models M3, M5, M6, Z4M, and Z8.

zinc = TBD

phos = TBD

moly = TBD

33. 5W20 Valvoline Premium Conventional, API SN = 90,144 psi

zinc = TBD

phos = TBD

moly = TBD

34. 5W30 Havoline, API SN synthetic = 89,406 psi

zinc = TBD

phos = TBD

moly = TBD

35. 30 wt Castrol Heavy Duty, API SM conventional = 88,089 psi

zinc = 907 ppm

phos = 829 ppm

moly = 56 ppm

36. 20W50 LAT Synthetic Racing Oil, API SM = 87,930 psi

zinc = TBD

phos = TBD

moly = TBD

37. 5W30 Valvoline Nextgen 50% Recycled Oil, API SN conventional = 87,563 psi

zinc = 947 ppm

phos = 778 ppm

moly = 0 ppm

38. 10W30 Joe Gibbs HR4 Hotrod Oil synthetic = 86,270 psi

zinc = 1247 ppm

phos = 1137 ppm

moly = 24 ppm

39. 5W20 Pennzoil Ultra, API SM synthetic = 86,034 psi

I have not been able to find this oil with the latest API SN certification.

zinc = TBD

phos = TBD

moly = TBD

40. 15W40 RED LINE Diesel Oil synthetic, API CJ-4/CI-4 PLUS/CI-4/CF/CH-4/CF-4/SM/SL/SH/EO-O = 85,663 psi

zinc = 1615 ppm

phos = 1551 ppm

moly = 173 ppm

41. 5W30 Castrol Edge w/Syntec, API SN (formerly Castrol Syntec) black bottle, synthetic = 85,179

psi

zinc = TBD

phos = TBD

moly = TBD

42. 5W30 Royal Purple API SN synthetic = 84,009 psi

zinc = 942 ppm

phos = 817 ppm

moly = 0 ppm

43. 20W50 Royal Purple API SN synthetic = 83,487 psi

zinc = 588 ppm

phos = 697 ppm

moly = 0 ppm

44. 20W50 Kendall GT-1 High Performance with liquid titanium, API SN conventional = 83,365 psi

zinc = 991 ppm

phos = 1253 ppm

moly = 57 ppm

titanium = 84 ppm

45. 5W30 Mobil 1 Extended Performance 15,000 mile, API SN synthetic = 83,263 psi

zinc = 890 ppm

phos = 819 ppm

moly = 104 ppm

46. 0W20 Castrol Edge with Titanium, API SN synthetic = 82,867 psi

zinc = TBD

phos = TBD  
moly = TBD

47. 5W30 LAT Synthetic Racing Oil, API SM = 81,800 psi  
zinc = 1784 ppm  
phos = 1539 ppm  
moly = 598 ppm

48. 5W30 Peak, API SN synthetic = 80,716 psi  
zinc = TBD  
phos = TBD  
moly = TBD

49. 5W30 Edelbrock "Cat-Safe", API SM synthetic = 78,609 psi  
This oil is made for Edelbrock by Torco  
zinc = 924 ppm  
phos = 659 ppm  
moly = 28 ppm

50. 15W40 ROYAL PURPLE Diesel Oil synthetic, API CJ-4 /SM, CI-4 PLUS, CH-4, CI-4 = 76,997 psi  
zinc = TBD  
phos = TBD  
moly = TBD

51. 5W30 Pennzoil, API SN yellow bottle, conventional = 76,989 psi  
zinc = TBD  
phos = TBD  
moly = TBD

52. 10W40 Chevron Supreme, API SN conventional = 76,806 psi  
zinc = TBD  
phos = TBD  
moly = TBD

53. 5W30 Lucas API SM synthetic = 76,584 psi  
zinc = 1134 ppm  
phos = 666 ppm  
moly = 0 ppm

54. 5W30 GM's AC Delco dexos 1 API SN semi-synthetic = 76,501 psi  
zinc = 878 ppm  
phos = 758 ppm  
moly = 72 ppm

55. 5W50 Castrol Edge with Syntec API SN, synthetic, formerly Castrol Syntec, black bottle = 75,409 psi  
zinc = 1252 ppm  
phos = 1197 ppm  
moly = 71 ppm

56. 5W30 Royal Purple XPR (Extreme Performance Racing) synthetic = 74,860 psi

zinc = 1421 ppm  
phos = 1338 ppm  
moly = 204 ppm

NOTE: This particular bottle of oil was just opened, but was out of a 3 ½ year old case.

57. 5W40 MOBIL 1 TURBO DIESEL TRUCK synthetic, API CJ-4, CI-4 Plus, CI-4, CH-4 and ACEA E7 =  
74,312 psi  
zinc = 1211 ppm  
phos = 1168 ppm  
moly = 2 ppm

58. 5W30 Peak, API SN conventional = 73,690 psi  
zinc = TBD  
phos = TBD  
moly = TBD

59. 15W40 CHEVRON DELO 400LE Diesel Oil, conventional, API CJ-4, CI-4 Plus, CH-4, CF-4,CF/SM, =  
73,520 psi  
zinc = 1519 ppm  
phos = 1139 ppm  
moly = 80 ppm

60. 15W40 MOBIL DELVAC 1300 SUPER Diesel Oil conventional, API CJ-4, CI-4 Plus, CI-4, CH-4/SM,  
SL = 73,300 psi  
zinc = 1297 ppm  
phos = 1944 ppm  
moly = 46 ppm

61. 15W40 Farm Rated Heavy Duty Performance Diesel Oil conventional CI-4, CH-4, CG-4, CF/SL, SJ  
= 73,176 psi  
zinc = 1325ppm  
phos = 1234 ppm  
moly = 2 ppm

62. 15W40 SHELL ROTELLA T Diesel Oil conventional, API CJ-4, CI-4 Plus, CH-4, CF-4,CF/SM =  
72,022 psi  
zinc = 1454 ppm  
phos = 1062 ppm  
moly = 0 ppm

63. Brad Penn, Penn Grade 1 Nitro 70 Racing Oil semi-synthetic = 72,003 psi  
zinc = TBD  
phos = TBD  
moly = TBD

64. 0W30 Brad Penn, Penn Grade 1 semi-synthetic = 71,377 psi  
zinc = 1621 ppm  
phos = 1437 ppm  
moly = 0 ppm

65. 15W40 "OLD" SHELL ROTELLA T Diesel Oil conventional, API CI-4 PLUS, CI-4, CH-4,CG-4,CF-



4,CF,SL, SJ, SH = 71,214 psi  
zinc = 1171 ppm  
phos = 1186 ppm  
moly = 0 ppm

66. 10W30 Brad Penn, Penn Grade 1 semi-synthetic = 71,206 psi  
zinc = 1557 ppm  
phos = 1651 ppm  
moly = 3 ppm

67. 15W40 VALVOLINE PREMIUM BLUE HEAVY DUTY DIESEL Oil conventional, API CJ-4, CI-4 Plus, CI-4, CH-4, CG-4, CF-4, CF/SM = 70,869 psi  
zinc = TBD  
phos = TBD  
moly = TBD

68. 15W50 Mobil 1, API SN synthetic = 70,235 psi  
zinc = 1,133 ppm  
phos = 1,168 ppm  
moly = 83 ppm

69. 5W40 CHEVRON DELO 400LE Diesel Oil synthetic, API CJ-4, CI-4 Plus, CI-4, SL, SM = 69,631 psi  
zinc = TBD  
phos = TBD  
moly = TBD

70. 30wt Edelbrock Break-In Oil conventional = 69,160 psi  
zinc = 1545 ppm  
phos = 1465 ppm  
moly = 4 ppm

71. 5W30 Motorcraft, API SN synthetic = 68,782 psi  
zinc = 796 ppm  
phos = 830 ppm  
moly = 75 ppm

72. 10W40 Edelbrock synthetic = 68,603 psi  
zinc = 1193 ppm  
phos = 1146 ppm  
moly = 121 ppm  
This oil is manufactured for Edelbrock by Torco.

73. 5W40 SHELL ROTELLA T6 Diesel Oil synthetic, API CJ-4, CI-4 Plus, CI-4, CH-4, SM, SL = 67,804 psi  
zinc = TBD  
phos = TBD  
moly = TBD

74. 15W40 LUCAS MAGNUM Diesel Oil, conventional, API CI-4,CH-4, CG-4, CF-4, CF/SL = 66,476 psi  
zinc = 1441 ppm

phos = 1234 ppm  
moly = 76 ppm

75. 15W40 CASTROL GTX DIESEL Oil conventional, API CJ-4, CI-4 Plus, CI-4, CH-4, CG-4, CF-4/SN = 66,323 psi  
zinc = TBD  
phos = TBD  
moly = TBD

76. 10W30 Royal Purple HPS (High Performance Street) synthetic = 66,211 psi  
zinc = 1774 ppm  
phos = 1347 ppm  
moly = 189 ppm

77. 10W40 Valvoline 4 Stroke Motorcycle Oil, API SJ conventional = 65,553 psi  
zinc = 1154 ppm  
phos = 1075 ppm  
moly = 0 ppm

78. 5W30 Klotz Estorlin Racing Oil, API SL synthetic = 64,175 psi  
zinc = 1765 ppm  
phos = 2468 ppm  
moly = 339 ppm

79. "ZDDPlus" added to Royal Purple 20W50, API SN, synthetic = 63,595 psi  
zinc = 2436 ppm (up 1848 ppm)  
phos = 2053 ppm (up 1356 ppm)  
moly = 2 ppm (up 2 ppm)

The amount of ZDDPlus added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was 24% LOWER than this oil had BEFORE the ZDDPlus was added to it. Most major Oil Companies say to NEVER add anything to their oils, because adding anything will upset the carefully balanced additive package, and ruin the oil's chemical composition. And that is precisely what we see here. Adding ZDDPlus SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

80. Royal Purple 10W30 Break-In Oil conventional = 62,931 psi  
zinc = 1170 ppm  
phos = 1039 ppm  
moly = 0 ppm

81. 10W30 Lucas Hot Rod & Classic Hi-Performance Oil, conventional = 62,538 psi  
zinc = 2116 ppm  
phos = 1855 ppm  
moly = 871 ppm

82. 0W20 Klotz Estorlin Racing Oil, API SL synthetic = 60,941 psi  
zinc = TBD  
phos = TBD  
moly = TBD

83. 10W30 Comp Cams Muscle Car & Street Rod Oil, synthetic blend = 60,413 psi

zinc = 1673 ppm

phos = 1114 ppm

moly = 67 ppm

This oil is manufactured for Comp Cams by Endure.

84. 10W40 Torco TR-1 Racing Oil with MPZ conventional = 59,905 psi

zinc = 1456 ppm

phos = 1150 ppm

moly = 227 ppm

85. 10W40 Summit Racing Premium Racing Oil, API SL = 59,483 psi

This oil is made for Summit by I.L.C.

zinc = TBD

phos = TBD

moly = TBD

86. 10W40 Edelbrock conventional = 59,120 psi

zinc = TBD

phos = TBD

moly = TBD

This oil is manufactured for Edelbrock by Torco.

87. 0W20 LAT Synthetic Racing Oil, API SM = 57,228 psi

zinc = TBD

phos = TBD

moly = TBD

88. "ZDDPlus" added to O'Reilly (house brand) 5W30, API SN, conventional = 56,728 psi

zinc = 2711 ppm (up 1848 ppm)

phos = 2172 ppm (up 1356 ppm)

moly = 2 ppm (up 2 ppm)

The amount of ZDDPlus added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was 38% LOWER than this oil had BEFORE the ZDDPlus was added to it. Adding ZDDPlus SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

89. "ZDDPlus" added to Motorcraft 5W30, API SN, synthetic = 56,243 psi

zinc = 2955 ppm (up 1848 ppm)

phos = 2114 ppm (up 1356 ppm)

moly = 76 ppm (up 2 ppm)

The amount of ZDDPlus added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was 12% LOWER than this oil had BEFORE the ZDDPlus was added to it. Adding ZDDPlus SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

90. "Edelbrock Zinc Additive" added to Royal Purple 5W30, API SN, synthetic = 54,044 psi

zinc = 1515 ppm (up 573 ppm)  
phos = 1334 ppm (up 517 ppm)  
moly = 15 ppm (up 15 ppm)

The amount of Edelbrock Zinc Additive added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was a whopping 36% LOWER than this oil had BEFORE the Edelbrock Zinc Additive was added to it. Adding Edelbrock Zinc Additive SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

91. 10W30 Comp Cams Break-In Oil conventional = 51,749 psi  
zinc = 3004 ppm  
phos = 2613 ppm  
moly = 180 ppm

92. "Edelbrock Zinc Additive" added to Lucas 5W30, API SN, conventional = 51,545 psi  
zinc = 1565 ppm (up 573 ppm)  
phos = 1277 ppm (up 517 ppm)  
moly = 15 ppm (up 15 ppm)

The amount of Edelbrock Zinc Additive added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was a "breath taking" 44% LOWER than this oil had BEFORE the Edelbrock Zinc Additive was added to it. Adding Edelbrock Zinc Additive SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

93. "Edelbrock Zinc Additive" added to Motorcraft 5W30, API SN, synthetic = 50,202 psi  
zinc = 1680 ppm (up 573 ppm)  
phos = 1275 ppm (up 517 ppm)  
moly = 89 ppm (up 15 ppm)

The amount of Edelbrock Zinc Additive added to the oil, was the exact amount the manufacturer called for on the bottle. And the resulting psi value here was 22% LOWER than this oil had BEFORE the Edelbrock Zinc Additive was added to it. Adding Edelbrock Zinc Additive SIGNIFICANTLY REDUCED this oil's wear prevention capability. Just the opposite of what was promised. Buyer beware.

94. 30wt Lucas Break-In Oil conventional = 49,455 psi  
zinc = 4483 ppm  
phos = 3660 ppm  
moly = 3 ppm

At the end of the day, it is not my goal to convince anyone of anything. I'm simply sharing valuable real world test data for folks to consider. Everyone can obviously decide for themselves if they want to embrace this data and make use of it, or if they simply want to ignore it.

540 RAT  
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