

ZDDPlus

Restores ZDDP
Saves Engines

REAL
ZDDP



After 70+ years of trouble-free, metal-to-metal engine protection,

the E.P.A. is forcing ZDDP (Zinc Dialkyl Dithio Phosphate = zinc and phosphorus) from domestic motor oil.

If your engine was designed prior to the 1990s, the non-roller lifters require ZDDP in the motor oil to avoid premature deterioration.

Don't let the lifters run metal-to-metal.

Keep ZDDP, via ZDDPlus™, in your motor oil.

Add a 4 oz bottle of ZDDPlus™

to every 4- to 5-quart oil change.

One bottle of ZDDPlus™ contains more ZDDP than two bottles of GM's EOS.

ZDDPlus™

simply restores the zinc and phosphorus your high-performance classic car requires.

What about off-the-shelf additives and supplements?

API oils have always been more than adequate for the engines designed when the oil was current. The use of current API grade oils has always been adequate to satisfy car manufacturer's requirements and warranty demands. Historically, with few exceptions, newer API grades have superseded the performance of their predecessors. The removal of ZDDP has resulted in a clear change to that philosophy. It has never been necessary or desirable to include additives or supplements to any API rated oil to meet car manufacturer's specifications or warranty requirements. In virtually all cases, off-the-shelf additives amount to little more than automotive snake oil. Current additive technology has yet to develop an EP anti-wear agent as effective as ZDDP. Consequently, if these additives actually had adequate levels of ZDDP, they would be incompatible with modern engines and void manufacturer's warranties.

Due to this unprecedented turn of events in emissions requirements, ZDDPlus™ should not be confused with any off-the-shelf additive. ZDDPlus™ should be considered a replacement for a missing oil component critical for older cars.

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Why add ZDDPlus™ ?

ZDDPlus™ is not a typical oil additive. By adding a small 4 oz bottle of ZDDPlus™ at every oil change, an adequate amount of zinc and phosphorus will continue to protect your classic engine.

Why can't we use diesel CI/CJ-4 rated oils?

There are some diesel engine rated oils on the market which may still have some ZDDP. There are problems associated with using these oils in a normal gasoline engine, which can become severe in a high-performance gasoline engine. One issue is the high amount of detergent additive, and another is the high viscosity.

High detergent oil has a lower surface tension and lower shear pressure rating which can cause higher bearing wear in gas engines. A diesel engine needs oil with very high detergent capabilities in order to hold the large amount of combustion byproducts in suspension, but it is not optimized for a gasoline engine. The bearing journal size-to-

displacement ratio on a gasoline engine is designed around the use of a lower detergent oil and relies on a high-shear rating to the oil.

The other problem with high detergent oil is that it actually reduces the friction reduction that the ZDDP affords, especially in a high-performance, high valve spring pressure engine.

The viscosity rating of most diesel rated oils is higher than optimum for our higher revving gasoline engines, and can cause oil starvation in bearings at high rpms.

Why can't we use racing oils?

There are some racing oils which maintain a level of ZDDP. Racing oils are optimized for short term severe duty, in contrast to an oil that has been designed for day in, day out street operation. The additive package in a racing oil does not have the same detergent characteristics designed into extended service oils. As a result, racing oils may not have the capability of neutralizing acids and keeping contaminants in suspension. Also, the breadth of choice of viscosity, so important to correct street engine operation over a broad temperature range, is not available in racing oils.

By using ZDDPlus™ in addition to a modern high-quality oil of the proper viscosity for your gasoline engine, the correct EP lubrication level is established, and the oil characteristics remain optimized for your engine.

ZDDPlus™ is a product offered by car enthusiasts to meet the needs of classic car aficionados.

The automotive industry in general is changing in response to the environmental and financial pressures of today, with little concern for the classic car industry. We are engineers and automotive technicians by trade, and bring many years of problem-solving experience to the task of keeping our classic cars operational and running better than new. We hope one of the solutions we have designed for our own use will meet your needs as well. We have developed ZDDPlus™ to address the needs of classic car owners for an oil that will meet the specifications of the original oil for which their car engines were designed.

Why do we need ZDDPlus™ ?

As part of an effort to reduce vehicle emissions, the U.S. EPA offers vehicle manufacturers "credits" for early implementation, as well as penalties for violation of emission reduction standards. The EPA's program called for 100,000-mile catalytic converter life by 2004, 120,000 miles by 2007, and 150,000 miles by 2009. To achieve these goals, automotive manufacturers have pressured their oil suppliers to remove substances from motor oils which would shorten the service life, including the proven EP (Extreme Pressure) additive ZDDP (zinc dialkyldithiophosphate). Zinc and phosphorus from the ZDDP can be present in small amounts in the exhaust gas of an engine, depending on the amount of oil which is consumed in combustion. These elements can coat the catalyst reducing the amount of catalyst exposed to the exhaust gases, ultimately increasing emissions at the tailpipe. As a result of the EPA mandate, the ZDDP level in engine oils has been declining since the mid-1990s, roughly coinciding with the implementation of OBDII.

ZDDP has been an important additive to engine oils for over 70 years, and has an excellent track record at protecting the sliding metal-to-metal cam lifter interface. Historically, ZDDP has been added to oils in amounts resulting in approximately 0.15% phosphorus and 0.18% zinc. ZDDP protects by creating a film on cams and flat lifter contact points in response to the extreme pressure and heat at the contact point. The film of zinc and phosphorus compounds provides a sacrificial wear surface protecting the base metal of the cam and lifter from wear. In the course of normal service, this conversion of ZDDP to zinc and phosphorus compounds depletes the ZDDP level in the oil. Studies show that depending on the specific engine and severity of duty, after 2000-4000 miles of operation, the level of ZDDP can drop below that

considered adequate to provide wear protection to the cam and lifters.

According to the SAE Tech Bulletin #770087 [1], operation of a flat-tappet engine without adequate EP additives such as ZDDP, quickly leads to lifter foot scuffing and cam lobe wear. Camshafts are typically only surface hardened leaving the core ductile for strength. According to the SAE Bulletin, once cam lobe wear reaches 500 μm or 0.020", "subsequent wear is usually rapid and catastrophic."

In order to make engines last in the absence of ZDDP, virtually all IC (Internal Combustion) engines designed in the last ten years utilize roller lifters. Today, ZDDP has been removed from practically all automotive engine oils, rendering them unsuitable for use with older engines with non-roller lifters.

Why is it being reduced?

Contemporary engines with roller bearings no longer require the additional protection of zinc and phosphorus. Not true for classic cars, tractors, muscle cars, etc. Also removing the zinc and phosphorus from motor oil increases the life of the catalytic converter. But classic cars, tractors, etc., don't have cats! Also, as part of its ongoing effort to reduce vehicle emissions, the EPA has mandated that emission systems must have a service life exceeding 120,000 miles. To achieve this, automotive manufacturers have required oil suppliers to remove additive packages from motor oils which could reduce emissions compliance.

ZDDPlus™ is the ONLY EP component which re-establishes the ZDDP levels our classic car engines were designed for, while allowing the car owner to use the base oil of their choice. While some off-the-shelf additives may have some ZDDP, the amount per bottle is small, and when enough is used to get the proper concentration of ZDDP, there is a quart or more of unspecified oil that comes along with it. This dilution of 20% of your oil with an unspecified oil also means there is 20% less of the proper additive package.

[1] Pless, Loren G., and Rodgers, John J., 'Cam and Lifter Wear as Affected by Engine Oil ZDP Concentration and Type', SAE pub 770087, 4/(1977)

What's in our oil ?

As lubrication technology improves, so does the base oil used in the manufacture of engine oils. Oils are also changed and updated in response to advancements in engine technology.

Modern engine oil is a precise mix of a base oil with additives totaling 10% or more of the oil by volume. Pound for pound, these additives are each more expensive than the base oil, and oil companies are in business to make a profit. Common sense says that these additives are there with good reason.

Modern engine oil is a multi-purpose fluid in an engine, carrying the heat away from hot spots and releasing it in the sump, as well as providing lubrication to critical areas which need protection against wear. Different additives are put in the oil in order to address the needs of each specific engine system supplied with oil:

- The crankshaft and connecting rod bearings discharge oil into the spinning reciprocating assembly, and an anti-foaming additive keeps the oil from turning into foam.**
- The heat developed on high-pressure contact areas can exceed the breakdown temperature rating of the base stock, so heat stabilizers are added in order to fight viscosity breakdown and ashing.**
- In a multi-viscosity oil, the multi-viscosity characteristic is established by an additive.**
- Acids and byproducts of combustion are neutralized by another additive.**
- A dispersant additive helps keep combustion particulates from clumping.**
- Detergents are added to lower the surface tension to a specific value to help keep contaminants in suspension and off of the metal engine parts. Some detergents also interact with the EP additive to gain an additional level of wear protection.**
- The sliding cam-to-cam-follower interface in a non-roller lifter engine requires a special EP additive, which has historically been the ZDDP that is now reduced in all API rated automotive oils.**

ZDDPlus™ contains the proper amount of ZDDP to give at least an 0.18% zinc and 0.13% phosphorus level when a single 4 oz bottle is added to a normal 5-quart oil change. This level of zinc and phosphorus is the level designed into pre-OBDII oils. Using ZDDPlus™ affords you total control over the choice of oil brand and viscosity.