

BEARINGS FOR THE QUARRYING
AND MINING INDUSTRIES



As one of the world's leading manufacturers of rolling bearings, linear technology components and steering systems, we can be found on almost every continent – with production facilities, sales offices and technology centres - because our customers appreciate short decision-making channels, prompt deliveries and local service.



The NSK company

NSK commenced operations as the first Japanese manufacturer of rolling bearings back in 1916. Ever since, we have been continuously expanding and improving not only our product portfolio but also our range of services for various industrial sectors. In this context, we develop technologies in the fields of rolling bearings, linear systems, components for the automotive industry and mechatronic systems. Our research and production facilities in Europe, Americas and Asia are linked together in a global technology

network. Here we concentrate not only on the development of new technologies, but also on the continuous optimisation of quality – at every process stage.

Among other things, our research activities include product design, simulation applications using a variety of analytical systems and the development of different steels and lubricants for rolling bearings.

Partnership based on trust – and trust based on quality

Total Quality by NSK: The synergies of our global network of NSK Technology Centres. Just one example of how we meet our requirements for high quality.

NSK is one of the leading companies with a long tradition in patent applications for machine parts. In our worldwide research centres, we not only concentrate on the development of new technologies, but also on the continual

improvement of quality based on the integrated technology platform of tribology, material technology, analysis and mechatronics.

More about NSK at www.nskeurope.com or call us on + 441636 605123



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.

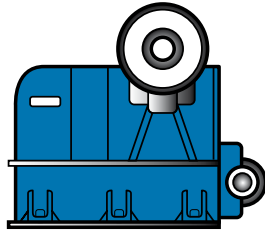
Leaders in our field, we are not content simply to supply a range of products to meet the needs of today. At NSK we go much further: constantly challenging accepted thinking, exploring new and better methods of design and manufacture and, above all, looking beyond the needs of today to meet customer 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 maximise 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.

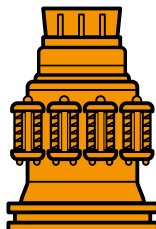
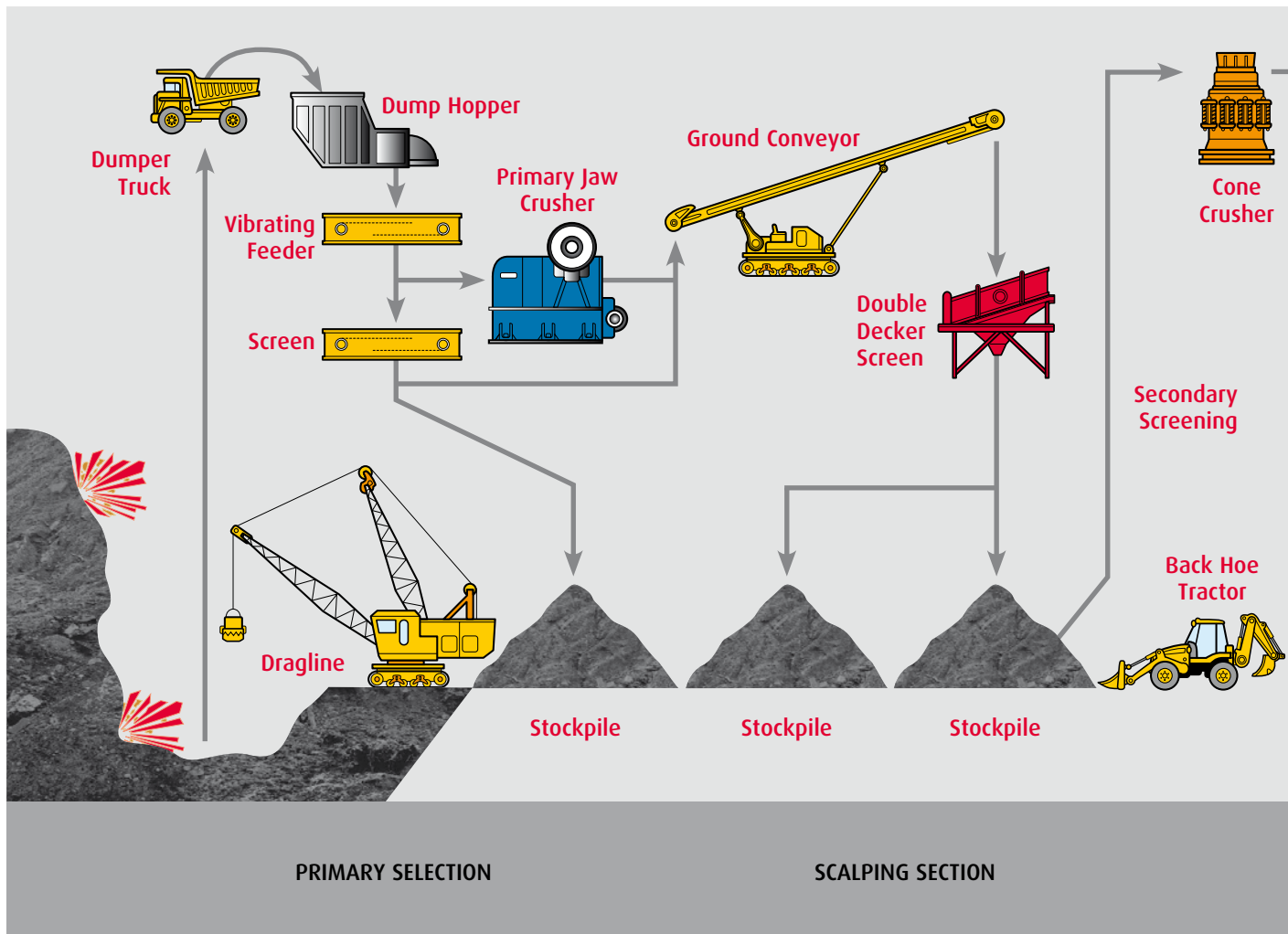


Quarrying and Mining Process



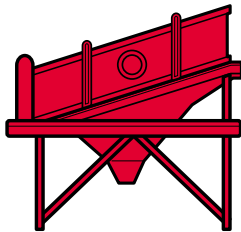
Jaw Crusher

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



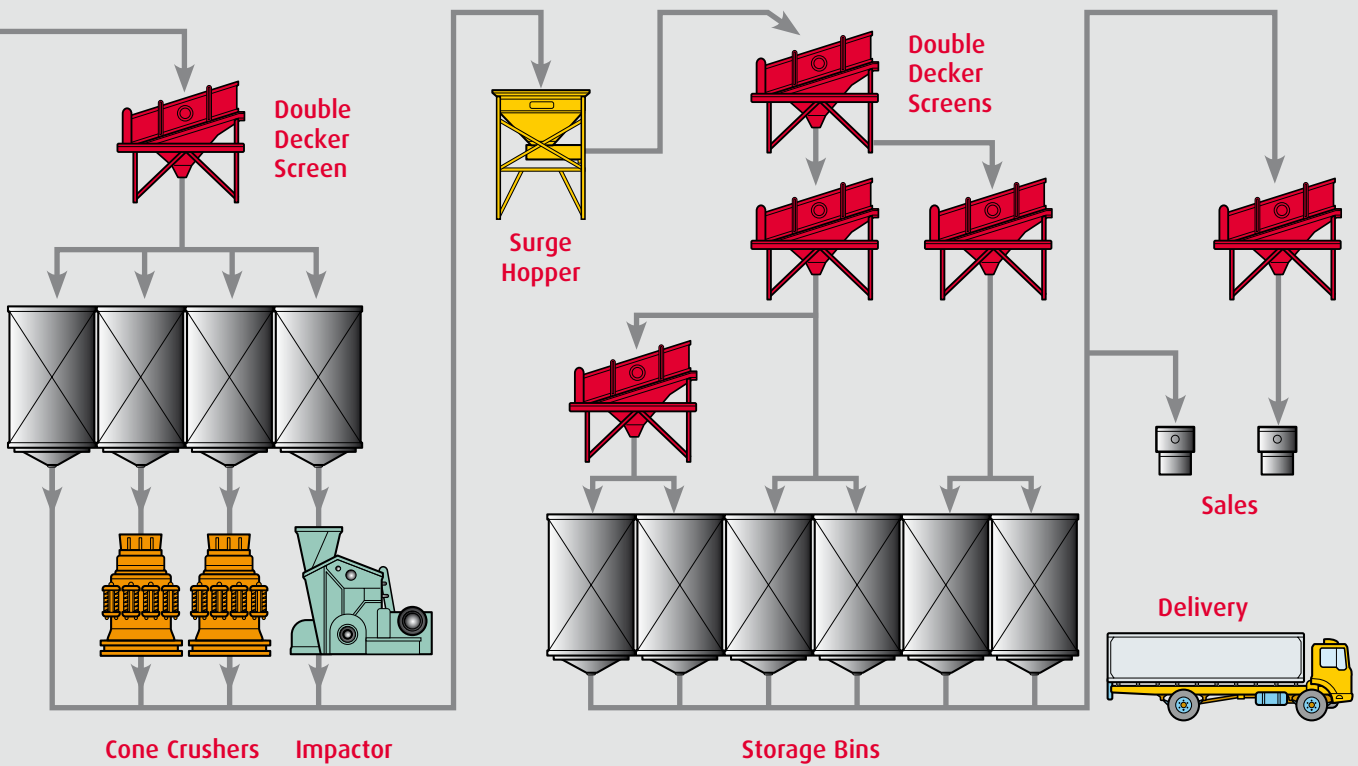
Cone Crusher

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.



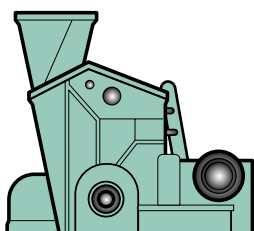
Vibrating Screen

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 stick.

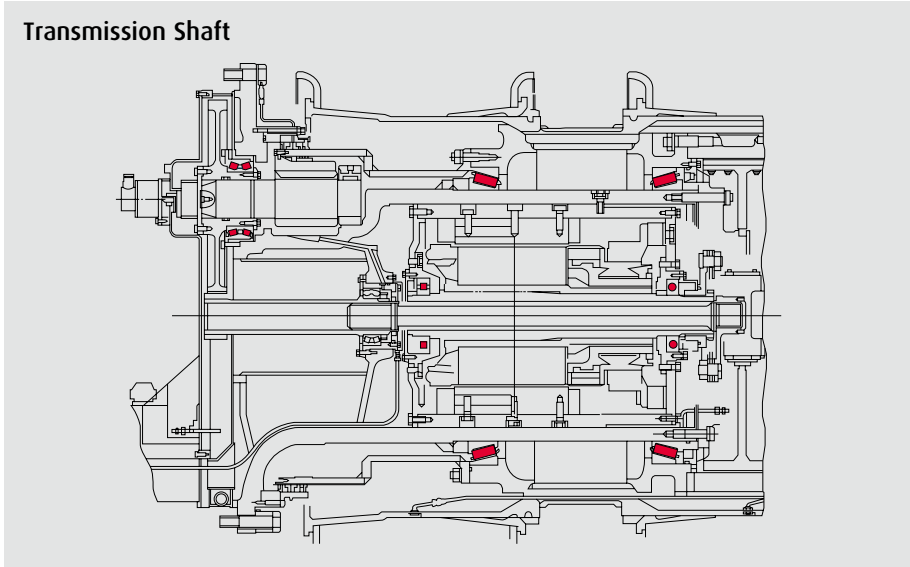
Move



Bearing Selection:

- Ball Bearings
- Cylindrical Roller Bearings
- Tapered Roller Bearings

Transmission Shaft



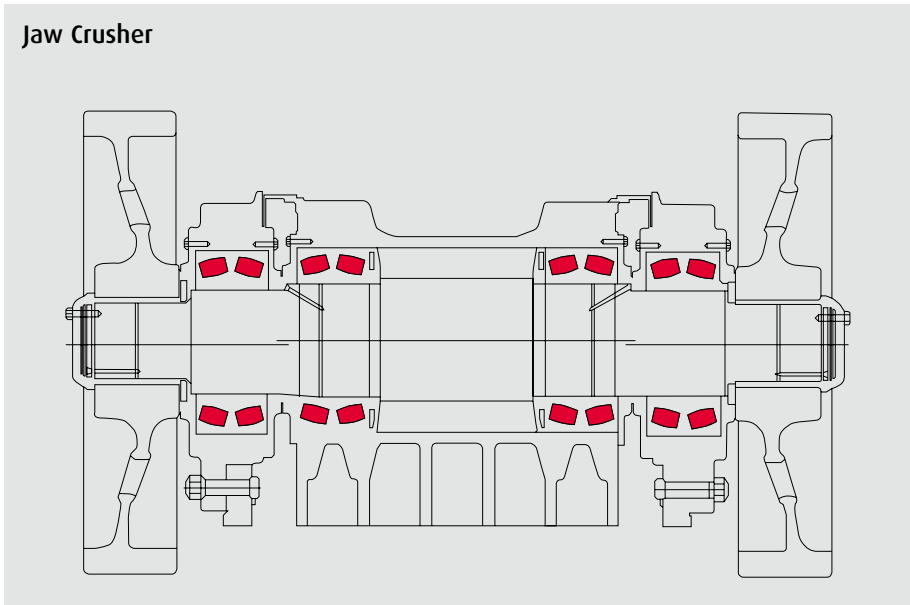
Crush



Bearing Selection:

- Spherical Roller Bearings

Jaw Crusher



Grind



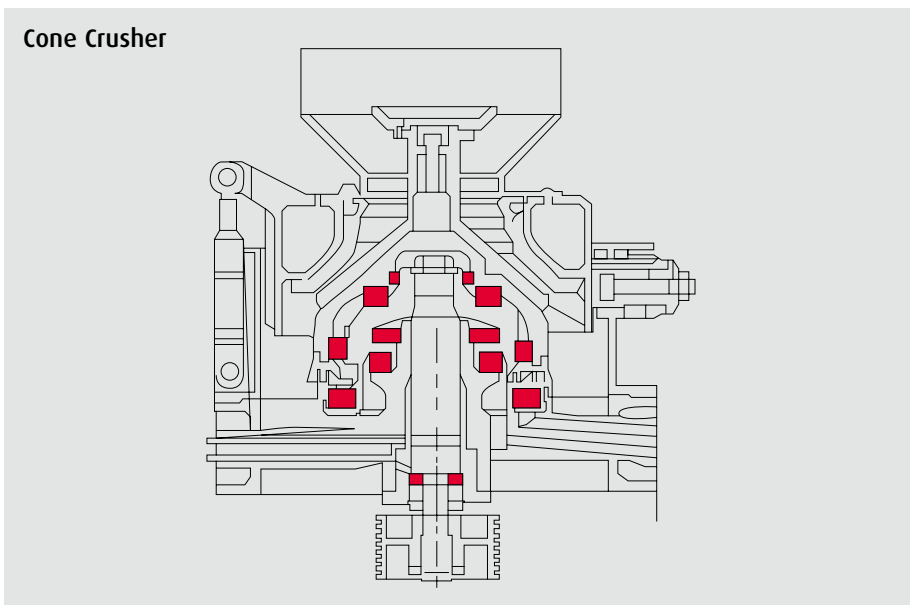
Bearing Selection:

- Cylindrical Roller Bearings
- Tapered Roller Bearings

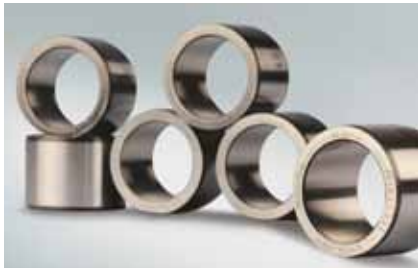
Also available:

- High strength cages
- Shock resistant raceway materials

Cone Crusher



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.



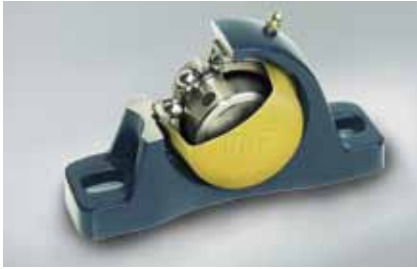
Molded-Oil™ Bearings

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 CA/CAM-VS

Specifically engineered to withstand the harsh vibrating applications and tough working environments of the mining & quarrying industry. CA 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 stabilised 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

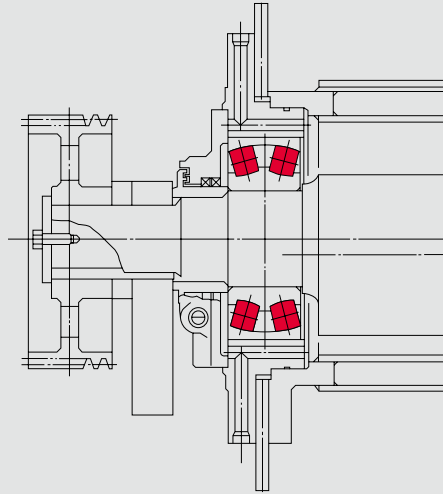
To ensure effective sealing, plummer blocks are available with a variety of special seal options and end covers. The benefits include a facility for easy mounting and dismounting of pre-assembled shafts.

Screen



Bearing Selection:
Spherical Roller Bearings
(machined brass cage)

Vibrating Screen

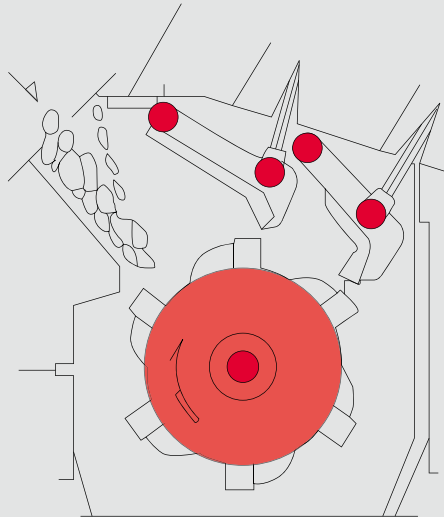


Impact

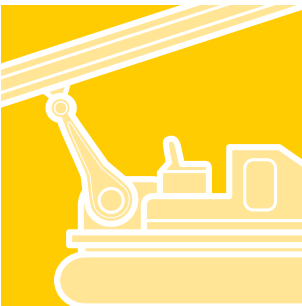


Bearing Selection:
Spherical Roller Bearings (machined
brass cage)
Also available:
Shock resistant raceway materials

Impact Crusher

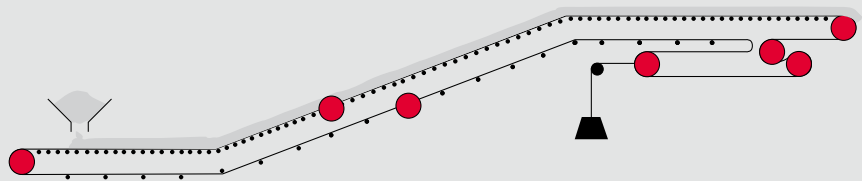


Move



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.



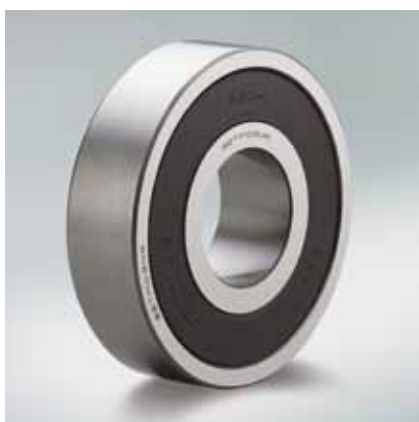
- **HR Series Tapered Roller Bearings**

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.



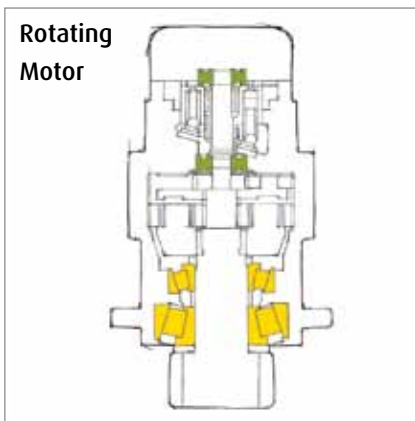
● **Needle Roller Bearings**

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

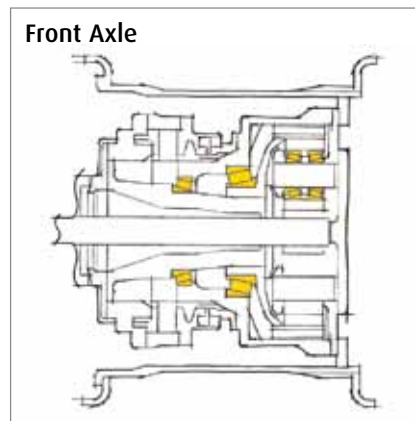
Bearings typically used:

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



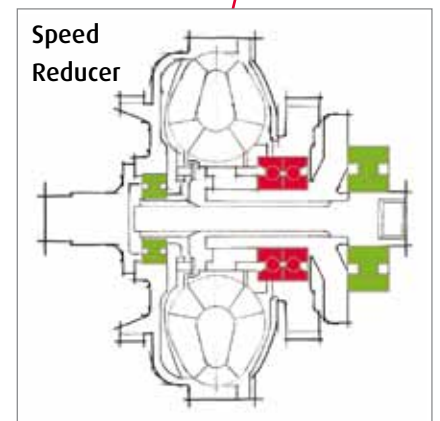
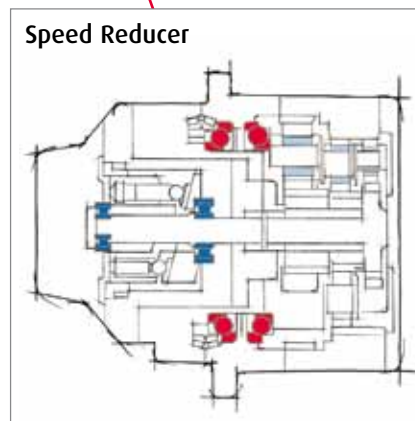
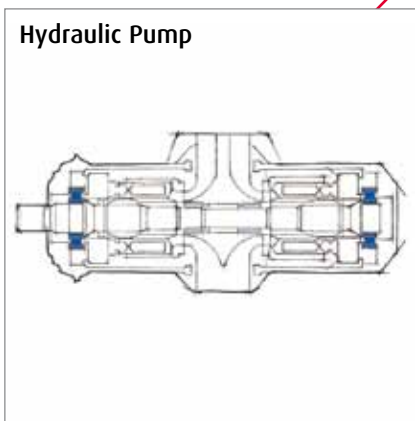
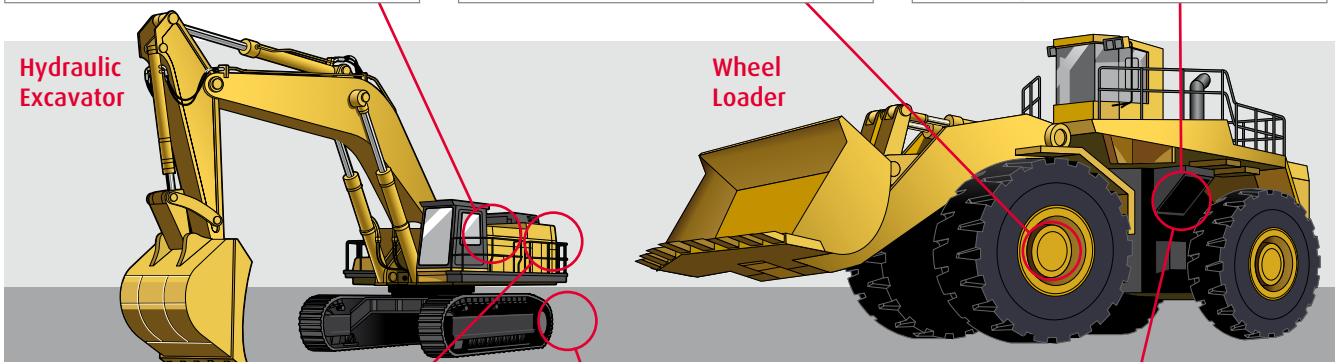
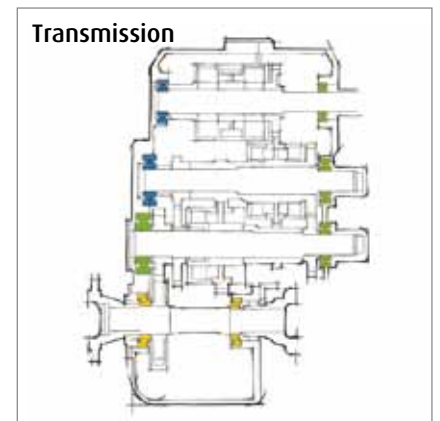
Bearings typically used:

- Tapered Roller Bearings



Bearings typically used:

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



Bearings typically used:

- Cylindrical Roller Bearings
- Needle Roller Bearings

Bearings typically used:

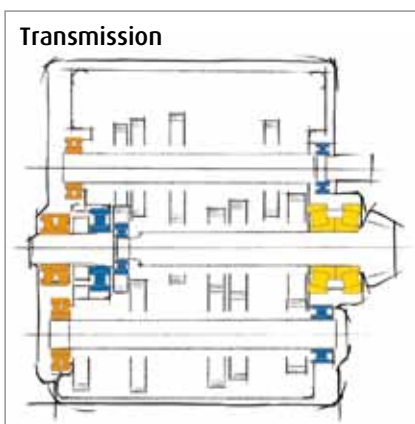
- Cylindrical Roller Bearings
- Needle Roller Bearings
- Angular Contact Ball Bearings

Bearings typically used:

- Deep Groove Ball Bearings
- Angular Contact Ball Bearings

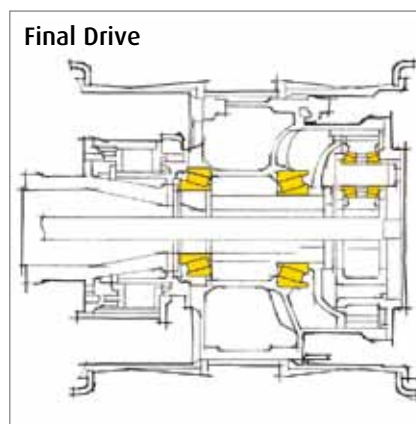
Bearings typically used:

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



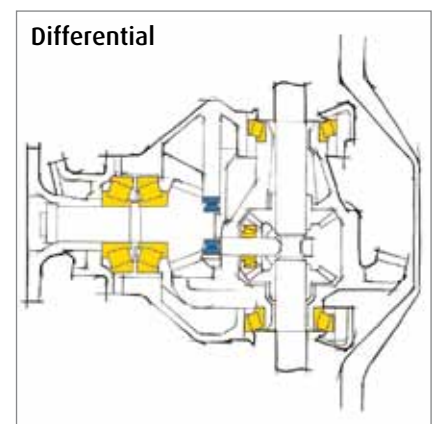
Bearings typically used:

- Tapered Roller Bearings

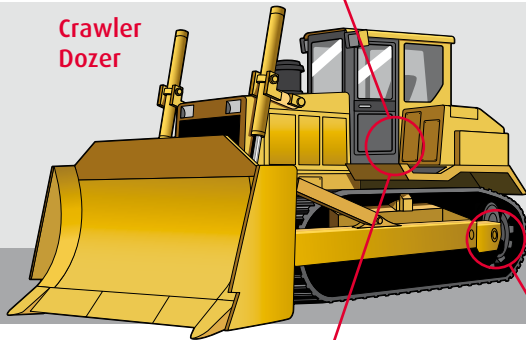


Bearings typically used:

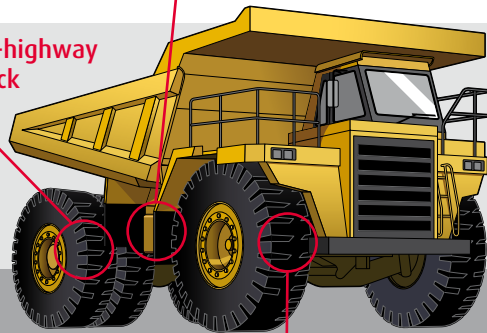
- Cylindrical Roller Bearings
- Tapered Roller Bearings



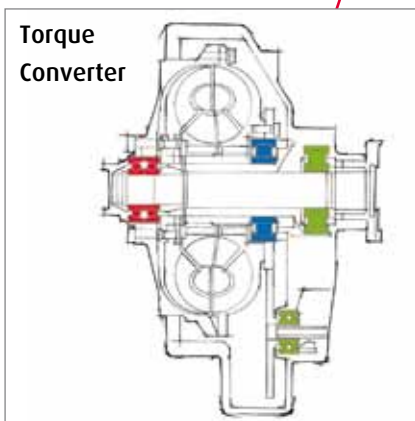
Crawler Dozer



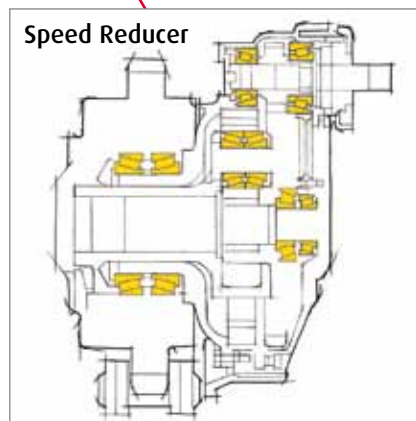
Off-highway Truck



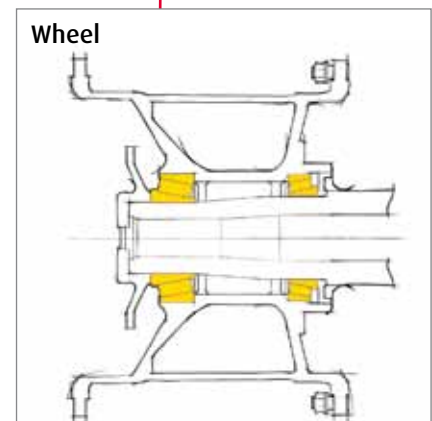
Torque Converter



Speed Reducer



Wheel



Bearings typically used:

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

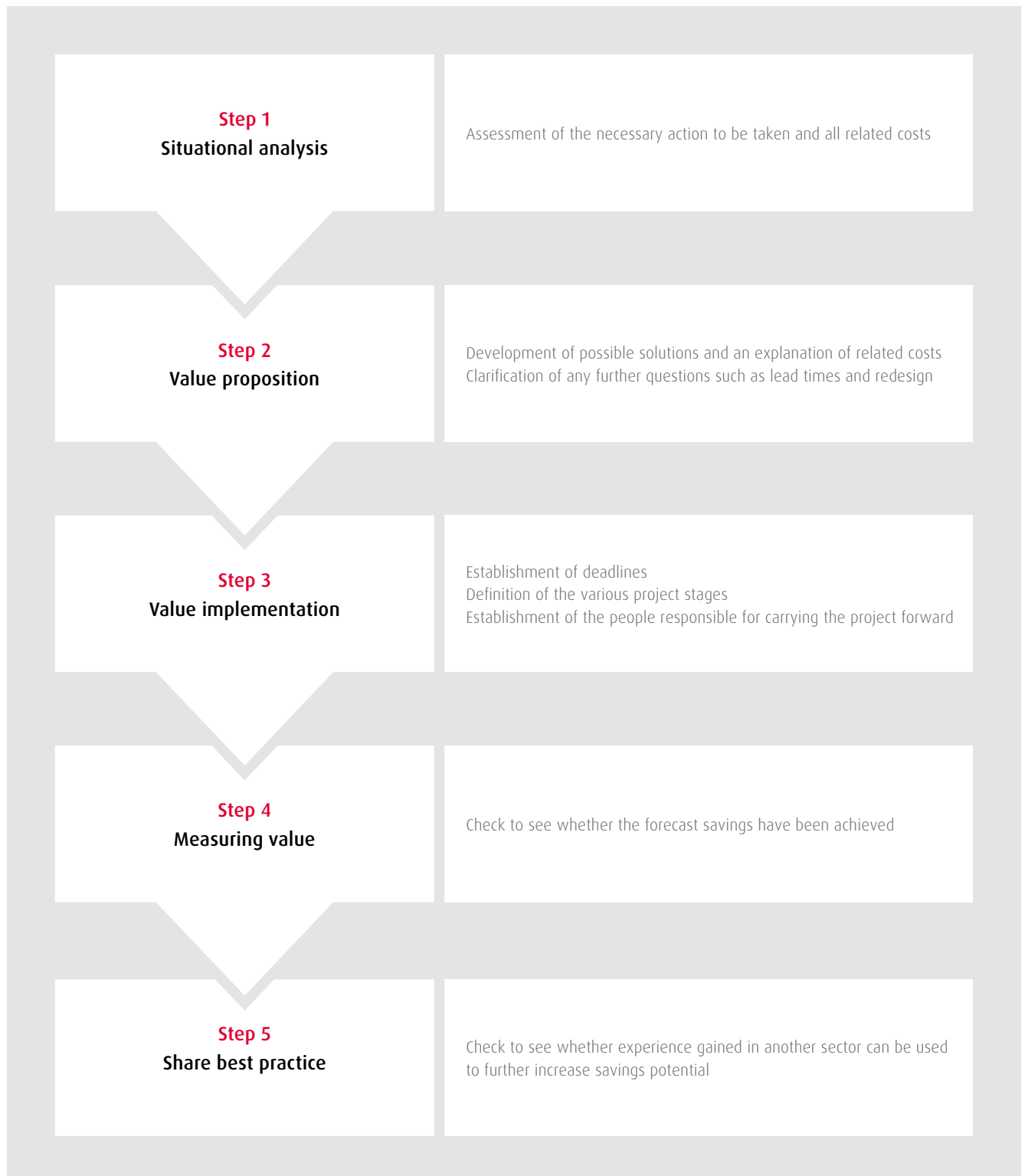
Bearings typically used:

- Tapered Roller Bearings

Bearings typically used:

- Tapered Roller Bearings

Getting to the heart of service: the AIP Value Cycle





To be the manufacturer and distributor of good products is not enough nowadays; we believe that being an active partner with a broad spectrum of services to support our clients is more important. Our highly experienced staff are on the ground and ready to work with you directly to find individual solutions for smooth, efficient and profitable production processes in your company.

Increased profitability thanks to AIP

Less machine and plant downtime. Cost reduction without affecting quality. With AIP, a well-proven asset improvement programme, we help you to recognise, and act on, profitability potential. The programme combines existing knowledge in your field of competence and your corporate processes with the latest NSK technical knowledge.

Starting with a situational analysis, we compile a structured catalogue of measures together with you and assist you with its implementation. A Measuring Value check ensures that you achieve the sought-after advantages inside the agreed time frame.

Additionally, we offer training courses, carry out specialised service and repair services in our NSK Service Centres, and continually expand our online applications on our secure client site.



NSK Service Spectrum

Technical Support	Training Courses	Analytical Services	Value Added Services
Application Reviews	Introduction to Bearing Technology (Parts 1 & 2)	Failure Mode Analysis	NSK Cost Down Approach
Engineering Support	Best Practice Fitting & Removal of Bearings (Sections 1 & 2)	Material Analysis	Maintenance Schedules
Machine Design Consultancy	Bearing Diagnostics	OEM Part Conversion	Site Surveys
Bearing Surveys	Application of Bearings	Standardisation & Rationalisation	Maintenance Tool Audits
Diagnostic & Vibration Analysis	Sector Specific		Super Precision Service Package
	Food & Beverage Pumps & Compressors Quarry, Mining & Construction	Paper, Metals & Steel Machine Tool, Railway	

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 analysed by performing a quantitative analysis of vibration amplitude and frequency using a frequency spectrum analyser. 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.	

If you require anymore information about other NSK products, please visit our website: www.tec.nsk.com

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