

Your essential
guide



PLASTIC BEARINGS



SMB
BEARINGS



An essential guide to plastic bearings



Hostile. Harsh. Corrosive. If you're looking to source bearings for these kinds of environments, then plastic bearings could be the ideal option for your project. But how do you know if its time to put the traditional steel bearings to one side and use this alternative material?

This guide explains the relevant applications for plastic bearings and how to choose from the many variants of plastic bearings available on the market. While lots of options means you have more design flexibility, we appreciate this could result in choice overload if you don't know the facts.

Fear not. Whether you need bearings for the marine, food and beverage or pharmaceutical sector, we've got you covered. If you have any remaining questions after reading this guide, call a member of the SMB Bearings technical team on +44 (0)1993 842555 who will answer any queries you have.

Chris Johnson
Managing director
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WHY THE HYPE?

Plastic bearings are five times lighter than steel, which reduces the weight and energy required to get them rolling. For low load and low speed applications in harsh environments, they remove concerns of rusty steel bearings and their inevitable recurring replacements, saving end-users time and money.

PLASTIC BEARINGS CAN BE USED IN WASH-DOWN APPLICATIONS, SALTWATER ENVIRONMENTS AND HARSH CHEMICALS WITHOUT COMPROMISING PERFORMANCE, ENABLING MORE FREEDOM IN MAINTENANCE.

However, the real cost savings come from the reduced friction that plastic bearings can offer compared with steel. Plastic bearings can reduce costs up to 25 per cent with their low coefficient of friction because easier to spin bearings use less energy.

PLASTIC BEARINGS AREN'T 100 PER CENT PLASTIC?



There are multiple parts in plastic bearing design, including the rings, balls and cages, which can vary in material — and they may not necessarily be made from plastic. The 'plastic' in the generalised phrase 'plastic bearings' only refers to the bearing rings.

Here are the four plastic bearing ring options you need to know about:

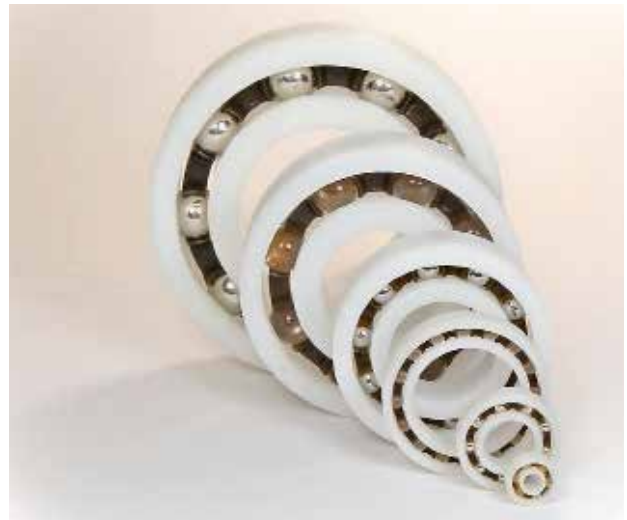
- Acetal resin/POM-C
- Polytetrafluoroethylene (PTFE)
- Polyvinylidene fluoride (PVDF)
- Polyether ether ketone (PEEK)



Acetal resin/POM-C

Acetal is the standard plastic bearing material. Our stock of acetal bearings fit shaft sizes from 3mm to 50mm in diameter. This type of plastic has the following properties:

- Excellent corrosion resistance to water, saltwater and weak chemicals.
- Non-magnetic and electrically insulating
- Maximum temperature 110°C (subject to cage/seal material)



Polytetrafluoroethylene (PTFE)

With the capabilities to handle the widest temperature range out of all four plastic options, this option is fit for niche cryogenic applications as well as high temperature environments. It also offers:

- Excellent corrosion resistance to water, saltwater and most chemicals
- Good high temperature performance
- Non-magnetic and electrically insulating
- Very wide temperature range of -190/+250°C (subject to cage/seal material)





Polyvinylidene fluoride (PVDF)

Often used in submerged liquid applications, this plastic variant offers:

- Excellent corrosion resistance to water, saltwater and most chemicals
- Nonmagnetic and electrically insulating
- Wide temperature range of -50/+150°C (subject to cage/seal material)



Polyether ether ketone (PEEK)



All four of these plastic bearing ring options offer semi-precision, suitable for low load and low speed only. PEEK offers the highest load and speed ratings out of this group of bearing ring materials, plus:

- Excellent corrosion resistance to water, saltwater and most chemicals
- Good high temperature performance
- Non-magnetic, electrically insulating and suitable for high vacuum
- Wide temperature range of -70/+250°C (subject to cage/seal material)

CAGES

The cage of a bearing is sometimes referred to as a retainer and plays an important role in ensuring the balls are evenly spaced around the raceway, to prevent ball-to-ball contact. In plastic bearings, this part is most often made from nylon (PA66) but can be made of various other polymers such as polypropylene or PEEK.

BALLS

Plastic bearing balls can be made from 316 stainless steel or glass in most cases. They are also available in ceramic or plastic if the specification calls for it.

There are clearly a lot of different combinations available for buyers, so we're going to make things simple for you. We'll tell you exactly which bearing combinations are most likely suited to an individual application or environment. If your application isn't on the list, then don't hesitate to get in touch so we can advise further.



MARINE ENVIRONMENTS

The marine industry offers a great challenge, due to the ever-present risk of corrosion. Plastic bearings are used in the marine industry and depending on the ball and cage materials, can be permanently submerged in seawater.

Acetal resin bearings with 316 stainless steel or glass balls have very good resistance to seawater but can only be used in lower precision, low load and low speed applications. The speed capacity of plastic bearings can be increased by using an alternative material such as PEEK, but these are still classified as semi-precision, low load bearings.



FOOD AND BEVERAGE

The food industry has many corrosive pitfalls for bearings. From sterilising chemicals, to recurring wash-downs, bearings in operation in this sector must contend with a lot. For applications that are too corrosive for stainless steel bearings, food grade plastic bearings made from acetal resin, polypropylene or PEEK provide an alternative.

Acetal resin bearings are widely used in food and beverage industry applications. These bearings cope with regular wash-downs, steam-cleaning, high temperatures, fluids and exposure to corrosive materials.

Many steel bearings for this industry need to be supplied with non-toxic lubricants approved to NSF (formerly USDA) H1 or H2 standards. These lubricants are also designed to be resistant to washout. However, plastic bearings can run without lubrication, eliminating the risk of contamination and concerns about washout.

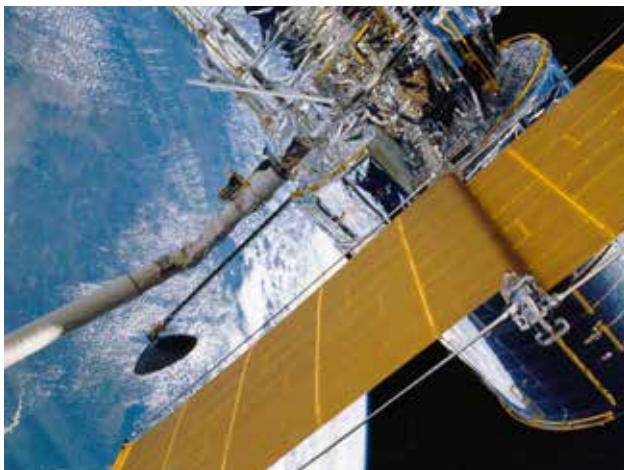
PHARMA OR CHEMICAL?

Similarly to the food and beverage manufacturing sector, bearings in pharmaceutical and chemical environments are often subjected to washdowns, harsh cleaning equipment and other sector-specific challenges such as chlorine exposure, fuel handling and solvent handling.

Acetal resin corrosion resistant bearings cope well with many alcohols

VACUUM OR CLEANROOM?

Great care must be taken when choosing bearing lubricant for a vacuum or cleanroom because most greases will vaporize to an unacceptable level, contaminating the environment and preventing the grease from lubricating correctly.



and chlorides while PTFE bearings will offer excellent resistance to acids and alkalis. If your application is highly changeable, PEEK bearings can be used in the presence of a wide range of chemicals.



Plastic bearings generally operate cleaner than metal bearings because they do not need lubrication and do not rust. Plastic bearings made from PEEK perform well in low load, semi-precision applications in this environment as PEEK is a material with very low outgassing characteristics also.

Plastic bearings can also be equipped with special low volatility, perfluorinated greases with very low outgassing rates, which are designed to perform well in highly regulated conditions such as cleanrooms. These greases are regularly used in applications such as semiconductor manufacturing or in equipment used in deep space.

HIGH TEMPERATURE APPLICATIONS

We can supply plastic bearings with alternative ring or cage materials, such as PEEK, PTFE or PVDF, for extreme temperatures. The standard plastic bearings are open but may be supplied with plastic shields on request.

Acetal bearings with nylon cages have a temperature range of -30°C to 100°C. This range can be extended with the use of different ring and cage materials. PTFE can be used down to -190°C while PEEK and PTFE are good high temperature options for up to 250°C.

Note, plastic bearings are more prone to temperature induced expansion and contraction, so if this is a concern, ceramic bearings may be a better alternative.



MRI EQUIPMENT

MRI scanners are high value pieces of equipment that hospitals want to keep running without high maintenance parts. That's why high-quality plastic bearings could prove crucial in the design of this equipment.

Plastic ball bearings are completely nonmagnetic when fitted with polymer, glass or ceramic balls. They are ideal for use in MRI X-ray equipment or sensors where there cannot be any magnetic distortion. The rings can also be made from different plastics too, such as PEEK or PTFE.



FREQUENTLY ASKED QUESTIONS



WHAT ARE THE ADVANTAGES OF PLASTIC BEARINGS?

PLASTIC BEARINGS ARE IDEAL IF YOU NEED CORROSION RESISTANT BEARINGS.

Where some metal bearings would corrode over time, plastic bearings will stay intact thanks to their excellent resistance to water and chemicals. They are also much lighter than steel bearings.

As a result, plastic bearings are a great option for applications that expose bearings to regular washdowns, like equipment in the food industry. Similarly, plastic bearings are suitable for applications requiring non-magnetic bearings. It is important to note that plastic bearings are made to looser tolerances than our precision bearings and are referred to as “semi-precision”.



Of course, we can't mention the advantages of plastic, without mentioning the reasons other materials might be better suited for your application.

PLASTIC BEARINGS ARE GENERALLY MADE FROM ACETAL RESIN RINGS AND NYLON CAGES, WHICH ARE SOFTER THAN STEEL. THEREFORE, THESE BEARINGS ARE INTENDED FOR LIGHT LOADS AND LOW SPEEDS.

Additionally, the maximum temperature for the acetal bearings with a nylon cage combination is 100°C. But if you swap both materials for PEEK, this raises the temperature resistance up to 250°C.

ARE PLASTIC BEARINGS WATERPROOF?

YES. UNLIKE METAL BEARINGS, PLASTIC BEARINGS RESIST WATER AND CORROSION. AS PLASTICS HAVE LOW MOISTURE ABSORPTION, IT MEANS THEY WILL NOT EASILY SWELL OR IMPACT THE EQUIPMENT THEY ARE USED IN.

Many plastic bearings have PA66 nylon retainers. PA66 does absorb more moisture than many other plastics so for very wet conditions, PE, PP or PVDF cage material can be specified. As plastic bearings can be run dry, there isn't the problem of lubrication washout.

WHAT ARE PLASTIC BEARINGS USED FOR?

There's a whole plethora of low precision applications that plastic bearings are suited for, many of which involve exposure to corrosive environments such as pharmaceutical or food processing.

In these environments, even 400 grade stainless steel bearings may corrode due to the regular washdowns and exposure to aggressive cleaning chemicals. Plastic bearings don't have this problem.

Plastic bearings also have their place in marine applications as they have very good resistance to seawater. Plastic with very low moisture absorption, such as PEEK or PVDF, can be used for submerged applications.

Similarly, for applications where the bearings mustn't be magnetic or conductive, plastic bearings are ideal.

It should be noted however that plastic bearings do have limitations in load handling, precision and speed due to their softer material.

WHAT ARE PLASTIC BALL BEARINGS MADE OF?

SMB standard plastic ball bearings are made of acetal resin (POM-C) rings, nylon (PA66) cages and balls made from 316 grade stainless steel or glass.

These plastic bearings are generally used as corrosion resistant bearings, non-magnetic bearings or non-conductive bearings. We can also supply corrosion resistant and chemical resistant plastic bearings made from PEEK, PE, PP, PVDF or PTFE.



CAN PLASTIC BEARINGS RUN DRY?



Yes. You can use corrosion resistant plastic bearings dry (unlubricated), which is what we recommend for many applications that expose the bearings to highly concentrated acids and alkalis, or saltwater. This eliminates the problem of lubricant washout in very wet environments. Plastic bearings are only designed for low loads and speeds.

ARE PLASTIC BEARINGS AS GOOD AS STEEL BEARINGS?

It depends on what you're using them for. Both plastic bearings and steel bearings have their pros and cons depending on the application.

PLASTIC BEARINGS ARE IDEAL IF YOU NEED CORROSION RESISTANT, NON-MAGNETIC OR NON-CONDUCTIVE BEARINGS. HOWEVER, DUE TO THE SOFTER MATERIAL COMPARED WITH STEEL, THESE BEARINGS HAVE LIMITATIONS WHEN IT COMES TO LOAD HANDLING, SPEED AND PRECISION.

Steel bearings are the traditional option and many sizes are available in stainless steel, offering different levels of corrosion resistance depending on the grade of stainless steel. Check out our marine grade 316 stainless steel ball bearings which also have low load and speed ratings but excellent corrosion resistance. Our 440 grade stainless steel bearings are precision grade and have much tighter inner and outer ring tolerances compared with plastic. This makes them better for high precision or high load/speed applications.



ANY OTHER QUESTIONS?

For further information about SMB's wide range of plastic bearings, contact us today.



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