



# Bearing Briefs

## **Bearing Specific Topics**

**Bearing Installation & Fitting**

**Bearing Repair**

**Hybrid Ceramic Ball Bearings**

**Linear Bearings**

**Plane Bearings**

**Seal Selection**

**Spherical Plain Bearings**

**Vibration Analysis**

**Wear Sleeves and Other Shaft**

**Repair Options**

**Planetary Roller Screws**

**Bearings for the Food &**

**Beverage Industry**

**Split Roller Bearing Technology**

**Bearing Mounting Tools**

**Reduced Operating Costs**

**Through Condition Monitoring**

**Understanding Linear Actuators**

**Special Coatings & Materials to**

**Enhance Bearing Performance**

## **Bearing Industry Information**

**Bearing Standards Organizations**

**Brief History of Bearings**

**The Domestic Bearing Industry:**

**Investing in the Future**

**History of Adhesives**

**Load Ratings & Bearing Life**

**Status of Bearing Load Ratings**

## **Special Coatings & Materials to Enhance Bearing Performance**

Have you ever wondered why manufacturers have been able to extend the warranties or service intervals for their products? Or how an automaker can offer an unlimited power-train warranty? Often this is because of recent advances in material science that have allowed that very essential component - the bearing - to last longer and perform better than ever before, even in environments that were, until recently, quite inhospitable to bearings.

With the availability of higher quality bearing steel, new alloys and platings, heat treatments and microstructure control for improved service life, bearings are going into more places than ever before, while providing superior solutions and improved performance under the most demanding conditions.

Figure 1 shows the wide variety of characteristics needed by bearings in various applications. They can operate in high-tech environments or very demanding applications found in steel and paper mills. Whatever the application, there will likely be a material or plating designed specifically to allow the bearing to provide the equipment life required.

Obviously, due to the many operating conditions listed,

**Figure 1: Operating Requirements for Bearings and Bearing Components**

Wear resistance

Resistance to specific media

Protection against fretting corrosion

Increase in physical rating life limit

Suitable for vacuum

Resistant to radiation

Heat resistance

Corrosion resistance

Low maintenance

No electrical conductivity

Amagnetic

Clean room suitability

# Special Coatings & Materials to Enhance Bearing Performance

the list of available materials is quite extensive. Therefore, for the purpose of this paper, the following chart provides detail on only three key operating requirements: protection from corrosion, protection from wear and electrical conductivity protection.

## Protection from corrosion and fretting corrosion

Coating types	Purpose / Advantage	Typical Applications	Typical Bearing Types
Zinc with metal alloy	Corrosion protection	Paper processing, rolling mills, automotive applications and outdoor equipment	Insert bearings, tapered roller bearings
Zinc and chrome (non ferrous materials)	Corrosion protection	Various accessories, primarily for automotive engineering	Insert bearings, tensioners
Zinc phosphate (ZnP)	Fretting corrosion Corrosion protection	Rail vehicles	Tapered roller bearing, cages sleeves, wheel bearings
Thin dense chrome (TDC)	Fretting corrosion Corrosion protection	Vibrating screen bearings, applications involving exposure to seawater	Spherical roller bearings, spindle bearings
Nickel plating	Corrosion protection	Food industry	Pillow blocks, track rollers

## Protection from wear, friction and skidding

Coating types	Purpose / Advantage	Typical Applications	Typical Bearing Types
Black iron oxide	Running-in behavior oil film retention	Wind power, rail applications	Cylindrical roller bearings
Manganese phosphate (MnP)	Sliding and running in behavior	Mixer gears	Spherical roller bearings (Steel cage), adaptor sleeves
Thin dense chrome (TDC)	Wear resistance	Oscillating equipment and at risk lubrication conditions	Linear monorail systems
PTFE (Polytetrafluorethylene)	Frictional behavior	Bearings for cement mills, ship engine, suction roll	Spherical plain bearings, spherical roller bearings
PVD (physical vapor deposition)	Multi-purpose as various materials can be applied for each characteristic	Paper processing, rolling mills, automotive applications, wind, mining and outdoor equipment	Deep groove ball bearings, track rollers

## Conductivity prevention

Coating types	Purpose / Advantage	Typical Applications	Typical Bearing Types
Ceramic coating of aluminum oxide	Current insulation	Electric motors, traction motors, axle box	Deep groove ball bearings, cylindrical roller bearings tapered roller bearings
Hybrid bearings using ceramic rolling elements	Current insulation	Electric motors, welding	Deep groove ball bearings

Again, the above list is not meant to be comprehensive, but a sampling of what is being used to make bearings last longer. Many materials are proprietary to specific manufacturers and their production processes. The bottom line in the evaluation of any application is the cost benefit – the improved life, and the increased production time, worth the added cost of the special material.