TSB: MO-2006-10-26

Technical Service Bulletin

Date: 10/26/2006

Product Description: AMSOIL Synthetic Motor Oils

Subject: Flat Tappet and Camshaft Lubrication

OBJECTIVE:

To provide information about the use of motor oils formulated with lower levels of zinc and phosphorus additives in flat tappet and camshaft style engines.

ISSUES:

Engine oils contain anti-wear additives. The most common anti-wear chemistry is zinc dithiophosphate (ZDP), which is a combination of zinc and phosphorus. In 2005 the American Petroleum Institute (API) and International Lubricants Standards Approval Committee (ILSAC) instituted API SM and ILSAC GF-4 quality standards. These two standards are closely related, with GF-4 being viscosity dependent and API SM applying to all SAE automotive viscosities.

API SM/ILSAC GF-4 licensed oils with viscosity grades 0W-20 & 30, 5W-20 & 30, and 10W-30 are restricted to .06 - .08% phosphorus, while previous API SL/ILSAC GF-3 oils were restricted to .1% phosphorus. There is concern that oils containing lower levels of phosphorus are insufficient in protecting the high-contact regions of the flat tappets and camshaft lobes found in many older cars and high-performance engines.

TECHNICAL DISCUSSION:

During the development of API SM/ILSAC GF-4 the anti-wear requirements of flat tappets were given particular consideration by the engine manufacturers and by the oil industry. Engines with flat tappets were used to qualify API SM/ILSAC GF-4 oils. The anti-wear requirements of these tests are severe. In one case where the same Sequence IVA engine test was used for previous higher zinc and phosphorus oils, the average camshaft wear limits were reduced, allowing only 90(μm) max wear for API SM/ILSAC GF-4 oils compared to the former 120(μm) max wear limits. The results showed that API SM/ILSAC GF-4 oils protect factory designed flat tappet/camshaft engines just as well as previous higher phosphorus API SL/ILSAC GF-3 oils. If the engine is new, rebuilt or is modified from stock with high-pressure valve springs, proper precautions should be taken to insure long camshaft life. These recommendations apply regardless of the lower zinc and phosphorus associated with API SM/ILSAC GF-4 specifications.

Lower quality lifters are increasing in popularity. These lifters may not have the proper metallurgy to withstand long-term service or, in particular, the extra force applied by high-pressure valve springs. Lifter quality should be considered as a contributing factor where excessive wear or premature failure is experienced.

RECOMMENDATION:

For all new or rebuilt engines with flat tappets, proper assembly lubes and oil additives should be used during the break-in phase. These additives provide extra protection at the point of contact, helping the flat tappet face to properly mate with the cam lobe. Once the break-in phase is over, these additives should not be used. This includes the GM product E.O.S., which is an assembly lubricant only and is not to be used, as the label clearly states, as an engine oil additive.

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. That load increases significantly where non-stock, high-pressure valve springs are used. The use of properly formulated engine oils for this application will help reduce wear and extend the flat tappet/camshaft life.

There are many more ways to achieve good anti-wear performance than just using zinc and phosphorus compounds alone. Zinc and phosphorus are widely used because they are the most cost effective solutions to achieve anti-wear properties.

Submitted By: AA **Reviewed By: KM** **Approval By: AA Date: 10/26/06**

Distribution: ___Internal _X_All

Technical Service Bulletin

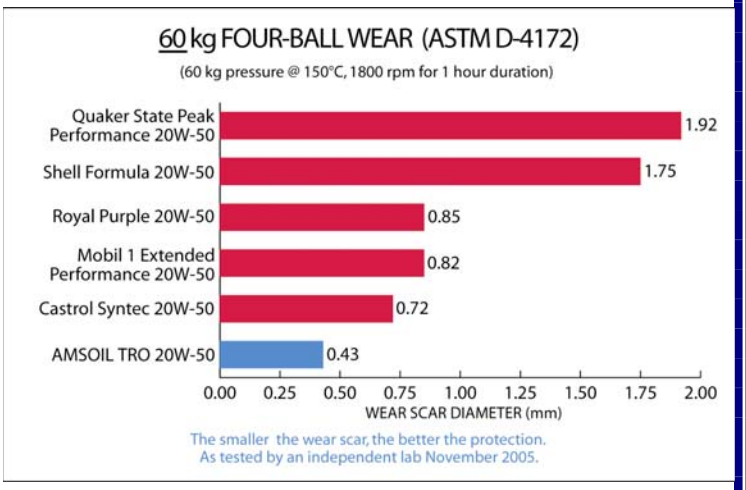
Date: 10/26/2006

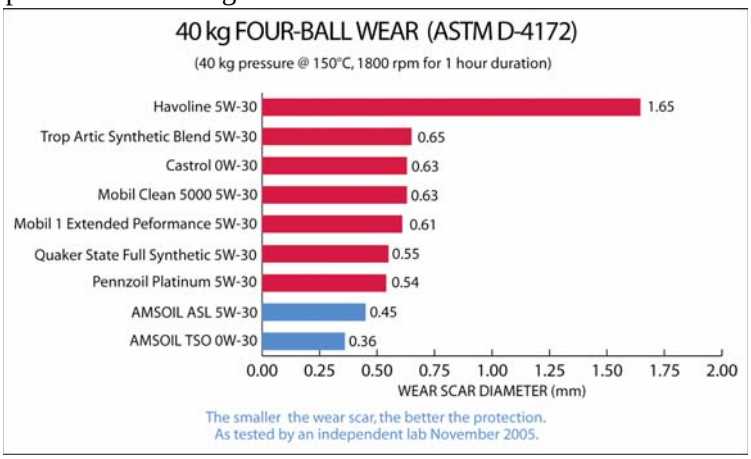
Product Description: AMSOIL Synthetic Motor Oils

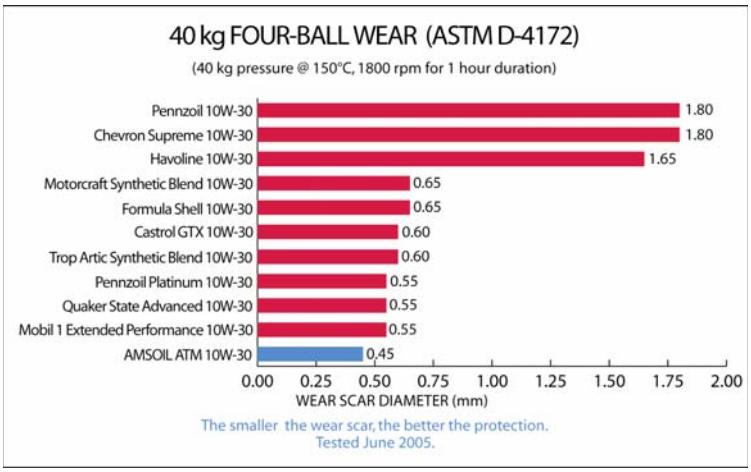
Subject: Flat Tappet and Camshaft Lubrication

In addition to zinc and phosphorus compounds, AMSOIL combines "ashless" anti-wear and friction modifier additives with high quality synthetic oils to achieve truly superior anti-wear performance, including in flat tappet applications.

AMSOIL 0W-30 (TSO), 5W-30 (ASL) and 10W-30 (ATM) are premium synthetic, API SM (gasoline)/CF (off-road diesel)/ ILSAC GF-4 formulations containing a proprietary combination of zinc and phosphorus, detergent and friction modifier additives to generate exceptional anti-wear properties as demonstrated in the four-ball wear test. These oils are recommended for use in newer and older engines with flat tappets in both stock and high-performance configurations.







AMSOIL 20W-50 (TRO) is a premium synthetic racing oil for gasoline engines with superior film strength and anti-wear protection. It is excellent for street or race use in cars, hot rods, and trucks or boats. It is the preferred choice for highly modified, high horsepower engines.

AMSOIL 10W-40 (AMO), 15W-40 (AME) and 20W-50 (ARO) are premium synthetic, API SL (gasoline)/CI-4 Plus (heavy-duty, on-road diesel) quality formulations. They are an excellent choice for those who desire diesel style engine oils recommended for use in both gasoline and diesel engines.

Submitted By: AA **Reviewed By: KM** **Approval By: AA Date: 10/26/06**

Distribution: ___Internal _X_All