

Modern Motor Oil and the LT5 Engine

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Engine oil has evolved in many ways over the last 20 years. The oiling needs of the LT5 have remained fixed as they were in 1989, when the first ZR-1 was sold to the public. GM specified API standard SGⁱ for the '90 to '93 engines. GM specified API "SG or SH"ⁱⁱ for the '94 and '95 engines.

As new engines have evolved, so have the requirements for oil performance. Today's modern oil has been changed to reduce friction, pumping losses, formation of deposits, more tolerance of high temperature, and for emissions system performanceⁱⁱⁱ. Catalysts are affected by metallic additives in motor oil. The metallics can lower the efficiency of a catalyst through a process known as deactivation^{iv}. The EPA has extended the government mandated catalyst life requirement to 80K miles^v. It is this requirement that runs contrary to the needs of the LT5. API SG oil uses zinc and phosphorus as EP (Extreme Pressure) anti-wear additives. The two additives are often referred to as a package designated as ZDDP. Phosphorus is the more detrimental of the two, and is being progressively reduced to address the catalyst deactivation issue.

Maximum phosphorus per the API standard:	SG	.12% or 1200 ppm
	SH	.12% / 1200 ppm
	SJ	.10% / 1000 ppm
	SL	.10% / 1000 ppm
	SM	.08% / 800 ppm

Zinc has been reduced in proportion to phosphorus

within the ZDDP package, typically:	SG	.13% or 1300 ppm
	SH	.13% / 1300 ppm
	SJ	.11% / 1100 ppm
	SL	.11% / 1100 ppm
	SM	.09% / 900 ppm

Most modern GM engines use roller valve lifters. They have short timing chains to drive a single camshaft or dry belts to drive multiple camshafts. The need for EP protection for these engines is decreasing. Japanese carmakers that like to use long metal timing chains are evaluating the effects of the future oil standard on their designs.

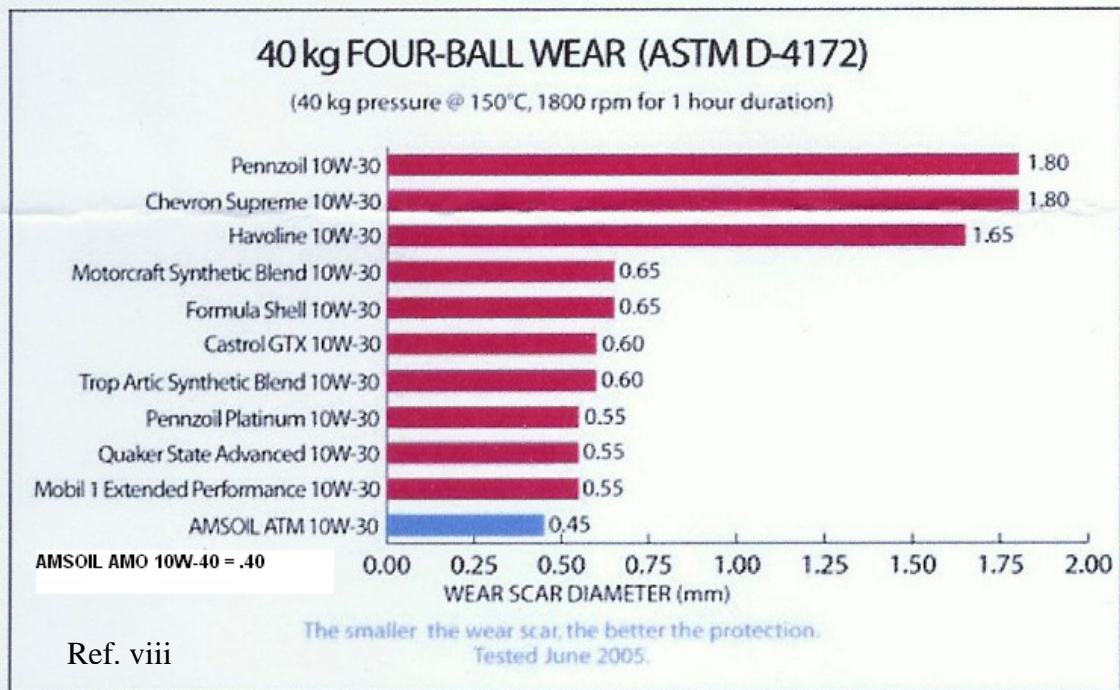
My concern is for the flat valve lifters, the camshafts, the timing chains and the sprockets in the LT5. I believe that the SM oil for new cars is not appropriate for the LT5. The Mobil 1 Oil Company has also recognized the needs of flat lifter engines with respect to their products. They recommend their reformulated 15W-50 product^{vi} for engines with high-tension valve springs. I think that 15W-50 oil is too high in viscosity for the LT5. The Mobil 1 High mileage products are also acceptable for the LT5 engine.

Mobil 1 ZDDP specifications: ^{vii}	Phosphorus	Zinc	Comment:
Mobil 1 10W-30	800 ppm	900 ppm	Unacceptable
Mobil 1 Extended Performance	800 ppm	900 ppm	Unacceptable
Mobil 1 15W-50	1200 ppm	1300 ppm	Very good ZDDP. Viscosity is too high.
Mobil 1 High Mileage 5W-30, 10W-30, 10W-40	1000 ppm	1100 ppm	Acceptable for the LT5 with OE valve springs.

The Amsoil Company has addressed this issue with a product that is specifically designed for engines with flat valve lifters and high tension valve springs. It is formulated with high phosphorus and zinc protection. It meets the API SG specification that was used when the LT5 was designed. The product is named AMO 10W-40 Synthetic Premium Protection. It takes a two-pronged approach, higher EP additives and superior film strength due to the higher viscosity.

Amsoil AMO ZDDP specifications:	Phosphorus	Zinc	Comment:
	1265 ppm	1378 ppm	Recommended for the LT5 engine. Also for other engines with high tension valve springs.

EP performance can be measured with the Shell Four-Ball Wear test, ASTM D-4172. This test uses a machine to rotate a steel ball against three other steel balls. The test is run at a specific pressure, speed and temperature and for a specific amount of time. The width of the wear scar on the rotated ball is measured to reflect the effectiveness of the oil to protect the materials.



The Amsoil AMO 10W-40 product offers additional EP protection beyond the Amsoil ATM 10W-30 product because of the contribution from the additional film strength.

For the LT5, I recommend Amsoil AMO, or another oil that can demonstrate similar EP performance in comparative product testing.

Amsoil also has the ZRT 10W-30 Z-Rod product for flat tappet engines.

Amsoil Z-Rod ZDDP specifications:	Phosphorus	Zinc	Comment:
	1320 ppm	1440 ppm	Secondary recommendation.

I recommend AMO as a first recommendation because it uses slightly higher quality base stock than Z-Rod. If you would change Mobil 1 at 3000 miles you can go 5000 miles on AMO. In the same comparison you can go 3000 miles on Z-Rod. I prefer 10W-40 viscosity because it has a thicker film than 10W-30. A thicker film contributes further to extreme pressure protection. Z-Rod is a good alternative if the car is driven less than 3000 miles per year.

Amsoil is available from Amsoil dealers and directly from Amsoil at www.amsoil.com.

ⁱ GM '90-'93 Service Manuals.

ⁱⁱ GM '94 -'95 Service Manuals.

ⁱⁱⁱ Larry Carley, Underhood Service, January 2007.

^{iv} Critical Topics in Exhaust Gas After-Treatment, Chapter 6. Peter Eastwood, UK. SAE publication.

^v EPA document EPA420-F-96-020

^{vi} http://www.mobil1.com/USA-English/MotorOil/Oils/Mobil_1_15W-50_.aspx

^{vii} http://www.mobiloil.com/USA-English/MotorOil/Files/Mobil_1_Product_Guide.pdf

^{viii} Amsoil test data.