

Loyal understands the extreme conditions that rolling mills and casting operations face. Using our bearings and mechanical systems expertise, we deliver bearings and machinery parts tough enough to perform reliably in such harsh environments.

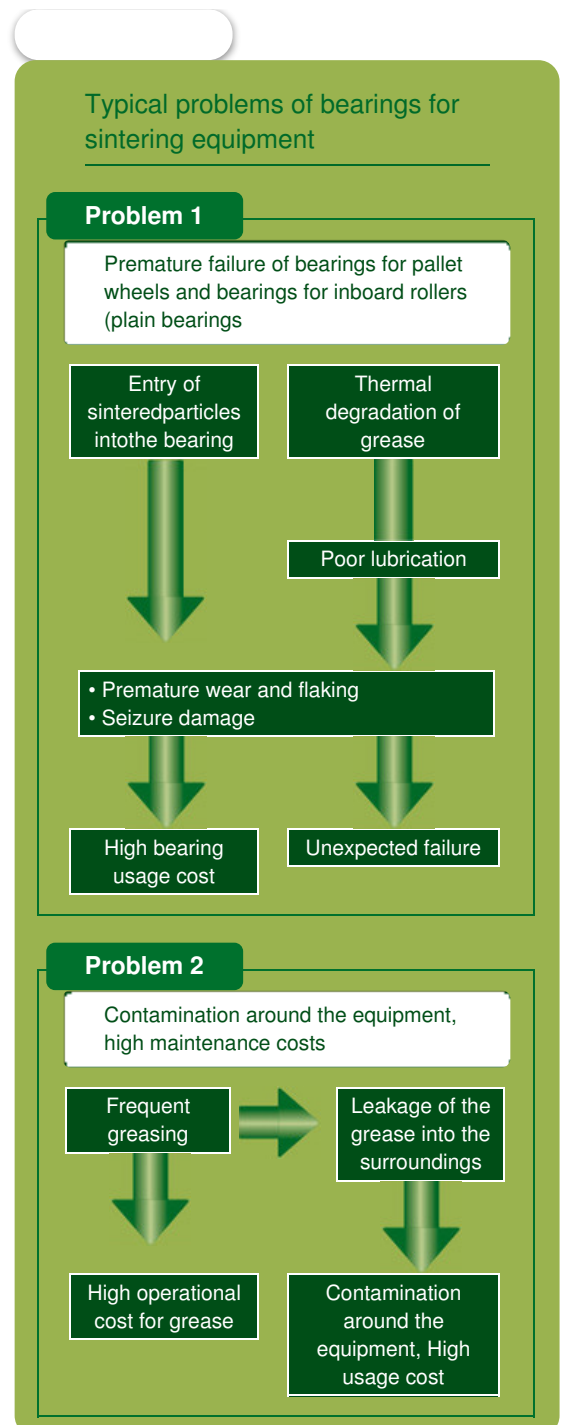
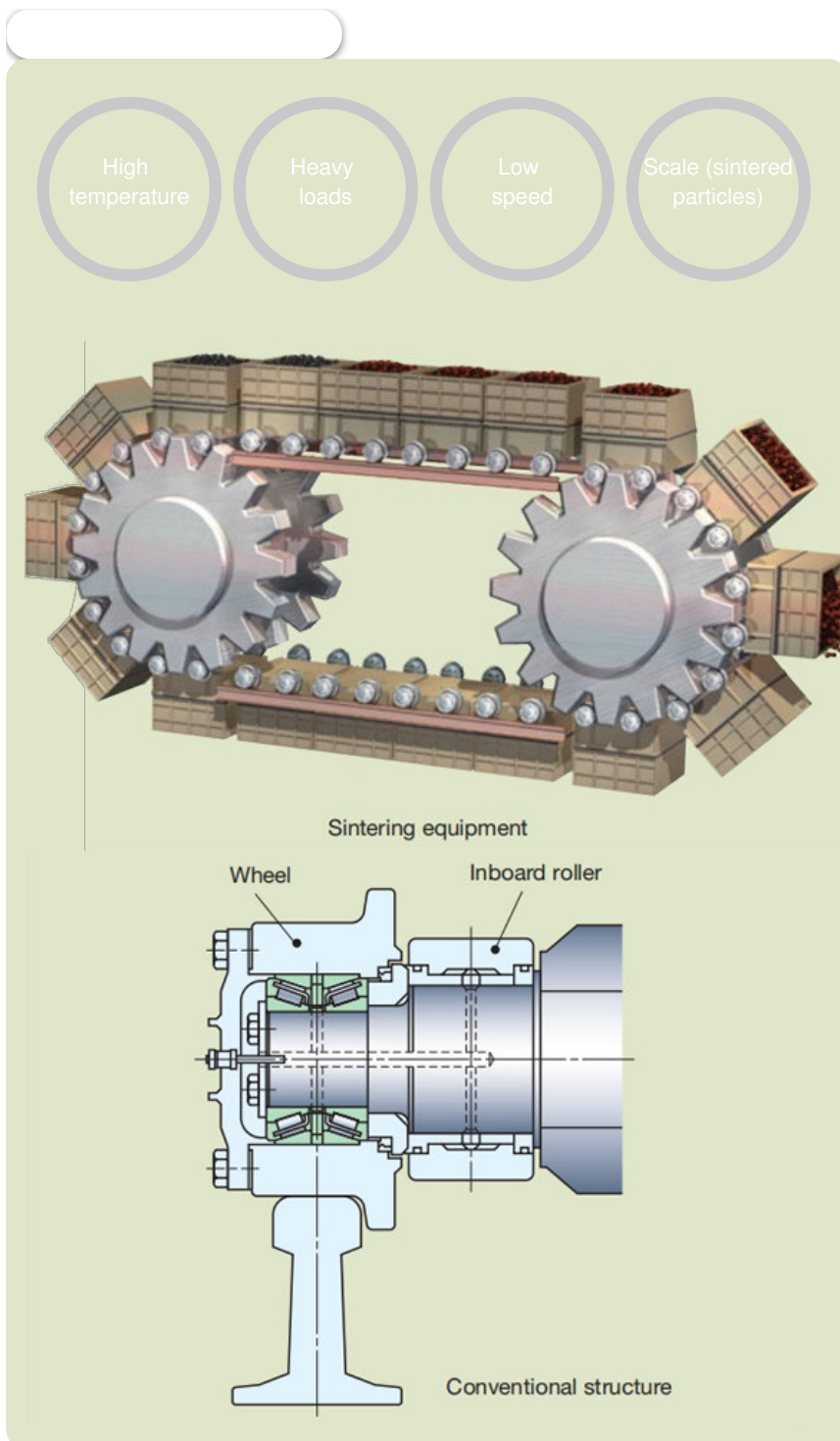
## Steel Industry



### BEARINGS FOR THE STEEL INDUSTRY

Our bearing solutions and services help ensure reliable and efficient operations across the steel industry, while our bearing team of technologists are always working on the solutions to help take the steel industry to the next level.

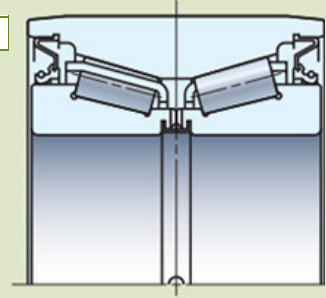
In response to the need for increased productivity and product quality, We offer bearings that have been specially developed for all the relevant conditions encountered throughout the entire process. from raw material storage yard to the steelmaking, rolling and refining processes, Loyal understands the extreme conditions that rolling mills and casting operations face. Using our bearings and mechanical systems expertise, we deliver bearings and machinery parts tough enough to perform reliably in such harsh environments.



Design measures

**Features Sealed-Clean Bearings for Pallet Wheels—AR Series**

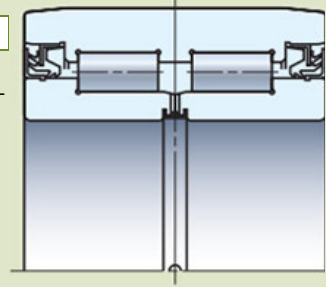
- Optimum crowning of the roller raceway surface enabling resistance to unba
- High sealing performance (featuring a special contact seal)
- Packing of grease with excellent heat and pressure resistance
- Easier handling (one-piece design with fastening ring adopted for the inner ring)



Design measures

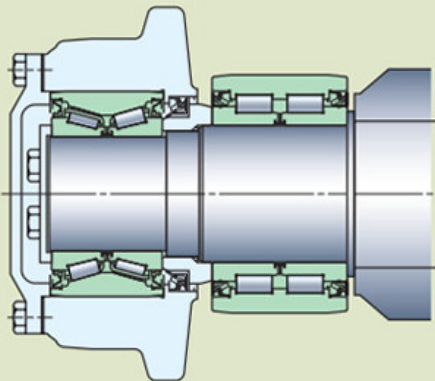
**Features Sealed-Clean Bearings for Inboard Rollers—2J Series**

- Higher load capacity (by outer ring thickness design with high strength and full-complement roller type)
- High sealing performance (featuring a special contact seal)
- Packing of grease with excellent heat and pressure resistance
- Easier handling (one-piece design with fastening ring adopted for the inner ring)



**• Durability Performance of Bearings in Field Test**

	Comparison of actual life extension in field tests		
Conventional structure	1		
Newly developed structure	2.5 on average		3 at maximum



Newly developed structure



**Estimated effect of maintenance cost reduction**



The maintenance cost includes the replacement costs for bearings, seals, and grease and the operational costs associated with the bearing replacement

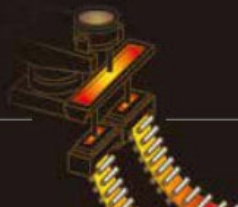
If the bearing life extends 2.5 times on average as a result of using the newly developed structure for bearings for pallet wheels/inboard rollers for pallet dollies, the total maintenance cost reduction effect is estimated to be 25% to 35%.

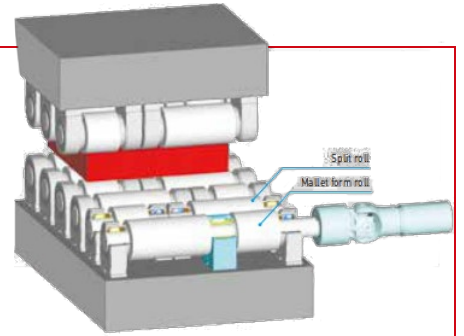
In steel & non-ferrous industries, bearings is unique to steelmaking, with particle contamination, water intrusion and high heat. They have to additionally handle hefty or shock tons, vibration, operational speeds ranging from extremely slow to extremely high, coupled with rapid acceleration and deceleration - this creates a requiring operating atmosphere.

With Loyal's full range of bearing products, from Spherical Roller Bearings for Use in Continuous Casting and Cylindrical Roller Bearings with Aligning Rings for Locating Position, reliable Taper Roller Bearings with Aligning Rings for Locating Position, control systems, advanced Long-Life Split Cylindrical Roller Bearing Units technology and power management through to process technology and optimization solutions, we enable our customers' plants to run more efficiently, produce high quality products while increasing a comprehensive range of bearings to help combat these issues, from standard bearings to our own innovatively developed, high-capacity bearings.

**Products for continuous casting machines**

Offering long-life bearings for systems, we manufacture bearings for continuous casting equipment, bearing housing units, oil/air lubrication





- Measures for high contact stress/roll deflection under heavy load
- Measures for roll elongation under high temperature
- Measures for corrosion / lubrication failure due to the infiltration of steam (water)
- Measures for surface roughness / indentations due to the intrusion of mill scale

Optimal configuration for roll elongation absorption using single and split rolls

Optimal configuration for roll elongation absorption using pestle-shaped roll



- ■ Measures for heavy load / high temperature

## RZ-type Spherical Roller Bearings

- Features**
- Designed for maximum load rating; internal design reduces contact stress
  - Designed to stabilize roll position
  - Resistant to high temperature
  - for use in various environments

**[Service life]**



**Outer ring**

JTEKT specification steel

**Roller**

- Roller maximized
- Number of rollers increased
- Roller position stabilized

**Inner ring**

JTEKT specification steel



- ■ Measures for heavy load / high temperature

## Cylindrical roller bearings with self-aligning ring

- Features**
- Smooth absorption of roll movement in the axial direction
  - Absorption of roll deflection and misalignment



[Static load rating]



Spherical roller bearings

## HSC bearing units with half round outer ring

Features

Heavy load type using a compact sealing structure  
Water-cooled structure with high cooling efficiency

[Service life]

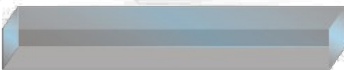


Conventional unit

Approx. **2.4-fold**

HSC bearing units with half round outer ring

[Rated static load]



Conventional unit

Max. **30% increase (approx)**

HSC bearing units with half round outer ring

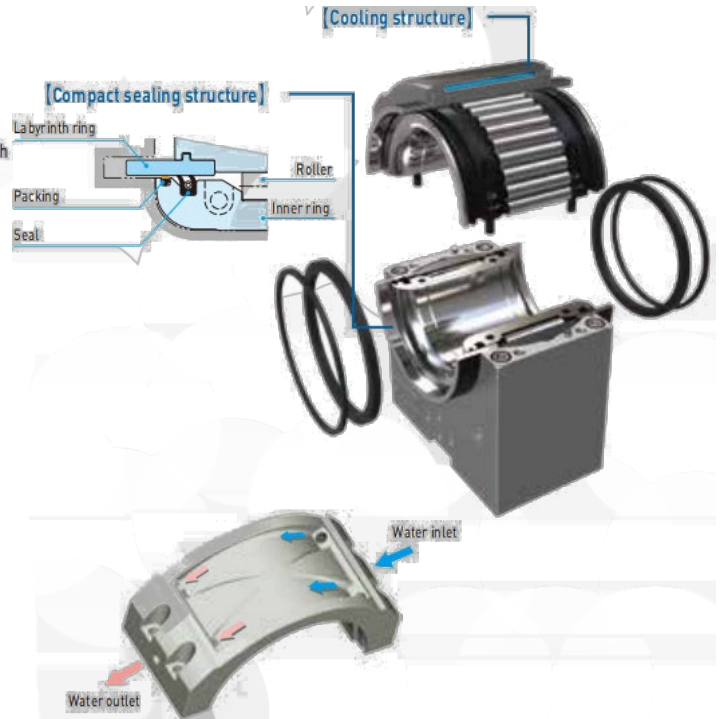
[Flow consumption]



Conventional unit

Reduced **45% (approx)**

HSC bearing units with half round outer ring



Measures for intrusion of water / mill scale

## Oil seals

Features

Superior sealing performance  
Lip contact stress dispersed  
Materials used are hydrogenated nitrile rubber (HNBR) and fluoro rubber (FKM)



Loyal expertise at your service

Loyal puts its expertise at bearing service to maximise the life of your bearing and reduce your costs

## Bearings for multi-roll mill backup rolls

We provide high-precision bearings with excellent durability based on long years of experience and achievements.



Seal structure that maintains a favorable lubricated state



Longer inner ring rolling fatigue service life



Improving outer ring durability



Improving outer ring rotational accuracy



Improving ease of outer ring regrinding work



Improving ease of outer ring regrinding work



Longer inner ring rolling fatigue service life



Improving outer ring durability



Improving outer ring rotational accuracy

## Bearings for oil mist lubrication

### Features

Improved bearing service life (2-fold/4-fold compared to the conventional type)

High sealing performance

Space-saving size for simple installation / removal

### [Service life]



Conventional type



Approx. 2-fold

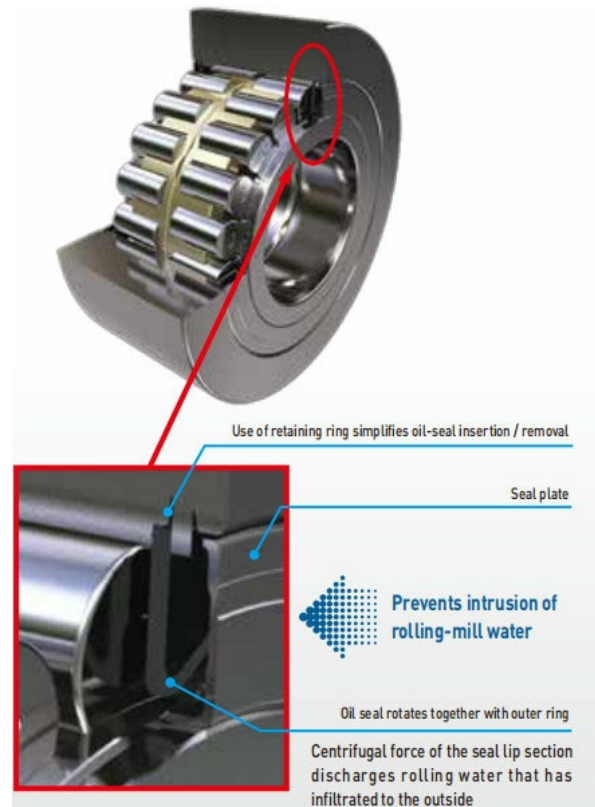
(JHS210 Standard)



Approx. 4-fold

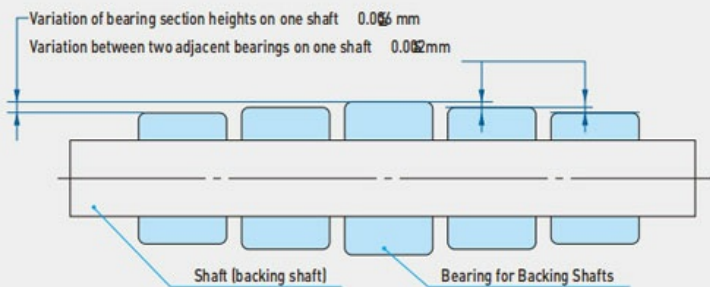
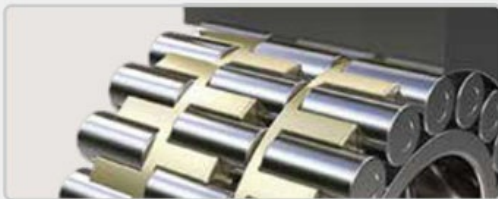
(JHS210 Premium)

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. For oil-seal materials, fluoro rubber is used, improving sealing performance and realizing an increase in bearing service life of approximately four-fold compared to the conventional type.



## Optimized load distribution

Contributes to rolled coil quality / precision



Longer inner ring rolling fatigue service life



Improving outer ring durability



Improving outer ring rotational accuracy



## Bearings for forced oil lubrication

- Features**
  - Outer ring with both high rigidity and durability realized
  - High resistance to fatigue realized owing to superior materials composition
  - Design optimized to match surrounding structure

Case-hardened steel is used for the inner ring to suppress the loss of rolling service life under low-viscosity lubrication. Bearing service life is approx. 1.5~3-fold that of conventional products.



### Improving ease of outer ring regrinding work

#### Bearings-regrinding Jigs

- Features**
  - Bearing radial runout minimized
  - Installation / removal work simplified
  - Reproduction of radial runout accuracy equivalent to that when product is new



### Improving ease of outer ring regrinding work

#### Measurement for Bearing Section Height

- Features**
  - High rigidity, possible to make extremely accurate measurements
  - Possible to measure outer ring rotational accuracy
  - Adoption of mandrel shape realizes easy bearing insertion / removal



Loyal have developed sealed spherical roller bearings and thrust Bearings prevent the ingress of contamination and offer optimal service life. we increased the service life, by 4 or 5 times, of the floating bearings used in continuous casting thanks to the axial load capacity of Loyal bearing, four-row tapered roller bearings and spherical roller bearings with self aligning outer ring are also perfectly suited for continuous casting plants.we increased the service life, by 3 times, of a rolling mill bearing by using the four-row tapered roller bearing and Direction Angular Contact Thrust Ball Bearing .

Taper roller bearings which are available in various special materials for rolling mills with our Sealed-Clean technology.Loyal 's surface treatment makes it possible to extend the life of the rolling mill bearings even further.

## Bearings for Rolling Mills

### Four-Row Tapered Roller Bearings for Work Rolls

## Benefits

- 1 Higher reliability and longer operating life prevent unexpected accidents
- 2 Bearing seal requires less cleaning of work environment and reduces grease consumption
- 3 Reduced maintenance costs

### 1. Operating conditions

High speed/Low speed

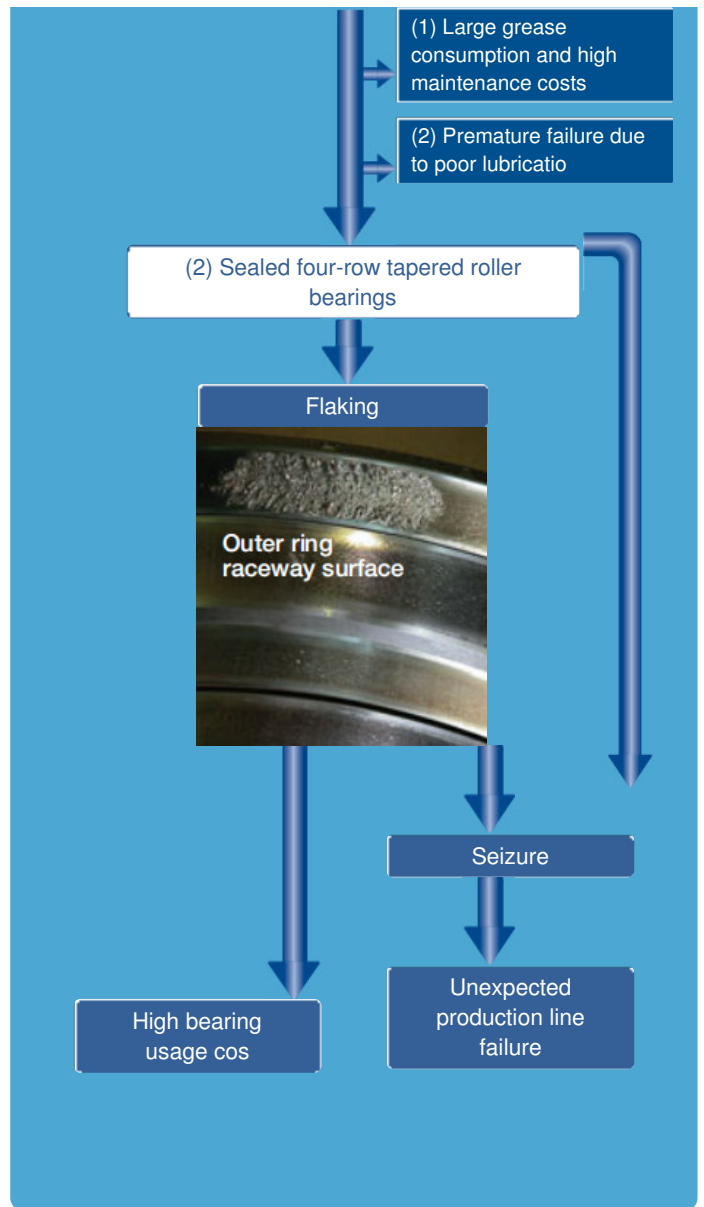
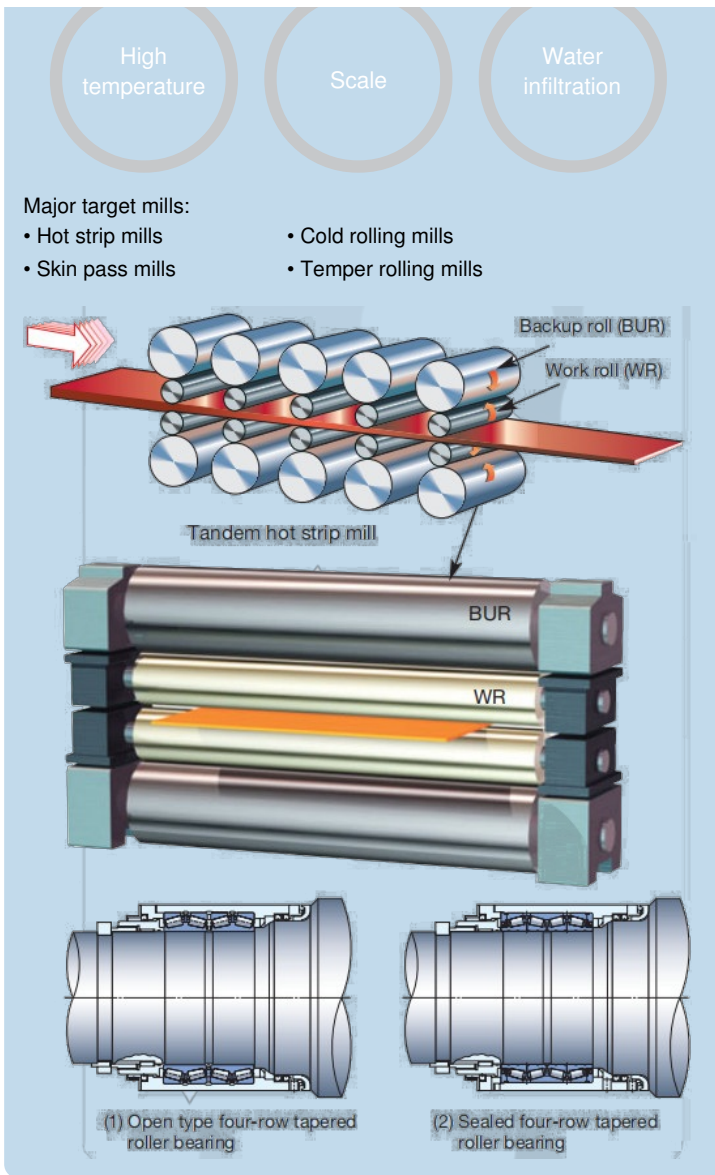
Heavy loads

Vibration and Impact

### 2. Problems

#### Typical problems of work roll bearings

- (1) Open type four-row tapered roller bearings



### 3. Countermeasures

Material  
Material  
measures

- Identified flaking damage mechanism caused by water infiltration
- Developed countermeasures against severe conditions for cases where water and particle contamination are unavoidable

#### Features Water-TF® Bearings—WTF Series

- Adoption of super-clean steel with optimum alloy balance controls development and progress of cracks at early flaking stage caused by water infiltration
- Control of the retained austenite reduces concentration of stress resulting from dents caused by infiltration of debris

	Comparison of actual life extension in field test		
Conventional steel	1		
Material for Water TF Bearing		3	

Water-TF Bearings are a special purpose bearing series in the same design as the standard KVS types (see below).

**User Benefit**

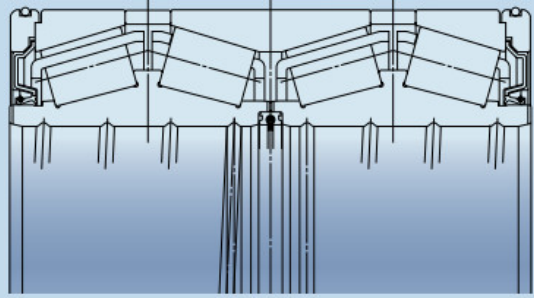
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Material  
Material  
measures

- Developed countermeasures against harsh load conditions
- Improved sealing against water infiltration and foreign contamination

**Features** Extra-Capacity Sealed-Clean™ Four-Row Tapered Roller Bearings—KVS Series

- Higher load capacity: increased by 15%–35% compared to conventional sealed bearings
- Super-TF steel: resistant to foreign contamination, used as standard
- Controlled negative pressure during rolling to prevent water infiltration
- Easier handling of seals



	Comparison of actual life extension in field test		
Conventional sealed bearing	1		
KVS Bearing	2		

**User Benefit** Page 23–24

Bearings for sinter machines, converters, chain conveyors, levellers and many more. Loyal offer the sealed four row tapered rolling bearing (Sealed Clean) on the market. which not only leads to lower costs but also makes it more environmentally friendly. Loyal have continually improved and have been able to measurably increase its load-carrying capacity through newly-developed internal construction and a new sealing system. Loyal's various steel specifications are particularly wear and shock resistant due to our special heat and surface treatment technology Sealed-Clean bearings can be supplied in case-hardened and through-hardened steel.

Loyal of Selective bearings allows you to tailor a machinery parts solution for your needs, including Cylindrical Roller Bearings , Taper Roller Bearings , Long-Life Split Cylindrical Roller Bearing Units solutions for radwaste streams in commercial power plants. Loyal support you ensure the success of your operation and reduce the total cost of ownership of your bearings.