FOCUS

Customer magazine from SKF Industrial Sales | Issue 118 | Spring 2020

Conveying the benefits of split roller bearings
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Mounting made simple with new portable heater
→ Page **19**

SKF ProCollect: a new portable monitoring solution

Tried, tested and trusted

SKF Explorer deep groove ball bearings: The right choice for high-performance systems

SKF Explorer deep groove ball bearings run more smoothly, more quietly, at cooler temperatures, and for longer than typical deep groove ball bearings.

Made from fatigue-resistant SKF-specified steel and with the capacity to handle greater loads, SKF offers you a high performing solution that's available off-the-shelf, but is versatile enough to be used in many different applications.

Ball bearing seals are a key factor in durability, so SKF has also extended the size range of its unique RSH seals. These are designed to provide excellent sealing efficiency, as well as improve grease retention, and exclude water and contaminants, reducing maintenance costs and helping your machine run longer.

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Welcome to the Spring edition of FOCUS, SKF's regular magazine for customers and distributors across the UK and Ireland.

One major initiative is the introduction of our brand new website: www.skf.co.uk. The most obvious change is the design, but there are also three other major improvements. Firstly, the website is now fully responsive on any device; there's a smarter search function; and finally, the content is more concise. We hope you enjoy the experience!

Included in this edition is our new fee-based Rotating Equipment Performance (REP) service, in which both SKF, and our customer, benefit from maximising their machinery's productivity, reliability and efficiency. Under a REP contract, the customer pays a fixed fee dependent on SKF meeting agreed targets for machine production level, uptime or other KPIs.

I'd also like to highlight our extensive portfolio of PEER and SKF branded solutions for the agricultural sector. With over 1,800 bespoke bearings we are now able to offer a product range that helps deliver consistent performance, improved productivity, and enhanced quality for manufacturers and farmers alike.

Finally, two new market offers. SKF ProCollect is a portable vibration monitoring solution, designed to help companies adopt smart condition-based maintenance approaches; and the TWIM 15 induction heater, which is more versatile and convenient to use than other similar models available.

I hope you enjoy reading the latest edition of FOCUS!

David Norris
Sales Director UK & Ireland
SKF Industrial Sales

skf.co.uk/focusreply

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Contacts

General Enquiries
Sundon Park Road, Luton,
Bedfordshire LU3 3BL
T: 01582 490049
E: marketing.uk@skf.com

Technical Helpdesk
T: 01582 496534
E: technical.helpdesk.uk@skf.com

Asset Management and Condition Monitoring Services
T: 01224 723321
E: aberdeen.sales@skf.com

Training Solutions
T: 01224 723321
E: training.uk@skf.com
www.skf.co.uk/training

Lubrication Systems
T: 01295 256611
E: lbu.uk.sales@skf.com
www.skf.co.uk/lubrication

Sealing Solutions
T: 01753 696136
E: seals.uk@skf.com
www.skf.co.uk/seals

Contributors

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Editor: Phil Burge
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Fee-based business models for a better future

In the traditional transaction-based model, suppliers' profits depend on numbers of parts sold and not on improvements in machine performance. There's fundamental conflict of interest, as longer component life means fewer sales for the supplier. SKF is now offering a forward-thinking, fee-based Rotating Equipment Performance (REP) service, in which both SKF as a supplier and its customers are benefiting from maximising machinery's productivity, reliability and efficiency.

Under a REP contract, the customer pays a fixed monthly or quarterly fee dependent on SKF meeting agreed targets for machine production level, uptime or other KPIs. The all-inclusive fee covers provision of bearings, seals, lubrication and condition monitoring. SKF's engineering expertise in this specialised area ensures the ideal specification and application of all elements, which is important as 90% of industrial bearings fail because they are wrongly specified, installed, lubricated or used.

REP can be applied to both long-established and modern equipment, including conveyor belts, pumps, crushers, paper machines, steel or pulp mills and railway bogies, to name but a few examples. SKF experts discuss the needs of the machinery and the business before proposing a solution. Importantly, REP helps bring the customer's maintenance and production departments together, with a strong focus on uptime and output.

The scope for performance improvement through fee-based business models has been enhanced by digitalisation. SKF can provide inexpensive, easy-to-use condition monitoring units and automatic, fully integrated lubrication systems. These connect with the SKF Cloud and the customer's existing production management system to generate useful real-time data which can be acted upon remotely.

Entry-level hardware and software make it simple for any company to adopt a digital approach, and solutions are scalable to suit all sizes of operation. If businesses lack the analytical expertise to make use of the data generated, SKF can provide the necessary onsite or remote support. All systems are connected to SKF REP Centres, where data scientists and application engineers monitor five million bearings in real time.

"As well as reducing costs and increasing profitability, our REP fee-based approach reduces waste in the value chain and lowers environmental impacts," says Alrik Danielson, SKF's President and CEO. "REP contributes to the circular economy through remanufacturing or recycling of bearings, and filtration and regeneration of lubricants. It also lowers material and energy consumption more generally thanks to longer-lasting components and more efficient machine performance. This is all good news for the future of businesses and our planet."
www.skf.com/REP

SKF sponsored university wins Formula Student competition

SKF sponsored University of Modena from Italy won the 2019 Formula Student competition, beating over 100 undergraduate teams from more than 20 countries at the international racing car event held at Silverstone.

Formula Student is run by the Institution of Mechanical Engineers (IMechE), and challenges students to use their creativity and technical skills to design, build and race single-seater cars in a series of events at the famous track.

Runner up for the second year running was Oxford Brookes University, while Germany's West Saxon University of Applied Sciences of Zwickau took third place.

Formula Student chief judge, Terry Spall, said: "Congratulations to the Modena team who scooped a number of awards including the coveted 2019 Overall Winner trophy. They entered two cars - a hugely innovative hybrid, which secured the best powertrain installation award and a more conventional, but superbly designed, petrol engine car which secured them runner up in Engineering Design and several wins in the dynamic events – all driven with such precision, passion and style. A truly great performance by the Modena team."
www.imeche.org/events/formula-student

Orbital chooses SKF technology for world's most powerful tidal turbine

SKF has developed a powertrain for the world's most powerful tidal turbine, capable of generating 2MW, being developed by Scotland-based Orbital Marine Power.

SKF has been supplying bearings and components to Orbital since 2011 but has now taken a further holistic step in its technical capacity, by developing the full powertrain system.

Thomas Fröst, President Industrial Technologies at SKF says: "We have almost a decade's worth of experience of being a technical partner to developers of advanced tidal turbine technologies. By now taking the step from being a mechanical component supplier to supplying fully integrated power trains, we strengthen our position and focus on supporting selected cleantech industries."

The O2 is made up of a 73m-long floating superstructure that will support two 1-MW turbines at each end. With rotor diameters of 20m, it will have a total rotor area of 600m2 – the largest ever on a single tidal turbine to date – and will be capable of powering more than 1,700 homes per year.

The turbine will feature 360° blade pitching, which will allow the safe, dynamic control of its rotors and will enable power to be captured from both tidal directions, eliminating the need to rotate the entire platform. These controllers will also support the installation of even larger blades on the turbine in future.

Andrew Scott, Orbital Marine Power's Chief Executive Officer, says: "Commercialising our product will create an entirely new global market for power generation equipment and services, and we are delighted to be working with SKF."

Michael Baumann, Business Development Manager, Marine and Ocean Energy at SKF, says: "We see great potential in floating tidal turbines, owing to their low costs to install and operate. We look forward to helping Orbital to commercialise its O2 turbine technology and contribute to increased generation of tidal energy."

www.orbitalmarine.com

Welcome to the brand new SKF UK website

One of the most frequent comments we received regarding our old website was how difficult it was finding the right information. We took this on board, as well as analysing our website traffic for further insights.

The most obvious change, is of course, the new design. However, the three biggest improvements are:

- The site is now fully responsive, making it optimised for any device
- A smarter search function, giving more accurate search results
- More operational and to-the-point content

A website like ours is never completely finished. We will continue to improve functionality and content, guided by your feedback and clicks!

www.skf.co.uk

SKF acquires cleantech start-up company

SKF has acquired RecondOil Sweden AB, a Swedish cleantech start-up that has developed a chemical filtration and rejuvenation process for industrial lubrication fluid and slop oil.

RecondOil's turnover in 2017 was SEK 10 million and the acquisition will strengthen the Group's lubrication management business and rotating equipment performance offer.

Alrik Danielson, President and CEO, said: "This acquisition is a good strategic fit for us. It complements our existing offer around the rotating shaft and will strengthen our ability to offer customers a fee-based value proposition, in which lubrication management systems play an important role."

"The acquisition is also in-line with our ambition to develop and offer solutions that help customers reduce the environmental impact of their own operations. By bringing together RecondOil's technology with SKF's scope and industrial expertise, we will be able to industrialise this offering."

www.recondoil.com

Competition

After reading the magazine visit: **www.skf.co.uk/focusreply** and select the three correct answers by 31 May 2020 for your chance to win. **1st prize: A powerful, portable, waterproof, wireless speaker**. 2nd prize 5 x Mini Maglite torches. 3rd prize 10 x Cross A5 notebooks.

By using an SKF Cooper split bearing instead of a solid bearing, how much can you reduce mean time to repair by:

☐ 50% ☐ 60% ☐ 70%

What is the designation of SKF's new portable induction heater:

☐ TMFT 36 ☐ TWIM 15 ☐ TIH 030M

How many agricultural-specific bearings are available from the PEER and SKF portfolio:

☐ Over 1,500 ☐ Over 1,800 ☐ Over 2,000

FOCUS 117 COMPETITION WINNERS

→ 1st PRIZE

Ring video doorbell goes to:
John Clement - ERIKS UK Ltd.

→ 2nd PRIZE

5 x leather SKF travel wallets go to:
Stephen Weavill - Arriva Rail North, Kajal Bhogaita - Sterling Corporation, John Ashe - Irish Rail, Stuart Clement - ERIKS UK Ltd., Simon Ross - BRT Bearings Ltd.

→ 3rd PRIZE

10 x leather SKF men's wallets go to:
Konrad Zawadzki - ERIKS UK Ltd., Matthew Shaw - Brammer Buck and Hickman, James Henderson - Iggesund Paperboard, Helen Hardon - BRT Bearings Ltd., Mandy Horton - Acorn Industrial Services, Stephanie Graham-Hibling - BRT Bearings Ltd., Paul Ramsden - Leeds Engineering Solutions, Jeremy Watt - Automotive Bearings Ltd., Alan Learmonth - Hayley Group Scotland, Andrew Evans - ProCo-STS Ltd.

Wind turbine reliability dashboard will help reduce operating costs

SKF is developing, in partnership with Boralex - a leader in the Canadian market and France's largest independent producer of onshore wind power - a new dashboard to help wind farm operators optimise the proficiency of wind turbines. The dashboard will also improve operators ability to reduce costs and make long term planning decisions based on in-depth data drawn from a range of critical sources; these include condition monitoring systems, estimated remaining useful life and the lead-time of replacement parts.

The Wind Reliability Dashboard is an evolution of SKF's current condition monitoring and predictive maintenance tools. It extends existing capabilities by allowing data to be captured and analysed from all forms of rotating systems in each turbine, from both SKF and other CMS (Condition Monitoring System) providers.

Typically it keeps track of components actual and remaining service life, based on previous detection CMS cases. This allows the creation of a reliable component library which allows the move to predictive maintenance via better risk management.

The dashboard also captures information from maintenance systems as well as from the supply chain; for example, it allows the matching of replacement spare parts lead-time with remaining useful life of the component.

Ultimately, it can provide external Systems like CMMS (Computerised Maintenance Management Systems) the key indicators for maintenance best practices, components MTBF (Mean Time Between Failure) and lead time.

Giannino Martin, Operational Excellence Deputy Director for Boralex explains: "We see the Dashboard as an effective and innovative method of streamlining critical elements in our business. Working with SKF is giving us access to new in-depth data, which we believe will be instrumental in helping us reduce our operating costs while increase reliability and predictability of the production, so providing even a better service to all our customers."

Nordic Paper and SKF sign agreement aimed at increasing productivity

SKF and Nordic Paper have signed a five-year fee- and performance-based contract. The agreement aims to improve Nordic Paper's productivity, health and safety and sustainability performance.

Nordic Paper is a pulp and paper manufacturer with operations at four sites, producing craft and natural greaseproof paper. The site in Säffle, which produces greaseproof paper, is covered by the agreement.

Mattias Årstadius, SKF's Head of Industrial Sales in Sweden and Norway, says: "More and more customers are becoming open to new, fee-based business models, especially as we can show that these models help improve the competitiveness of their machines."

The agreement will see increased automation and digitalization of PM2 in Säffle. During the summer of 2019, work commenced on installing 500 lubrication points and 230 condition monitoring points, all of which are connected to SKF's IMx monitoring system. Data from the connected machinery is monitored and analysed at SKF's Rotating Equipment Performance Centre in Gothenburg, Sweden.

Peter Bergkvist, Nordic Paper's Mill Manager in Säffle, says: "Working with SKF has enabled us to develop a better understanding of our machines, as well as given us the opportunity to increase the competence of our own staff."

"Our paper is made from locally sourced materials and is good for the environment, as it does not have any added fluorocarbons. Working with SKF is in line with our ambitions to run our operations in a sustainable and responsible manner."

SKF's fee-based business model is developed around the customer's needs and productivity targets. Based on these, SKF is able to offer an appropriate combination of products and services.

www.nordic-paper.com

SKF acquires industrial AI company

Presenso Ltd. is a company that develops and deploys artificial intelligence (AI)-based predictive maintenance software. Presenso's AI capability enables production plants to find and act on anomalies that were previously difficult to detect, automatically and without the need to employ data scientists. Presenso's competence will be used to strengthen SKF's Rotating Equipment Performance offer.

Victoria Van Camp, CTO and President, Innovation and Business Development, says: "SKF is all about reliable rotation, technology leadership and solving real world challenges. Today, we are welcoming a team of world-class AI developers, with a production-ready analytics solution into SKF. Together we will change the way industry looks at reliability and make AI an integrated part of production."

www.presenso.com

Farmers reduce costs and increase productivity – sustainably - thanks to PEER and SKF solutions

Due to their combined years of experience in tractors and tillage equipment, SKF is presenting its PEER and SKF branded solutions for the agricultural industry; with farmers benefitting from the company's extensive range of standard and bespoke bearing-related solutions.

With variable seasons agricultural machinery is working harder and more intensively, and farmers are under increasing pressure to improve productivity and reduce cost. With this in mind, PEER and SKF branded bearing solutions from SKF are proving popular with manufacturers, dealers and farmers alike, offering a range of integrated solutions that help deliver consistent performance, improved productivity, reduced maintenance cost and enhanced quality.

With over 1,800 bearings specifically tailored to the demands of the agricultural sector, PEER and SKF branded solutions are at the forefront of innovative bearing design. With many years of experience in the industry, the company's range of bearings and seals has been designed specifically for the challenges faced by the agricultural sector. Their innovative solutions include maintenance-free units for use in rolling baskets, tillage equipment and seeding machines, as well as seals that have been designed to eradicate over greasing blowouts and are specifically suited to the demands of farming life.

A case in point is the SKF and PEER Agri Hub range. This easy-fit hub solution for tillage has an integrated flange and is a reliable sealing solution for agricultural implements. Unplanned breakdowns and downtime for attachment maintenance can be significantly reduced by fitting Agri Hubs, as they are greased and sealed to be virtually maintenance-free throughout their bearing life. The hubs can also help to reduce lubricant consumption, minimising operational costs and benefitting the environment. Also, the service life of SKF Agri Hubs is three times longer than a traditional bearing, reducing the environmental impact of the unit still further over its lifetime.

Application knowledge, innovation and quality are the cornerstones of PEER and SKF branded bearing solutions from SKF. With a long heritage in designing bearing solutions for tractors and tillage equipment, the company's engineers have extensive application knowledge and work closely with agricultural manufacturers to ensure that every bearing and seal gives outstanding, consistent performance.

John Hirst, Business Development Manager for PEER comments: "In the UK there is a big drive to work the land in a more environmentally friendly way using strip tillage, direct drilling, etc. New machines are very expensive and with this in mind, farmers want reliability. We have many years' experience in delivering unique bearing solutions that make the lives of farmers easier, helping them improve productivity and saving them time and money."

SKF automatic lubrication proving popular in supply ship applications

Automatic lubrication boosts safety and prolongs the service life of marine wire rope.

The harsh environments experienced by supply ships and their limited downtime between jobs means that maintenance of standard components, such as wire rope, is both essential and challenging. The SKF automatic lubrication solution for wire rope is proving popular with Thor Ltd, a leading operator of support vessels for the oil, gas and pipelaying sector, where it is being used across their global fleet, as it promotes safety as well as profitability.

The loads that supply ships transport are frequently heavy, making the thorough care of winches crucial. At regular intervals, the crew must lubricate the steel cable to reduce friction and minimise wear. Frequent lubrication is important, as the fleet often has a full schedule and cannot afford downtime. This is especially challenging in the harsh environmental conditions under which vessels often have to operate.

The wire rope lubricator (WRL), launched by SKF in 2016, has been reducing downtime and prolonging service on many fleets. It eliminates manual lubrication and is available in a range of models for use with any wire rope up to 52mm in size. It is designed to deliver highly effective lubrication in virtually any application using wire rope, including oil and gas rigs, wharf and ship cranes, deck winches, ship hoists, remotely operated vehicles and winding machines in mines. The WRL can also significantly increase the wire rope life expectancy compared with conventional lubrication methods.

In the case of Thor Ltd. the company has already installed automatic lubrication on five of its eleven ships that are often working for weeks at a time servicing locations ranging from Angola to Greenland. Lubrication was previously applied by hand, sometimes to ropes that are several hundred meters in length. The automatic system can easily be operated by every crew member from a knuckleboom crane (as in the Thor Ltd. case) or winch, which significantly reduces potential risks to crew members, while increasing the lifespan of each wire rope.

Supporting all lubricants typically used with wire rope, the WRL ensures optimum lubrication by applying the exact amount of grease required. The system distributes grease across the surface of each rope and forces it deep into the rope's core ensuring every strand is evenly coated. This reduces friction and heat generation, while protecting against corrosion. In addition, a groove cleaner also removes old lubricant before applying the new protective coating. As a result, time spent on lubrication is reduced by up to 90% compared with manual lubrication, as well as eliminating excessive waste and environmental contamination, and reducing maintenance costs.

Bringing noise and maintenance back on track

Mainz is the capital and largest city of the federal state of Rhineland-Palatinate in Germany. Located on the Rhine river at its confluence with the Main river, it is regarded as a major transport hub in southern Germany, and for European distribution. The city has had a tramways network in operation since 1883. Today, the popular service is operated by Mainzer Mobilität (MM), the public transport operator for Mainz.

Previously, on some sections of the tracks, trams would occasionally emit a noisy squeal as they approached. In addition, MM found that the track was becoming increasingly worn. One of the causes of this was the lack of a suitable track lubrication method. The situation was remedied using several solutions from SKF lubrication systems. In addition, the network uses significantly less lubricant, and maintenance has become much more efficient, both welcome bonuses to MM.

MM, a subsidiary of the city's municipal utilities, has approximately 500 employees, who look after a route network of around 40 kilometres. In addition to numerous buses, the fleet also boasts 41 trams. However, at certain locations around the city, these would emit too much noise as they passed by. "The existing lubrication systems were 25 years old, and the control system was an in-house development. We were no longer able to make precise adjustments, and there were no spare parts left," explains Kai Buhl of MM Infrastructure Management. In addition, the lubricant consumption was excessive. To remedy this, MM decided to renew the systems, step by step.

> "Today we achieve lubricant savings of up to 70% compared to our old solution."

This resulted in an offer from SKF. "We proposed just replacing the pump cabinet as a first step, while leaving the old technology on the track," says Tobias Weber, Account Manager Railway Lubrication Business Unit.

MM was able to test the user-friendly system for six months, and was very pleased with the outcome. As a result, it decided to continue its partnership with SKF to oversee additional projects.

Obsolete track technology gradually replaced

To bring up to date the network was in need of several upgrades. In addition to replacing the pump cabinets, SKF identified a need to replace obsolete track technology.

MM accepted the idea, and a progressive system from SKF was initially used. This involved a wheel sensor that registers passing wheels and triggers a lubrication cycle. The lubricant was conveyed from the pump to the progressive distributor, which distributed the lubricant evenly and accurately between all the lubrication channels drilled into the rails, at 0.2 cm^3 per outlet. "It was slightly more than a drop of water," said Tobias Weber. After the distributor has supplied all the lubrication points, the pump stopped and was ready for another cycle.

New SKF single-line system

Once planned expansion work of the track network at the Mainz Zollhafen port was imminent, MM opted for a new technology from SKF: the single-line system. Here too, the approaching tram triggers a lubrication cycle and the pump sent the lubricant to single-line distributors. “However, these supplied each lubrication channel with only 0.05 cm^3,” said Swen Dorsch, Supervisor Field Service at SKF. Compared to the progressive system, this was a significant advantage, as the small output volume was better absorbed by the wheels and the track bed remained clean.

Lubricant savings of up to 70%

The use of SKF technologies in different variants has paid off for MM. “Today we achieve lubricant savings of up to 70% compared to our old solution,” says Kai Buhl.

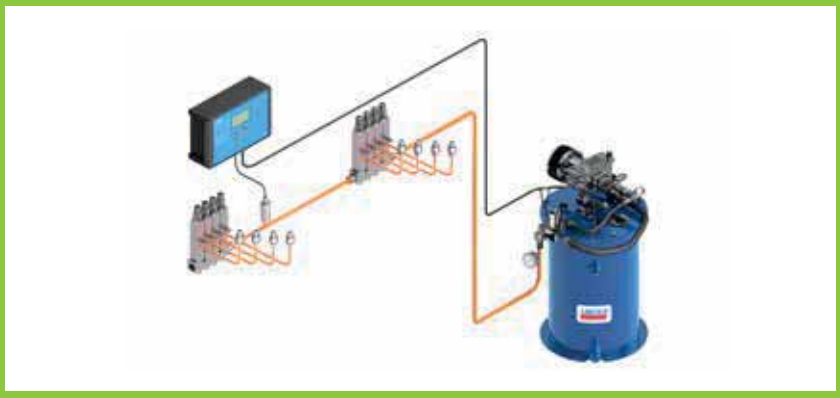
“We are very happy with the various systems and receive nothing but positive feedback from our employees,” he says. There has also been a significant reduction in the amount of maintenance effort that is now required.

In the past, Kai Buhl would send his employees out several times a week to carry out checks. Today four times a month are enough. In addition, filling the grease tanks is now easier, faster, and cleaner across the board.

Kai Buhl also praises the collaboration with SKF. “We felt we were in excellent hands; we often went out together, examined the problem areas closely and designed the systems accordingly,” he says. Noise emissions have fallen significantly thanks to the SKF solutions. Since then, five progressive and three single-line systems have been installed on the MM track network. Kai Buhl has no doubts about further cooperation with SKF. His long-term aim is to convert other old systems to the single-line technology.

Meanwhile, for SKF lubrication systems, the innovative lubrication solution appears to be developing into a success model that continues to prove popular and beneficial. Most recently, the company has won a contract from the city municipal utilities in Ulm, Baden-Württemberg, where it will be fitting a total of 51 installations with the single-line system.

SKF and Lincoln single-line lubrication systems for grease



Advantages:

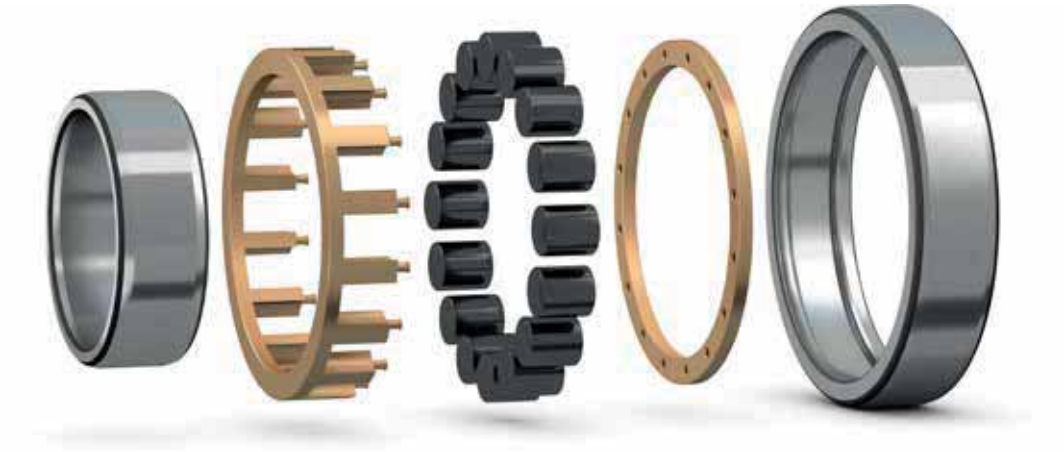
- Easy to understand, install and maintain
- Fully adjustable or customisable for any application
- Suitable for almost all lubricants
- Simple system expansion
- System continues to operate if one point becomes blocked
- Integrated system control and monitoring
- Able to pump long distances within a wide temperature range

Applications:

- Mining and quarrying
- On/Off-road
- Construction machinery
- Cement industry
- Food and beverage
- Machine tools
- Railways
- Forestry
- Steel

A real-world view of hybrid bearing life

A new modelling approach is helping engineers pick the right bearing for the right application.



Hybrid bearings, which use ceramic rolling elements on steel raceways have some well-known advantages over their all steel counterparts. Those advantages include low weight, good electrical resistance and good performance under demanding lubrication and contamination conditions, characteristics that have earned hybrid bearings an important niche in specialist applications like high speed machine tool spindles for more than 50 years.

Over time, the range of possible uses for hybrid bearings has grown. In part this has been due to advances in manufacturing technology, which have brought down costs. But users have also found that in many circumstances ceramic rolling elements can outperform those in all-steel bearings. For example, they generally exhibit lower operating temperatures, are more resistant to surface damage from particulate matter, and do not suffer from the potential risk of steel-to-steel surface welding, which can occur in traditional bearings under extreme conditions. Additionally, hybrid bearings have a lower boundary-lubrication coefficient of friction, which allows them to function more efficiently in applications with poor lubrication.

Until now, however, it has been difficult for engineers to know in advance whether a hybrid bearing will outperform a steel one in their application, or whether the possible performance benefits are worth the extra cost. According to Guillermo Morales-Espejel, Principal Scientist as SKF Research and Technology Development, that's because the existing equations engineers normally use to calculate the rating life of a bearing don't reflect the real-world performance of hybrid designs.

"The conventional bearing life model is based on sub-surface fatigue," he explains. "As bearings rotate, their components are continually loaded and unloaded. Over millions of cycles, fatigue accumulates in the material, eventually leading to failure." Because fatigue behaviour is well-understood, engineers can plug information about the loads and speeds expected in their application into an equation to determine the rating life of a given bearing design. The dynamic load rating C, which can be found for any bearing in the SKF general catalogue or in the online product catalogue, is mainly used to quantify the sub-surface performance of the bearing."

This traditional model is widely used and incorporated into international standards, but Morales-Espejel notes that it doesn't show hybrid bearings in the best light. "Because the ceramic rolling elements are stiffer than steel, they deform less under load. That means loads are concentrated over a smaller area of material, increasing stress and accelerating sub-surface fatigue."

More significantly, however, real-world experience doesn't always align with the traditional model. "We know from experience in the field that the majority of bearings fail due to problems at the surface, not in the body of the material," explains Morales-Espejel. "The root cause is usually damage caused by poor lubrication or contamination." Nobody disputes that analysis, and modern standards such as ISO 281 include correction factors in an attempt to accommodate these effects.

A new model

Those correction factors didn't attempt to represent the real behaviour of bearings in service, however, so in 2012, Morales-Espejel and colleagues at SKF set out to do better. To create a new bearing life

model, he says, they needed three things. "The first was a model of sub-surface fatigue within the material, which we already had. The second was a model for failure at the surface. The third was data from endurance tests that we could use to calibrate and validate our model."

The SKF team worked on the new model over the next two years, drawing on decades of study in materials science and tribology. The approach required a detailed understanding of the behaviour of bearing surfaces, from their friction characteristics to the way dirt particles indent them under load.

Although an initial concept model was presented as a Generalised Bearing Life Model (GBLM) in 2015 at the Hannover Messe, at that time it did not cover the modelling of hybrid bearings.

"One needs data to calibrate and then validate any bearing life model. To collect enough data for this, however, there is no substitute for hard craft. We needed data on the operating life of bearings over a wide range of loads and surface conditions," explains Morales-Espejel. "We were trying to build behaviour curves. For each point on the curves we needed to test around 30 bearings, with the expectation that several of them would fail." The SKF team also needed to compare bearings with steel and ceramic rolling elements, and bearings operating with poor lubrication and in contaminated environments.

All this added up to hundreds of tested bearings. In total, the test programme and the adaptation of the concept model required a further four years of effort by scientists and technicians at SKF's facilities in the Netherlands and Austria.

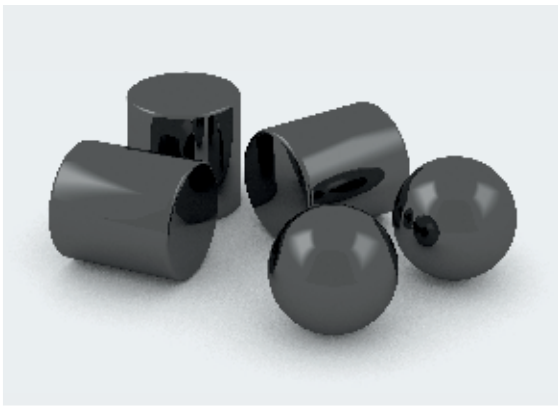
The SKF team completed its new Generalised Bearing Life Model for hybrid bearings in mid-2018. The approach has since been tested and approved by an important group of company's application engineers, who used prototype versions of the model alongside conventional bearing life estimation techniques, and compared its outputs to their real-world experience on customer projects.

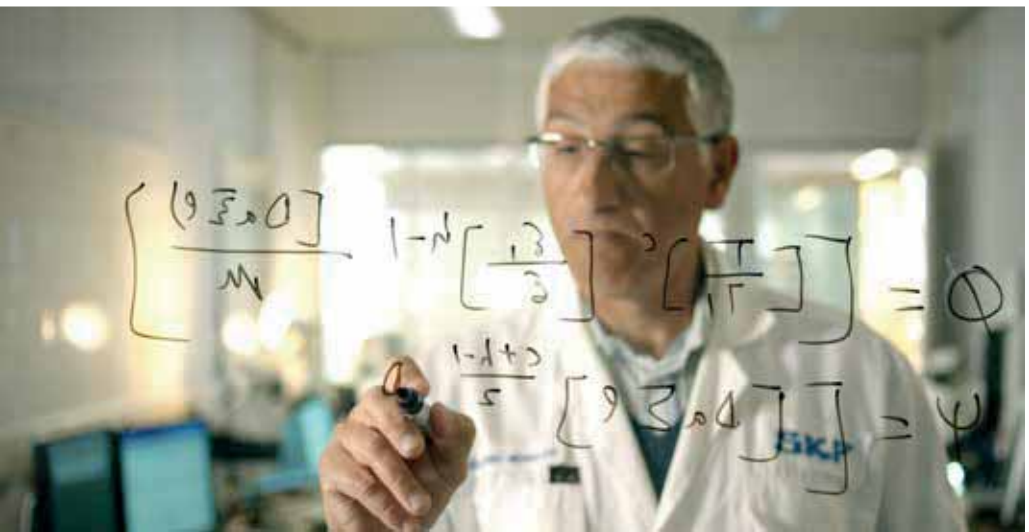
Real life insights

What does the new model mean for engineers and designers? "We already knew that hybrid bearings had advantages in many commonly experienced conditions," explains Morales-Espejel. "When a bearing is heavily loaded, but able to run in a clean, well-lubricated environment, sub-surface fatigue is likely to be the ultimate failure mode, and a steel bearing may perform better than a hybrid. But a lot of bearings operate under lighter loads, but with a greater likelihood of poor lubrication or contamination. Our model will show if a hybrid solution would offer a longer life on those applications and will quantify the difference."

In a scientific paper presented earlier this year, Morales and his colleagues have run those calculations for four representative real-world applications. In the case of a pump bearing running with oil-bath lubrication and diluted oil resulting in poor lubrication, the rating life of a hybrid bearing was eight times longer than a steel equivalent. For a screw compressor bearing running with contaminated lubricant, the hybrid offered a rating life time a hundred times greater than a conventional steel bearing.

In the other two cases, which looked at an electric motor operating in clean, well-lubricated conditions under two different load regimes, the rating life of the hybrid bearing was very similar to the conventional bearing. The paper's authors note, however, that in these cases other potential benefits of hybrid technology, such as electrical resistance or a longer grease life, might be the decisive factors in bearing selection.





A clean line to productivity improvements

A radical new bearing design addresses key challenges in the food and beverage sector.

The UK food and beverage industry is a quiet economic powerhouse. Larger than the country's automotive and aerospace sectors combined, the industry accounts for around a fifth of all manufacturing and contributes almost £29 billion to the country's economy. Annual food and drink exports are worth more than £22 billion.

Like other industries, however, the food and drink sector is wrestling with a number of critical challenges. One is labour: the sector struggles to the get the skilled people it needs to fulfil manufacturing roles. With a third of the industry's 400,000 workers coming from other countries within the EU, the uncertainties surrounding Brexit are putting extra pressure on labour supply.

Then there are commercial challenges. Food and drink companies have to manage volatile ingredient prices and fast-changing customer preferences. In the wake of recent hygiene and food safety scandals, they face relentless pressure to meet rigorous operating standards.

The efficiency imperative

Against this background, it is no wonder that the vast majority of food and drink players are striving to ramp up their productivity. Accountancy firm BDO, which conducts an annual survey of the sector, found last year that 89% of manufacturers thought productivity improvement was a critical priority for the year ahead.

In any manufacturing sector, machinery and productivity are closely linked. It's no surprise, therefore, that more than half the companies surveyed by BDO said that additional investments in automation were part of their performance improvement strategy for 2018. In the food and drink sector, however, the characteristics of machines when they aren't running is almost as important as their performance when operating at full capacity.

Washing profits away

Food and beverage manufacturing systems must undergo regular, thorough, washdowns to guard against the build-up of bacteria and material residues and to avoid cross-contamination between batches. But the washdown process is a drain on productivity. The costs associated with washdowns are not limited to the time, labour and resources required to perform them.

Dowsing equipment with water and detergent can also affect its longevity and reliability. Cleaning products can find their way into bearings, for example, shortening the life of lubricants and accelerating corrosion. Managing those issues can drive up maintenance costs, either because components need more regular lubrication and attention or, worse, because problems introduced by cleaning lead to early failures and unplanned downtime.

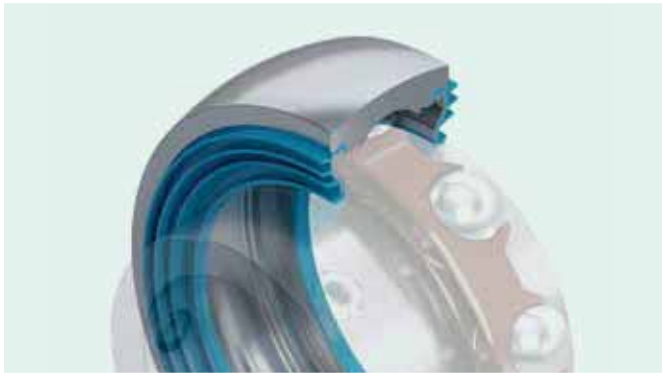
Clean sheet design

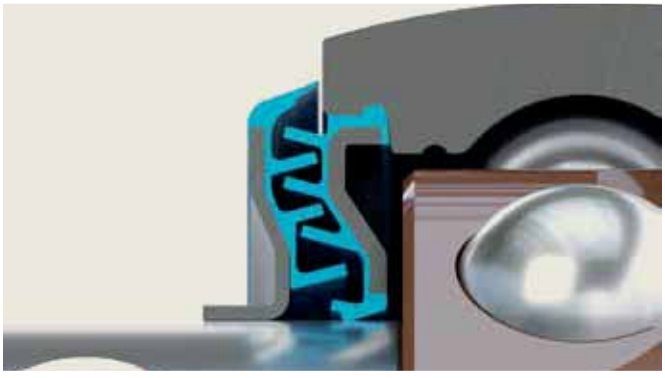
It was with exactly these issues in mind that SKF recently set out to design a range of bearings specifically for the food and beverage sector. The company went back to the drawing board for the new range, starting with a blank sheet of paper and building up a design, component by component, to improve hygiene, performance, and compliance with food safety regulations.

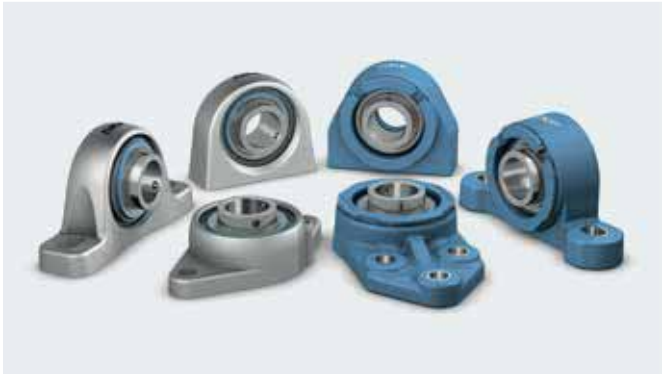
The new Food Line bearing range incorporates a host of innovations that addresses many of the long-standing issues associated with conventional bearing units. The housings, for example, use an over moulded rubber base seal that prevents contamination and bacteria growth between the unit and the mounting frame. A special back seal and an end cover prevent process material from entering the bearing from either side. The end cover uses a patented locking mechanism to ensure it cannot be accidentally dislodged. The geometry of the entire housing is designed to eliminate crevices or recesses where bacteria might establish themselves. Angled surfaces and a smooth surface finish reduce material accumulation and ensure liquids drain away easily, regardless of bearing orientation.

Inside, a special multi-lipped sealing arrangement (another patented innovation) keeps lubricant inside the bearing and contaminants out. The corrosion-resistant stainless-steel bearing inside rotates in long-lasting, high performance food-grade grease. The factory-installed lubricant is designed to last for the full life of the bearing, eliminating the need for regular relubrication and the associated material, labour, clean-up and disposal costs.

For food and drink players, the new Food Line bearings are a game changer. Their smart external design reduces the time, water and detergent required for washdowns by 33%. Taking away the need for relubrication eliminates a major source of downtime and maintenance costs at stroke. Significantly, those benefits don't mean a compromise in terms of longevity. Their advanced materials and sophisticated sealing technology mean the Food Line bearings achieve a longer service life than their conventional counterparts. When they do eventually wear out, the new units have been designed for efficient recycling, with no components that require disposal in landfill.







Conveying the benefits of split spherical roller bearings

When it was first introduced a little over a century ago, the heavy-duty belt conveyor revolutionised the mining, quarrying and cement industries. Maintaining this machinery, however, has always been a slow, expensive and dangerous task, but now there's a solution to these problems.

Despite significant reductions, the number of injuries and fatalities that occur in the mining industry each year remains high. Many of these happen when maintenance and repair work is being carried out. Industry studies have found that 43% of all accidents and 24% of all fatalities occur during maintenance work on conveyors. Partly because couplings and gearboxes on these machines need to be hoisted during repair, which creates certain risks.

Indeed, in the mining, mineral processing and cement industries, conveyors are by far the most troublesome machinery to keep running efficiently. One problem is grease consumption; conveyors typically use standard open-pulley bearings, which require large amounts of grease to purge any contamination. Furthermore, open bearings have a relatively short service life and therefore normally do not last as long as the pulley lagging itself.

The premature failure of bearings entails their frequent repair and replacement. To compound the issue, this is time-consuming, costly and – as we have seen – dangerous work. Since bearings are often situated in difficult to access locations, it can take up to 24 hours to replace them. Preventing the contamination of conveyor bearings, reducing the amount of lubrication they need and speeding-up repair times are therefore crucial challenges for the mining, mineral processing and cement industries.

In response to these challenges, the SKF Cooper split spherical roller bearing has been developed. These are designed to counteract the contamination that so frequently causes open pulley bearings to fail, to extend the service life of the bearing and to reduce costly downtime.

The split design of the bearing enables its in-situ replacement in machinery, thereby reducing downtime, maintenance costs and risks to worker safety. The sealed variant greatly reduces the need for lubrication, by providing effective protection against contamination.

The bearing comprises inner and outer rings, a cage and rollers, an outer shroud and two inner clamp rings, and screws to bolt the shrouds and clamp the rings together. The design of the rings in particular serves to enhance the performance of the bearing and increase its service life. Both the inner and the outer rings are wire cut to minimise discontinuities, ensuring superior clamping and the accurate alignment of the two halves of the ring. The interlocking outer race and shroud joints not only ensure the good alignment of the two halves, they also reduce risk of damage at the splits during operation. The wire cut angular inner race joints further ensure a smooth roller path.

Moreover, using wire cutting as a splitting technique, rather than employing alternative methods also means that the risk for fretting corrosion with the shaft is minimised. Finally, the steel clamp rings allow permissible axial loads (shaft clamping) of

around 50–100% greater than comparable split spherical roller bearings and they are even quieter when in operation.

For customers looking for bearings designed to be easily replaced in situ, with little disturbance to the shaft alignment or driveline, the use of SKF Cooper split spherical roller can reduce mean time to repair (MTTR) by as much as 70%.

The main use of the SKF Cooper split spherical roller bearing is in the trapped bearing position of the machine. Here, the replacement of a bearing with a standard (non-split) version would require the removal (hoisting) of the gearbox and drive coupling. With the SKF Cooper split bearing, the number of actions required to replace a bearing in the trapped position is reduced from seventeen to just eight.

For instance, use of the bearing eliminates the need to make any changes to the alignment of the shaft or the driveline. There is no need to dismount the drive coupling or cantilevered drive, reducing the amount of equipment, such as cranes and alignment tools, that need to be rented to complete the job.

Moving the conveyor belt to access the pulley, and moving the pulley and gearbox, can be very dangerous operations to carry-out since these components are often heavy and elevated above ground. This increases the risk to maintenance personnel.

By contrast, the in-situ replacement with a split bearing only requires the slight raising of the shaft and little or no disturbance of the drive coupling or gearbox. This greatly reduces the exposure of workers to safety hazards.

As a further benefit, the use of a sealed split bearing also greatly reduces the need for lubrication – approximately 90 to 95% less grease can be used – resulting in reduced costs, safety risks and environmental impact.

The SKF Cooper split spherical roller bearing can be fitted in all the SKF metric (SNL, SNLD) and inch (SAF, SAFD, SDAF) split plummer block housings. The split bearing outer ring has the same dimensions as a standard spherical roller bearing and can fit into split plummer block housings with standard locating rings, if needed. The shaft requirements of the split bearing are the same as those needed for a standard spherical roller bearing mounted on an adapter sleeve.

As we have seen, use of SKF Cooper sealed split spherical roller bearings can help those in the mining, quarrying and cement industries slash maintenance costs and production losses, and reduce their environmental impact—all while improving worker safety.

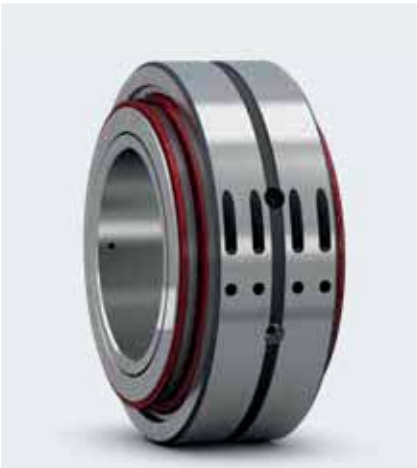
Sequence of procedures for replacing a bearing in the trapped position

Standard bearing:

- Safety lockout/tagout
- Block machine (pulley) from rotation
- Block and move belt to access pulley
- Disconnect gearbox coupling from motor
- Disconnect gearbox coupling from machine
- Remove coupling from machine
- Lift and remove gearbox
- Remove split block housing cap
- Lift and support machine shaft
- Remove and replace bearing
- Replace housing cap
- Reposition gearbox
- Connect gearbox to machine
- Connect gearbox to motor
- Check alignment of motor to gearbox
- Remove machine blocking
- Remove safety lockout/tagout

Split bearing:

- Safety lockout/tagout
- Block machine (pulley) from rotation
- Remove split block housing cap
- Lift and support machine shaft
- Remove and replace bearing
- Replace housing cap
- Remove machine blocking
- Remove safety lockout/tagout



SKF Enlight ProCollect: accessible, flexible advanced condition monitoring

SKF Enlight ProCollect is a new portable vibration monitoring solution, designed to help companies adopt smart condition-based maintenance approaches, or for those seeking to extend their machine monitoring programs to a wider range of assets.

The solution incorporates an updated version of SKF's rugged QuickCollect hand-held sensor, together with SKF ProCollect - a totally new mobile app. Running on a standard iOS or Android device, ProCollect has been designed to simplify the collection, interpretation and communication of both operational and machine condition data. Furthermore, the new software links seamlessly to SKF Enlight Centre - SKF's advanced, web-based monitoring platform.

Enlight ProCollect is easy for non-specialists to use, allowing frontline operators and maintenance personnel to incorporate vibration monitoring tasks into their everyday activities. For example, pre-programmed inspection routes can be downloaded from Enlight Centre to a ProCollect device, which will then guide the operator through the steps necessary to collect data. That data is then transferred automatically to the Enlight Centre platform, where it can be analysed and visualised.

Despite its simplicity, Enlight ProCollect doesn't compromise on the power of what it can do. Pre-programmed alarms can be used to help operators and maintenance staff to diagnose and fix common problems on the shop floor. The visualisation capabilities of the Enlight Centre platform, meanwhile, allow companies to generate dashboards that provide an overview of plant performance.

That helps them to make better-informed maintenance decisions that deliver on their business objectives. Maintenance teams can use the platform's suite of advanced tools to spot trends, diagnose problems and conduct root-cause analyses. Users also have the option of a connection to SKF Remote Diagnostic Services, giving them access to the company's global network of reliability experts.

Ownership of Enlight ProCollect is as flexible as its use. Customers can opt to buy the solution outright or choose a subscription approach that provides all the hardware, software and support services they need for a fixed monthly fee.

"Our subscription model allows companies to shift the cost of maintenance programme improvements from CAPEX to OPEX," says Barrie Rodgers Product Line Manager - Mobile Solutions at SKF. "They can easily extend their agreement to include other equipment and services – such as bearings or lubrication." Customers can even shift to performance-based pricing models that reduce the costs and risks associated with the transition to advanced condition-based and predictive reliability approaches.

Hot-mounting made simple with new portable induction heater

The TWIM 15 induction heater has been designed to simplify the hot-mounting process. Product Development Manager at SKF, Alberto Herrera, says: "All the operator has to do is to place the bearing in the centre of the heater and connect a temperature probe to the top of inner ring or workpiece bore. With the push of a button, the TWIM 15 will heat the bearing to the target temperature for hot-mounting."

Induction heaters introduce heat into a component using alternating magnetic fields. These fields create currents in the bearing or workpiece, which heats up owing to its natural resistance to electric currents (the so-called Joule effect). The resulting increase in temperature causes the material to expand, allowing the bearing to be mounted without any friction or force. As soon as the bearing is correctly positioned and the temperature decreases, it contracts to its original form and creates the right interference fit on the shaft.

This process reduces risks of damage to the bearing, shaft and operator compared with other methods for heating bearings such as oil baths or open flame. However, some induction heaters can cause overheating, which can damage the bearing.

The TWIM 15 is fitted with a temperature probe, smart electronics and an advanced operating software, enabling the heater to optimise the heating process accordingly, ensuring that the bearing is heated safely and reliably.

The TWIM 15 is more versatile and convenient to use than other bearing heaters. It features a flat induction plate

that does not require the use of a support yoke and it can heat a wide variety of bearings and components, including sensitive parts such as bearings with reduced clearance.

Manufactured from rugged glass fibre-reinforced plastic, the TWIM 15 is lightweight and transportable, allowing it to be used in the field, and its user-friendly control panel enables it to be operated without any special training.

Easy bearing conversions with SKF Cooper SNQ pedestal

The SKF Cooper SNQ pedestal is a range of plummer blocks suitable for split roller bearings. The pedestal is angled which simplifies the fitting of bearing units, as the angled joint allows the pedestal to be slid under the shaft without the need for tools or the requirement of a hoist to lift the shaft, subsequently reducing expensive downtime. Pedestals, also called pillow or plummer blocks, are the most common mountings for bearings.

Launched by SKF Cooper and available for many years as a 'bespoke' solution, the angled pedestal is now available across the standard range of SN and SD equivalent pedestal housings.

Detailed design and the number of fixing bolts vary with the bearing series and size. This includes two bolt, four bolt, and large-bore options. Besides the SNQ range, SKF Cooper offers pedestal ranges that allow direct replacement of SN, SD and SAF pillow block units.

The design builds on the SKF Cooper concept of quick, easy and safe assembly, and eliminates any impediment to conversion. The combination of same base to centre heights, distance between bolt holes, and angled pedestal means changing from a problematic non-split spherical roller bearing and plummer block assembly is simplicity itself.

Besides pedestals and housings, SKF Cooper's full range of split roller bearings includes standard bearings such as cylindrical roller bearings and tapered roller bearings, as well as special bearings and large bearings over 600 mm bore size. Typical applications include marine propulsion, conveyors, fans and blowers, cooling beds, continuous casters, stacker reclaimers, and many other applications, especially where bearings are in trapped positions and access is limited.

www.cooperbearings.com

Visual inspection made easy with new stroboscopes

All rotating equipment needs to be inspected periodically to ensure that it is working correctly. Sylvain Humbert, Product Development Manager at SKF says: "If visual inspection is not carried out, machine damage can be overlooked and unexpected breakdowns can occur. With visual inspection, problems can be detected and preventive measures can be planned and taken."

However, machinery often must be shut down to allow visual inspection to take place, interrupting vital operations and causing costly downtime.

SKF's TKRS stroboscopes enable visual inspections to be carried out on equipment while it is rotating. The hand-held devices emit flashes of light timed to coincide with the speed of the running machine, creating an optical effect whereby the moving parts appear to be permanently frozen in place. This allows visual inspection to take place.

Matching the timing of the strobe effect with the machinery to be inspected can be tricky using some stroboscopes. By contrast, all TKRS stroboscopes are quick and easy to set-up and use. Users of TKRS stroboscopes can change the frequency with which the stroboscope flashes to match with the speed of the rotating machine simply by turning a rotary control wheel with their thumb.

Advanced TKRS stroboscopes, meanwhile, use lasers to detect the speed of the machinery and feature a built-in trigger input that can receive signals from machines that express their rotation speed. These features enable their flash frequencies to be synchronised automatically.

Through the use energy-efficient light-emitting diodes (LEDs), the TKRS range of stroboscopes are some of the brightest hand-held options on the market, which enables the user to view the rotating equipment with a high degree of clarity. Importantly, this brightness is achieved without having to increase the duration of the flashes, which can generate blurriness in the frozen image

The compact and ergonomic design of the stroboscopes ensures that they can be carried conveniently in a pocket or toolbox. Furthermore, they feature large user interfaces that are simple to use yet provide access to a wide range of features and settings.

The TKRS range comprises four stroboscopes with differing levels of functionality. These are:

- TKRS 11, a compact and affordable LED stroboscope
- TKRS 21, a compact yet high-power LED stroboscope
- TRKS 31, a compact advanced LED/ laser stroboscope
- TKRS 41, a high-performance LED stroboscope

Jens Kammann, Marketing Manager says: "The TKRS range has been designed so that we can offer our customers an efficient and easy-to-use stroboscope, no matter their budget."

The TKRS range is suitable for general maintenance tasks, including inspection of couplings, fan blades, gears, belts, chains and more. However, the stroboscopes also may be used for advanced production quality control and visual vibration analysis.

Lever-action pump exceeds DEF transfer specifications

This addition to SKF's line of DEF-compatible products is suitable for multiple applications including automotive, trucking, agriculture and construction."

SKF now offers the Lincoln model 1392 lever-action transfer pump for diesel exhaust fluid (DEF). This pump is designed to simplify the transfer of bulk fluids to smaller DEF containers or directly into vehicle reservoirs.

"The model 1392 transfer pump was developed to help our customers meet strict diesel emission regulations," said Keith Rohan, Product Portfolio Manager. "Its seals, hose and nozzle surpass DEF transfer requirements, providing user confidence."

Featuring the industry-preferred polypropylene construction and PTFE seals, this durable pump is made to last. Its telescoping pickup tube adjusts to fit a wide range of tank depths, increasing versatility. Also, the pump's unique locking ring lets the user place the nozzle in the optimum position to reduce pump load.

Its threaded 2-inch bung mounts securely to bulk DEF tanks, providing stable pumping action while also helping prevent contamination that can damage the catalytic properties of DEF. A nozzle hanger keeps the hose within reach and off of the floor.

The pump package includes a premium non-kink, six-foot hose with 3/4-inch outlet nozzle that fits all standard DEF reservoirs. It also has a 45-degree nozzle for dispensing fluid at the pump head.

Silent Series ball bearings for machine tool spindles

SKF has unveiled its Silent Series super-precision angular contact ball bearings (ACBBs) for the production of grease-lubricated spindles."

The Silent Series super-precision angular contact ball bearings have been developed in direct response to key issues faced by manufacturers of machine tool spindles. They identified that minimising noise and vibration levels during operation was key to improving confidence in the performance of their spindles.

Bearing cages in lower-speed spindles can make rattling noises during rotation. This is normal, but can be mistaken for a sign that something is wrong with the spindle or its components. Rudolf Groissmayr, Product Line Manager at SKF says: "The SKF Silent Series feature a new and innovative polyamide cage centred on the balls that minimises this 'cage rattling' during rotation. Their silent operation increases the confidence of the end-user in the quality of spindles."

SKF Silent Series bearings are fast and cost-efficient to mount. Furthermore, the bearings have an optimised tolerance range on the bore and outside diameter, resulting in improved load sharing across the bearings when mounted in sets. This not only improves spindle efficiency, but means less time is spent during the validation and testing processes to select the appropriate bearings.

With the SKF SuPB Data Manager App from SKF, the most important specifications of the bearings are close at hand on smartphones and tablets. The Data Matrix code on packages and bearings can be simply scanned to receive information on the exact marking of the bearing, and when and where the bearing was manufactured.

SKF Silent Series bearings are available in two designs: high-capacity D design 719 and 70 series, which exhibits a high degree of system rigidity and stiffness, and a high power density for a compact design; and high-speed E design 70 series, which demonstrates excellent thermal stability across a wide range of operating speeds.

Rudolf Groissmayr concludes: "Our experts are here to help our customers make better product choices based on the value they want to create for their businesses. We also provide bearing calculation tools such as SimPro spindle, which makes it easier for our customers to design and choose the right bearings for their spindles."

CUSTOMER CASE STUDY

Capital uses SKF technology to control maintenance costs and avoid breakdowns

A condition-based monitoring program, devised for the marine industry by SKF, enables ship operators to control costs and avoid damaging equipment breakdown.

One leading operator, Capital Ship Management Corp. (Capital), has been investigating condition monitoring strategies since 2006, in order to reduce maintenance costs, and minimise unexpected machinery and equipment breakdown. Together with SKF, Capital came up with an effective strategy by utilising a new handheld device, launched recently by SKF; the SKF QuickCollect. The company has implemented the solution across a fleet of 30 vessels, with a plan to extend the program to the whole fleet of 56 vessels. SKF helped the company to determine which onboard machines should be regularly monitored.

SKF's equipment supports ship operators such as Capital to improve the reliability of operations. Onboard engineers use the handheld device to collect vibration data from critical machinery including cargo pumps, engine room fans, compressors, purifiers and electric motors.

George Ioannidis, Technical Fleet Director at Capital. said: "The SKF QuickCollect portable vibration measuring instrument helps us to have quick and reliable results for immediate action, and reduces the cost of repairs dramatically. Furthermore, the onboard engineers now using this vibration device can collect vibration data from all critical and non-critical machinery, and present detailed vibration reports to class surveyors during a periodical machinery survey (CMS)."

The device is small, portable and offers a fast, convenient way of monitoring the condition of critical machinery. The quick and accurate vibration data analysis and its ease of use, makes it a powerful diagnostic tool, not only for all Chief Engineers but also for office technical superintendents.

It provides vibration data in real time, allowing engineers to carry out maintenance and replace components immediately if required. It collects velocity, acceleration enveloping and temperature data, and connects with mobile apps such as QuickCollect and ProCollect, accessed via a tablet or smartphone. Its easy-to-understand interface means that even a non-trained user can understand its principle of operation and validate results of the vibration data measurements. The system can be customised for different marine customers, depending on their specific needs.

Vibration data can be viewed in real-time through the app or downloaded and reviewed using Analysis and Reporting Manager (ARM) software on any accessible PC. Data can also be uploaded to the Cloud, allowing SKF's onshore vibration analysts to make a more detailed assessment and prepare a report if needed.

The latest brochures and catalogues from SKF

To download your own personal copies simply visit: www.skf.co.uk/focusreply and select as appropriate.
Alternatively for printed copies complete the reader reply service on the inside back cover and return to SKF.

Rolling bearings

Ref no: BU/P1 17000 EN

This 1152-page catalogue is seen as the essential reference guide for rolling element bearings. It covers their appropriate selection, configurations and applications, and provides detailed guidance on correct installation procedures. The Engineering Section now includes a step-by-step bearing selection guide.

Super-precision bearings

Ref no: BU/P1 13383 EN

This 424-page catalogue contains the standard assortment of SKF super-precision bearings typically used in machine tool applications. Divided into 9 chapters including design and application recommendations, bearing types, lock nuts, gauges and a full index.

Spherical plain bearings and rod ends

Ref no: BU/P1 06116/1 EN

This 220-page catalogue profiles the range of bearings suitable for oscillating movements that can accomodate misalignment. Includes design and application recommendations, types, product tables and also selection charts.

Food Line ball bearing units

Ref no: 65/P2 18157 EN

This 124-page catalogue presents a complete range of relubrication-free solutions. Blue Range units are compliant with food safety regulations; and stainless steel ball bearings and housings are cast from AISI 300 series stainless steel. Mounting instructions, product data and an equivalents list are all included.

Y-bearings and Y-bearing units

Ref no: BU/P1 13728 EN

A 266-page catalogue detailing the range of conventional SKF ball bearing units. These units can accommodate moderate initial misalignment, but normally do not permit axial displacement. They are supplied as ready-to-mount and ready-to-use units.

Training courses 2020

Ref no: SR/T9 14778 EN

This 46-page catalogue profiles e-learning. classroom training, hands-on workshops, onsite mentoring, instrument and software-specific training, as well as a complete training needs analysis.

Hydraulic seals

Ref no: SE/P1 12393 EN

This 356-page catalogue contains the standard assortment of SKF hydraulic seals and guides typically used in hydraulic cylinders. This includes piston, rod and buffer, and wiper seals, guide rings and strips, O-rings and back-up rings.

Industrial shaft seals

Ref no: SE/P1 10919/I EN

This 484-page catalogue includes a selection of our complete assortment of shaft seals and accessories. Product lines include radial shaft seals axial shaft seals and wear sleeves and incorporates material, design and application guidelines.

Bearing housings

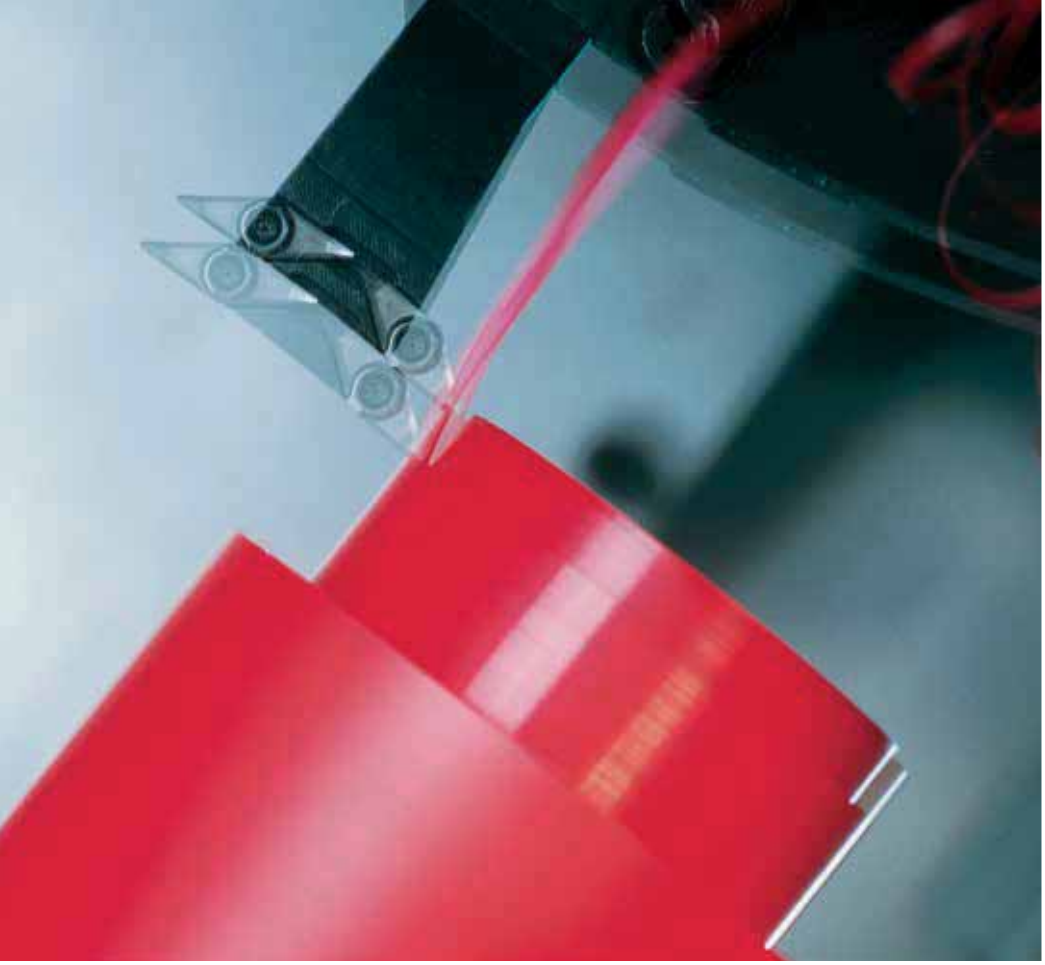
Ref no: BU/P1 13186 EN

This 782-page catalogue features 18 chapters, beginning with an overview looking at selection and application, plus detailed advice on issues such as lubrication and mounting. With a comprehensive index engineers can find information quickly and easily.

Maintenance and lubrication products

Ref no: MP/P1 03000 EN

This 192-page catalogue profiles the range of bearing mounting and dismounting, instruments and lubrication products available from SKF. Also included is the SKF Bearing Life Cycle - helping your bearing achieve its maximum service life.



Unique sealing on demand

SKF machined seals: Custom-engineered for you

SKF is the global leader in high quality, custom-engineered sealing solutions, offering a comprehensive range of machined seals.

SKF's innovative SKF SEAL JET production system reduces manufacturing and dispatch time to a minimum. Almost all kinds of seal can be produced, for any conceivable application, in any dimension and design.

SKF can manufacture on demand in many class leading materials such as:

- NBR rubbers: HNBR, low and high temperature, EPDM, Silicone and ECOFLAS
- Polyurethane: Standard, high and low temperature, low friction and hard grades
- PTFE: Many grades available
- Plastics: PEEK, Polyacetal UHMWPE

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  01224 723321
  seals.aberdeen@skf.com
- **Bristol**
  0117 982 5729
  seals.bristol@skf.com
- **Leeds**
  0113 231 0303
  seals.leeds@skf.com
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  01753 696136
  seals.uk@skf.com
- **Thetford**
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  seals.thetford@skf.com
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