Beyond Bearings Basics

When to consider custom bearings instead of standard bearings

Mark Bos

The bearing selection process is seemingly simple:

1. Select the bearing type based on direction of load in the application;
2. Select the appropriate rolling element based on load and speed requirements;
3. Select the bearing material based on operating environment. Temperature, corrosion, and contamination are the primary considerations.

There are thousands of sizes and types of standard bearings. In many applications, specifying a standard bearing yields an effective result.

But in selecting a standard bearing, can a product designer actually make a costly mistake? In some cases: Yes.

Standard bearings are made to standard sizes, use standard materials, carry a maximum load and operate at a maximum speed for their size. They almost always exceed the functional requirements of an application.

While such a bearing is a workable and safe choice, there are times when a custom bearing might offer decreased cost, increased productivity or greater opportunity for design innovation.

Compare a Standard Bearing to a Custom Bearing

There is a widely held misconception that a standard bearing is cheaper than a custom bearing. A custom bearing may actually reduce costs and allow the designer to create value throughout the production process, from design to assembly to supply chain management.

When can a custom versus standard bearing analysis reduce costs and add value? Suggestions follow.

Reduce Bearing Complexity to Reduce Cost

Does the bearing contain components that don't support functionality?

Standard bearings are made from a full complement of components and are often unnecessarily complex for an application. Many applications do not require all bearing components. For example, a full thrust bearing includes a retainer and two races. Perhaps only the retainer is required. The use of a standard bearing requires the purchase of the full bearing components (unnecessary cost), a larger than necessary housing to ensure that the bearing fits the application (size and cost) and additional elements to protect the bearing (cost).

On the other hand, a custom bearing might allow the designer to simplify the design and contain cost by eliminating unnecessary components. The simplified design can be more compact and cheaper to produce and protect.

Right-size the Bearing to Reduce Cost

Does the bearing's size require a modification to the size or shape of the mounting or mating components?

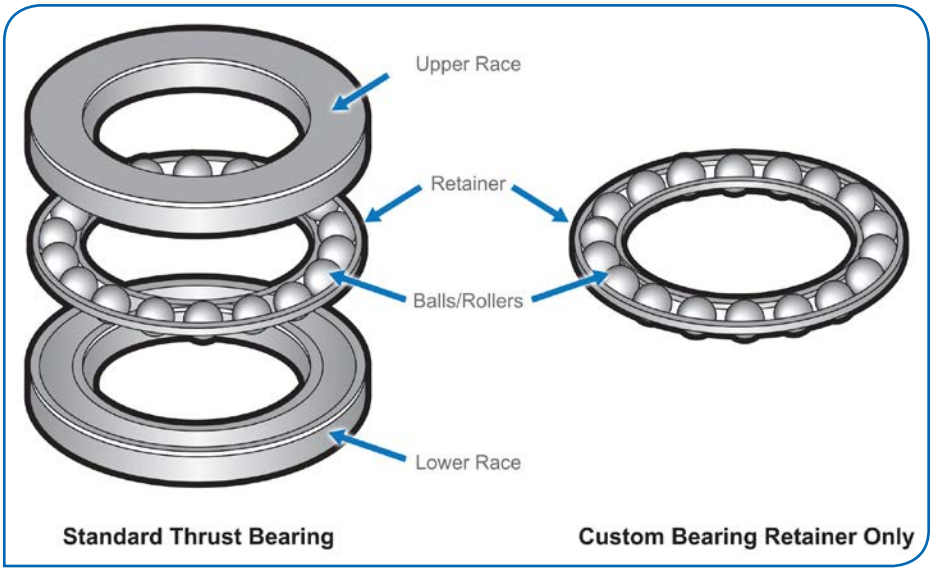
A standard bearing is almost always one size larger than necessary. Consequences of this mismatch in size can be OD, ID or a bore that is a different size than the shaft on which it will turn. If the bore is too big, the size of the shaft must be increased or an adapter sleeve added. If the bore is too small, the shaft must be ground down to fit or re-made to a different size.

It is often easier and cheaper to customize the bearing's dimensions than to bear the increased cost in tooling, processing and materials of more expensive components like shafts, castings or housing.

Choose Proper Materials to Reduce Costs, Streamline Production

Is the standard bearing's material the "right fit" for the operating environment? Will this material contribute to the bearing failing prematurely? Or require expensive efforts to protect the bearing?

Standard bearings are made from a few materials. 52100 bearing steel and 440C stainless steel are the most common. In some environments, the use of a standard bearing material will pre-



Standard bearings are made of a full complement of components. Custom bearings provide only the components needed for the application.

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cipitate premature bearing failure, create unnecessary production expenses or require extraordinary efforts to protect the bearing from its operating environment.

Standard bearings are typically machined, heat treated and ground. Choosing an alternative material allows the bearing to be produced more economically. Example: For jobs that run in large production volumes, the use of stamped washers and races costs a fraction of machined and ground races and washers. 52100 steel and 440C stainless are not readily available in strip steel. Other steels, like high carbon steel, are readily available in strips.

There are instances in which a bearing can be made from a less expensive material and still achieve peak performance. If corrosion resistance is important, for example, and the load on the bearing is light, 300 Series stainless or even plastic may be a better option than the more expensive 440C. Cost is lowered further because heat treating and grinding are not necessary.

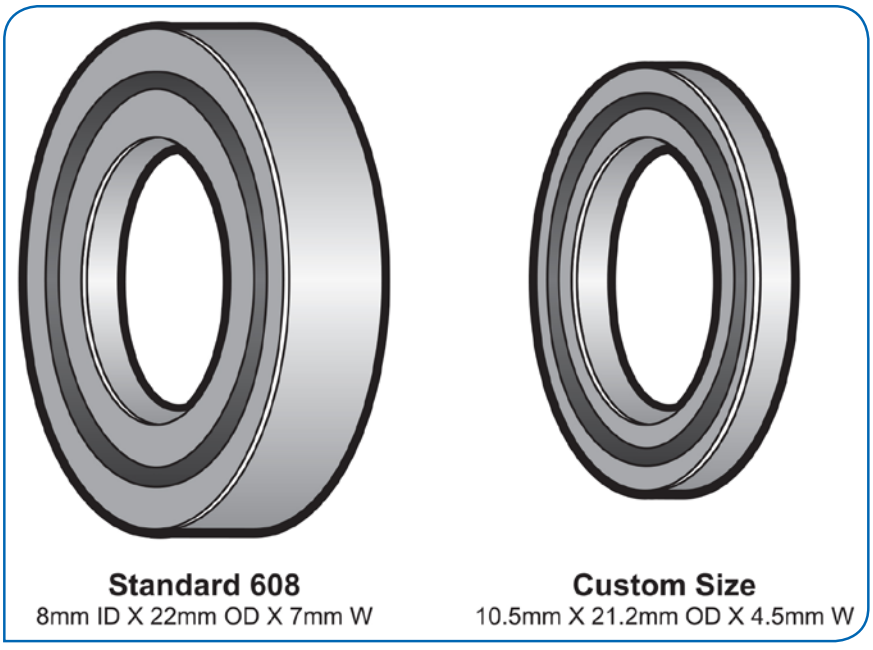
A standard bearing may require extraordinary efforts to protect it from operating conditions. A custom bearing, manufactured with a material specific to an operating environment, can eliminate expensive protective measures such as sealed bearing housings, extra seals or layers of grease that will ultimately disappear out of the application or become fouled. Custom bearings can be made from corrosion-resistant materials such as engineered plastics and ceramics. They can also be made to work without lubricants or from materials that can function in extreme temperatures or meet special requirements such as bio-compatibility.

Enhanced Design Innovation

Does the bearing allow for the incorporation of desirable product features?

With a custom bearing, the product designer can eliminate components while integrating features that improve functionality. For example, adding a threaded stud for mounting a roller or bearing eliminates the need for a shoulder bolt. Installation can be further simplified with a screwdriver slot, hex head or socket head broach. Savings are achieved because the eliminated components do not need to be purchased or inventoried.

And with a custom bearing, aesthetic qualities such as the limitation of movement and audible sounds can easily be integrated into the product design. To add features with a standard bearing, components and cost will be added.



Design the bearing to fit your application, instead of designing your application to fit the bearing.

Assembly and Supply Chain Efficiencies

Does the standard bearing provide an opportunity to streamline assembly or supply chain processes?

Subassemblies can have labor- and cost-saving benefits by reducing the number of components or steps in an assembly process. Subassemblies improve productivity and reduce the number of purchase orders, inventory to be stocked, quality inspections, and documentation. A bearing subassembly can include many of the other components that surround the bearing in an application.

Custom bearings can use a custom packaging solution that presents bearings to personnel ready to install and properly sized for the assembly area. In one instance, a simple redesign of the tray resulted in 30% fewer trays, 30% fewer boxes, 30% fewer pallets and a $25,000 per year savings for one OEM.

Closing

By asking a few additional questions about the bearing, the application's design, and of the manufacturing process, the product designer can identify opportunities for value engineering. For the best result, consult a bearing engineer to compare the option of standard vs. custom. **PTE**

Mark Bos is a manufacturing professional with extensive experience in custom bearing and assembly design and manufacturing. In his current position with National Bearings, Bos serves as VP of Business Development, and he is actively involved in product development, engineering, marketing and sales management. Bos has specialized in bearings and bearing component design and manufacturing for the past 18 years.