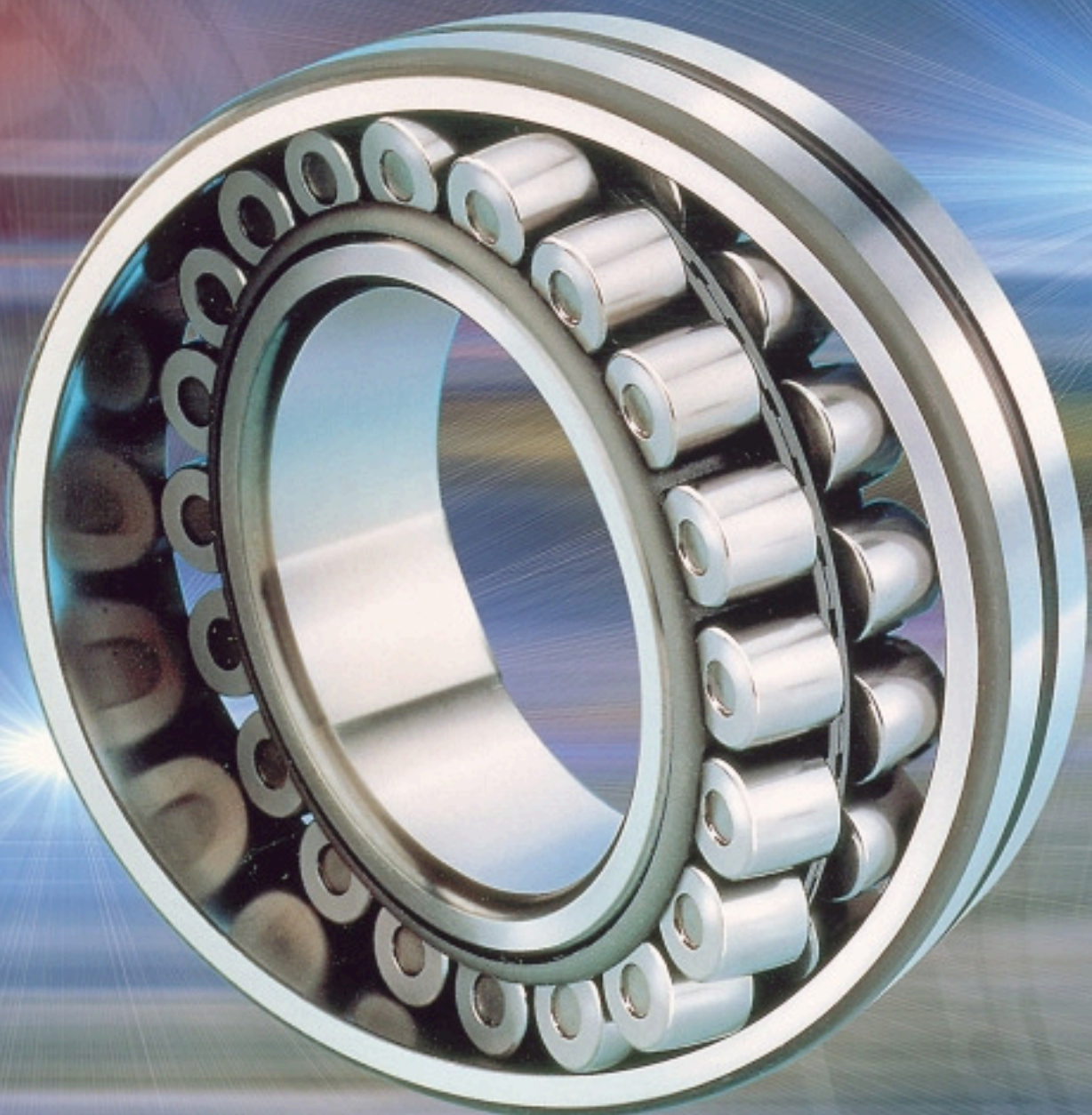


Spherical roller bearings for industrial applications



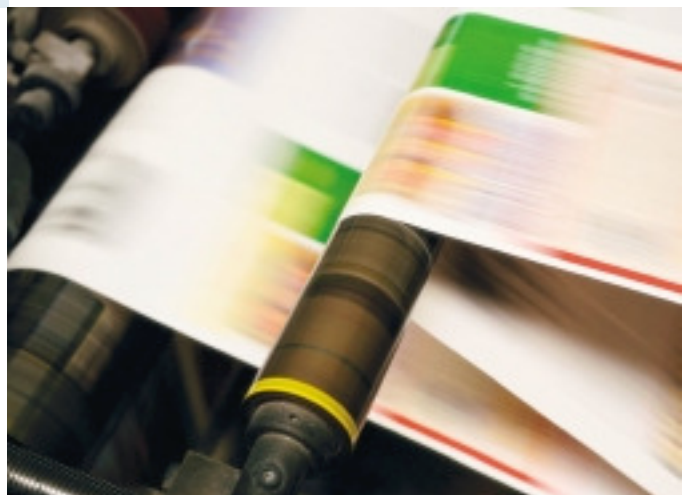
NSK is a **World Leader** in **Spherical Roller Bearings**

Today, in all types of industries, designers seek to reduce the sizes and weights of their products, improve their competitiveness and all without loss of reliability. For bearings this invariably means a tougher working regime of increased loads, higher working temperatures, faster speeds, contamination tolerance and longer fit-and-forget operating intervals.



Yet despite these operating conditions, the main requirement on the bearing manufacturer is still to provide longer operating life. Meeting such demands has meant that bearings have moved from being ordinary support and load bearing components to actual performance enhancers in their own right. What is making this possible is the bringing together of materials, software, mechanical design and lubrication technologies to produce ever better bearings.

Ever better bearings means NSK's latest development in Spherical Roller Bearing – NSK HPS Series.



HPS™ redefining the standard

A quantum leap in spherical roller bearing design

Service life achieved from the NSK HPS can be up to twice any other products available on the market today.

Machine performance and efficiency are enhanced by the high reliability, long life and outstanding performance of these bearings. This makes it possible to reduce machine weight, size and cost by moving to smaller bearings with life equivalent to that of larger bearings.

High performance in diverse applications with reduced maintenance costs and more compact design

HPS spherical roller bearings meet the needs of various equipment for components with reduced maintenance costs and unsurpassed functionality. By taking full advantage of NSK's wealth of experience and expertise, HPS spherical roller bearings realise unprecedented endurance and high limiting speeds to support downsizing while at the same time improving performance and lengthening equipment operating life.



Design Technology

Exclusive NSK design through advanced analytical technology.

Material Technology

Made from NSK's high cleanliness specification steel. Special surface treatment increases resistance to wear.

Manufacturing Technology

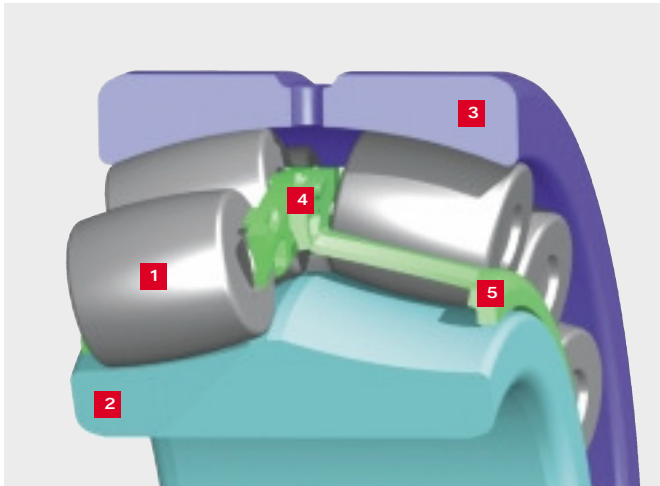
The most advanced production system guarantees outstanding quality control.



**Life - up to
2times
the operating life**

**Limiting Speed
up to
20% higher**

Features of HPS Spherical Roller Bearings



- 1 Rollers**
Increased size and number.
- 2 Inner Ring**
High-temperature operability.
- 3 Outer Ring**
High-temperature operability.
Lubrication groove and holes.
- 4 Cage Flange**
High limiting speed.
- 5 Cage**
High-strength pressed steel.
Special surface treatment.

Long Life - Lower Maintenance Cost

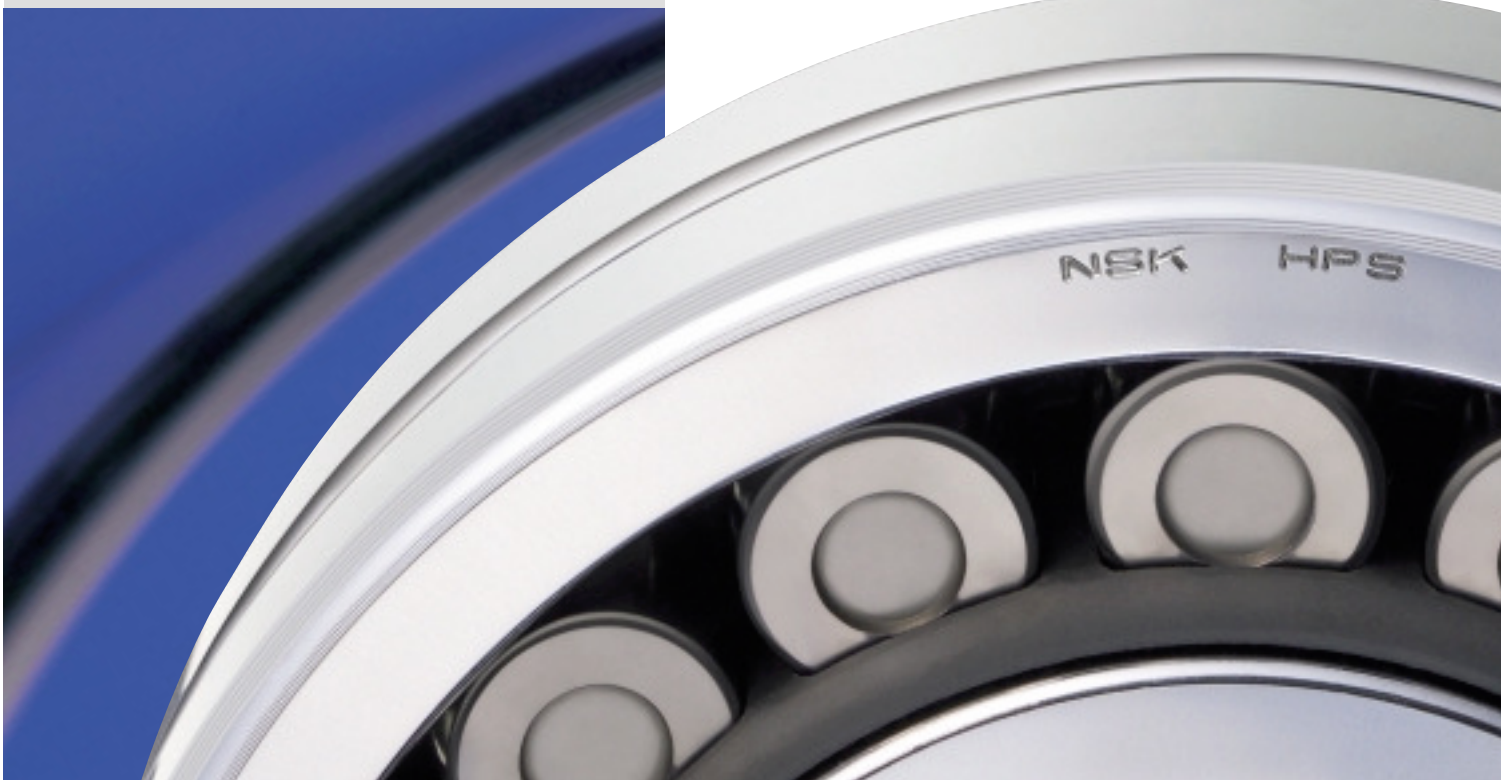
Maintenance costs are an important factor in reducing total equipment costs. HPS spherical roller bearings realise twice the operating life of conventional products, and longer operating life leads to lower maintenance costs.

Flexible - Applicable to a variety of applications

With improved cage resistance to wear at higher speeds over longer period of operation, HPS spherical roller bearings deliver high performance to a variety of applications.

Compact - Contributing to equipment downsizing

Achieving longer operating life can be realised together with the selection of smaller bearings. HPS spherical roller bearings allow compact design for various equipment, thereby supporting the demand for downsizing.

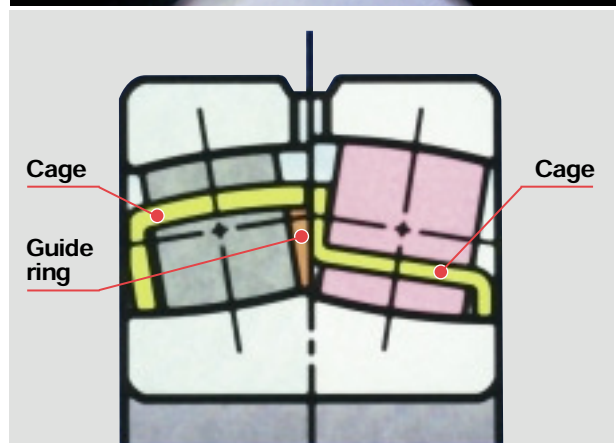


Technology

Innovative design drawing upon a variety of technologies leads to high performance in next generation products.

Innovative design developed through enhanced structural analysis

The HPS cage incorporates a roller guide function in place of a guide ring. Eliminating the guide ring and optimising the design of the inner and outer ring configuration facilitates the placement of additional, larger rollers. Optimised design for the internal specifications and improved press technology greatly increase load capacity, and realise longer life. Special surface treatment further strengthens the cage, reducing wear, heat and friction; it also allows for higher limiting speeds.



Conventional design

HPS

Bearing Interior Design Comparison

Elimination of the guide ring allowed for a design change that improves cage balance and strength.

Adoption of state-of-the-art materials

HPS spherical roller bearings are made from NSK's high-cleanliness Z steel. This steel features greater fatigue strength. In addition, special surface treatment makes it more resistant to wear and more durable in a variety of applications.

Industrial Solutions

NSK Advanced Technology problem solving

In addition to having the widest range of spherical roller bearing production of any bearing manufacturer, NSK has extensive experience of solving the most difficult application problems with a range of technologies, examples of which are outlined in the following pages.

NSK is one of the most technologically advanced bearing makers in the world. At the heart of the search for more advanced technologies is a simple idea: make bearings work better in real life, bearings that are more reliable, more efficient and longer lasting. We pursue this idea at our Technology Centres and through our network of technical experts and facilities around the world. The results are shown in better manufacturing processes, cleaner bearing steels, advanced bearing cages and designs, and numerous other innovations.



"make bearings work better in real life, bearings that are more reliable, more efficient and longer lasting."

NSK Advanced Technology Molded-Oil™ spherical roller bearings

NSK's patented material Molded-Oil forms the lubricant in this series of bearings. Molded-Oil consists of a lubricating oil suspended in a resin matrix which fills all of the bearing space. It provides a lubricating oil content of more than 50% and offers an excellent lubricating regime. The oil discharge mechanism is temperature dependent; the higher the heat generation, the greater the discharge rate.

Excellent performance in dust and water contaminated environments

Since the Molded-Oil fills the entire internal space of the bearing, it acts as an effective barrier to the entry of contamination. This leads to extended bearing life and improved reliability.

Environmentally friendly

Oil slowly seeping from the resin matrix is sufficient to lubricate the bearing. Therefore oil leakage is avoided, as is the need for relubrication.

Low torque

Before the bearings are filled with Molded-Oil a special surface treatment is applied to the internal surfaces. This enables the rolling elements to rotate more smoothly and therefore allows all Molded-Oil bearings to exhibit a consistent low torque level.

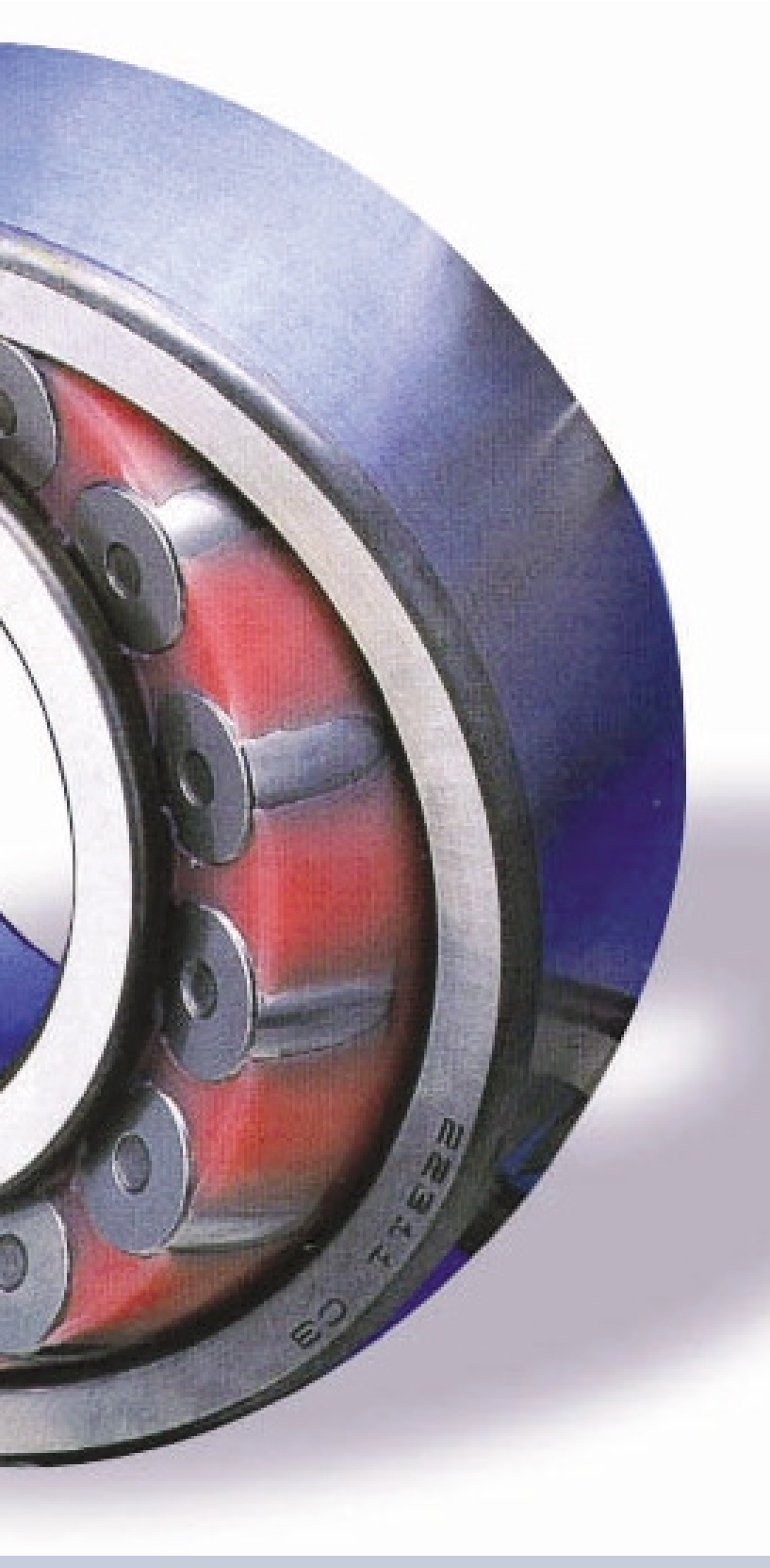
Continuous lubricant supply

This allows the removal of grease pipework or automatic lubricators in most instances, making the bearings ideal for remote locations where lubrication reliability is paramount.

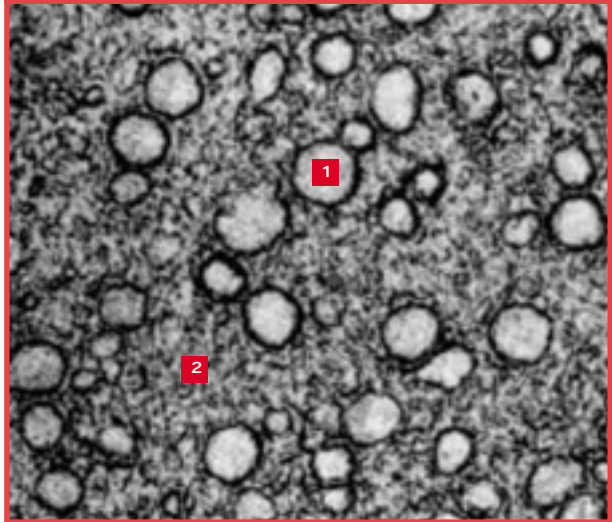
Low overall cost

Guaranteed lubrication without the degradation caused by contamination ensures exceptional reliability and longer service life. Thus the combination of reduced maintenance costs and elimination of other lubrication components provides users with excellent cost performance.





Close up of Molded-Oil

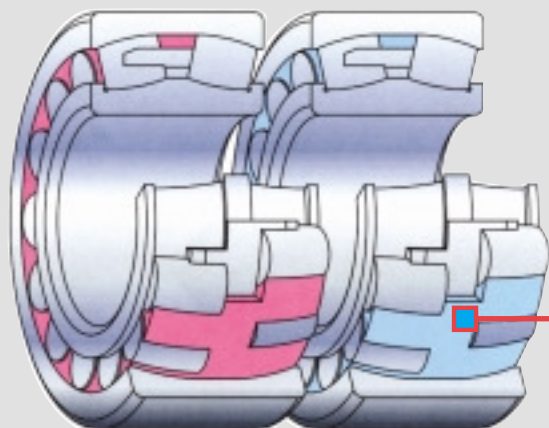


1 **Portion containing mostly polyolefin**
Polyolefin has been used to replace dioxin-generating vinyl chloride, for example in packaging food for supermarkets.

2 **Portion containing mostly lubricating oil**
The lubricating oil is mineral oil-based.

For general use

For high-speed operation



NSK Advanced Technology Sealed spherical roller bearings

To meet the diverse challenges of many demanding applications, NSK offer several versions of sealed spherical roller bearings.

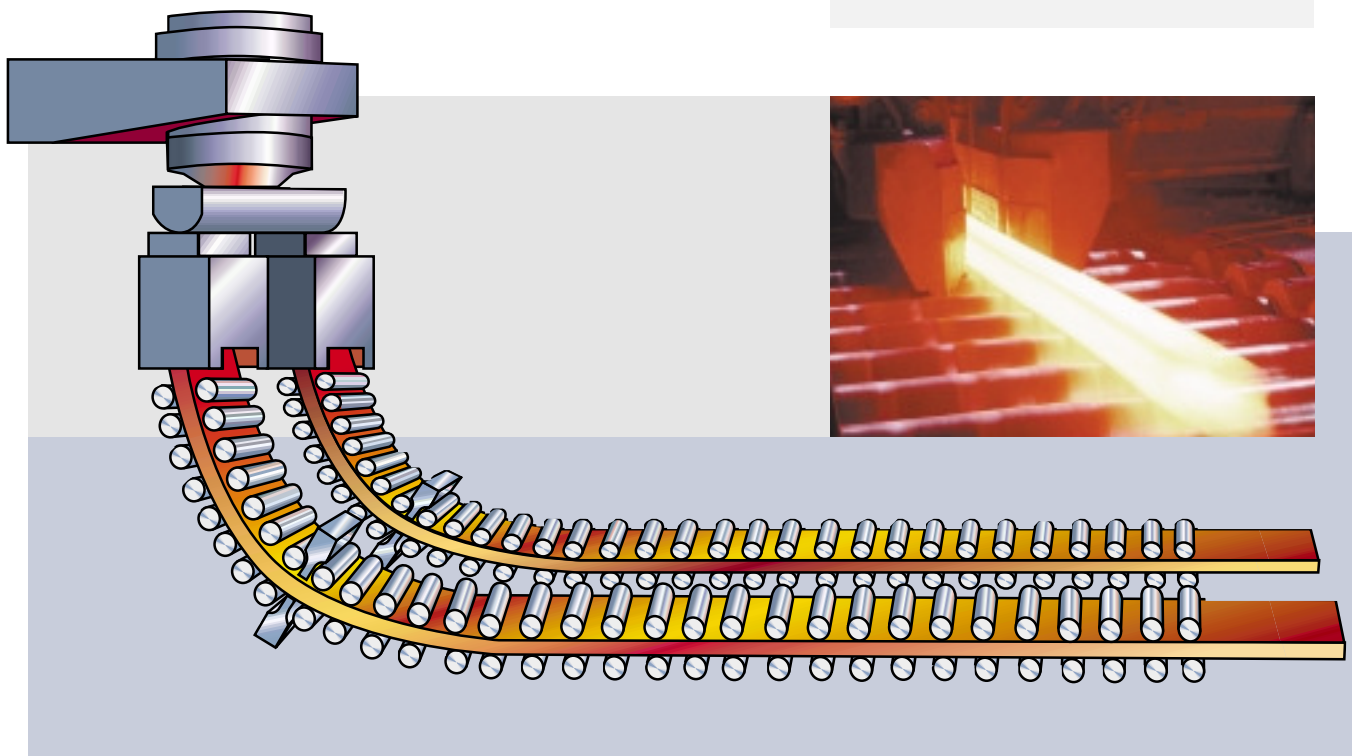
Sealed spherical roller bearings are available in Sealed-Clean or grease replenishing types, with shields or various types of high performance seals. Both types can be supplied with an appropriate long-life bearing grease chosen by our highly experienced engineers.

NSK sealing technology effectively prevents entry of contaminants and different sealing materials are available depending on the operating temperature of the bearing.



Sealed bearings have many benefits for users:

- Significant cost savings
- Increased maintenance intervals
- Great reduction in grease consumption
- Prevention of sudden failures due to blocked grease lines
- Environmentally friendly
- No contamination of surroundings



NSK Advanced Technology **Spherical Roller Bearings manufactured from special materials**



The new bearing steels and heat treatment technologies developed by NSK provide clear benefits for many industrial applications. From the cleanest bearing steels available to novel wear-resistant processing technologies, the combination of advanced materials and the latest generation internal designs provide unbeatable performance.

Super-TF Bearing Steel

Field proven in transmissions and steel rolling mills, this versatile product provides long life with significantly less premature failure rates in any application where contaminated lubricant is a problem.

Patented steel composition and heat treatment process enables service life to be extended up to ten times under contaminated conditions, compared to ordinary bearing steel.

The heat treatment process ensures that STF bearings have a 40% increase in seizure resistance over standard bearing steel.

STF material shows outstanding performance under high temperature conditions, providing less temper softening, greater dimensional stability and around four times the life of standard bearing steels. This reduces downtime, bringing improved productivity and lower costs.

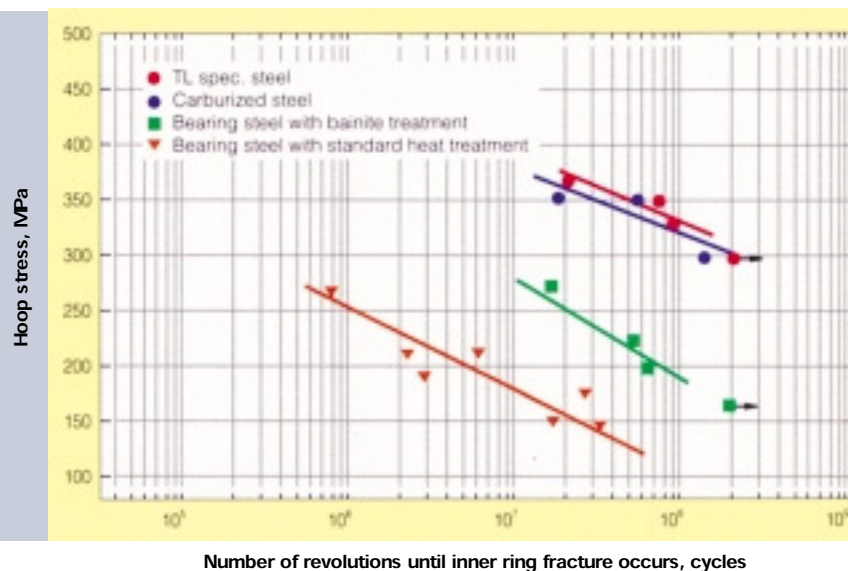
TL Steel

NSK Tough and Long Life (TL) steel was originally developed for Paper Mill dryer cylinders and offers the best cracking resistance of any commonly available material. It is therefore best suited to any application where high inner ring stresses are likely.

TL Steel offers:

- Significantly better fracture resistance than through hardened or Bainite steel
- A fatigue life over three times that of Bainite steel and more than twice that of carburised steel
- A cost effective solution for bearings, since TL steel is usually only applied to bearing inner rings

Results of inner ring fracture test



Spherical Roller Bearings for vibrating equipment

- Engineered to be as tough as the conditions

Vibrating equipment bearings available in both NSK and RHP brand are engineered specifically to withstand the shock loading, misalignment and marginal lubrication conditions typical of vibrating machinery applications. This means extra performance when it is needed in mineral crushing, screening and compacting. Performance enhancements include extra precision on the bore and outside diameter; extremely tight radial clearance tolerance; and superfinished, specially heat-treated rollers with superior shock load capacity.



Improved reliability

The elimination of the cage guide ring means increased space in the bearing and thus greater grease capacity. The precision one piece machined brass cage dampens vibration and affords better roller guidance.

Reduced operating costs

The improved design reduces friction, wear and operating temperatures. This increases reliability and bearing life, and cuts maintenance costs.

Higher operating temperatures

Heat stabilised rings mean these bearings can be used for continuous operation up to 200°C.

Other features

Reduced bore and outside diameter tolerances together with tightly controlled internal clearances to meet demands of vibrating equipment

Increased capacity

The improved internal design allows the inclusion of longer rollers. This gives increased capacity for existing machine design or the option to downsize new designs by using smaller bearings.

These bearings resist seizure, maintain dimensional stability and resist wear in spite of constant vibration, misalignment and shock loads.

Spherical Roller Bearings

Adding value in industry

NSK has built a solid reputation for solving the most challenging industrial problems in ways that exceed customer expectations. Extensive experience, accumulated expertise and strict attention to quality control make NSK a world-class supplier.

The company's experience in diverse, often difficult, applications, plus proven expertise in many sectors, means that however extreme the working environment, NSK can provide the bearing solution.



Keeping the steel industry rolling

NSK keep steel mills running smoothly in spite of the harsh environment and abrasive contaminants.

Molded-Oil™ bearings provide reliable operation on roller tables, eliminating the need for maintenance-intensive centralised lubrication systems and the cost associated with relubrication. A lubricated for life bearing therefore offers substantial reduction in total life costs.

Using sealed spherical roller bearings on continuous casting machines brings life cost reductions by the elimination of premature failures. Also, big savings in consumed grease quantity can be made, along with an associated improvement in environmental protection, cleaner and safer work areas and a reduction in contamination/disposal costs.

The Super-TF bearing technology provides outstanding toughness under harsh conditions. This means a longer, more reliable bearing life in difficult applications such as gearboxes, remote line-shafting and general use in contaminated environments. This means that valuable maintenance resource can be invested elsewhere, instead of replacing premature bearing failures.



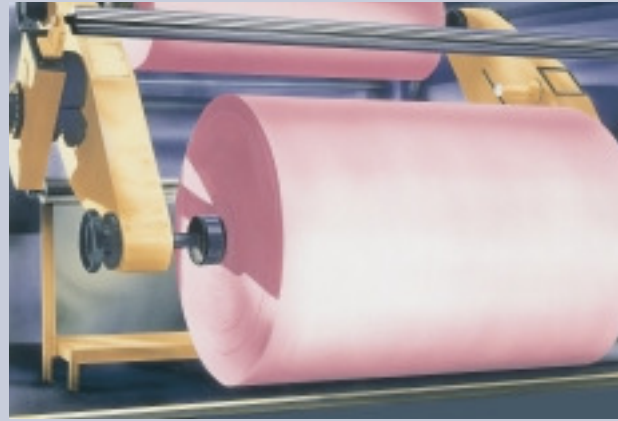


Moving mountains in quarrying

The pressurised, cost-down nature of global business puts every bearing under pressure to perform at higher speeds and under higher loads than ever before. Nowhere is this more evident than in the rigorous environment and duty cycles of quarrying and mining.

The NSK and RHP vibrating screen specification bearings utilise high strength machined brass cages to offer the necessary strength and internal damping that such applications require. Good availability combined with an excellent field reputation enable users to trust the NSK product and service.

Large spherical roller bearings for crushers and mills can be supplied in alternative materials in order to meet specific requirements. Here the experience of specialist NSK engineers can provide appropriate technologies resulting in cost-effective solutions.



Cutting it in the paper industry

NSK offer industry-leading technology for some of the toughest applications found in paper mills.

At the paper machine wet end, the use of NSK spherical roller bearings with Molded-Oil™ lubricant brings improved reliability without using continuously purging bearings with grease to remove the water. The physical barrier formed by the NSK Molded-Oil, combined with the long lubricant life, provides a very cost-effective, reliable bearing solution.

TL steel bearings originally designed for the dryer section help prevent premature failure of the bearing through inner ring fracture. Normally the progression of fatigue spalling can be tracked with condition monitoring, and thus a machine stoppage planned. However with ring fractures the problem is sudden and unpredictable, leading to unplanned downtime with significant lost production. By virtually eliminating this problem, NSK TL steel bearings provide excellent reliability and safety from unforeseen costs.



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