

ZDDP In Engine Oils -

Because the EPA wants a minimum 100,000-mile lifespan from catalytic converters, they need a fighting chance at survival. Zinc in the oil undermines that survival. That's why both the automakers and Washington decided zinc had to be eliminated from engine oil.

Without zinc in the oil, wear for vintage engines with flat tappet cams increases exponentially. In fact, it is alarming how quickly it happens and how much damage it does. Zinc is crucial not just for cold start-up, but extreme conditions that make heavy-duty engine oils necessary for reliable operation. There's no magic in heavy-duty engine oil, just higher levels of ZDDP to help reduce wear.

In the years previous to 1996, zinc levels between 1,200 and 1,400 ppm could be found in all brands of high-performance motor oils. In 2001, API category SL was introduced with 1,000 ppm maximum phosphorus/zinc content; this was a mandatory 18 percent reduction. In 2005, the API SM category was introduced and "phosphorus/zinc" level was reduced again to a maximum 800 ppm (an additional 20 percent reduction, total 34 percent reduction from API SJ rating); this reduces the phosphorus/zinc to an inadequate level of protection for high-performance engines.

The first thing you want to know about engine oil is if it has an "SM" rating, which indicates greatly reduced or zero zinc levels, which makes it harmful to your vintage or ¹Pre-OBD II engines. Do not use engine oil with the "SM" rating. Or, if you're going to use engine oil with the "SM" rating, use a zinc additive that will maintain proper ZDDP levels. Front and center for this issue is California, which wants all zinc eliminated from engine oil. Regardless of what government and industry mandate for engine oil, it is up to you to ensure sufficient zinc levels are maintained when you change or add oil.

ZDDP is crucial to engine wear and break-in issues because so many things need to happen when you fire an engine for the first time. When you fire a vintage engine with flat tappets for the first time and run it at 2,500 rpm for 30 minutes, you are work-hardening the cam lobes to ensure long life. Cam lobes not only move the lifters, pushrods, and valves, they also spin the lifters in their bores for proper function. The lifter and lobe must have sufficient traction for spinning to happen. This is why you don't want to run synthetic oil or friction-reducing additive during break-in. ZDDP helps lifter/lobe traction. It also works into your engine's hardest working parts.

¹All cars and light trucks built and sold in the United States after January 1, 1996 were required to be OBD II equipped (On-Board Diagnostic System). In general, this means all 1996 model year cars and light trucks were equipped with OBD II, even if built in late 1995.

Comparison of Various Engine Oil Additives

Additional Zinc and Phosphorus Content When Added To
5 Quarts (160 oz.) of Motor Oil

PRODUCT	ENGINE PRO HI-ZINC ENGINE PROTECTOR	ZDDPlus	ELGIN ENGINE ARMOUR	COMP CAMS BREAK-IN OIL	TORCO ZEP
Bottle Size	4 oz.	4 oz.	4 oz.	12 oz.	12 oz
Dilution Ratio	41:1	41:1	41:1	14.3:1	14.3:1
Phosphorus Content, ppm	1575	1171	1024	503	421
Zinc Content, ppm	1741	1659	1463	532	474

API SM Oils can only contain a maximum of 800ppm of zinc/phosphorus. The numbers above for each product would then be added to that amount. For example, if the fill oil had a zinc level of 800ppm the resulting zinc level would be $1741\text{ppm} + 800\text{ppm} = 2541\text{ppm}$