



Technical Service Bulletin

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Product Description: AMSOIL Synthetic Motor Oils

Subject: Flat-Tappet and Camshaft Lobe Lubrication

OBJECTIVE:

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

ISSUES:

Flat-tappet camshafts undergo extreme pressures and loads, requiring a motor oil 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.

Phosphorus levels in motor oil have been reduced to preserve catalytic converter life, but concerns have risen that oils containing lower levels of zinc/phosphorus could provide insufficient protection in the high-pressure areas of flat-tappet 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. AMSOIL Break-In Oil is specifically formulated with zinc and phosphorus anti-wear additives to protect cam lobes, lifters and rockers during the critical break-in period. Break-in duration varies between engines and should follow the engine builder's or manufacturer's recommendations. Once the break-in phase is completed, AMSOIL synthetic motor oils, which are formulated with high levels of zinc and phosphorus, provide premium protection for 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, reduced ZDDP levels can compromise protection to engine components, most notably 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. Because this load increases significantly when non-stock, high-pressure valve springs are employed, the use of properly formulated motor oil 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) |
|---|-------------------------------|-------------------------|
| Break-In Oil (BRK) | 2040 | 2265 |
| 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 |

Submitted By: DP

Reviewed By: DP

Approved By: AA

Approval Date: 9/4/13

Distribution: Internal _____

All X

| AMSOIL Synthetic Racing Oils | Phosphorus Level (ppm) | Zinc Level (ppm) |
|--|-------------------------------|-------------------------|
| 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 |
| DOMINATOR® SAE 60 Synthetic Racing Oil (RD60) | 1424 | 1575 |

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, 15W-50 and SAE 60 Synthetic Racing Oils (RD20, RD30, RD50, RD60) are all formulated with the same robust additive package. They are heavily fortified with zinc and phosphorus to protect flat-tappet cams in the most-extreme racing conditions.

AMSOIL Break-In Oil, Z-ROD® Synthetic Motor Oil, Premium Protection Synthetic Motor Oil, Series 3000 5W-30 Synthetic Heavy Duty Diesel Oil, 15W-40 Synthetic Heavy Duty Diesel and Marine Motor Oil and DOMINATOR® Synthetic Racing Oil all contain high levels of zinc/phosphorus, maximizing flat-tappet/camshaft life in stock modified and high-performance applications.

AMSOIL Break-In Oil (BRK) is formulated without friction modifiers to allow quick and efficient piston ring seating in new and rebuilt high-performance and racing engines. It contains zinc and phosphorus anti-wear additives to protect cam lobes, lifters and rockers during the critical break-in period when wear rates are highest.

AMSOIL Z-ROD® 10W-30 (ZRT) and 20W-50 (ZRF) Synthetic Motor Oils are formulated with high zinc and phosphorus levels to provide superior protection in gasoline engines with flat-tappet camshafts. Z-ROD also contains 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 outstanding protection in both gasoline (SL) and diesel (CI-4 Plus) applications. They are an outstanding choice where high zinc-containing protection is required, such as 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. It 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. It is formulated with

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