

Should You Pay a Premium for a Mounted Ball Bearing?

Kyle Sobke, Baldor Electric Company

Mounted ball bearings are everywhere in industrial applications. They serve critical roles in keeping a manufacturing operation running smoothly and in ensuring that equipment functions properly and reliably. So why might it be advisable to spend significantly more for a dimensionally comparable bearing from one supplier versus another? These are commodity products, right? Is there really any difference from one mounted ball bearing to another?

Let's first address the notion of a mounted ball bearing being a commodity product. Components which offer little value and no differentiation in performance, like a steel bolt or a plastic hose, are considered commodities. However, if there is a marked difference in performance between like products, then by definition, those products are not commodities. If the features and benefits associated with one product afford a user longer life and better performance than with another product, the commodity nature of that particular offering has been removed from the equation. That is

the case with mounted ball bearings. Some last for a long time; some do not. Hence, they cannot be considered to be commodity products if there exists a difference in performance between offerings.

So what causes a difference in the length of time one mounted ball bearing lasts versus another? Bearings by nature are fatiguing components absent infinite life. At some point, all bearings wear down and must be replaced. Why does one out-perform another? Three primary factors affect the life of a mounted ball bearing in an application.

The most important predictor of the life of a bearing is how effectively an adequate level of clean, useable lubrication is maintained inside the bearing. Without effective lubricant, the bearing's balls and inner and outer ring raceways may not be fully separated, resulting in wear on the surfaces and leading to potential failure. This brings up the absolutely critical nature of sealing in a mounted ball bearing. In addition to ensuring a proper maintenance and lubrication sched-

For Related Articles Search

bearings

at www.powertransmission.com

ule is employed, using a mounted ball bearing with effective seals is vital to keep liquid and solid contamination from entering a bearing and breaking down the lubricant. Seals also protect from the possibility of lubrication being washed out of a bearing. Another crucial component of bearing performance is the method for ensuring the seals stay in place. If a bearing employs mechanical seal retention, the seal is less likely to become dislodged during operation or relubrication. Seals held in place via elastomeric compression may become compromised as a result of heat or pressure associated with operation and may not stay in place. This situation is disastrous for a bearing. Finally, the use of a bearing end cover can help prevent contamination and grease loss. Higher quality bearings which feature effective end covers may prolong the life of the product. In the mounted ball bearing world, the better the seals and prevention of contamination, the longer the performance a user may expect.

Next, high quality, consistent and repeatable manufacturing processes also contribute to overall mounted ball bearing performance. The methods used to machine steel and iron before they are assembled into a finished product are critical to the life of the product, and they can vary greatly from one manufacturer to the next. Some of the most important machining factors are as follows:

- Surface finish of the inner and outer ring raceways – the smoother the surface of the mating components, the better the balls and inner and outer rings will run together. If a surface finish is not controlled through precise machining processes, heat, vibration, and self-contamination may occur. Industry standards typically stipulate a 4-Ra maximum surface finish. Values



The use of a bearing end cover can provide additional protection from the environment, preventing contamination and grease loss. A snap-on design may be easier to install than a bolt-on style.

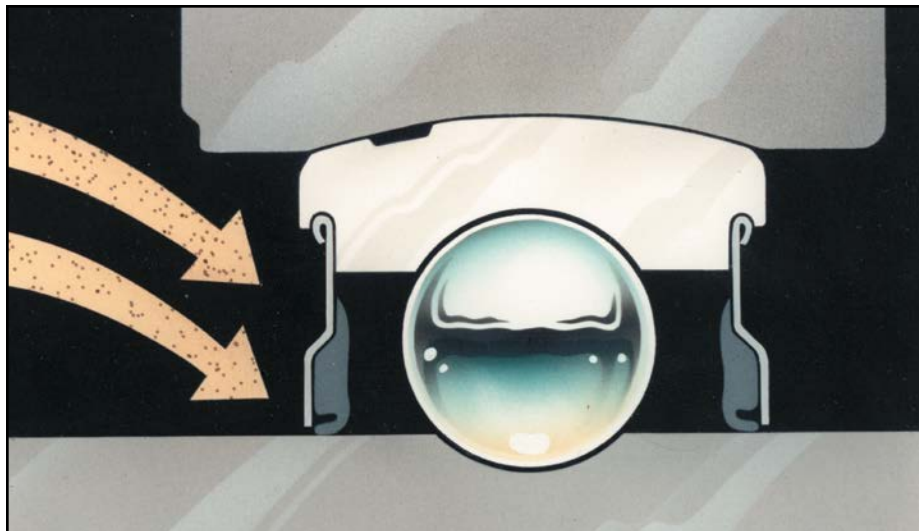
outside of this level may lead to premature failure.

- Radial clearance - the amount of space between the balls and the raceways must be within specification as well. Allow for too much movement, and excessive vibration is likely. Not enough clearance, and excessive heat generation can occur. As an example, the American Bearing Manufacturers Association specification for radial clearance of a 205 series mounted ball bearing (e.g., 1" bore size) is 0.0005" to 0.0011". Radial clearance values outside this range may lead to premature failure.
- Swivel torque - this measure represents the amount of force it takes to swivel the insert within the housing. Industry-based specifications for swivel torque for the same 205 series mounted ball bearing assembly are 3.75 to 13.5 foot-pounds. The inability of a bearing insert to align properly within the housing can stress the mounting structure and lead to unnecessary, compounding loads on the raceways that directly accelerate bearing fatigue. Once again, failure to control this dynamic is an indication of inadequate manufacturing processes and may lead to premature failure.

Manufacturers who control their processes tightly can ensure the parameters noted above are within specification, thus leading to a higher quality, longer performing bearing product. Those suppliers whose processes are not as sophisticated or regulated may have problems meeting the minimum



Bearing failures on this roll sizer machine were causing significant downtime at a Lamb Weston potato products plant. After installing a stainless steel mounted ball bearing with a superior sealing system that retains lubrication and prevents washout in wet environments, this machine went from being the least reliable to the most reliable.



Bearings that employ a mechanical seal retention, like the steel shield protection illustrated in this drawing, make it less likely that the seal will be dislodged during operation or relubrication.

requirements, and their products are destined for a shorter life span.

Finally, a third critical factor in mounted ball bearing performance is the quality of the heat treatment process the product undergoes. A manufacturing process with tight heat treatment controls is crucial to long-term bearing performance. Bearing steel under load in an application must exhibit the proper degree of hardness in order to perform adequately. There are a number of different materials and processes employed in the industry to achieve heat treatment results. To put it simply, though, mounted ball bearings need to be sufficiently hard in the raceways and sufficiently soft in other areas of the inner ring. Proper hardness in the raceways ensures the required load carrying capabilities. The inner and

outer rings must be hardened adequately in order to withstand the load associated with balls running at high speed while in operation. Other parts of the inner ring, however, must exhibit lower hardness values when compared to the raceways. If a set screw hole is too hard because of ineffective heat treatment methods, the steel may become brittle and have

the potential to crack when a set screw is tightened onto the shaft. Or, if a set screw hole is too soft, the set screws may loosen during operation. The heat treatment process must effectively account for growth or shrink of the materials in order to ensure dimensional tolerances are met. Improper heat treatment processes may affect a bearing's reliability and performance functionality prior to and after installation. This heat treatment balance is difficult to attain, and if a manufacturer does not have the right process controls in place, bearing performance will suffer as a result.

So what type of mounted ball bearing is right for a user's application? When does it make sense to pay two or three times as much for a product that can be purchased for a lower price? The answer is dependent on performance expectations. If a user wants a high quality mounted ball bearing solution which lasts and performs for an extended period of time, he probably needs to spend more up front. It will save money in the long run by preventing frequent failures; preventing excessive costs associated with downtime, maintenance and replacement; and preventing the potential for catastrophic failure and damage to more costly connected equipment. **PTE**

For more information:

Baldor Electric Company
 Phone: (479) 646-4711
www.baldor.com