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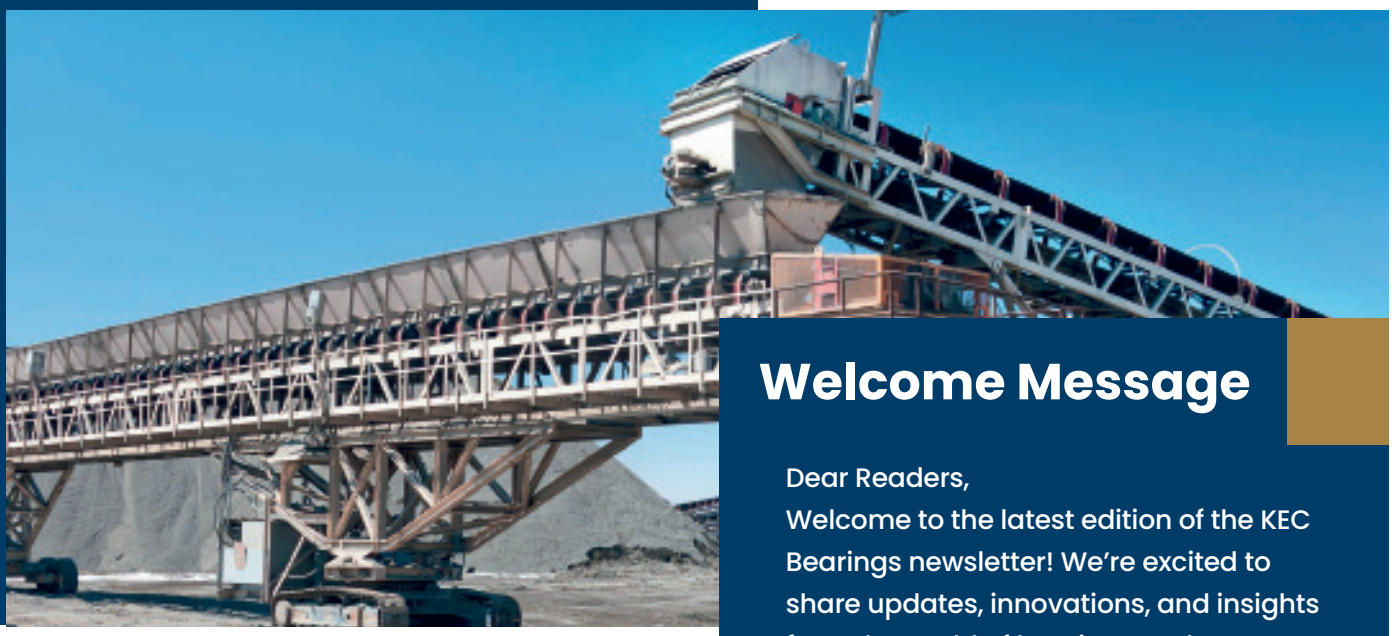

Welcome Message

Dear Readers,
Welcome to the latest edition of the KEC Bearings newsletter! We're excited to share updates, innovations, and insights from the world of bearings and mechanical solutions. Thank you for being a part of our journey.
Best regards,
Mehul Viradia
Director - Operations
KEC Bearings Pvt Ltd

• Respect for all – Core value of the company

Respect for all is a core value that defines our company culture and guides every interaction we have. We believe in fostering an inclusive environment where every individual, regardless of their background, role, or perspective, is treated with dignity and fairness. This value drives our commitment to collaboration, open communication, and mutual understanding, ensuring that every team member feels valued and empowered. By upholding respect as a cornerstone of our operations, we create a positive, supportive, and harmonious workplace that strengthens our relationships and fuels our success.

Central India's Biggest SME Exhibition

Industrial ENGINEERING EXPO

RAIPUR

27 28 29 30

DECEMBER 2024

SHRI RAM BUSINESS PARK

• Upcoming Events

Join us at INDUSTRIAL ENGINEERING XPO on 27-30 DECEMBER 2024 at RAIPUR. We'll be showcasing our latest technologies and solutions. Don't miss the chance to connect with our team and explore new opportunities.

• Health Camp

- We have recently organised a health camp with Rajkot's best hospital "Backbone Medicity". We prioritised our employee's health throughout so that we can have better and healthy environment in the company which will encourage everyone to achieve their targets within deadlines mentioned.
- We have also arranged CPR training to all the employees which will enable them to ensure fast first aid in the emergency situation. It is also great to have advice and demos from the experts to have right and effective CPRs while emergency.
- "Our workers' health camp is dedicated to promoting wellness and fostering a healthier workforce. Through comprehensive health check-ups, expert consultations, and wellness sessions, we aim to ensure the well-being of every team member. By prioritizing preventive care and health awareness, we create a supportive environment where our workers can thrive both professionally and personally

• Latest Trends in Bearing Technology

The image shows a full complement bearing, a type of bearing designed to maximize load-carrying capacity by incorporating the maximum number of rolling elements (rollers) within its structure. Unlike standard bearings with cages, full complement bearings eliminate the cage, allowing more rollers to fit into the assembly. This design is particularly suited for applications where heavy radial loads are predominant, as the increased number of rollers distributes the load more evenly. However, this design may trade off higher speed capacity and lubrication efficiency due to increased friction. Full complement bearings are commonly used in industrial machinery, construction equipment, and heavy-duty applications requiring high durability and reliability.

• Wind Turbine Gear Box Bearing Failure

The gearbox in a wind turbine plays a critical role in transmitting the rotational energy from the slow-moving blades to the high-speed generator. Bearings within the gearbox are subject to significant stress due to variable wind loads, high rotational speeds, and harsh environmental conditions. Bearing failure is a common cause of wind turbine gearbox downtime, leading to high maintenance costs and operational losses. This case study examines the root causes, failure mechanisms, and mitigation strategies for gearbox bearing failures in wind turbines.

• Background

A wind turbine gearbox typically consists of multiple stages: planetary, helical, and sometimes bevel gears. Bearings in the gearbox are subjected to:

- High loads and vibrations: Fluctuating wind speeds create uneven loads.
- Harsh environments: Exposure to moisture, dust, and temperature variations.
- Lubrication challenges: High speeds and loads make effective lubrication essential but difficult.

Common bearing types used include cylindrical roller bearings, spherical roller bearings, and tapered roller bearings.

Observed Failure

In a 2.5 MW wind turbine, the gearbox began showing abnormal vibrations after 6 years of operation. Inspections revealed failure in the high-speed shaft bearing and planet bearings in the planetary gear stage. The turbine experienced a 30% efficiency drop before it was taken offline for repairs.

Root Causes of Failure

1. Surface Fatigue (Spalling):
   - Repeated high loads caused surface cracks in the raceways and rollers, leading to spalling (material flaking).
   - This was exacerbated by uneven load distribution due to misalignment.
2. Wear and Lubrication Degradation:
   - Poor lubrication due to inadequate oil viscosity and contamination resulted in metal-to-metal contact.
   - Oil analysis revealed high levels of particulate matter and water contamination.
3. White Etching Cracks (WEC):
   - Microscopic cracks, often associated with hydrogen embrittlement, were found in failed bearing material.
   - WEC is linked to electrical discharges or tribo chemical reactions within the lubricant.
4. Overloading and Misalignment:
   - Wind gusts and incorrect gear alignment caused localized stress on specific rollers and raceways.
5. Environmental Factors:
   - Frequent temperature fluctuations and condensation caused thermal expansion and corrosion.

Failure Impacts

Downtime Costs: The turbine was offline for two weeks, resulting in significant revenue loss.

Repair Costs: Replacing the gearbox bearings and associated components cost approximately $100,000.

Operational Implications: The failure underscored the importance of proactive maintenance and monitoring.

Mitigation Strategies

1. Enhanced Bearing Design:
   - Use of full complement cylindrical roller bearings with higher load capacity.
   - Adoption of advanced steel materials resistant to wear and cracking.
2. Improved Lubrication:
   - Use of high-quality synthetic lubricants designed for high-load applications.
   - Implementation of advanced filtration systems to prevent contamination.
3. Condition Monitoring:
   - Installation of vibration sensors and oil analysis systems for early detection of anomalies.
   - Regular thermography to monitor temperature variations.
4. Operational Adjustments:
   - Improved turbine control systems to minimize extreme loading conditions.
   - Periodic realignment of gears to prevent uneven load distribution.
5. Coating Technology:
   - Use of surface coatings such as tungsten carbide to enhance wear resistance.

• Conclusion

Wind turbine gearbox bearing failures can significantly impact turbine performance and operational costs. This case study highlights the importance of addressing design flaws, improving lubrication practices, and adopting condition monitoring techniques. By proactively addressing these challenges, wind farm operators can reduce downtime, extend the lifespan of critical components, and improve overall turbine reliability.

• Technical Tips

Brief Introduction about Lubrication

Lubrication is a critical aspect of bearing performance and longevity. Bearings, essential components in machinery, reduce friction and support rotational or linear motion. Proper lubrication minimizes wear, reduces friction, and protects bearings from contaminants and corrosion, ensuring smooth operation.

Why Lubrication is Important:

- Friction Reduction:

Lubricants create a thin film between rolling and sliding surfaces, reducing direct contact and wear.

- Heat Dissipation:

Lubricants absorb and transfer heat generated during operation, preventing overheating.

- Contamination Control:

Proper lubrication prevents dust, dirt, and other particles from entering the bearing surfaces.

- Corrosion Prevention:

Lubricants form a protective layer, safeguarding the metal surfaces from moisture and oxidation.

Types of Lubricants Used in Bearings:

- Grease: A semi-solid lubricant, ideal for most applications due to ease of application and longevity.
- Oil: Suitable for high-speed or high-temperature applications, offering efficient heat dissipation.
- Solid Lubricants: Used in extreme conditions where liquid or semi-liquid lubricants may fail (e.g., graphite or molybdenum disulfide).

Lubrication Methods:

- Manual Application: Simple but requires regular monitoring.
- Automatic Systems: Continuous lubrication for demanding environments.
- Oil Bath/Reservoir: Common for high-speed bearings.

Conclusion:

The right lubrication method and type significantly enhance bearing efficiency, reduce downtime, and extend equipment life. Regular maintenance and proper lubrication selection are key to optimal bearing performance.

Community Engagement

Sustainability Initiatives:

Our company is committed to driving sustainability through innovative initiatives that align with our mission to create a positive environmental and social impact. We prioritize reducing our carbon footprint by optimizing energy efficiency, transitioning to renewable energy sources, and implementing waste reduction strategies across operations. Our supply chain is built on ethical sourcing practices, promoting sustainable materials and responsible partnerships. Furthermore, we engage employees and communities in green programs such as tree planting, recycling drives, and environmental education campaigns. By integrating sustainability into our core business strategies, we aim to foster long-term value for stakeholders and contribute meaningfully to a more sustainable future.

Contact Us

We'd love to hear from you! If you have any questions, feedback, or would like to learn more about our products and services, please contact us at:

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