



**Technical Service Bulletin**

**Date:** 8/8/07

**Revision 2:** 5/2/11

**Product Description:** AMSOIL Synthetic Motor Oils

**Subject:** Flat Tappet and Camshaft Lobe Lubrication

**OBJECTIVE:**

Provide facts outlining lubrication requirements of flat tappet camshaft engines and the importance of higher levels of zinc and phosphorus.

**ISSUES:**

Flat tappet camshafts undergo extreme pressure and loads, thus requiring an engine oil that is fortified with anti-wear additives to provide premium protection. The severity of higher spring pressure in racing engines also creates the need for additional wear protection.

To preserve catalytic converter life, phosphorus levels in motor oil have been reduced. Concerns have risen that oils containing lower levels of zinc/phosphorus could provide insufficient protection in high-pressure areas of flat tappets and camshaft lobes found in many older and high performance engines.

**TECHNICAL DISCUSSION:**

The most commonly used anti-wear additive in motor oils is zinc dialkyldithiophosphate (ZDDP). ZDDP contains both zinc and phosphorus components working together to provide anti-wear protection, and is most important during cam "break-in" procedures. Proper break-in lubes should be used during the break-in phase for all new or rebuilt engines with flat tappets. These lubricants provide the extra protection required to reduce wear at the point of contact during break-in and help the flat tappet face properly mate with the cam lobe. Once the break-in phase is completed, AMSOIL motor oils, which are formulated with high levels of zinc and phosphorus, will provide premium protection to flat tappet cams.

The American Petroleum Institute (API) and International Lubricants Standards Approval Committee (ILSAC) have mandated the reduction of phosphorus to extend catalytic converter life. However, reducing the level of ZDDP can compromise protection to engine components, most notably in flat tappet camshafts. Current API SN and ILSAC GF-5 specifications for gasoline engines have maximum

and minimum phosphorus levels of 800 ppm and 600 ppm, respectively, for SAE 0W-20, SAE 5W-20, SAE 0W-30, SAE 5W-30 and SAE 10W-30 motor oils.

All engines, especially high-performance modified engines, benefit from oils with superior film strength and anti-wear properties. The flat tappet/camshaft lobe interface is the one area in an engine that has extreme contact load. Since this load increases significantly when non-stock, high-pressure valve springs are employed, the use of properly formulated motor oils is extremely important to reduce wear and extend flat tappet/camshaft life.

**RECOMMENDATION:**

AMSOIL recommends motor oils containing high levels of zinc/phosphorus for superior protection. The following tables list many of the AMSOIL synthetic motor oils that are formulated with high levels of anti-wear additives:

Primary Recommendations	Phosphorus Level (ppm)	Zinc Level (ppm)
Z-ROD™ 10W-30 Synthetic Motor Oil (ZRT)	1320	1440
Z-ROD™ 20W-50 Synthetic Motor Oil (ZRF)	1320	1440

Secondary Recommendations	Phosphorus Level (ppm)	Zinc Level (ppm)
Premium Protection 10W-40 Synthetic Motor Oil (AMO)	1265	1378
Premium Protection 20W-50 Synthetic Motor Oil (ARO)	1266	1379
Series 3000 5W-30 Synthetic Heavy Duty Diesel Oil (HDD)	1266	1379
15W-40 Synthetic Heavy Duty Diesel and Marine Motor Oil (AME)	1267	1377

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<b>AMSOIL Synthetic Racing Oils</b>	<b>Phosphorus Level (ppm)</b>	<b>Zinc Level (ppm)</b>
Dominator® 5W-20 Synthetic Racing Oil (RD20)	1424	1575
Dominator® 10W-30 Synthetic Racing Oil (RD30)	1424	1575
Dominator® 15W-50 Synthetic Racing Oil (RD50)	1424	1575
SAE 60 Super Heavy Weight Synthetic Racing Oil (AHR)	1265	1375

AMSOIL SAE 60 Super Heavy Weight Synthetic Racing Oil (AHR) is a super heavy weight racing oil designed for alcohol and nitro burning race engines where viscosity loss associated with fuel dilution is a concern. AHR includes a high dose of zinc-containing anti-wear chemistry that race engines require.

AMSOIL ZRT, ZRF, AMO, ARO, HDD, AME, RD20, RD30, RD50 and AHR all contain high levels of zinc/phosphorus, maximizing flat tappet/camshaft life in stock modified and high-performance applications.

AMSOIL Z-ROD™ 10W-30 (ZRT) and 20W-50 (ZRF) Synthetic Motor Oils are formulated with high zinc and phosphorus levels to provide protection in gasoline engines with flat tappet camshafts. Z-ROD oils also contain high levels of rust and corrosion inhibitors for maximum protection during long periods of storage.

AMSOIL Premium Protection 10W-40 (AMO) and 20W-50 (ARO) Synthetic Motor Oils are formulated with high zinc and phosphorus levels to provide protection in both gasoline (SL) and diesel (CI-4 Plus) applications. These oils are an outstanding choice where high zinc-containing protection is required, such as in late model hot rods that require extra camshaft protection.

AMSOIL Series 3000 5W-30 Synthetic Heavy Duty Diesel Oil (HDD) is a combination diesel/gasoline oil with a higher starting TBN to handle the significant stresses from high soot loading and acid generation in modern diesel engines. HDD contains the high phosphorus and zinc required for long life engine protection.

AMSOIL 15W-40 Synthetic Heavy Duty Diesel and Marine Motor Oil (AME) is engineered for use in a wide variety of light and heavy-duty applications. AME is formulated with high levels of zinc and phosphorus to ensure protection of flat tappet camshaft lobes in high performance diesel engines.

AMSOIL Dominator® 5W-20, 10W-30 and 15W-50 Synthetic Racing Oils (RD20, RD30, RD50) are all formulated with the same robust additive package. These oils are heavily fortified with zinc and phosphorus to protect flat tappet cams in the most extreme racing conditions.

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