



NSK Solutions

## Slurry Pumps

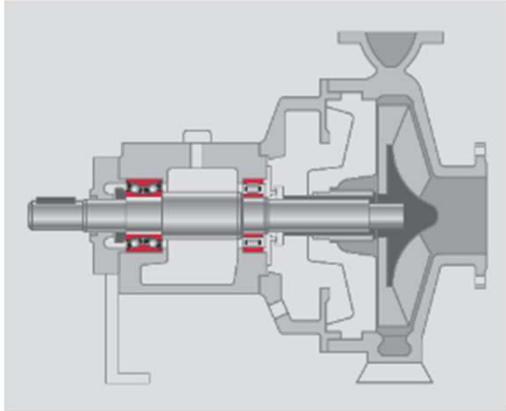
› 2025

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## Slurry Pumps

- › Slurry pump is a type of centrifugal pump. They are adapted for handling fluids with solids. They incorporate heavy-duty construction and wear-resistant materials to withstand the abrasive nature of the slurry. Used in mining, the pumps are designed to transport slurry, a mixture of water and solid particles such as ore, minerals, sand, or other debris. These pumps are essential in mining operations where the handling of highly abrasive, corrosive, and often high-density materials is required. Slurry pumps are built to handle the wear and tear caused by the solid particles in the slurry, as well as the often-harsh environmental conditions found in mining processes.
- › Slurry pumps are used in various stages of mining, such as:
  - › Transporting slurry to and from processing plants
  - › Pumping tailings to storage areas
  - › Moving concentrated ore or waste material
  - › Pumping water-sand mixtures in dredging operations

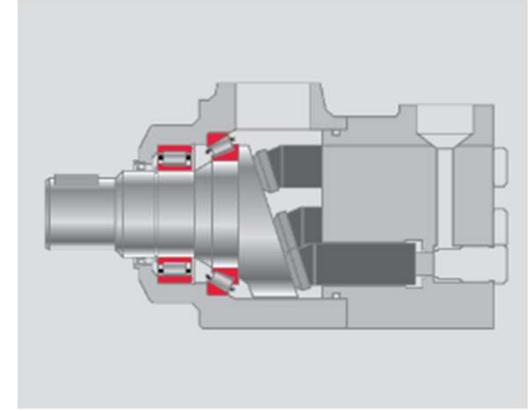




**HPS Angular Contact Ball Bearings**



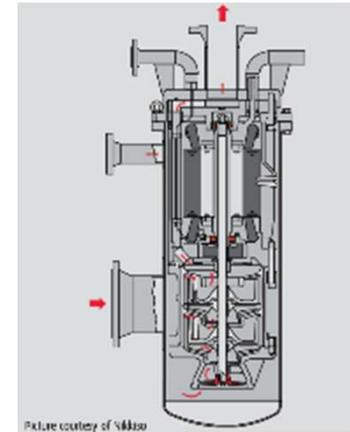
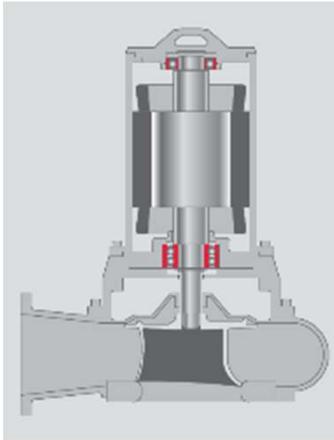
**High-Capacity Deep Groove Ball Bearings**



**High-Capacity Double-Row Angular Contact Ball Bearings**



**Creep Free Bearings**

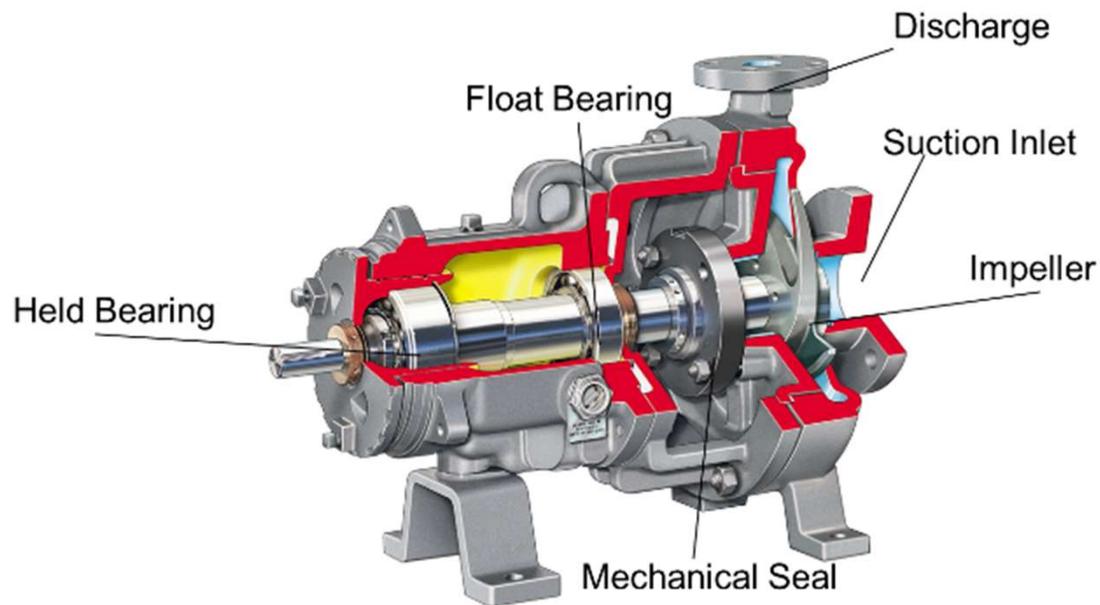


**NSK**

Introduction:  
**Bearing Arrangements**



## Centrifugal Pump Bearings



### Why Bearings Are Critical in Pumps

- Minimize Axial End Movement: Bearings control axial thrust, preventing excessive shaft movement along its axis.
- Limit Radial Deflection: They maintain shaft alignment by minimizing side-to-side (radial) deflections during operation.
- Ensure Proper Impeller Clearance: Bearings help maintain the correct gap between the impeller and the housing, which is vital for hydraulic efficiency and reducing wear.

# SLURRY PUMPS APPLICATIONS IN MINING



## APPLICATION IN MINING

- › Tailings transport: Moving waste slurry to containment areas.
- › Ore processing: Circulating slurry through grinding and flotation circuits.
- › Hydraulic mining: High-pressure slurry jetting to extract materials.
- › Pit dewatering: Pumping water and debris out of mining pits.

## TYPICAL ROTATION SPEEDS (rpm)

- › Small horizontal pumps: 1,200 – 3,600 RPM - Used in light-duty or low-viscosity slurry applications.
- › Medium-duty pumps - 900 – 1,800 RPM - Standard for many mill discharge and tailings pumps.
- › Heavy-duty large pumps - 400 – 1,200 RPM - Lower speeds reduce wear in high-solid-content slurries.
- › Vertical sump pumps - 900 – 1,800 RPM - Speed depends on motor and shaft design.

## TOP OEM

- › Weir (Warman) – Market leader in centrifugal slurry pumps.
- › Metso – Offers a range of horizontal and vertical slurry pumps.
- › FLSimdt (Krebs) – Offers a comprehensive range of KREBS® slurry pumps designed to meet the diverse needs of mineral processing, mining, and industrial applications.
- › KSB – Known for wear-resistant pump designs.
- › GIW Industries
- › Grindex
- › Schurco Slurry

Extending Slurry Pump Uptime:  
**The Bearing Challenge**



# BEARING CHALLENGE EXTEND SLURRY PUMP UPTIME



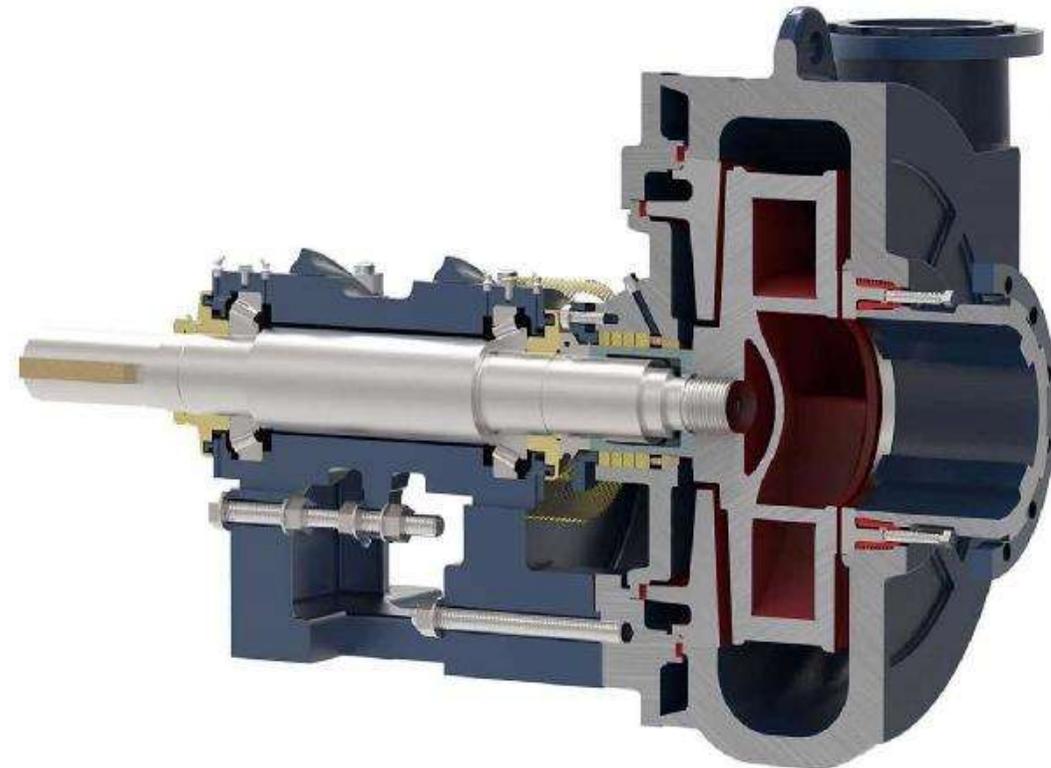
## In Slurry Pump Applications...

### » Challenging Operating Conditions

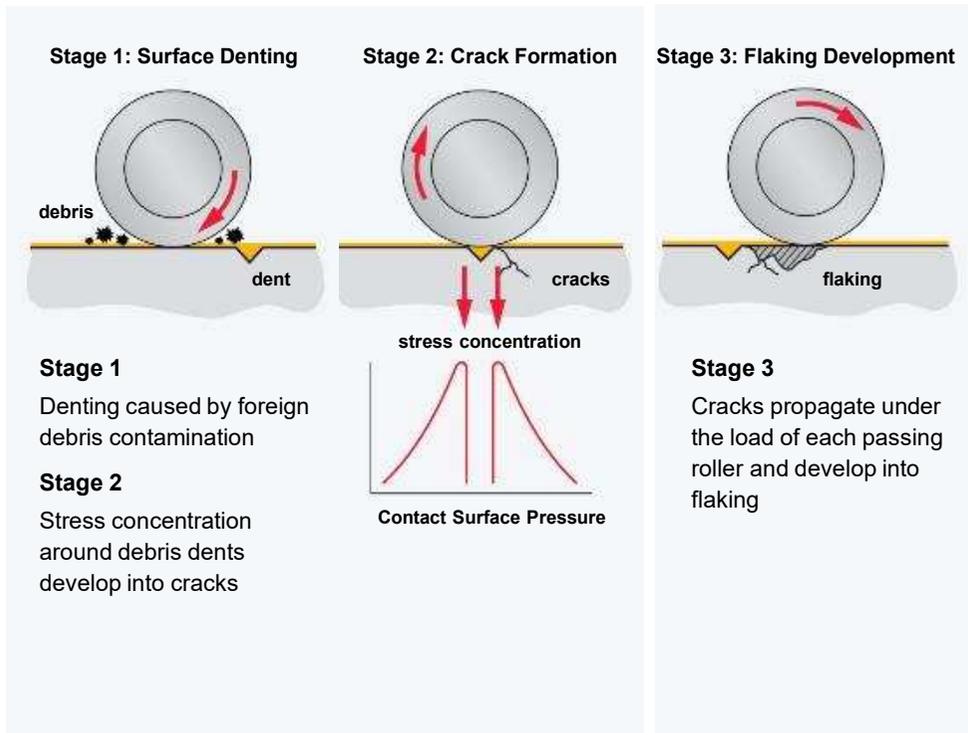
- › Water and contamination
- › Compromised lubrication conditions
- › High load
- › Misalignment
- › Shock and vibratory loads

### » Industry Requirements / Expectations

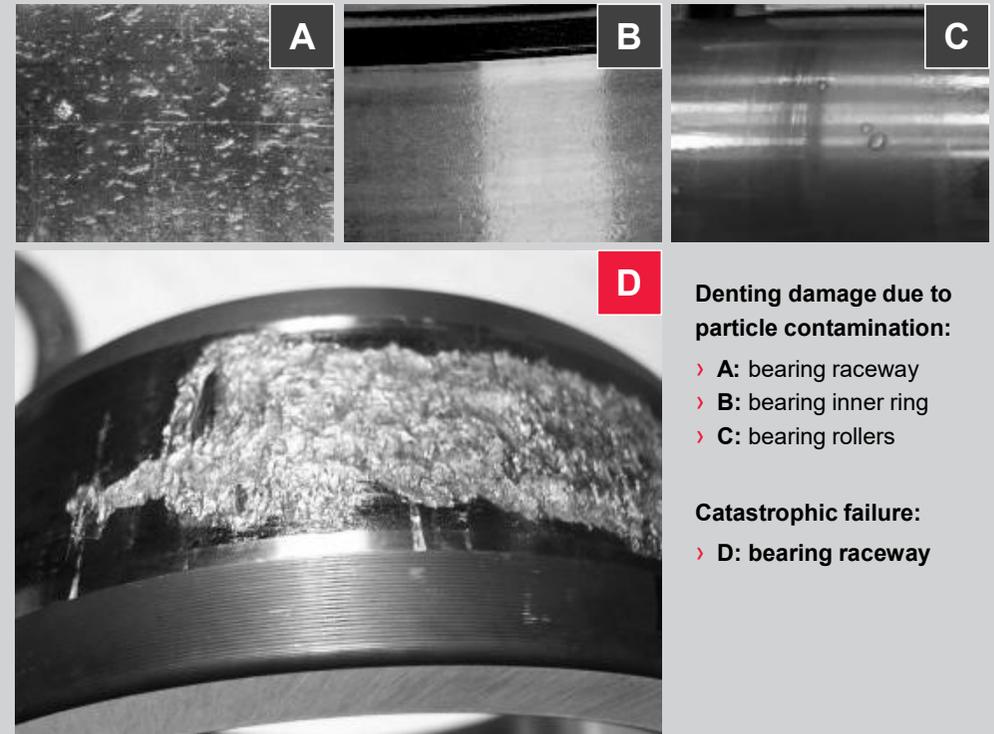
- › Maximized productivity
- › Minimized unplanned downtime
- › Optimized bearing life
- › Reduced maintenance burden
- › Reduced total cost of operations



## Identification of Failure Mechanisms



## Contamination Failures



Contamination Countermeasure:

**Advanced Material  
Technology**



# NSK LONG-LIFE TOUGH STEEL MATERIAL TECHNOLOGY



## » Material Composition

- › Containing appropriate levels of chrome and molybdenum for increased material hardness

## » Special Heat Treatment

- › Optimized dispersion of finer carbide and carbonitride particles for increased compressive stress

## » Retained Austenite

- › Alleviation of the stress concentration on the contact surface



### Life test: Result under contaminated lubrication

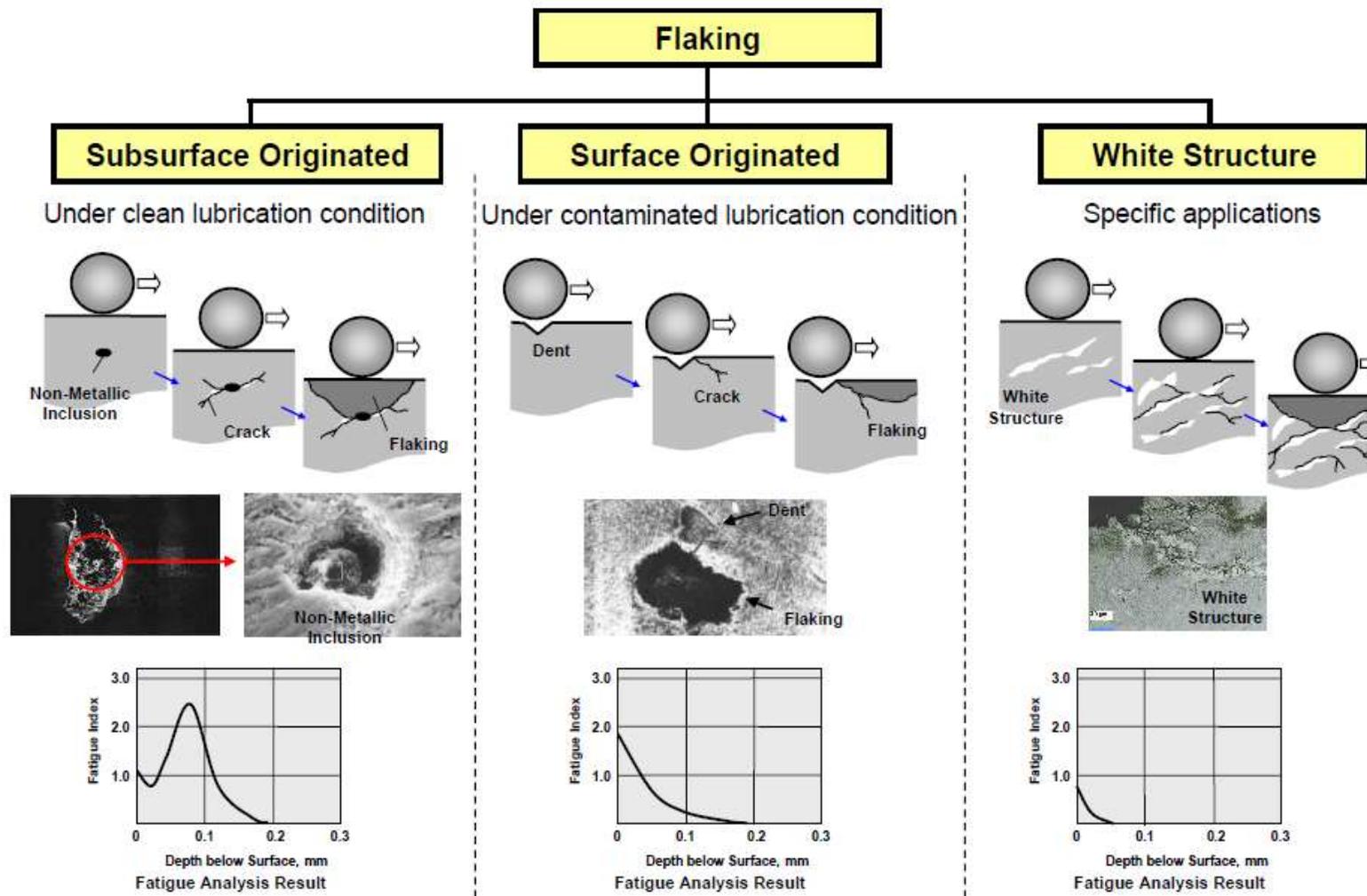


- » Under contaminated lubrication conditions, NSK Tough Steel bearings deliver as much as 10 times longer operating than general carburized steel alternatives.

### Long-life benefits v. standard bearing steel

- » **Wear resistance:**  
less than 1/3 the rate of wear
- » **Seizure resistance:**  
as much as 40% improvement
- » **Heat resistance:**  
up to four times the service life at 160°C

# CLASSIFICATION OF FLAKING



### Through Hardened

- › 1.0% Carbon Steel
- › Short heat treatment time
- › Uniform material properties
- › Standard fracture toughness and dimensional stability
- › Excellent sub-surface fatigue properties

### Carburized

- › 0.2% Carbon Steel
- › Long heat treatment time
- › Different case and core material properties
- › Improved fracture toughness and dimensional stability
- › Better surface fatigue properties

## NSK TOUGH STEEL™ TARGET OBJECTIVES



› Economical heat treatment cycles (like through hardened steel)

› Steel material that can be mass produced

› Fracture toughness, surface fatigue properties, and dimensional stability similar to carburized materials

› Subsurface fatigue properties similar to through hardened materials

## BEARING FAILURE MODES AND TOUGH STEEL COUNTERMEASURES



### »Surface-initiated fatigue

›Increased contact stress due to the shape of dents from contaminants



»High retained austenite and surface hardness improve life

### »Insufficient lubrication

›Stress concentrations at the asperity peaks can lead to peeling damage



»Retained austenite helps to relax the stress concentration  
»High hardness also improves resistance to peeling damage

### »Subsurface-initiated fatigue

›Repeated stress cycles and non-metallic inclusions in the material



»Higher carbon steels tend to have better cleanliness

**NSK**

Field Proven Success:  
**Case Studies**



# FIELD CASE STUDY CEMENT MILL SLURRY PUMP



## » Background

- › **Mill:** Cement
- › **Application:** Slurry pump
- › **Location:** USA

## » Conditions

- › **Abrasive particle contamination**

## » Issues

- › **Bearing failures:** approximately every 2-3 months due to contamination ingress
- › **Downtime:** lost production, increased maintenance costs

## » Solution

- › **Upgrade:** bearing material to NSK Hi-TF Tough Steel

Customer documented cost savings:

**USD 55,000**

Extended bearing life:

**12 months plus**



Because efficiency is everything, improvement pays

