

TECH



TECH INFORMATION FROM CLEVITE ENGINE PARTS

TB-2078

Issued: August 16, 2001

Page: 1 of 2

ENGINE BEARING FUNDAMENTALS PART 9 "CAMSHAFT BEARINGS"

Most of the information published about engine bearings tends to deal with crankshaft bearings. Camshaft bearings are more or less taken for granted. We knock out the worn pieces, press in a new set and assume everything will end up the same as it originally was. This bulletin is intended to explain why this assumption is not necessarily true and why we should not just take cam bearings for granted.

All but a very few cam bearings are bimetal in construction and nearly all engines originally have their camshaft bearings installed in the unfinished condition and machined to size in the block as part of the block manufacturing process. This practice allows cam bearing ID's to be closely controlled for size, shape, and alignment. In the rebuilding process we remove these "Finished-In-Place" (FIP) bearings and replace them with parts which have been "Precision" machined outside the engine.

Replacing FIP with Precision cam bearings introduces a number of variables not present in the original engine assembly. Originally, the clearance between the shaft and bearings was a direct result of the difference between the ID size the bearing was machined to and the shaft OD. When a precision part is installed its final ID size is determined by a combination of the bearings wall thickness and the diameter and shape of the housing it is installed in. These variables introduce a set of conditions we have little control over. If metal shaved off the bearing OD builds up between the bearing and housing, the bearing will distort inward. If the block varies from spec due to distortion from overheating or the installation and removal of heads and manifolds, these variations will be reflected in the new cam bearings ID size and shape and ultimately in the bearing clearance and alignment. Main bearing housing bores are commonly reconditioned to correct for out-of-roundness and misalignment. The same causes of distortion are likely to produce similar effects in the cam bearing bores. This explains why, after installing new cam bearings, we sometimes encounter problems installing the camshaft.

Unfortunately, align boring the cam bearing housing bores is not practical for the typical rebuild. Besides the fact that special cam bearings with oversize OD's would be required, the process is further complicated by the fact that most engines have cam bearing bores that are stepped in size to facilitate automated installation during original manufacture. This would require re-boring each hole to a different size. Re-boring all holes to a common size to accept bearings of differing wall thickness would result in boring progressively more stock from each hole. This would

For further information contact:



Clevite Engine Parts Division • 1350 Eisenhower Place • Ann Arbor, Michigan 48108-3388 U.S.A.

probably necessitate more than a single pass boring operation. Using FIP cam bearings in the rebuilding process is not a practical answer since engines with stepped camshaft journal diameters require boring each bearing to a different diameter.

Before undertaking a rebuild, check the cam bearing housing bores for size and shape. Bores that are undersize, oversize, or out-of-round are likely to cause problems. Some engines are built with oversize OD cam bearings as a result of a salvage operation to correct bores originally machined out of spec. Replacement parts for these blocks are frequently difficult, if not impossible, to obtain. Check main bearing housing bore size, shape, and alignment. If the main bores are out of alignment or shape, it is likely the cam bearings are also. Nobody wants to scrap a block just because the cam bores are out of alignment, but after having made the above checks you will at least know what to expect and understand that the problem is not the fault of the new cam bearings.

So how do we correct these problems when we encounter them? The solutions are not always simple, and each engine is likely to represent a different situation depending on the engine design and the nature of the problem. A tight fit can be corrected by reaming or hand scraping the bearing surface. Honing is not recommended because grit from the hone stone will become embedded in the bearing surface and cause wear to the camshaft journals. A homemade reamer can be made using an old camshaft if the journals are still within spec. Cut a groove diagonally across each journal about 1/8" deep. Then relieve the journal surface on one side of the groove, leaving the other side sharp. This produces a single flute reamer that can be turned with the aid of an old cam sprocket to remove bearing metal from the high or tight spots. This procedure works pretty well with babbitt lined cam bearings, which have a soft surface that cuts easily. The stronger (and harder) copper-lead and aluminum based bearing metals are somewhat harder to cut. These materials are used in late model automotive and most heavy duty engines for their greater strength and temperature resistance. As cam loads and engine operating temperatures have increased, babbitt has had to be replaced in favor of these stronger materials for better durability.

Loose fits are a tougher problem to deal with because metal is already missing and cannot be put back on (at least not easily). Where housing bores are oversize they can be sleeved. Some people have had cam bearing OD's built up with nickel to produce a tighter fit. These practices are generally only employed when the block absolutely cannot be replaced.

Because of the popularity of the Small Block Chevrolet in high performance applications, special oversize OD parts are available to permit align boring the cam bearing housing holes. Because all of the cam journals are the same size in this engine, the block can be bored to one size in all positions (rather than stepped as originally built) and a single bearing will fit all 5 positions. Although this practice involves special machining, it does provide a solution to the problems associated with used blocks and is frequently used by high performance engine builders. Parts are available at .010 and .020 larger than the #1 position, which is the largest housing bore in the original design.