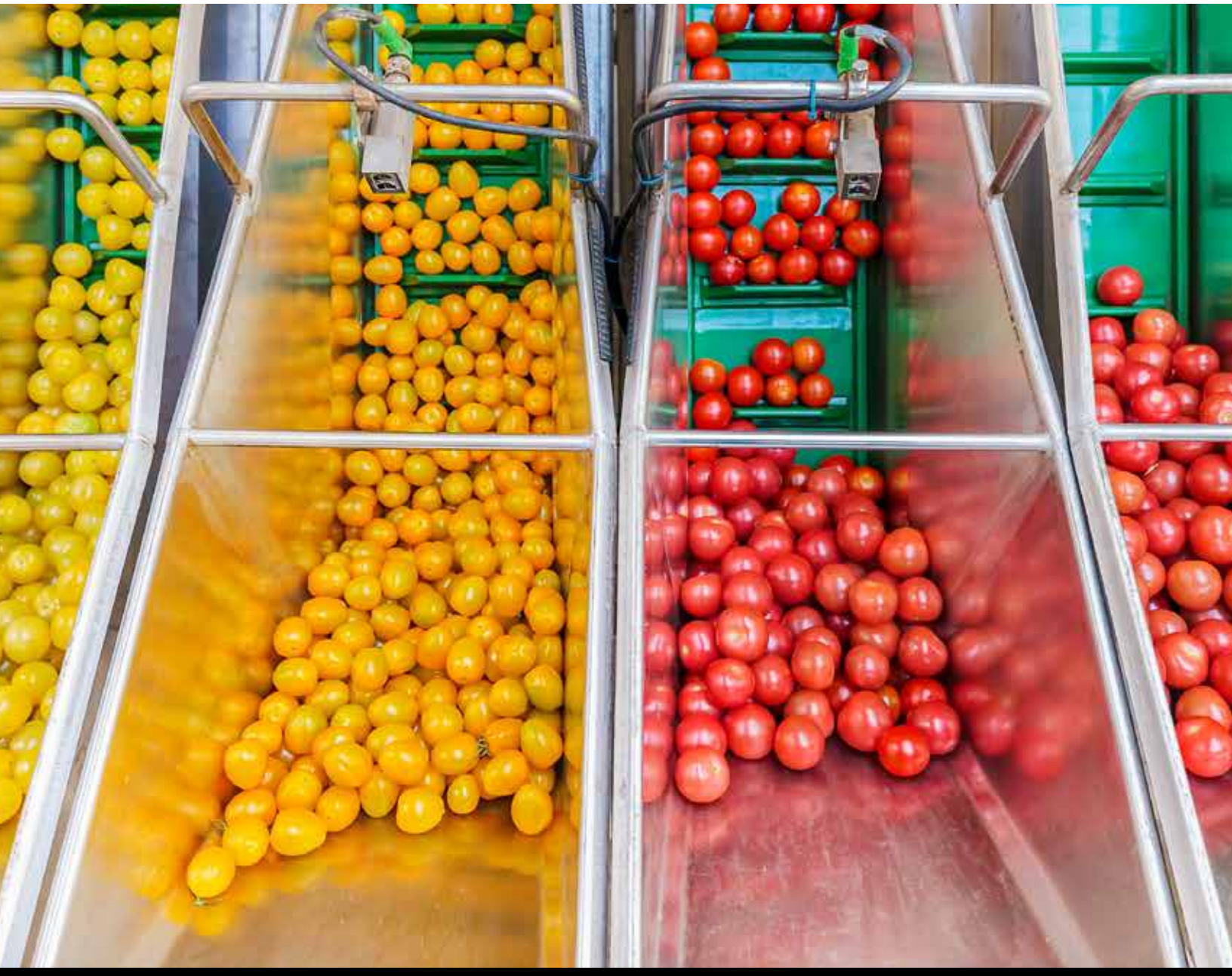
TIMKEN

Technical Article

Choosing the right bearing housing for your food and beverage equipment





It's an enormous engineering challenge to produce the amount of food and beverages that the global population needs every day. This is a challenge that must incorporate efficiency and cleanliness. To do this, producers like you rely on a wide range of machinery to harvest, process, package and ship product all around the world. Much of this equipment uses a variety of mounted bearings to support rotating shafts. These bearings must be carefully specified to meet application demands. Choosing the right one involves not only understanding the bearing itself, but the housing as well. From housing design to material selection and available features, you might wonder how to determine the best options for your equipment. Understanding the main features of bearing housings and how to best choose the right one for your equipment can help improve food safety, maximize uptime and reduce costs.

Housing design – which one to choose?









There's a diverse range of applications used throughout the food and beverage industry. These applications experience a full spectrum of operating conditions and feature almost every housing design available.

There are many designs to choose from, with some even featuring numerous subvariants depending on the manufacturer and product line. Examples of several common housing designs and their subvariants include:

Pillow block
- High base or low base.
- Standard or heavy-duty.
- Split or solid.
- Tapped base.

Bolted flange
- Square or round four-bolt flange.
- Offset or round three-bolt flange.
- Piloted bore flange.

Take-up unit
- Narrow or wide slot.

Hanger block

This list is in no way exhaustive. But you can see how it can quickly grow to an overwhelming number of options. When it comes to choosing a design for your application, you should consider factors including the bearing type, dimensions, serviceability, hygienics and load transfer.



Bearing type

Before selecting your housing design, it's important to understand the different bearing types (or "bearing inserts") that are available. Then, you need to choose the proper one for your application based on many factors such as loads, speed and temperatures. This selection is outside the scope of this article. But keep in mind that the bearing insert you choose will likely impact your housing options.

Dimensions

Whether you're specifying a housing for an existing application or trying to find the right one for your design, you might be wondering which dimensions are the most important to consider. Each design is unique, and dimensions sometimes change from manufacturer to manufacturer, but consider these primary dimensions to begin:

- Boundary dimensions: overall length, width and height of the housing.
- Bolt hole spread: distance between each bolt hole.
- Bolt hole size and recommended bolt size.
- Base-to-centerline height: primarily for pillow-block and tapped-base designs.
- Grease fitting location relative to mounting locations.

Finding these dimensions is as easy as going to the manufacturer's website or appropriate catalog. You can often find CAD models and 2D drawings to help quickly analyze the housing design and see how it fits with your equipment. Many common housing styles incorporate industry-standard dimensioning. Due to this, many styles will interchange from manufacturer to manufacturer. However, keep in mind that specialty and slight differences do exist. Therefore, it's important to consider every dimension crucial to your application.

Serviceability

The serviceability of your equipment is an important factor that can be directly influenced by the housing design. Examining the housing mounting locations and the space needed to insert or remove a bolt from each one is key for installation and removal. Orientation of the grease fitting (if available) also changes between each design, so it's important to note this and ensure there is enough room for greasing. Some designs, such as piloted flanged units, can make mounting easier by improving alignment using a precision fit with the machine frame. If a particular piece of equipment has multiple mounted bearings, such as a conveyor, you might choose to use a housing with fewer bolt holes to speed up installation and removal.



Hygienics

Housings specific to the food and beverage industry are typically designed with hygienics in mind, having large radii for easy cleaning and minimizing small areas for bacterial growth. However, your selection of a particular housing design can also impact your equipment's overall hygienics. Keeping bearings mounted in an easy-to-reach area can not only improve serviceability, but also improve cleanability. Consider using designs such as the two-bolt flange and tapped base pillow block that minimize areas for food scrap to collect. For bearings that are re-greaseable, consider housing styles that locate the bearings away from food product. This can mitigate contamination risks from grease purge. Some manufacturers include features such as extended feet, which elevate or stand the flat mounting face away from the machine surface. This design is intended to minimize "dead space" between the bearing and machine, which can hold bacterial growth.

Load transfer

You should also consider how the applied loads are translated through the housing and into the machine frame. Depending on the direction of applied forces, the housing may be reacting to radial, axial or combined loads. For example, when a pillow block reacts to a pure axial load, a moment force is induced within the mounting feet and bolts. In this case, it may be beneficial to use a flanged unit, which, depending on its mounting location, could translate the forces directly into the machine through its flat base. Alternatively, if the loads are expected to be purely radial, a pillow block or tapped base unit might be beneficial. Overall, most housing styles are designed to take a combination of radial and axial loads during operation. However, some housing designs limit the load-carrying capability depending on the resulting force direction. Refer to the manufacturer for more information in these instances.



Housing material – which one is right for you?

In combination with choosing the right housing design, selecting the proper housing material can contribute to machinery efficiency and food safety. There are a number of housing materials available in the marketplace today for your specific needs. The material that a housing is made from can impact its overall strength, corrosion resistance, chemical resistance, food contact ability, detectability and more. All of these are important attributes for food and beverage applications.

Some typical materials offered by today's mounted bearing manufacturers include:

- Cast iron.
- Ductile iron.
- Cast steel and stainless steel.
- Machined steel and stainless steel.
- Stamped steel and stainless steel.
- Thermoplastic polymers.
- Thermoset polymers.



As with housing designs, this list is only a broad overview of the common housing materials you'll likely come across. As it pertains to the food and beverage industry, these housing materials fall into two primary categories: standard and corrosion resistant. Due to the large amount of moisture found in food processing, corrosion resistance is often very important when selecting a housing material. Stainless steels and polymers are popular choices primarily for this reason.

Polymers

Thermoplastic polymers are usually the standard polymer material used for corrosion-resistant housings. These polymers are materials that will become pliable or soften at a specific temperature. When manufacturing thermoplastic housings, the raw polymer is often heated until soft then injected into a mold. Lower-strength and lower-temperature capabilities are typical attributes of thermoplastics when compared to thermosets or stainless steels. High loading or elevated temperature applications, such as ovens, are therefore not ideal for these housings. However, there are many applications where loading and temperatures are not a concern. In these cases, the affordability of thermoplastic housings makes them an attractive option.

Thermoset polymers typically have increased strength and temperature capabilities over thermoplastics. Rather than being formed through an injection procedure, thermoset housings are poured into a mold and cured through the addition of heat. Once cured, elevated temperatures will not return the cured housing to a pliable state. These housings can often incorporate additional features not found in thermoplastic housings such as smooth surfaces and detectability features. Overall, this housing material bridges the gap between thermoplastic polymers and stainless steel.

Stainless steel

Stainless steel is one of the most popular housing material choices for food and beverage applications. While it's the strongest corrosion-resistant material, stainless steel also maintains excellent chemical-resistant properties and high-temperature capabilities. Stainless steel housings are commonly found in either cast or fully machined variants. Fully machined variants are slightly stronger, making them great for harsh loading conditions. They also incorporate very smooth surfaces for better cleanability and increased hygienics. It's easy to see why stainless steel is a popular choice. But keep in mind that it's also typically the most expensive option.

Additional material considerations

Food contact ability and detectability can also be impacted by housing material. Stainless steels are widely accepted for use in food contact applications. The food contact ability of the polymers is dependent on several factors and should be verified with the manufacturer. Some manufacturers offer optically detectable polymers, which are designed to be spotted quickly if a piece falls into food. Stainless steel housings, on the other hand, can often be detected with a metal detector in those instances.



Lastly, it's good to keep in mind that while corrosion-resistant materials are needed in much of the food and beverage industry, there are applications that require standard materials such as cast iron. These applications are typically found in pre-processing and post-processing operations where high moisture or exposure to food are not an issue.

Accessories – what other features should you consider?

Manufacturers often offer other features that go beyond different housing designs and material selections.

- Coatings can provide an extra layer of corrosion or chemical protection to your housing for severe washdown applications.
- Fixed/floating housings can be helpful in applications that experience high temperatures, causing shaft thermal expansion.
- Sensors can help remotely monitor bearing performance through temperature and vibration analysis.
- Machined feet can assist in increased accuracy when aligning housings.
- End covers help protect personnel from rotating shafts and can shield the bearing from debris.

If used in the right application, these features can help extend bearing life and improve safety.

A combination of the right features

With the wide range of application challenges from the food and beverage industry, there are a number of mounted bearing solutions to meet them. While choosing the right bearing itself is important, the bearing and housing go hand in hand to ensure a proper fit for the application. Next time you're looking for the right mounted bearing, consider all the details that make up that housing and how they will impact your equipment. If you're unsure about a particular feature or application fit, reach out to the bearing manufacturer for more information. Being more educated on the proper housing to select will help you improve food safety, increase uptime and reduce maintenance costs.

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