

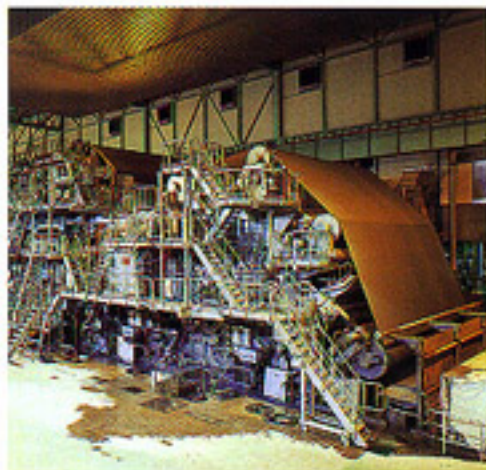
NSK Bearings for Paper Making Machines

Standardized for improved quality,
cost efficiency and prompt delivery



NSK Bearings for Paper Making Machines

NSK has more than 80 years of experience in the design, development and manufacture of nearly every kind of anti-friction bearing. Driven by intensive research and development, 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 have made NSK a world-class supplier to the paper industry. Bearings are vital components in every section of paper manufacturing machinery. As a result of working closely with machine builders, NSK has developed innovative manufacturing methods and new designs to provide bearings with higher quality, increased speed and longer operating life.



TL Bearings

Superior performance under high-temperature conditions

NSK's innovative TL Series continues a tradition of excellence by providing outstanding performance under the high-temperature conditions and manufacturing environments found in paper making, where inner ring fractures can result in work stoppages. TL bearings exhibit superior resistance to inner ring fractures while providing extended life and excellent dimensional stability, resulting in improved productivity and lower costs for customers.

Features

- 1 A special steel and heat treatment developed by NSK **strengthens the inner ring** against increasing hoop stress caused by rising shaft temperatures.

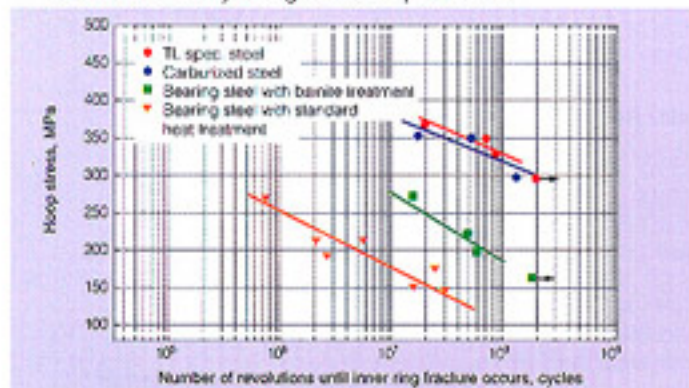


Fig.1 Results of inner ring fracture test



- 2 Increased hardness of raceway surface provides **longer life** when foreign debris is present than that of other bearings.

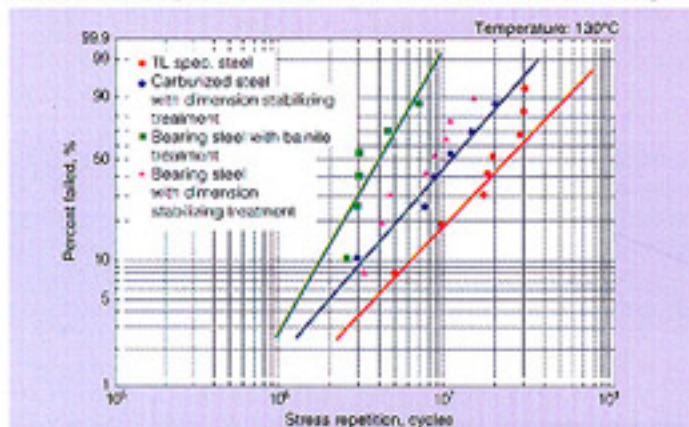


Fig.2 Results of rolling life test under high temperatures with foreign debris

- 3 **Dimensional stability under high temperatures** is adopted as a standard specification (Max. 200°C).

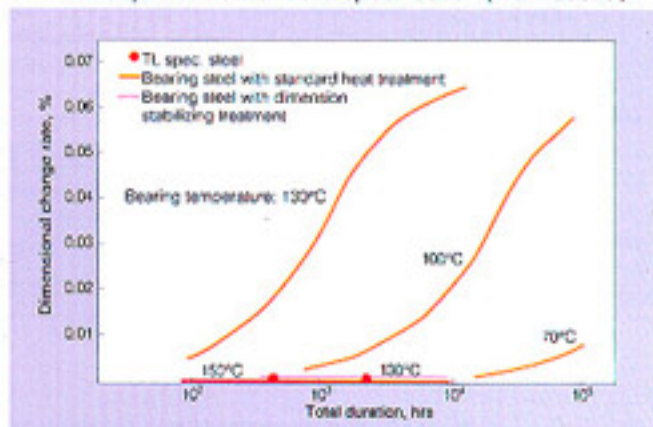


Fig.3 Results of dimensional stability test

Triple Ring Bearings

Extensively used in controlled crown rolls for a simplified surrounding structure and easier installation.



Features

1. Symmetrical rollers and no center rib realizes high load capacity.
2. Use of ultra-clean carburizing grade bearing quality steel in critical components.
3. High-precision dimensional tolerance (suffix UPA).
4. Specially designed inner ring and retainer optimize inner bearing lubrication.
5. Standardized oil holes and grooves in inner and outer rings.

Finite Element Analysis of Triple Ring Bearing and Housing

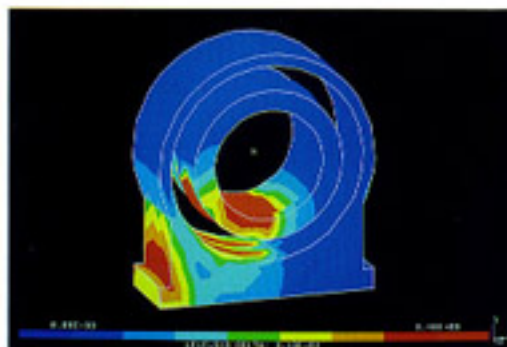
NSK has performed finite element analysis (FEM Analysis) of the triple ring bearing and housing in cooperation with paper machine manufacturers.

This analysis assists housing designers in developing bearing support structures that minimize bearing stress levels and extend life.

An example of this analysis is shown in the drawing to the right.




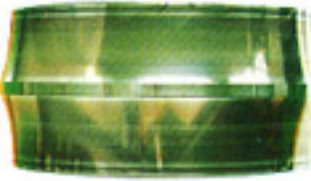
Bearing No.: 2SL280-2 UPA

Application: Press C.C. Roll



Maximum principal stress distribution

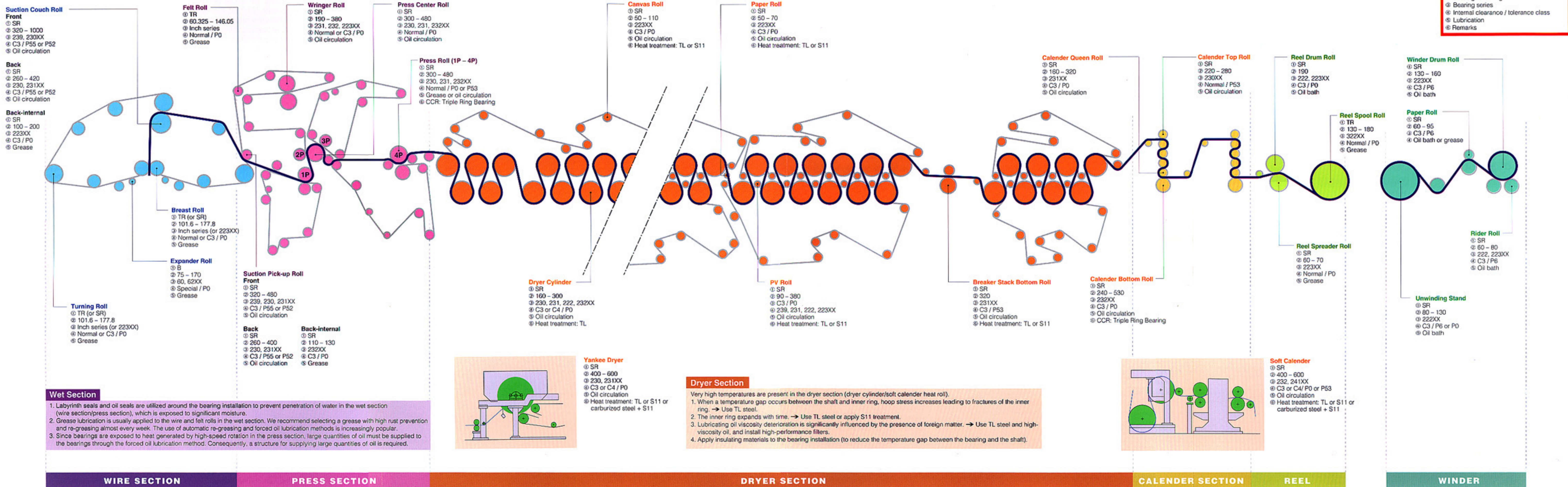
Examples of Major Bearing Damage

Damage	Application	Cause of damage	Countermeasure
Inner-ring creep 	Dryer canvas roll	Dimensional variation at high temperatures	Use TL steel or apply dimension-stabilizing treatment (S11).
	Press CC roll	Insufficient interference (hollow shaft)	Tighten interference.
Inner-ring fracture 	Dryer (cylinder)	Excessive force applied during mounting	Control residual clearance.
		Defective bore face contact	Adjust with taper gauge.
		High hoop stress	Use TL or carburized steel.
Flaking 	Dryer (cylinder)	Insufficient oil film formation at high temperatures	Use TL steel. Increase oil viscosity. Lower supplied-oil temperature.
	Wire suction roll	Insufficient oil film formation due to water entry	Reinforce lubrication oil control. Improve bearing housing.
	Dryer canvas roll	Excessive axial load due to Expansion of outer-ring on the free-end bearing	Use TL steel or apply dimension-stabilizing treatment (S11).
Smearing 	Calender CC roll (triple ring)	Insufficient oil film formation	Increase volume and viscosity of oil. Lower supplied-oil temperature. Add additives to lubrication oil.

Paper Making Machine Layout and Typical Bearing Specifications

Key to Bearing Specifications:

- ① Bearing type
- SR: Spherical Roller Bearing
- TR: Tapered Roller Bearing
- B: Ball Bearing
- ② Bearing inner ring bore diameter
- ③ Bearing series
- ④ Internal clearance / tolerance class
- ⑤ Lubrication
- ⑥ Remarks



WIRE SECTION

PRESS SECTION

DRYER SECTION

CALENDER SECTION

REEL

WINDER