

# RUBIX

A worker wearing a blue shirt and black gloves is holding a metal bearing component. The background shows a factory setting with blue metal frames and machinery. A large blue diagonal shape is overlaid on the right side of the image.

## Bearings Innovations

Their Impact On  
Improving Production  
Efficiency, Reducing  
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## Introduction



Keeping up with technology changes in any area of business or personal life is a challenge so it's no surprise that many production maintenance professionals find it hard to stay abreast of the latest innovations in that most ubiquitous of production line spares – the bearing. It's challenging enough to keep the lines running at maximum productivity at minimum cost without having to think if a new product might work better.

Especially when you take into account the natural tendency to replace like with like and remain within the Original Equipment Manufacturer (OEM) machine guidelines. It works, it's compliant, so why take a risk with a new part?

In this white paper, Dean Askew, Group Category Director for Bearings at Rubix (Europe's number one distributor in Maintenance, Repair and Overhaul (MRO) industrial supplies and services) shares with you the key information on the most relevant innovations in bearing technology, so that you can consider how you might apply it in your plant.

These innovations are all focussed on increasing your plant productivity, saving you time, reducing maintenance requirements and bearing failure and ultimately reducing your costs

And, if it is OEM manual restrictions that are making you hesitate, then keep in mind that the next generation bearings are specifically designed in almost every case to fit the same footprint as their predecessors and can be re-specified by the OEM.

## › Materials That Are Making A Difference

Steel remains the most commonly used material for bearings manufacturing. According to industry figures more than 1.7 billion tonnes of steel are in use worldwide in bearings manufacture and that's expected to grow to 2.8 billion by 2050. But the fact remains that there are emerging new materials.

As Steve Lane of SKF notes "the weight to strength relationship of materials is becoming increasingly relevant for design engineers, which is opening up new possibilities to use ceramics, composites, polymers and light alloys, providing of course they are both technically and economically feasible for replacing steel".

In this section of the white paper we review changes to steel technology and some the other materials you will increasingly find in bearings manufacturing.

## Steel Technologies



Steel remains the 'go to' material for bearings manufacture as the figures above make clear. But even here there are innovations that are impacting the sector.

For example, extruding a greater depth and hardness of steel or applying vibration-reducing techniques has led to a wealth of innovations within bearing design from all of the 'big five' global manufacturers.

Examples of bearings that have seen such improvements are the SKF upgraded Explorer<sup>1</sup> self-aligning roller bearings range, featuring a combination of high-quality steel and an improved heat treatment process. The result: a superior balance between hardness and toughness, enabling as much as twice the service life as the original SKF Explorer.

This range have been optimised to deliver very high load carrying capacity – both radially and axially, very high running accuracy, low friction and combine all this with high wear-resistance.

SKF note that benefits here also include:

- Increased uptime
- Improved reliability
- Resistance to contamination
- Higher levels of productivity
- Reduced noise and vibration levels
- Excellent wear resistance

Elsewhere companies such as NTN SNR are applying surface hardening and powder metallurgy techniques for applications in aerospace steels and other high-performance environments.

## Ceramics - Hybrid Bearings



These hybrid products offer a combination of steel rings and rolling elements manufactured from silicon nitride (ceramic). They are designed to be dimensionally interchangeable with all steel bearings in many cases, but will help to increase reliability and robustness and provide excellent electrical insulation. Because the ceramic rolling element is extremely hard and tough, chemically inert and dimensionally stable at higher operating temperatures, it is ideal in demanding and more extreme environments.

In addition to being excellent electrical insulators, hybrid bearings have a higher speed capability, have more resistance to potentially damaging abrasive particles and will therefore provide longer service life than all-steel bearings in most applications.

SKF offer a Hybrid range as do NSK<sup>2</sup> and Schaeffler<sup>3</sup>. As NSK point out, these bearings are ideal for use in machine tools manufacture or power generation or in any arduous or corrosive environment. Designed to deliver the same load capacities as standard steel bearings and supplied to ISO standard dimensions, they are hybridised by using a brass cage with ceramic balls.

Schaeffler's offer are designed for use in electric motors where they are more susceptible to damage caused by the passage of current. Their innovations include inner and outer rings with oxide ceramic coating as well as hybrid bearings with ceramic rolling elements. Coated bearings are suitable for breakdown voltages of up to a minimum of 500 V or 1,000 V, depending on the layer thickness.



<sup>1</sup> 'SKF Explore Performance Class Bearings', SKF

<sup>2</sup> 'Hybrid Bearings With Ceramic Balls', NSK Europe

<sup>3</sup> 'Traction Motors & Gearbox Bearings', Schaeffler UK

Schaeffler notes that hybrid bearings with ceramic rolling elements provide even better protection and are an ideal alternative for their Insutect bearings. The rings of these hybrid bearings are made from rolling bearing steel, while the rolling elements are manufactured from ceramic material that is absolutely resistant to wear and also functions as a current insulator. They also provide a longer grease operating life than standard bearings that are lubricated for life. They offer these hybrid bearings as ball and cylindrical roller bearings.

## Plastics

Once the preserve of only very low load applications, advances in plastics technology now mean that use of plastics in ball bearing application is growing and is likely to see significant growth in the future. Used currently in less demanding environments where temperatures and stresses on the materials are less exacting, polymer-based materials have many benefits including part longevity (they wear more slowly), strength, corrosion resistance, and have less need for lubrication.

As Craftech Industries Inc. point out, examples of plastics materials used include:

**Teflon (PTFE):** This amazing material developed as a by-product from the 1960s space race also provides many benefits in plastic bearing application. First, being Teflon, you gain the advantages of a low friction material combined with high self-lubricating characteristics. Chemical ingress has very little or no effect on the substance and it can perform fully comfortably across a range of temperatures from -201°C to +180°C continuous, to 285°C short-term. All of this makes bearings manufactured from Teflon ideal for use in applications where the bearing is subject to prolonged exposure to weather, water or chemicals. The downside of these bearings is the comparative cost in relation to traditional metal ones.

**Nylon:** This material is the most ubiquitous in plastic bearings because the bushings exhibit low friction and require no lubrication. Nylon also offers the benefits of being quieter and abrasion resistant. The fact that highly accurate moulding, casting and machining is comparatively easy in this substance also makes it highly attractive and its rigidness and wear resistance can be improved by application of additives such as graphite. They can resist distortion at temperatures up to 145°C.

**Phenolics:** These bearing materials are often used in ships' engines, electrical switch-gear, rolling-mill, and water-turbines. They excel in relation to strength and shock, water, acid and alkali resistance and in in heavily loaded systems.

Two others worth a mention are Delrin which is widely used in automotive, appliance, and industrial applications where its low cost and water resistance makes it an attractive option and Ultrahigh-molecular-weight Polyethylene (UHMWPE). These boast a smooth, low-friction surface and offer a great alternative to parts typically made from acetal, nylon, or PTFE material.

<sup>4</sup> 'Top 5 Materials For Plastic Bearings Used On Metal Surfaces', *Craftech Industries*  
<sup>5</sup> Based on NTN-SNR lab internal analysis

# ➤ New Approaches To Bearing Lubrication & Manufacturing Materials

## Reducing Lubrication Requirement & Extending Bearing Life

With 21% of bearing failure due to foreign matter ingress and 13% due to lubrication failures<sup>5</sup> developments here are more important than ever so in this section we will consider in some detail what the science of Tribology (the study of friction, lubrication and wear) has offered in relation to bearing innovation.

## Pre-lubrication Innovations



The new approach to pre-lubricated bearings comes from innovations such as in the application polymer materials and thermoplastic resin.

The SKF offer here, called Solid Oil<sup>6</sup>, uses oil-saturated, micro-porous polymers and are actually proven to reduce maintenance. The lubrication entirely fills the bearing to coat all rolling elements and raceways with an even film. Holding up to four times as much oil as a traditional grease-filled bearing, the polymer material releases oil gradually around the moving parts to maintain this consistent coating. As the oil remains in position within the bearing, both particulate and fluid contaminants are kept out, while it is also resistant to chemicals which can damage seals and introduce foreign bodies.

SKF bearings with Solid Oil are therefore ideal for inaccessible or remote applications where re-lubricating and maintenance are difficult due to positioning – for example in applications including cranes and traverses, mixers, bottling machines and track-running rollers.

**Ideal for inaccessible or remote applications where re-lubricating and maintenance are difficult due to positioning**

<sup>6</sup> 'Bearings With Solid Oil', *SKF*

The Solid Oil polymer material itself provides resistance to centrifugal forces, making it suitable for demanding applications in paper and wood processing or utilities. It is also available with specific food-grade lubricant for hygienic applications in food or pharmaceutical processing.

But if you are focused only on the food sector, then there is a very recent innovation from Sweden you need to know more about. Launched in January of 2019 this innovation from SKF aims to set new standard for hygienic design<sup>7</sup>. Part of their Food Line, they call these Blue Range.

SKF have combine an innovative sealing system with high performing food grade bearing grease, and complete seal-ability of the units (where needed). This not only gives increased performance and uptime and reduces maintenance costs, it helps to eliminate the risk of contamination and reduce the spread of bacteria. Because they are lubricated for life and designed to withstand frequent washdowns, the new bearing units also solve many of the problems connected with traditional maintenance in the food and drink sector.



## Matching Pre-lubrication To New Materials

The NSK approach to application of new lubrication and new materials technology is based on martensitic stainless steel with nitrile rubber seals and a PBT thermoplastic resin housing. NSK call these Lifelube Housed Bearings<sup>8</sup> and they result in a corrosion-and contamination-resistant bearing which increases operating life. The range has been designed for operations where fluid process is unavoidable, either due to general operating conditions or due to washdown in food-grade applications.

The paint-free housing prevents chipping and flaking which could not only damage bearing operation but contaminate products and is typically used in conveyors making it ideal for food and drink processing as these products often come into direct contact with the belt. The Molded-Oil™ inserts negate the need for re-lubrication and prevent oil being washed away by process or cleaning water.

**Paint-free housing prevents chipping and flaking, making it ideal**

**for products that often come into direct contact with belts.**

The bearing has also found popularity within the mining and quarrying industry, as its self-contained nature is suitable for wet and dusty environments. As a further benefit, the bearing offers super finished raceways for quiet and efficient running as well as a spherical seating which allows for initial misalignment when first mounted.

## Lubrication In Linear Motion Applications

Then there's the innovations in lubricant application for those with linear motion applications such as those used in medical equipment, measuring apparatus, palletisers and mechanical handling. Here the KUVE Ball Monorail Guidance System from INA<sup>9</sup>, part of the Schaeffler Group, has specifically been designed to address these types of uses.

It is a linear recirculating bearing with integral lubricant reservoirs adjacent to raceways which can vastly reduce maintenance for linear motion applications of all types. Comprising at least one carriage, the system

<sup>7</sup>SKF Sets New Standard For Hygienic Design With Ground-breaking Food Line Ball Bearing Units, SKF

<sup>8</sup>NSK Innovative Products: Life Lube, NSK Europe

<sup>9</sup>Linear Guidance Systems: Linear Actuators, Schaeffler Switzerland

also includes a full complement ball system and sealing strips to the upper and lower faces of the carriage. In addition, the system is fully customisable as it is available in guideway widths from 15 to 55mm and with an extensive range of interchangeable carriage types as well as accessories including wipers.

The KUVE monorail assemblies are designed for applications with long unlimited stroke lengths, high loads and rigidity, and low friction. Suitable for accelerations up to 150m/s<sup>2</sup> and speeds of up to 300m/min, KUVE units can also operate across a temperature range of -10°C to +100°C.

# › Housed Bearing Innovations For Longer Life In Demanding Environments

Here Timken is leading the charge in a blend of new technology application. Designed for challenging, heavy-duty applications in the aggregate, power generation and metal processing industries, Timken® Spherical Roller Bearing Solid-Block Housed Units vastly reduce the risk of contamination in dusty, gritty environments as well as lowering lubrication consumption. Housed in solid steel, the self-contained units feature an extended black oxide inner and a relief valve for non-purging seals. Inside are new high-performance Timken® spherical roller bearings.

Each unit is pre-assembled and pre-lubricated to ensure the bearing is never exposed to contaminants. With machined feet for one-time alignment, the unit can be installed within ten minutes. The units can run efficiently on misaligned shafts up to +1.5° without affecting performance, thus negating a common cause of bearing failure. Used for varied applications from cranes, lifts and hoists through to fans and blowers, these housed units can significantly increase uptime by reducing maintenance and re-lubrication operations common for alternative components. For extremely harsh conditions, optional steel auxiliary covers offer added protection.

## Roller Bearings For High Radial Loads & High Contamination Environments



Another very recent innovation from NTN-SNR called KIZEI<sup>10</sup> delivers the first ever roller bearings with metallic shields to provide protection against external solid contaminants and deliver increased grease retention. These two factors alone account for 21% and 13% of bearings failures respectively as we have already seen. So, any product that provides innovations that help to reduce these risks and extend spherical roller bearing life is one worth knowing about. This KIZEI range are provided in standard ISO dimensions which means that, as they are 100% interchangeable, they can easily be fitted to replace current open spherical roller bearings.

**External solid contaminants and poor grease retention account for 21% and 13% of bearings failures. So, any product that provides innovations to reduce these risks and extend bearing life is one worth knowing about.**

Load capacity is increased by optimisation of the contact surfaces and the quality of the steel sheet metal cages which have been processed to increase their resistance and allow better contact with the rollers. This also allows increased operating speeds. Designed to tolerate shaft deflection and misalignment between the shaft and the housing the Nitrided steel cage and shields give much better shock and corrosion resistance. And they work across a wide working temperature range (-40°C up to +200°C).

Mounting the bearing uses the same equipment and procedures as that of any standard bearing making them simple to fit. Initial and re-greasing is also simple though you will find you need to do that far less often than currently thanks to the new design. NTN SNR estimate you will do that three times less often than with open bearings.



<sup>10</sup> 'Ultager Spherical Roller Bearings', NTN-SNR

# How To Put Some Of This To Work In Your Plant

So, there you have it. Some important innovations that can make a substantial difference to the maintenance needs of your production line, and all available from Rubix.

**Expert technical advice on specification, installation, maintenance and upgrades, as well as the ability to project-manage bespoke bearing design and development.**

To take full advantage of the latest innovations in bearing technology, it is important to source products from an authorised distributor. Not only can such suppliers offer complete traceability of components and a full warranty, but they also benefit from close-working relationships with leading bearing manufacturers.

This results in expert technical advice on specification, installation, maintenance and upgrades, as well as the ability to project-manage bespoke bearing design and development. Rubix is Europe's only Pan-European maintenance, repair and overhaul (MRO) supplier to have achieved authorised distributor status with all five leading bearing manufacturers.

To find out more about how to get the latest bearing technology working in your plant or if you have any further questions and comments on this white paper please do get in touch using the details below.

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