

RKB

Pin-Type Cages for Large-Sized Bearings

Q&A session with Dr. Eng. Alberto Barili

Bearing manufacturing is a highly competitive industry, one direct consequence being its high rate of research and development. The extent to which innovation is built into the production flow represents a key differentiation factor among the companies acting in this market. If effectively achieved, it is also a resource for organic growth and, on this basis, for ongoing design and performance improvements of various types of bearings.



Dr. Eng. Alberto Barili,
Part of the RKB Technical Team Unit.

To get the detailed information regarding the RKB strategy and actions in this crucial field, we discussed with Dr. Eng. Alberto Barili, part of the RKB Technical Team Unit.

Q: Good afternoon, Alberto! Thank you for your readiness to answer a couple of questions on the RKB approach regarding the prompt and effective introduction of technological progress in bearings manufacturing. Out of this extensive topic, let us focus on the pin-type cage for large-size bearings. Let's start with where RKB bearings with pin-type cages are used the most and which are the criteria that are guiding the RKB application engineers toward this solution.

A: Typically, the bearings with a pin-type cage are used when a significant increase in bearing load capacity is required compared to the traditional window-type cage design. Pin-type cages feature a greater load carrying capacity mainly due to the increased number of rollers. This is the optimal solution for the heavy industry where the RKB bearings are exposed to high working loads. To withstand these harsh working conditions, it's required to maximize the basic load ratings without sacrificing the reliability of the bearing. A typical

application is a backup roll of a 4-high cold rolling mill stand in the steel industry.

Q: Please present an already concluded RKB case study on the pin-type cage's effective performance.

A: Sure. The below picture shows the same bearing but, on the left, the version with a pressed steel cage and solid rollers and, on the right, the one with a pin-type cage and pierced rollers. As you can see, the number of rollers increases from 38 to 39.

PIERCED ROLLER BENEFITS – REAL CASE STUDY 1 OF 2

Pierced roller bearings with pin-type cage assemblies are generally used due to the increased number of rollers compared to standard window-type cage (RKB EVO) or pressed steel cage, especially for heavy load conditions and low operating speeds.

			
Bearing PN	RKB Set 2xTDI 243309 SPAVL	Bearing PN	RKB Set 2xTDI 243309 SPAVL
 Design	Pressed steel cage	 Design	Pin-type cage
 Rollers	Solid rollers	 Rollers	Pierced rollers
 N° of rollers	Z = 38	 N° of rollers	Z = 39

Pin-type cage design with pierced rollers has more rollers than window-type cage!!!

This small change, with other internal dimensional improvements, leads to an L10 value higher by nearly 37%!

Q: Let's continue with the example of the RKB 4-row tapered roller bearings with pierced rollers and a pin-type cage. Which are their main features?

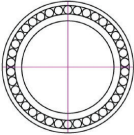
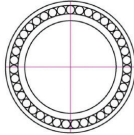
A: Even if not typical when answering questions, I would start with a conclusion I believe is relevant from our customers' perspective. All features, such as the preset or custom BEP, allow making assembly, disassembly and maintenance operations easier and to maximize the bearing life. Coming back to your question, the picture below presents the main features of the bearing we chose for exemplification purposes.

Q: As an engineer, how would you scale the manufacturing of bearings with pierced rollers and pin-type cages? Do we speak or not about a routine process? In other words, is it or is it not something accessible to many, if not all producers in the bearings market?

A: First, I believe it is needed to focus on the premium bearings. By definition, their production is not reachable, not manageable by many.

To better present the difficulties which occur, it is useful to have a brief overview of the most common failures in low-quality bearings of this type.

PIERCED ROLLER BENEFITS – REAL CASE STUDY 2 OF 2

	RKB set 2xTDI 243309 SPAVL (Pressed steel cage - solid rollers)		RKB set 2xTDI 243309 SPCVL (Pin-type cage - pierced rollers)
--	--	--	---

Parameter	RKB set 2xTDI 243309 SPAVL (Pressed steel cage - solid rollers)	RKB set 2xTDI 243309 SPCVL (Pin-type cage - pierced rollers)	Pin-type cage benefits
D_{wb}	100%	101,9%	+ 1,9%
D_{pw}	100%	99,8%	- 0,2%
L_{wb}	100%	105,3%	+ 5,3%
Z	100%	102,6%	+ 2,6%
C_r	100%	109,8%	+ 9,8%
L_{10}	100%	136,5%	+ 36,5%

4-ROW TRB – PIERCED ROLLER DESIGN



Bearing Design:

- One double cup, two single cups, plus two cup spacers (plain or with lubrication grooves and holes)
- Two double cones, plus one cone spacer (plain or with lubrication holes)
- Four two-piece steel pin-type cages
- Pierced roller execution to increase load rating capacities
- Preset or adjusted BEP on customer's request
- Available with helical groove in the bore (G)
- Marked zones on cups side face to easy mounting and maintenance operations

For further information on all RKB pierced roller designs and much more, please consult our [online catalogue](#).

LOW QUALITY NO-BRAND PIERCED ROLLER BEARINGS



Catastrophic failure of low quality no-brand pierced roller bearing M 274149 DW/110!!!



Premature failure of low quality no-brand cage-roller assembly F-802030.TR4/LM274449DW.410.410D



Typically, the most critical areas are:

- the welding of the cage rings
- the pin/ cage threaded coupling
- the entire roller/ pin/ cage assembly.

To continue with our practical approach, above there is an example of failure related to the roller/ pin/ cage assembly.

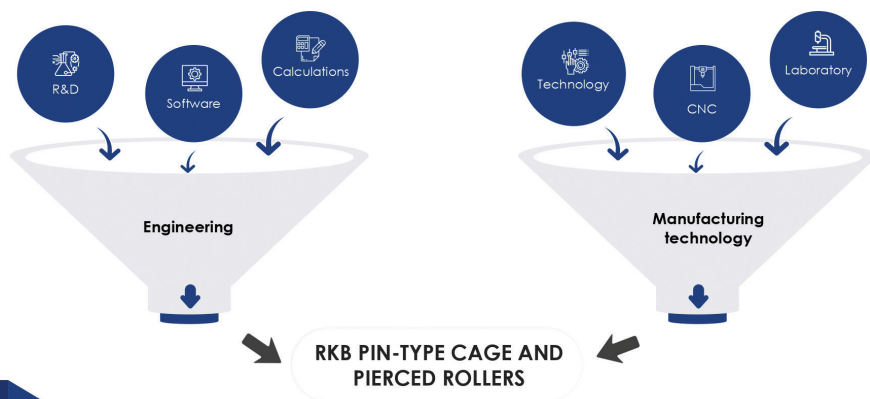
As it can be seen, the fracture of some rollers and the fracture and deformation of some pins during bearing rotation caused the immediate bearing seizure with an unplanned production stop.

To conclude my answer, I believe it is clear that the choice of the actual bearing acquired is not a neutral, consequences-free decision. Even if a low-quality generic bearing seems like a good initial investment, its major comparative disadvantages frequently appear even in the short-term, not to mention the mid and long-term ones. Losses generated by production equipment downtimes and repairs result in a sharp increase in the customers' Total Cost of Ownership.

Q: Maintaining and consolidating the RKB competitiveness requires, among other important aspects, keeping up with the technological advancements in the bearings industry. Which is the RKB strategy in this regard? Which are the R&D guidelines followed?

A: It is not an overclaim but a realistic evaluation that RKB is permanently

RKB LATEST TECHNOLOGY



committing relevant resources in order to implement technological progress in our production and, thus, to manufacture up-to-date, high-quality bearings.

I believe it is appropriate to continue with the example detailed during our discussion.

The pin-type cage bearing is one of the most complex designs and, given this, its proper production requires the manufacturer have high know-how standards. RKB R&D activity is advancing in various directions to develop products which meet the continuously more demanding needs of our customers.

In the case of the pin-type cage design, RKB R&D is focused mainly on manufacturing technology and engineering. The pin-type

cage design has some critical areas that should always be effectively managed, operated and supervised to offer premium products in our competitive market. Some of these criticalities are, for example, the location tolerances of the cage ring holes, the clearance between each roller hole and the related pin, the clearance between the cage rings and the afferent roller face and the sorting tolerances of the rollers.

Q: Many thanks, Alberto, for the information provided. I wish you and the RKB team the best of luck!

A: Thank you!

You can learn more about RKB bearings at www.rkbbearings.com