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Do Older Engines Need Oil With ZDDP Additives?

Using a high-zinc oil with a high dose of ZDDP additives helps protect classic car and hot rod engines. AMSOIL...



by JOHN BAKER
July 13, 2022

the
INSIDE TRACK



- How do ZDDP additives work?
- Flat-tappet cams vs. roller cams
- The role of piston rings
- Do you always need an oil with ZDDP additives?



Hugh Ashburn We are Amsoil Dealers in Lewisville TX. My interest is in Older engines, and rebuilt older engines. Do they need zinc additives throughout there running life, or just to break-in the cam , lifters, etc.?

I have a 1964 Ford Thunderbird with it's original 60,000 mile 390 cu in motor. I run Z-Rod in it. (Very happy motor now)

I have seen comments around the old car/restoration/hot rod world, that the older engines only need zinc additives while your breaking in a new or rebuilt motor.

Just wondering the long term benefits of the additives on the motors.

Thanks.

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Thanks to Hugh Ashburn for asking on our [Facebook page](#) about using high-zinc oil in older engines. Specifically, should you use a motor oil with ZDDP additives only during engine break-in or throughout the engine's lifespan?



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What is high-zinc motor oil?

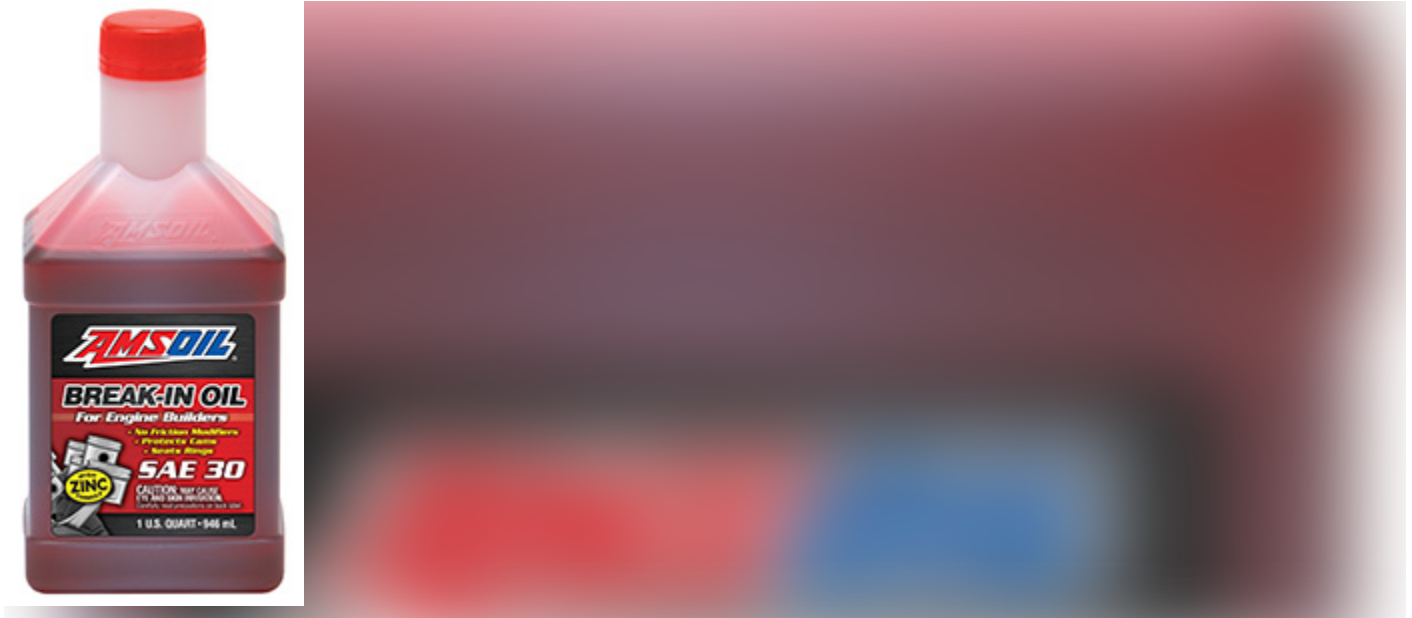


However, because the zinc and phosphorus found in ZDDP can negatively affect catalytic converters, it has been phased out of motor oil formulations in recent years.

Reducing ZDDP has drawbacks, as classic-car owners have found. Older vehicles with flat-tappet camshafts and, in particular, engines that include high-tension valve springs or other modifications that create high contact pressures, can suffer premature wear due to reduced ZDDP levels.

For best protection, engine builders and gearheads typically use high-zinc and high-phosphorus motor oil to offer extra protection for flat-tappet cams, lifters and other components during break-in.

AMSOIL Break-In Oil, for example, contains **2,200 ppm zinc** and **2,000 ppm phosphorus**.



How do ZDDP additives work?

ZDDP anti-wear additives are **heat-activated**, meaning they provide wear protection in areas of increased friction.

As temperatures rise and surfaces come closer together, ZDDP decomposes and the resulting chemistry protects critical metal surfaces.

When parts move during operation, any sliding or rolling motion takes place on top of or within the ZDDP anti-wear film, which reduces metal-to-metal contact.



**Flat-Tappet
Lifter**

This is **especially important in engines with flat-tappet camshafts or engines modified to create more horsepower**. High-tension valve springs, often used in racing applications, also increase the potential for cam wear and require additional ZDDP.

Flat-tappet cams vs. roller cams

The design of flat-tappet cams makes them especially vulnerable to wear. As the name indicates, the tappet – or lifter – is flat. During operation, the cam-lobe slides rapidly over the tappet, increasing friction and temperatures.

A thin oil film is the only barrier that prevents the lifter and cam lobe from welding together.

If the oil film fails or provides insufficient wear protection, the two components can eventually wear the flat-tappet cam and affect valve operation.

Engine power and efficiency can decline if the flat-tappet cam cannot lift the valves enough to adequately charge the chamber for ignition or release exhaust fumes. Because most V-8 engines of the muscle-car era came standard with flat-tappet cams, the problem is especially prevalent to classic-car and hot rod owners.

Roller cams, on the other hand, are differentiated by rolling contact rather than sliding contact. Although costlier, roller cams are common in most modern vehicles and can be retrofitted into classic-car and hot-rod engines.

The role of piston rings

Even though Hugh didn't ask about it specifically, I should also mention the importance of seating the [piston rings](#) during break-in.



The sharp peaks, meanwhile, provide insufficient area to allow the rings to seat tightly. That means highly pressurized combustion gases can blow past the rings and into the crankcase, reducing horsepower and contaminating the oil.

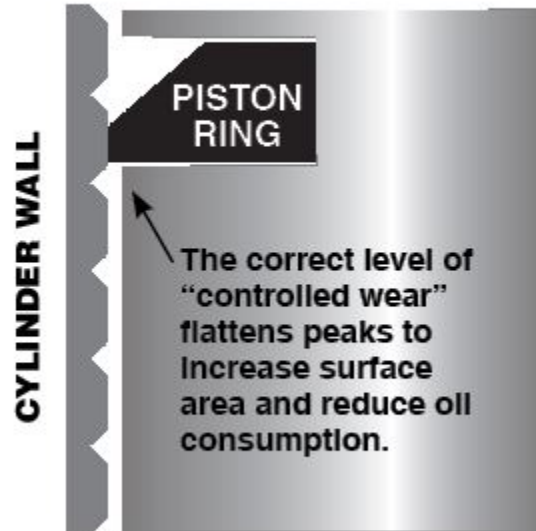
Find out why championship engine builder Jesse Prather requires his customers to use AMSOIL Break-In Oil.

Breaking in the engine wears the cylinder-wall asperities, providing increased surface area for the rings to seat tightly. The result is maximum compression (i.e. power) and minimum oil consumption.

Fig. 1: New Cylinder



Fig. 2: Broken-In Cylinder



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Do you always need an oil with ZDDP additives?

Do you need to use high-zinc motor oil in an older engine after break-in, which is typically about 500 miles?

Yes, if you want to maintain horsepower and promote longevity.

Even after the cam has seasoned, it's still exposed to tremendous heat and pressure, especially in a heavily modified or racing engine. The constant barrage of pressure can rupture the oil film responsible for preventing wear, leading to metal-to-metal contact.

After break-in, we recommend using an oil with at least 1,000 ppm ZDDP in a flat-tappet engine.

That way, you're providing your expensive engine with maximum protection against wear and horsepower loss.

AMSOIL Z-ROD Synthetic Motor Oil, our primary recommendation for classic cars and hot rods, contains more than...

- 1,400 ppm zinc
- 1,300 ppm phosphorus







Updated. Originally published Aug. 25, 2017.

Related Reading

- The Art and Science of Engine Break-In
- Break-In Oil: What is it and When Do I Use it?

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by JOHN BAKER

AMSOIL Technical Writer and avid DIYer with 12 years in the synthetic lubricants industry, who enjoys making technical topics in the automotive, powersports and industrial markets easy to understand.

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