TECH

TECH INFORMATION FROM MAHLE CLEVITE INC.

TB-2076 **Issued: August 16, 2001**
Re-issued: May 10, 2010

ENGINE BEARINGS FUNDAMETALS PART 7 "TRIMETAL"

Just about the time bearing engineers were convinced that the only way to obtain a stronger bearing was to give up surface properties, along came tri-metal to make an apparent contradiction to that general rule. Tri-metal bearings are not a contradiction, but rather a clever (and more complicated) way of allowing us to have some of the best of both worlds.

Tri-metal bearings are made up of three main layers. Actually, almost all tri-metal bearings have at least four and sometimes even more layers. To start out, we have our basic steel back for strength and also to reduce cost since steel is the cheaper material. Next, we add a layer of some relatively strong (fatigue resistant) bearing lining; typically a copper-lead alloy. This is called the intermediate layer. On top of the intermediate layer we add a thin overlay of babbitt. Remember, we said babbitt offers the best combination of surface properties. We also said we can make babbitt carry more load if we keep it thin. In tri-metal bearings, we use a .001" thick layer of babbitt to provide the surface properties which our stronger intermediate layer lacks. By keeping the overlay thickness at .001" (less in high performance and some heavy duty applications) we produce a bearing capable of carrying much higher loads than any bi-metal, along with the surface properties of babbitt. Sounds too good to be true, doesn't it? Well actually, there are some trade-offs. Having a babbitt layer that is only .001" thick does limit embeddability and conformity but the result is still the best overall combination of properties of fatigue strength, embeddability and load-carrying capacity.

COPPER-LEAD ALLOY: There is basically just one family of copper-based bearing alloys used for intermediate layers. All of these contain varying amounts of copper, lead and tin. Tin is a key player in these alloys because it can influence both corrosion resistance and fatigue strength. Varying the tin content from less than 1% to only about 3% can increase fatigue strength by as much as 20% and offer corrosion resistance which is adequate under all but the very worst conditions.

Another factor in copper-lead alloys is the method of manufacturing. These alloys can be produced by either casting or sintering. Although sintering is the more common practice, casting results in greater fatigue strength. Cast copper-lead alloys are therefore commonly used in heavy duty diesel applications where extremely long life at continuous high levels of loading is required.

Cast copper-lead is also the mainstay of the extensive line of Clevite® performance and race bearings. Sintering copper-lead, cheaper to manufacture, generally results in adequate strength for passenger cars as well as light and medium duty truck applications.

For further information contact:

MAHLE Clevite Inc. • 1240 Eisenhower Place • Ann Arbor, Michigan 48108-3388 U.S.A.• www.mahleclevite.com