NSK

BEARINGS FOR THE QUARRYING AND MINING INDUSTRIES

Quarrying and Mining Industries

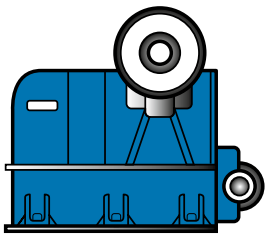
Worldwide, NSK is the acknowledged leader in advanced motion and control technology, rapidly driving major developments in materials, mechanical design, lubrication and sealing to downsize bearings and reduce costs without compromising machine performance.

Leaders in our field, we are not content simply to supply a range of products to meet the needs of today. At NSK we go much further: constantly challenging accepted thinking, exploring new and better methods of design and manufacture and, above all, looking beyond the needs of today to meet customer requirements in the future. Severe environments demand outstanding performance. NSK bearings provide the toughness required above all else. Dust, mud, and tremendous loads – these are the challenging conditions under which quarrying machinery must operate. Unlike typical passenger cars, quarrying and mining machinery must, first and foremost, be tough. Based on proprietary state-of-the-art technology, NSK has exceeded the limits of conventional bearings in terms of long operating life and high limiting speed. NSK continues to deliver the reliability required of mining machinery around the world.

NSK Versatility – Moving Mountains

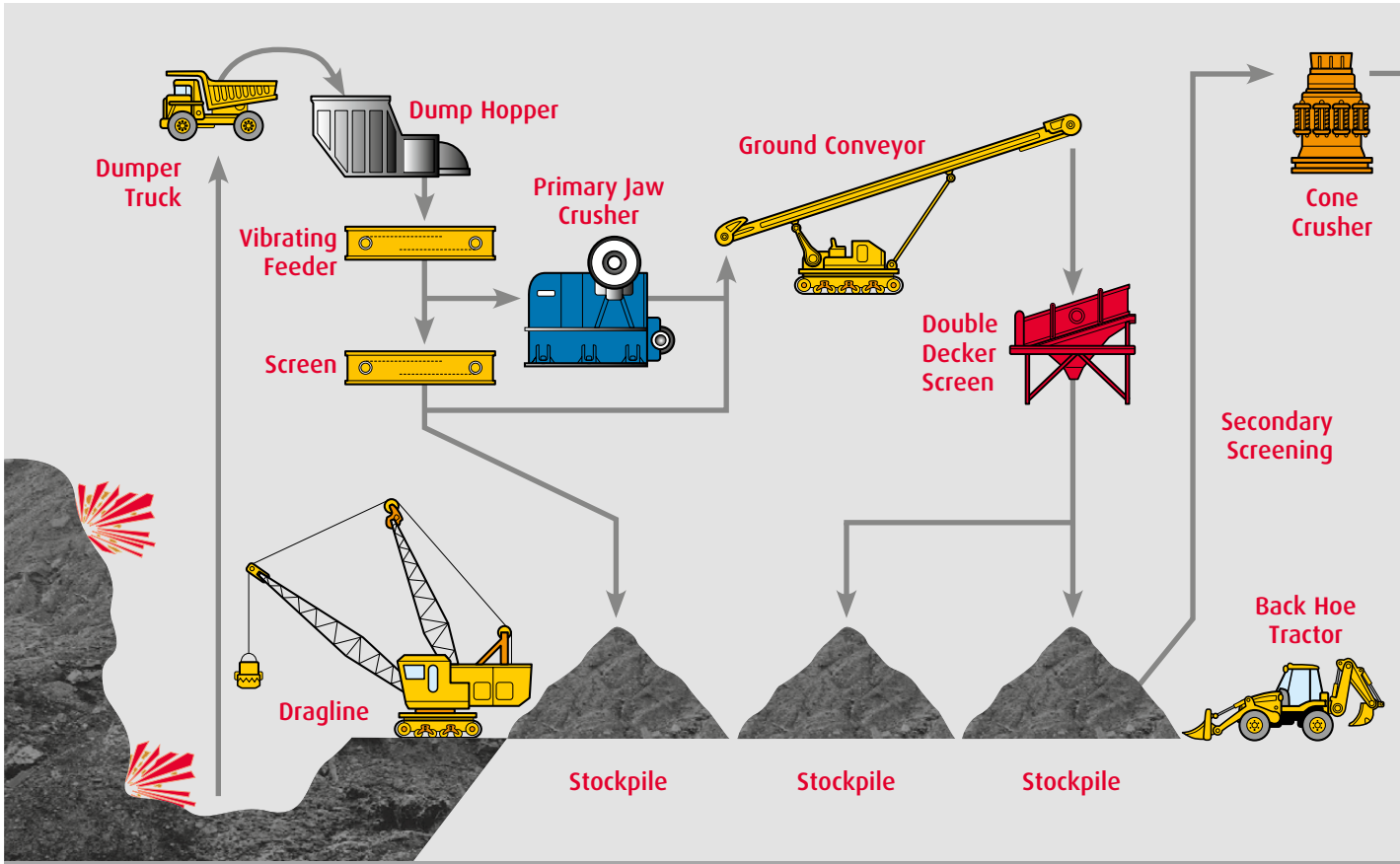
NSK bearings offer Quarry and Mine operators longer service life under the most challenging operating conditions to maximize uptime and reduce maintenance costs for improved productivity at mining sites. Durability and reliability are of paramount importance for mining machinery operating in remote locations such as mountains and deserts, where failure of a single component can impact the entire mining operation. NSK has applied state-of-the-art technology to exceed the life and limiting speed of conventional bearings. Our superior bearings offer high performance with robust design giving longer operating life, thereby reducing maintenance costs for mine operators.

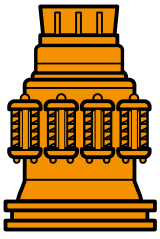
Quarrying and Mining Process



Jaw Crusher

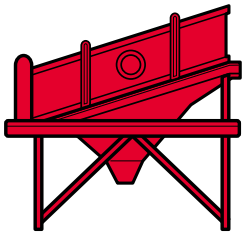
Work material is crushed between two opposing jaw plates. One plate opens and shuts, crushing raw material against the stationary jaw plate.





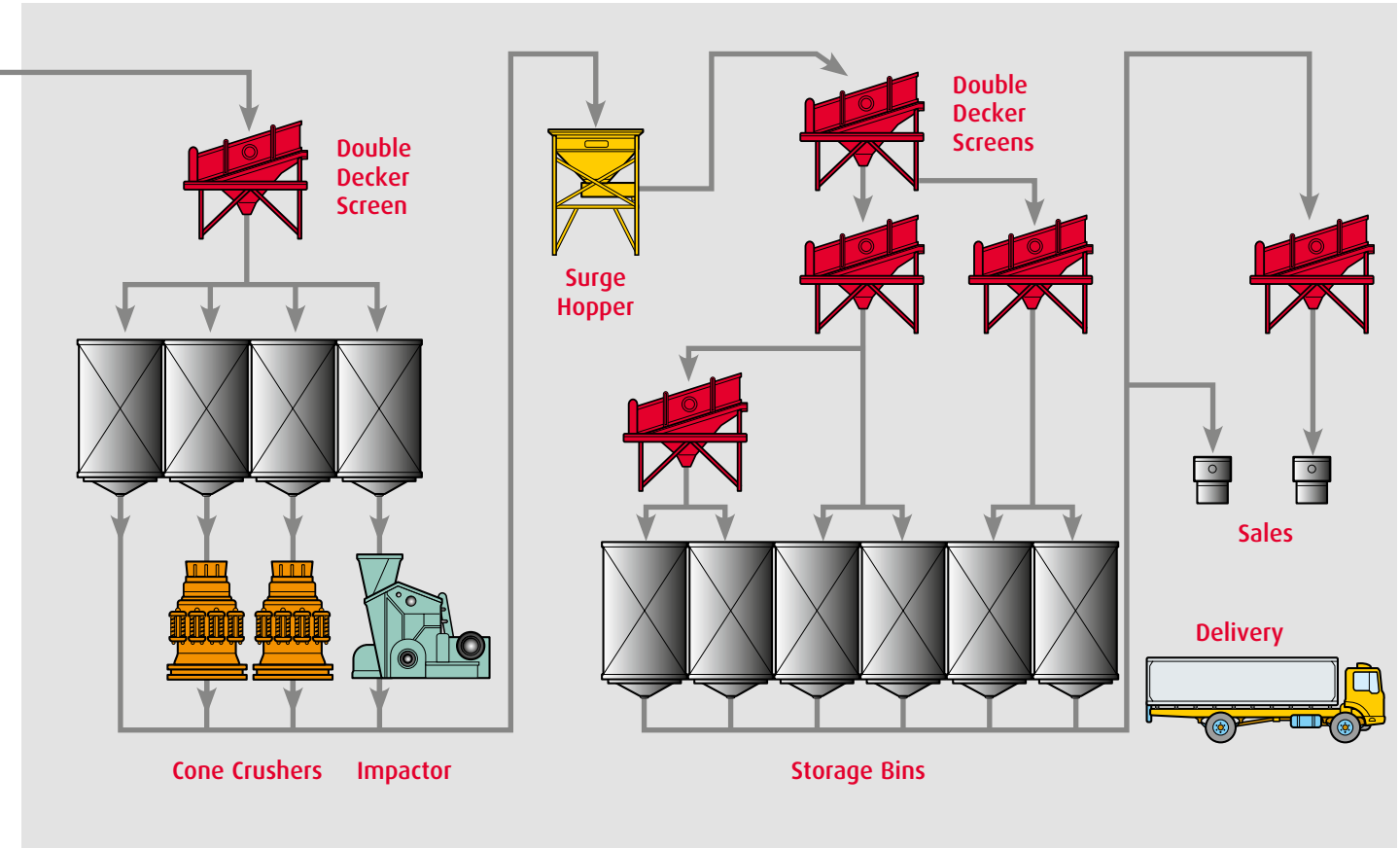
Cone Crusher

Material is fed into the crusher cavity and processed by the eccentric rotating action of the inner cone against the outer cone. Product can be reduced to a diameter ranging from 50mm to 100mm.

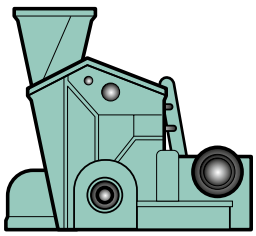


Vibrating Screen

The vibrating screen consists of a case with a shaft and housing installed inside, with springs supporting the case. The swing and rotation of the shaft is produced by the attached unbalanced weight, which generates vibration. This vibration sifts the material set on the screen.



SELECTOR SCREEN & TERTIARY **FINAL SCREENING**



Impact Crusher

As indicated by its name, this machine crushes ore through impact and steadily reduces the size of the crushed particles through sharp, repeated impact with a rapidly spinning hammer, steel plate or bar.

Quarrying and Mining Bearings

Bespoke Bushings

Rigorously designed and fully tested to meet exacting customer specifications, bespoke bushes in hardened bearing steel offer longer service life and superior resistance to wear, seizure and heat.

Crane Sheave Bearings

By virtue of the line contact between rolling elements and raceways, these bearings have high radial load capacity and are suited to high-speed applications. With a patented high strength cage design in pressed steel, machined brass or polyamide, they also can be supplied in a range of advanced special materials.

Cylindrical Roller Bearings

By virtue of the line contact between rolling elements and raceways, these bearings have high radial load capacity and are suited to high-speed applications. With a patented high strength cage design in pressed steel, machined brass or polyamide, they offer low noise and heat generation and, for more arduous applications, can be supplied in a range of advanced special materials.

Molded-Oil™ Bearings

Designed to be maintenance free, NSK Molded-Oil™ bearings provide excellent performance in water and dust contaminated environments. Oil is released from the internal Molded-Oil system on demand and there is no need for relubrication.

Mounted Units

NSK Bearing Units consist of a sealed single-row ball bearing with spherical outside diameter and extended inner ring mounted in a pillow block or flanged housing. The spherical fit accommodates initial misalignment. The NSK Bearing Units also feature 'flingers' that keep contaminants away from the bearing and improve the sealing performance. Housings are available in ductile cast iron, cast steel or stainless steel with a variety of shaft locking mechanisms.

Mounted Units – Self-Lube

RHP Self-Lube® units come in pillow block and flange mounted configurations with one-piece cast iron and triple lip seal available for very arduous applications.

Spherical Roller Bearings CAM-VS

Specifically engineered to withstand the harsh vibrating applications and tough working environments of the mining & quarrying industry. These bearings feature a one-piece machined brass cage and can accommodate varying degrees of misalignment. CAM-VS are specially designed to resist seizure and wear vibration, misalignment and shock load conditions.

Spherical Roller Bearings EVB

Heat stabilized for operating conditions up to 200°C, EVB bearings have a one-piece machined brass cage with special ring tolerances as part of their extra capacity design.

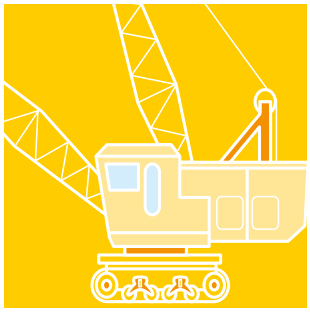
Taper Roller Bearings Single Row

Capable of taking high radial loads and axial loads in one direction, they are also available in two and four row versions to support axial loads in either direction.

Plummer Blocks

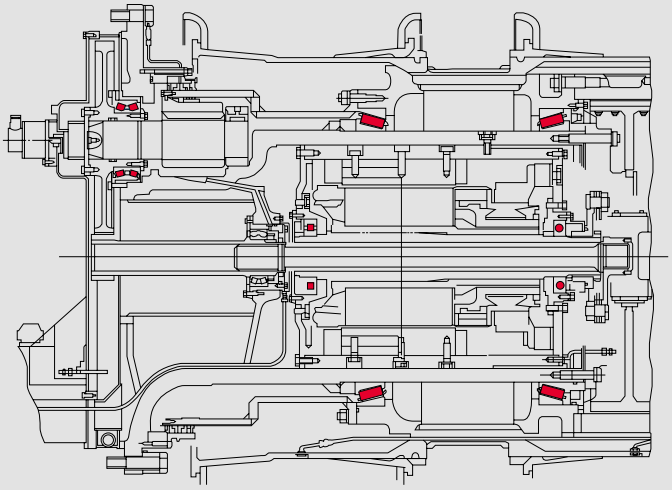
To ensure effective sealing, plummer blocks are available with a variety of special seal options and end covers. The benefits include a facility for easy mounting and dismounting of pre-assembled shafts.

Move



Bearing Selection:
Ball Bearings
Cylindrical Roller Bearings
Tapered Roller Bearings

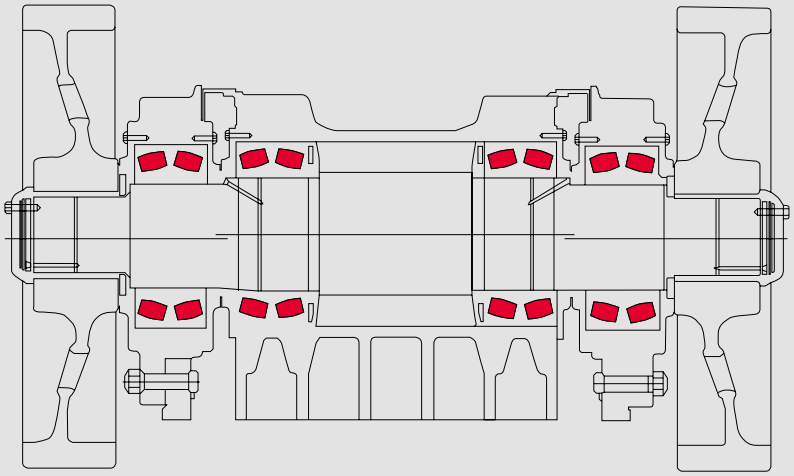
Transmission Shaft



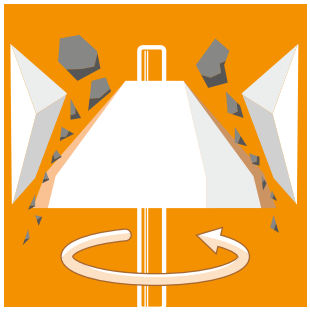
Crush

Bearing Selection:
Spherical Roller Bearings

Jaw Crusher

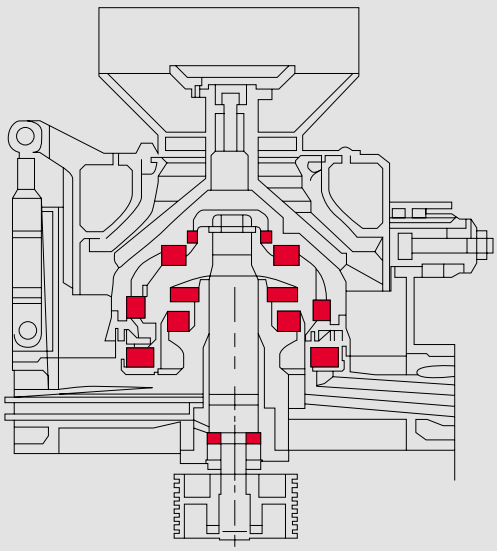


Grind



Bearing Selection:
Cylindrical Roller Bearings
Tapered Roller Bearings
Also available:
High strength cages
Shock resistant raceway materials

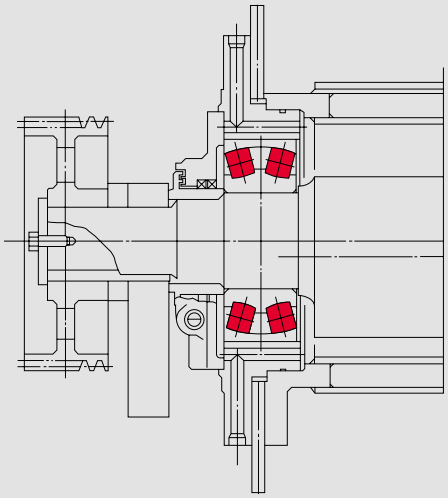
Cone Crusher



Screen

Bearing Selection:
Spherical Roller Bearings (machined brass cage)

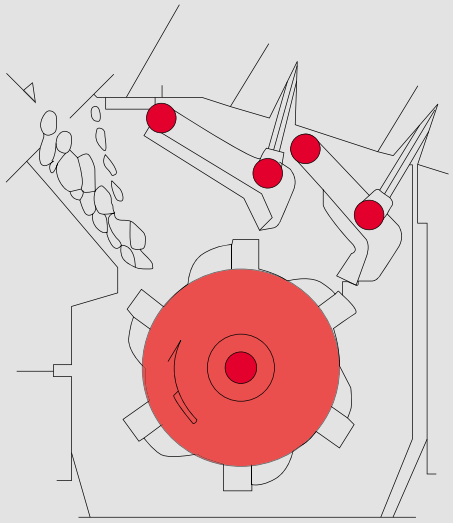
Vibrating Screen



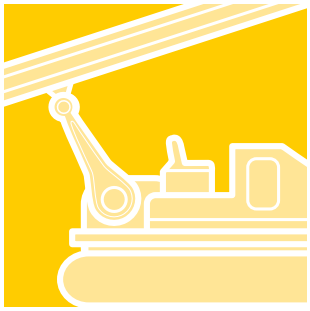
Impact

Bearing Selection:
Spherical Roller Bearings (machined brass cage)
Also available:
Shock resistant raceway materials

Impact Crusher

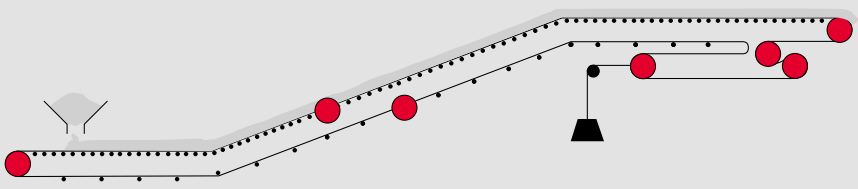


Move



Bearing Selection:
Spherical Roller Bearings (HPS)

Conveyor



Mobile Plant Bearings

HPS™ Spherical Roller Bearings

HPS series bearings are double-row self-aligning spherical roller bearings capable of carrying heavy radial loads with moderate axial loads in either direction. The spherical profile of the rollers, the inner ring raceway and the outer ring raceway, enable a self-aligning function that allows full capacity loading. The HPS series offers standard-size (steel-cage) and large size (brass cage) bearings with longer operating life and higher limiting speeds than conventional bearings.

EM/EW Series

EM and EW bearings are cylindrical roller bearings capable of carrying particularly large radial loads and are suitable for high speed applications. The EW series features a pressed steel cage and the EM series features a one-piece machined brass cage. Both cages offer high-load capacity for standard-size bearings, in addition to excellent functionality and longer operating life.

HR Series Tapered Roller Bearings

HR series bearings are tapered roller bearings capable of taking combined heavy radial loads and axial loads in one direction. The HR series features tapered rollers guided by the large rib face of the inner ring, which allows for a greater number of larger rollers for superior high-load ratings.

Hi-TF Bearings

Hi-TF bearings were developed with innovative materials and heat treatment technology for increased durability under harsh conditions. They combine long service life with good resistance to wear and seizure even under contaminated lubrication to achieve outstanding cost performance.

TM Series Sealed Deep Groove Ball Bearings

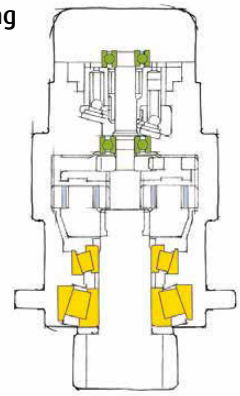
TM series bearings are deep groove ball bearings capable of carrying radial and axial loads in either direction. The low frictional torque of these bearings enables use in high-speed applications and feature low noise and reduced vibrations. The TM series features a special sealed lip structure that allows the flow of lubricant while preventing the entry of foreign matter in an oil bath situation.

Needle Roller Bearings

Needle roller bearings incorporate rollers that are three to ten times longer than their diameter and exhibit a relatively large radial load capability. The M-type cage and roller assemblies for construction machinery applications contain controlled contour rollers to deliver high durability even under heavy loads or misaligning operating conditions. The resin cage and roller assemblies afford a higher load capacity than conventional machined cages by securing cage strength at higher oil temperatures using a resin cage made of nylon 46.

Mobile Plant Bearings

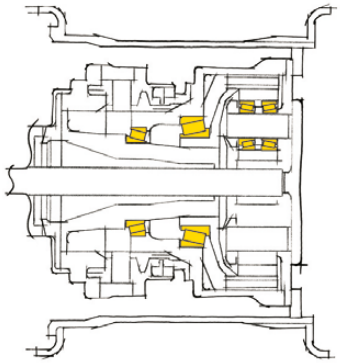
Rotating Motor



Bearings typically used:

- Tapered Roller Bearings
- Deep Groove Ball Bearings
- Needle Roller Bearings

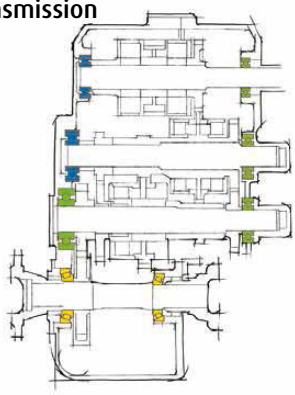
Front Axle



Bearings typically used:

- Tapered Roller Bearings

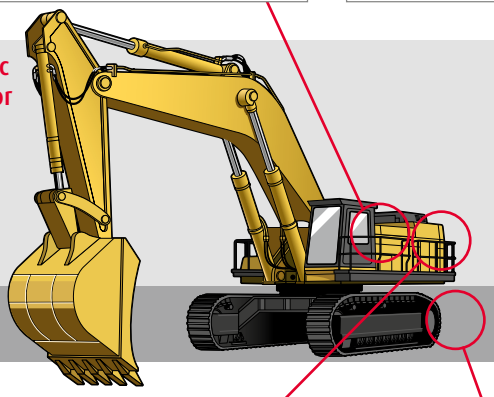
Transmission



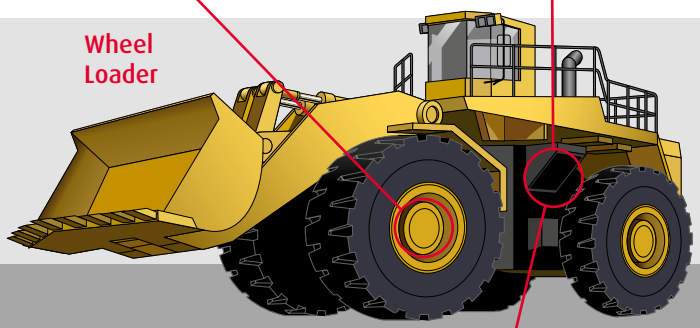
Bearings typically used:

- Cylindrical Roller Bearings
- Tapered Roller Bearings
- Deep Groove Ball Bearings

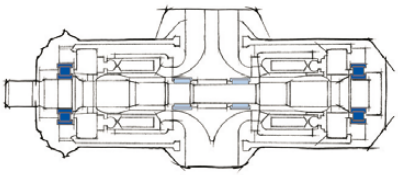
Hydraulic Excavator



Wheel Loader



Hydraulic Pump



Bearings typically used:

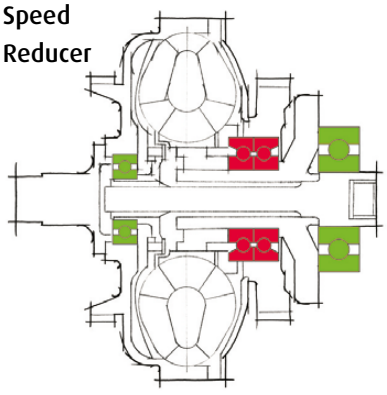
- Cylindrical Roller Bearings
- Needle Roller Bearings

Speed Reducer

Bearings typically used:

- Cylindrical Roller Bearings
- Needle Roller Bearings
- Angular Contact Ball Bearings

Speed Reducer



Bearings typically used:

- Deep Groove Ball Bearings
- Angular Contact Ball Bearings

Bearings typically used:

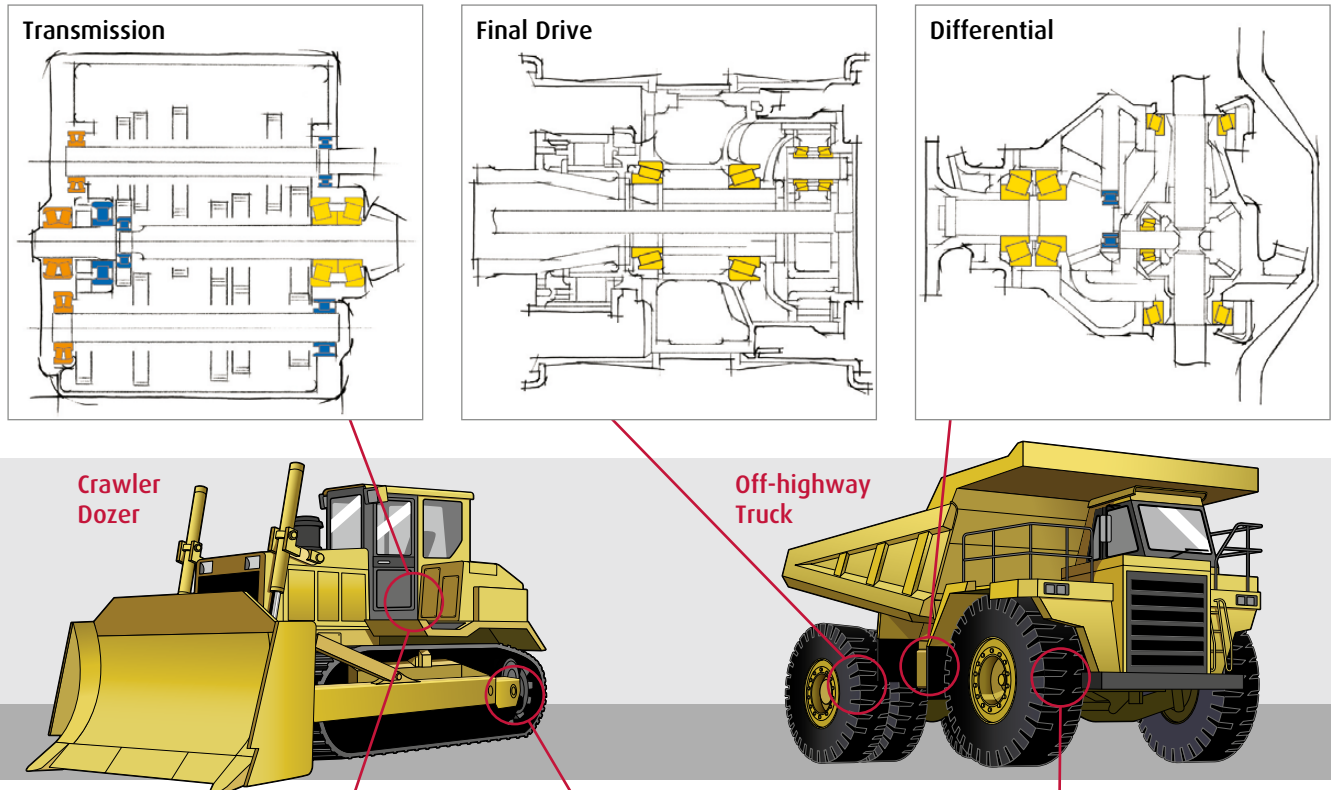
- Cylindrical Roller Bearings
- Tapered Roller Bearings
- Spherical Roller Bearings

Bearings typically used:

- Tapered Roller Bearings

Bearings typically used:

- Cylindrical Roller Bearings
- Tapered Roller Bearings



Bearings typically used:

- Cylindrical Roller Bearings
- Deep Groove Ball Bearings
- Angular Contact Ball Bearings

Bearings typically used:

- Tapered Roller Bearings

Bearings typically used:

- Tapered Roller Bearings

Increasing efficiency – with AIP, the value-added program from NSK

Incorrectly applied or selected bearings can lead to anything from a reduction in machine performance to failure of an entire system. We support you in solving these technical problems. The value-added program AIP incorporates a comprehensive service package which enables you to design both productive operation and maintenance processes with increased efficiently and consequently better profitability. With AIP, you reduce your costs at every value-added stage.

Concentrated knowledge, many years of experience

Thanks to their in-depth technical knowledge and industry know-how, the experienced NSK application engineers are able to identify profitability potential and recommend appropriate measures. Our experts work according to a procedure which has been tested in practice and standardized – the value cycle. The ideally coordinated solution for your application is developed in close cooperation with them.

AIP services made to measure

The comprehensive range of AIP services is purposely designed to enhance efficiency and competitiveness. Your NSK expert will advise you about which measures can be derived from the examination results and will support you in implementing them.

AIP NSK Solutions

Example success stories show how profitability and reliability can be increased using tried and tested practices.

- Stores Survey
- Workshop Survey
- Process Map
- Bearing Cross Referencing

- Application Reviews
- Machine Design Support
- OEM Part Conversion
- Diagnostics

- Product Training
- Application of NSK Bearings
- AIP Training
- Industry Specific Training

- Bearing Condition Analysis
- Failed Bearing Analysis
- Lubrication Analysis
- Material & Dimensional Analysis

Discover how you can increase your profitability with the help of our value-added AIP programme and our high-quality products.

Bearing Maintenance and Inspection

Maintenance

Bearings and operating conditions must be periodically inspected and maintained to maximise bearing life to prevent mechanical failure, ensure reliable operation, raise productivity, and enhance cost performance. Maintenance should be performed regularly according to work standards that may vary according to machine operating conditions. Operating conditions should be monitored, lubricant replenished or changed, and the machine periodically disassembled and overhauled.

1. Inspection under operating conditions

Review lubricant properties, check operating temperatures, and inspect for any vibrations and bearing noise to determine bearing replacement periods and replenishment intervals of the lubricant.

2. Inspection of the bearing

Be sure to thoroughly examine the bearings during periodic machine inspections and part replacement. Check the raceway for any damage and confirm if the bearing can be re-used or should be replaced.

Inspection points

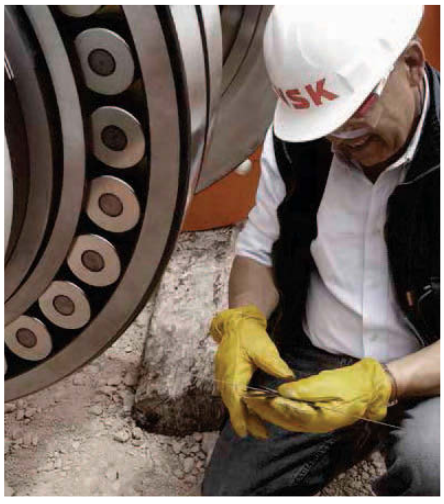
Items to be checked while the machine is running should include bearing noise, vibrations, temperature, and lubricant condition.

1. **Bearing noise**

Sound detection instruments can be used during operation to ascertain the volume and characteristics of bearing rotation noise through sound patterns that are readily distinguishable, which can reveal the presence of bearing damage such as slight flaking. Three typical noise conditions are described in the table on next page.

2. **Bearing vibration**

Bearing irregularities can be analyzed by performing a quantitative analysis of vibration amplitude and frequency using a frequency spectrum analyzer. Measured data varies depending on the operating conditions of the bearing and the location of the vibration pick-up. Therefore, this method requires the determination of evaluation standards for each measured machine.



Irregularities		Possible Causes	Countermeasures
Noise	Loud Metallic Sound	Abnormal Loud	Correction of fit, internal clearance, preload, position of housing shoulder, etc.
		Incorrect mounting	Correction of alignment of shaft and housing, accuracy of mounting method.
		Insufficient or improper lubricant	Replenish lubricant or select proper lubricant.
		Squeaking noise	Replacement by low-noise bearings, selection of small clearance bearings.
		Sliding of balls	Adjustment of preload, selection of small clearance bearings, or adoption of softer grease.
		Contact of rotating parts	Correction of labyrinth seal, etc.
	Loud Regular Sound	Flaws, corrosion, or scratches on the raceways	Replacement of bearing, cleaning, improvement of sals, and usage of clean lubricant.
		Brinelling	Replacement of bearing and careful handling.
		Flaking on the raceways	Replacement of bearing.
	Irregular Sound	Excessive clearance	Correction of fit and clearance and correction of preload
		Penetration by foreign particles	Replacement of bearing, cleaning, improvement of seals, and relubrication using clean lubricant.
		Flaws or flaking on the ball surfaces	Replacement of bearing.
		Excessive amount of lubricant	Reduce amount of lubricant, select stiffer grease.
Abnormal Temperature Rise		Insufficient or improper lubricant	Replenish lubricant or select proper lubricant.
		Abnormal load	Correction of fit, internal clearance, preload, position of housing shoulder.
		Incorrect mounting	Correction of alignment of shaft and housing, accuracy of mounting, or mounting method.
		Creep of fitted surfaces, excessive seal friction	Correction of seals, replacement of bearing, correction of fit or mounting.
Vibration		Brinelling	Replacement of bearings and careful handling.
		Flaking	Replacement of bearing.
		Incorrect mounting	Correction of squareness between shaft and housing shoulder or side of spacer.
		Penetration by foreign particles	Replacement of bearing, cleaning, correction of seals.
Leakage or Discoloration of Lubricant		Too much lubrication. Penetration by foreign particles or abrasion chips	Reduce amount of lubricant, select stiffer grease. Replace bearing or lubricant. Clean housing and adjacent parts.

NSK AMERICAS

Argentina
NSK Argentina SRL
Buenos Aires
54.11.4762.6556

Brazil
NSK Brasil Ltda.
Sao Paulo SP
55.11.3269.4700

Canada
NSK Canada Inc.
Mississauga ON
1.877.994.6675

Latin America
NSK Latin America Inc.
Miami FL
1.305.477.0605

Mexico
NSK Rodamientos Mexicana, S.A. de C.V.
Tlainepantla de Baz MX
52.55.3682.2900

United States
NSK Corporation
Ann Arbor MI
1.888.446.5675

Website: www.nskamericas.com
NSK Global: www.nsk.com