ZKL NEWS

December 2025, Issue No. 67

ZKL GROUP

BEARINGS: KEY ELEMENTS OF THE FUTURE INDUSTRY

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Opening speech

Dear colleagues and business partners,

The year 2025 is developing positively in terms of revenues. The Bearing Division expects earnings of CZK 1.16 billion from finished products and approximately CZK 10 million from services and other products.

In the Real Estate Division, the outlook for 2025 remains practically unchanged compared to 2024. The main reason is investments associated with the ongoing extension of the accommodation facility in Brno. The company ZKL Reality has also launched the development of family houses for sale. Currently, four houses are under construction in Podolí near Brno. In Klášterec, a medical centre building has been completed and the reconstruction of utility networks within the production premises has begun.

In the long term, the real estate sector continues to show growth both in profit and revenue. In contrast, the Bearing Division faces a decline in demand for standard catalogue products, which are gradually being replaced by the production of special bearings with higher added value. For this reason, we are purposefully investing in technologies that increase labour productivity and support the production of technologically advanced bearings. At the same time, part of our investments is directed to the Real Estate Division, where the market is growing, and the return on investment is higher.

Within the Bearing Division, we are focusing mainly on automation and higher productivity. In 2026, we plan to implement a production line for small axial ball bearings in Klášterec and, in Brno, we will invest in an automatic visual inspection line for rolling elements supported by artificial intelligence.

Considering high manufacturing costs in Europe, we are taking strategic steps to relocate part of our production outside the European Union in cooperation with our long-term partners.

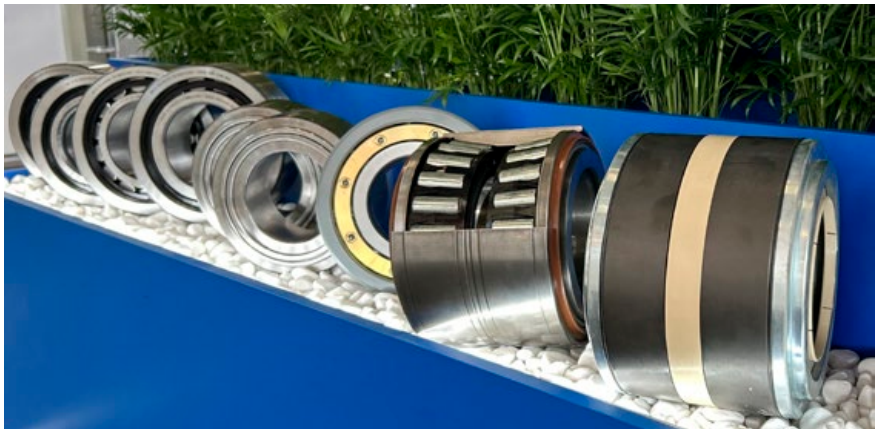
At ZKL Brno plant, a production reorganization is underway with the goal of maintaining competitiveness and increasing sales. The primary cause of declining demand is the reduction in the mining and steel industries in Europe. A secondary decline has also occurred in freight railway transport, which we are compensating for by expanding our portfolio of railway bearings.

The company's productivity is significantly higher than in the past. The production volume that required 800 employees in 2018 is now managed by 400 people. The digitalization of internal processes helps reduce fixed costs, and modern production technologies increase work efficiency.

From a commercial perspective, in Europe we will focus on railway bearings for trams and passenger transportation, while in export markets we will concentrate on certifications of our bearings for freight and passenger railways. In the long term, we will also focus on growth in the aerospace sector and bearings for extreme conditions. We will continue to ensure a comprehensive range of standard bearings with the aim of reducing minimum production batches. We will achieve this through better supplier cooperation and the use of standardized bearing designs. Our key objective remains increasing productivity and efficiency, and we believe that the current management is capable of achieving these goals.

As 2025 comes to a close, I want to sincerely thank all colleagues for their hard work and accomplishments. Wishing them and our business partners a wonderful Christmas season and a prosperous New Year.

Ing. Jiří Prášil, *CEO of ZKL, a.s.*



ZKL Reality advances modernization and expansion

ZKL Reality, s.r.o., the company within the ZKL Group responsible for managing production facilities, residential buildings, and other properties, continues to strategically develop its real estate portfolio and modernize both residential and non-residential spaces.

In 2025, the company began the second phase of extending the dormitory at Jedovnická 8. The new four-story addition will introduce 50 modern housing units, ranging from studios (1+kk) to three-room apartments (3+kk), providing comfortable accommodation not only for ZKL Group employees. The project also includes a new covered parking area with 30 spaces, partly reserved for ZKL staff. The parking roof features a photovoltaic system, which will support both the building's energy needs at Líšeňská 45 in Brno and the charging of ZKL's electric vehicles.

Brno will also see a new development on Líšeňská Street, planned to offer 91 housing units. The construction is expected to take place over the next three to five years.

Modernization efforts are continuing in Klášterec nad Ohří, where the former main gatehouse of the complex has been renovated. The building is being converted into a smaller health center, specializing in dermatology and preventive care, with an opening scheduled for late 2025 or early 2026.

ZKL Reality is also expanding into residential development projects. The first phase includes the construction of four family homes in the village of Podolí near Brno, followed by the adaptation of three existing buildings for family housing. Plans for further residential development in the area are already underway.

Ing. Jan Harwot, *CEO of ZKL Reality, s.r.o.*

People, processes and digitalization: How ZKL unifies HR across the Group

JUDr. Lenka Povolná has been working at ZKL since February 2023 as the Head of the Human Resources Department. With extensive experience in HR management and law, she focuses primarily on unifying HR processes across the ZKL Group, modernizing systems, and digitalizing HR administration. Together with her team, she successfully implemented the new Helios personnel and payroll system and introduced transparent and standardized remuneration guidelines. In this interview, she speaks not only about her work but also about why personal and individual approaches in HR are irreplaceable.

"HR must be a partner – to management, employees, and production alike."

■ ***You have been working at ZKL since February 2023 as the Head of Human Resources. How would you describe your role within the ZKL Group?***

My role is largely strategic. I oversee HR not only at ZKL, a. s., but also within all companies across the Group. My task is to set unified rules and processes so that our HR work is effective, transparent, and aligned with ZKL's strategy. At the same time, the role is also very hands-on. I deal with real personnel matters at different workplaces, with specific managers and their teams. I consult on labour law issues and communicate with both managers and employees.

I enjoy creating tailor-made labour law solutions for specific cases and situations – solutions that are not only legally compliant but also meet the needs of the business and its employees. In this area, I can draw on both my legal background and extensive experience in employment law. A big part of my role also includes communication with various stakeholders such as union representatives, labour inspectorates, lawyers, or legal advisors representing employees. I consider this an important aspect of my work.

■ ***What have you focused on the most over the past year?***

The main objective has been unifying and modernizing HR processes across the entire Group. We updated internal regulations, introduced a clear and transparent remuneration system, and digitalized part of our HR agenda, especially requests and forms. We are also working closely with our IT department on further digitalization. The goal is to make HR processes more transparent and, at the same time, provide quality data for decision-making by both executives and line managers.

Together with IT, we also launched our HR Intranet this year. This tool now serves as a practical hub where employees can quickly find relevant HR information—whether they are planning to take maternity leave, join a language course, or simply need an overview of valid HR regulations. It also contains a section dedicated to managers, helping them navigate personnel processes and administration linked to team management.

It is important to me that information is clear, easy to understand, and always accessible—ideally within two clicks.

■ ***One major project was also the implementation of a new HR system. How did it go?***

Yes, I consider it one of our biggest achievements. We successfully implemented a brand-new Helios payroll and HR system. We switched from SAP, where HR had been managed for many years, and we managed the transition quickly and without affecting payroll processing. It was demanding, but above all, it was a great team effort. The HR team delivered an excellent performance, and I'm proud that we have established a modern and stable system for the years ahead.

As part of the implementation, we focused on "data cleanliness," meaning a thorough review and correction of all personnel and payroll data before launching the new system. We customized Helios to meet the specific needs of the ZKL Group, particularly manufacturing.

Our IT department also played a key role, ensuring integration with other essential applications, such as the Estelar attendance system and SAP, which continues to be used for production, finances, and accounting.

■ ***How large is the team behind all these activities?***

My immediate team consists of two colleagues: Eva Pechartová, Payroll Accountant, and Romana Čadílková, HR Specialist and Payroll Accountant. I also provide methodological support to HR specialists at the production plants in Brno and Klášterec nad Ohří. Together, we form a relatively small but well-coordinated team delivering professional and personalized HR support.

■ ***What do you enjoy most about your work?***

Definitely the work with people. Each day brings new situations that require both sensitivity and expertise. I enjoy preparing arguments that comply with labour legislation but also make practical sense from a human and organizational standpoint. There's no point in creating something that cannot work in real life.

Sometimes we have to deal with difficult situations, such as contract terminations. That requires resilience, but also empathy. HR is ultimately about people — understanding their needs, communicating effectively, and finding the balance between rules and human relations. And that is something no technology can ever replace.

■ ***How often do you use your legal education in practice?***

Every day. Employment law is inseparable from HR. I provide consultation to managers and HR teams — from employment contracts and dispute resolution to collective bargaining. My legal education helps me see issues in context and approach each situation not only formally, but also with regard to its impact on employees and the company.

■ ***How do you manage to balance such a demanding job with family life?***

Good time management is key. I like order and structure, which helps both at work and at home. My job, however, is not strictly "nine to five". It doesn't end when I close the office door. Often, it requires solutions outside standard working hours, but I see that as part of a management role. With proper planning, I can maintain balance between work commitments and family time.

■ ***From your perspective, why is HR so important at ZKL?***

Because behind every result, there are people. HR is not just about payroll or administration. It is about relationships, motivation, communication, and development. When processes are set fairly and correctly, managers have clarity, employees have trust, and the company gains stability. And for a manufacturing group like ZKL, this is absolutely essential.

■ ***What are your future plans for HR at ZKL?***

We will continue modernizing and unifying HR processes, fully expand digitalization, and strengthen cooperation across all companies within the Group. I want HR at ZKL to be seen as a reliable and professional partner.

At the same time, it is crucial to support production efficiency from an HR perspective — ensuring that our production managers have stable, qualified, and motivated teams, which are necessary for smooth and high-performance operations. Connecting the strategic and practical aspects of HR will be key going forward.

I have also secured, through cooperation with representatives of the Ministry of Labour and Social Affairs, access for ZKL to participate in pilot testing of a new Tool for Job Evaluation and Measurement of Job Value. This tool will help us compare job value across professions and provide valuable data for equal and transparent remuneration. Thanks to participation in this pilot programme, ZKL will gain an advantage in preparing for an upcoming EU directive that will regulate this area at the European level.

The hidden heart of machines: Bearings as a key element of the industry of the future

Today's market offers a wide range of rolling-bearing brands, both newly established and long-standing. Only a few of them, however, possess a qualified development team and truly strong technical know-how. ZKL GROUP is unquestionably among them, proudly ranking within the TOP 5 bearing manufacturers in Europe. This makes us a reliable partner for our customers in the development and resolution of complex technical challenges, testing, and in-depth analyses of bearings returned from operation.

Discussions about Europe's self-sufficiency—and with it the technological and resource security of key industrial sectors—are becoming increasingly prominent. The bearing industry is an integral part of this topic, and our strategic goal has long been to develop this know-how directly in the Czech Republic. Regarding production localization and differing conditions across continents, our group has adopted a long-term strategy of globally diversified manufacturing capacities, with a strong emphasis on competitiveness and future profit growth. At the same time, we are ready to offer our customers innovated solutions for a wide range of applications in 2026.

A newly introduced CTBU 110×180 tapered bearing unit has entered serial production for metro cars and lighter suburban rail transport. Thanks to a unique, patented cage design, ZKL WJ/WJP bearing units for railway axles are engineered to minimize the risk of smearing when rolling elements enter the load zone—a common issue with competing solutions. ZKL thus provides customers with an even higher level of operational safety.

As part of our long-term plan to improve quality through innovations in manufacturing processes, our radial spherical roller bearings now achieve more precise guidance of rolling elements, higher running stability, and reduced friction losses. By consolidating manufacturing operations, we can also efficiently produce smaller production batches, something that was not common in the past. We believe these improvements offer our partners a significant competitive advantage in today's dynamic market.

The company ZKL – Výzkum a vývoj (Research and Development) has long served as a design organization and testing laboratory for the aerospace industry and other specialized high-precision applications. We have systematically developed expertise in this field, and our bearings have been proven for many years in aircraft engines and power units. Building on this know-how, we are launching a new strategic development initiative in 2026: "Hybrid Bearings for the New Generation of High-Performance Unmanned Systems" (CZ.01.01.01/01/24_063/0006947), supported by the European Union. The project will deliver optimized bearing geometry with lower lubricant and fuel consumption, supported by state-of-the-art testing capabilities for high-precision bearings at speeds of up to 100,000 rpm.

Ing. Libor Nohál, Ph.D.
Technical director of ZKL Group

Developing employees' digital competencies

From July 2024 to September 2025, employee training took place at ZKL Klášterec nad Ohří, a.s. as part of the DIGI for Companies project (Reg. No. CZ.31.6.0/0.0/0.0/24_109/0010192), implemented through the National Recovery Plan and the Labour Office. The project focused on developing professional and digital skills that are essential for maintaining competitiveness and increasing the company's efficiency.

Strengthening workforce adaptability through training and courses in IT and Industry 4.0 represents an important investment in the company's future. Over the course of 15 months in Klášterec nad Ohří, employees participated in seven specialized courses aimed at enhancing digital competencies.

In the IT area, the training included Excel courses as well as artificial intelligence training specifically designed for ZKL employees. These helped reinforce knowledge that employees can apply in their everyday work.

Training within the Industry 4.0 framework included courses focused on operating and programming Fanuc industrial robots, automation of CNC machines, and advanced use of precision measuring instruments. These courses supported the development of professional skills for operators, mechanics, setters, and technologists.

In total, employees completed 2,227 hours of training, representing a significant portion of the production plant's workforce. Despite the organizational complexity required to maintain smooth production operations, the project was successfully implemented and brought substantial benefits for the further development of both the company and its employees.

Ing. Jarmila Bůchová, *project manager*
ZKL Klášterec nad Ohří, a.s.

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Trade fairs – a platform for innovation, collaboration, and growth

Trade fairs are important marketing and business tools. They enable direct meetings with customers, the introduction of new products, and the strengthening of partnerships. That is why ZKL regularly uses these opportunities to develop its brand in global markets.

ZKL at Canadian Mining Expo 2025

In early June, we participated in the Canadian Mining Expo 2025 in Timmins, Canada, an exhibition focused on the mining industry. The participation took place in cooperation with our long-term partner, Ringball Corporation, thanks to whom we can jointly strengthen the ZKL brand overseas.

Among more than 340 exhibitors, global leaders such as Komatsu, Epiroc AB, and Weir were present. ZKL was represented by our CEO and Sales Manager for North America. Our main objectives were to strengthen our position in the North American market and to present ZKL as a reliable supplier of bearings for demanding mining applications — from conveyor systems to mining machinery.

Download the brochure and explore how ZKL bearings excel in challenging mining environments:

Successful debut at TRAKO

In the autumn, we made our first appearance at TRAKO in Gdańsk, Poland — the largest Central European trade fair focused on railway transport.

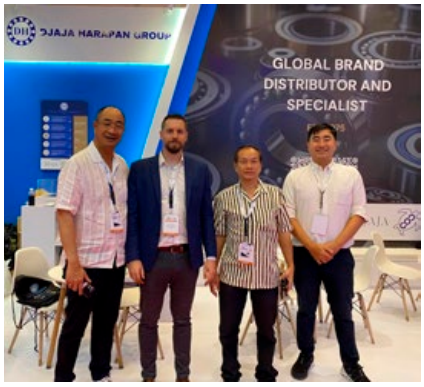
We showcased a complete range of bearings for railway applications: WJ/WJP axle roller bearings, roller and tapered bearing units, as well as spherical roller bearings for locomotive axles.

The fair brought new contacts, strengthened our brand, and opened doors to promising projects. *"The results of our meetings confirm the strategic importance of railway bearings as a key development pillar of ZKL,"* said Libor Nohál, Technical Director of the ZKL Group. He added: *"We will continue to invest in this product line and participate in sector events such as InnoTrans in Berlin or Rail Business Days in Ostrava."*

ZKL at Palmex Indonesia 2025

Our international activity continues to grow in Asia. In October, we presented our solutions at Palmex Indonesia 2025 — the largest global exhibition dedicated to palm oil processing.

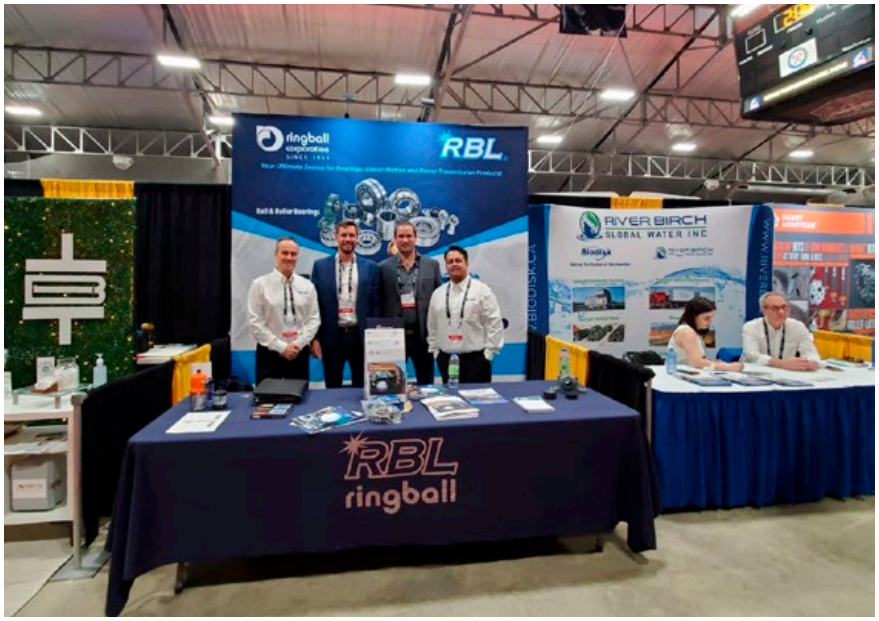
At the booth of our partner PT. Djaja Harapan Makmur, our Sales Manager Jan Křemen introduced customers to ZKL solutions designed for more efficient and reliable operation of machines used in this industrial sector.



We would like to thank everyone who visited us at the trade fairs and joined discussions about our products and innovations. Our gratitude also goes to our partners for excellent promotion of the ZKL brand and for strengthening business relations in international markets.

Follow our website and social media so you won't miss upcoming trade fair dates.

Ing. Hana Luxová
marketing ZKL Bearings CZ, a.s.



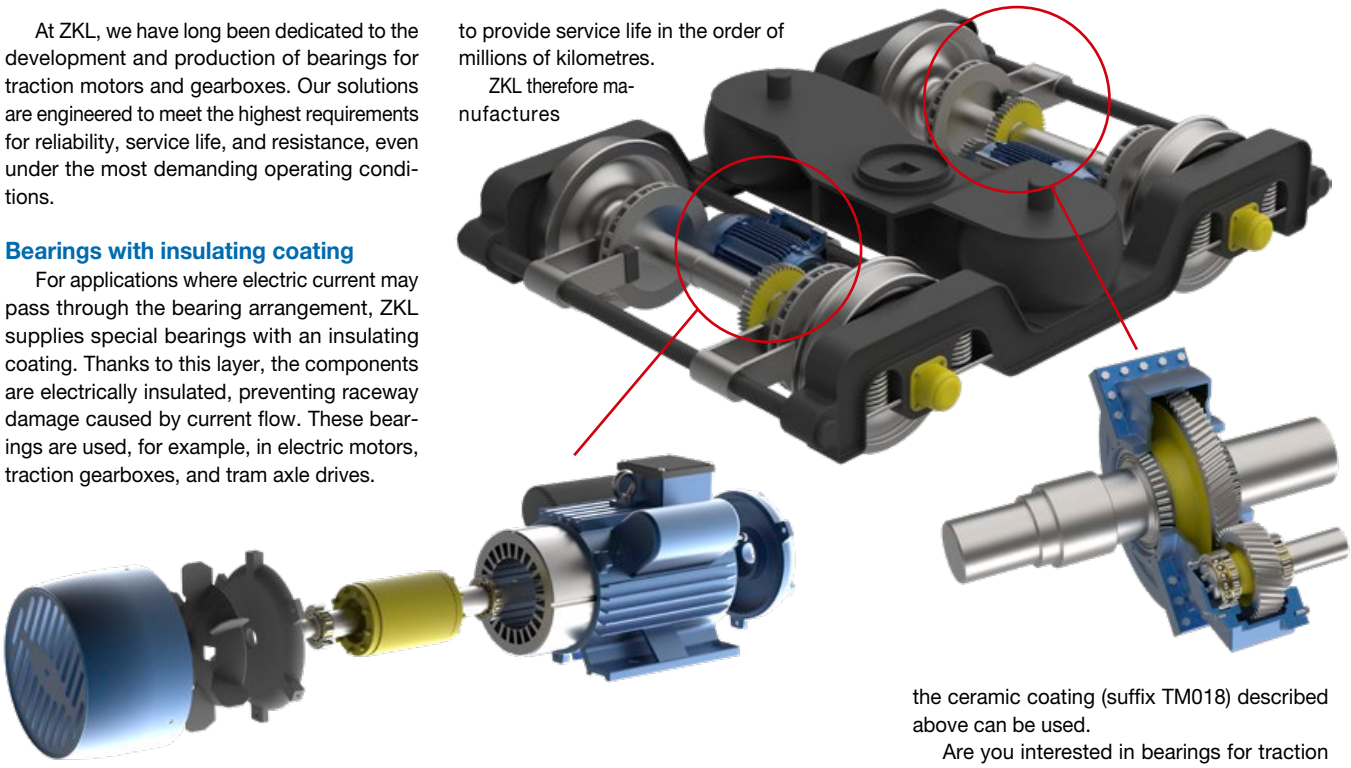
ZKL bearings for traction drives

Traction motors and traction gearboxes form the core of railway vehicle drive systems. In both cases, they are designed for maximum reliability and long service life. A key structural element that often determines their durability is the bearing.

At ZKL, we have long been dedicated to the development and production of bearings for traction motors and gearboxes. Our solutions are engineered to meet the highest requirements for reliability, service life, and resistance, even under the most demanding operating conditions.

Bearings with insulating coating

For applications where electric current may pass through the bearing arrangement, ZKL supplies special bearings with an insulating coating. Thanks to this layer, the components are electrically insulated, preventing raceway damage caused by current flow. These bearings are used, for example, in electric motors, traction gearboxes, and tram axle drives.



The coating is applied using plasma spraying technology: powdered aluminium oxide is melted in a plasma arc and sprayed onto the surface of the bearing components. The surface is then impregnated to improve resistance to environmental influences. The coating provides electrical insulation resistance of 200 MΩ at a DC voltage of 1,000 V.

The coating is most commonly applied to the outer surface of the outer ring but may also be applied to the inner ring or to both rings. It can be used on various bearing types—typically deep groove ball bearings, cylindrical roller bearings, and tapered roller bearings. The designation includes a TM suffix with a numerical extension depending on the specific application (e.g., TM01 – coating on the outer ring, TM02 – on the inner ring, TM03 – on both rings).

When designing the bearing, the thickness of the coating layer is taken into account so that the resulting dimensions and tolerances remain identical to the non-coated version. Therefore, coated and standard bearings are fully interchangeable. Electrical insulation resistance is 100% verified during final inspection of all coated products.

Bearings for traction motors

A traction motor is an electrical rotary machine used to drive railway vehicles such as locomotives, trams, or metro sets. It converts electrical energy from the power supply into mechanical energy that rotates the drive axle.

Traction motor bearings must withstand radial loads, circumferential speeds of up to 5,000 rpm, thermal stress (temperatures often exceeding 100 °C), and electrical erosion. Despite these conditions, they are commonly expected to provide service life in the order of millions of kilometres.

ZKL therefore manufactures special ball and roller bearings with the TM05 suffix, designed for these demanding conditions. They typically feature increased radial clearance (C3, C4) and higher precision classes (P6, P5) for smooth, vibration-free operation. They are supplied with a solid brass cage guided either on the rolling elements or on the outer ring.

Where electrical insulation is required, versions with ceramic coating (suffix TM015) described above can also be supplied.

Bearings for traction gearboxes

A traction gearbox is a mechanical transmission that transfers torque from the traction motor to the axle of a railway vehicle. In most cases, one- or two-stage gearboxes with helical gearing are used. Emphasis is placed on low noise and high efficiency, which is important not only for passenger comfort but also for energy efficiency.

The input shaft of a traction gearbox is typically supported by two cylindrical roller bearings and one four-point contact ball bearing. The output shaft – and, where present, also the intermediate shaft – is most often supported by tapered roller bearings or spherical roller bearings.

For these applications, bearings with the TM08 suffix are designed, featuring increased radial clearance and, depending on the application, also higher running accuracy. Where insulation is required, the ceramic coating (suffix TM018) described above can be used.

Are you interested in bearings for traction motors and gearboxes? For detailed information on this assortment and its advantages, please contact our sales team or technical support:

Contact details:
ZKL – Výzkum a vývoj, a.s.
Technical Support Department
support@zkl.cz www.zkl.eu
+420 544 135 412

Ing. Lukáš Fiala
Application Engineer ZKL – Výzkum a vývoj, a.s.

You can also download individual product sheets here:

Root cause analysis of bearing damage: How we enhance the reliability of your equipment

In previous issues of our magazine, we focused on specific diagnostic methods used to evaluate bearing damage, including fractography. However, a fracture or crack in a bearing is usually the final consequence of a wider range of influences—ones that can only be fully understood through comprehensive expert analysis.

During the first half of 2025, our team carried out dozens of root cause analyses of damaged bearings manufactured by leading global producers, used across a variety of applications and industrial sectors. Our goals were to identify key factors affecting bearing lifespan and help customers prevent future failures.

Based on collected data, contamination has proven to be the most frequent cause of bearing damage. In more than 30% of all cases, we identified particles or impurities within the bearing originating from machining, assembly procedures, or the lubrication system. Even microscopic particles can significantly affect bearing performance, influence fatigue life, increase noise or vibration. With detailed analysis, these influences can be detected and eliminated through suitable corrective steps.

Identifying the true primary cause is not always straightforward. It often appears together with secondary effects such as localized fatigue damage or abnormal vibration. Thanks to our expertise and well-equipped laboratory, we can accurately determine the root cause and recommend a specific solution.

What can we do for you?

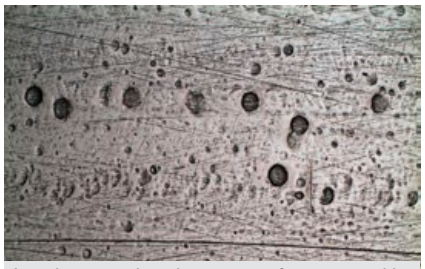
We provide our customers with:

- Technical support in complaint and warranty evaluations.
- Recommendations to optimize product design and manufacturing processes.
- Quality control and preventive guidance to increase equipment reliability.

"The marks on a bearing raceway can be read like fingerprints at a crime scene. They help us determine the true cause of the damage."

Combining expert knowledge, modern laboratory equipment and experience, we ensure that your machinery remains reliable and performs efficiently over the long term.

Marks from manufacturing residues—small, irregular indentations and scratches.



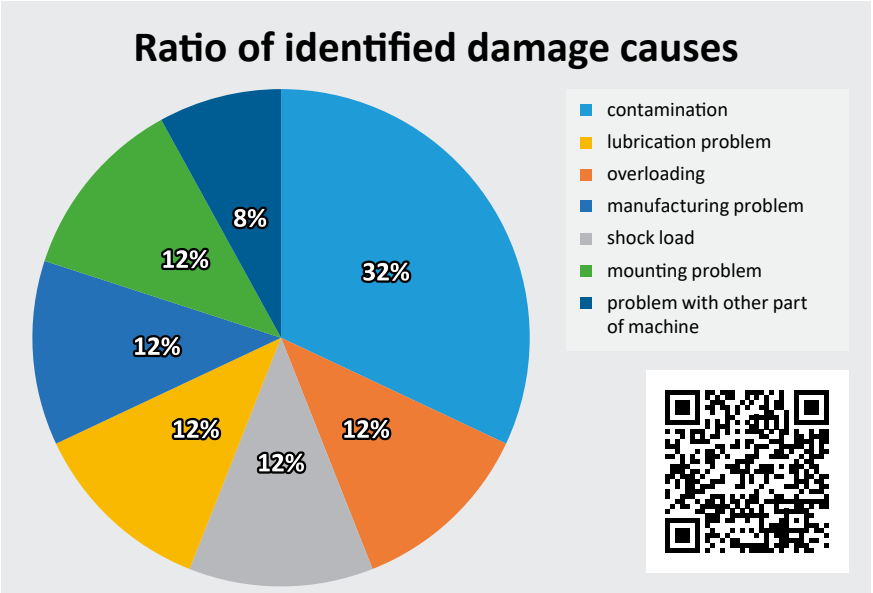
Imprints on a bearing part surface caused by equally sized process contaminants.

What does bearing damage from contaminated lubrication look like?

If contamination enters the bearing internal space—or remains there as a residue from manufacturing process—on raceway are typical marks / bruises from solid contaminant. When a rolling element passes over a contaminant, the particle imprints into the raceway surface, which is usually softer than the rolling element.

This makes it possible to identify contamination from the manufacturing process. Typical evidence includes short steel chips, brittle grinding residues shaped into small spheres, or abrasive particles. Other types of contamination may originate from outside the bearing.

Contaminants from external manufacturing processes could be from deburring, cleaning, or polishing—commonly consist of powders or suspensions. They create uniform indentations of similar size on the bearing parts surface.



How to prevent premature damage caused by contamination?

You can significantly reduce contamination risk by following a few basic guidelines:

- Maintain a clean assembly environment—avoid dust and drafts.
- Ensure all related components are perfectly clean and free of machining residues.
- Open the bearing's original packaging only immediately before installation.
- Use clean tools, clean lubrication equipment, and clean gloves.
- Use clean lubricants from original sealed package. If needed, filter the lubricant before use.

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ZKL split bearing saves time and costs at the Port of Açu, Brazil

Ferroport, operator of one of the largest port terminals in Brazil, handles year-round 24/7 transshipment of iron ore. A key piece of equipment in this process is a bucket-wheel reclaimer, which transfers ore from stockyards onto conveyor belts and further to the pier.

Due to heavy loads and continuous operation, such machines face severe bearing wear, and their replacement can be both time-consuming and costly.

Challenge

The standard bearing used in this application required a complex disassembly. At a port where every hour of unplanned downtime means a loss of up to 13,000 tons of iron ore handling capacity, every minute counts. The goal was to find a solution that would significantly reduce bearing replacement time and minimize production interruptions.

Solution

A team of ZKL technical specialists, together with the local ZKL representative ZKL Rodamientos S.A., recommended a split bearing type PLC_62-14-06.R with a 500 mm inner diameter. This bearing design allows installation without fully dismantling the shaft and surrounding components, drastically reducing downtime and eliminating the risk of damage during handling.

The installation was carried out by Ferroport's maintenance team under the supervision of Edson Almeida, ZKL Technical Representative in Brazil. The complete installation process took approximately 12 hours, representing only 25% of the usual assembly time required for a conventional bearing.

Results

- 75% reduction in installation time
- Minimal equipment downtime and fast return to operation
- Smooth, trouble-free installation supported by ZKL experts
- Improved operational reliability of critical equipment

About the equipment

- Type: Bucket-wheel reclaimer with boom conveyor
- Capacity: 13,000 t/h
- Operational reach: 785 m
- Boom length: 50 m with lifting winch
- Original bearing: 230/530K (Ø530 × Ø780 × 185 mm)
- New ZKL split bearing: PLC_62-14-06.R (Ø500 × Ø780 × 185/270 mm)

The machine was originally designed and manufactured by BARDELLA S.A. for the Porto Açu terminal, today known as Ferroport, a joint venture of Anglo American and Prumo Logística Global.

Reliability proven over time

The split bearing had been purchased in advance and stored at the port for several years under harsh conditions marked by high temperatures, humidity, and salt air. When unpacked, it was found in perfect condition with no signs of corrosion or damage, confirming the quality of both ZKL engineering and protective packaging.

Conclusion

This project confirms once again that the right bearing choice can deliver measurable savings—reducing downtime, lowering operating costs, and increasing equipment reliability. ZKL split bearings have proven to be a trusted solution for demanding industrial environments.

For more information on the application of ZKL split bearings in industrial operations, please contact your ZKL sales representative.

Edson Almeida
ZKL Rodamientos S.A.

ZKL NEWS

ZKL Group Magazine
This Issue: December 2025
Run by Editorial Board
For needs of ZKL Group published by ZKL, a. s., Jedovnická 8, 628 00 Brno

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Registered at Ministry of Culture of Czech Republic under Ref. No. E 11989.

Type Setting and Print:
Ideal Graphics s. r. o.
www.ideal-studio.cz