To Cut Or Not To Cut

BY **chuck lynch**

We have been machining crank housing bores and connecting rods for ages. When it comes to sizing those bores, it used to be pretty straight forward. You cut the cap to reduce the diameter and hone the housing back to the correct diameter.

Today, we are pretty familiar with fractured cap rod but now there are fractured cap blocks. One example of that technology is the 2.7 Ford Ecoboost which is also a Compacted Graphite Iron block. We spoke of CGI in an earlier edition of Engine Professional Magazine and I made the comment that CGI is probably reserved for performance and heavy duty and likely would not trickle down to production gas engines. I spoke too soon as the Ecoboost family most definitely is not diesel and by the way we classify vehicles, light duty.

Figure 2. Photo courtesy Jasper Engines.

So, how are machine shops going to deal with this challenge? This is not really new to the PER's or Production Engine Rebuilders. They started using OSOD (oversized outside diameter) bearings as more and more fractured cap rods were being released. Now, we have that strategy figured out, we need to make sure that we are notifying our suppliers of what we are seeing so that they can get these OSOD bearings developed, cataloged and in inventory.

Are there other advantages to using an OSOD bearing? If you have ever honed anything, you know that the closer the bore is to round, the easier it is to maintain a round bore. If you can re-size connecting rods or other housing bores without having to cut caps, not only are you saving time, you can be assured that issues like non-cleanup at the parting line are eliminated.

Is there a concern with the area that does not hone when cutting caps? We know that we have successfully honed shaft housing for many years in that manner and I am not going to say that it is bad. I am saying that you can improve by using an OSOD bearings. With an OSOD bearing, you are given a better opportunity to ensure that the bearing back will have maximum contact with the housing bore.

For any bearing to perform optimally, you need the housing to meet the following parameters.

1) Correct surface finish to ensure adequate heat transfer between the bearing shell and the mating component. You have to be careful not to be too coarse or oil can migrate behind the bearing causing

Figure 1. Photo courtesy Sunnen Products Company.

"coking" or the oil to become glass like. Glass is a poor heat conductor as is minimized metal to metal contact.

2) Correct surface finish to aid in bearing retention. Some traction if you will. Too smooth can allow movement which can lead to false brinelling or micro-welding.

3) Diameter influences bearing crush. Proper crush height coupled with proper surface roughness retains our bearing. An out of round housing may not maintain the bearing shape well enough to yield the correct eccentricity for the application. The bearing has eccentricity produced at manufacturing. Bearing housing with eccentricity may result in greatly varied amounts of eccentricity throughout the lube circuit.

So, I spoke of eccentricity in the above statement. Eccentricity is a critical bearing design characteristic. Eccentricity has to be factored into a bearing design because of bearing crush. When there is a larger circumference of material being clamped into a smaller bore, something has to give, especially when the parts are split plain bearings. The natural tendency would be for the bearing to crush inward if the bore is truly cylindrical as opposed to oval.

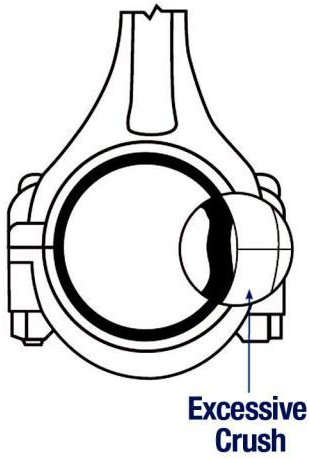
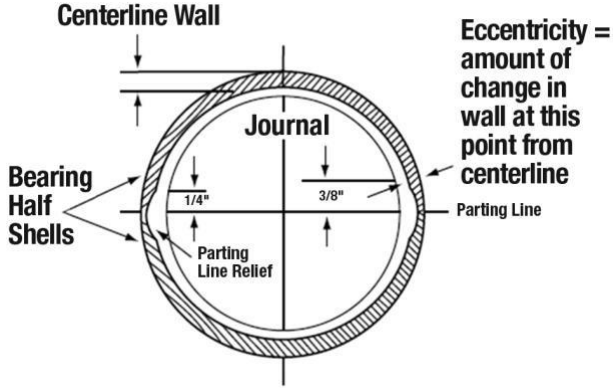


Figure 3. (right) and Figure 4. (below) Images courtesy of MAHLE.



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Eccentricity has other benefits besides protecting the journal surface from contacting the crankshaft. Eccentricity can be used to tune flow across the bearing load area, allow some debris to flush out of the flow circuit and allow for very minor misalignments.

Misalignment of caps to the mating surface in components is a huge reason for the fractured cap design. We can't just throw all of the old stuff away and make new rods and blocks away that are not fractured cap but we can reduce the stack up of tolerances by removing some of the variation that comes with cutting caps. As I stated earlier in the article, you actually reduce some of the work by not cutting caps.

Another factor that you definitely cannot control in your shop is the brand choice and the grade of oil the end user will choose to use. That can make the need for exacting bearing tolerances all the more critical. Today's oils are designed to flow freely to reduce windage, drag and enhance speed/functionality of solenoid valves, lifters and so on. That means that eccentricity, chamfers, groove selection will have a greater impact on pressure and flow which also will affect runability.

Currently there are many OSOD rod bearings offered in the aftermarket. This is now even true of applications that are not fractured cap design. The most common oversize is .002"/0.05mm for connecting rods. Through the years there have been a select few engines that have had OSOD main bearings from the factory, it was usually a result of salvaging blocks during the manufacturing process. As an example, some of the smaller German made Ford engines with a .015" (.375 MM) oversize main bore. Currently, there are also OSOD main bearings and cam bearings for various other popular automotive engines such as the 350 Chevy. Most recently, bearings are becoming available for some mid-range diesel engines that have problems with spinning main bearings. Those bearing sets will have main bearings available in a .040" (1.016 MM) OSOD.

These OSOD applications are being produced with request of between 250 to 500 sets of bearings for special needs applications. Many of the rod bearings are being developed at the OSOD dimension as soon as the product development begins rather than wait for the industry to ask at this point in the game.

So, if you haven't taken a look at trying an OSOD bearing in lieu of cutting caps and fighting to hone an egg, I recommend doing that. Plus, you can cut a little grinding dust from your diet.n

Chuck Lynch has been in the automotive repair industry for nearly 30 years, from Depot Maintenance Vehicle Repair in the U.S. Marine Corps to Production Engine Rebuilding (PER), Engine Service Equipment Repair Technician and Industry Trade Association Support.

Chuck is currently the PER Sales Engineer for MAHLE Aftermarket, working with PERs in support of their unique needs and requirements. In addition, he also works closely with the trade associations that support the OEs and aftermarket automotive repair sectors.