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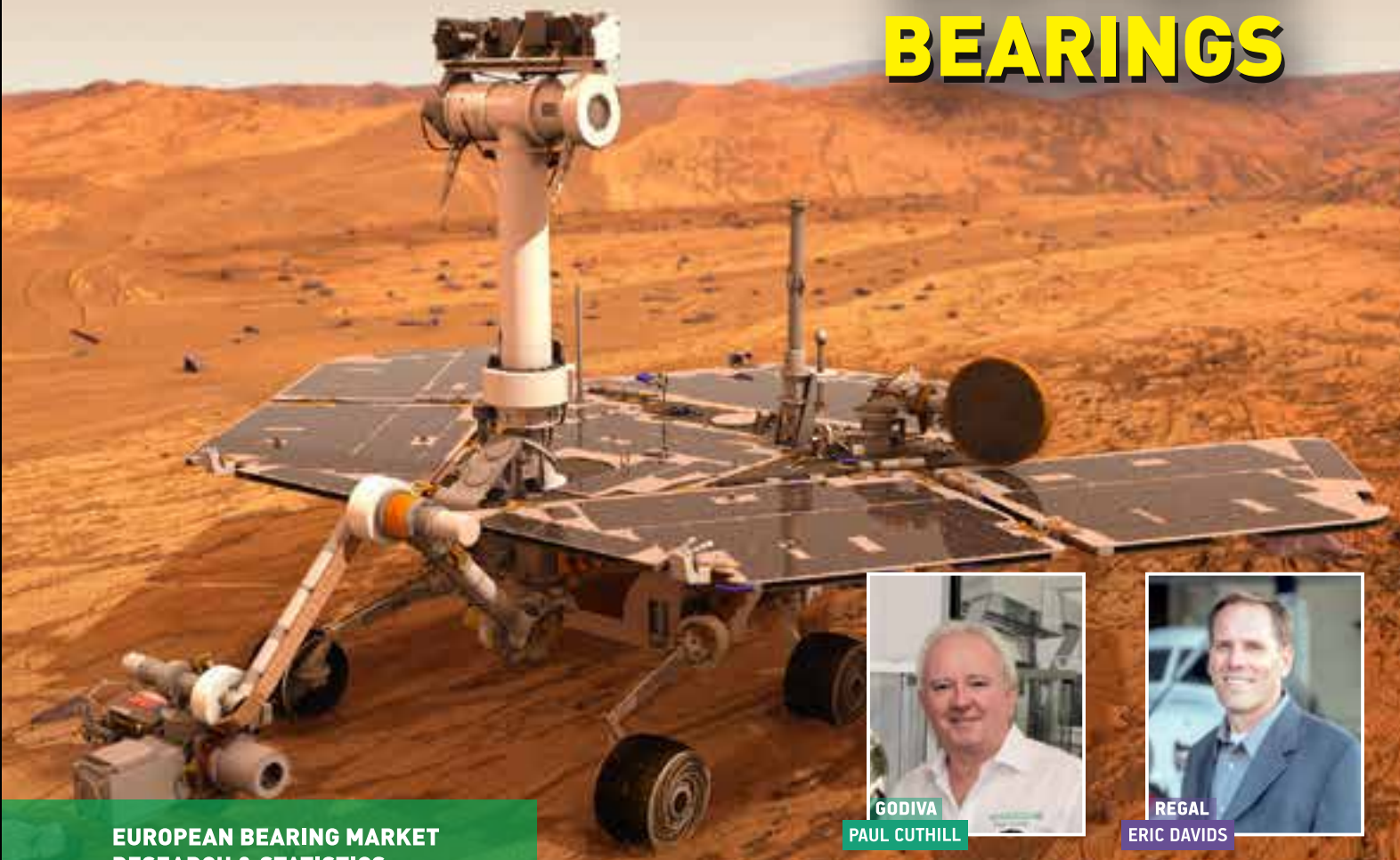
Bearing NEWS

2018
SEPTEMBER
ISSUE 10

BEARING INDUSTRY MAGAZINE

Unveiling The Secrets of MARS ROVER BEARINGS



GODIVA
PAUL CUTHILL

REGAL
ERIC DAVIDS

SCHAEFFLER
PROF. DR. TIM HOSENFELDT

NKE
THOMAS WITZLER

EUROPEAN BEARING MARKET RESEARCH & STATISTICS

INTERNATIONAL BEARINGEXPO & CONFERENCE INDIA 2019

DISCOVER THE ENERGY SAVINGS ALTERNATIVE TO BALL BEARINGS

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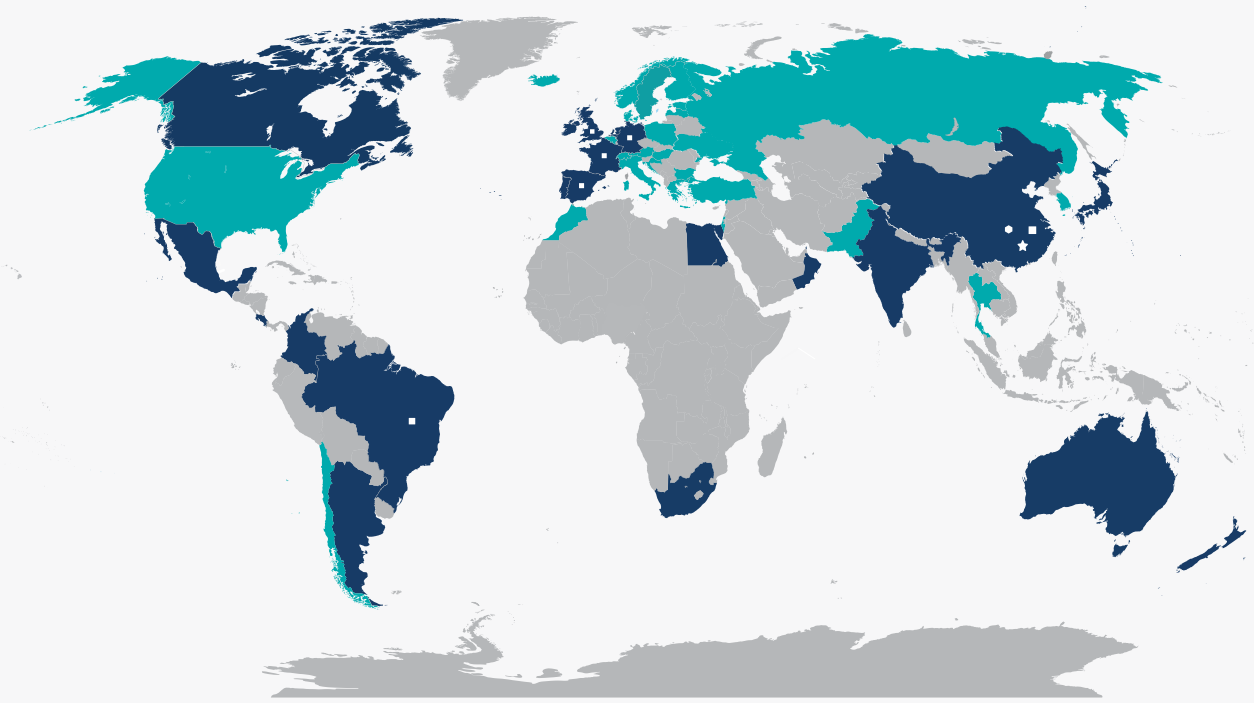

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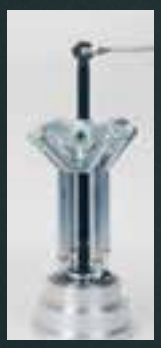
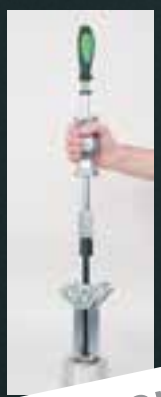


The ball bearing is inside a casing, but has no shaft for support



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Bearing NEWS
BEARING INDUSTRY MAGAZINE

The BearingEXPO & Conference, the event that will shape the future of the bearing industry

BearingNEWS magazine has developed and launched end of 2017 the BearingEXPO (bearing-expo.com), online exhibition and network portal for the bearing & rolling equipment components Industry. The portal has grown since then to an unique network of more than 700 companies from different aspects of the bearing and power transmission industry. Upon many requests and the great success of the online portal, BearingEXPO is preparing to launch physical BearingEXPO & Conference events starting from 2018 in four different countries and continents, in cooperation with the Hannover and Deutsche Messe organizations.

The BearingEXPO & Conference will be an unique event serving a wide scope of bearing industry professionals, original equipment manufacturers and reliability engineers. Each event is designed according to the demand and needs of the local players where the event takes place. The aim is to create synergy between the companies by networking and sharing the latest available knowledge, innovative products and services within the bearing, power transmission, OEM, lubrication, equipment, industrial services, organizations and maintenance industries. For 2018 and 2019 the International BearingEXPO & Conferences will be held in Shanghai, Istanbul, Hannover and Mumbai.

Further in this issue, we have 'a BearingNEWS classic': four exclusive interviews with the leaders of important production and distribution organizations in the bearing and related products. The first interview is with Eric Davids, Application Engineering Manager Aircraft Technology at Regal Beloit America. We discussed with him the Regal specialty bearings which are designed for specific applications and the reason why these specific applications cannot accommodate a catalogue bearing.

The second interview is with Paul Cuthill, Director at Godiva Bearings in UK. Paul Cuthill started his journey to the top of GODIVA Bearings 40 years ago as a summer helper; and has proved the upcoming young generation that the bearing industry rewards hard workers. We tried to reveal a tip of his adventures at Godiva with the "Story of the original Godivaman".

Our third interview is with the four managers at NKE Austria and Fersa Bearings. NKE Austria has been part of the Fersa Group for more than two years now. We discussed the details about the group's international expansion, investments in the next two years and the future outlook with Thomas Witzler, General Manager at NKE in Steyr, Austria; NKE's Sales Director JesUs Monforte; Fersa Bearings's CEO Carlos Oehling and COO Pedro Pablo.

Our last interview in this edition is with Prof. Dr. Tim Hosenfeldt, Senior Vice President Technology Strategy and Innovation at Schaeffler. He explained us how global mega trends such as climate change, globalization, urbanization and digitalization affect the corporate strategy and product portfolio of a mobility providers and rolling bearing manufacturers.

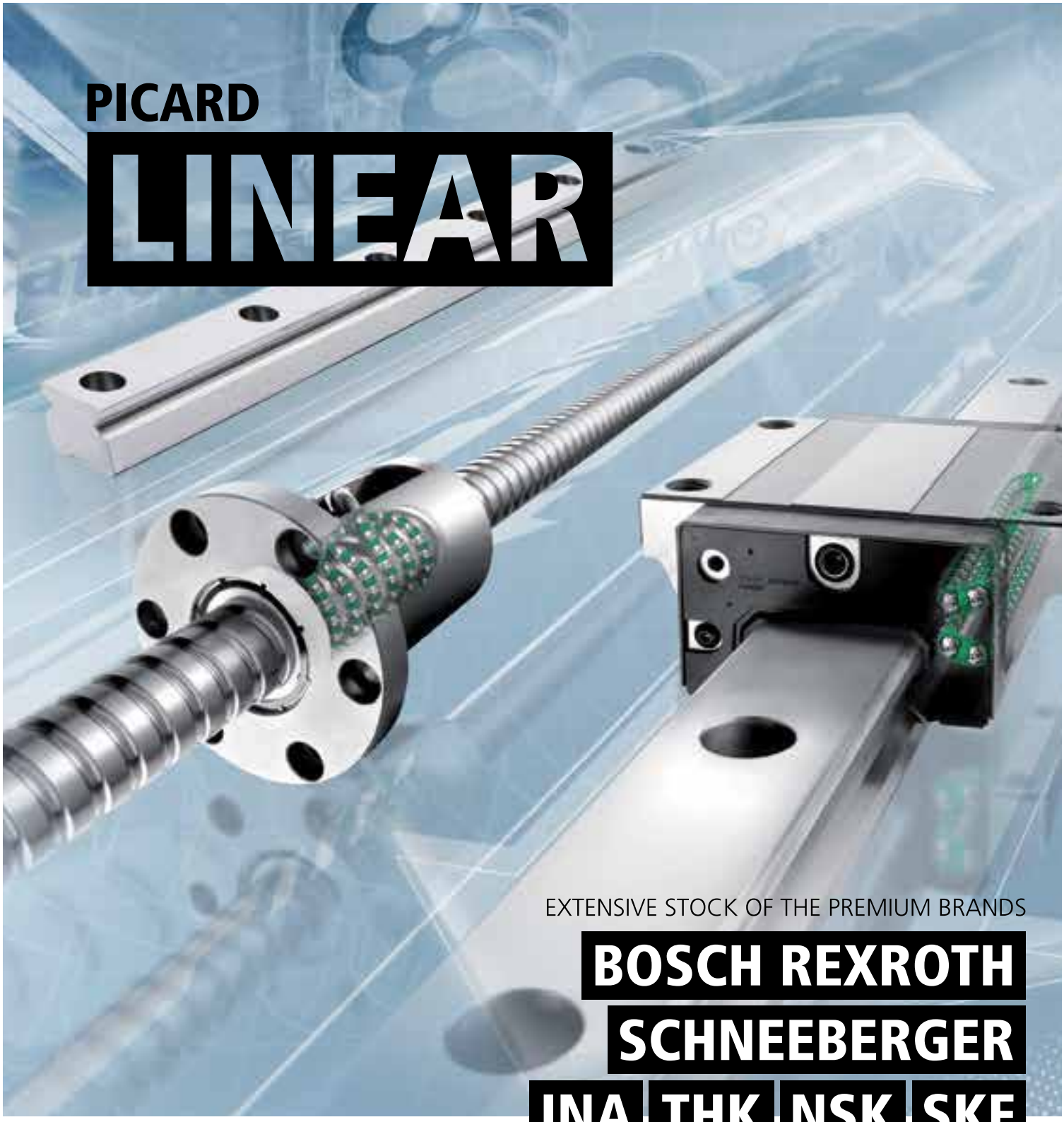
What's Rolling..

What's rolling in the bearing industry? A brief summary of what happened during the last six months in the bearing industry; bearings operating on Mars; details of an efficient maintenance with automatic lubrication dispensers; an exclusive interview with the traditional gearbox manufacturer CIDEPA; preparation and approach to bearing damage analysis; details of an acoustic lubrication program; energy savings alternative to ball bearings; how proper lubrication can enhance a plant's reliability; bearing materials key to increased reliability and a new volume of top 100 bearing reliability tips from Per Arnold Elgqvist... Together with all these interesting topics, many other bearing industry related articles, case studies, insights and developments can be discovered in this September issue of the BearingNEWS magazine.

156 pages full of BearingNEWS. We hope that you will enjoy it!

Kenan M. Özcan

Editor in Chief
BearingNEWS



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What's Rolling...

What Happened in the Bearing Industry First Half of 2018

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BEARING FAILURE ANALYSIS

Presented by
PER ARNOLD ELGQVIST

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Six Signs *of* A Successful ACOUSTIC LUBRICATION PROGRAM

Acoustic Lubrication is just one of the 8 application pillars adopted by world-class ultrasound programs. And what an important one it is. Poor lubrication practices account for as much as 40% of all premature bearing failures. When ultrasound is utilized to assess lubrication needs and schedule grease replenishment intervals, that number drops below 10%. What would 30% fewer bearing related failures mean for your organization?

Keep up with the changes in on-condition bearing lubrication or risk falling behind. For example, Technology advancements from ultrasonic innovator SDT are transforming the way we look at the grease replenishment task. SDT's LUBExpert, an ultrasound solution that helps grease bearings right, simplifies a complex process into a simple, 2-step procedure.

A successfully implemented world class, acoustic lubrication program delivers many wins for your company. Reduced maintenance costs as well as other savings on grease consumption and less unplanned downtime are two big doors that open other possibilities for factory maintenance teams. Another win will be factory wide efficiency. Properly maintained and lubricated bearings run more efficiently, using less energy and lowering their environmental impact.

With so much innovation available, the question begs, is your lubrication program world-class?

"Here are six signs to help you decide."

Six signs your lubrication program is on track

1. A Change in the Quantity of Grease Consumed

Maintenance departments should track grease consumption to monitor and control costs. Root Cause Analysis on failed bearings points to over-greasing as the leading contributor. Bad procedures lead to bearings routinely receiving more grease than they're designed to handle. The excess ends up being pushed into the motor casing or purged onto the floor. Reduction in grease consumption is a sure sign that your lubrication program is on the right track.

Over lubrication happens when grease replenishment intervals are scheduled based on time instead of condition. Control lubrication tasks with ultrasound to monitor condition and maintain optimal friction. The time between greasing intervals increases, resulting in less grease used per bearing. Over-greased machines are not only more susceptible to fail, but run less efficiently. Optimally greased bearings draw far less energy and contribute to a greener factory. That alone should be motivation enough to Grease Bearings Right
.

2. Fewer Lube-Related Failures

Your organization should track failures and perform root cause analysis to eliminate sources of defects.

Optimized greasing programs experience fewer lube-related failures. Less fixing and fire-fighting translates to more creative time for maintenance. Use that time to bring more machines into the greasing program.

Additionally, with ultrasound you find many non-trendable defects. For example, broken or blocked grease pipes and incorrectly fitted grease paths that prevent grease from reaching the bearing.

3. Optimized MRO Spares Management

Your new and improved lubrication program is delivering wins; better control of grease consumption, fewer failures, and more productivity for maintenance. Use this time to study trends and better manage your storeroom.

A decrease in bearing related failures improves spares optimization. Share your ultrasonic lubrication data with your MRO Stores manager to create a plan to reduce the number of emergency parts on hand.

Since you're taking stock, why not shift some burden to your suppliers? Ask them to confirm your emergency parts against their own stock. If it can be supplied on the same day then why keep it on your balance sheet?

4. Increased Number of Machines Monitored

One benefit of an effective lubrication program is time.

- Time allotted to monitoring machines instead of fixing them.
- Time allotted to correctly assessing the real needs for lubrication.
- Time to look at the big picture.

Take for instance, criticality assessment. Many lubrication programs begin with small steps. All the "A" critical machines receive priority, rightly so. But what about the rest? With more time to plan, organize, and schedule, increase the number of machines acoustically monitored for optimal lubrication.

5. Save Time. Combine Acoustic Lubrication and Condition Monitoring

You worked hard for these results. It's time to use your data for more than just lubrication.

Acoustic lubrication is the proven method to ensure precise bearing

lubrication. New technology from SDT, LUBExpert, combines the power of onboard lubrication guidance with Four Condition Indicators for bearing condition assessment.

The time savings from assessing bearing condition during the lubrication process is beyond valuable and another sign your acoustic lubrication program is on the right track.

6. Inspector Confidence at an All-Time High

Reliable machines are the product of an effective lubrication program. You have:

- Managed grease consumption
- Fewer grease related bearing failures
- Optimized MRO spares
- More machines under watch
- Increased data collection intervals

The power of adding ultrasound to your greasing program delivers win after win for reliability. Reliability breeds confidence. More confident inspectors make better decisions and infect a positive culture throughout the organization.

Ultrasound assisted lubrication of plant assets offers significant benefits that calendar based lubrication cannot. Lubrication serves a primary purpose, which is to create a thin layer of lubricant between rolling and sliding elements that reduces friction. So, it makes sense that the best way to determine the lubrication requirement of a machine is to monitor friction levels, not time in service.

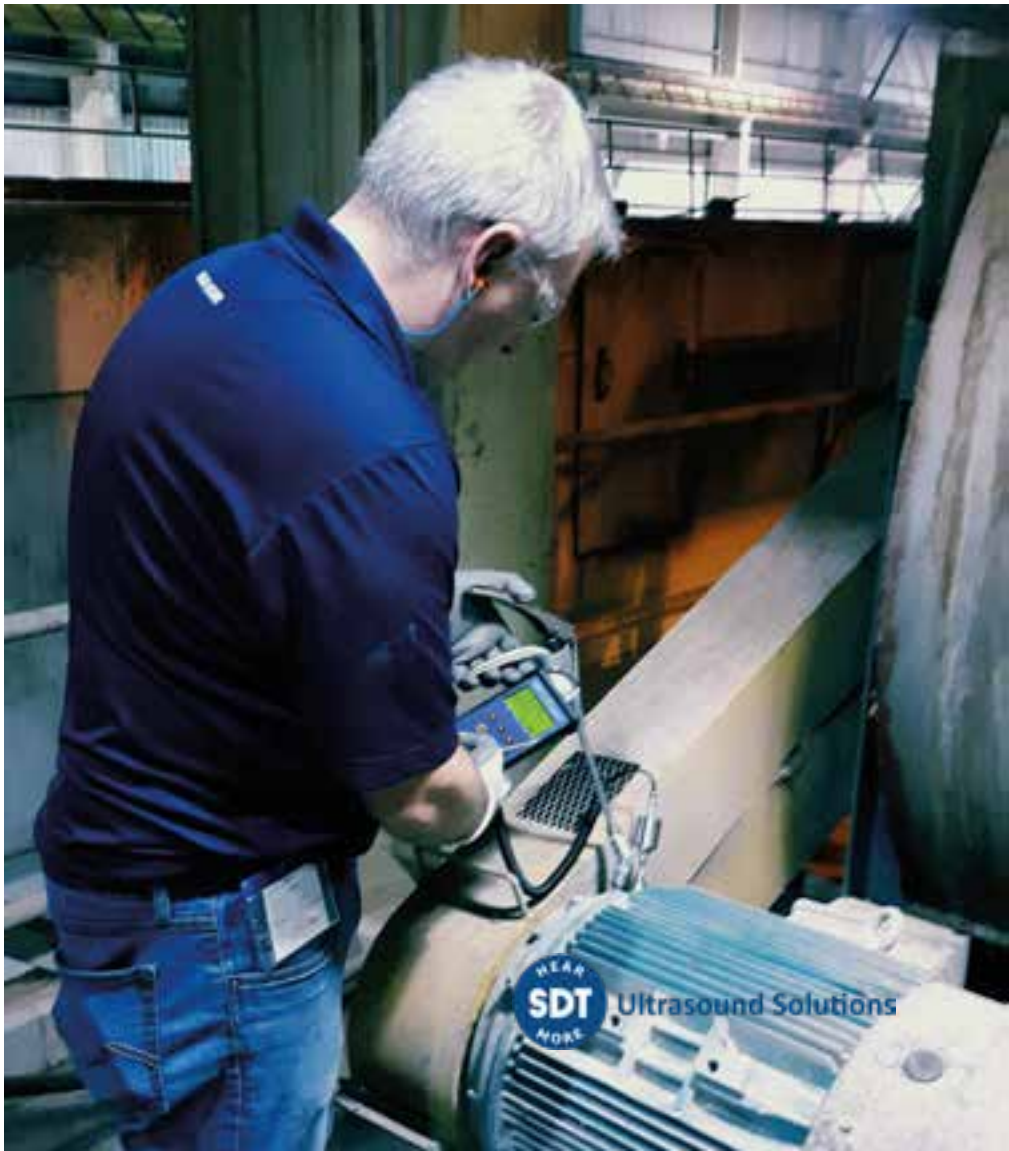
Machines that are properly lubricated require less energy to run. Imagine that reducing grease consumption can lower your energy bills. Machines that consume less electricity run cooler and enjoy longer life cycles.

Finally, by monitoring the condition of your machinery's lubrication, you are at the same time collecting valuable condition data about the machine itself. Dynamic and static ultrasound data coupled with the 4 condition indicators (RMS, Max RMS, Peak, and Crest Factor) are all indicators of bearing health.

Optimizing lubrication of plant machinery with ultrasound results in a significant reduction in grease consumption. Successful ultrasound programs accelerate the velocity of positive culture change.

Who knew so much good news could come from such a simple shift from calendar to condition based maintenance?

For more information visit www.sdtultrasound.com



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Almagard clings tenaciously to metal, and will not pound out or sling off, even in extreme conditions.

Highly resistant to water
Almagard (left) stays in place, while the competitor's grease (right) washes away.

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ZeN™
RAISE THE BAR WITH ITS
NEW FACILITY IN SHANGHAI

With more than 50 years of cumulated experience in the bearing industry and remarkable growth over the last 15 years, the ZEN Group announces now promising capabilities with the opening of its brand new facility of Shanghai. This new facility will extend the logistics possibilities and include a new inspection and product development center for ZEN bearings. And the investments won't stop there.

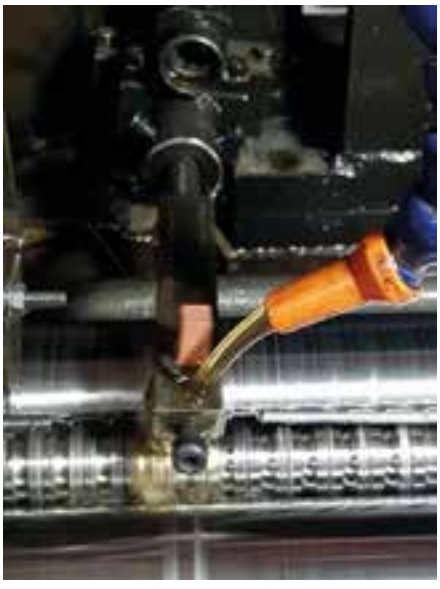
German quality standards, international presence

Founded already in 1965 under the the name of Eisenberg as a national bearing dealer in Dusseldorf (Germany), ZEN has been one of the pioneers of bearing manufacturing in China at the very-demanding level of German quality standards. Early investment in modern production lines and quality controls quickly gave the group a prominent reputation. Initially active in miniature bearings in the outskirts of Shanghai, the group quickly expanded its program to all existing bearing types and relies today on a powerful network of 22 distributors, in no less than 20 countries spread on 6 continents. Three factories operating throughout China produce millions of bearings every day to meet the needs of millions of industrial users. Want an example of ZEN group can do ? At the time of writing this article, Zen ranks one of the largest independent stainless steel bearing producers in the world.

Focus on quality controls

Beside to the existing prestigious ISO 9001 certification awarded by TUV Rheinland the ZEN group will obtain the even more sophisticated ISO/TS 16949 certification beginning of 2019 to achieve the growing quality demands of the international automotive industry that places the group among the world leaders in terms of quality management. In addition to the logistical capabilities offered by the 5,000 square meters of the new facility, 20 inspectors are working tirelessly to perform a full cycle of TUV approved tests, including:

- ***Visual inspection:*** The eye of the experts helps detecting any material or assembly fault
- ***Dimension Testing:*** A very strict tolerance check is performed on the inner and outer diameters to guarantee the best service life
- ***Noise Testing:*** The noise level can be critical in many applications, which is why an accurate measurement is performed
- ***Vibration Testing:*** High frequency analysis can detect incorrect internal clearance, misalignment or imbalance
- ***Radial Clearance Testing:*** The machines are regularly calibrated to ensure DIN standards certified by the German TUV



"Initially active in miniature bearings in the outskirts of Shanghai, the group quickly expanded its program to all existing bearing types and relies today on a powerful network of 22 distributors, in no less than 20 countries spread on 6 continents."

- ***Hardness Testing:*** The Rockwell test measures the hardness of the material by measuring the penetration depth of the penetrator
- ***Salt Spray Testing:*** This test evaluates the overall resistance to corrosion of metallic parts

The facility also features a technical department of 5 engineers and an AutoCAD department. Therefore, ZEN can provide a high quality technical support and innovative solutions to all technical challenges.

Paving the way for the future

This new achievement is actually part of an investment plan of approximately $ 3.1 million over a 24-month horizon : ZEN is working on its fourth plant, to be announced in 2019, to further strengthen its position in the domestic market.

Logically, the new facility supports this next strategic milestone and levels up the distribution and logistics capabilities. The global management team expressed its pride regarding all the work done by the Chinese management team, which achieved continuous growth over the past 15 years. The ZEN group, already half-a-century old, quietly pursues its expansion by proving, as if it were necessary, that only high standards engender lasting collaborations.

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AIR BUSHINGS

Discover the Energy Savings Alternative to Ball Bearings

Five Ways
Air Bushings Outperform Ball Bearings

Energy savings continues to be a focal point for consumers and companies alike.

To remain competitive and cost-effective, companies today invest in energy initiatives to identify areas with potential energy savings. This type of thinking is what our world demands to not only preserve our future resources but to keep a company competitive for the long-haul.

If you are serious about cutting energy costs, you need to make sure you've considered everything—including questioning the efficiency of even the most fundamental of components—including your bearing. But to justify changing something as fundamental as a bearing, you need hard data.

Fortunately, New Way® Air Bearings did the homework for you. We're on a mission to inform engineers, regardless of industry, of the benefits of air bearings in energy usage as well as operations efficiency.

Friction - Your Obstacle to Savings & Efficiency

In use for centuries, ball bearings are tried and true. In fact, we have become accustomed to their often costly side-effects, such as:

- Friction
- Heat Generation
- Maintenance Downtime
- Wear

- Noise
- Speed Limitations

Friction is the main culprit here as it is the trigger activating a cascade of the other disadvantages. Energy costs rise as more energy is required to power the moving parts with the friction-laden bearing. Ultimately, manufacturing operations feel the impact of this through decreased production and profit.

While bearing technology has advanced to reduce friction through special coatings, friction is still nonetheless present.

But what would happen to our energy costs and productivity if we could eliminate friction? Thankfully, companies no longer have to accept and mitigate the effects of friction on energy and production.

Air Bearing Technology - A Proven, Viable Option

Air bearings offer an alternative to traditional lubrication-based bearings by providing a pressurized film of air to produce the necessary gap for operations. Friction is removed creating a domino-effect of advantages, such as:

- No Contact
- No Wear
- No Moving Parts
- Less Heat Generation
- No Burdensome Lubrication Requirements
- Less Maintenance Downtime
- Higher Speeds

Again, friction is the key component here, however, removal of friction creates a host of benefits. Energy costs decrease since there are no moving parts, and manufacturing operations see an increase in efficiency and production yield. A win-win for the bottom line!

So, why aren't air bearings more prevalent?

Despite being fairly new to mainstream use, air bearings are a proven technology, dating back more than a half-century. The removal of friction made them ideal for use in the metrology and hard drive industries where accuracy and control are paramount. At that time, air bearings were custom built so were out-of-reach for a typical manufacturing company.

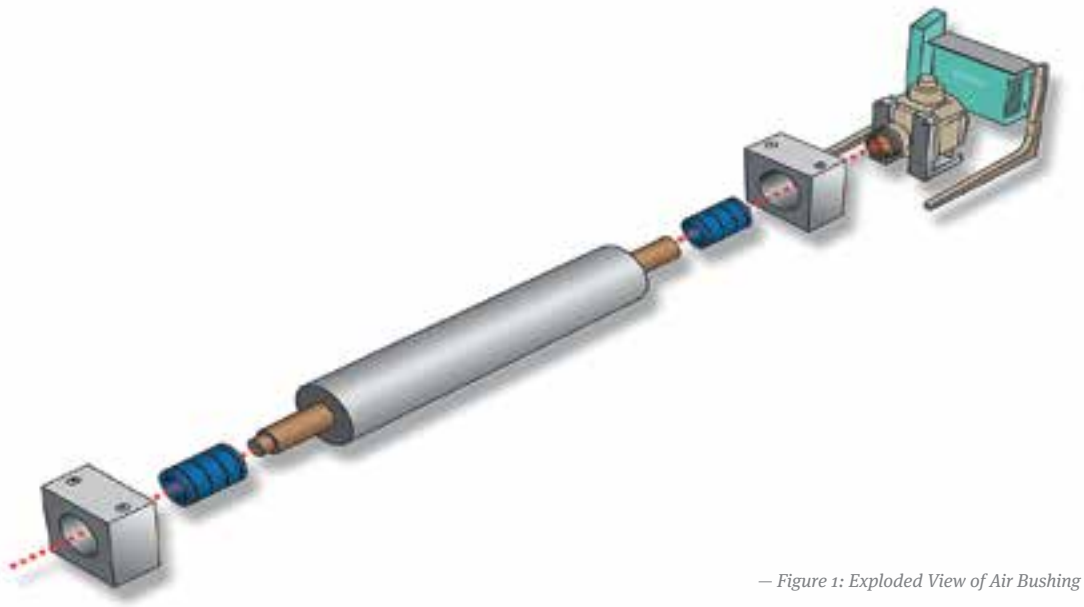
Standardized air bearings were first introduced in 1982 by New Way Air Bearings, then known as Aeolus Bearings. Air bearings became economically viable for a broad range of customers, particularly in light of the growing demand for micro and nano-level accuracies demanded during manufacturing and inspection. But, the benefits of removing friction go even further by increasing operational efficiencies, decreasing energy costs and thereby increasing production.

It's All In the Numbers - Air Bushings vs. Ball Bearings

New Way Air Bearings recently put these energy and efficiency claims to the test with one of its own products. A New Way Air Bushing was chosen for use in a side-by-side comparison test with a mechanical ball bearing. The air bushing was chosen because of its wide use across industries in linear and rotary motion, including applications where both motions are required concurrently.

The air bushing, like all New Way products, is built on New Way's Porous Media TechnologyTM. This unique design distributes the air evenly across millions of sub-micron holes inherent to the porous carbon face, providing a "zero friction" load bearing interface. Essentially, the air bushing is a tube of porous media which self-centers from the force of the air flow, allowing for true 360° non-contact motion on round shafting.

Figure 1 shows an exploded view of an air bushing in use with a roller.



— Figure 1: Exploded View of Air Bushing Setup

— Figure 2: Ball Bearing Unit

— Figure 3: Air Bushing Unit

Co-polymer O-rings are provided for ease of installation into a pillow block housing unit to compensate for parallelism errors of up to .002" over the length of the shaft. While not used in the demo, the air bushing design can also accommodate an axial constraint by adding on a porous media thrust face to the tube. A thrust bushing is thereby created, allowing for radial motion while constraining one end axially to prevent linear motion in one direction.

Figure 1 above shows how air bushings are essentially interchangeable with existing ball bearings. The similarity in uses and setup made the air bushing a perfect candidate to compare with a ball bearing. For the demo, two different units were constructed, as seen in Figures 2 and 3.

Each demo unit consisted of:

- Identical Rollers: 5” diameter, 26” wide, roll with shaft = 75 lbs.
- Identical Direct Drive Motors and Couplings
- Identical Drives and Motor Setup/Tuning Files
- Identical Testing speeds: 300, 900 and 1800 RPM

Tests were conducted at each speed where the motor current to maintain the roll at speed was measured. Consistently, each test showed the air bushing required only 20% of the current the ball bearing needed to keep the roll spinning at speed. That’s an 80% savings in energy by the air bushing over the ball bearing!

New Way engineers weren’t surprised by these findings based on the removal of friction. We realize it takes seeing real numbers to consider and justify changes to fundamental components like bearings.

But there’s even more than energy savings. There are some natural extensions to the energy savings that make a switch to air bushings a prudent investment.

Five Ways to Realize Your Investment

As with any purchase, it’s important to understand more than just the initial cost. A wise decision-maker looks beyond and considers the overall return on investment (ROI.) Let’s look at several other reasons which make a compelling argument for the switch to air bushings.

1. Increased Operations Time

Since there are no lubrication requirements or wear from moving parts, less downtime is required. This opens the door to more production time increasing production quantity.

2. Decreased Heat Generation

No friction or contact equates to less heat generated increasing component life. This also contributes to more operation time since less wear is experienced driving component failure/replacement.

3. Improved Reliability

Since there are no moving parts, there is less likelihood of failure, improving reliability over ball bearing operations. One of the advantages of New Way’s Porous Media Technology is the decreased chance of damage in the event of a loss in air supply. The porous material allows the air to slowly diffuse; when touchdown occurs, the soft carbon face minimizes chances of damage or scratching.

4. Increased Speed

Since air bushings have no moving parts and are non-contact, higher speeds can be achieved. Similarly, the concern of heat generation due to high speeds is also eliminated, opening the door to increased production.

5. Decreased Operational Energy Costs

This last benefit is a step beyond the energy savings demonstrated by the air bushing over the ball bearing. We can take this a step further and note a savings in energy for time previously spent to perform maintenance of ball bearings whether for lubrication or part replacement. Additionally, less energy would be spent to offset friction-induced heat in operations.

Ready to Make the Switch?

If you are ready to experience the benefits of Frictionless MotionTM, New Way stands at the ready! With more than 30 years experience in air bearings, New Way can guide you through the process of use in either a new system or a retrofit to existing equipment. Our air bushings are designed to accommodate commonly-available shaft sizes and are available in a range of standard metric, English as well as custom sizes. We pride ourselves on working directly with customers to find solutions, either with one of our standard products or developing a custom solution. Let us get you started on the road to efficient operations with a complimentary consultation to determine the right product for your operation!

To learn more about New Way Air Bearings, air bushings and our other products, please visit us online at www.newwayairbearings.com

Author: Drew Devitt, CEO/CTO, Founder of New Way Air Bearings

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European
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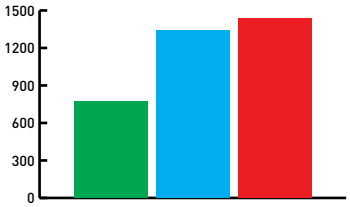
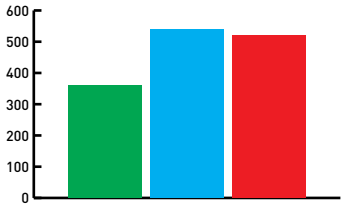
Data about the bearing distribution market and individual Import, Export, Manufacturing statistics for
28 EU member countries

The bearing market is playing a major role within the European industry and can be defined as a solid indicator for the economy. Many large and family-owned companies are today the key players on the continent, supplying thousands of industrial users active in hundreds of industry segments. In the research below we tried to share estimated imports, exports and manufacturing of different type of bearings, which are forming the main categories within the bearing industry. The shared statistics are an estimation of previous years and gathered from various sources. The accuracy of the data depends on the reporting companies and registration authorities and cannot be considered as absolute, since data from many small size companies and some manufacturing companies are not shared. The research includes the import, export and manufacturing of ball bearings, tapered roller bearings, spherical roller bearings, needle roller bearings, cylindrical roller bearings, bearing units and other less common bearing types.

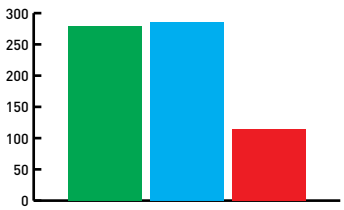
Germany



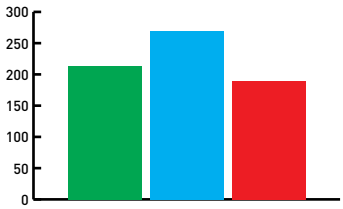
Ball Bearings



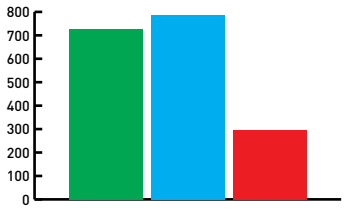
Tapered Roller Bearings



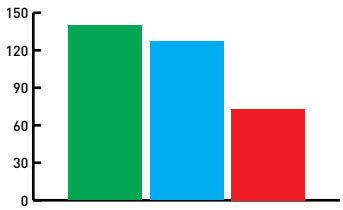
Spherical Roller Bearings



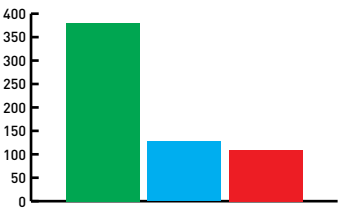
Needle Roller Bearings



Cylindrical Roller Bearings

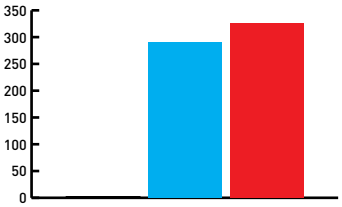


Bearing Units

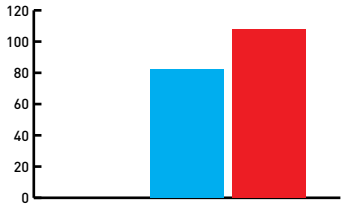


Other Bearings

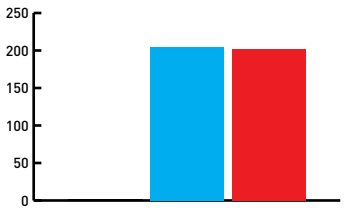
Belgium



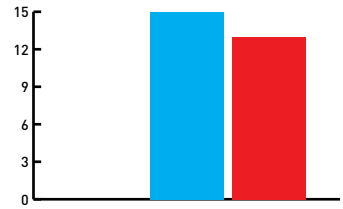
Ball Bearings



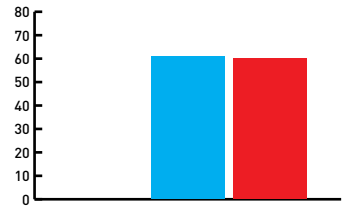
Tapered Roller Bearings



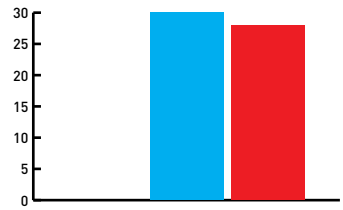
Spherical Roller Bearings



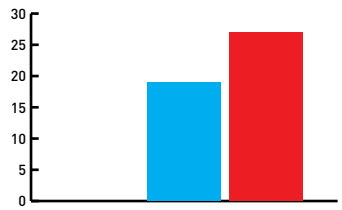
Needle Roller Bearings



Cylindrical Roller Bearings

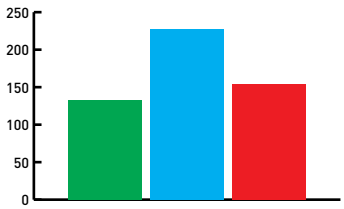


Bearing Units

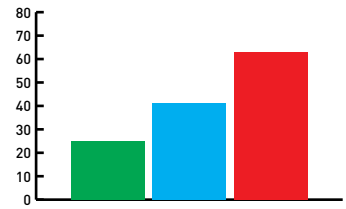


Other Bearings

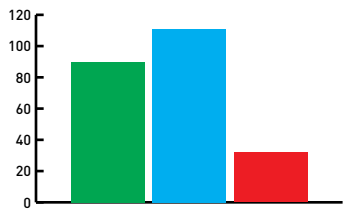
UK



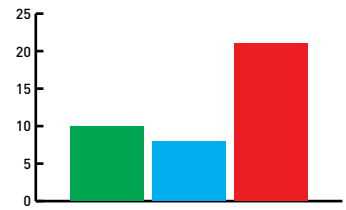
Ball Bearings



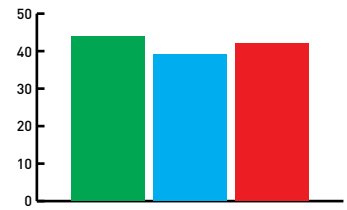
Tapered Roller Bearings



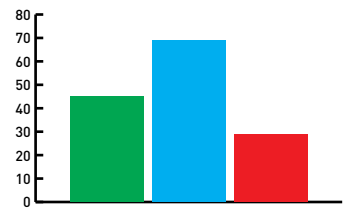
Spherical Roller Bearings



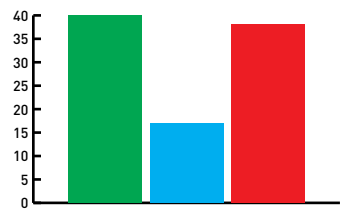
Needle Roller Bearings



Cylindrical Roller Bearings



Bearing Units



Other Bearings

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Aerospace technology prolongs your bearing life

A beverage bottling plant was experiencing failures on the standard cam followers used in a case packer. Due to the environment, excessive corrosion was resulting in reduced bearing life, which required the cam followers to be replaced every three months.

The standard cam followers were replaced with McGill® CRES CAMROL® stainless steel cam followers, which were dimensionally interchangeable with standard cam followers.

In addition to the standard McGill CAMROL cam follower bearing features, CRES CAMROL cam followers utilize stainless steel materials, LUBRI-DISC® + seals and H1 food grade grease. Our seal design incorporates aerospace technology to help prolong bearing life in a variety of corrosive environments.

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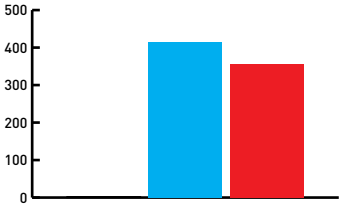
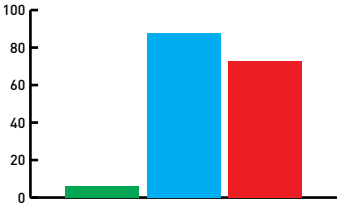
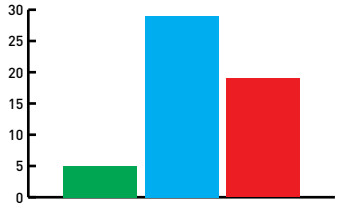
Netherlands



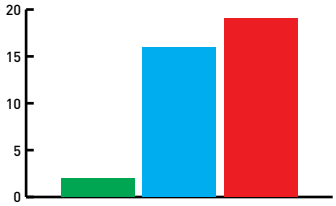
Ball Bearings



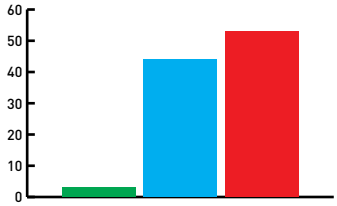
Tapered Roller Bearings



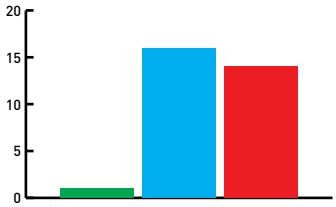
Spherical Roller Bearings



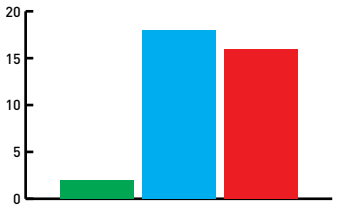
Needle Roller Bearings



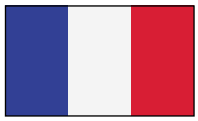
Cylindrical Roller Bearings



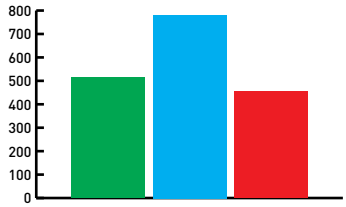
Bearing Units



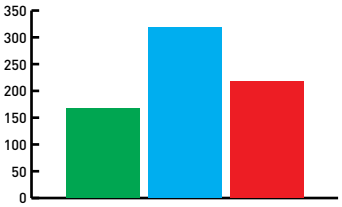
Other Bearings



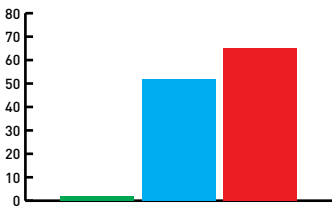
France



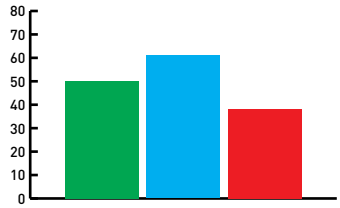
Ball Bearings



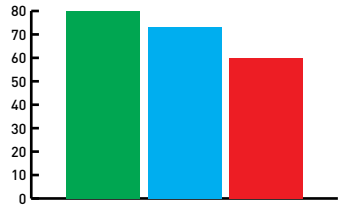
Tapered Roller Bearings



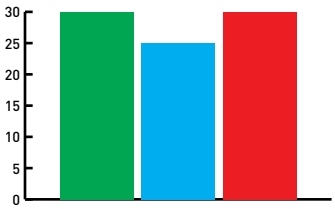
Spherical Roller Bearings



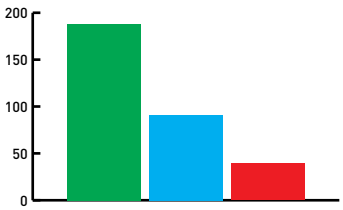
Needle Roller Bearings



Cylindrical Roller Bearings

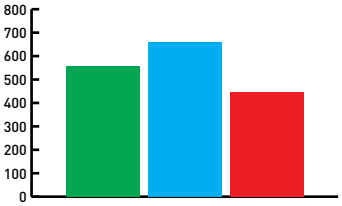


Bearing Units

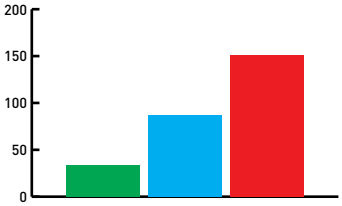


Other Bearings

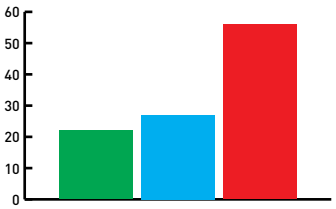
Italy



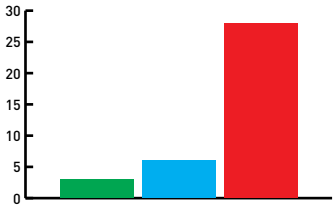
Ball Bearings



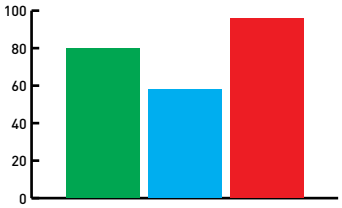
Tapered Roller Bearings



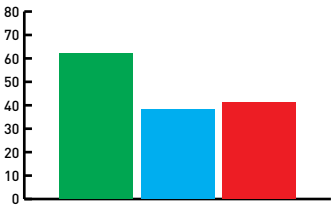
Spherical Roller Bearings



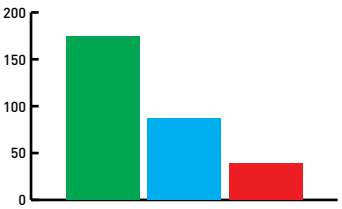
Needle Roller Bearings



Cylindrical Roller Bearings

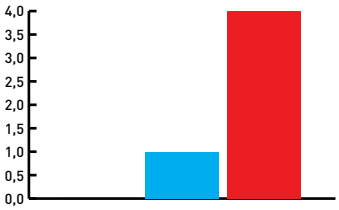


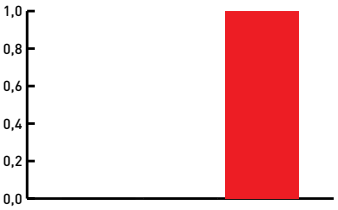
Bearing Units

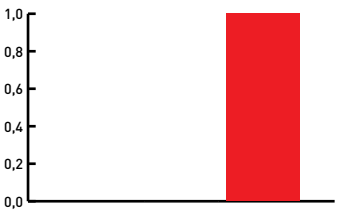


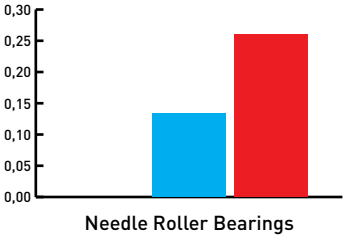
Other Bearings

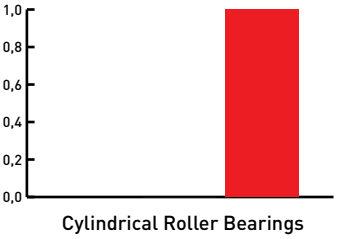
Luxembourg

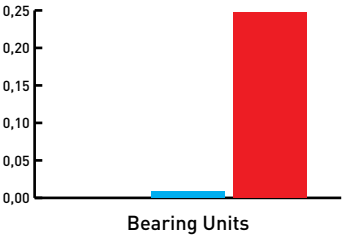


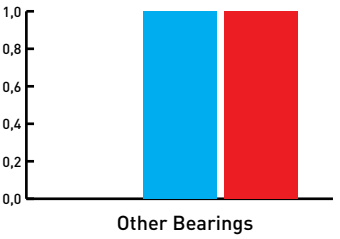




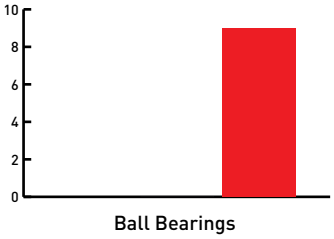


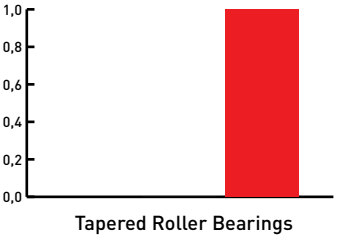


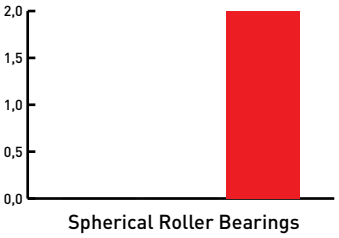


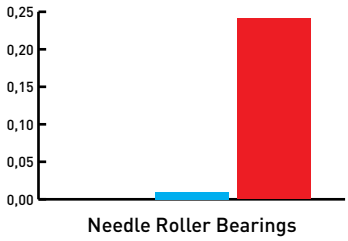


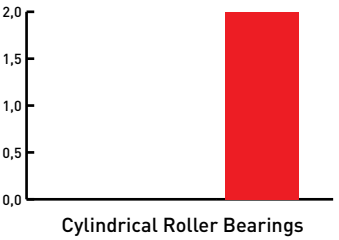
Ireland

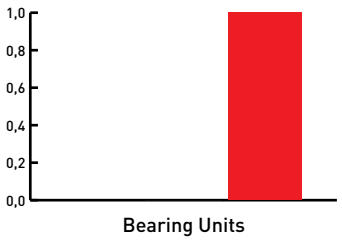


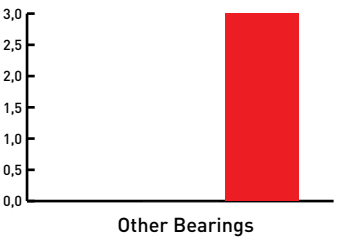


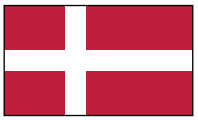












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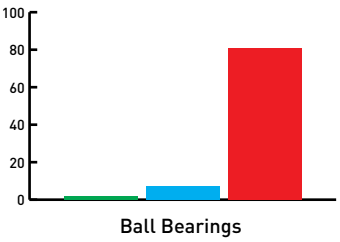

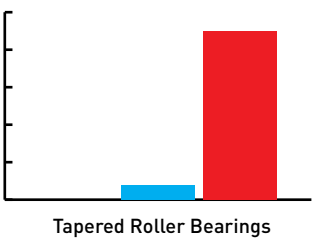

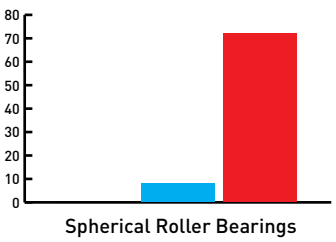

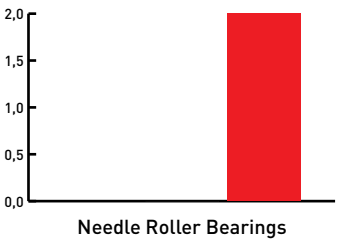

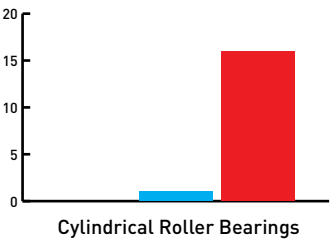

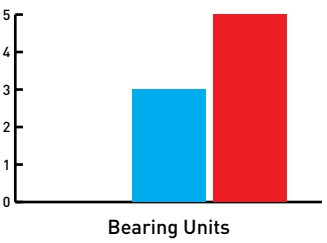

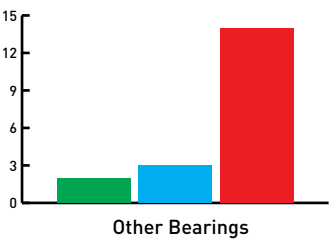

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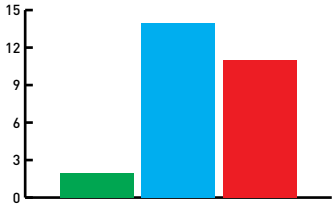
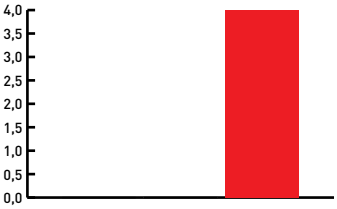
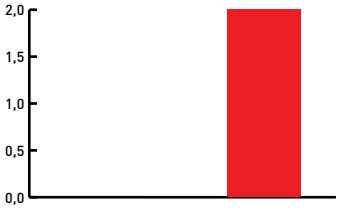


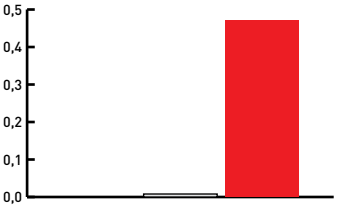
Ball Bearings



Tapered Roller Bearings



Spherical Roller Bearings



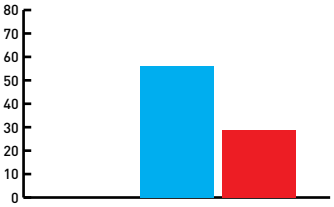
Needle Roller Bearings

Cylindrical Roller Bearings

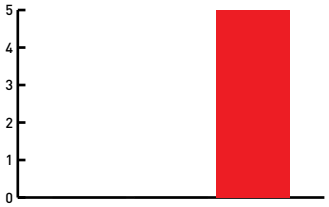
Bearing Units

Other Bearings

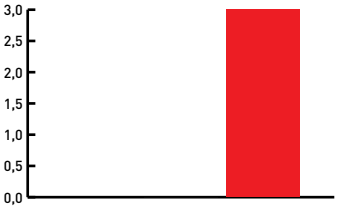
Portugal



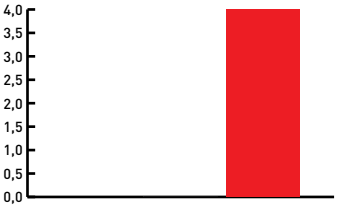
Ball Bearings



Tapered Roller Bearings



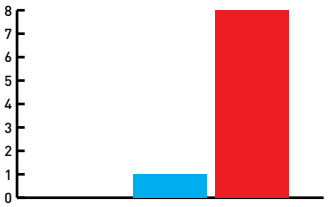
Spherical Roller Bearings



Needle Roller Bearings

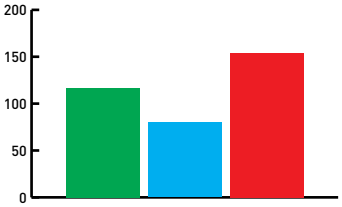
Cylindrical Roller Bearings

Bearing Units

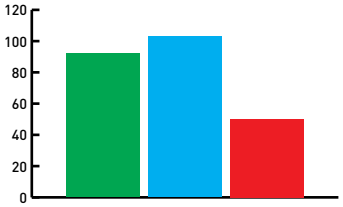


Other Bearings

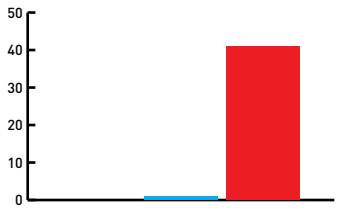
Spain



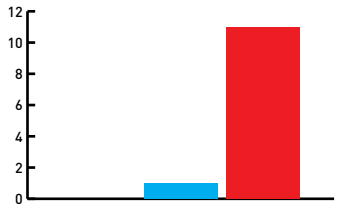
Ball Bearings



Tapered Roller Bearings



Spherical Roller Bearings



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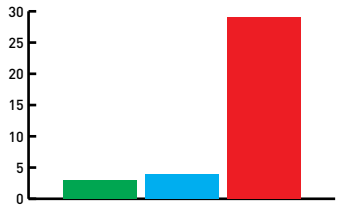
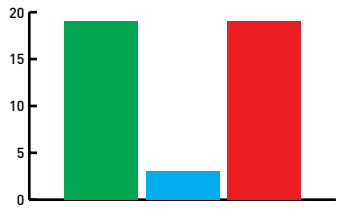
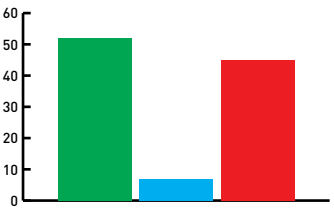


Cylindrical Roller Bearings

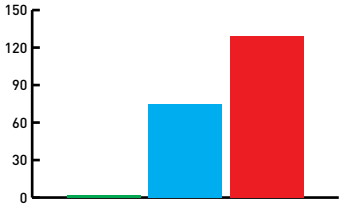


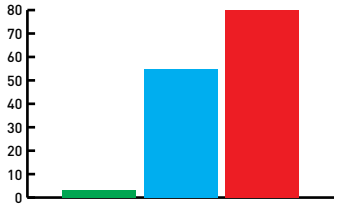
Bearing Units

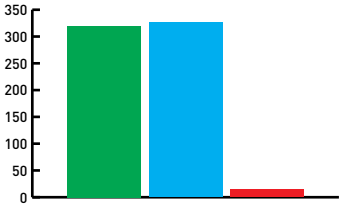


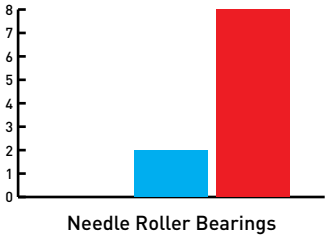
Other Bearings

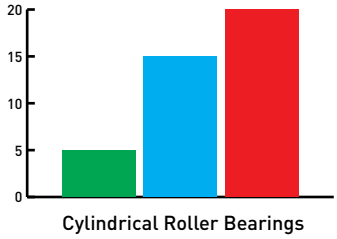
Sweden

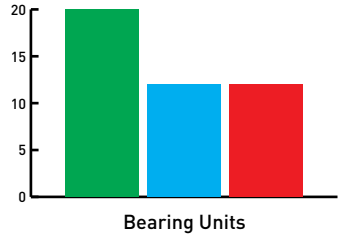


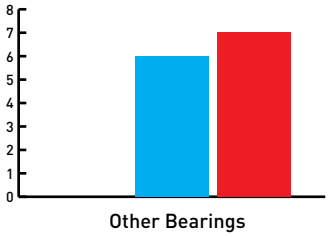












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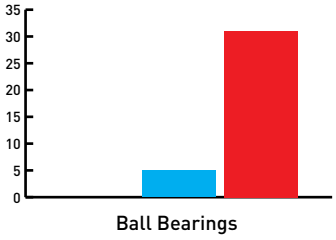

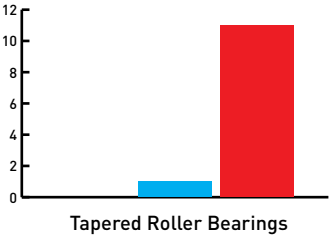

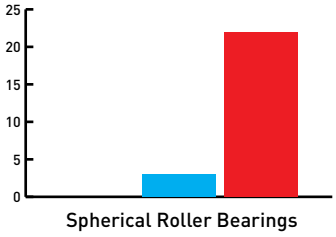

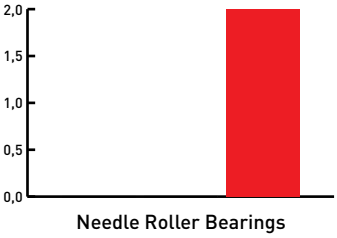

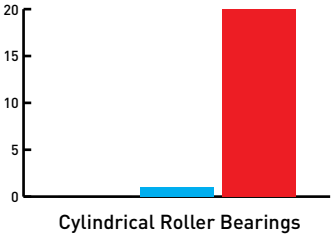

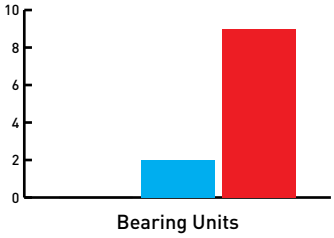

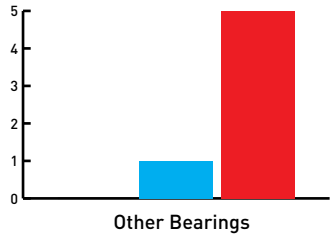

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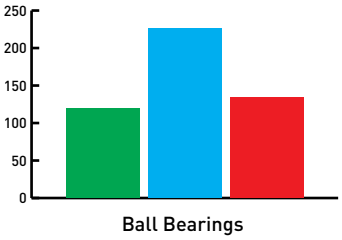

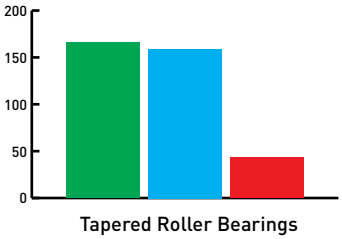

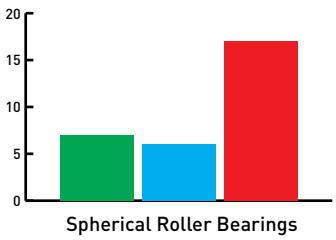

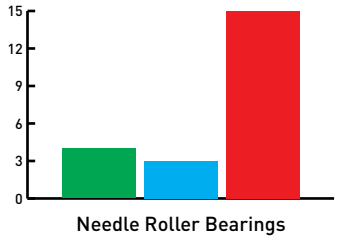

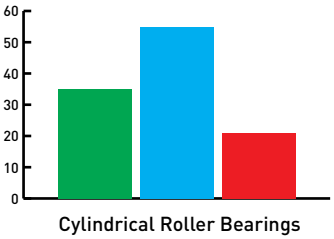

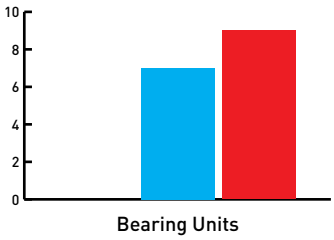

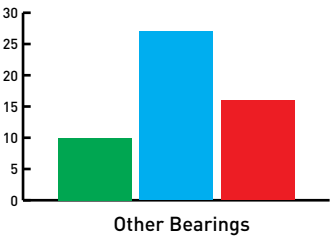

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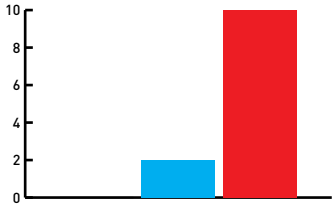
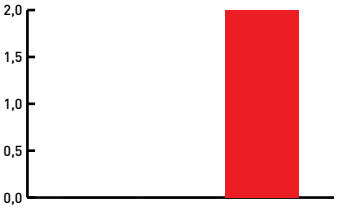
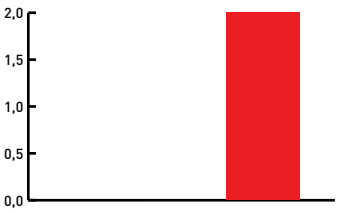


Ball Bearings



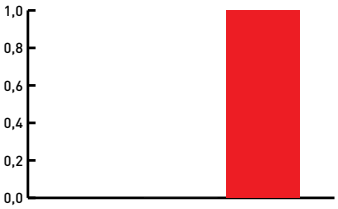
Tapered Roller Bearings



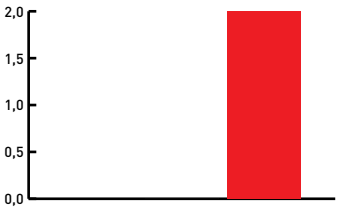
Spherical Roller Bearings

Needle Roller Bearings

Cylindrical Roller Bearings

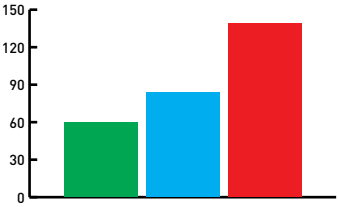


Bearing Units

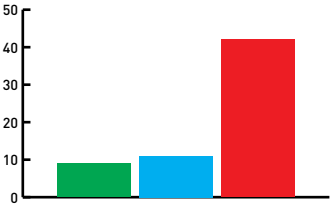


Other Bearings

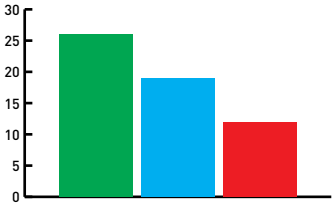
Czech Rep.



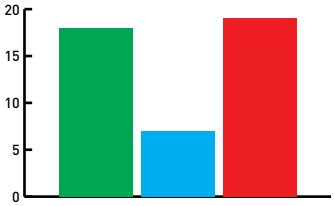
Ball Bearings



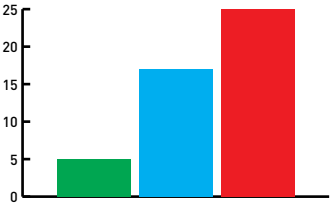
Tapered Roller Bearings



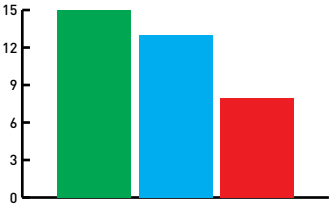
Spherical Roller Bearings



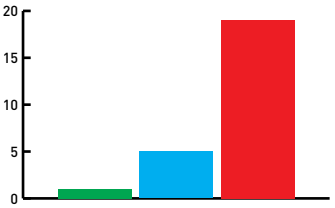
Needle Roller Bearings



Cylindrical Roller Bearings

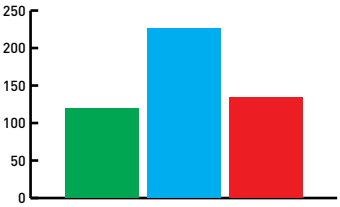


Bearing Units

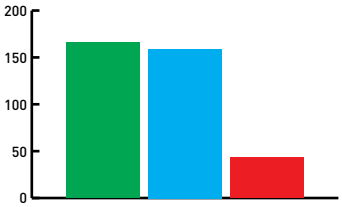


Other Bearings

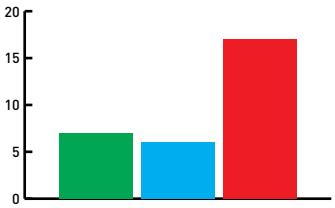
Estonia



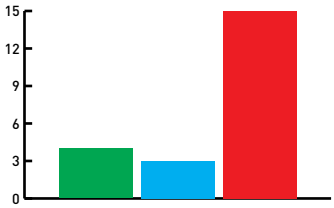
Ball Bearings



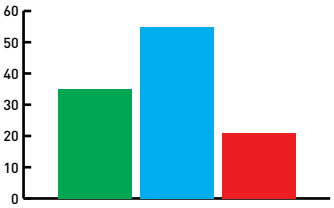
Tapered Roller Bearings



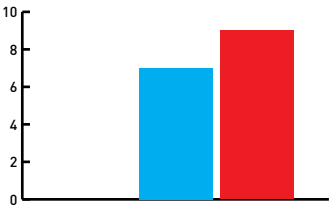
Spherical Roller Bearings



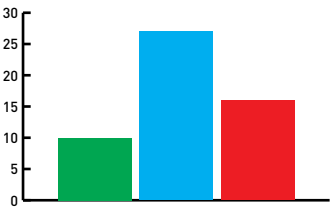
Needle Roller Bearings



Cylindrical Roller Bearings

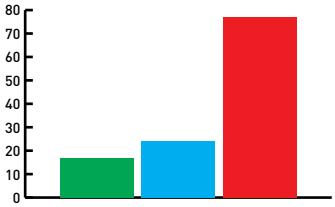


Bearing Units

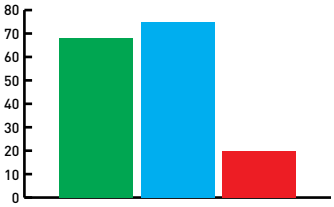


Other Bearings

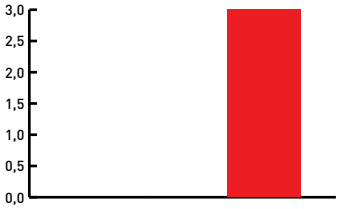
Hungary



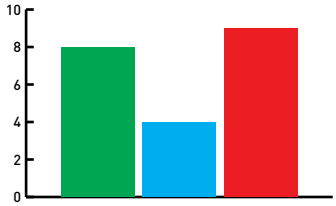
Ball Bearings



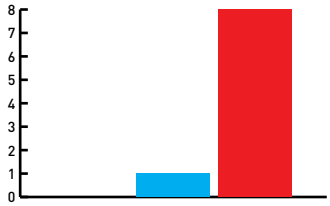
Tapered Roller Bearings



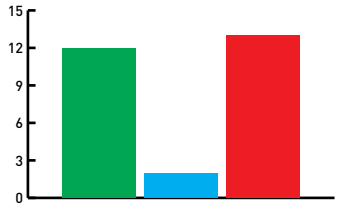
Spherical Roller Bearings



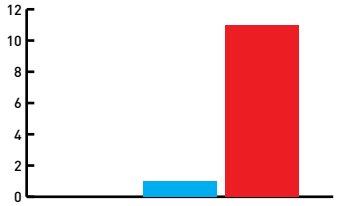
Needle Roller Bearings



Cylindrical Roller Bearings

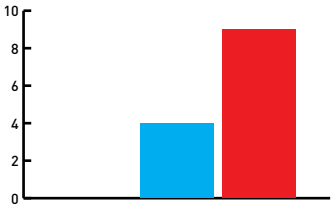


Bearing Units

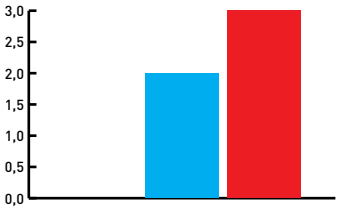


Other Bearings

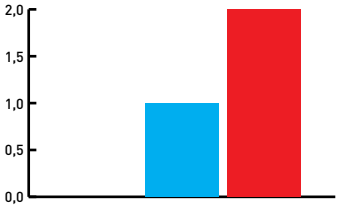
Lithuania



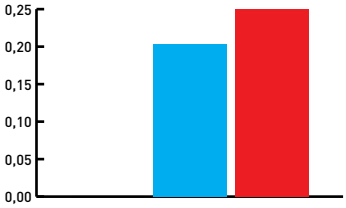
Ball Bearings



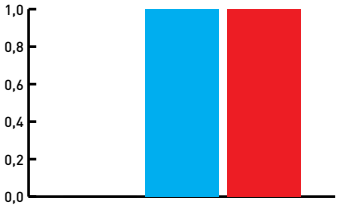
Tapered Roller Bearings



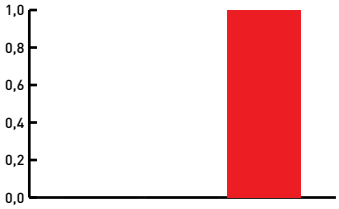
Spherical Roller Bearings



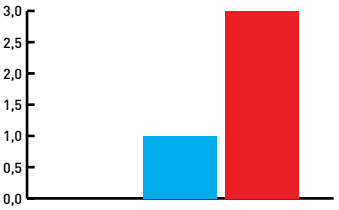
Needle Roller Bearings



Cylindrical Roller Bearings

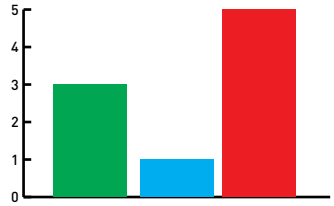


Bearing Units



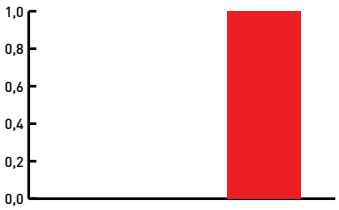
Other Bearings

Latvia

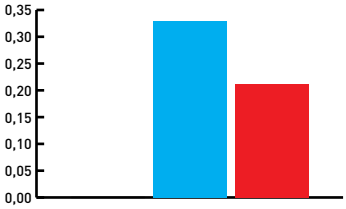


Ball Bearings

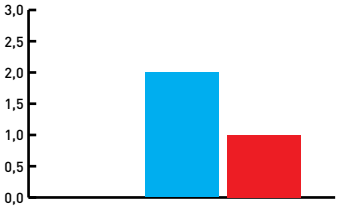
Tapered Roller Bearings



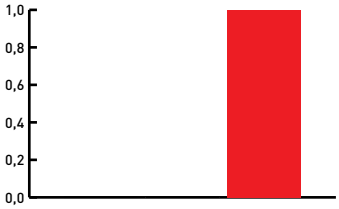
Spherical Roller Bearings



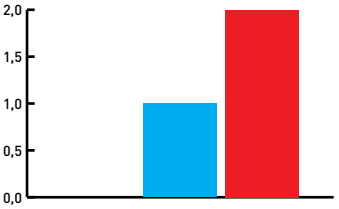
Needle Roller Bearings



Cylindrical Roller Bearings

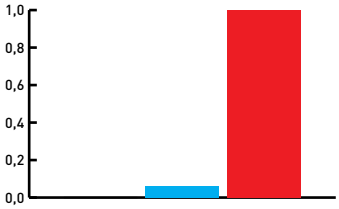


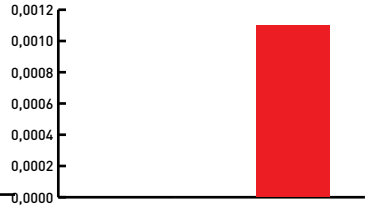
Bearing Units

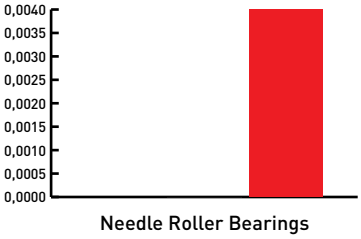


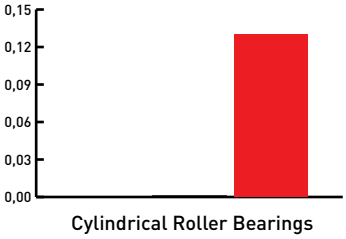
Other Bearings

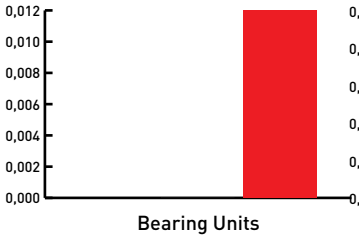
Malta

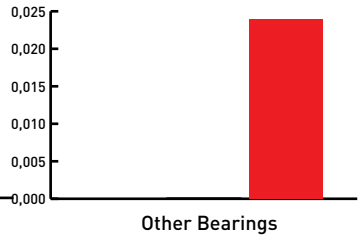




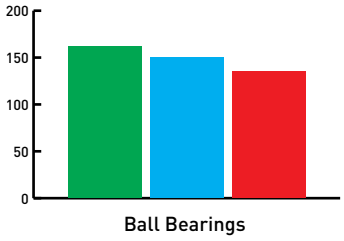


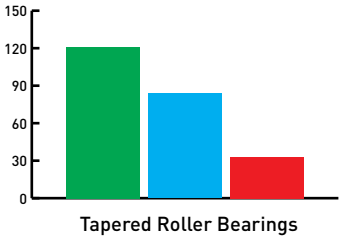


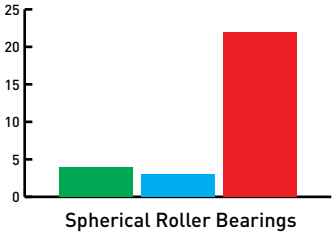


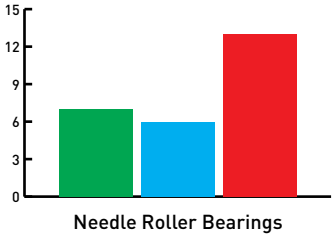


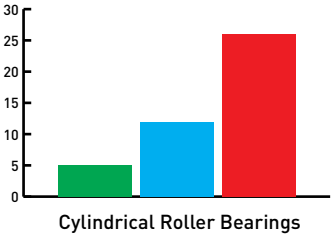
Poland

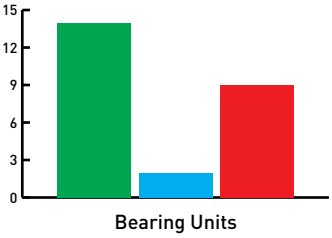


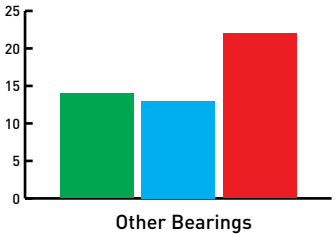




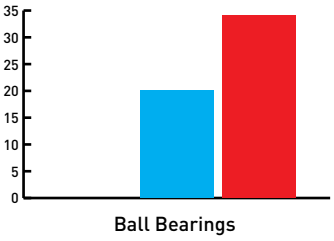


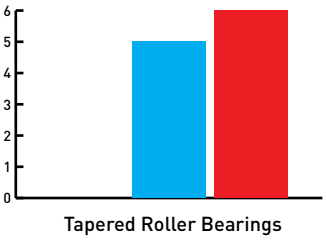


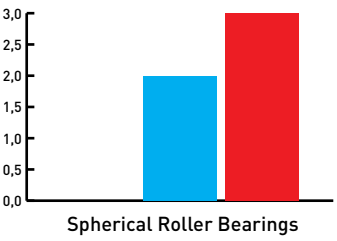


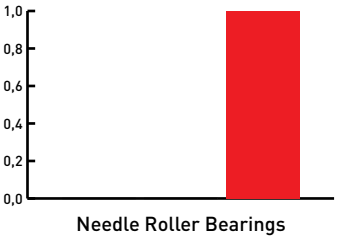


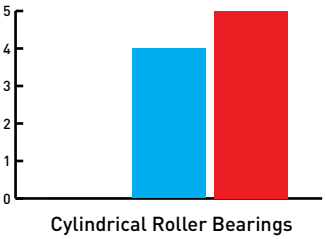
Slovenia

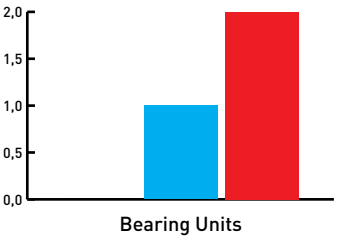


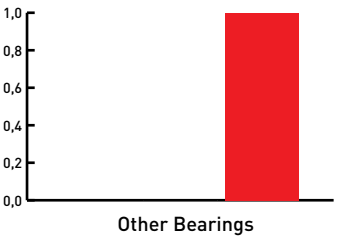




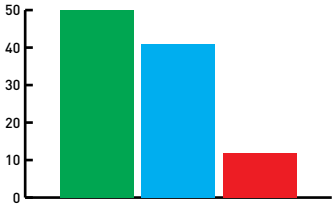




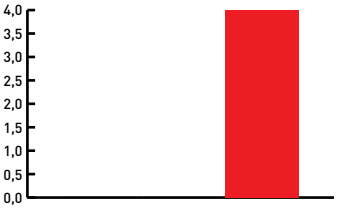




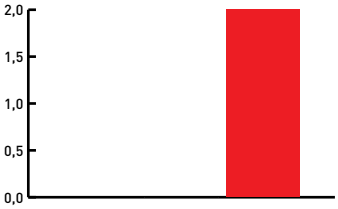
Bulgaria



Ball Bearings



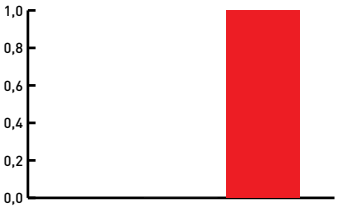
Tapered Roller Bearings



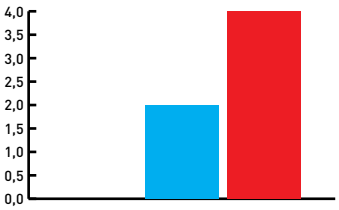
Spherical Roller Bearings

Needle Roller Bearings

Cylindrical Roller Bearings

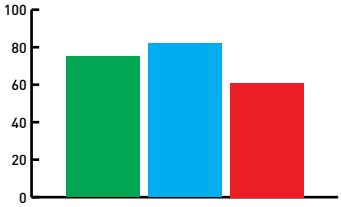


Bearing Units

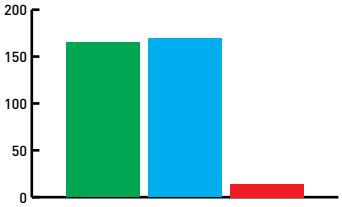


Other Bearings

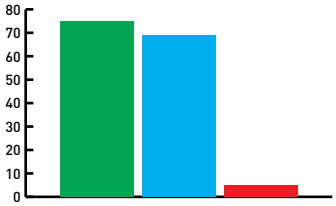
Romania



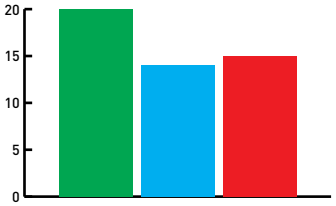
Ball Bearings



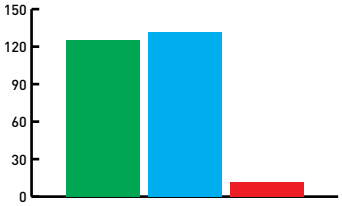
Tapered Roller Bearings



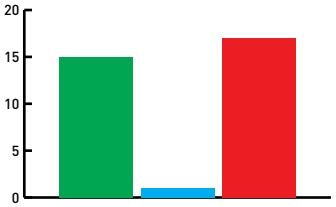
Spherical Roller Bearings



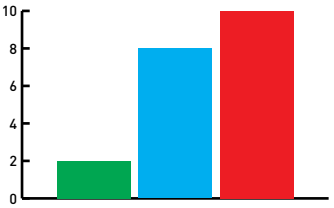
Needle Roller Bearings



Cylindrical Roller Bearings

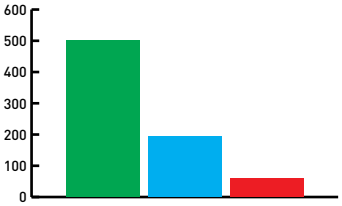


Bearing Units

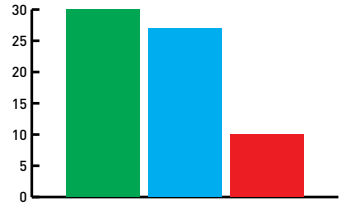


Other Bearings

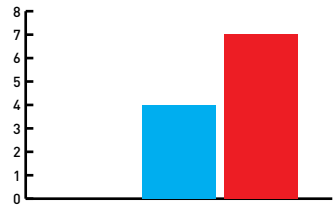
Slovakia



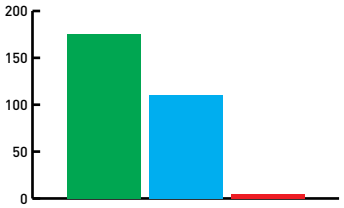
Ball Bearings



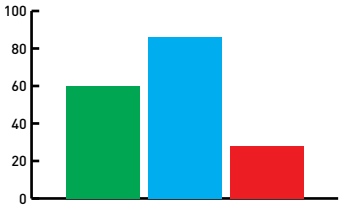
Tapered Roller Bearings



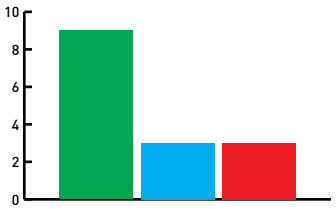
Spherical Roller Bearings



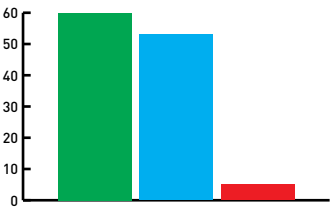
Needle Roller Bearings



Cylindrical Roller Bearings



Bearing Units



Other Bearings

Eric Davids
Regal Beloit America

"At Regal, we are always searching for new and innovative ways to increase bearing life within new and existing applications."

Sky High Technology

Today we meet Eric Davids, Application Engineering Manager Aircraft Technology at Regal® Beloit America. Eric is located in Regal's Specialty Bearing manufacturing facility in Valparaiso, Indiana, USA and has been involved in the aerospace and specialty bearing industry for 13 years.

How did you get involved in the specialty bearing industry?

Eric: "My background previously was in the aerospace industry working in multiple positions related to product design. I have been able to translate the design requirements learned in the aerospace industry and apply them to the specialty bearing industry. The requirements related to risk aversion and bearing life can be different when comparing specialty bearings to catalog bearings."

What makes a bearing a specialty bearing?

Eric: "For McGill® bearings, a specialty bearing is a bearing designed for a specific application. These specific applications for various reasons cannot accommodate a catalog

bearing. There are also applications where it is cost advantageous to design a specialty bearing over a complicated design accommodating a catalog bearing. Different bearing materials and bearing construction all can be designed to optimize the life of the bearing in the application. Examples of McGill® specialty bearings include modifying a bearing outer ring geometry to allow for anti-rotation features (for example a bolted flange). We have also worked with customers to modify roller geometry and bearing material to optimize bearing life within specific applications."

Why do people use specialty bearings?

"Specialty bearings are needed for applications where catalog bearings cannot adequately achieve design requirements," says Eric. "If an overall system redesign outweighs the cost of a specialty bearing, specialty bearings have an advantage. Application examples such as extreme environment conditions related to temperature or salt water as well as critical aerospace applications are common for specialty bearings. Other examples include bearing designs where relubrication of the bearing is not possible or extremely time-consuming and expensive."

Where are specialty bearings used?

Eric: "Common areas for specialty bearings are in the aerospace industry. This industry has bearings that require special designs due to risk aversion. Also, there are special quality requirements and non-destructive testing inspections common in this industry. Traceability of the bearing back to raw material is also a common requirement. Other industries are moving in this direction for bearings that are critical to an application's design."

"Different bearing materials and bearing construction all can be designed to optimize the life of the bearing in the application."

What are some specialty materials and why do you use them?

"Bearings are generally produced from 52100 thru-hardened steel (AMS 6440) or carburized steels such as 8620 or 9310," says Eric. "The thickness of the material and impact loading in the application are factors in the selection of thru-hardening or carburizing grade steels. For high temperature applications (approximately > 400°F or > 200°C) a tool steel known as M50 per AMS 6491 is used. Advances in steel cleanliness and processing have also allowed for an increase in bearing life. VIM-VAR 52100 thru-hardened steel (AMS 6444) is an example of a higher cleanliness steel which allows for longer bearing lives in well - lubricated environments."

"There are also steels which provide corrosion protection. 440C steel is common but is not the most beneficial steel in regards to maximizing bearing life. Crondiur®* 30 and XD15NW are more recently developed corrosion resistant steels that provide the benefit of not only corrosion resistance but theoretically longer bearing life. BG 42 is a further corrosion resistant steel that can be used at higher operating application temperatures."

** Crondiur registered trademark of Energietechnik Essen GMBH.*

"McGill® bearings have been positioned over the years to ensure one of their strengths is effectively meeting the needs of customers who require specialty bearings in their applications. Our company has been providing aerospace bearings for over 60 years."

Why does Regal[1] have specialty bearings?

"McGill® bearings have been positioned over the years to ensure one of their strengths is effectively meeting the needs of customers who require specialty bearings in their applications. Our company has been providing aerospace bearings for over 60 years," says Eric. "We have application/design engineers whose sole purpose is to design bearings for specific customer applications. Our engineers talk directly to the customers' engineering groups. Therefore, our vast experience in the aerospace industry has helped in increasing the knowledge in manufacturing, heat treatment as well as design processes. The McGill® specialty bearing engineers and production personnel have experience in a wide range of bearing products from cylindrical roller bearings, angular contact ball bearings, gothic arch ball bearings, spherical roller bearings, and airframe cam followers."

Eric: "The McGill® specialty bearing plant has been planned to specifically meet the production needs for specialty bearings. The plant is oriented to manufacture small manufacturing lots with various manufacturing requirements. Turning/Machining, Heat treatment, grinding, and other operations are all contained within the plant. With customer service, engineering, and marketing also

"At Regal, we have multiple bearing analysis programs and capabilities including Finite Element Analysis tools to review applications and determine what bearing options are needed."

onsite, collaboration to handle specialty bearings product is possible."

How do you know what features are needed in a specialty bearing?

Eric: "From the experience gained over the years in the types of bearings created and material used, McGill® bearings engineers can review certain applications and provide guidance regarding not only the best material for an application, but also the optimum size and type of bearing needed. At Regal1, we have multiple bearing analysis programs and capabilities including Finite Element Analysis tools to review applications and determine what bearing options are needed. We also have tools to review bearings that have been in service in applications These tools and reviews provide a detailed look at the bearing to see if any design changes may be needed. An example of a tool regularly used would be a scanning electron microscope."

In conclusion do you see any new developments forthcoming in regards to specialty bearings?

"Advancements in materials and lubrication are always being developed within the industry. The McGill® specialty bearing team is reviewing new materials by conducting rolling contact fatigue tests. We are also reviewing improvements in surface finish and the corresponding effect on bearing life. At Regal[1], we are always searching for new and innovative ways to increase bearing life within new and existing applications," concludes Eric.

About Regal Beloit Corporation

Regal Beloit Corporation (NYSE: RBC) is a leading manufacturer of electric motors, electrical motion controls, power generation and power transmission products serving markets throughout the world. The company is comprised of three business segments: Commercial and Industrial Systems, Climate Solutions and Power Transmission Solutions. Regal is headquartered in Beloit, Wisconsin, and has manufacturing, sales and service facilities throughout the United States, Canada, Latin America, Europe and Asia. For more information, visit RegalBeloit.com

[1] *References here to 'Regal' mean 'Regal Beloit Corporation and its affiliates worldwide or any one of Regal Beloit Corporation or an affiliate.*

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How proper lubrication can enhance A PLANT'S RELIABILITY

Everybody wants a reliable plant with a predictable maintenance schedule and a key part of achieving that goal is to ensure that your lubrication program is organized, well-funded and employing the best practices across the board. What are those, and how will they affect your plant's reliability? Here are a couple of things to keep in mind.

Lubrication can't be the last priority

It's sadly common for lubrication technicians or oilers to land on the low end of the seniority scale or come last in managerial assessments of what's important. Make no mistake – they're actually incredibly important. Without well-educated, motivated and trained lubrication technicians, your operation will literally grind to a halt. It's important to invest in education and certification for your people, so that they can excel in areas such as:

- Storing and handling oil and lubricants
- Learning the proper types and amounts of lubricant to use for various applications
- Avoiding the pitfalls of over-lubrication
- Regularly inspecting machines to ensure that proper protocols are being followed

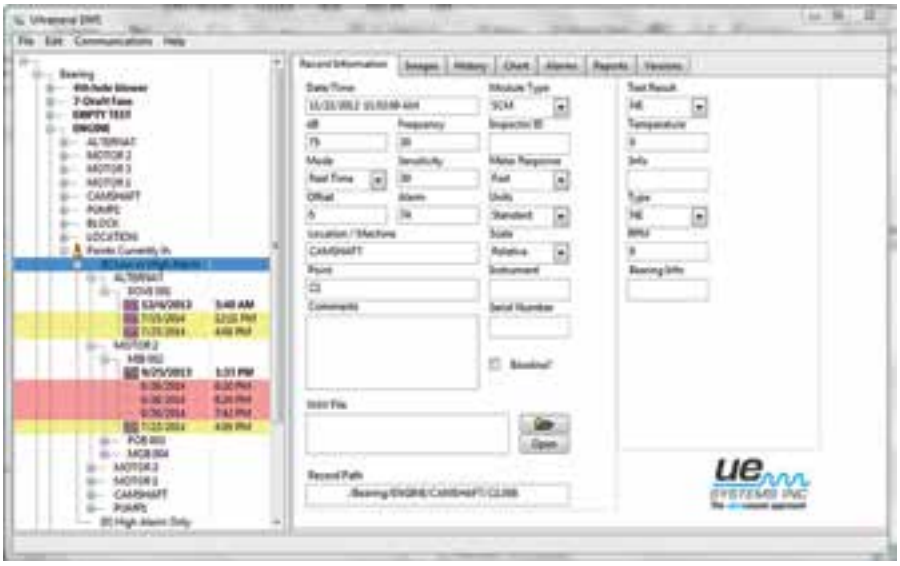
When your technicians feel valued and their work is considered a core component of overall operations, your uptime will increase and repairs will go down.

Improper lubrication gets expensive – fast

Buying high-quality oil and grease and investing in training is expensive, sure – but not nearly as expensive as not funding them.

Des-Case conducted a study on the True Cost of Poor Lubrication, and found figures from ExxonMobil which showed "less than 0.5 percent of the average plant's maintenance budget is spent purchasing lubricants, but the downstream effects of poor lubrication can impact as much as 30 percent of a plant's total maintenance cost each year."

The multiplier effect here is huge – just a small improvement in your lubrication program can have a massive positive impact on your overall reliability.



Overall, the study found that, given annual maintenance costs of $9 million, about $1.62 million of those can be attributed to issues arising around poor lubrication, and $567,000 of those could be addressed immediately.

The study also found that simple time-based predictive maintenance strategies were bound to fail, because of wide variations in the life of different bearings. One subcomponent might be perfectly healthy while another is on the verge of failure. That's why testing for contamination, setting aggressive targets and taking action as issues arise will eventually prove more effective.

Proper lubrication frees up technician time

There are only so many hours in a day – and this feels especially true in the demanding environment of round-the-clock plant operations. Every minute spent dealing with inefficient lubrication protocols or the consequences of under- or over-lubrication is time technicians aren't spending on other issues.

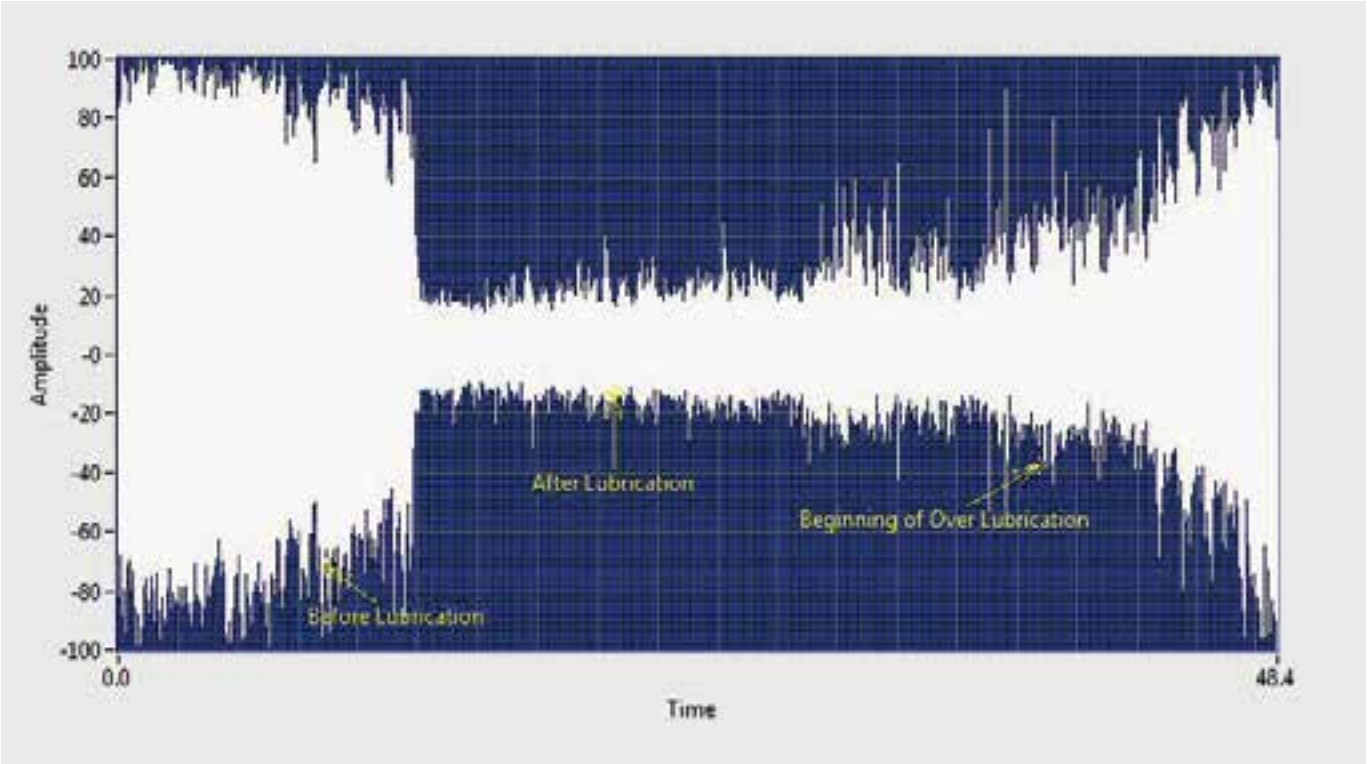
By ensuring that your program is optimized to maintain oil health and to reduce downtime, you create space in your maintenance staff's schedules to deal with other issues proactively. This gets you ahead of the game across the plant, ultimately improving your overall reliability and in the long term, lowering your costs.

The importance of oil analysis, proper storage & high-quality lubricants

The most precise lubrication in the world won't help if the lubricants in question are poor quality, contaminated or breaking down under heat and pressure. Contracting with an oil analysis laboratory or investing in your own analytics kit will allow you to detect these kinds of issues before they result in machine failure.

Many different factors can impact the quality of your lubricant. Improper storage or a blown seal on a component could allow dirt, water, or metal fragments to corrupt your supplies. Even new oil should be tested – while your lubrication program might be top-notch, you've got little control over its handling before it's delivered to your facility.

There are also many factors that can affect the storage of industrial lubricant, including using containers that already contain contaminants, storing them outside in harsh conditions, and not using color-coded containers to prevent accidentally mixing two different oils.



Any auxiliary equipment, lines, and vessels should also be thoroughly cleaned and certified before being used with fresh lubricants.

Finally, all the maintenance, storage and analysis technology in the world won't serve you well if you're not using both high-quality and properly selected lubricants. Most if not all technicians are comfortable with selecting the right grade of oil for a given application, but there are more complex factors than that to weigh. Considerations such as additives, duration of use and ambient conditions can all make for a significantly more complicated decision process.

Avoid over-lubrication by using Ultrasound

Lubrication is far more complex than just buying oil or grease and throwing it into your equipment, of course. Selecting the right type or types of lubricant, storing and filtering them correctly, monitoring bearing noise, and ensuring that over-lubrication and under-lubrication don't occur all play an important role. Fortunately, there are more technologies than ever in the marketplace that allow you to manage your lubrication program effectively.

An ultrasonic instrument as the UE Systems Ultraprobe 401 Digital Grease Caddy can bring your facilities management game to the next level. The Ultraprobe 401 uses ultrasound technology to provide critical data about baseline dB levels, dB levels before and after applying grease, cost analysis of lubricants and other vital information.

Over-lubrication is often a problem as big as or bigger than under-lubrication – in fact, 70 percent of lubrication professionals believe it's a problem at their plant. When excess grease gets into a bearing, it begins to churn and heat up. This churning causes the lubricant to solidify, blocking the entry of more, fresh grease and ultimately causing a bearing to fail. Another possible failure mode that can arise from over greasing is seal damage. Adding more than the necessary amount of lubricant to a bearing under the high psi of a grease gun can crack the seal, allowing outside pollutants to infiltrate.

The Ultraprobe Grease Caddy uses ultrasonic technology, so that lubrication technicians know when to stop adding grease, which can prolong the life of your equipment. Its digital display allows the user to gauge friction levels through the dB levels. Even in high-noise environments, the Ultraprobe 401 is able to isolate the necessary ultrasonic waves and transmit them to the user.

Conclusion

In all, the field of precision lubrication and maintenance has grown more complex and diverse than ever before. It's easy to get lost in the minutiae of these processes and products, and sometimes the measures you think are helping may actually lead to failures down the line. With the right techniques and technologies, however, it's possible to see real return on investment from your maintenance efforts.

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Koyo

Delivers 7,7m diameter slewing bearing for one of Japan's largest tunnel excavation shield machines

Keeping rotational run-out to 0.1 mm with a diameter of 7.7 m

JTEKT's large slewing rim bearing is sold under the Koyo brand, which goes by the motto "Key of your operation", and was adopted in the shield machine used in tunnel excavation for the portion of the Tokyo Outer Ring Road which runs for a length of 16.2 km to join the Kan-Etsu Expressway and Tomei Expressway. The 16.1-meter diameter cutter shield used in this shield machine is the largest in Japan; even bigger than the one approximately 14 meters in diameter used when constructing the Tokyo Bay Aqua-Line opened in 1997. JTEKT developed Japan's largest slewing rim bearing with a 7.7 m diameter, in order to support the rotation of this large cutter shield.
The cutter shield is used to dig up soil and cut through hard rock, therefore its performance greatly affects the efficiency of tunnel excavation work. The newly developed slewing rim bearing has a diameter of 7.7 meters, but at the same time is able to keep rotational run-out down to around a mere 0.1 mm due to using special polishing technology, thus improving the cutter shield's rotational accuracy. The new bearing is highly regarded by users due to adopting optimal materials and heat treatment technology so as to offer sufficient durability and reliability to accomplish long-term construction work during which part replacement is difficult.

Realizing high rotational accuracy even if transported in installments and assembled on-site

Due to Japan's narrow roads, generally large shield machines are transported to excavation sites in a number of separate

"JTEKT was selected to participate in this project due to being recognized as the only Japanese manufacturer capable of manufacturing large slewing rim bearings requiring split design, and for the high technological capabilities."

"The newly developed slewing rim bearing has a diameter of 7.7 meters, but at the same time is able to keep rotational run-out down to around a mere 0.1 mm due to using special polishing technology, thus improving the cutter shield's rotational accuracy."

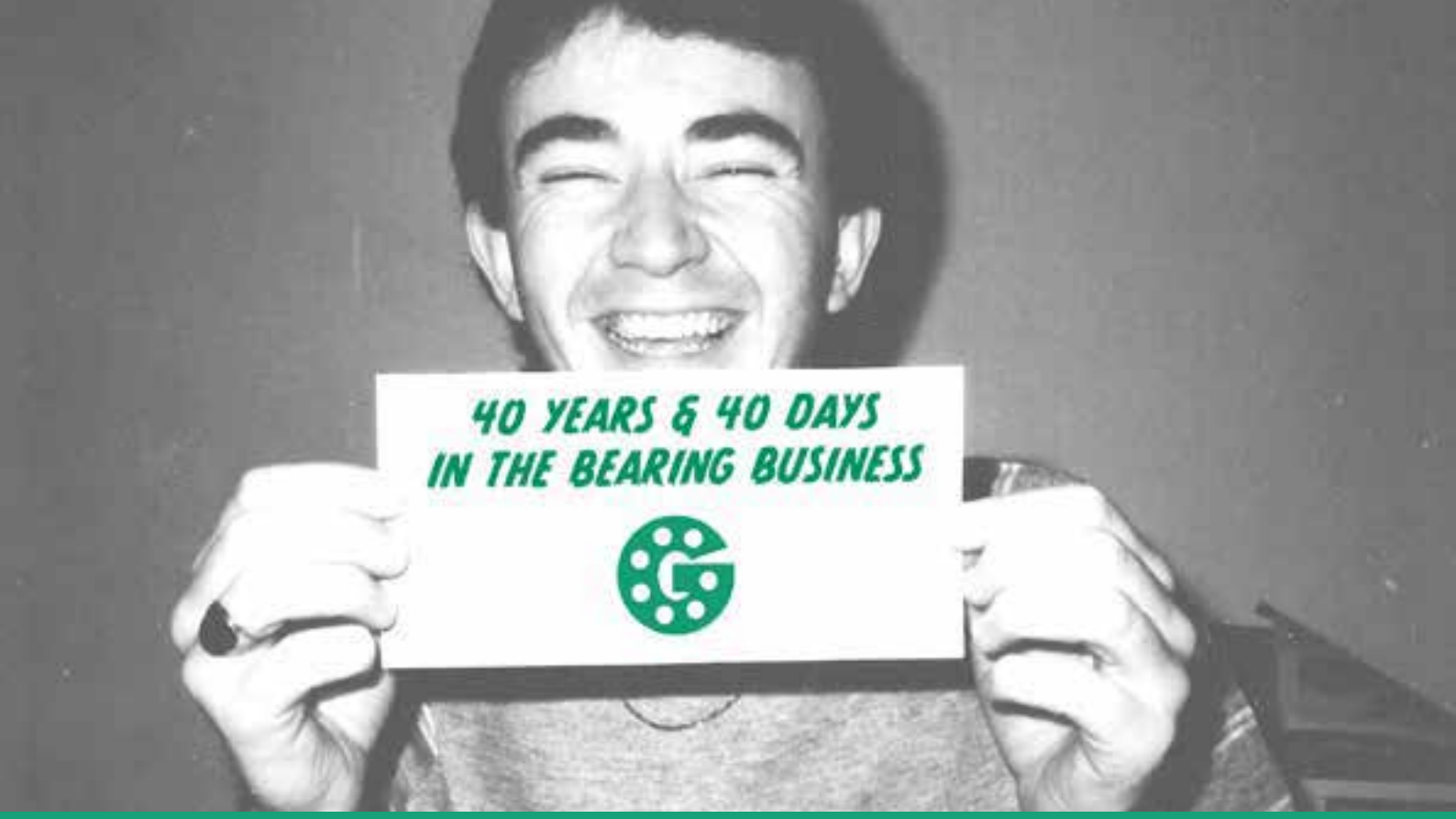
segments. For the Tokyo Outer Ring Road tunnel excavation also, the slewing rim bearing was sent in four segments and assembled on-site. Compared to integrated-type shield machines, machining of shield machines with a split design is much more difficult, including aspects such as distortion control during heat treatment.

JTEKT was selected to participate in this project due to being recognized for its track record of supplying bearings to a high number of shield machines, both small and large, as the only Japanese manufacturer capable of manufacturing large slewing rim bearings requiring split design, and for the high technological capability accumulated through such experience. The demand for tunnel excavation work in Japan is set to grow further in the future in areas such as railway and road infrastructure.

As an "Only One" manufacturer of large slewing rim bearings, JTEKT will continue to promote further product development and contribute to the advancement of infrastructure both in Japan and abroad.

Paul Cuthill
Director Godiva Bearings

The Story of The Original Godivaman



THE STORY OF THE ORIGINAL GODIVAMAN

Paul Cuthill started his journey to the top of GODIVA Bearings 40 years and 40 days ago as a summer helper; and has proved the upcoming young generation that the bearing industry rewards hard workers.

What I remember from my first meeting with Paul was his warm, friendly, energetic and cheerful presence during a business event somewhere in the south of Europe. I thought first that this must be the "atmosphere of the location"...After meeting him for several years, I know now that it was not "the atmosphere of the location". This was and is just Paul himself.

We can fill the whole magazine with Paul's career highlights, experiences and stories, which would be too many to list, so we just tried to take a snapshot during a short interview with Paul Cuthill to reveal a tip of his story.

How and when did your 40 years journey started at GODIVA?

I joined once my school exams had finished. I was going to college to study engineering and my brother Ian had the company running but was in need of help over the summer so I said I could do some running around on my moped (Suzuki AP50). By the time September had come around I'd decided I quite liked the money the work was giving me so turned my back on education.

We had mentioned in a past edition of BearingNews magazine that the story behind GODIVA is like a never ending comic book with its own unique dynamics, characters and Superheroes.

As which character can you define yourself? and share the evolution of your roles within the organization for the past 40 years?

Tough question as over the years, like in all small up and coming companies, I have worked in every department. I suppose I'd like to be the original Godivaman.

How does the 40 years story and evolution of GODIVA look like from the eyes of Paul Cuthill

In the early days we had two local customers and by coincidence they both used lots of MPB rod-ends (as they were by then). We started telling the local bearing trade and one of our best customers then became Olympic Bearings in Hayes. They were part of a bigger organisation so at company meetings they would tell the others about us and then the rod-end business grew.

We were by then appointed as official Rose Bearing (which later became NMB) and Fluro agents.

Taking on the IKO agency over 30 years ago got us in to the needle bearing market then a few years later we got the INA agency (which then 15 years later got us FAG), so we were synonymous rod-ends and needles.

From there it has grown with agencies from all over the world giving us over 60,000 products in stock. As we only sell to the trade we have to stock in depth. Quoting delivery times is normally a none starter for the sale.

Shepperton has been our base and head office for 38 years, then came Newcastle in 1996 and then Dudley in 1998, where we now have four warehouses full of stock.

Our staff have over 300 years of bearing experience so sourcing and identifying parts is never an issue.

Which were the main turning points for GODIVA?

Winning two fantastic accounts in the early years was somewhat lucky but we rode the luck and made it work. Made the people within these two companies personal friends (people deal with people). Then moving to Shepperton to a purpose built industrial unit really elevated us along with the opening of Newcastle in 1996 then Dudley in 1998.

Is there any project you truly enjoyed or a customer experience you are most proud of?

Supplying the bearings for Ayrton Senna's Formula 3 winning car in 1983 and then meeting the great man at the winners party was pretty special.

Which were the biggest challenges you had to deal with?

Divorce !!

Are there any decisions taken in the past which you would like to change, if you could go back in time?

Never good to look back and think what might have been. You need to stand by the decisions made otherwise the wrong ones will eat away at you.

Can you give us an overview of the last 40 years evolution within the bearing industry? Do you see there any big changes?

There have been so many changes. When I was first starting the Japanese were just entering the market but finding it very difficult to gain any market share. Now of course they are all well respected because of the quality they produce. Then the Chinese started to have an impact predominantly in the cheaper end, but still the market is dominated by Schaeffler and SKF.

How do you define the point that GODIVA has reached today?

An amazing achievement when you consider everything we have achieved has been from within. There have been no sister larger companies to help us.

What are the future plans for GODIVA?

Who knows the future holds? But with the energy of the staff plus the direction of the management team it certainly looks very good. Lots of opportunity's on the horizon :-)

How do you see your role within GODIVA in the future?

When the time comes that I don't want to get out of bed to go to work, that is the time I'll hang up my boots. I'm pleased to say I still get a buzz from work so hopefully that time is a long way off.

Do you have any suggestion for young and ambitious bearing distributors?

Yes, always buy from Godiva!

The Godiva Bearings and INA partnership started over 30 years ago and in that time, we have grown to be one of the largest Stockists of INA in the World.

In 2005, the FAG brand joined the INA brand in what was a massive step within the Bearing Industry. The prestigious Schaeffler Group are leading Global manufacturers of outstanding and technologically engineered products designed for the automotive and industrial market. Constantly building on their product innovation enables Godiva Bearings to offer the UK an extensive range of quality Bearings.

What's new? Godiva Bearings now stock the full range of FAG Black Series Pillow Blocks. The innovative Black Series boosts decreasing product lifecycle costs, shorter production downtime and improving maintenance systems. We hold both metric and imperial sizes in our main warehouse in the West Midlands for Same-day collection or dispatch, delivered with instantly recognisable single-boxed FAG packaging, which creates a great visual impact too!

Did you know... Our warehouse holds quantities of the full range of INA Needle Roller Bearings in abundance. Our Superhero expertise extends to all types of applications, in both metric and imperial. In fact, our experience and knowledge with INA Needle Bearings simply cannot be beaten. Whether it be an HK or a large SL Bearing, we have them all and everything in between!

We hold the smallest to the largest sizes, even including the eccentric versions of INA Cam-Followers which are used all over the World and in various types of applications.

FAG Ball Bearings cover an enormous range of sizes. We stock in-depth the ever popular metric series but we always ensure larger types are available to our customers too; these include the ZZ and 2RS versions as well as C2, C3 and C4. We can also supply these with special Lubricants (on request).

Our stock of FAG Cylindrical Roller Bearings are predominantly used in heavier duty applications, from high speed, high quality gearboxes to the quarry and mining industries - we have the full range available. We also supply and stock Cage versions such as plastic, steel and brass.

What can we offer? Our very experienced Sales force are able to offer you help with identifying your Bearing and can offer full technical back up; on occasions, we can even organise an engineer visit your customer. Being Trade-Only means we only supply to the Trade and your customers always remain your customers.

We are the Bearing Superheroes ready to support and assist you in meeting your customers' needs. If you need to find a particular size, have an urgent query or require technical support, contact us today on either our Dudley Sales Line: 0845 345 5955 or Newcastle Sales Line: 0845 345 5920.

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Bearing Housing

Oil Contamination and Degradation

CAUSES & CURES

A large majority of rotating equipments rely on rolling element bearings for continued successful operation. Identifying rolling element bearing faults before they disrupt operation is the basis for most predictive maintenance programs. Bearing manufacturers provide very detailed maintenance, lubrication and operation procedures to maximise it' life. However due to operational environment, non precision tolerances, assembly errors, poor lubrication and contamination these bearings fail. If the failures are detected before a complete failure occurs the resultant damage and repair are usually minimal and confined to the bearing itself. The quality of lubrication is affected by contamination and oil degradation, which is a large contributor to premature bearing failures In this paper the causes of the oil contamination and oil degradation are discussed.

Introduction

A large bearing manufacturer has estimated that about 16% of bearings failures are because of mistreatment. This is caused by improper storage, transportation or installation of the bearing. The remaining 84% of rolling element bearings are installed defect free. At this stage there are no indicators of bearing faults. But 36% of rolling element bearing fail due to poor lubrication, 34% of bearings fail due to wrong operation, misalignment, unbalance or other maintenance requirements and 14% fail due to contamination. If we consider one centrifugal pump 50% of the failure occurs due to improper lubrication and contamination. These failures can be avoided if we monitor the bearing housing properly.

Fig-1 bearing failure reasons

Oil Bath method

The simplest method of oil lubrication is the oil bath . The oil, which is picked up by the rotating components of the bearing, is distributed within the bearing and then flows back to a sump in the housing. Typically, the oil level should almost reach the centre of the lowest rolling element when the bearing is stationary. The bearing rolling elements pass or "plough" through a portion of this oil sump as the shaft revolves (Figure 2).For smaller bearing arrangements and slower speeds oil bath lubrication arrangements are commonly employed. Oil bath lubrication is feasible if too much frictional heat is not generated by the ploughing action of rolling elements at excessively high speeds. Because heat reduces oil film strength and greatly accelerates the rate at which oil oxidizes, the oil bath lube method is avoided on process pumps whenever DN, the inches of shaft diameter (D) multiplied by shaft revolutions-per-minute (N) exceeds 6,000. The DN limit of 6,000 is an experience-based value that takes into account real-world conditions of misalignment and a host of other factors that make the actual pump environment different from test stand practices.
In oil bath method the normal oil level is set at around 1/3rd to ½ of the diameter of the rolling element ball (or roller) as shown on Figure 1. These arrangements have the advantage of simplicity of design and manufacture. If the oil level is higher than this, the bearing temperature may increase at high circumferential speeds and losses due to splashing may occur. The oil churning account for about 50% of the total heat generated in the bearing. Furthermore, foaming of the oil may occur. The oil quantity in the housing must be adequately proportioned, otherwise very short oil change intervals will be necessary.

Contaminated Lubricant

The quality of lubrication is affected by contamination, which is a large contributor to premature bearing failures. The major types of contaminants are particulate, moisture, incompatible fluids and air entrainment. Particles impede lubricant performance and further localize pressure on components causing denting, fatigue, spalling and abrasion to the surface of mating surfaces. Water will affect the lubricant's ability to provide a proper fluid film, causing premature failure and excessive wear. Corrosion, cavitation, and premature oxidation and filter plugging of the oil are other symptoms of water contamination. Air contamination affects oil compressibility, causes poor heat transfer, film strength loss, oxidation and cavitations.

The sources of these contaminants are:
Generated contamination
External ingression of contaminants
Maintenance induced

Moisture and dust often enter bearing housings through old-style labyrinth seals or lip seals as airborne water vapor, or via a stream of water from hose-down operations. Contaminants can also enter through a breather vent, or from the widely used non-pressure balanced constant level lubricators .An often-overlooked source of oil contamination is abraded oil ring material.

How to Stop the Contamination

Unless the rotating equipment is provided with suitable bearing housing seals, an interchange of internal and external air (called "breathing") takes place during alternating periods of operation and shutdown. Bearing housings "breathe" because rising temperatures during operation cause gas volume expansion, and dropping temperatures at night or after shutdown cause gas volume contraction .Open or inadequately sealed bearing housings promote this back-and-forth movement

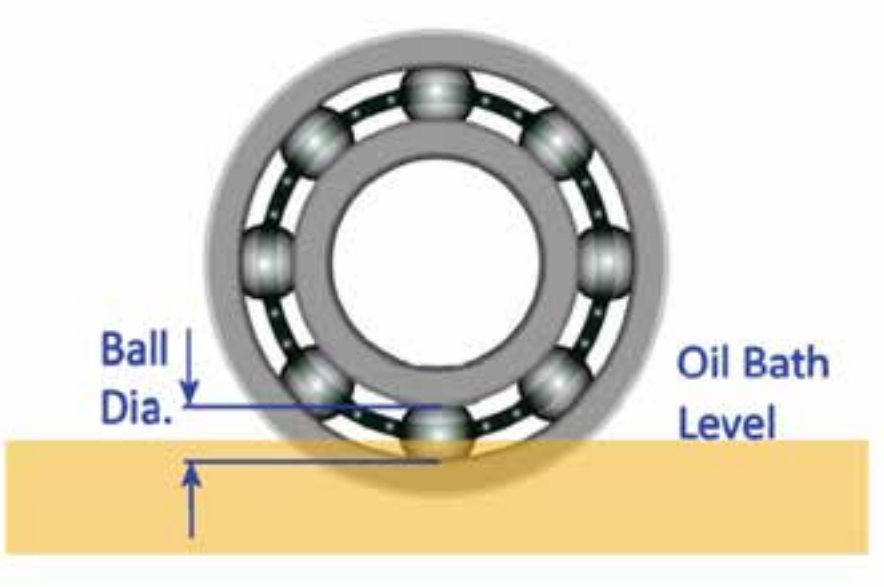

Figure 2: Oil bath lubrication showing a typical oil level

of moisture-laden, contaminated air.

To stop this breathing and resulting contamination, there should be no interchange between the housing interior air and the surrounding ambient air. Breather vents should be removed and plugged.

Instead of the widely used (non-pressure-balanced) constant level lubricators , which allow the oil to come in contact with dirty air, a pressure-compensated (or "balanced") constant level lubricator should be installed (Fig. 3).

Slinger ring

Regardless of whether the bearing housing is sealed or not, the serious limitations of the oil rings ("slinger rings") also need to be addressed, as they can be a source of INTERNAL contamination. Operating oil rings on rotating shaft systems that are not horizontal will cause the bronze slinger ring to spin and rub against the low side of the housing, resulting in severe wear on the ring. The resulting bronze particles can clearly damage the bearings.

Beware of oil sumps with incorrect oil viscosity, or with varying depths of oil ring immersion, or incorrect roundness or rough surface finish of the slinger ring. All of these conditions can result in insufficient lubrication from the oil ring and ring wear.

Pressure-balanced oilers (Fig. 3) decrease downtime risk . They differ from the non-balanced type by incorporating an external pressure balance pipe so as to make sure that the pressure inside the bearing housing and the pressure at the tip of the wing nut in the constant level lubricator are always identical. Consequently, the oil in the bearing housing is pushed downward by the hot gas (air) with the same pressure that is pushing downward on the oil in the oiler, and there is no change in the oil level.

Oil degradation-

A combination of several issues was believed to have been contributing to the oil degradation
Chemistry-related issues. Issues

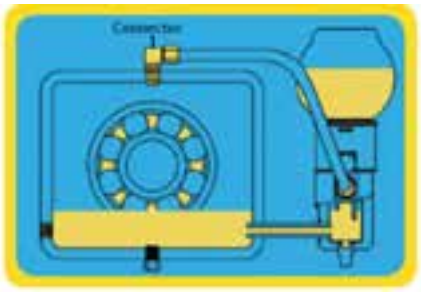

Fig3- pressure balanced constant level lubricator.

related to chemical reactions
Cleanliness-related issues. Issues related to contamination during manufacture, assembly or operation
Wear-related issues. Issues related to wear mechanisms.

Chemistry-related Issues

Because it is possible for oil to react with other chemicals present in the bearing housing. Known examples of this phenomenon include reactions between some oil additive packages and the rolling element bearing. Three issues were contributors to the black oil. They were reaction of the oil with the preservative (corrosion inhibitor) used inside the bearing housing, reaction of the oil with the sealing paint used inside the bearing housing, and changes in the lubricating oil and additives.

Cleanliness-related Issues

Cleanliness of the lubricating oil is of great concern. If the oil or the system into which it is placed is contaminated, the contamination will be circulated through the rolling element bearings. These bearings are easily damaged by particles passing through them or by

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corrosion caused from water in the oil.

Wear-related Issues

Four wear-related issues were identified may cause oil degradation. These were oil ring stability and immersion depth, bearing fit, low oil delivery to the bearings, and oil viscosity .

Oil Ring Stability and Immersion Depth

The tests showed that oil ring stability varied and depended strongly on oil viscosity and oil ring immersion depth. Generally, the bronze oil ring operated erratically once operating temperature was reached.

Issues with oil rings

A bearing housing with lower oil level and intended for DN-values in excess of 6,000. Bearings with DN-values in excess of 6,000 will require the addition of either a flinger disc (as shown here) or an oil ring or similar lube application component to dependably lift or spray-feed oil into the bearings. But oil rings are potentially vulnerable components. They will not interact in the same way with lubricants of different viscosities, or at different immersion depths.

Unless used on perfectly horizontal shaft systems, oil rings will run downhill and then often make contact with the bearing housing.To resist deformation while operating, oil ring fabrication must include an annealing step to relieve stresses. Without this annealing, many oil rings will become more oval in shape. Also, oil rings tend to become progressively more unstable as DN-values approach or exceed 8,000. Instability means that the oil rings skip, skew, misalign and abrade.

To get oil rings to function as designed, the shaft system must be near-perfectly horizontal. Ring immersion in the lubricant must be in the right range – usually close to 5/32? or 8-10 mm below the oil level. Moreover, to avoid ring abrasion and dangerous oil contamination, ring eccentricity must be within 0.002? (0.05 mm) and surface finish should be reasonably close to 32 and, at most, 64 RMS. Oil viscosity should be in a close range of typical ISO VG 32 properties and temperatures must be in the moderate range.3 These different and equally important parameters are rarely all within their respective desirable ranges in actual operating plants. If several of the individual parameters are just “borderline acceptable,” oil rings will intermittently malfunction.

Bearing fit affect oil degradation:

Level of bearing preload. Tests showed that a higher level of bearing preload resulted in less black oil formation. It is believed that this is due to preloaded bearings having a lower probability of skidding. The disadvantage to using preloaded bearings is that they have the tendency to run hotter than comparable clearance bearings. Bearing assembly techniques. Two of the conducted bearing tests used improved assembly techniques. With this process, great care was taken to ensure that the correct internal clearance within the matched angular contact bearings was achieved. The tests showed that good results could be obtained by using correctly assembled medium clearance angular contact bearings.

The internal clearance of the matched angular contact bearings is critical to their correct operation. As long as the bearing’s internal clearance is held at the design value, the bearing can be made to operate with minimum skidding and black oil formation.

OIL DELIVERY

Low Level

In a low-level operating condition, the bearing will not receive enough lubricant necessary for proper film strength – a precursor to surface contact, skidding and possible catastrophic failure. Without enough oil to prevent friction, thermal runaway can happen quickly to a steel bearing. As the temperature of the bearing increases, the ball and race both expand, which creates an even tighter fit. This increases the temperature even more, and the cycle continues to a rapid, catastrophic failure.

A low level of oil will affect all types of oil splash lubrication. In direct contact, there will be insufficient film strength and rings or discs may not be able to pick up enough oil to satisfactorily lubricate the bearings.

High Level

In a high-level operating condition, churning of the lubricant will occur, accelerating the oxidation rate due to excessive air and elevated temperatures. It is a common mistake to believe that more is better – especially when it comes to oil sump lubrication. Too much oil can affect the operation of oil rings, flingers and direct bearing contact. Another result of high lubricant levels is leaking seals. If the oil level is too high, the ring will become submerged and no longer sling the oil. Flinger discs are less susceptible to this as they are directly attached to the shaft.

Oil Viscosity

oil viscosity affects the oil film thickness at the ball/raceway/cage interface. Thus, generally speaking, the thicker the oil film, the better its separation potential. So that higher viscosity oil has lesser chance for oil degradation.

Conclusion

Over the years, pump users and manufacturers have collectively estimated that 33% of all pump failures are due to bearing distress. Incorporating feedback from many pump users, bearing manufacturers generally attribute roughly half of these failure incidents to airborne (atmospheric) debris and water vapor entering the bearing housings of process pumps or oil degradation . Yet, it is widely known that contaminants can be excluded with suitably configured bearing housing seals and using pressure balanced lubricator. Oil degradation can be avoided by maintaining proper oil temperature, proper bearing fit, oil viscosity and oil level.

PEDRO STUDIO

NTN-SNR shows strong growth on The European Steel Market **Thanks to Premium Bearings**

NTN-SNR has shown high growth in its sales of premium bearings for the steel industry in the last two years. With a strong presence in Europe and CIS countries, NTN-NR is an established and trusted supplier thanks to the positioning of its premium and technological bearings, which have already conquered the Asian market, Japan in particular. This approach enables NTN-SNR to meet its customers' demands for quality and service life, for optimal operation of their production facilities. NTN-SNR's asserted ambition on this market is to increase its sales by 50% over the coming years and become an undisputed benchmark for machine manufacturers and the leading steel manufacturers.

A strategic market for NTN-SNR

A premium positioning, a development factor

The European steel market is a strategic market for NTN-SNR and now represents a significant driver of growth. Since it started investing actively in this market two years ago, NTN-SNR has seen a sharp rise in its sales, over half of which have been generated with high value-added technological bearings. This premium positioning, driven in particular by the ULTAGE® label, is at the heart of NTN-SNR's development strategy both in the steel market and in other industrial markets in which it operates

Service and local presence

In addition to its high-performance products, NTN-SNR also offers its customers advisory and assistance services, as well as training in optimal use and maintenance of the equipment. NTNSNR offers in-situ diagnostics and tools for mounting and dismounting large bearings.

A premium range meeting all the needs of the steel industry

With its rolling bearings, bearing units and transmission seals, NTN-SNR is present across the entire steel-making process, from raw material conveyors, blast furnaces and converters to rolling mills and finishers. A significant proportion of the proposed bearings bear the ULTAGE® label, a guarantee of high performance and increased service life. Furthermore, NTN-SNR has developed special seals for working in this very harsh environment combining heat, moisture and carbon deposits.

Bearings for converters

NTN-SNR has developed double row spherical roller bearings of very large dimensions to be fitted in converters and trunnions. The principle implemented by NTN-SNR consists of fitting one side of the converter with a split bearing with an inner diameter of 1,120 mm, an outer diameter of 1,540 mm and a width of 525 mm. This split design, achieved through a process of breaking without removing material, saves 90% of dismounting time compared with a conventional one-piece bearing, thereby facilitating maintenance and cutting costs.

Bearings for continuous casting

The NTN-SNR rolling bearings for fixed-type, floating-type and intermediate bearings of continuous casting cylinders can cope with the very high load stresses and temperatures of this equipment. Among others, NTN-SNR offers cylindrical roller bearings with a self-aligning feature, split cylindrical roller bearings and SRB ULTAGE® bearings (spherical roller bearings), including a sealed version, SRB ULTAGE® EE, especially suited for high temperature, load and pollution constraints.

Bearings for rolling

To address rolling safety and reliability constraints, NTN-SNR has developed 4-row cylindrical roller bearings for working rolls and backup rolls, and ULTAGE® 4-row tapered bearings. The latter, available in a sealed version, can be used in highly polluted environments without increasing the space requirement, with a service life multiplied by 3. They can also benefit from the Rust GuardTM treatment, a special corrosion-resistant coating that prevents premature failures and extends the bearings replacement cycle by 50%. NTN-SNR also offers specific support bearings suitable for Sendzimir-type cold rolling mills with thicker outer rings for very high load capacity and high precision. A version with seals optimises the life of cylinders offering the option of using special low viscosity lubricants.

Unveiling
The Secrets of
MARS ROVER BEARINGS

Meet the Rovers

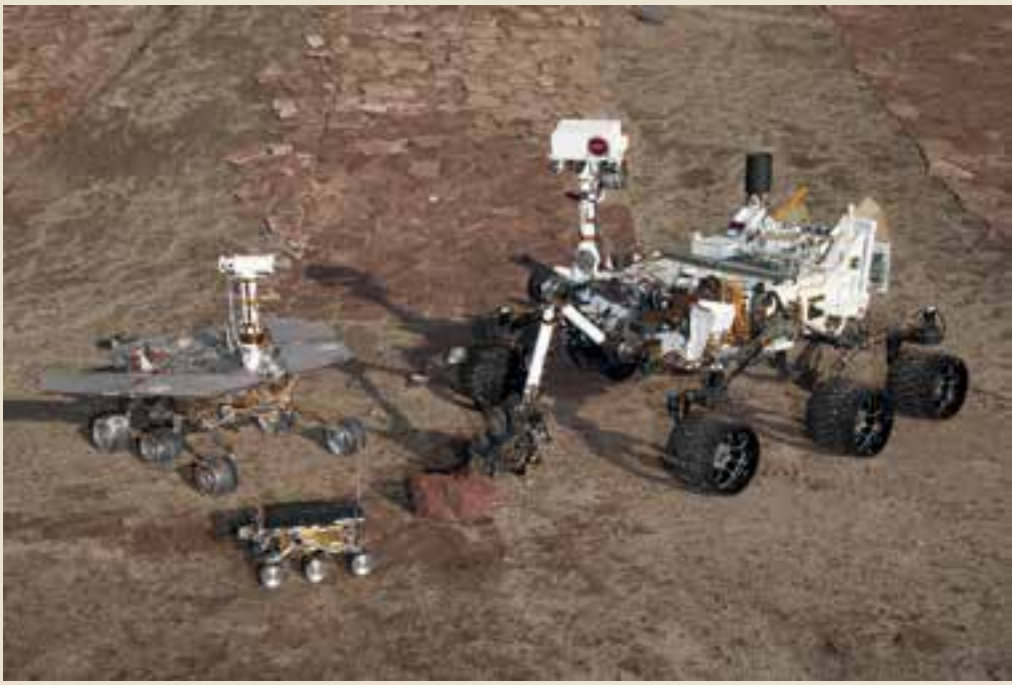
NASA's Mars Exploration Rover mission began in 2003, with the launch of Spirit and Opportunity, to rovers that landed on Mars in January 2004. This ongoing mission relies on fully automated space robots, named rovers, that explore the surface of Mars and gather multiple information to help scientists answer some of the most fundamental questions of the human kind: are there other clues of past water activity? Are there evidences that could assess that environmental conditions that existed when liquid water existed, were favorable to life? The engineers at NASA's Jet Propulsion Laboratory (JPL) in Pasadena (California) worked hard on the rover mobility system, making sure it can climb dunes, maintain his stability up to 30° of inclination. But what about the bearing selection?

Pushing the limits

Safely riding across the landscape is one thing, ensuring an extended service life in extreme conditions is another one. Indubitably, top bearing performance was required to guarantee success of NASA's Mars mission. A great opportunity for bearing manufacturers to demonstrate their know-how in the most extreme conditions.

The Japanese bearing manufacturer NACHI equipped the drive system of Curiosity, the rover currently in activity on Mars. Very lightweight but stable and strong thin section bearings were designed and manufactured to meet the strict requirements. Helped by advanced material characteristics, the raceway design and the space-proven tribology, the NACHI bearings could exceed the expected lifetime of the Mars rover Curiosity which was formerly planned to be 2 years.

GGB Bearing Technology participated on the primary suspension components for the drill spindle, through their DU® metal-polymer self-lubricating bearing segments. The bearings feature high wear resistance and ability to function in harsh conditions and temperatures that characterizes Martian atmosphere. The bearings can operate successfully at temperatures ranging from 200°C to +280°C.



— Front and center is the flight spare for the first Mars rover, Sojourner. On the left is a Mars Exploration Rover Project test rover that is a working sibling to the rovers Spirit and Opportunity. On the right is a Mars Science Laboratory test rover the size of that project's Mars rover, Curiosity. Credit: NASA/JPL-Caltech

At the heart of the rover, the spectrum analyzer that screen thousands of samples from the soil, requires advanced motion control and a miniature pump, both involved in the process of collecting and analyzing specimens. The center hub of the Curiosity's carousel system rotates on Timken bearings, positioning sample cups. In addition, the vacuum pump, having the size of a "D" cell battery, supports the analytical equipment that utilizes 2 miniature Timken bearings with an outer diameter of 0.2500 inches. Already in the past, the US bearing leader supplied super precision bearings, that are currently being used on both other NASA's Mars Rovers, Spirit and Opportunity.

Barden Corporation also took part in the turret mechanism, on the drill bit assembly and in the vibration motor. Angular contact ball bearings where chosen for the drill bit assembly (15 degree contact angle). The bearings were manufactured to ABEC 7 standards, with SAE 52100 steel rings and balls and Phenolic ball retainers. The vibration motor bearings were also manufactured to ABEC 7 standards, with 440C rings, Phenolic ball retainers and were lightly pre-loaded.

Let's not forget another important function of Curiosity: taking images and sending them back to Earth! Myonic (part of MinebeaMitsumi Group) worked on special ball bearings, the ULQW 917 X series, to be equipped on the cooling system "Cooler K508" for the embarked infrared devices.

Operating on Mars

Like mentioned in the beginning of the article, the Mars Explorer Mission presents a series of challenges whether it concerns the exploration, the overall performance of the vehicle or the durability of his components. Let's first look at a few key numbers:

- Gravity is approximatively the third compared to Earth
- Average temperature varies around -63°C
- Atmosphere is 150 times less dense than Earth
- Water presence (at liquid stage) still under investigation
- Continuous dusty atmosphere, frequent dust storms

Such conditions imply faultless lubrication, wear resistance and excellent friction behavior. But not only: thin-section bearing designs had to prove excellent performance despite their lower section and mass. Timken, awarded by NASA subcontractor Starsys for the mission, explains on his official website: "Timken bearings provided a lower mass to help reduce weight; a decreased contact angle on some applications provided a higher radial capability which provides greater mobility; and a decreased radial play for improved radial run out at the rotating outputs to allow for accurate steering and pointing. Timken also ran numerous tests to make sure the bearings would be able to operate in the harsh environment of space. Most of the testing was analytical in nature and involved looking at different load cases to make sure that the bearings are not over-stressed. Starsys also performed its own tests to be sure the bearings could operate under a certain torque level so the motors are not overworked."

—NACHI bearings could exceed the expected lifetime of the Mars rover Curiosity

Mars 2020 mission already on tracks

According to Science Friday magazine, NASA engineers should borrow existing elements from Curiosity for their next mission, such as its body architecture and some of its technology. The rover's design will also remain unchanged, at the exception of his total length a weight to accommodate a different payload of scientific instruments.

The mobility team is also working on wheel design improvements. Top manufacturers that equipped previous rover version (and that wouldn't have done it already) should confirm their selection as solution provider.

Other companies made early communication about it, like NY based manufacturer PKB Bearings: "Pacamor Kubar Bearings (PKB), manufacturer of ball bearings for aerospace and defense systems, was recently awarded a contract by Sierra Nevada Corporation (SNC) to supply critical hardware for the Mars 2020 mission." Will the next NASA's rover mission offer new discoveries to the world? We sure hope so. As we are sure that the next aerospace bearing will keep the new rover right on track.

F MARS ROVER BEARINGS

Bearing materials key to
INCREASED RELIABILITY

The use of application-specific bearing steels and surface treatments permits the reliability of bearings to be increased significantly, which in turn contributes to the reduction of machinery and equipment TCO (total cost of ownership).

For high-performance bearings, the selection and optimisation of (steel) materials plays a central role in their development. For this reason, materials engineering is one of four core research and development technologies at NSK.

Material purity

The fatigue life of alloyed bearing steels such as 100 Cr6 (or SUJ2 in the Japanese standard), for instance, depends principally on the inclusion content. Oxide or non-metallic inclusions in particular, promote negative effects under the raceway surface. As an example, it is known that aluminium oxide inclusions, which are formed by the process of oxidisation during the melt, can lead to a major reduction in bearing fatigue life. This effect is created because aluminium oxide inclusions are relatively hard and can break up when the steel is being processed, such as during forging. When break-up occurs, the inclusions shrink and weaken the microstructure.

In partnership with a leading steel manufacturer, NSK has developed materials like Z steel, EP steel and BNEQUARTET to prevent this type of negative effect. Some of these materials are manufactured using special melting processes that reduce non-metallic content and prolong fatigue life.

— A combination of a special alloy and specific heat treatment was used to develop NSK's Super Tough steel

Application-specific heat treatment

Heat treatment is another parameter which impacts the specific characteristics of steels and consequently also affects the bearings. This fact is why materials such as NSK's SHX steel are subjected to a specific heat treatment that is particularly resistant to wear at high operating temperatures. Bearings of this type are required not just where heat is present as an inherent part of the process, but in applications such as machine tools, where fast spindle speeds generate high temperatures in the drive components.

During development, the characteristics of SHX steel were proven by means of comprehensive wear resistance tests, including four-ball and roller tests, as well as material

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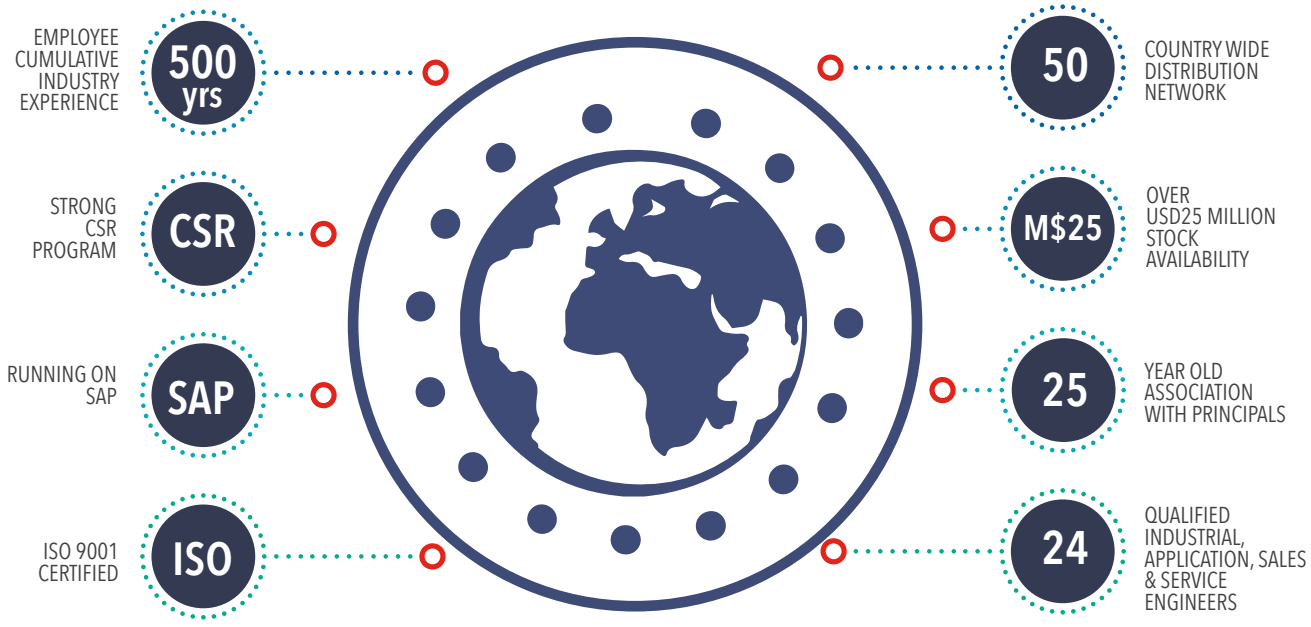

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and surface fatigue life tests.

The difference is in the alloy

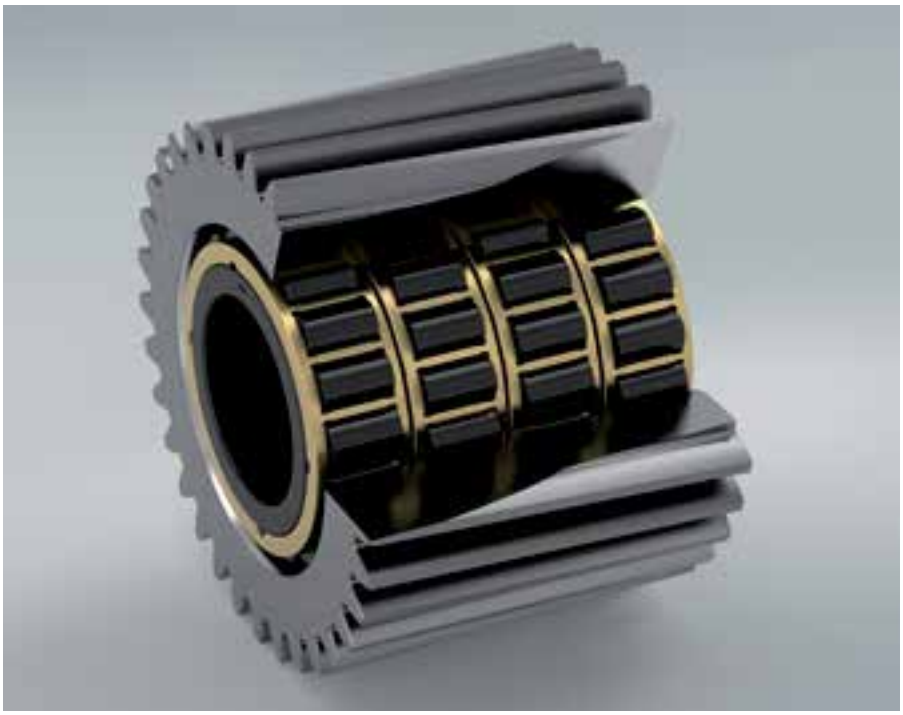
The third parameter in the quest for greater bearing reliability is the alloy. Alloys can prevent, or at least minimise, the formation of cracks in the bearing microstructure. Again in collaboration with steel manufacturers, NSK has developed various special alloys for this application profile.

Materials such as NSK's Super Tough steel come from combining the optimum heat treatment with a special alloy (Image1). For instance, the hardening of steels using a process such as carbonitriding increases service life by a factor of two in comparison with the estimated service life under contaminated lubrication conditions. In environments where the lubricant has normal impurities, bearing service life can even be increased by a factor of 10. The reason for this improved performance is that surface-induced wear caused by insufficient lubrication or contamination of the lubricant is significantly reduced. In turn, any potential damage caused by 'white etching cracks' (WECs) is delayed.

Example 1

The development of new materials is usually in response to industrial trends or changes in the application requirements. This was the case with BNEQUARTET technology, which NSK first introduced two years ago (Image2). BNEQUARTET was initially created in response to the steady increase in size of washing machine drums. The deep groove ball bearings found extensively in front-loading washing machines across Europe are subject to uneven and asymmetric loading. With increasing drum sizes, higher washing loads place even greater demands on bearings.

In response, NSK materials experts set about improving the alloy composition



—Burnished four-row cylindrical roller bearings used as integrated planetary bearings in wind turbines

of a special steel that prevents cracks and indentations from forming in the raceways and, most importantly, stops them from propagating. In addition, this particular steel is especially pure. The set of measures applied in BNEQARTET technology resulted in a doubling of bearing service life while under high load and unfavourable environmental conditions.

Example 2

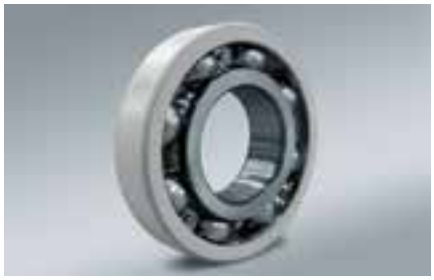
Another example of application-oriented materials development comes from wind turbine technology. Here, damage to the bearings in the form of WECs can occur below the material surface (Image3). These white structures of brittle ferrite, which are formed by changes in the microstructure, can be observed in etched and polished cross-sections of the material. The altered structures are no longer able to withstand the high loads that are applied. WECs form and spread out, which leads to surface defects such as pitting or WSF (white structure flaking).

Scientists have never been able to fully explain the reasons for WEC. Current thinking assumes that the conditions are caused by the effects of component interaction within the powertrain. These include dynamics, mixed friction, electrical charges/currents, chemical factors, slip/slide movements and hydrogen diffusion.

Developing countermeasures

Thanks to success in replicating WEC in the laboratory, NSK has subsequently been able to develop

— BNEQARTET deep groove ball bearings are used in the drives of electrical machines such as household appliances



— Ceramic components and coatings for bearings are an additional area of research at NSK

countermeasures that include the burnishing of martensite-hardened bearing steels, along with specific other materials (Image4). This additional process has been shown to significantly delay the occurrence of WEC damage.

Another effective method of reducing the probability of WEC damage is the use of bearing rings made of NSK's Tough Steel. Using this combination of material and surface treatment, dynamic load rating can typically be improved by 23%, which in rolling bearings is equivalent to a doubling of fatigue life.

Reducing WEC damage

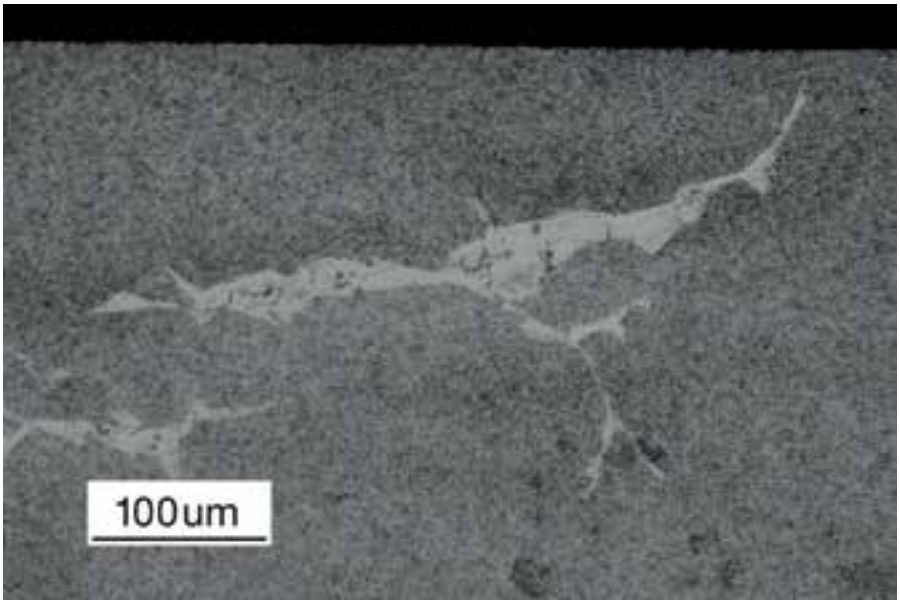
With regard to surface-induced wear due to poor lubrication or contaminated lubricant, this is greatly reduced with the use of STF bearings (Image5), while potential WEC damage is delayed. A series of NSK tests showed that the time prior to the onset of damage was doubled.

Another advantageous strategy is to use bearing rings made of 'Anti-White Structure-Tough' (AWS-TF), a proprietary NSK material that was developed specifically to prevent WEC damage. In an extensive series of tests, the operating life of conventional steel bearing rings was measured up to the moment when WEC damage was detected. Then, the test series was repeated with AWS-TF. After eight times more service life than the conventional steel bearing rings, no WEAs (white etching areas) were detected in the material.

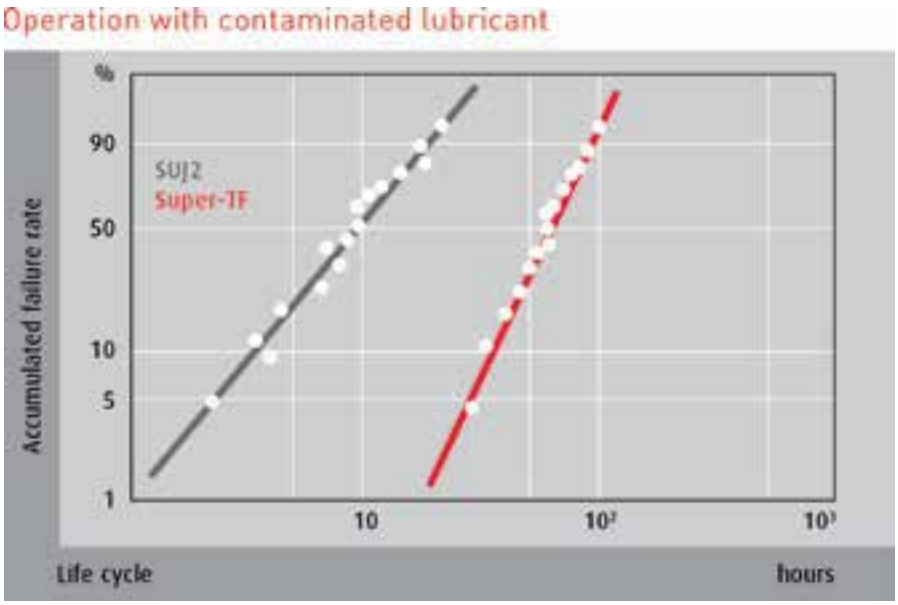
Plastics and ceramics

Materials development at NSK is not only about steel. Plastic materials, as well as non-ferrous metals such as brass, are also tested in order to make precisely targeted improvements to the characteristics of cages. Furthermore, ceramics and ceramic coatings (Image6) play an increasing role when adjustments are needed to the electrical conductivity properties of bearings and their resistance to wear. On this subject, NSK has recently introduced a ceramic development called HDY2, which features optimised insulation and thermal conductivity characteristics.

Finally, another focus area for materials development concerns lubricants. Tribology is a separate core competency in NSK's research and development organisation, alongside materials technology.



— Typical damage pattern: White etching areas below the material surface 3



— Advantages of Super-TF when operating with contaminated lubricant

NKE AUSTRIA & FERSA BEARINGS:

International Expansion and Investments

NKE Austria GmbH has been part of the Fersa Group for more than two years now. The corporate group was established through the merger of the Austrian bearing manufacturer with Spanish company Fersa Bearings S.A. Both companies are active in the development, production and sales of bearings for the global automotive and industrial markets: NKE in Steyr covers the industrial sector and Fersa, headquartered in Zaragoza, the automotive sector.

Thomas Witzler
General Manager of NKE

Fersa Bearings's CEO Carlos Oehling, COO Pedro Pablo Andreu, NKE's general manager Thomas Witzler and NKE's sales director Jesús Monforte talk about the group's international expansion, investments in the next two years and the future outlook.

The Fersa Group has sales offices and trade partners in 86 countries as well as four production sites, six distribution centres, and four research and development facilities, two of which are located in Europe and two in Asia. "Fersa wanted to go beyond just having international sales", says Fersa Bearings' COO Pedro Pablo Andreu. "So in 2009 we started to establish commercial offices in Brazil. They were followed by our subsidiary in China, which we built in 2011, the United States in 2015, the acquisition of NKE Austria in 2016, and in 2017 the implementation of our quality center in India as well as our joint venture with Shenyang Hanking Precision Bearing in China." CEO Carlos Oehling says: "In addition to our presence in Zaragoza, Jiaxing and Steyr, where manufacturing plants, logistics centers and quality control are located, Fersa has added two logistic centers in Brazil and in Toledo in Ohio, USA, while in Jodhpur in India we have another quality control center. Our aim is to continue our growth in foreign markets."
Fersa Group's turnover is expected to exceed 80 million euros in 2018, with EBITDA (earnings before interest, tax, depreciation and amortization) of 9 million euros. "In 2020, we plan to achieve a turnover of 110 million euros and EBITDA of 15 million euros", Andreu adds. The total workforce in all of the group's locations is 500 employees, 100 of which work at NKE in Steyr. "In Zaragoza, with the factory, logistics, quality control and the R&D department, we employ about 215 people", Oehling says. "The facility was recently expanded, but the company believes that the productive capacity can still be increased." Continues Andreu: "To achieve this aim, Fersa Bearings plans to invest 16 million euros in the facilities in Zaragoza by 2020. In April 2018, we opened a new warehouse in Zaragoza's industrial park Plaza (Plataforma Logística de Zaragoza), which involved an investment of 3.2 million euros. This was necessary to release stock space in the production hall to accommodate new production lines. By 2020 we plan to build an additional warehouse with a height of 16 meters. To further increase production capacities, we plan to build a fourth production line by the middle of next year. We want to go from the 1.85 million bearings produced last year to more than 3 million. In addition to expanding production capacities in Zaragoza, this will involve an additional production line in Jiaxing in China." In addition, the Fersa Group is investing in intelligence and information management systems: "In 2018, we are continuing with our digitalization, investing 700,000 euros in our intelligence and information management systems", Andreu explains.

"Investments at NKE's facilities in Steyr include a new production line for bearings ranging from 100 to 500 mm", says NKE's General Manager Thomas Witzler. "This automated line will be set up to meet

European OEM demands, with shortened production cycles and of European origin: Produced in the region, for the region". He continues: "We are optimistic about the future and are investing heavily in tomorrow's technologies. Since conventional rolling bearing technology is a fairly limited field, profitable growth will, in the long term, be possible only in niche markets. NKE is therefore focusing on the development of intelligent products for the industrial market, like our sensor bearing that we are currently developing."

"Due to the growing trend towards electric mobility, the reduced demand for conventional bearings will be especially felt in the automotive market", Witzler says. Oehling, however, is optimistic about applications for Fersa's bearings in electric cars: "Our bearings are used not in the engine but in the transmission and the wheels, so that is where the company will continue to focus its activity."

Asked about Fersa Group's current projects, Andreu says: "To get business with two of the largest original equipment manufacturers in Europe, strengthen our subsidiaries in the United States and Brazil, and increase activities in our quality center in India. Moreover, we are analyzing the possibility of opening a new subsidiary in Europe or Asia and are in the process of searching for potential acquisitions. As you can see, we have many challenges ahead! We are convinced that technology and our company culture will continue to be our distinguishing elements and will give the Fersa Group a competitive edge." NKE's new sales director Jesús Monforte adds: "The ambitious investment plans of the Fersa Group also represent an important step towards the internationalisation of our sales operations. We can now reach more international customers in locations across Europe, Asia and the Americas and provide them with the right product fit at the same, high quality level from our internal production and engineering capabilities."

"Due to the growing trend towards electric mobility, the reduced demand for conventional bearings will be especially felt in the automotive market." - Thomas Witzler, General Manager of NKE Austria GmbH in Steyr, Austria

Carlos Oehling
CEO of Fersa Bearings in Zaragoza, Spain

Pedro Pablo Andreu
COO of Fersa Bearings in Zaragoza, Spain

Thomas Witzler
General Manager of NKE in Steyr, Austria

Jesús Monforte
Sales Director of NKE

NKE company information:

NKE Austria GmbH is a bearing manufacturer with headquarters in Steyr, Austria. The company was founded in 1996 by a group of senior staff members of the former company Steyr Wälzlager. Spanish rolling bearing manufacturer Fersa Bearings, which is specialised in the automotive sector, acquired an interest of 49 percent in NKE in 2016. NKE offer both standard and special bearings for all industrial applications. Engineering, product development, production and final processing of components, assembly, quality assurance, logistics, and sales and marketing are centralised at its Steyr headquarters. The factory in Steyr is certified to ISO 9001:2008, ISO 14001:2004 and OHSAS 18001. A wide range of standard bearings is available from stock or at short production leadtimes. NKE also provides tailored products and solutions. In addition to product development and application engineering NKE offers a full range of technical services, consulting, documentation and training. NKE's products are distributed through 12 international representative offices and more than 240 distribution outlets in 60 countries.

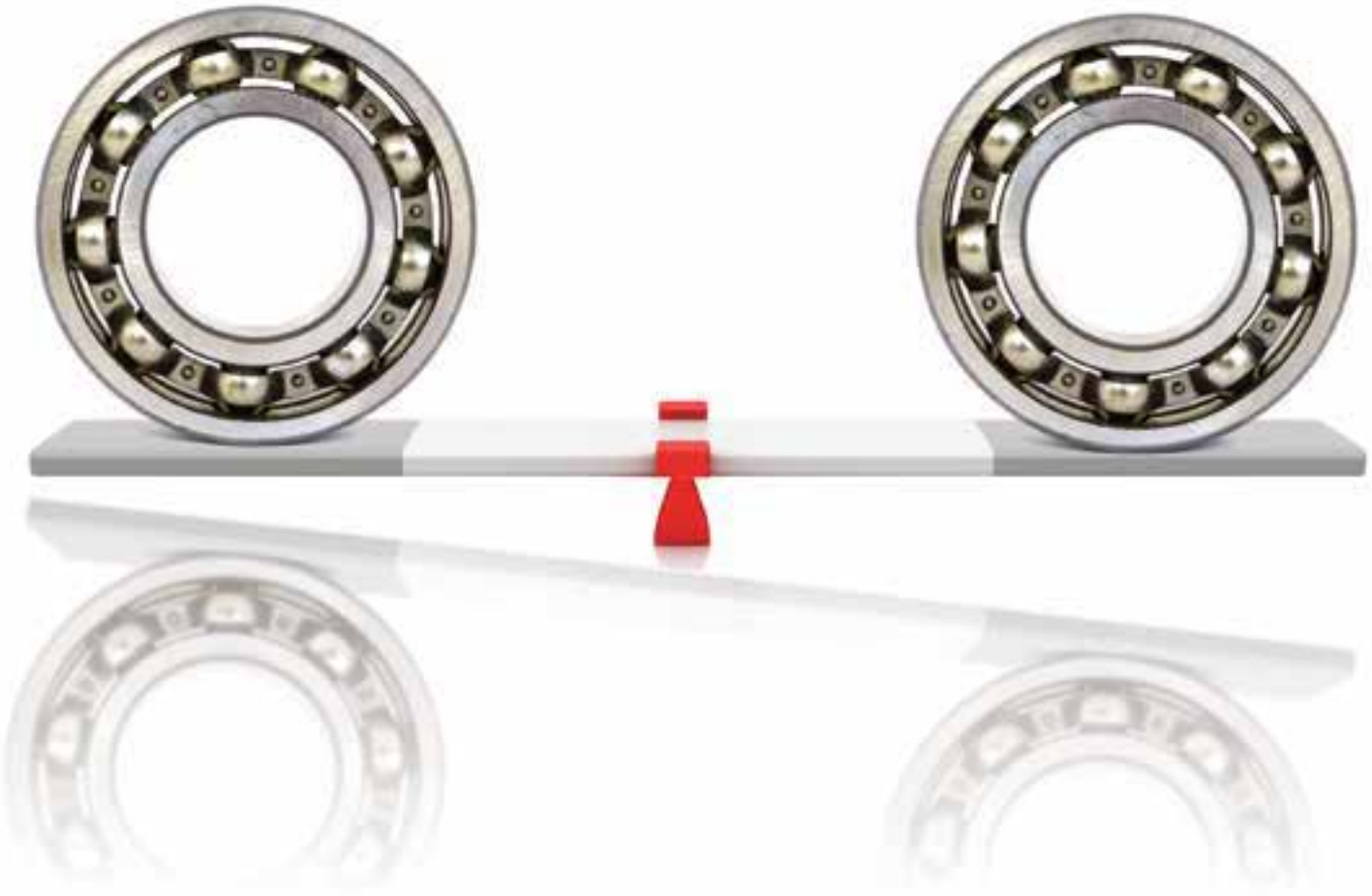
VOL. 03

LET'S FACE IT
– BEARINGS WORK IN A TOUGH WORLD.

EXCESSIVE CONTAMINATION. POOR LUBRICATION. HIGH HEATS. HEAVY VIBRATIONS. THESE MERELY SCRATCH THE SURFACE OF ALL THE WEAR AND TEAR YOUR BEARINGS GO THROUGH ON A GIVEN DAY.

That's where the knowledge and precision of Timken come into play. Our sales and service engineering teams solve problems and offer solutions for customers in virtually every industry. Couple this experience with a long-standing history in material science and tribology, and you gain a team of experts uniquely qualified to help you analyze bearing damage. And we want to share this knowledge with you. We developed this reference guide to help you identify some of the most common types of bearing damage, explaining the possible causes and discussing the necessary actions needed to avoid them. We also include useful bearing references and lubrication guidelines you can follow. If your bearing damage goes beyond what we cover, or if you just need help getting started, call us. Our service engineers can work with you – often on-site – to get to the root cause of your problems. We even offer in-depth training that's customized to your specific industry or application. It's a tough world out there. Let us help you make your business roll forward more smoothly.

IS THERE REALLY A DIFFERENCE?
ARE YOU WILLING TO RISK THE UNKNOWN?



Bearing quality varies widely within the global supply chain and variations you don't identify can result in catastrophic failures within your application. Bearing qualification provides technical information about a manufacturer's design, capability, and quality so you can successfully partner with a quality bearing supplier. Understanding the importance of bearing qualification within the global bearing supply chain will help save you time and money. Napoleon Engineering Services, as the largest independent bearing testing and inspection facility in the U.S., has the experience, capability, and knowledge to help you create and carry out a plan, unique to your needs, for successfully qualifying bearing suppliers.

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ue SYSTEMS INC
The ultrasound approach

PREPARATION AND APPROACH TO BEARING DAMAGE ANALYSIS

BEARING DAMAGE: OVERVIEW OF THE FACTS

Timken analyzes bearings from operations across the world. Our bearing service and repair specialists find that fully 50 percent of the bearings submitted to us haven't reached their calculated lives. In some cases, the cause is contact fatigue (inclusion origin, point surface origin, geometric stress concentration and micro-spalling). In 90 percent of the cases, though, the cause is non-fatigue factors, including:

- Foreign materials.
- Corrosion.
- Inadequate lubrication.
- Improper handling.
- Bad running conditions.

If you're concerned that your bearing is deteriorating, look for the following signs:

- Vibrations – whether felt by hand or measured with a frequency analyzer.
- Abnormal noises.
- Displacement of rotational centerline.
- Running temperature increase.
- Odd smells.
- Lubricant deterioration.
- Lubricant leakage.
- Visual discovery during routine maintenance check.

SUGGESTED PROCEDURE FOR BEARING ANALYSIS

Follow the steps below for an accurate and complete analysis when investigating any bearing damage or system breakdowns. If you need help, contact one of our sales or service engineers.

1. Gather operating data from bearing monitoring devices; analyze service and maintenance records and charts; and secure application diagrams, graphics or engineering drawings.

2. Prepare an inspection sheet to capture all your observations. Take photographs throughout the procedure to help document or describe the damaged components.

3. Extract any used lubricant samples from bearings, housing and seal areas to determine lubricant conditions. Package it separately and label it properly.

4. Secure a sample of new, unused lubricant. Record any specification or batch information from the container. Obtain the technical specifications and any related material safety data (handling, disposal, toxicological) documentation to accompany lubricant shipments.

5. Check the bearing environment for external influences, like other equipment problems, that preceded or occurred at the same time bearing damage was reported.

6. Disassemble the equipment (either partially or completely). Record an assessment of the mounted bearing condition.

7. Inspect other machine elements, especially the position and condition of components adjacent to the bearing, including locknuts, adapters, seals and seal wear rings.

8. Mark and record the mounted position of the bearings and components prior to removal.

9. Measure and verify shaft and housing size, roundness and taper using certified gauges.

10. Following removal, but before cleaning, record observations of lubricant distribution and condition.

11. Clean parts and record the manufacturers' information from markings on the bearing rings (part number, serial number, date code).

12. Analyze the condition of the internal rolling contact surfaces, load zones and the corresponding external surfaces.

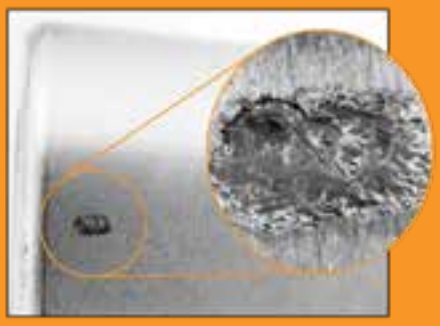
13. Apply preservative oil and repackage the bearings to avoid corrosion.

14. Compile a summary report of all data for discussion with Timken sales or service engineers.

BURNS FROM ELECTRIC CURRENT

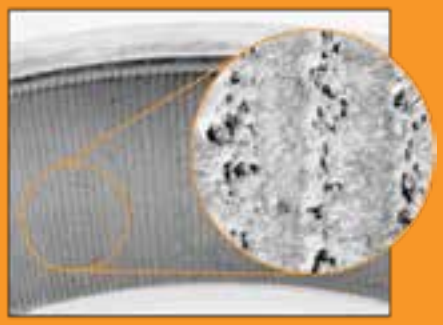
Arcing, which produces high temperatures at localized points, occurs when an electric current that passes through a bearing is broken at the contact surfaces between the races and rolling elements. Each time the current is broken while passing between the ball or roller and race, it produces a pit on both parts. Eventually fluting develops. As it becomes deeper, it creates noise and vibration. A high-amperage current, such as a partial short circuit, will cause a rough, granular appearance. Heavy jolts of high-amperage charges will cause more severe damage, welding metal from the race to the ball or roller. These metal protrusions on the roller will, in turn, cause a crater effect in the race, generating more noise and vibration.

Causes of arcing include static electricity from charged belts or processes that use calendar rolls, faulty wiring, improper grounding, welding, inadequate or defective insulation, loose rotor windings on an electric motor and short circuits.



— Fig. 60. Electric arc pitting or small burns, magnified 10X here, were created by arcs from improper electric grounding while the bearing was stationary.

— Fig. 61. Welding on a machine, while the bearings were rotating, caused electric arc fluting on this spherical roller bearing.

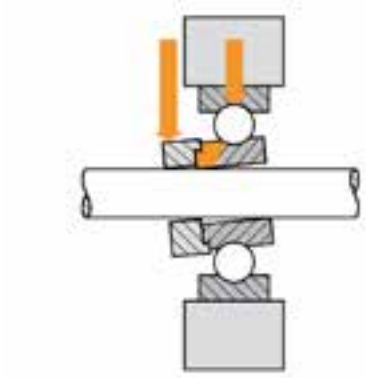


— Fig. 62. Magnified 10X, this fluting, defined as a series of small axial burns, was caused by an electric current passing through the bearing while it was rotating.

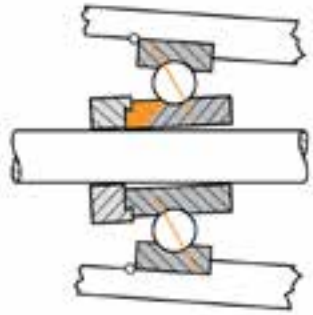
CAM FRACTURE

Cam Fracture: Wide Inner Ring Ball Bearings

An undersized shaft or an outer ring that cannot be aligned due to the housing may cause a broken cam, a misaligned travel path or bearing wobble.
This type of bearing damage may be prevented by using the correct size shaft and by using the Timken self-aligning feature, a spherical outer ring to compensate for initial misalignment and correctly mount bearings.



— Fig. 63A. Shaft below suggested tolerance levels.



— Fig. 63B. Misaligned outer ring.

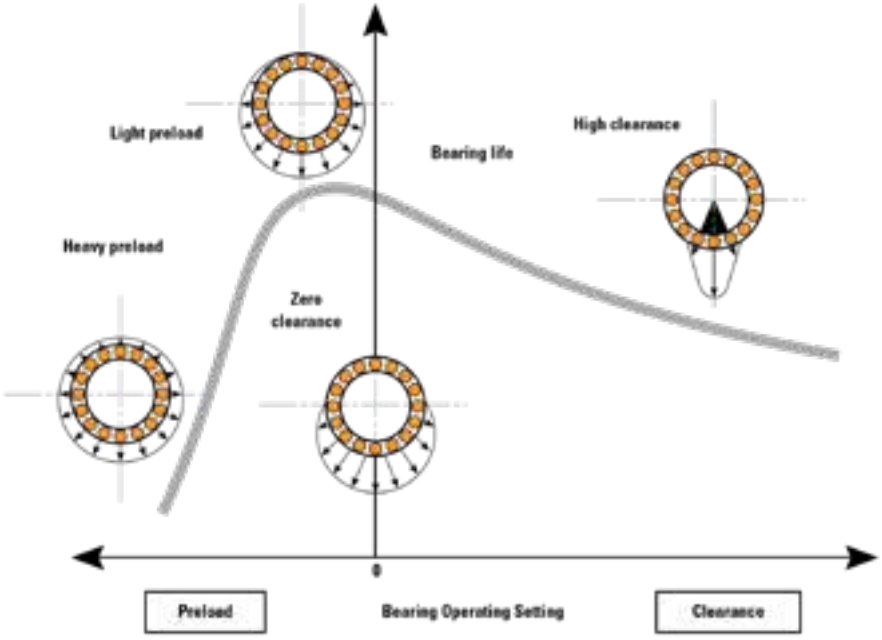
UNDERSTANDING BEARING LIFE

Bearing Service Life

Bearing service life is based on many factors. Depending on the application requirements, the actual service life can greatly vary. For example, a machine tool spindle bearing may be unfit for further service because of minor wear that affects spindle accuracy. In contrast, a rolling mill roll neck bearing may have a satisfactory service life even if the bearing developed spalling damage, as long as the spalls are properly repaired in a timely fashion. Reduced service life can be caused either individually or by any combination of:

- Faulty mounting.
- Improper adjustment.
- Insufficient lubrication.
- Contamination.
- Improper or abusive handling.
- Poor housing support.
- High-static misalignment or shaft and housing deflection.
- Poor or inconsistent maintenance practices.

The life of your bearing also depends on the load zone obtained under operating conditions. Generally speaking, the greater the load zone, the longer the life of the bearing under stabilized operating conditions. Fig. 64 illustrates this relationship for tapered roller bearings; other roller bearings with radial loads possess a similar performance relationship.



— Fig. 64. Bearing life vs. bearing operating setting.

LUBRICATION REFERENCE GUIDE

Factors that Impact Lubrication Performance

As we explained on earlier, the life of a Timken® bearing depends on the proper bearing lubrication. Grease lubricants help protect surfaces against corrosion while reducing friction. Inadequate lubrication causes a high percentage of bearing damage.

Although it's a broad term, we classify "inadequate lubrication" into these basic categories:

- Overfilling
- Underfilling.
- Incorrect greas.
- Mixing greases.
- Worn-out grease.
- Water contamination.
- Incorrect lubrication systems and intervals.

Overfilling

Overfilling a bearing with too much grease can cause excess churning and high temperatures during operation. This can create overheating and excess grease purging (leaking) – see note below. Overheating happens when the generated heat can't dissipate correctly, continually building until damage occurs. As the bearing's operating temperature rises, the oxidation (breakdown) rate of the grease sharply increases – doubling every 10° C (18° F).

— Fig. 65. This petri dish above contains heavily oxidized grease, which purged from an overfilled bearing. Grease undergoing heavy oxidation often has a very distinguishable black color and burned odor. In addition, it gets stiffer in consistency.

— Fig. 66. "Clean" grease slightly purging (leaking) from a bearing during initial start-up is generally acceptable. The grease is wet and evenly purged. If this slight purge is not causing any problems, leave it alone as it is an effective barrier seal.

NOTE

During initial start-up, it is common for a properly greased bearing to purge a small amount of grease. A slight grease purge is often recommended by original equipment manufacturers, as it acts as a barrier seal to help keep out external debris contamination (Fig. 66). Always follow original equipment manufacturers' recommendations regarding grease purging and correct replenishment amounts. An overfilled bearing may also purge grease during initial start-up. However, over time and as temperature rises, excess grease will continue to purge from an overfilled bearing and have a darkened color (Fig. 65).

Let's talk about:

DUNLOP PREMIUM ROLLER CHAIN

Dunlop Premium Chain production was started in 1949 and manufactures a wide range of power transmission products; many of which provide innovative solutions to original equipment manufacturers and trade distributors alike. We also understand the importance of having stock immediately available to fulfil our customer's requirements and expectations.

Our UK warehouse holds stock in excess of €6.5m and offers a wide product range including both British standard and American standard roller chains, sprockets in both taper and pilot bore options along with taper bushes to suit both metric and imperial shaft sizes.

We also produce power transmissions products such as vee & wedge belts and pulleys, timing belts and pulleys and both flexible and rigid couplings.

EU Production

Dunlop has a production site in Consett, Co. Durham, north east UK and a warehouse and distribution centre in Ashford, Kent, south east UK that serves the markets of both the UK and Europe, Dunlop premium roller chain is proud to be manufactured in the EU.

Easy Dis-assembly

With Dunlop's unique design of rivet roller chain, it is easily dis-assembled, each component has been manufactured to tight dimensional tolerances which ensures the smooth functioning of a precision gear system.

Environment

Dunlop takes its environmental responsibility very seriously in all of its state of the art production facilities. The new BS/DIN series premium roller chains contribute significantly to reducing CO2 emissions due to the reduction in chain replacement frequency.

Constant Quality

In pursuit of continued quality, every Dunlop chain is made of a special steel alloy developed by our Engineering Department which when combined with advanced heat treatment processes ensures that our customers can always rely on a constant quality level of all Dunlop premium roller chains. Dunlop premium chains are easily recognisable by their high quality black boxed packaging and hologram label design, look out for the Dunlop flying D on the outer plates for further reassurance that you are receiving a genuine Dunlop premium product.

Please consult Dunlop for more detailed information

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Underfilling

Underfilling a bearing with grease also can have adverse consequences. As in overfilling, underfilling can generate heat but for different reasons. A low amount of grease can create a condition known as a grease starvation, which causes heat generation or excessive metal wear during operation. If a bearing suddenly becomes noisy and/or the temperature increases, excessive wear may be taking place.

—Fig. 67. Grease removed from an underfilled bearing shows shiny bearing metal debris.

Incorrect Grease

The base oil in a particular grease may have a different thickness (viscosity) than what's recommended for your application. If the base oil viscosity is too heavy, the rolling elements may have difficulty pushing through the grease and begin to skid (Fig. 68). If this happens, excessive grease oxidation (breakdown) (Fig. 69A) may cause premature grease degeneration and excessive wear of bearing components. If the viscosity is too light, the thin lubricant film from the higher temperatures may cause peeling (micro- spalling) and wear (Fig. 69B). Additionally, the additives contained in a particular grease may be inappropriate or even incompatible with the surrounding components in your systemexcessive wear may be taking place.

—Fig. 68. This cylindrical roller flattened as a result of skidding

—Fig. 6A

—Fig. 6B Micro-spalling in a tapered roller bearing outer race (Fig. 69A) and inner race (Fig. 69B) was due to thin lubricant film.

MIXING GREASES

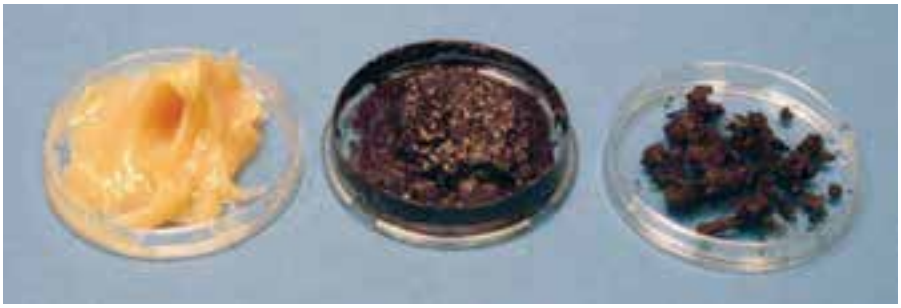
A bearing should run well with the correct grease. When performing routine maintenance, make sure that you lubricate the bearing with the same type of grease or a compatible substitute. If you use an incompatible grease, or one with the wrong consistency, this new mixture may:

1. Soften and leak out of the bearing because of the incompatibility of the grease thickener.
2. Become lumpy, discolored and hard (Fig. 70).

—Fig. 70. Grease A and Grease B are not compatible. When mixed together they become lumpy, discolored and hard in composition (Grease C).

Worn-Out Grease

Grease is a precise combination of additives, oil and thickener (Fig. 71). It acts like a sponge to retain and release the oil. Time and temperature conditions can deplete oil release properties. When this occurs, the grease is worn-out (Fig. 72).



— Fig. 71. Grease is a precise combination of additives, oil and thickener

—Fig. 72. The above photo shows the same grease at three stages from left to right. 1) new grease, 2) heavily oxidized grease, and 3) worn-out (failed) grease where the thickener and additives have decomposed and the oil has broken down.

Incorrect Lubrication Systems and Intervals

To help prevent bearing components from wearing prematurely, it's critical to maintain the correct bearing lubrication systems and intervals.

If you don't follow maintenance schedules, excessive oxidation may cause the lubrication to deteriorate.

—Fig. 73. A technician records key bearing lubrication data on a maintenance sheet.

WATER CONTAMINATION

Fig. 74 shows the effect of water on grease by comparing fresh grease to a grease emulsified with 30 percent water. The fresh grease is smooth and buttery compared to the water-laden grease, which has a milky white appearance. The presence of as little as 1 percent water in grease can make a significant impact on bearing life.

—Fig. 74. The effect of water on grease is depicted here.

—Fig. 75. A tapered roller bearing cone and rollers, and a ball bearing outer race and balls (Fig. 76) show rusting with pitting and corrosion from moisture/water exposure.

—Fig. 76.

QUICK AND EASY FIELD TEST TO DETERMINE WATER IN GREASE

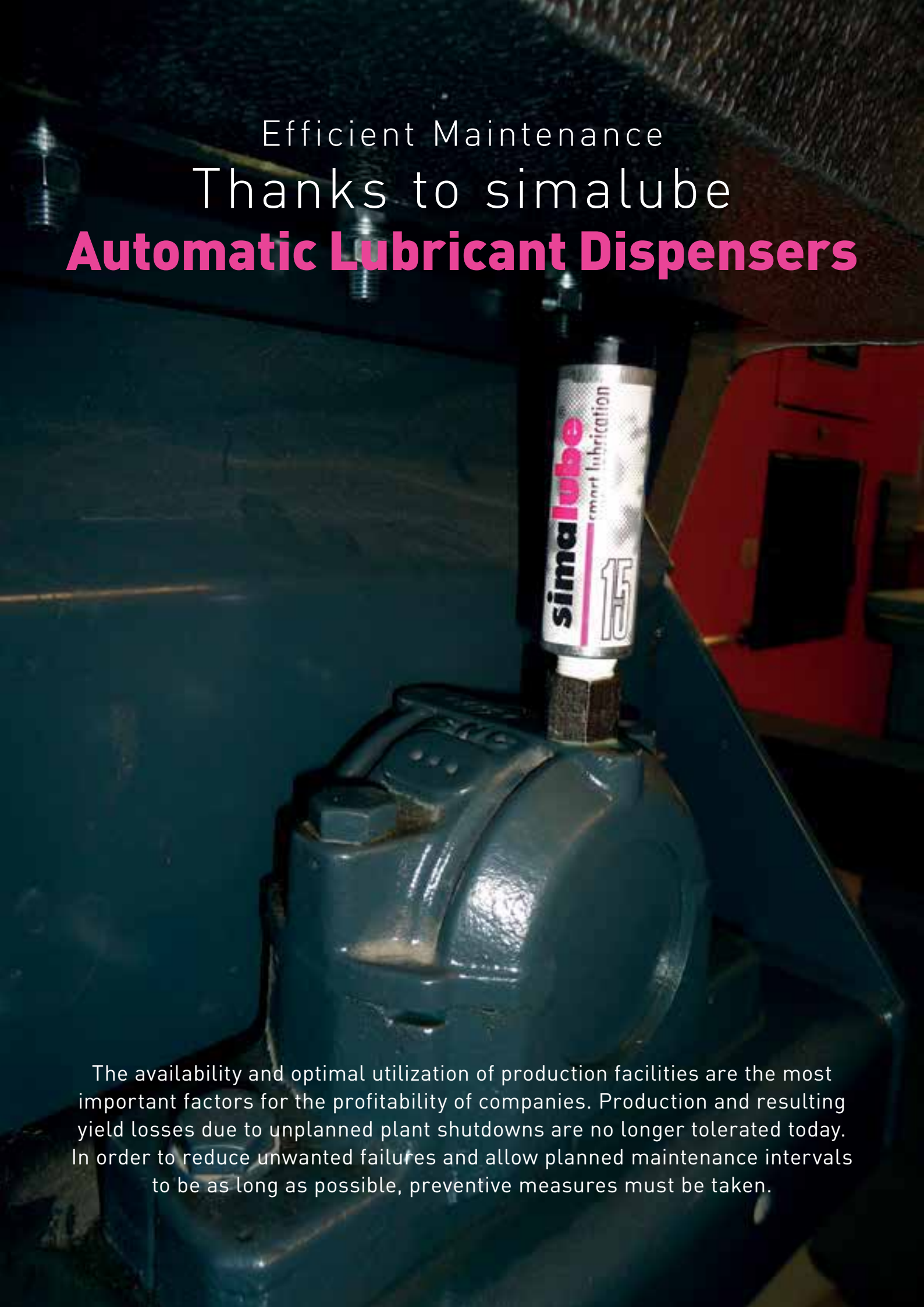
An easy, non-quantified method of determining the presence of water in grease is known as the crackle test. To perform this test, place a grease sample on a piece of aluminum foil (Fig. 77) and put a flame under the foil (Fig. 78). If the grease melts and lightly smokes, the presence of water is minimal. However, if the grease crackles, sizzles and/or pops, the grease contains a considerable amount of water.

—Fig. 77. To perform a crackle test, first put the grease sample on a piece of aluminum foil.

—Fig. 78. A crackle test determines the presence of water in grease.

Failure to observe the following warnings could create a risk of serious injury.

Heated grease or water may create a risk of burns or eye damage. Wear suitable personal protective clothing, including eye protection and gloves, when performing this test.



Efficient Maintenance

Thanks to simalube

Automatic Lubricant Dispensers

The availability and optimal utilization of production facilities are the most important factors for the profitability of companies. Production and resulting yield losses due to unplanned plant shutdowns are no longer tolerated today. In order to reduce unwanted failures and allow planned maintenance intervals to be as long as possible, preventive measures must be taken.

Lubrication is a very demanding and important maintenance task. It is important to select the correct lubricants and then supply them to the lubrication points in a suitable form and in the correct quantities. Likewise, the selection of the lubrication system is crucial; a choice must be made according to the requirements.

For lubrication, expensive high-performance lubricants of the latest technologies are increasingly being used today. It is therefore all the more astonishing that relubrication is usually carried out by hand and that only 5% of all lubrication points are equipped with an automatic system. Obviously there is a lot of catching up to do here, be it as a retrofit or the initial installation.

In both cases, simalube automatic lubricant dispensers from the Swiss manufacturer simatec are the ideal solution. The customer can select the sizes, lubricants and running times of the dispensers and thus receives the tailor-made solution for each lubrication point. Each lubrication point is supplied independently, reliably and continuously with the daily lubricant quantity pre-selected by the customer.

The lubricators generate exactly the pressure required to deliver greases or oils to the lubrication points. Separation of oil and thickener is avoided, the consistency remains constant and the freshly fed lubricant delivers its full capability at the lubrication point. The wear on the components is reduced, unplanned downtime avoided and maintenance intervals extended. By eliminating manual lubrication, valuable time is also saved. Continuous supply of fresh, unused lubricant provides better quality lubrication than manual lubrication.

In contrast to complex centralized lubrication systems, the installation of simalube single-point lubricant dispensers requires much less effort and expense. Ideally, the customer screws in the desired grease generator directly at the lubrication point. Long lubrication lines or distribution systems are not necessary; the connection to a controller or an external power supply is eliminated. The user has a wide range of accessories available, making the initial installation of the simalube child's play.

To calculate the correct amount of lubricant, the manufacturer simatec provides the free program Calculation Pro on its website, in the App Store or on Google Play. If the customer wants to be reminded that the lubricators should be checked, replaced or reordered, he can use the online tool Lubechart. The manufacturer also offers this service to its customers free of charge for use.

The simalube lubricant dispenser family comprises five different sizes. The dispensers work independently and reliably in every installation position. They can be set with a duration of 1 - 12 months. The standard program includes grease and oil dispensers with modern high-performance lubricants. These can be refilled and are also available empty for your own filling. The simalube lubricant dispensers meet the requirements for use in all potentially explosive areas (gas, dust and underground mining).

For more information, visit www.simatec.com

JESA has lost its founding father

Joseph Egger has had a lasting impact on the industrial footprint of Fribourg following the creation of the precision bearing manufacturer JESA, which will celebrate its 50th anniversary in 2019. Mr. Egger passed away at the beginning of May aged 93.

JESA, an SME based in the canton of Fribourg, Switzerland, is a specialist in bespoke solutions incorporating high precision ball bearings, engineered metallic and plastic components and plastic injection technology. Its founder and long-time director, Joseph Egger passed away in May.

A NEW CHALLENGE

The adventure began in April 1969. At the time, Joseph Egger was Sales Manager for a local ball bearing supplier and decided to begin a new challenge from scratch. Together with his son Rolf and Vincent Basile, he created the company J.Egger SA (shortened to JESA) whose first commercial venture was the general sale of ball bearings. Two years later, driven by the demands of the market, he began to manufacture specialist ball bearings. The premises were located originally on Route Neuve in the town of Fribourg. Business was good and thanks to investment in modern machines daily output increased from 1'500 to 5'000 pieces.

—Mr. Joseph Egger

THE FACTORY IN VILLARS-SUR-GLANE

Now cramped in its premises, in 1976 JESA began the construction of a new building in the industrial zone of Villars sur Glâne and subsequently moved there. In 1978 daily bearing production had risen to 11'000 pieces. The machine park was increased, and the manufacturing premises were expanded and now included a plastic injection department together with its own mould making shop in addition to a mechanical workshop and a stock to support the daily business. Thereafter the Saurer-Wermex factory was taken over in 1984.

For its 20-year anniversary JESA acquired a stake in the company Bultech Precision

— The first JESA premises in Fribourg

specialised in turning and forming. Despite a difficult economic situation, the year 1992 marked an important step in the evolution of the company in the form of the creation of a sister company Jeska in Slovakia, the introduction of a computer system and a new production hall thanks to a new expansion of 2'300m2 on the back of which daily production grew to 38'000 bearings. Most importantly however in this year JESA achieved its ISO 9002 certification, infact being one of the first in the canton to achieve this. For its 30th anniversary JESA fully acquired the company Bultech Precision.

BIOGRAPHY

A hard worked all his life, Joseph Egger only decided to retire at the age of 77. With the wish that his company would remain in Swiss hands, he turned to the POLYGENA Group who specialise in providing succession for SME s and guaranteeing a long-term future for them. So, he handed over the reins of his business and in fact 2001 was a record year for production

THE FORMULA FOR SUCCESS

The success of JESA was not by chance but was as a result of hard work and attention to detail. Joseph Egger lived to the age of 93 but over the years he made an impression in the hearts and minds of many of his employees whether they stayed only a short time or whether they are still within the business. When asked about Mr. Egger he is described as well-respected and as someone that you did not say "no" to because he was in return very respectful to his employees. "he was very demanding but also very

— The Villars-sur-Glâne factory in 1976

— Goods -in and despatch

— The Villars-sur-Glâne factory in 1976

respectful". Some people remember clearly his obsession with order and tidiness. "when he decided that things were not well organised he thought nothing of throwing everything out into the corridor or tipping over the shelves... In these instances, then Monday morning was for tidying up or we had to wear slippers when we went into his office". He was however also very generous with his teams and often organised football matches with other companies in the area... Football was one of his passions. "At my interview, he asked me if I played football. It was one of his criteria for selection" remembers one of his former employees at JESA.

THE JESA OF TODAY

JESA today, as a member of the POLYGENA Group, has approximately 280 employees worldwide. Its headquarters and its Swiss production site are still located in the industrial zone of Villars-sur-Glâne. The company now also has a manufacturing location in Wuxi, China.

Winner of the Prize for Innovation in 2012, the company has recently made significant investments in new production machinery and also in the infrastructure in order to be able to continue to propose cutting edge solutions to the market.

JESA will celebrate its 50th anniversary in 2019.

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ISB SPAIN:
Interview with CIDEPA,
The Traditional Gearbox Manufacturer

With the support of the ISB Group, the specialized company in Spain region “ISB SPAIN” has been the starting point for the expansion of the “green brand” in Europe. With its headquarters in Barcelona going by the name of Euro Bearings Spain SL, the Spanish branch has been managed by the Abad family for over 50 years, when in 1966 its founder, Ernesto Abad established “Rodamientos Abad”, a production site of industrial components and also a production site specialised in the manufacture of bearings units

for the automotive industry.
This experience as manufacturers among with a deep knowledge of the product and the bearing sector, would lead them to create the current ISB SPAIN in 1998. Today ISB Spain directly supplies over 4.000 Spanish companies with a team of 30 staff and a network of dealers with 17 sales outlets across the country. The management of large stocks and the support of the headquarter in Italy undoubtedly represent the main advantages that have allowed the Spanish branch to become a reliable partner, both for retailers and large machinery and systems manufacturers (agriculture, bottling, packaging, automation, logistics, etc.). Recently

the Spanish company also launched ISB Sport, a range of bearings for sports applications which has quickly taken hold in the cycling and motorcycling world. Not only investments in products but also in logistics. In 2018, ISB Spain will create an automatic warehouse used for the storage of 80.000 boxes, in addition to those already present in the 4,000 m2 conventional warehouse. All this with a view to supporting customers, professionally and reliablility, every day.

One of the companies who is using the products and services of ISB Spain is Cidepa-Sincron, a traditional gearbox manufacturer. We tried to reveal the details of this cooperation during an Interview with Mr. Jose Manuel Cid, Purchase Manager and one of the owners of the Company Cipdepa-Sincron.

What does your Company do?

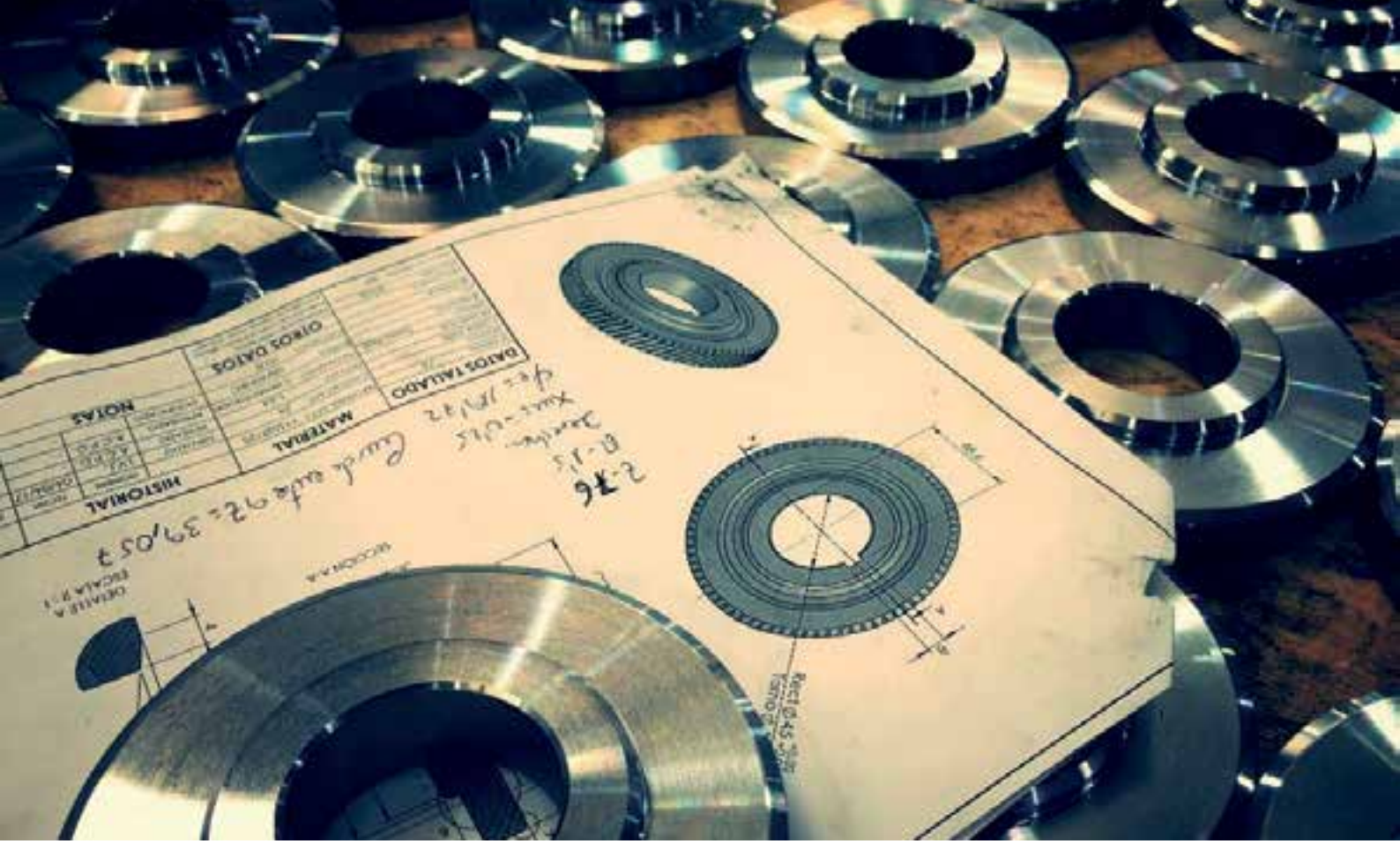
Cidepa-Sincron is specialized on the manufacture of speed reducer gears since 75 years. Placed in Alcala de Guadaira, in Seville, currently occupies 7000 m2 and is the result of the the work of three generations of the Family Cid de la Paz. The Company has inhereted a philosophy based on the quality, profitability and technical strictness. As a national reducers factory, we are present throughout the european market thanks to a complete network of Distributors. Our field of activity includes the adaptation of our gear - reducers to our clients through flanges, shafts, extensions, support... according to the requirements of each machine.

What is your flagship product?

I would not distinguish any in particular, our entire range is sold internationally equally: worm-wheel gear box, worm gears, coaxial gears, pendulars,

parallel and orthogonal shafts.
it depends on the alternative that the client needs to cover as we make the necessary adjustments so that our speed reducer gears are fully compatible with other brands on the market and offer high performance in combination with the customer’s machinery.

When and why did the collaboration begin between the ISB brand and Cidepa?
Our collaboration with ISB began in 2010, when we were looking for a reliable supplier that could respond to our quality needs. At the beginning, we put the bearings through a series of tests and they all got over it without any problem, both the cylindrical roller bearings of the NJ and NU type, and the tapered roller of the 30,000 series or the balls of the series 6000. This gave way to its subsequent internal homologation and the assembly in our products.



What are the advantages of this collaboration with ISB?

The ISB brand covers our needs and accomplishes our expectations in every way. The combination of price, quality and service offered by ISB is something that we take into account when selecting our suppliers, since they are the pillars on which the philosophy of CIDEPA and the main lines of our work have been set.

What are your projects for the future?

The market itself leads us to continue working on expanding our range in order to offer the customer more options of interchangeability with other brands, betting on quality and a better service.

We are finishing the project of the parallel and orthogonal CF and CK models and we continue developing the coaxial reducer TR with the same philosophy. All these advances will be presented at the trade shows as Expomin 2018 (Chile), EMAF 2018 (Portugal) and Hannover Messe 2019 (Germany).

BEARING & GEARBOX SEMINARS

AACHEN (GERMANY) OCTOBER 2018

SEMINAR PROGRAM

BEARINGS

1th of October 2018
Development of bearing suppliers and quality control during purchasing

2th of October 2018
Basics of bearing technology

3th of October 2018
Bearing failures: Investigation and analysis of practical examples

GEARBOXES

3th of October 2018
Bearing failures: Investigation and analysis of practical examples

4th of October 2018
Preventive maintenance and condition monitoring of industrial gearboxes

5th of October 2018
Supplier development for large industrial gearboxes and quality control

BEARING SEMINARS

Development of bearing suppliers and quality control during purchasing

1th of October 2018, 10:00 a.m. – 05:00 p.m.

Global sourcing of bearings opens plenty of opportunities for optimization of supply chains. However, any new supplier approval goes along with a certain quality risk. Therefore, this seminar is focused on the following subjects:

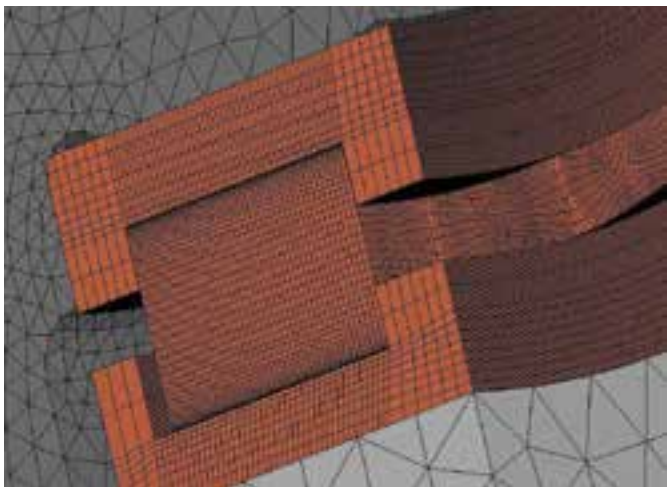
1. Definition of quality requirements, technical specifications
2. Approach during supplier visits and audits
3. Requirements related to documentation of production
4. Methods for incoming inspection
5. Concepts for quality control

Basics of bearing technology

2th of October 2018, 10:00 a.m. – 05:00 p.m.

This one day seminar provides basic knowledge especially for design of bearing arrangements and for quality assurance during purchasing. Lectures shall focus especially on:

1. Types, Properties, Concepts
2. Basics of Tribology
3. Raceway crowning
4. Material properties
5. Sample assessement



Bearing Failures: Investigation and analysis of practical examples

3th of October 2018, 10:00 a.m. – 05:00 p.m.

Identification and understanding of failure root causes is necessary in order to initiate the required counter measures. Therefore, this seminar shall show based on practical examples how damage characteristics can be identified and to which conclusion they lead. Main topics are especially:

1. Methods for damage investigation
2. Damage mechanisms
3. Quality characteristics of bearings
4. Examples from numerous applications

GEARBOX SEMINARS

Preventive maintenance and condition monitoring of industrial gearboxes

4th of October 2018, 10:00 a.m. – 05:00 p.m.

In many technical systems, breakdowns of particular components lead to enormous subsequent costs as production will be affected significantly. Detection of damages at early stages can lead to minimization of downtime and helps to avoid secondary damages by which overall breakdown costs can be highly reduced. Therefore, this seminar refers to the following topics:

1. Investigation of lubricants
2. Regular inspection and endoscopy
3. Vibration measurement and analysis of obtained results
4. Automation of shutdown in case of detected defect

Supplier development for large industrial gearboxes and quality control during purchasing

5th of October 2018, 10:00 a.m. – 05:00 p.m.

Large industrial gearboxes are typically produced in small series while frequently, individual solutions are requested which require close collaboration between supplier and customer. Here, especially clear communication of requirements, verification of technical concepts and of course the general assessment of production processes are essential. Accordingly, the topics of this seminar are:

1. Structure and content of technical specifications
2. Verification of technical documents such as drawings, stress and lifetime calculations of shafts, gearings, bearings and housings
3. Approach during supplier visits and audits
4. Requirements related to documentation of production
5. Methods for incoming and production related inspection

"Special Deals"

BEARING PACKAGE

- ☑ Development of bearing suppliers and quality control during purchasing
- ☑ Basics of bearing technology
- ☑ Bearing failures: Investigation and analysis of practical examples

GEARBOX PACKAGE

- ☑ Bearing failures: Investigation and analysis of practical examples
- ☑ Preventive maintenance and condition monitoring of industrial gearboxes
- ☑ Supplier development for large industrial gearboxes and quality control

You can download the registration form and all the seminar details on the Elgeti Engineering website at **www.elgeti-engineering.de** in order to susbcribe for one or more of the training seminars or contact Ms. Alexandra Becker on **ab@elgeti-engineering.de** or call **+49 (0) 241 16 91 93 20**

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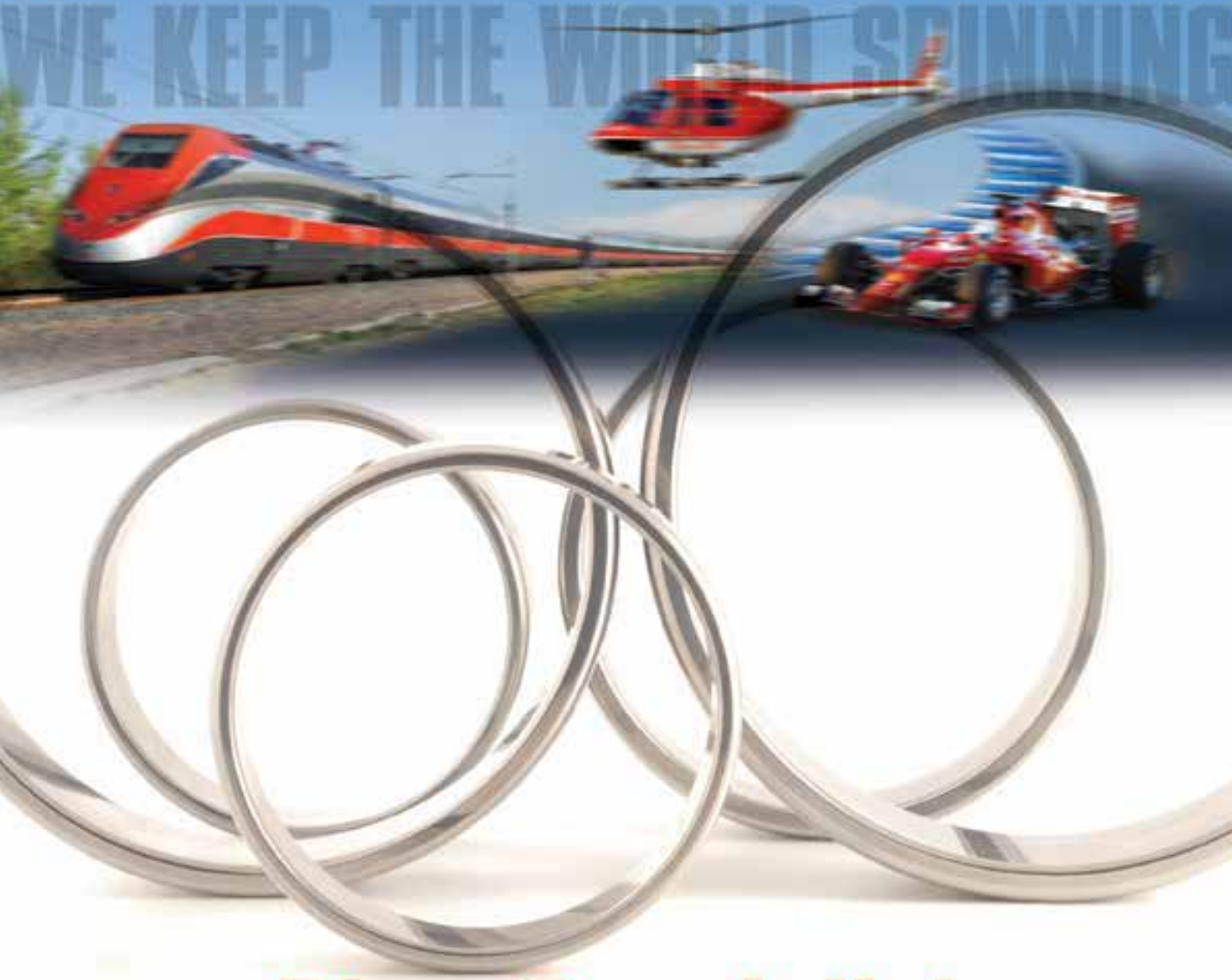

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Upcoming Events Agenda

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For 2018 and 2019 the BearingEXPO & Conferences will be held at the following locations:

PTC MDA ASIA

SHANGHAI 2018 (Conference)

during PTC ASIA *show*

06 – 09 November 2018

WIN EURASIA

ISTANBUL 2019 (Conference)

during WIN EURASIA *show*

14 – 17 March 2019

HANNOVER MESSE

HANNOVER 2019 (Conference)

during Hannover Messe *show*

01 – 05 April 2019

Bearing EXPO & Conference

MUMBAI 2019 (Exhibition & Conference)

during BearingEXPO & Conference India *show*

03 – 04 October 2019

CONTACT **info@bearing-expo.com** FOR ALL EVENT PARTICIPATION AND SPONSORSHIP DETAILS.
BE&C EVENTS ARE ORGANIZED BY BEARINGNEWS, IN COOPERATION WITH DEUTSCHE MESSE FOR SPECIFIC EVENTS.

International BearingEXPO & Conference India 2019

The BearingEXPO & Conference India 2019 will be held at the Lalit Plaza, a calm and peaceful oasis for the BearingEXPO visitors and conference attendees; which is located near to Mumbai city's airport and minutes away from business and financial districts.

EXHIBITORS	VISITORS	SIZE	COUNTRIES	SPEAKERS
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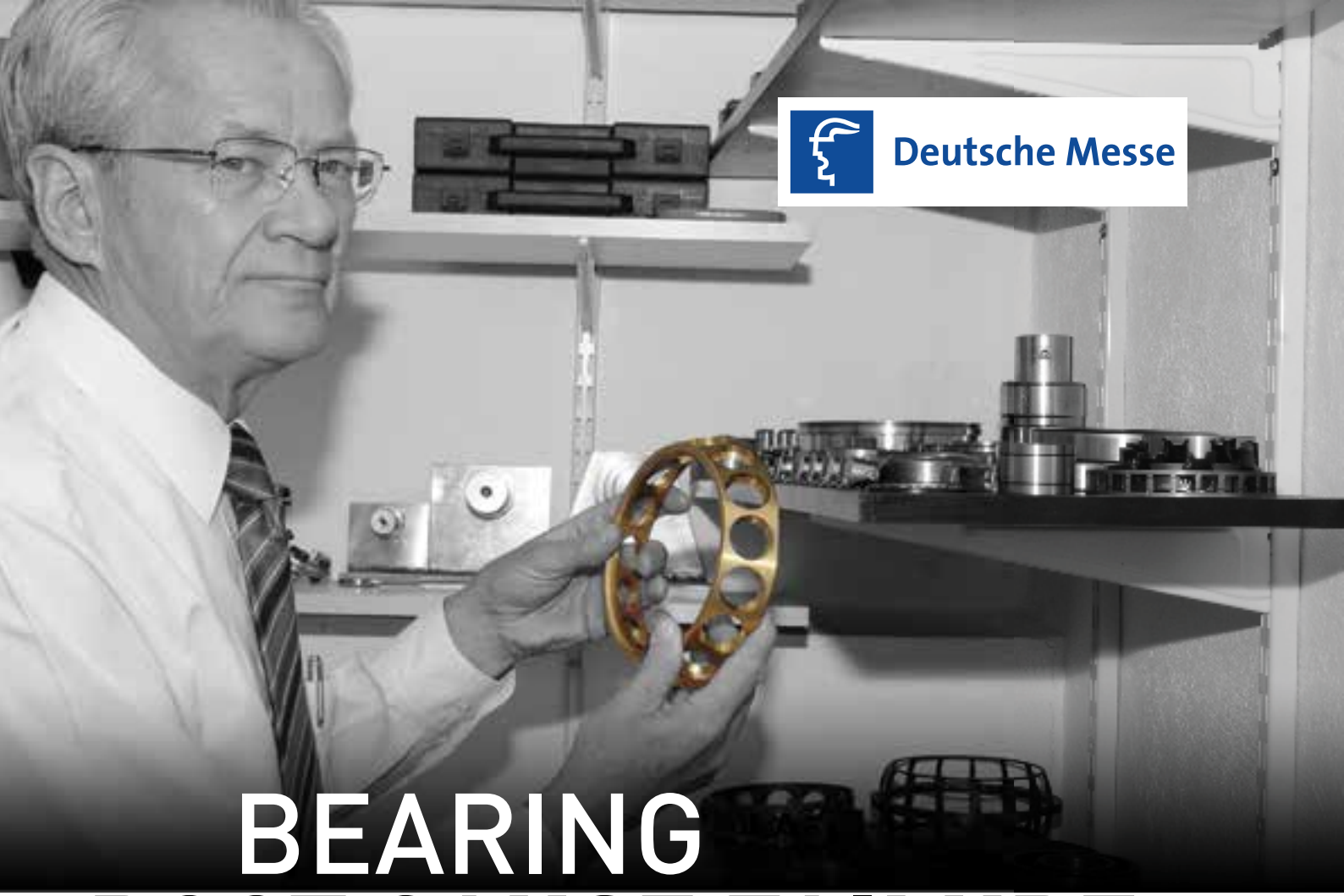

Deutsche Messe

BEARING
ROOT CAUSE FAILURE
ANALYSIS WORKSHOP

PTC ASIA EXHIBITION IN SHANGHAI

ON 8TH OF **NOVEMBER** 2018

Presented by **PER ARNOLD ELGQVIST**

- To emphasize the importance of Bearing failure root cause analysis as a tool to improve the efficiency of Maintenance: Identifying the root causes for the failures and determining the exact required corrective actions, in order to avoid further failures for the same cause will help maintenance to perform a precise repair and avoid waste of time and unnecessary use of spare parts.
- To terminate the workshop blindness of accepting bearing failures as "normal" and the simple replacement of bearings as consumables without implementing any corrective actions as "let's hope that this bearing will last longer".
- To describe the most common causes for bearing failures, in order to easier determine and understand the required corrective actions.
- To emphasize the importance of understanding the different bearing failure modes according to the ISO 15243 will also be pointed out as these, in many cases, will clearly and directly indicate the failure causes.
- This workshop will also cover a simple and practical procedure on how to perform a bearing root cause failure analysis and some relevant success stories will be solved in an interactive way.

Content of the Workshop

- First determination to be made: Natural or premature failure?
- Why should we do Bearing Root Cause Failure Analysis?
  First of all, in order to avoid further repetitive failures and unplanned downtime.
  Second, to perform no more nor less than the required repair, which means increased efficiency.
  Reduction of both unplanned and planned downtime.
- Benefits:
  Reducing unnecessary downtime, both planned and unplanned (OEE+).
  Extended bearing life increasing the availability of the process (OEE+).
  Reduced total cost by reducing the failure cost and avoiding further repetitive failures.
- Example: Success story at a cement mill
  Failure cost: 40,000 USD
  Lost production value: 28'000,000 USD

Failure of a large bearing in a cement mill:

Service life:
¡105 hours!

It may be very simple when you have the knowledge. By knowing the most common causes for bearing failures and the different bearing modes it will, in many cases, be very easy to identify the failure root cause and logically to immediately indicate the required corrective action.

Example of a simple analysis:

Vertical pump

Bearings: 6215 + 51115
Lubricant: Grease ISO VG460 Moly.
Speed: 1500 RPM
You got 10 seconds!

ISO 15243 established Bearing Failure Modes.

The following failure modes will be described:

Fatigue:
» Subsurface initiated fatigue
» Surface initiated fatigue

Wear:
» Abrasive wear
» Adhesive wear

Corrosion:
» Moisture corrosion
» Fretting corrosion
» False Brinelling

Electrical erosion:
» Excessive voltage
» Current leakage

Plastic deformation:
» Overload
» Indentation from debris
» Indentation by handling

Fracture and cracking:
» Forced fracture
» Fatigue fracture
» Thermal cracking

The Procedure of Bearing Root Cause Failure Analysis. A complete Failure Analysis Process should include:

1. Determination of the most complete information on the operating conditions.

2. Relevant photos during the process.

3. Samples of the lubricant from the application and sample of unused lubricant for comparison.

4. Marking of the bearings and their position in the equipment.

5. Careful dismounting of the bearing avoiding unnecessary additional damages.

6. Inspection of the other machine components to determine collateral damages.

7. Verify bearing seating on shafts and in housings.

8. Verify the condition and distribution of the lubricant inside the bearings. If possible, take additional samples.

9. Clean the bearings and the components and take note if possible of the markings, brand and complete designations.

10. Realize the analysis of the bearing and corresponding components. Take additional photos.

11. Determine the causes of the failure comparing the failure patterns with available standard photos from ISO 15243 and/or bearing manufacturers.

12. Determine the necessary corrective actions required in order to avoid the recurrence of the same failure.

13. Protect and keep the failed bearing for future use as comparison.

14. Example: Some examples of the above will be shown.

15. Interactive exercises: During the workshop, several interactive examples of bearing failure analysis will be performed.

16. Conclusions and recommendations.

Register today as **there are only 50 seats available.**

Kenan Özcan

WORKSHOP REGISTRATION

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What Happened in the Bearing Industry First Half of 2018

January 15

Ovako launches its Digital Heat Treatment guide

Ovako has launched its Heat Treatment Guide, the first digital tool on the market to enable customers to calculate the mechanical properties of a selected steel after heat treatment. This will save the customer time and money by offering a digital alternative to physical testing.

Ovako's Heat Treatment Guide provide the customer with a unique service to help choose the right steel for their specific application. By choosing a steel grade composition in the Heat Treatment Guide, users will be able to predict how a steel of a specific composition will perform after heat treatment. The user can alter the steel compositions to investigate the impact of different alloying elements. Customers then can compare different steel compositions by layering them in the resulting graphs.

The Ovako Heat Treatment Guide is a development of the Ovako Steel Navigator, a digital platform created to help customers identify the best steel for their application. Ovako has developed the guide to be valid for most steel grades.

February 02

NOMO acquires Swedish bearing distributor

Nomo, part of Axel Johnson International, strengthened its position on the Nordic market for bearings, transmissions and seals by acquiring Rotera Kullager in Täby AB and Rotera Kullager in Västberga AB on February 2. The Rotera Kullager companies have annual sales of SEK 27 million.

The move is in line with the long-term strategy of Axel Johnson International's Industrial Solutions business group. "This is part of our ambition to grow our power transmissions business by developing existing companies and expanding in new markets throughout Europe," says Ola Sjölin, Industrial Solutions' managing director. Rotera Kullager supplies bearings, transmissions and seals combined with related services and strong technical skills to industrial customers on the Swedish market. The company was founded in 1997 and has a wide product portfolio with strong and well-known brands.

Rotera Kullager has worked with Nomo for many years and sees great benefits in becoming a part of the company. "Nomo's vision and business concept is entirely in line with how we want to develop the company," says Johan Pilskär, Rotera Kullager's majority shareholder. "Becoming a part of Nomo and Axel Johnson International gives us the opportunity to continue grow our business."

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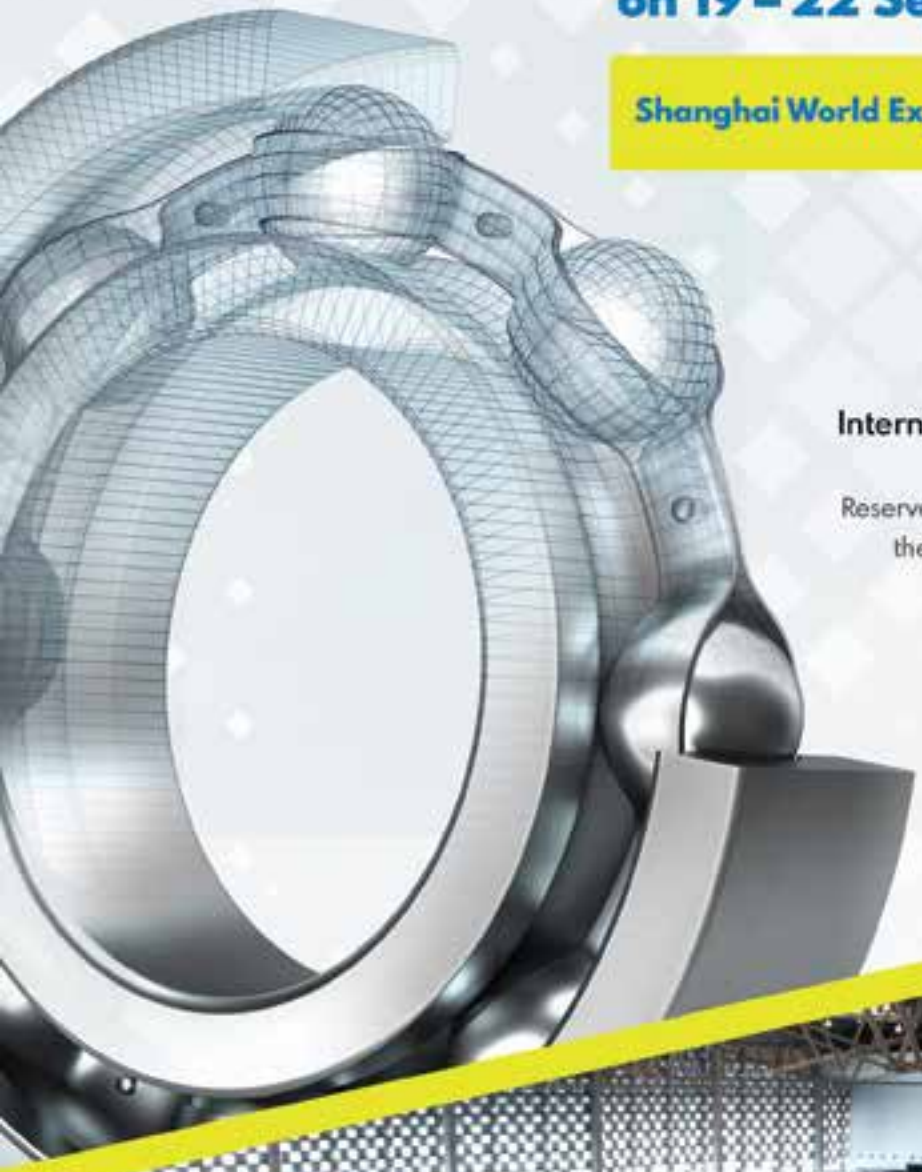
Shanghai World Expo Exhibition & Convention Center



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We produce belts for machine applications in food, agriculture, construction and mining.
We also make special conveyor-belts for large heavy-duty machines such as edgebanders and cable-pullers.




We made a belt of over 60 meters long (!) for a producer of wooden doors in Czech Republic.

Some other urgent orders that we solved:

- D32CON 24570mm, fully-white for woodindustry in Lithuania
- D32CON 20055mm + PKR0 for furnituremaker in Italy
- 8VX4325 25NX 10986mm for miningindustry in Jordan
- HSPC2 12970mm for agriculture machine in Slovenia
- 100×17 6121mm haul-off belt for cablefactory in Egypt

For STARKLINE it really does not matter: we produce any form in any size, tailored exactly to the machine specifications. Contact us anytime. We are happy to send a competitive offer.

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See your discounted prices for industrial belts.

February 15

EPTDA welcomes four & PTDA five new members in the first months of 2018

The EMEA Power Transmission Distributors Association (EPTDA), the leading organisation for the mechanical Power Transmission and Motion Control (PT/MC) industry in EMEA, is welcoming four new member companies in the first months of 2018, eight in total since EPTDA's Annual Convention in Rome, in September 2017. These four new comers are: two new distributor companies – Rekvisitt AS and FAM Group, and two new manufacturer companies: WEG (UK) Ltd and Bando Europe GmbH. The Power Transmission Distributors Association (PTDA), the leading association for the industrial power transmission/motion control (PT/MC) distribution channel, recently welcomed five new member companies. The new distributor and manufacturer members are: ERIKS North America, Transmission Equipment International, Bega Special Tools, Luff Industries, Oil States Industries.

March 02

Changes to the Board of Managing Directors of Schaeffler

The Supervisory Board of Schaeffler AG appointed Andreas Schick (47) to become Member of the Board of Managing Directors of Schaeffler AG as of April 1st, 2018. He took over the role as Chief Operating Officer of Schaeffler AG from Oliver Jung (56) who has decided not to extend his contract and will leave Schaeffler AG as of March 31st, 2018.

The Supervisory Board also decided to extend the contract of Corinna Schittenhelm (50), Chief Human Resource Officer, for a term of five years ending on December 31, 2023.

March 03

Fenner Drives acquires National Bearings Company

Manheim based Fenner Precision Polymers, a unit of Fenner PLC, has announced it has acquired the assets and business of National Bearings Company, a specialist manufacturer of engineered polymer and metal bearing solutions, based in Lancaster, PA.

National Bearings joins the growing Precision Polymers Division, which operates four facilities in Lancaster County, PA serving the power transmission, motion control, fitness, agriculture, and general industrial markets. Established in 1917, National Bearings manufactures a wide variety of products consisting of thrust bearings, angular contact bearings, radial bearings, thrust retainers, and plastic roller assemblies.

All current employees of National Bearings have been offered positions in the new unit of Precision Polymers. Fenner Drives aims to broadening its product solutions and expanding market presence with the acquisition.

March 05

SKF makes first major distributorship appointment in over a decade

Hayley Group Ltd becomes the seventh **SKF Authorized Distributor in the UK** and the first major UK distributor appointment to be made by SKF since 2005.

Hayley Group joins a UK-wide network of carefully selected distributors that are not only fully conversant with SKF knowledge and technology, but also equipped to provide industrial end-users with the widest range of SKF products and related services.

Hayley Group was originally established in Blackheath, West Midlands in 1976 under the name Hayley Bearings Ltd. It has since grown to become one of the largest engineering inventory suppliers in the UK. The company currently has 44 branches across the UK and achieved a turnover of £145 million in 2017.

SKF's UK-based authorized industrial distribution partners include: **Acorn Industrial Services Ltd, Antifriction Components Ltd, Brammer UK Ltd, BRT Bearings Ltd, ERIKS UK Ltd, and Sprint Engineering & Lubricants Ltd**; who operate alongside several product or industry specialist distributors. All of these companies have their own network of established sales and service centres strategically located throughout the UK.

March 14

NSK inaugurates new plant in Mexico

NSK announced that NSK-Warner K.K. (NWC; Headquarters: Fukuroi, Shizuoka Prefecture, Japan; President and CEO: Sakae Kuwashiro), an equity method affiliate, has inaugurated its new plant in Mexico.

NWC now operates manufacturing plants at four locations, in Japan, China, Indonesia, and Mexico, and a sales subsidiary in the United States. The company globally supplies products that underpin smooth and highly efficient gear shifting in automotive automatic transmissions. NWC has been operating some sections of the new plant in Silao City (Guanajuato, Mexico) since October 2017 to meet increasing demand for automotive automatic transmission products in Mexico and the USA

The inauguration ceremony, held on March 14, was attended by the Governor of Guanajuato, the Mayor of Silao, and representatives from our esteemed customers. Mr. Shigeyuki Suzuki, Executive Vice President of NSK, expressed his gratitude to the guests and to everyone who had helped make the plant a reality. He inaugurated the plant with a speech outlining its background, and its connection to the community.

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Enjoy world-class presentations from speakers discussing real-life business cases or forward-thinking strategies.

Discover a large number of EPTDA first-timers and establish new partnerships with proven high-quality EPTDA members and future members.

Celebrate with us! You simply cannot afford to miss EMEA's leading PT/MC industry association's 20th anniversary celebrations.

LONDON

annual convention

2018

26-28 September

20th anniversary

ONLINE REGISTRATION STARTING IN MARCH 2018

www.eptdaconvention.org

March 15

Nippon Steel & Sumitomo Metal Corporation signs agreement to acquire Ovako Group from Triton

Nippon Steel & Sumitomo Metal Corporation (NSSMC), one of the world's largest steel producers, has signed an agreement with funds advised by Triton to acquire 100 percent of Ovako Group. The acquisition is subject to regulatory approval.

NSSMC is a global market leader in steel production with world-leading technologies and manufacturing capabilities. The group makes a wide range of value-added steel products in more than 15 countries as well as at 12 steelworks in Japan. For the fiscal year ended March 31, 2016, NSSMC reported a crude steel production on a consolidated basis of 45 million tons.

The parties have agreed not to disclose the terms of the transaction. Upon closing of the transaction, it is Ovako's intention to redeem the Ovako AB (publ) EUR 310 million 5.00 percent senior secured notes, due 2022.

March 20

Festo appoints Acorn Industrial Services as the UK's first official partner for Electrical Automation

Recognising ACORN® as a leading supplier of linear systems, Festo has taken the strategic decision to appoint a partner specifically for **Festo** electrical automation products. ACORN's in-depth specialist product knowledge, award winning service and expert technical capabilities were a perfect fit for Festo, who have recently undergone a restructuring of their Official Partner network.

ACORN is now set to become the UK's first Festo electrical automation partner for linear actuators, positioning actuators, **servo press systems** and **gantry handling solutions**. This partnership has a focus on making it easy for machine builders, OEMs and automation end users to specify and set up automated systems.

The appointment will enable ACORN to deliver complete movement solutions to customers requiring easy setup of linear gantry systems, linear axes, linear actuators and servo press systems.

March 22

Motion Industries opening new West Coast distribution centre

Motion Industries Inc. will open a new distribution centre in Auburn, Wash., late spring in 2018.

Enhancing Motion Industries' logistical network, the new distribution centre in Auburn, Wash will open late spring 2018 and serve 24 area Motion Industries branch locations daily, as well as the entire Motion Industries North American footprint (500+ locations) as needed. Covering more than 62,000 square feet, the DC will stock and ship a broad range of industrial parts and supplies including bearings, power transmission products, fluid power components, electrical parts, safety supplies, and more.

The new facility will complement Motion's existing, primarily North American distribution centres in Birmingham, Ala.; Tracy, Calif.; Chicago; Baltimore; Dallas; Edmonton, Alberta; and Lachine, Quebec.

April 02

HARP doubles warranty storage period for bearing products

From April, 2018 Kharkov Bearing Plant (HARP) doubles warranty storage period for ball and roller bearings for agricultural, automotive and general industries (HARP, HARP AGRO and HARP AUTO).

HARP guarantees preservation of all features and operational indicators of the product range, which is over 500 types of ball and roller bearings. The latest HARP developments – range of modern insert bearings UC (analogs of YAR), ES (YET), EX (YEL), HARP AGRO bearings with unique X-SHIELD sealing systems of higher tightness, bearings with high-temperature grease for application in large-scale industrial mills and many others. According to HARP General Director, the improving of production, quality control system and products storage allow to introduce new

improved warranty conditions, which demonstrate confidence in HARP bearings, and also loyalty to the customers. He recalled that previously the warranty storage period was one year.

April 04

ISB opens new Linear Systems Centres in Bologna and Novara

The project comes from the acquisition of two Italian companies specialising in the linear sector since the early 90s, placing their experience gained and the knowhow of their technical and sales staff at the service of our customers.

ISB Linear Systems Centres have an extensive, complete range of products, including linear guides, precision guides, recirculating ball screws, sliding shafts and linear modules (standard/ customised). One of its strengths is the assortment available in stock, with material available immediately for sale or ready to be customised. Through shares acquisitions with production sites, ISB Linear Systems Centres have privileged access to the development of new products. The approach to continuous improvement guarantees that the products always meet the highest quality standards. This is why, in addition to the control of the whole production chain, ISB Linear Systems Centres check that duration and strength tests are regularly performed in the production sites to ensure product performance; this helps to acquire essential technical information for type-approval by large-scale manufacturers.

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April 15

New Technical Director for OEM HTL Group

UK headquartered OEM HTL Group have appointed Bob Fogerty as Group Technical Director.

Formerly Group Training Director at HTL, Bob's new role was a natural progression; Bob has decades of experience in the industry and is a well-respected technical authority in bolting on a global scale.

Since starting working life as an Apprentice Mechanical Fitter, Bob joined the bolting industry as a Field Service Engineer with Hedley Purvis in 1990. From then, career developments in various Senior Management Positions led Bob to utilise his 28 years industry expertise at HTL Group.

The new role of Group Technical Director will allow Bob to extend a technical support platform two fold; internally to help further develop HTL's OEM product range with the in-house design team and, importantly externally to support clients with technical queries.

April 20

New CEO of SCHNEEBERGER Group

Stefan Hantke (51) is taken over the position of CEO of SCHNEEBERGER Holding AG in Roggwil. In his new position, Hantke will be Chairman of the management team of Schneeberger Group and will be responsible for the entire linear bearings, system technology and mineral casting production business. He is succeeding Dr. Hans-Martin Schneeberger, who will continue serving as Chairman of the Board of Directors of SCHNEEBERGER Holding AG.

Hantke has more than 25 years experience in mechanical engineering, specifically in the area of bearings and linear technology. After completing his degree in mechanical engineering at the University of Applied Sciences for Engineering and Economics in Saarbrücken, Hantke started his professional career in 1992 with the Schaeffler Group in the INA Linear Application Technology division in Homberg. After holding several management positions within the Schaeffler Group and other companies, in 2005 he took over management of the linear technology business unit at Schaeffler for which he was responsible for all industrial business in North America for two years. Hantke then took over management of worldwide sales and engineering for Schaeffler Group Industry in 2015, and became a member of the Industry Executive Board.

May 02

NTN will invest 36 million € in Hauts-De-France till 2031

NTN group is planning considerable investments in Hauts-de-France: €4 million between 2018 and 2020, 10 million up to 2021 (and then 36 million up to 2031). These investments aim to modernise the current site and enable new jobs.

NTN group, which specialises in making steel automotive parts, this year celebrates its 100 year anniversary and is continuing to invest in its sites, especially in Crézancy in Aisne. The group's "Forging the future" plan provides for an investment of €50 million, divided into three parts:

- €4 million between 2018 and 2020
- €10 million from 2020 to 2021
- €36 million up to 2031

This investment is expected to enable modernisation of the site (reconstruction of part of the plant, addition of 2 more forges) and the hiring of new employees, with around 10 in 2018. NTN Corporation is now ranked the 2nd biggest Japanese investor in France.

Present in the region since 2000, the group has a site of 20,000 m² here in Aisne. This site, which specialises in steel parts for the automotive industry is the only European one to possess forges. Its production helps to supply many car manufacturers including Renault-Nissan, BMW, Dacia, Toyota, and more. Currently, the group has 130 employees at its Crézancy site, located near Château-Thierry.

May 02

EPTDA welcomes five new members

The EMEA Power Transmission Distributors Association (EPTDA), the leading organisation for the mechanical Power Transmission and Motion Control (PT/MC) industry in EMEA, is welcoming five new member companies in the second quarter of 2018, bringing the total of new members to 14 since its Annual Convention in Rome last September. These five new comers are two new distributor companies – Itsme and Bowman International Ltd., and three new manufacturer companies: Meter S.p.A, Tecnamic and Motive Srl.

May 25

IPH-Brammer changes group name into Rubix

With a turnover of more than €2.2bn in 2017, and over 650 locations across Europe, the business is Europe's largest supplier of industrial maintenance, repair and overhaul(MRO) products and services. The change in name signifies the company's ambition to transform the delivery of industrial products and solutions across Europe for its customers. IPH-Brammer was formed in September 2017 from the merger of IPH and Brammer, following the acquisition of IPH in September 2017 and the earlier acquisition of Brammer by Advent International. When the two groups were brought together, IPH Brammer was adopted as the name for the group as an interim option during the integration phase. The intention has always been to identify a new brand and identity signifying what the new company will stand for going forward.

Group CEO, Martin Gaarn Thomsen said: *"The launch of our new group brand marks the start of a whole new chapter for our business. We are a new company, with an agenda to transform our industry and provide innovative value-adding services and propositions for our customers. Our new brand encapsulates our ambition to help our customers in a smarter way and keep their businesses running smoothly." "The European industrial products distribution market is very fragmented, and it offers both good growth and margin prospects. There is a real opportunity for us to provide value beyond the product to our customers."*

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STRAIGHTER MOTION

With rolling element bearings, the balls create unwanted motion in all directions (for which no controller can completely compensate.) With Porous Media Air Bearings, there is no contact or internal moving parts, so there is no unwanted motion or need for such control.

SMOOTH AND SILENT OPERATION

The changing directions of the balls within the raceway of a conventional rolling element bearing results in velocity ripples, which compromise stability and impact performance. Without contact or competing forces, Porous Media Air Bearings provide smooth, silent motion.

HIGH SPEED

An order of magnitude separates the speed capabilities of conventional rolling element bearings (3-5 m/s) from their porous media air bearing counterparts (30-50 m/s,) which feature no contact and no internal moving parts.

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The rotational inertia of the balls in conventional rolling element bearings limits the acceleration capabilities of that solution, in contrast to the non-contact, high-acceleration solution that porous media air bearings provide.

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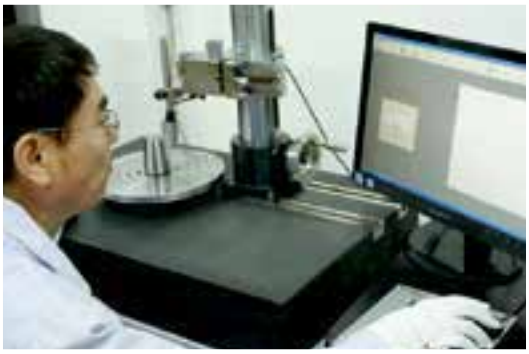





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June 02

Nomo Enters the Norwegian Bearing and Power Transmission Market

Nomo, part of Axel Johnson International, acquires the Norwegian bearing and power transmission specialist Rotek AS. By this acquisition Nomo enters the Norwegian market for mechanical power transmission products and services.

”The establishment in Norway has been a strategic objective for many years,” says Mattias Jaginder, CEO of Nomo. “By acquiring Rotek AS, Nomo strengthens its Nordic market position even further.”

Rotek AS supplies bearings, power transmission, seals and related services combined with strong technical knowledge. The company is located on the Norwegian west coast in Ålesund and has an annual turnover of approximately 2,4 MEUR. Founded in 1989, Rotek AS has developed strong relationships with both customers and suppliers and has a wide product portfolio including the private label RTK.

“Rotek AS product offering combined with their strong technical knowledge, is completely in line with Nomo’s ambition to operate as a technically skilled solution provider,” says Mattias Jaginder. Ola Erlandsen, former owner and founder of Rotek AS, sees new opportunities joining Nomo: “Becoming a part of the Nomo Group and Axel Johnson International, applying the Nomo business model and portfolio, will allow us to develop and strengthen our concept in the Norwegian market even further.”

June 15

Bowman and AMFG announce partnership to automate production of bearings

Bowman International, the UK’s leading manufacturer of bearings and sintered components, announced its partnership with automation software specialists, AMFG. The partnership comes as Bowman International expands its additive manufacturing division, Bowman Additive Production, with the division using AMFG’s AI-powered production automation software to oversee its end-part production.

With over 40 years’ industry expertise, Bowman International is one of the leading players in the bearings and sintered components market. The company’s innovative approach and adoption of additive manufacturing is enabling them to revolutionise the manufacture of bearings, and help other companies do the same within their respective industries. With several HP and SLS systems at its disposal, it is also one of a handful of companies in Europe to have the latest HP Nylon PA11 material.

Bowman’s partnership with AMFG will enable Bowman’s experienced team of engineers to streamline its entire AM production process, for example using printability analyses to optimise digital CAD files for production. The software also allows Bowman to automate the scheduling of production jobs, verify the build status of parts and automatically generate data intelligence reports. Additionally, the software has been integrated with Bowman’s ERP system and provides the company with a custom digital part catalogue.

Jacob Turner, Head of Additive Production at Bowman International, had this to say about the partnership:

"We're very pleased to be partnering with AMFG and using their automation software to scale our already expanding AM facility. Additive manufacturing is transforming the way bearings are manufactured, and we aim to continue to be at the forefront of innovating the production of bearings using AM. AMFG's automation software will enable us to achieve this by significantly increasing the efficiency of our production processes."

The bearings industry is facing a increase in demand for additive manufacturing, as the technology offers a cost-efficient way to produce complex components. Using the technology, Bowman has already been able to increase the load bearing capacity of its split bearings by up to 70%, and an increased working life of 500%.

"Our partnership with Bowman demonstrates the increasing demand for the automation of AM production processes across sectors, in this case within the bearings market," said Keyvan Karimi, CEO of AMFG. "Bowman is a leader in this field, and we're thrilled to be leading the move towards greater production automation for additive manufacturing."

Bowman International recently launched its revolutionary patent pending 'Rollertrain' cage technology, and aims to shape the future of manufacturing within the bearings industry. "While additive manufacturing has traditionally been used for rapid prototyping, true innovation will be in component production," said Jacob. "Our AM division is already taking steps to innovate the manufacturing process for bearings and components. Ensuring that our production processes are as efficient as possible, through automation, is a key part of this process."

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FOR A SMARTER, CLEANER AND SAFER WORLD

Prof. Dr. Tim Hosenfeldt

INNOVATIVE BEARING TECHNOLOGY WILL SHAPE THE MOBILITY FOR TOMORROW

One of the keynote speakers for this year's edition of the international scientific expert conference on bearings was Prof. Dr. Tim Hosenfeldt, Senior Vice President Technology Strategy and Innovation at Schaeffler.

In his keynote, Prof. Dr. Tim Hosenfeldt, explained how global mega trends such as climate change, globalization, urbanization and digitalization affect the corporate strategy and product portfolio of a mobility provider and rolling bearing manufacturer such as Schaeffler.

Most importantly, their effect on the mobility of the future makes it necessary to develop entirely new solutions and products in the rolling bearing industry.

We tried to reveal the essence of his keynote presentation and further the dynamic development in the field of electromobility during an interview.

What is your role in the organization?

I'm responsible for technology strategy and innovation for Schaeffler Group. This means first being responsible for the worldwide advanced research. We have several collaborations, like our Schaeffler Hubs for advanced research in different universities worldwide, where Schaeffler and people work together in shared offices.

Then we have our innovation strategy and roadmap within a perspective of 20 years; with innovation management, new business fields and public private partnership: with one objective in mind : "What need the customer from Schaeffler in the future and how we could be the preferred technology partner?

Finally, we have a third field where we bring science to business, that's what we call "Innovation Projects". We go from our knowledge and advanced research to build up for Schaeffler complete new demonstrators, like new wheel hub drive systems that enable new automated mobility concepts, like the "Schaeffler Mover". The department accounts around 90 people at Schaeffler worldwide, distributed between Germany, North America, Greater China, Singapore, and Japan (not including "virtual organizations" coming from universities worldwide). Besides technology strategy and innovation, I'm also responsible for the surface technology field. I'm myself Professor of Surface Technology and Tribology at the university of Erlangen.

Can you tell us more about your key note presentation at the Bearing World conference?

We talked mainly about the mobility of tomorrow: our focus is the need of innovative bearing technologies to make the world smarter, cleaner and safer. We have disruptive changes coming ahead of us. We actually don't have to decide or discuss; those changes are just coming. The only question is: "How disruptive are those changes?" For that reason, we are well prepared as an integrated automotive and industrial supplier developing to a "supplier of mobility". This is of course a challenging transformation of collaboration and skills. Are we prepared to meet the expectations? Not only what the OEM is ordering from us, but also how look the future of mobility.

Which are the current Global trends on mobility?

We are working on 94 trends at the moment, and 4 "megatrends" can be distinguished among them. The first is the environment, more specifically the climate change. According to the Paris agreement we must limit the temperature increase only of 2°C and to reduce the CO_2

"The fourth mega-trend is technology and digitalization"

Prof. Dr. Tim Hosenfeldt,
Senior Vice President Technology Strategy and Innovation at Schaeffler AG

"The IoT and Industry 4.0 are both aspects of the increasing digitalization and may drive us into more communicative and interactive projects."

emissions. This is not locally, but globally. Then, we have the society change: more and more people are living in mega-cities (in Europe: Paris and London) and driving or moving every day longer distances in very congested places. Moving to the third change is the globalization: more and more people have increased wealth and have higher standards, including for mobility. This increases the need of efficient mobility in the mega-cities, but also between them. If we discuss more locally for mega-cities, another objective is also to aim for emission-free solutions. Current diesel engines are relatively successful at reducing emissions but there's still work to do regarding particles.

The fourth mega-trend is technology and digitalization. It influences nearly everything, as a threat but also as a big opportunity. The key message for Schaefler as technology leader is: anything that could be electrified, connected and automated, will be in the future. This brings the topic of e-mobility, especially for mega-cities, and energy efficiency: lightweight, low-friction, low-noise bearing solutions. And finally, the Internet of Things will connect machines with people. This means that the bearings should get new functionalities, like collecting data related to mobility. From that point of view the bearing is the ideal machine element since you have motion, forces, torque present in the same component.

How do you see the correlation between IoT and Industry 4.0?

This is an important topic. For me, the IoT and Industry 4.0 are both aspects of the increasing digitalization and may drive us into more communicative and interactive projects. The key for Schaeffler is to make smarter products to collect data, allowing simultaneously stronger consumer-supplier impact off automated real-time processes. Of course, we will have to build knowledge from that data. Therefore we have a digital agenda running based on 5 key elements: product & services, machines, processes, analyses & simulations, and finally user experience. For this last part, the goal is to generate value for our customers but also for the people of the factories. To summarize, IoT and Industry 4.0 are great support to handle the growing complexity.

Can you share with us Schaeffler's "Mobility for Tomorrow" strategy focus areas?

This is where our corporate innovation management find its best role: looking how is the world changing and focusing on the four megatrends (as previously evocated).Practically, we've created four focus area's that we are currently working on at Schaeffler: eco-friendly drives (optimized combustion engines, electric drives, industrial drives), urban mobility (two wheelers, inner-city railway, micro mobiles), interurban mobility (rail vehicles, aircraft, off-highway) and energy chain (wind power, solar power and conventional power generation). The strategy is to deliver the right components and systems to address those focus areas. Moreover, we have now new business unit completely focusing on e-mobility and Industry 4.0.

How is Schaeffler as a global automotive and industrial supplier pushing ahead with its transformation process in readiness for the future?

It is doing this by means of "Agenda 4 plus One", our program for the future. The program is structured into four plus one categories: "Customer focus", "Operational excellence", "Financial flexibility", "Leadership and talent management", and – as the "plus One" – "Securing long-term competitiveness and value creation".

It is broad-based and encompasses 20 initiatives, including E-Mobility, Industry 4.0 and our Digital Agenda. 'Agenda 4 plus One' is the driving force behind our transformation.

What is the role of bearings for Industry 4.0 and eMobility?

A big challenge for Schaeffler is the ambidexterity in the field. On one hand, we have to produce better and better bearings in term of lifetime, endurance, tribology and energy efficiency. On the other hand, bearings are fitted everywhere in the mechanical processes and they are

—Flanged housing units with for electric motors

— Schaeffler integrates sensor technology into its spindle bearings

"The bearing is the sensor, or the sensor is an integrated bearing : collecting the data where the data occur."

therefore predestined for data collection in terms of process-control and machine monitoring, would it be a machine for production or just a driving application. For example, in our e-wheel drive there's a complete digitized drive-train in the rear. In that sense, Schaeffler develops sensorized components and mechatronic products. These are, according to me, formidable enablers for Industry 4.0

What can you say about the quote "The bearing of the future will be an integrated sensor"?

The bearing is the sensor, or the sensor is an integrated bearing : collecting the data where "the data occur". The pre-processing is made by Schaeffler and transmitted to the Schaeffler-Cloud allowing further analysis to support our customers with not only data, but also knowledge.

Can you give us some examples of Schaeffler's sensorized components and mechatronic products which play an important role for Industry 4.0?

I'd like to start first with our vision and base eco-system. We are today able to offer standard hardware solutions and IT infrastructure as well, from simple components to complete digital services. It encompasses all stages of the digital added value. In parallel, we've put efforts to build an open, flexible, extendable and application-oriented architecture to allow users to benefit from all the strategic services of Schaeffler. On top of it, via Cloud, we help the customers to control processes, maximize availability and optimize product quality.

Coming to the products, Schaeffler developed the "VarioSense" sensor-bearing: this is a standard bearing combined to an integrated modular sensoring system to measure speed, shaft displacement, vibration or temperature, depending on what the customer actually need to measure. It can be used in various applications like for example gearboxes, pumps but also e-motors.

The second solution we offer is build based on a holistic approach for linear guidance systems in machine-tool and handling systems. We call it "DuraSense" : it combines monitoring of the lubrication condition and automatic re-lubrication of the guidance. The customers can, that way, avoid unplanned downtime and reach longer lifetime.

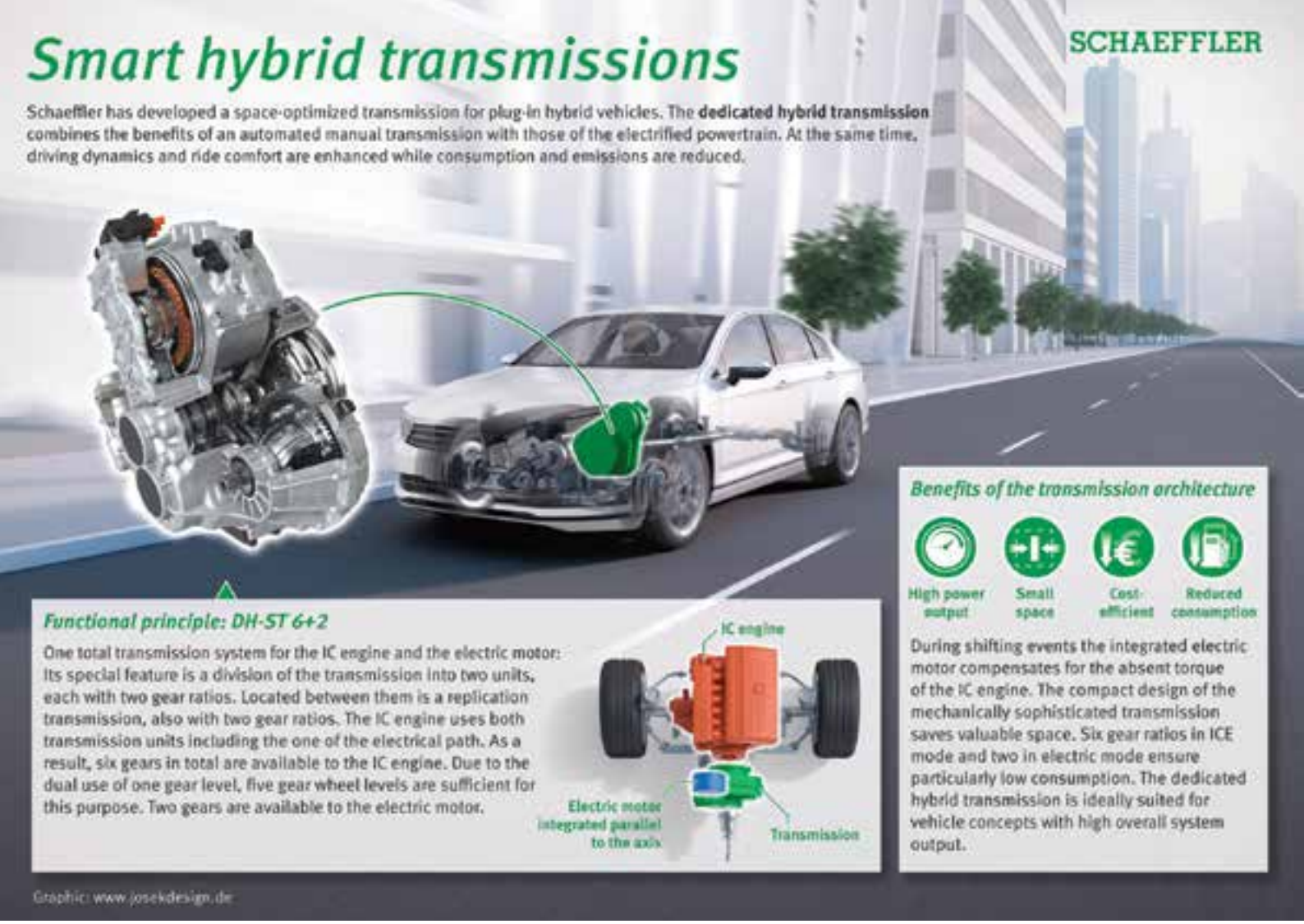
A newer sensorized product we offer is called "TorqueSense": it's a plug-and-play sensor unit for Off-Road powertrain applications. We enable direct measuring of the torque and the torque distribution using contactless and very robust physical principles.

Besides those specific, we have general solutions for condition monitoring, like our SmartCheck solution. The customer can directly mount it on most of applications like gearboxes, pumps or e-motors, to measure vibration, speed and temperature. Benefits for customers are clear: avoid unplanned breakdowns and support predictive maintenance operations. Schaeffler is able to equip existing solutions, new integrated solutions, as well as retrofitted applications.

How important will "coatings" be in eMobility?

In every tribological system, you have what you could call two "surface-partners" and -most of the time- a lubricant. So in terms of energy efficiency, it's obviously very important

— Urban vehicle concept for the future: "technologies for the mobility of tomorrow" powered by innovative wheel modules



— Schaeffler is accelerating electric mobility

to reduce first the friction losses. Therefore we developed a comprehensive "coating-toolbox" focusing on the most important criteria's :friction reduction for higher energy efficiency increased lifetime by wear and corrosion protection. Smart surfaces by sensorical coatings. Another important field is the electrical insulation (which is a growing field in the e-mobility): to avoid electrical current between the metallic parts and damages to the oil. Surface Technology addresses those matters to propose more efficient products. A better control of friction losses allows you to drive longer distances with or the same battery capacity.

Do you also develop new technologies for energy efficiency?

Like mentioned previously, everything where you have sliding contacts and/or friction is an important topic. On the other hand, we also tackle this challenge with "Lightweight" designs. The goal is to use new composite materials or multi-material concepts: using the right material at the right place. And finally, at the stage of exploration, we work on bearings where there's only air between the two surface-partner, avoiding thus any contact.

How will all these new developments affect the TCO for customers?

Total cost of ownership is a very important aspect, especially if you look into the B2C market. The customer doesn't necessarily pay for the product, but also for the use. Traditionally, we sell a bearing and the business is done. But more and more, the customer orders availability or productivity. For example in the railway segment, we are responsible to deliver availability or miles, and we support it with whole predictive maintenance solutions to keep the applications running.

This is what the customer pays for. If we come back on mobility, it will be more and more connected, automated, emission-free but also more and more shared. TCO-wise, people will want more and more to buy mobility instead of owning their mobility device. We can also imagine in the near future apps telling you automatically what devices to use to get from a point A to B. So yes, TCO will be more and more important in the future.

What is the purpose of "Multi-Material Concepts" and "bionic design"?

The Multi-Material Concept is how we enable optimal utilization of the material properties, and adapt the material selection locally to the product requirements.One technolgoy that perfectly allows us the local use of different materials is additive manufacturing. Indeed, the additive manufacturing enables the next step of coating: this is the coating "in three dimensions". That way, we can have

a quite intelligent material design and obtain the properties we exactly need. Therefore, developing traditional manufacturing with the new techniques is very important. Schaeffler is very strong regarding that aspect. We are not only experts in materials and surface technology research, but also in producing the best quality and delivering high quantities at the same time. In Aerospace for example, we have already developed solutions with special cooling features and integrated sensors. This is a great field for additive manufacturing development, but not the main market.

About the bionic designs, nature was a great inspiration. If you observe nature, for example how a tree is growing, material is used in an ideal manner only where it is needed. This inspiration can be used in technology, and this what I've showed in my presentation during the conference: bearings can be designed and manufactured from steel, multi-material plastics and plastic-metal hybrid design to reduce the mass by more than 20% and have the same lifetime or endurance. Better friction properties can also be obtained by putting a composite material in place of pure steel-to-steel counterparts, and only where it's needed. Finally, a significant cost reduction can be reached by building this optimized design in comparison with a whole component.

As conclusion; what are still the main challenges for a successful "Mobility for Tomorrow"?

The challenge lies in the ever-increasing complexity, more fractured mobility, the different demands, additional competences and also the different perceptions depending on the regions of the world. An important key to success is the capability for system based thinking and ambidexterity, the rare ability to use both hands at the time with equal skill. This means continuously perfecting proven products and at the same time developing new sectors and applications. This entails major changes in the variety of necessary competences and requires an overarching and agile collaboration within the company and across company boundaries across different industries. If you talk about "urban and micro mobility" solutions in Germany or Europe, it may not necessarily mean the same thing in Singapore, Greater China or Japan. Besides, we face more and more diverse drive-trains, more diverse and more complex vehicle components and even more diverse energy sources. Of course, today if you buy a car, you can do everything with it : driving in the city or inter-urban. But at the end of the day, we observe that still, people tend to use more and more diverse and specific mobility solutions.

The shared mobility model is also getting more important and we can imagine soon complete automated systems running 24/7, with a higher demand on component's lifetime. Of a course, to achieve this, a robust digital macro-infrastructure is needed an a very intuitive and self-explanatory interface as well. I have to notice that we still don't have at the moment in Germany. We need a broad, safe, complete internet access to achieve all the ambitions of the Internet of Things.

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A Publication of the Lubrication Engineers Technical Department

Grease Compatibility

Greases are available with many different thickener types, base oil types, and base oil viscosities. Compatibility of these different grease types can be very important for users of grease-lubricated equipment. Mixing of different greases can result in changes in physical and performance characteristics, leading to inferior properties of either of the original greases before mixing. Mixing incompatible greases often results in softening, but may also lead to hardening. In extreme cases, bleeding, or separation of the thickener and liquid, can be so severe that the mixture may run out of the greased component. Other properties that may be affected are dropping point, shear stability, pumpability, and oxidation stability. Extreme cases of grease incompatibility can lead to catastrophic failure of the components being lubricated.

It is always best practice to avoid mixing any types of grease. However, at some point in an organization's reliability journey there will be instances when different grease types are inadvertently or purposely mixed. When this happens, a thorough evaluation should be performed in order to ensure that lubricated components receive effective lubrication and avoid damage. Compatibility testing can be performed; however, the test method's strict parameters can make it difficult for two greases to pass as compatible. Fortunately, there already has been extensive testing and research done by many different sources to give practical guidelines when it comes to grease compatibility. Using this information, LE has developed the grease compatibility chart shown on the next page, which provides guidelines based on the thickeners.

Compatibility Considerations

It is important to note that even though grease thickener types may be compatible, there are other ingredients and properties that should be evaluated as well when considering a change in grease. Base oil type and viscosity are the most important. If the base oil types are not compatible, then the mixture will most assuredly not be compatible, even if the thickener types are the same.

In addition, if the base oil viscosities are significantly different, mixing the greases may result in a product that cannot provide adequate lubrication for the application.

Lab Testing

The generally accepted laboratory test for grease compatibility is *Standard Practice for Evaluating Compatibility of Binary Mixtures of Lubricating Greases, ASTM D6185.* This test evaluates binary mixtures of greases by evaluating the component greases by themselves and then evaluating a mixture of the two. The testing criteria of *ASTM D6185* are: Unworked Penetration, Worked 60 Penetration, Extended Worked Penetration (100,000) and Dropping Point. If the binary mixture passes the initial screening, the components and the mixture are subjected to a 70-hour storage test at 120°C (248°F) and the testing criteria are again repeated.

Compatibility within this test is defined as the characteristic of greases to be mixed together without significant degradation of properties or performance. Two greases are considered incompatible when these properties or performance criteria are substantially inferior to both of the unmixed, constituent grease. Two greases may be considered borderline compatible if the mixture results in only slight degradation of physical properties and performance.

When Mixing Is Necessary

Most equipment manufacturers recommend never mixing different greases. If switching to new grease is unavoidable, however, it is recommended that the old grease be completely cleaned out before installing the new grease. This is especially necessary when changing to a grease type that may be incompatible with what is currently in use.

When mixing greases that are considered compatible, purging of the old grease might be acceptable.

More frequent relubrication with the new grease is recommended until it is certain that all of the old grease has been purged.

Remember, it is always best to avoid mixing different greases. When mixing is inevitable, consult with your lubricant supplier and equipment manufacturer to ensure that the mixture of greases will be acceptable. Best practices should also be implemented to avoid inadvertent mixing of greases within a facility, such as clear grease gun tubes and proper labeling of greasing equipment and grease points.

Grease Compatibility by Thickener

	Aluminum Complex	Calcium	Calcium 12-Hydroxy	Calcium Complex	Clay Inorganic "Bentone"	Lithium	Lithium 12-Hydroxy	Lithium Complex	Polyurea	Calcium Sulfonate Complex
Aluminum Complex		No	No	No	No	No	No	Yes	No	No
Calcium	No		Yes	No	No	Yes	Borderline	Yes	No	Yes
Calcium 12 Hydroxy	No	Yes		Borderline	No	Yes	Yes	Yes	No	Yes
Calcium Complex	No	No	Borderline		No	No	No	Yes	Yes	Yes
Clay Inorganic "Bentone"	No	No	No	No		No	No	No	No	No
Lithium	No	Yes	Yes	No	No		Yes	Yes	No	Yes
Lithium 12-Hydroxy	No	Borderline	Yes	No	No	Yes		Yes	No	Yes
Lithium Complex	Yes	Yes	Yes	Yes	No	Yes	Yes		Borderline	Yes
Polyurea	No	No	No	Yes	No	No	No	Borderline		No
Calcium Sulfonate Complex	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	

This chart is for reference only; it is intended as a starting point to determine whether two greases might be compatible. Additional testing might be warranted.

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TOP100 TIPS *for* BEARING REABILITY

by Per Arnold Elgqvist

Bearing Tip No.41: A bearing failure analysis will confirm if the proposed corrective actions are the correct to avoid recurrence of the same failure.

When a bearing fail, there are always many opinions and proposed corrective actions for how to avoid the same failure to happen again. Especially if this Bearing has been subjected to predictive maintenance and several corrective actions are to be programmed. The very best way to identify the root cause or causes for bearing failures and to determine the precise required corrective actions is to perform a root cause failure analysis.
If the failure has been detected in time through predictive maintenance, for example vibration analysis, and the bearing has been dismounted before more severe damages have occurred that could have destroyed the initial failure patterns on the bearing, then it will be possible to identify the initial cause for the failure and determine the required corrective actions very thoroughly.

Bearing Tip No.42: Never try to reduce maintenance cost employing cheaper lubricants. I have seen very much too often how plants try to reduce maintenance cost looking for and using cheaper lubricants. This is one of the biggest mistakes they can do!

Bearing life depends on the quality of the lubrication! The cause number one for bearing failures is incorrect lubricant! A cheaper lubricant will never have the performance of a lubricant based on high quality raw materials as the base oil, the additives and the thickener (in

the case of grease) and manufactured with the highest technology. On the contrary, a high-performance lubricant, normally with higher price, will show a better performance both as lubricant, water resistance, corrosion protection, mechanical stability as so its service life. This will increase the life of mechanical parts it lubricates, being bearings, gears or other mechanical components, improving the efficiency and the availability of the equipment. At the same time, as a higher quality lubricant will last longer as lubricant in operation, the consumption will be reduced, so much that in many cases this reduction of the consumption just by itself alone justifies the higher price.

A typical phenomenon that confirms the above is when lower quality greases are employed and these after short time loses their consistency and start to leak out of the applications, causing both process and environmental problems. This is very typical, as one of the costliest properties to achieve in greases is the mechanical stability, as it depends on several factors: The raw material for the thickener, the process for the manufacture of the thickener and then the perfect blending of the thickener with the base oil.

Bearing Tip No.43: Seals must always be specified correctly. Correct seals are vital for the reliability of bearings, as they have to keep the contaminants out and the lubricant in!

In this case I will refer to dynamic contact outer seals. Also for these seals, as for the integral seals, it is of utmost importance to use the correct seal for each and every application, which means dimensions, design and its materials. There is a great variety of these seals, both in design and materials; Single lips double lips, lips with or without garter spring, etc. Different materials as nitrile, Viton, PTFE, springs of carbon Steel or stainless Steel, etc.

The bearing unit on a washing machine in the photos below had a standard nitrile seal with carbon steel garter spring. This washing machine is washing glass bottles with water at 90°C and caustic soda. This seal should have been of Viton with garter spring of stainless steel.

It is very common to see that the requests (of course also in the CMMS information) for this kind of products only indicate dimensions, for example, seal of 100 x 120 x 15 mm. Than it is the duty of Purchasing to by the cheapest seal corresponding to these dimensions.

Bearing Tip No.44: There are 3 ways to avoid electric erosion due to current leakage.
There is certain equipment that are prone to generate current leakage. Bearings in electric motors, generators and similar equipment are a risk when an electric current pass through the bearings. This will damage the contact surfaces of rolling elements and raceways in the bearing (electrical erosion) and rapidly degrade the grease. There are 3 different solutions for this problem:

1. Insulated bearings that are designed to prevent current from passing through the bearing. This is a very costeffective solution compared with other methods. By integrating the insulating properties into the bearing, these bearings can improve reliability and increase machine uptime by virtually eliminating the problem of electrical erosion.

These bearings are standards bearings that have the external surfaces of their inner or outer rings plasma sprayed with a ceramic material to form a coating.

2. Hybrid bearings that have rings made of bearing steel and rolling elements made of bearing grade silicon nitride (Si_3N_4). Because the silicon nitride ceramic material is such an excellent electrical insulator, hybrid bearings can be used to effectively insulate the housing from the shaft in both AC and DC motors as well as in generators.

In addition to being an excellent insulator, hybrid bearings have higher speed capabilities and provide longer

bearing service life under the same operating conditions than same sized bearings with steel rolling elements.

3. Bearing protection rings for shaft grounding.

These rings provide reliable shaft grounding for medium voltage applications, generators, and turbines to divert harmful shaft voltages to ground and extend bearing life. Install these grounding rings on the drive end and insulate the bearing on the opposite end non-drive end for best results. This rings are provided with microfibers that make contact with the shafts grounding any possible electrical current. The design and these fibers causes only a very small neglectable friction.

Bearing Tip No.45: The very best greases for bearings in electrical motors: Poly-urea greases.

The above refers specially to greases with the modern type of poly-urea, the di-urea. Poly-urea greases have been on the market for some time now, but the earlier poly-urea greases had several problems: Incompatible with all other greases and all rust inhibitors, which I experienced myself within the bearing manufacturing during the 80-ties. Besides they tended to be noisy.

The actual poly-urea greases are totally different. Not so incompatible any longer, low noise and additional improvements also in other properties:

- Extremely high mechanical stability (ASTM D1831), which means that it maintains its consistency for very long time.
- High temperature range (up to 150°C).
- Extremely high water resistance (ASTM D1264)
- Extremely good rust protection (ASTM D6138).
- Low noise.

Bearing Tip No.46: Correct lubrication point for radial spherical roller bearings.
Radial spherical roller bearings have the feature W33 as standard. The W33 feature indicates a groove in the outer diameter of the outer ring with 3 holes, specially design to facilitate the flow of the lubricant into the heart of these bearings, which means in between the 2 rows of rollers.

This is most important, as this type of bearing has a higher friction in the rolling contacts due to the skidding caused by the variation of the surface speed of the rollers due to their curvature.

This means that we must always see to that these bearings are lubricated at the W33 feature. This is even more important for these bearings in slit pillow blocks. If you lubricate these at the side, applying the recommended quantity of grease (0.005 x D x B), these bearings will never see new grease!

Thus, lubrication through the W33 feature has the following advantages:

- The new grease enters the bearing immediately displacing the old grease, lubricating and cleaning the bearing performing the most efficient relubrication.
- Facilitates the use of ultrasonic sensors to determine the exact required quantity of grease at the relubrication, avoiding under or over-greasing.
- Reduces the quantity of grease for the relubrication of these bearings to 40% compared with relubrication at the side of the bearing.

Bearing Tip No.47: "Bearings are Innocent until the Opposite has been proven"!
If you are using bearings of modern brands recognized by their manufacturing and product quality, their failures are due to external causes! These manufacturers apply the "Zero Defect" strategy and their defects are measured as a very few ppm (part per million). Earlier, bearings often failed due to quality problems with the design, material and manufacturing.
The above gives the users of the mentioned bearings a huge benefit, as they do not longer depend on the quality of the bearings but now have all the opportunities in their hands to reduce bearing failures and increase their reliability. Thus, now bearing failures are caused by EXTERNAL failures as follows

- Incorrect lubrication
- Incorrect bearing type or variant
- Contamination
- Misalignment
- Mounting damages
- Incorrect bearing arrangement.
- Overloads
- False Brinelling
- Low quality of bearing seating on shafts or housings
- Electrical erosion

Thus, just replacing the bearings will not reduce the failures. If you do not eliminate the root causes for the failures, this will repeat again and again!

Bearing Tip No. 48: Assure the quality off the bearings you are going to use – Verify their condition in the warehouse.

Do you know the condition of the bearings in your warehouse?

One detail that many times is ignored is the condition of the bearings in the warehouses, which I have been able to confirm during the visit to several facilities in different industries. Bearings can be in bad conditions due to the following causes:

1. Bearings that have been opened for several reasons and therefor have lost their anticorrosive protection

and logically have suffered corrosion. Remember that there is no way to eliminate corrosion without affecting the reliability of the bearings.

2. Bearings that has been stored for too long time and got obsolete. This is especially the case with capped bearings where the grease filled from factory no longer works. For this case please look at the recommendation from your supplier to establish the maximum time for the storage of these bearings.

3. Wrong bearing variants. There are several cases you should look into. Here I will mention 2: First, single row angular contact ball bearings intended for mounting in pair: These must always have been adjusted by the manufacturer for this type of mounting and this adjustment is shown in the designation of these bearings. Examples: Suffix CB for SKF or UA from FAG. Second, in the case of an Industry where there must be used capped bearings with contact seals, as for example food Industry with direct washing for hygienic requirements, there are shielded bearings (2Z or ZZ) in stock. Please have in mind that these bearings are not sealed against harsh environments!

4. Obsolete bearings. Bearings that are too old and have got obsolete as new designs with improved quality and capacity have been implemented.

The very best way to avoid all the above is to perform an inventory once the year!

Bearing Tip No. 49: Increase the reliability of the bearings in the most efficient way with Courses on Site.

The courses on site have enormous impacts on the reliability of your bearings. This is due to the following facts:
1. The subjects of these courses are determined based on the specific priorities and needs of the corresponding customer.

2. The course is dedicated to just only one customer and his opportunities for improvements will be analyzed in detail.

3. On site means that there is the posibilities to realice several practical exercises:

a.Evaluation of the bearings in the warehouse (conditions, variants, brands, etc.).

b.Evaluations of the Repair Shops as Mechanical and Electrical Maintenance (conditions, tools).

c.Evaluations of the quality of the repairs of shafts and housings for bearings (dimensions, cylindricity, out of roundness).

d.Practical exercises of mounting and dismounting of bearings.

e.Analysis of bearing applications showing lack of reliability (short MTBF: s).

4.Identification of Opportunities for Improvements. According to the detected opportunities for improvements several projects can be established. These will then after the corresponding course have my support via Email free of cost.

5.The Participants are so many from the same facility thus they will be able to form strong teams for the implementation of corrective actions.

Welcome to ask for quotations for this type of courses at proactivo.news@gmail.com.

Bearing Tip No.50: The Maintenance Department must be seen as a Productive Department.

The areas of maintenance must change their mind set and look at themselves as productive areas, thus they must determine and report not only their expenses but in first place what they are producing: All industrial facilities, in one or another way must report their results in a concept as the OEE (Overall Equipment Efficiency). This concept report the result per month as Availability x Efficiency x Quality of the process.

The maintenance areas are most involved in all these 3 factors; thus, they must calculate their contribution to the OEE and report this as their main results in the first place, naturally followed by the corresponding maintenance cost.

This means that the main objectives for Maintenance in the Budgets must be their targets for their improvements as regards the OEE for the corresponding facility and the estimated costs to fulfill these targets.

It is a most different mindset to look upon yourself as a productive area instead of an “Cost Area”.

Per Arnold Elgquist

Mr. Per Arnold Elgqvist has 34 years of experience in SKF as Quality, Product Engineering and Reliability Services Manager. He works for 10 years as private consultant for the industry in Mexico, Venezuela, Brazil, Colombia, Peru and Argentina.
Learn more about “Bearing Failures and Their æCauses” at

www.reliabilityinstitute.com

Complete Machining of **Spherical Components**

Sphero – The innovative machine solution by Thielenhaus Microfinish

The compact, high-precision tool machine Sphero, designed for machining workpieces with spherical forms, has been further developed by Thielenhaus Microfinish into a combination solution capable of handling the entire superfinishing process in just one clamping operation. The world leader has designed an innovative trial machine that can machine spherical workpieces with the highest demands, in terms of fine dimensional accuracy and surface quality, into finished components.

The workpiece unit is mounted vertically and easily accessible for fast changeover. Thanks to the integrated tool changer with a capacity for up to ten tools, even complex machining processes can be carried out in only one clamping process.

The trial machine is based on one that was previously used for the manufacturer's subcontracting work. It is also equipped with QuattroClean CO_2 snow-jet technology, which enables the workpieces to be cleaned using an environ-mentally friendly, dry and residue-free method. After cleaning, the machined component is subjected to a scattered light measurement procedure that al-lows, e.g., the shape or the gloss value to be precisely determined. If a meas-urement value is not yet satisfactory, the component can then be put through another machining step in the same clamping procedure.

Workpieces with diameters of up to 75 mm can be machined on the Sphero. The machine's construction is highly space-saving and is characterised by a modern, compact and ergonomic design.

It is used for example in the automotive industry for machining the joint heads of wheel suspension and steering components that require a high level of freedom and movement for the associated assembly units. Metallically-sealing valve balls and seating rings for valves in the chemical industry, through which aggressive or very hot media travel, are able to be machined with a high degree of dimensional and surface accuracy. Another instance is the axial piston pump found in all fields of hy-draulics: It has a spherical sliding surface at the end, and the dimensions of this component must be accurate to 1 µm or less in order to guarantee safe operation at great strain – such as in aviation.

This machining concept enables machining of surface topography,

spherical roundness, spherical diameter and sealing surfaces. Furthermore, defined contact rations that fulfil tribological requirements are possible. In just a few in-stallation steps that take only a very short time, the operator can convert the machine from outer machining to inner machining, i.e., from a sphere to a seal-ing ring or a socket. Operator influence is reduced to a minimum and errors due to repeated handling and clamping are ruled out, since the workpiece re-mains in the clamp until it is completely finished. This drastically increases process reproducibility.

Since this machining solution allows the implementation of several tool quali-ties, the machining process can, for example, be broken down into roughening and smoothing, fine finishing and polishing. The tool change takes place in just a few seconds with the added benefit that the workpiece stays in the clamp. Since the process takes place on a self-correcting basis, truing cycles are done away with. This means that better end results can be achieved with short cycle times. Thanks to the MicroSens capacitive sensor with workpiece con-tact detection, the machine monitors the stipulated parameters itself on an on-going basis and makes any necessary adjustments. The integrated measure-ment and cleaning process ensures that the workpiece is quality-controlled prior to being unclamped.

More information can be found at www.thielenhaus.com

— The new Sphero combination machining solution by Thielenhaus Microfinish makes it possible to machine spherical workpieces fully automatically to com-plete and controlled components with great precision. (Photo: Thielenhaus Technologies GmbH)

— The Sphero's working area with tool changer, measurement control and high-performance tool spindle – shown here without the new in-process cleaning and measurement technology (Photo: Thielenhaus Technologies GmbH)

Standardised Gearbox Model

REXS Simple Exchange of Gearbox Data

Standardisation is an important topic for drive technology, not least in connection with industry 4.0. Below as a short description and in the attechement as a detailed description in the form of a technical article you will find our press release on the standardised gearbox data model REXS of the Research Association for Drive Technology (FVA). This data model makes it easy to exchange transmission and component data.

The exchange of data between software systems is currently managed by a number of proprietary interface formats across the industry. This leads to duplicated efforts in modeling and data input. Working with consistent models is particularly advantageous for bearing design and technical consultation. This saves time and reduces the likelihood of errors. To capitalize on this potential, industrial companies such as SEW and Schaeffler want to work together with FVA to create a standard for exchanging data between calculation systems. As the first practical application, the REXS interface is included in the FVA Workbench and Bearinx. This makes it easy to combine FVA Workbench's detailed gear calculations with Bearinx's specialized bearing calculations. The REXS Standard 1.0 was released at the 2017 FVA Information Conference, where its data exchange capabilities were demonstrated live.

For the industry, FVA e.V., the German Research Association for Drive Technology, provides a free-available interface for the exchange of gearbox data.

FVA e.V., the German Research Association for Drive Technology, is committed to the goal of developing an industry-wide standard for the exchange of gearbox data. The interface with the name REXS (Reusable Engineering EXchange Standard) will be developed in close cooperation with the industry and research organisations.
REXS defines an industry-wide uniform modelling and nomenclature for the gearbox and its components, based on the detailed terminology of 25 of FVA's project committees. With many years of experience and broad roots in industry and research, FVA is in a unique position to develop an industry-wide standard.

Our vision – an interface that can be used for all CAE powertrain applications.

Although the current version of the interface is focused on the definition of gearboxes for calculation programs, the possibilities for future development are broad. According to the motto "if you want to achieve great things, you have to set high goals," FVA's vision for REXS is to develop an interface that can be used for all CAE powertrain applications.

Find more information and the first available version of the REXS interface here: https://www.rexs.info/

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Precision Parts
Forming Machinery

On the following pages you will find a detailed article on REXS, which you are welcome to use in full or in excerpts for your publication and online media.

If you need further material or additional information, please feel free to contact me. Find my contact details at the end of this text.

REXS – A Standardised Gearbox Model for the Simple Exchange of Gearbox Data

At a time when connectedness is becoming more and more important at all levels of society and industry, the software landscape in the field of gearbox development, simulation, and production is extremely heterogeneous. Although these programs perform different tasks, the data they use is largely identical. However, up to the present date, no industry-wide standard has been established for the exchange of gearbox data. This leads to high-cost, high-maintenance custom solutions and duplication of work that can be avoided. The history of German mechanical engineering, which began the standardisation of machine elements as early as 1918, has proven that consistent standardisation contributes significantly to success.

“100 Years of Standardisation in Mechanical Engineering“

What began with the standardisation of tapered pins more than 100 years ago must continue with software in the age of digitisation and Industry 4.0.

“The goal is to be able to efficiently and effectively use different systems with their own computational focuses, such as Bearinx, SIMPACK, and FVA Workbench,“ explains Dr. Heinrich Bolz, Head of Calculation and Simulation in Gearbox Development for SEW-Eurodrive GmbH & Co KG.”

The Solution: REXS - Standardised Interface for the Exchange of Gearbox Data

FVA e.V., the German Research Institute for Drive Technology, is committed to the goal of developing an industry-wide standard for the exchange of gearbox data. The interface will be developed in close cooperation with industry and research under the name REXS (Reusable Engineering EXchange Standard).

REXS defines an industry-wide uniform modelling and nomenclature for the gearbox and its components based on the detailed terminology of 25 of FVA’s project committees. With many years of experience and broad roots in industry and research, FVA is in a unique position to develop an industry-wide standard.

For FVA partners SEW Eurodrive and Schaeffler, the focus is primarily on the exchange of gearbox data related to bearing calculation. However, instead of developing another specialised solution, both companies became involved in the FVA “Standardisation of Gearbox Modelling” research project, thus laying the foundation for the interface.

Their many years of experience with gearbox software will ensure that the developed concept is applicable for the industrial environment.

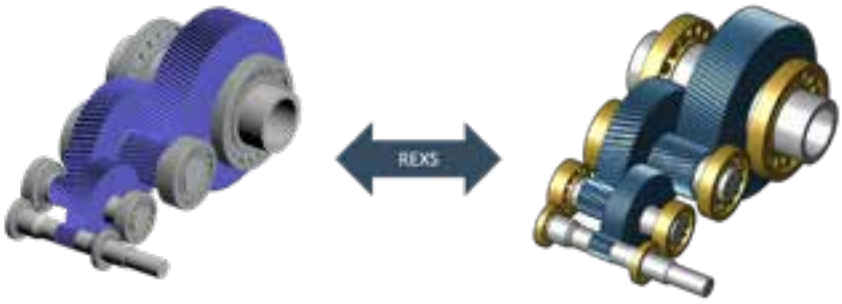
“For this purpose, we made a deliberate decision to develop a common standard with FVA, as this approach holds tremendous potential for the future,“ continued Dr. Heinrich Bolz and Stephan Evert, Leader of CAE Application Development for R&D Processes, Methods, and Tools for Schaeffler Technologies AG & Co. KG.

Stronger Together: Industry and Research are the Key to the Successful Establishment of REXS

The first practical implementation of the REXS interface was the exchange of data between the FVA Workbench, Shaeffler’s BEARINX, and SEW’s WESILAB software.

The New Interface Increases Efficiency and Quality

The advantages of the REXS interface are clear: it reduces errors during the exchange of data and minimises the effort required for communication between

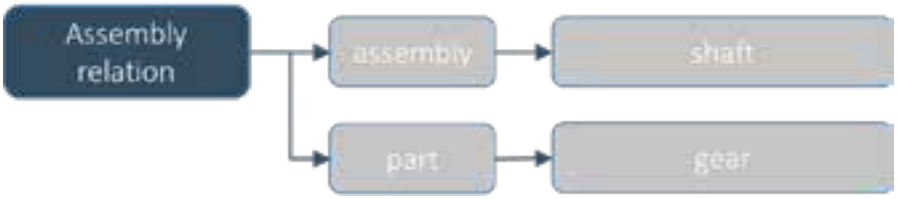


— 3-stage parallel shaft gearbox from SEW in Bearinx and FVA Workbench

different programs. Development of a new interface is very labour intensive. Therefore, the barriers to creating new links between existing software tools are high. A uniform interface can be used to efficiently implement such links, and to accelerate and improve the product development cycle.

"With REXS, gearbox data can be transferred quickly and reliably. Thus, the interface helps us to optimise our innovation processes," stated Dr. Heinrich Bolz. "With REXS, we can greatly reduce the effort for the technical coupling of CAD software tools, and at the same time simplify the IT architecture," added Stephan Evert.

— Example: A bevel stage component with shaft angle and hypoid offset attributes



— Example: A connection between shaft and gear components via an assembly relation

- *Shafts*
- *Cylindrical Stages and Gears*
- *Bevel Stages and Gears*
- *Rolling Bearings*
- *External Loads*
- *Shift Positions*
- *Load Spectra*
- *Lubricants*
- *Materials*
- *Tools*

— Fig.: Current scope of the REXS interface (Version 1.0)

Universal Schema for the Definition of a Gearbox and its Structure

In REXS, the components of a gearbox are defined based on common parameters. The REXS specification includes everything necessary to define a gearbox model. Essentially, this includes the machine elements, their attributes, and the relations which are used to define the relationships between machine elements. The simple and generic structure of REXS makes it possible to depict individual components, assemblies, and complex gearbox structures.

Open Architecture Enables Custom Solutions

The interface has an open architecture, so companies can define their own extensions without affecting the standard. Thus, the interface is suitable for exchanging data between standard programs as well for internal use with custom software solutions.

The First Version of the Interface is Available Now

The first version of the REXS interface was released at the annual FVA Information Conference on 29 November, 2017, and is freely available under Creative Commons License (CC-BY-SA) at www.rexs.info. Anyone who is interested can learn more about the interface as well as how they can contribute to its future development. Schaeffler and FVA demonstrated the simple transfer of data between their BEARINX and FVA Workbench software packages using the REXS 1.0 interface live at their stand at the FVA Information Conference.

Future Development of the Interface

Although the current version of the interface is focused on the definition of gearboxes for calculation programs, the possibilities for future development are broad. According to the motto "if you want to achieve great things, you have to set high goals," FVA's vision for REXS is to develop an interface that can be used for all CAE powertrain applications. Vision: A standard interface for all CAE powertrain applications.

"REXS defines a very simple, extensible data structure that was created from its conception as a standard to be distributed via free licensing," states Stephan Evert.

REXS in the FVA Workbench 5.0

The FVA Workbench is a platform in which new concepts for the further development of REXS are already being implemented and tested for practical suitability. From version 5.0, the FVA Workbench will always support the latest version of the REXS interface. This will make an important contribution to the efficient exchange of data and provide

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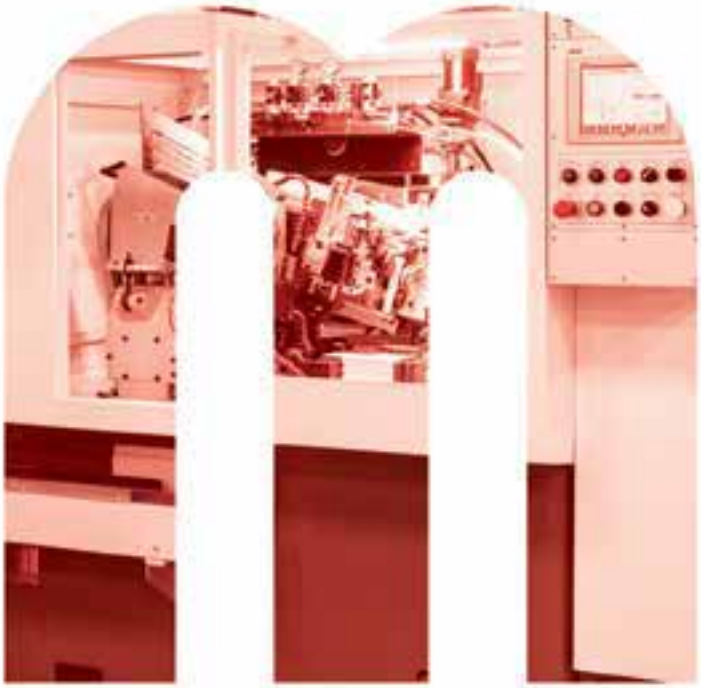

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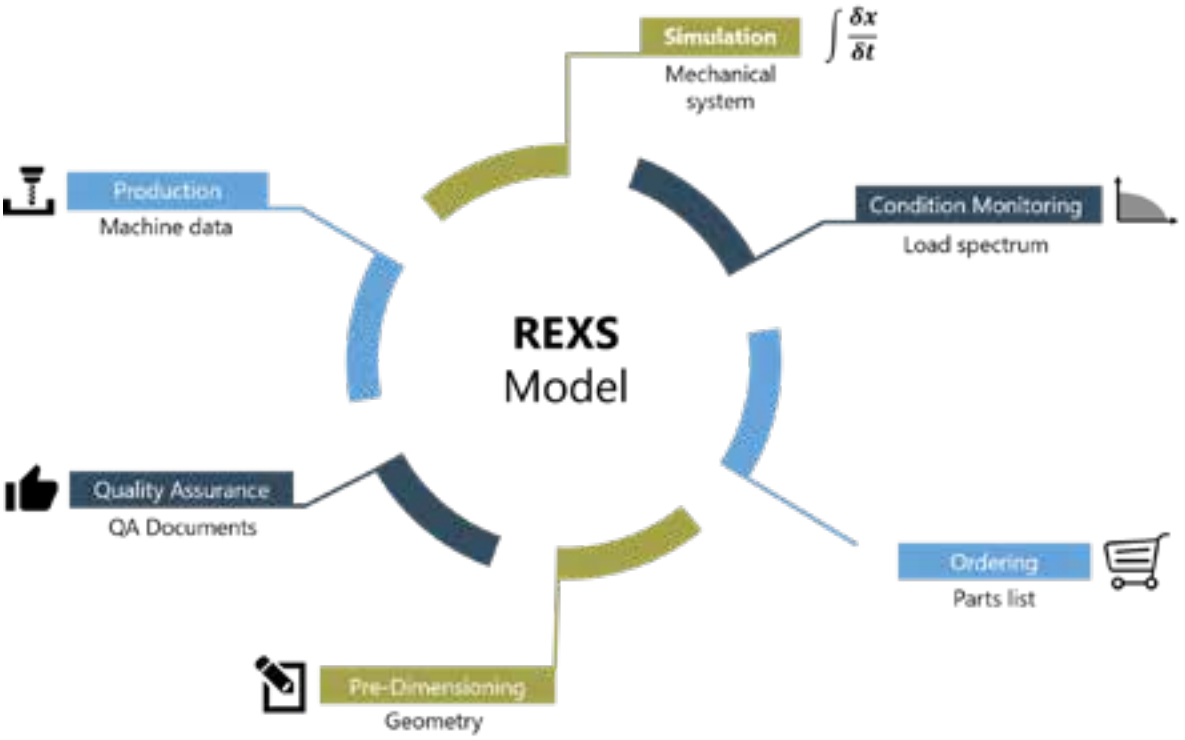

— Vision: A standard interface for all CAE powertrain applications

"REXS is a real step toward new business models based on digital services, and can be used as a standardised data container for digital twins," explains Stephan Evert. Hartmut Rauen, Managing Director of FVA, also sees the great significance of the interface for digitisation: "An important milestone for Industry 4.0 is the establishment and propagation of standards. The REXS format has the potential to achieve this goal."

users with reference software for the implementation of the interface.

About the FVA

The FVA (Forschungsvereinigung Antriebstechnik e. V.) is the world's leading research and innovation network in power transmission engineering. Researchers have been working together on the pre-competition fundamental questions of power transmission engineering since 1967. This type of industrial collective research provides the basis for product innovations of more than 200 FVA members. 210 member companies with over 2,000 industry experts and 100 research institutes with over 300 research employees form the foundation of the FVA network.

"In order to take advantage of digitisation, it is essential that data can be exchanged beyond system boundaries. Proprietary data formats do not help, as they increase complexity in the digital world. That is why we see the FVA Workbench not just as a calculation platform for the community, but also as a common data hub and enabler for digitisation in drive technology," explains Norbert Haefke, Managing Director of FVA GmbH.

Over the past five decades, the FVA has completed approximately 1,700 projects with a financial volume of more than EUR 230 million. These projects helped train thousands of young scientists in an application and future-oriented way.
fva-net.de

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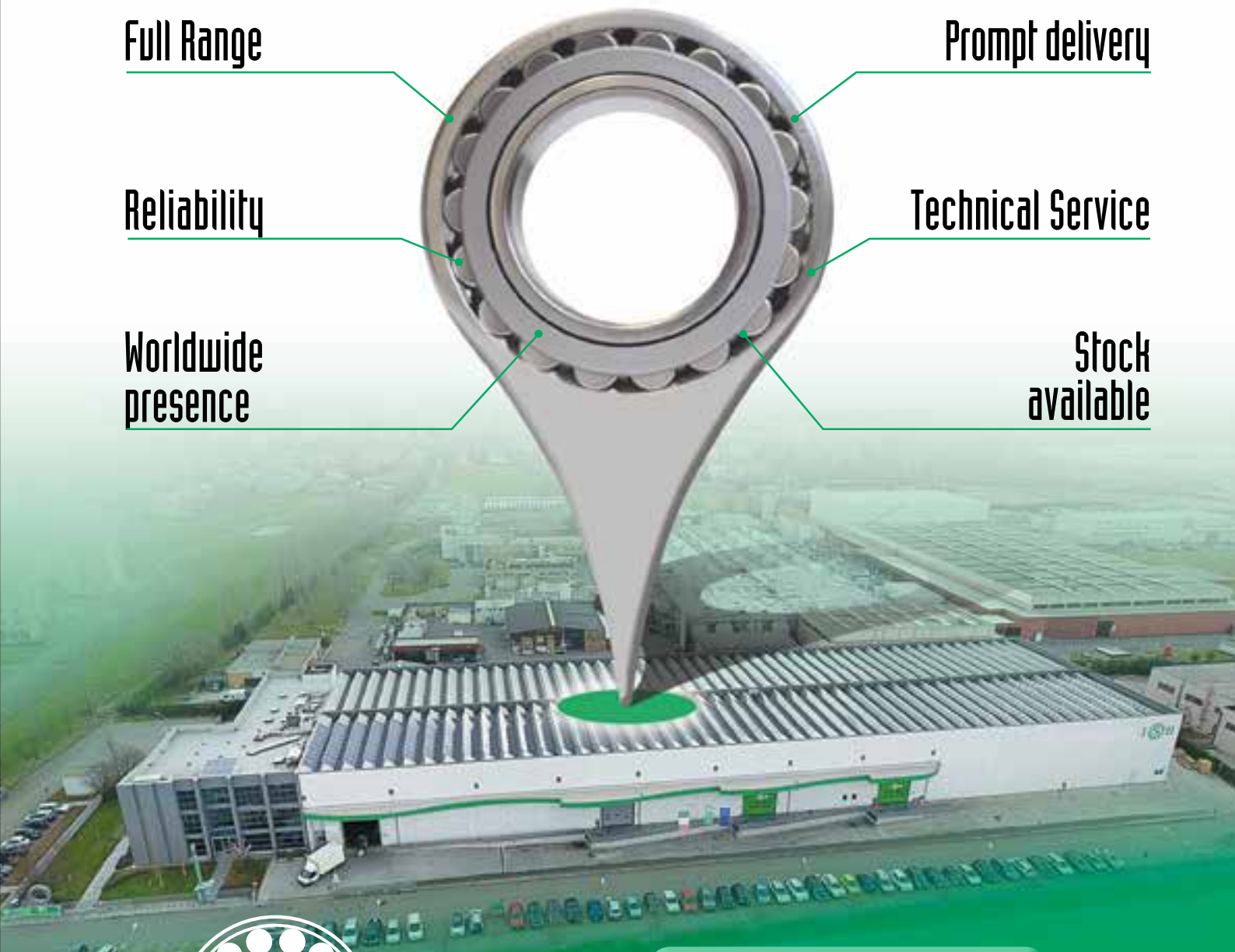

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