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TECH

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# TIPS FOR MAXIMIZING CAM BEARING PERFORMANCE IN HIGH PERFORMANCE AND STOCK ENGINES

For many years, nearly all camshaft bearings were manufactured with a lining of babbitt. Babbitt is a soft slippery material made up primarily of lead and tin and is quite similar to solder. As a bearing surface layer, babbitt possesses the desirable properties necessary to survive under adverse conditions such as foreign particle contamination, misalignment and marginal lubrication on start up.

The trend in modern engines has been toward higher operating temperatures and higher valve train loads. Babbitt is limited in its ability to survive under these conditions due to its relatively low strength. When babbitt cam bearings are installed under these demanding conditions, the lining may extrude or fatigue. Fatigue can be identified by craters in the bearing surface where sections of lining material have flaked out.

To meet the demands of higher loads and operating temperatures in modern engines as well as the requirements imposed by high performance, babbitt has been replaced by an alloy of aluminum. This aluminum alloy is much stronger than babbitt and will withstand several times the load which causes babbitt to fatigue or extrude. However, this added strength is obtained at the expense of some of the more forgiving properties of babbitt. The aluminum alloy is harder, making it somewhat less compatible with dirt, misalignment and marginal lubrication. This is typical of the compromises or trade offs that are frequently necessary when selecting a bearing material to suit the requirements of a specific application and in this case, higher loading.

Typically, whenever a higher level of loading is encountered, greater precision is required to maintain reliability. Conditions such as cleanliness, alignment, clearances, journal surface finishes and lubrication must all be controlled more closely. Following are some recommendations to help optimize performance when using aluminum alloy camshaft bearings.

Sufficient clearance is necessary in the initial installation. These stronger bearings will not wear in rapidly to make their own clearance like softer materials. Minimum clearance should be .002” for stock engines and .003” for high performance. Optimum clearance range for high performance applications is .003” to .004”. Because of the stack up of tolerances on the block, shaft and bearing it is impossible to control clearance to this range in the manufacture of the bearing alone. Clearances must be measured at installation.

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Honing the ID's of cam bearings to increase clearance is not recommended because hone grit may become embedded in bearing surfaces which will cause shaft wear. Bearing ID's may be reamed, but the most practical means is to adjust camshaft journal diameters by grinding. Even if not ground to provide additional clearance, camshaft bearing journals should be polished to a surface finish of 10 micro-inches Ra or better with the camshaft rotating in the same direction it will rotate in the engine.

Like clearance, alignment is also extremely important especially for high performance applications. Any block that has needed to have its main bearing bore alignment corrected due to distortion is likely to have experienced cam bearing bore distortion as well. Adequate clearance will help compensate for minor misalignment of less than .001". Special cam bearing sets with oversize outside diameters are available for Small Block Chevrolet engines to allow align boring the camshaft bearing housing bores in these engines. SH-1352S contains 5 bearings which are all the same size. Blocks must be bored to 2.030/2.031" (.010" larger than the original #1 position) in all 5 positions. Similarly, SH-1401S offers a .020 oversize (2.040/2.041" housing bore).

A third special cam bearing set also available for the small block Chevy is the SH-1528S. These are special trimetal bearings with .010" oversize OD for blocks align bored to 2. 030/2.031 ". These premium trimetal parts are priced higher than the aluminum alloy parts but offer the added advantage of a thin electroplated babbitt overlay for improved bearing surface properties in combination with high strength.

Installation of bearings into the block must be done with care to avoid shaving metal off the backs of the bearings. This galling action may cause a build-up of metal between the bearing OD and the housing bore which will result in a reduction in clearance. To prevent galling, check housing bores for a proper 25 to 30 degree lead-in chamfer before installing cam bearings. On blocks without grooves behind the cam bearings, care must be taken to insure that oil holes line up between the bearings and block. Where the block has a groove behind the bearing, the bearing should be installed with the oil hole at the 2 o'clock position when viewed from the front for normal clockwise camshaft rotation. This will introduce oil into the clearance space outside of the loaded area and allow shaft rotation to build an oil film ahead of the load.

Clean the block and all components thoroughly. Hot water and detergent are best for cleaning blocks, crankshafts and camshafts to remove grit from honing, grinding and polishing. After cleaning, blow dry and coat with oil immediately to prevent rusting. Coat all bearing surfaces, all camshaft lobes and lifter faces with Clevite Bearing Guard to provide a pre-lubricant to these critical surfaces. It is also recommended that engines be primed by externally driving the oil pump, or pressuring the system externally through the pressure sensing port, before initial start up. Engines should be operated at approximately 1500 to 2000 RPM for the first 15 minutes to insure proper lubrication during the initial stages of break in.