

FOCUS

SKF

Products, services and solutions from SKF Industrial Market

► Issue 105 | Spring 2016

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SKF bearings raise standards in building design

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APPLICATION FOCUS

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bearings

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Worn shaft sealing problems?

£15 of prevention is worth £600 of cure with SKF Speedi-Sleeve*

If a shaft becomes worn or damaged, the seal will no longer be effective and it becomes necessary to dismantle the machine to allow reworking of the shaft to bring it back up to specification. This is costly, both in time and money, but by fitting an SKF Speedi-Sleeve to a new or freshly reground shaft this damage can be prevented from happening in the first place.

The proprietary stainless steel material provides an optimised sealing counterface that is better than many shafts, and when the sleeve eventually wears out, it is much faster and simpler to replace this than to replace or remachine the entire shaft.

*Approximate average price of SKF Speedi-Sleeve and shaft regrounding

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In this issue



Michael Crean
Sales Director
SKF Industrial Market,
South West Europe

Dear Business Partner,

Welcome to this edition of FOCUS, SKF's magazine for the industrial market in the UK & Ireland.

For the UK, 2016 has started less well than we might have liked - with steel, oil & gas and other manufacturing industries struggling; plus the widening trade deficit. In this tough environment, attention to costs and improving efficiencies are more important than ever. Whether in terms of energy usage, product quality/output, maintenance costs, time to market or raw material efficiency - and as always SKF stands ready to help.

It is easy to think of bearings solely as industrial components, but in this issue we will be looking at how they can also be used in some prominent (and very large) civil engineering projects, and how the right bearings can make a significant difference in the operation of elevators in high-rise buildings.

We will also be discussing how SKF bearings and lubrication systems are used in fans and turbines to keep them working efficiently, in often extremely demanding conditions. Then we will examine the many ways in which your machinery can be helped to run more smoothly through good maintenance and condition monitoring practices.

Lastly, you will see the problems Aggregate Industries were having with their rock crushers, and how SKF helped them significantly reduce their downtime with custom-engineered housings and seals.

As always, I trust you enjoy this issue of FOCUS!



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NEWS

- ▶ Antifriction aims for record growth
- ▶ Bearing training receives excellent feedback
- ▶ French customs destroy large shipment of counterfeits

Antifriction aims for record growth as it celebrates 40 years in business

Antifriction, an SKF Authorized Distributor, is continuing its expansion as it celebrates 40 years in business. The company, which was founded in 1976 with a single outlet, is planning to grow revenues from £14m to over £20m, and strengthen its national coverage by adding new depots.

Andrew Fleming, Antifriction's Operations Director, comments, "New strategically located depots are a crucial part of our plan for growth. A new base in the South East will be our first of 2016. It will further strengthen Antifriction's national reach and supports our aim of reducing delivery times and increasing our competitive offering."

Antifriction, which recently opened a new depot in Ellesmere Port, now employs 100 staff at 11 sites across the country.

Fleming continues, "Turnover has increased healthily over the last few years, even in the challenging days following the recession. So, I believe we are very well placed to meet our goal of beating the £20m turnover mark as the economy gains strength."

The growth of Antifriction was boosted when it became part of leading Italian-based industrial distributor Gruppo Bianchi in 2011.

Since then Antifriction has spent over £300k upgrading its Bristol-based headquarters, enabling it to stock an additional £1m worth of components. The Birmingham branch has also undergone a £200k upgrade.

www.antifriction.co.uk



New online heater selection tool



However, for annular components, a suitable heater can be found by defining the application and by specifying the dimensions and weight of the work piece. The new heater selection tool chooses from SKF's comprehensive product range, including an electric hot plate, induction heaters and fixed induction heaters.

Hot mounting and dismounting reduces the risk of damage to the bearing, shaft or work piece and helps to increase bearing service life and machine reliability. www.mapro.skf.com/heatersselect

Bearing training receives excellent feedback



On behalf of Brammer, an SKF Authorized Distributor, Mark Townsend, SKF Mechanical Services and Service Engineering Manager, recently delivered a three-day bearing maintenance and service training course to one of their industrial customers.

The course taught attendees how to improve the service life of rolling bearings, which subsequently improves the reliability of rotating equipment.

Over the three days a combination of hands-on training, audiovisuals, lectures and discussion opportunities were delivered across a range of topics, including bearing basics, mounting and dismounting, fundamentals of lubrication, and bearing failure causes and analysis.

The course was so well received that the customer has already booked some additional training courses for later in the year. www.skf.co.uk/training

Aylesford Royals

We have received special thanks from the Aylesford Royals for our continued support of their under 13 football team.

The team has experienced a very successful season and were crowned Champions of Division 1 of the Maidstone Express Cabs Primary league under 13 section.



French customs destroy large shipment of counterfeits



Working with customs and police is one of the ways SKF combats the illegal trade in counterfeit bearings. Customs will not be able to stop all counterfeit trade, but every seizure puts a dent in the counterfeit industry. Recently, Group Brand Protection supported French Customs in seizing two full cargo containers of counterfeit SKF bearings and housings, which were subsequently destroyed.

French Customs had stopped a suspected shipment and sample photos were sent to SKF Group Brand Protection for immediate verification. The fact that the shipment contained nearly 60 different product designations, including large size bearings, housings and Y-bearings, meant that verification could take longer than normal. Responding in a timely fashion is critical for the cooperation and trust of the authorities, and SKF gave French Customs an initial declaration within 24 hours that the sample pictures showed counterfeit goods.

In recent times SKF has seen an increase in small counterfeit shipments sent by airfreight. Often they are below 100 kg in total weight, but even a small shipment is important to follow up! If the importing company is a final customer or end-user, they are often not aware that the goods are counterfeit. SKF Group Brand Protection has the important task of informing them of the risks and guiding them to trusted sources of genuine products. As has been seen in the past, counterfeits can be traded multiple times before reaching the market, and SKF is actively working with authorities to tackle the spread of counterfeit goods.

The best way to ensure authenticity is to buy from a distributor displaying the SKF Authorized Distributor identification mark.



U.S. Steel implements integrated solution

SKF will supply United States Steel with an integrated bearings, seals and lubrication solution on over 800 of their hot strip mill table rolls in Granite City, Illinois. The solution will help increase machine availability whilst at the same time reducing energy and grease consumption.

Operating under extreme conditions, components used in hot strip mill table rolls are constantly subjected to high temperatures and contamination, which can result in corrosion and, ultimately, bearing failure.

SKF seals combine a low wear rate with effective sealing, significantly reducing lubrication requirements, as well as allowing for the installation of an open SKF spherical roller bearing. Open spherical roller bearings operate with less friction than the previously used sealed bearings, contributing to improved energy efficiency.

www.ussteel.com

World's first subsea gas compression system uses SKF

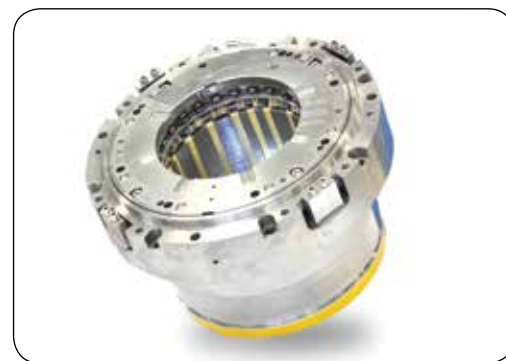


SKF has supplied magnetic bearings for use in the world's first subsea gas compression system at Statoil's Åsgard gas field off the Norwegian coast. The bearings will contribute to recovering additional gas from depleted gas fields as well as extending the lifetime of those gas fields which would otherwise be prematurely closed.

Traditionally, gas compression is carried out on platforms. For Åsgard, Statoil and its partners made the decision to locate it on the seabed, near the wellheads, to maximise gas recovery and significantly extend the gas field's production lifetime.

SKF's magnetic bearing technology was a key enabler in achieving this autonomous deep water subsea gas compression system. The bearings simplify the system architecture by removing the need for components such as lubricating oil, seals and gearbox. The magnetic bearings are integrated into the compressor casing, preventing gas leakage and allowing a smaller environmental footprint. Furthermore, the magnetic bearings are frictionless, enabling higher rotational speeds, leading to smaller compressor modules and ultimately lighter processing plant infrastructure.

www.statoil.com



Agreement signed with UTC

SKF has signed a long-term agreement with United Technologies Corporation (UTC) for the supply of a range of bearings and components to UTC's aerospace business.

As part of the agreement, SKF will supply UTC's aerospace divisions with precision roller and ball bearings, including main shaft bearings, as well as seals and precision elastomeric components used in helicopter applications.

Additionally, the agreement encompasses the delivery of engine bearings to Pratt & Whitney, a UTC division, to be used in their Next Generation Product Family geared turbofan engines.

Rutger Barndahl, President, Aerospace, says, "SKF and UTC have a long relationship, dating back to the 1950's. Through this contract, we ensure that SKF's technology and bearings continue to play a

part in the development of aircraft that are more fuel efficient, with lower engine noise and deliver improved environmental performance."

Sam Abdelmalek, Vice President, Supply Chain at UTC, says, "We are excited to continue our relationship with SKF, creating a strong foundation from which to further solidify and grow our relationship. This One UTC Company agreement with SKF is good progress in meeting our contractual governance model and ensuring an efficient procurement process."

www.utc.com



FAQs

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E: technical.helpdesk.uk@skf.com

Q: What type of grease is used in a standard 6000 series deep groove ball bearing with standard 2RS seals?

A: Bearings with O/D < 62mm = lithium soap grease with NGLI 2 consistency (MT 47) and a temperature range of -30 to +110 °C. Bearings with O/D > 62mm = lithium based grease with NGLI 3 consistency (MT 33) and a temperature range of -30 to +120 °C.

Q: Which adaptor is used to connect the SKF SYSTEM 24 single point automatic lubricator to an SE/SNL plumber block bearing housing?

A: Adaptor designation LAPN 1/8.

Q: How much grease do I use for the relubrication of a bearing?

A: $G_p = 0.005 \times D \times B$. Where D = O/D of bearing and B = width of bearing.



► FOCUS 104 COMPETITION WINNERS

► **1st PRIZE** Panasonic blu-ray player and movie goes to: Philip Lomas - ERIKS International

► **2nd PRIZE WINNERS** each receive an SKF leather conference folder: Eddie Farnworth - Harrison Lubrication Engineering Ltd, Kevin Frear - Tata Steel, Gavin McClements - ERIKS UK Ltd, Chris Massen - ERIKS UK Ltd, Amanda Thompson - Sulzer Dowding & Mills,

► **3rd PRIZE WINNERS** each receive an SKF computer mouse: Peter McMullan - Bombardier, Shane McClymont - Sealmasters Ltd, Robert Jarvis - Executive Decision GRC, Danny Hamlett - Godiva Bearings, Ian Johnstone - Acorn Industrial Services Ltd, Marianne Gordon - ERIKS, Lee Allen - Harrison Lubrication Engineering Ltd, Lisa Thompson - Brammer UK Ltd, Lisa Meakin - BRT Bearings, Gavin Bailey - BSC Engineering Services.

2016 exhibitions and conferences

If you are looking for dedicated engineering solutions that add real value to your business, then come and talk to our specialists at one of the following events:

Drives and Controls exhibition

Tuesday 12 to Thursday 14 April

SKF will be supporting Acorn Industrial Services, an SKF Authorized Distributor, on Stand EP10, Hall 3, NEC Birmingham

The UK's leading event for drives, automation, power transmission and motion control, it showcases the latest solutions from over 300 world class companies.

www.drives-expo.com

www.acorn-ind.co.uk

All-Energy exhibition and conference

Wednesday 4 to Thursday 5 May

SKF will be supporting HES LubeMec, an SKF Lubrication Systems Distributor, on Stand H38, SECC Glasgow

The UK's largest renewables event, devoted to all forms of clean and renewable energy.

www.all-energy.co.uk

www.grouphe.com/lubemec

Hillhead exhibition

Tuesday 28 to Thursday 30 June

SKF and Cooper Roller Bearings on Stand F2

SKF will be supporting Halomec, an SKF

Lubrication Systems Distributor on Stand M7

Hillhead Quarry, Buxton, Derbyshire

An international show for the quarrying, heavy construction and recycling sectors, showcasing static displays and physical demonstrations from 460 exhibitors, attracting some 17,000 visitors.

www.hillhead.com

www.halomec.com

Farnborough International Airshow

Monday 11 to Friday 15 July

Hall 1, Farnborough, Hampshire

The largest truly global event of its kind aimed at the aerospace, defence, space and security sectors.

www.farnborough.com

ONS exhibition and conference

Monday 29 August to Thursday 1 September

Stavanger, Norway

A broad-based international energy event and a unique meeting place for everyone involved in the entire energy sector.

www.ons.no/2016

Oil pump provides performance and dependability

The revolutionary Lincoln P653S Electric Centro-Matic oil pump from SKF is the company's first pump that includes a reservoir, pressure switch or transducer, vent valve, low level detector and controller in one compact unit. Developed for a broad range of applications, the unit's all-in-one construction reduces system design and installation costs.

Using Centro-Matic injectors, the integrated pump supplies lubricant to a single-line parallel lubrication system and pumps low- and high-viscosity greases, including NLGI grade 2 grease. Fully programmable, the P653S pump automatically dispenses, vents and resets with every lube event. The unit operates in temperatures ranging from -40 to 70 degree C for

DC models and 0 to 50 degree C for AC models.

The P653S pump interfaces with telematics technology in today's off-road and construction equipment. Its neutral switch allows mobile equipment to remain idling with pump power on and the timer deactivated, while maintaining a manual lubrication capability.



Lincoln lubricator excels in long distance and challenging applications



The Lincoln electrically driven lubricator EDL1, utilising progressive metering devices, has been developed for usage in sectional lubrication systems, as well as in large machines with different lubrication requirements at varying distances.

This easy to use dosage and pressure-booster pump is designed to increase input pressure of at least 2 bar (29 psi) up to a maximum of 280 bar (4,061 psi). As an affordable lubrication solution, the EDL1 can be used with existing tubing, fitting material and filling pumps.

The EDL1 operates effectively in challenging environments, including outdoor applications with fluctuating temperatures. Because lubricant is supplied by means of filling pumps or cartridges, the device provides flexibility and self-sufficient function, even in remote locations.

The EDL1 is suitable for food and beverage and railroad applications, as well as cement and other heavy industries. It also can be utilised in many industrial applications that require an affordable sectional lubrication system.

Spandau immersion pump with water-cooled motor

Developed to deliver water and emulsions, this multistage centrifugal immersion pump provides an optimal solution for electrical discharge machining (EDM).

Because EDM machines are temperature-sensitive applications, pumps with air-cooled motors are not suitable for installation inside the machines. However, a water-cooled motor allows for efficient collection and removal of excess heat. The Spandau PSC Immersion Pump with water-cooled motor can be installed vertically inside an EDM machine, saving space and helping to ensure that machining accuracy and quality are maintained.

Designed for versatility, the pump is available in immersion depths ranging from 376 to 812 mm. The Spandau PSC Immersion Pump is constructed of stainless steel for durability and corrosion resistance.



Versatile system controller

The SKF LMC 101 controller is suitable for applications with single-line or progressive lubrication systems. Developed for use on off-road and mobile equipment,

the unit is also suitable for many low-voltage industrial lubrication applications, such as those found in food and beverage, pulp and paper, and metals.

Designed to function as either a timer or controller, the versatile SKF LMC 101 can cycle a pneumatically, hydraulically or electrically driven pump at different timing intervals. The unit is configured easily using PC software and a USB connection and can control a high-current pump without an external relay.

The SKF LMC 101 has LED indicators that display power, pump function, low-level faults and system faults. Its data-logging feature includes date and time of alarms, power ups, configuration changes and lubrication cycles, as well as total lubrication count, manual lubrication count, pressure alarms, low levels and pump on-time information.



Keeping the fans happy

Fan systems are being pushed harder than ever, making failures increasingly common. Paul Dysiewicz, Engineering Manager at SKF, explains how choosing the right components and maintenance strategies can help overcome this.

Fans are an integral part of most manufacturing processes, whether they provide ventilation for operating personnel, deliver air or gases to processes, or extract hot or dangerous fumes.

Their simplicity and pervasive nature means fans often don't receive the same attention as other items of production equipment. However, the integral role they play means that as companies work their production assets harder, fans must work harder too – whether that's handling hotter gases, faster operation to deliver higher flow rates, extended duty cycles, or lengthier periods between maintenance interventions.

Increasingly, these tougher operating conditions are taking their toll, as fans are asked to do more than their conventional bearings and lubrication systems can handle. The result is an increase in failures, production downtime and maintenance costs.

SKF has responded to the challenge with a number of technologies and design approaches that can dramatically improve the reliability and longevity of critical fan components.

Better bearings

In many everyday fan applications, problems introduced when fans are installed sow the seeds of their eventual demise. Poor bearing alignment can cause excessive vibration in use, for example, while insufficient, excessive, contaminated or incompatible lubricant can accelerate bearing



failure. These issues can be avoided by installing relubrication-free bearing units, such as the patented SKF ConCentra ball and roller bearing units.

These bearing units are factory-filled in a clean environment with a long-lasting bearing grease, and protected by durable double seals. Perhaps the biggest benefit of these bearing units in both installation and use, however, is their locking technology, which is based on two mating surfaces with precision-engineered inclined serrations on its contact surfaces. This provides a true concentric fit that's tight, accurate and highly reliable, even under the most difficult operating conditions.

SKF ConCentra bearing units save around 3kg of grease per fan during its lifetime, while reducing electrical consumption by around 2,000kWh/year. This may be small for a single fan, but taken across an entire company that is a significant volume of both grease and electricity.

Total solution

An answer to axial displacement is the SKF total shaft solution – which dissipates heat generated by the bearings through a combination of self-aligning roller bearings, housings and seals. This allows bearings to run at lower temperature, and for longer.

Self-alignment is achieved by using a CARB toroidal roller bearing in the non-locating bearing position and an SKF Explorer spherical



roller bearing in the locating position.

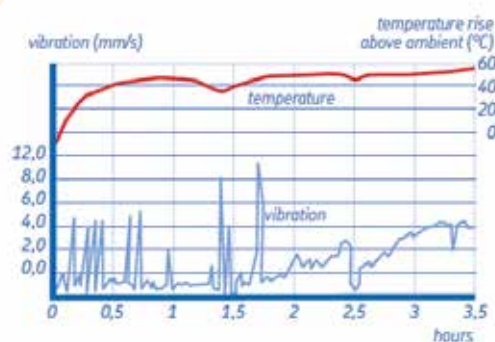
This arrangement eliminates the problem of induced axial loads created by thermal expansion of the shaft, as well as reducing friction, vibration, heat generation and power consumption by the bearing. Most importantly, the lower bearing temperatures enable higher speeds.

Containing this within an SNL or SE split plummer block housing reinforces the effect. They act as stiffer housings, maintaining roundness of the housing bore enabling lower bearing temperatures. A bearing housing variant with a K7 bore tolerance, helps to lower vibrations and avoid the risk of outer ring rotation.

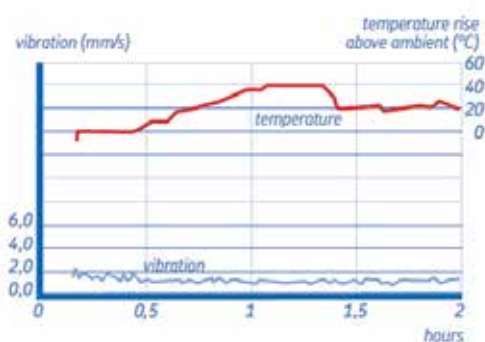


Typical seals work at fan speeds of up to 8m/s, but the specially designed L-seal can easily go up to 13m/s and handle misalignments of up to 1 degree. Labyrinth seals are available for higher speeds. The SKF total shaft solution can also expand the capability of systems that already use oil-based lubrication systems.

SKF applied these principles when helping a customer fix the ventilation system in one of its warehouses – saving more than £18,000. The maintenance manager had tried to solve the problem of noisy bearings by refilling the housings with fresh grease, but this was not successful. Instead, SKF determined that the bearing arrangement was wrong



Fan with a 22244 CC/C3W33 spherical roller bearing at both positions



The same fan with a C 2244/C3 toroidal roller bearing at the non-locating position

– and installed a CARB self-aligning bearing and SNL housings. Three years later, the system is still running smoothly.

Handling heat

The highest performing fan applications, like those used to handle hot gases, require special measures to control the operating temperature of components. In grease lubricated applications, for example, specialist bearing housings such as the SE range include reinforcement ribs to maintain the roundness of the housing bore under high loads and temperatures, while the base of the housing is designed with an increased surface area to better dissipate heat.

Where high operating temperatures preclude the use of grease, fans will require an oil lubrication regime instead. While oil lubrication is traditionally associated with higher costs and maintenance requirements, modern systems include features like automatic oil levellers to maintain and adjust lubricant levels during operation and simple, reliable oil cooler cartridges that can be connected to any water supply.

Energy management

Controlling bearing temperature ensures that fans run faster – but controlling energy consumption will boost profits. Energy is the largest running cost of any industrial system, so anything that can reduce this will benefit the bottom line.

“

The SKF Energy Monitoring Service can cut a huge 20% off the energy needs of a fan

”

The SKF Energy Monitoring Service can cut a huge 20% off the energy needs of a fan through careful monitoring of its vital statistics. This can be done as part of an ongoing condition monitoring programme.

By carrying out routine measurements and monitoring fan efficiency, plant staff, or SKF personnel, can determine when the time is right to repair a

worn or damaged fan. A database can be created in SKF @ptitude Inspector – which takes the results, analyses them and gives appropriate warnings on fan performance.

This information might include nameplate data, fan curves – especially energy efficiency curves – and carbon emissions. If fan performance is significantly below the fan curve's best efficiency point (BEP), the next step is to identify the underlying reason – a simple enough troubleshooting task, and another way of boosting fan performance.

Mastering maintenance

The final vital ingredient in any program to improve fan performance and reliability is a maintenance strategy.



The right maintenance approach depends on the technology and operating conditions of the fan, its criticality to operations and the implications of degraded performance or failure. In some cases, it may make sense to use a full reliability centred maintenance (RCM) approach, based on a full failure modes and effects (FMEA) analysis of the fan system to develop an appropriate condition monitoring, inspection and maintenance strategy. Where the fan is less critical, simpler, streamlined RCM or risk-based maintenance strategies may be more appropriate.

RCM and FMEA are key elements within the SKF Asset Efficiency Optimisation methodology, which combines in-depth knowledge and industrial experience to identify which work tasks are needed in order to improve maintenance and consider how best to execute these for maximum gain.



Automated lubrication systems reduce turbine maintenance costs

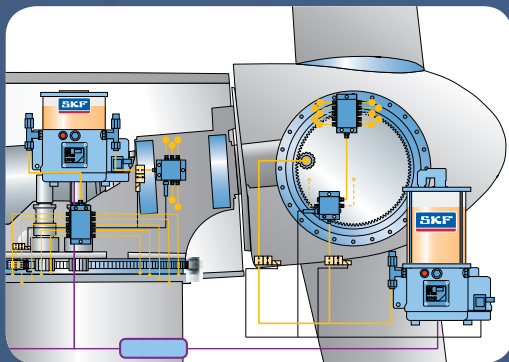
As with any mechanical device, a wind energy system needs timely, appropriate lubrication in order to function reliably and predictably. Wind turbines must routinely withstand extremely demanding conditions: vibration, high mechanical loads, contamination and moisture are all potential threats to operational efficiency, especially in critical rotating components such as bearings and gears.

Turbine servicing and maintenance can be expensive. For example, pitch bearings, yaw bearings and gears, generators and main bearings are all areas where the correct lubrication regime is not only critical, but as a manual activity, time consuming and driven by availability of the asset at the required time.

Traditionally, the maintenance of many older, early generation turbines has been driven by a predetermined programme of regular service procedures. Within these, manual lubrication is typically carried out at regular intervals, using set quantities of lubricants – regardless of the actual condition of the components in question.

This approach is clearly wasteful and potentially adds to overall operating costs, especially in the case of offshore wind turbines. As a result, following years of experience and driven by the ever increasing demand to reduce asset management costs, methods of lubrication have moved towards the use of far more effective and reliable automated systems.

A good example is the Lincoln single-line lubrication system, which is ideal for wind turbines and other applications that must withstand harsh conditions. It automatically dispenses precise amounts of lubricant to all lubrication points within the system while the turbine is in operation.



The key to the system is the 603S or 653S pump, which includes accessories such as programmable controller, pressure switch/transducer and vent valve, and is designed to be easy to program. Alongside it, a polyurethane pinion helps to lubricate the gear drives, applying a constantly renewed lubrication film to the tooth flank, which reduces wear and provides

corrosion protection. An SE1 suction element extracts used lubricant from the wind turbine single-line system and collects it in a container.

In similar fashion, the Lincoln Quicklub Lubrication System cuts the cost of maintaining wind turbines – which is good news for manufacturers, owners, operators and external contractors. Using Quicklub, lubricant is dispensed by a piston pump via progressive metering devices; giving the right quantity in the right place at the right time. The system is easy to monitor, providing feedback should a failure occur.

Automated lubrication systems are now being adopted as a standard fit by large turbine manufacturers and have been shown to provide significant improvements in operational reliability and efficiency. This relatively low cost addition can provide a quick return on investment by increasing the availability of each turbine, extending maintenance intervals and preventing unforeseen failures of major mechanical components. As a direct consequence, additional savings can also be achieved through proper lubricant handling and reduced consumption.

At this time, many early wind turbines are now being serviced and maintained by independent companies. This aftermarket is characterised by older, often smaller, turbines that are going through an upgrade to modern technologies and techniques to improve and lengthen the mean time between maintenance visits. The service providers, operator maintainers, OEM service organisations and turbine owners managing these assets are requesting solutions for improved lubricating regimes, and for removing exhausted and spent lubricant, as well as training in maintaining and managing these assets.

As well as needing to reduce the number of service visits, operators are demanding more feedback from these assets to maximise energy production and provide the data to ensure efficient management of operational costs.

This can be met by introducing remote condition monitoring and diagnostics, linked to the output data from the lubrication system. This provides key information on the status and functionality of the lubrication system, making it possible to prevent

bearing damage and unscheduled turbinedowntime, helping to optimise asset efficiency and manage service periods, component part replacement and manpower resources.



Retrofit and spare parts

- Available for: pitch, main bearing, generator, yaw bearing, yaw gear
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- Upgrades available to the latest specification

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- Includes safety precautions, systems/ components used and fault diagnosis
- Can be provided on your site or at our facility
- 1-day course duration

For further information contact:

Matt Preston | T: 01295 256611 | matt.preston@skf.com

SKF bearings raise standards in building design

The most modern elevators use the latest bearing technologies to make them more compact, energy efficient and quieter than ever before.

Increased urbanisation is leading to the construction of larger cities. Larger cities means taller buildings; and taller buildings can only be properly traversed with modern, reliable elevators. The trend towards low- and no-maintenance solutions – especially for something as critical as an elevator – means that the underlying systems must be robust and reliable.

With its broad expertise and product offering, SKF is helping the elevator industry build a new generation of assets while optimising the maintenance of existing systems. Some of the advantages it can provide include enhanced reliability, lower noise and vibration, reduced maintenance and a more comfortable ride.

Space constraints and the need for greater energy efficiency are pushing elevator designs into new areas. A good example is the growing prevalence of 'machine roomless' (MRL) designs – which incorporate the lifting mechanism into the hoistway itself, rather than in a machine room on the roof.

Going gearless

Gearless traction machines offer faster lift speeds, but there are challenges: the motors need robust bearings that can handle higher loads, while minimising friction, noise and wear. For MRL gearless traction systems that integrate the sheave and motor, most of the load will be carried on the sheave side – placing even higher stress levels on the bearings.

As there is no gearbox, there is no gear oil. This means that bearings supporting the rotating shaft must be regularly lubricated, which can be difficult and potentially dangerous for workers who must access the sheaves in inaccessible positions.

SKF Explorer sealed spherical roller bearings are widely used in this kind of application: following a three-month programme of endurance and function testing, a leading Asian elevator manufacturer switched its entire production to SKF Explorer sealed spherical roller bearings as a low-maintenance solution that would last for the life of the machine – at least 20 years.

Moving away from traditional ball bearings helps manufacturers to increase carrying capacity while maintaining – or even shrinking – bearing arrangements. SKF Explorer spherical roller bearings, with integrated seals, are virtually maintenance-free and can also cut noise and vibration.

A European elevator manufacturer used SKF Explorer spherical roller bearings with adapter

sleeves when it needed a quickly mountable bearing on its first high-rise gearless traction machine. SKF also trained the OEM's team on the fast bearing mounting process. These bearings can handle very high radial and axial loads, while correcting for both misalignment and shaft deflection.

Another manufacturer, looking to build a high-rise elevator that worked at 10m/s, chose these bearings because of their ability to allow axial displacement and angular misalignment.

SKF radial shaft seals HMS5 and HMSA10, for example, feature a rubber-covered outside diameter for optimised sealing ability. They can handle high surface roughness and thermal expansion, so are suitable for open bearing arrangements in gearless traction systems.

Similarly, SKF Explorer sealed deep groove ball bearings offer extended service life and low noise operation in elevator designs.

One leading European manufacturer – which was developing a range of gearless traction machines with maximum speeds of 2m/s for low- to mid-rise buildings – chose the bearings because they allowed a design upgrade while boosting carrying capacity and service life.

Design expertise

SKF's design expertise can help OEMs optimise new or existing elevator designs. Its knowledge across five key areas – bearings, seals, lubrication, mechatronics and specialised services – allows it to take a systems approach to design. At the same time, a range of proprietary modelling and simulation packages helps to optimise the design early in the prototyping stage. They range from easy-to-use tools up to sophisticated calculation packages that run on parallel computers.

SKF Bearing Beacon 3D modelling software, for example, helps OEMs find the best bearing arrangement for a gearless traction system, while a Beast simulation software virtual test rig performs

detailed studies of the conditions inside a bearing under almost any load conditions.

Getting in gear

Although geared traction machines are of older design, they are still widely used as the basis for elevators. They are typically slower than gearless machines – with speeds up to about 2.5m/s – and require less powerful motors. They are typically used for heavy duty, low speed or mid-rise applications.

They rely on a high speed electric motor to drive a worm gear, which then turns the hoisting sheave to move the elevator car. A worm gear operates with two shafts: the primary (input) shaft and the secondary (output) shaft. Primary shafts endure largely axial loads, while secondary shafts withstand mainly radial loads. Both must operate with minimal noise, vibration and wear. However, in worn gears without seals, metallic particles in the lubricant can affect all these requirements – limiting bearing service life and machine reliability. SKF bearing and sealing solutions can help overcome some of these challenges – from new installation to system upgrades.

An SKF hub bearing unit integrates into a geared traction machine's primary shaft. Comprising a double row of angular contact ball bearings equipped with cassette seals and special grease, it can accommodate heavy axial loads caused by gear meshing and carry radial loads by supporting the shaft.

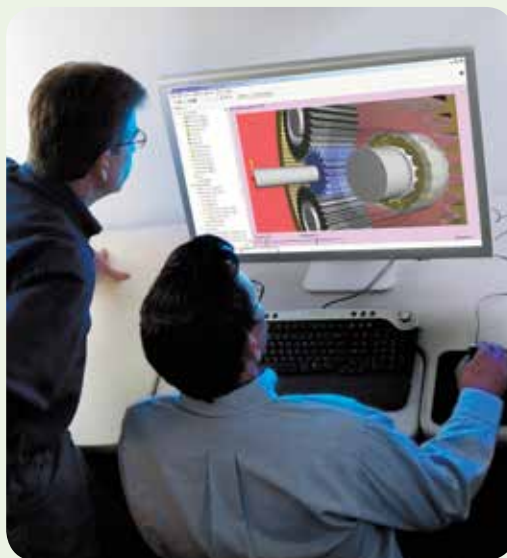
It is preloaded to provide the necessary axial stiffness and help maximise bearing service life. Its integrated seal prevents contamination, while a special 'silent running' grease helps to minimise noise.

One major manufacturer used the hub bearing unit to eliminate ingress on the primary shaft bearing of its worm gear traction machine. It protected the bearing against fine metallic particles in the gear mesh lubricant, which had been entering the bearing.

Other bearings are also commonly used in these applications. SKF angular contact ball bearings, which are designed to handle axial and radial loads, feature preset operational clearance for extended service life. One European manufacturer used them on the primary shaft of its geared traction machine, as it was robust enough to handle high axial and radial loads with limited vibration and noise.

Pulleys and sheaves

Elevator pulleys and sheaves are the rolling pivot point between the elevator car and its counterweight. Linked by traction rope, the two rise and fall as the motor turns the sheave one way or the other – moving the rope along with it.





The motor only need produce enough torque to get the sheave moving, then the counterweight does the rest. Depending on the elevator application and load, a different number of pulleys can be used to create roping ratios of 1:1, 1:2 or 1:4.

Whatever the numbers involved, SKF has a range of bearings to increase pulley and sheave lifecycles and reduce maintenance. For example, SKF deep groove ball bearings with Solid Oil can eliminate dangerous grease leaks – as well as banishing the need for relubrication.



Inside the bearing, the rolling elements and cage are encapsulated in a polymer matrix that is saturated with lubricating oil. Using the cage as a reinforcing element, the polymer

rotates with the cage. As it does so, oil is released, providing lubrication for the rolling elements and raceways during operation.

One Asian manufacturer used this system as a way of avoiding initial and periodic relubrication in its diverter wheel bearings. Mounting sealed, lubricated-for-life SKF deep groove ball bearings with Solid Oil allowed a lubrication-free assembly with reduced maintenance demands and extended service life.

Cutting maintenance

Modern elevator systems try to reduce maintenance, and this is partly delivered by condition monitoring systems – which flag up potential problems as they occur. Although this cannot banish maintenance, it is more effective than the traditional time-based maintenance approach, when work is carried out at pre-defined intervals. It also helps to reduce unplanned downtime.

Elevator maintenance has always been challenging, due mainly to inaccessibility, the need for manual

lubrication and various risks to worker safety. By incorporating condition-based monitoring technologies – and systems like automatic lubricators – some of the traditional problems can be overcome.

All manner of elements can be monitored in this way, including elevator motors and gearbox, counterweight position, and the motor, gearbox and step chain elongation of escalators.

One complete condition monitoring system – which also applies to escalators – is SKF MetroCon, which helps transit operators minimise the cost of system shutdowns. It is particularly appropriate for areas with heavy ‘people traffic’, such as stations: London Underground Limited (LUL) installed such a system to help it increase uptime, reliability and safety of its critical escalators and elevators.



It has already helped LUL to cut maintenance and inspection activities by 40%, while cutting power use by 15%. Other benefits included less unplanned downtime and higher equipment reliability.

SKF is helping the elevator and escalator industry to build the next generation of designs – contributing products, design insight and maintenance expertise to make more robust, compact and energy efficient equipment.

“SKF MetroCon has helped London Underground cut maintenance by 40% and power by 15%”



Shipping fleet equipped with SKF Marine Condition Monitoring Kit

SKF has initiated a condition-based maintenance program for Tsakos Columbia Shipmanagement (TCM) fleet that has the potential to prevent unexpected equipment failures and cut costs across its fleet of 70 ships.

The detailed maintenance program provides a range of benefits, from preventing unexpected failures in critical machinery to providing early indication of possible problems in auxiliary machinery. The customised monitoring and reporting instrument provides specific data as to which tasks need to be performed and when, enabling on-board engineers to perform maintenance activities and replace components at the right time.

TCM decided to take the next step in maintenance by adopting, adopting advanced condition-based maintenance practices. The target was to prevent unexpected failures in critical machinery, minimising their impact on associated components, and ensuring the reliability of fleet operations.

SKF engineers, together with the local SKF Authorized Distributor, visited TCM's facilities to discuss their specific needs and define which machines should be regularly monitored. "Ensuring equipment reliability is one of our key objectives and in this regard condition monitoring is a very useful tool. At the same time, we need to maintain a consistently high standard of condition monitoring expertise on every ship with a workforce that rotates between ships. Therefore, it's important to have a simple to use instrument to monitor the condition of critical auxiliary machinery", said Mr. Dimitris Psaradakis, Technical Manager of TCM SA.

SKF developed a customised version of the kit, adapted to the customer's needs. The SKF Marine Condition Monitoring Kit is a hand-held instrument,

equipped with predefined machinery models and clear work instructions, to make sure that TCM engineers have a reliable on the spot assessment of a machine's condition, for each vessel. The kit offers a quick and easy solution to monitor the condition of critical auxiliary machinery. In fact, even a non-trained user can understand the results of vibration data measurements and locate the source of the fault in the machinery.

With the kit, vessel engineers collect vibration data from critical auxiliary machinery, including cargo pumps, engine room fans and blowers, compressors, purifiers and electric motors as well as monitoring and evaluating vibration levels in accommodation area, as per MLC guidelines. The data is then downloaded and transmitted through the ship's communication system to TCM's headquarters, where a precisely detailed report is produced for each vessel on the current condition of the machinery.

The results are put into simple-to-use customised reports that help vessel engineers to prioritise their work schedule and thereby increase efficiency. The feedback can also generate a work order in the vessel's maintenance management system, ensuring that each Chief Engineer is aware of all current issues when scheduling maintenance. This service aims to maximise the availability of TCM's fleet by keeping their many vessels at sea and operating at maximum performance.

SKF provides advice and support during all stages of the project, from customising the instrument's features in line with the customer's needs and training the technical team, to integrating the solution with ship's maintenance management system (MMS). SKF engineers also offer after-sales support, providing expert 24-hour service to solve problems and help maximise fleet availability. In addition to

supporting modern maintenance strategies, this innovative solution also provides an easy way to check machine acceptance criteria after a machine repair in the workshop or onboard.

Taking the step toward condition-based maintenance does not have to be a large investment. "With the SKF Marine Condition Monitoring Kit we can identify and rectify problems at an early stage. In a short period we managed to improve our machinery availability and reliability, and reduce maintenance costs significantly. Overall, our investment cost proved to be very low compared to the benefits we gain from implementing this solution," concluded Mr. Psaradakis.

Tsakos Columbia Shipmanagement provides management, operation and crewing services for a diversified fleet of approximately 70 ships consisting of tanker, container and dry cargo ships with a capacity above 6.0 million deadweight tons.

www.tcsa.gr



Building the future

Civil engineering projects are built on a grand scale, and as such they require very special bearing solutions.

Think of bearings, and the first thing that springs to mind is probably fast-moving machinery such as spindles, fans, drives and other industrial applications.

Civil engineering certainly uses far fewer bearings, but some of the most sophisticated bearing systems are helping to keep a variety of civil engineering projects – from bridges to aircraft hangars – in working order.

Of course, the demands are much different. These bearings must usually withstand much higher loads, but are usually not required to move at enormous velocities. Nevertheless, moving the immense doors on an aircraft hangar or raising and lowering a drawbridge have challenges of their own.

Sliding doors

A case in point is the Cardington Airship Hangar, which SKF helped to refurbish for the Building Research Establishment (BRE).



BRE uses the building to house the largest enclosed laboratory in the world. Despite an earlier refurbishment programme, it began to experience difficulties sliding aside the southern hangar door, which is 55m high and 24m wide, and weighs 470 tonnes.

BRE needed an urgent solution to the problem, as the door is opened and closed almost every day.

The doors run on a twin track system using four, four-wheeled bogies mounted on each track. On examining the bogies on the inner track, SKF found that the existing bearings had degraded due to them skidding rather than rotating, which had created flats on some of the 760mm diameter wheels. One bearing was removed, and found to be a poorly constructed needle roller bearing design that had disintegrated. Most rollers were in a similarly poor condition while the side plates were almost entirely worn away.

While BRE could have simply tried to replace the bearing arrangement with a similar system, it was concerned about the degree of wear on the side plates and contacted SKF to see what benefits modern bearing arrangements could provide, and how the wear problem could be overcome.

SKF closely analysed the problems that BRE was having and proposed a new design, using heavy duty spherical roller bearings along with the adaption and reuse of existing bogie components where possible, to give the best all-round solution while remaining cost effective.

After on-site tests, SKF and BRE engineers determined that the inner bogies were carrying three-quarters of the door's weight, equivalent to a load of 33 tonnes on each wheel. Track measurements revealed that the side plate wear was caused by a difference of 20 mm in the height level of the inner and outer rail tracks.

To accommodate these massive loads, SKF's refurbishment included detailed redesign plus shaft, housing and wheel re-machining, and complete assembly of the wheel units. In all, SKF refurbished 16 wheels on four bogies on one door and fitted 32 new spherical roller bearings. To save cost, existing shafts and wheels were used where possible, and incorporated into the new design.

The enormous doors can now easily be opened and closed, with bearings that are likely to last for at least another 50 years.

Lifting boats

On a similarly massive scale, SKF bearings played a huge part in an enormous water wheel which transfers boats between two canals in Scotland.

The Falkirk Wheel, the only structure of its kind in the world, forms the centrepiece of the Millennium Link – a £78m project that reopens and reconnects the Forth and Clyde canal with the Union Canal between Glasgow and Edinburgh.

The two canals were originally linked by a series of locks, but these fell into disrepair and it was not feasible to restore them. Instead, a giant water wheel – shaped like a double-headed axe – rotates in a continuous circle, lifting and lowering two 22m long

caissons. Each can hold a payload of 300 tonnes – enough for four boats and the water for them to float on.



To support the wheel, SKF developed a new bearing solution that uses a pair of 4m diameter, three-row slewing bearings – one positioned at either end of the wheel, with outer rings bolted to the support structure and inner rings bolted to the arms.

This was an unusual solution, as slewing bearings are usually used in applications with heavy axial loads such as large cranes. SKF designed them to be positioned on a horizontal axis, and cope with the specified combination of radial and axial loads. When fully loaded, the wheel weighs 1,800 tonnes – producing a radial load of 9,095kN per bearing.

The wheel is turned by 10 hydraulically driven gearboxes via the geared slewing bearing. The low friction torque of the SKF anti-friction bearings means that a rated torque of only 2,972kN is needed to rotate the wheel.

The bearings are supplied with their own integral seals and have a life expectancy of 120 years. SKF also supplied additional seals of 4m and 2.5m diameters that are designed to withstand the heavy-duty conditions, while virtually guaranteeing the prevention of water ingress.

Bridging the gap

Advanced spherical roller bearings are also supporting a 40 tonne, 30m opening deck on the Pont Y Werin bridge in South Wales. The bearing units form part of



a powerful hydraulic system that can lift the bridge to a vertical position of 75 degrees in just two minutes, while withstanding wind speeds of up to 25m/sec.

Arash Farahani of engineering consultancy KGAL said: "We developed a system that allows the lifting span to be controlled by two hydraulic rams, with its base end being hinged by pairs of 440 mm diameter SKF spherical roller bearings set into a specially engineered deck trunnion. Additional bearings are fitted at the top of the hydraulic rams to enable them to pivot smoothly as the span opens and closes."

The bearings used for the bridge were of CC design type, with symmetrical rollers, two window-type steel cages and an inner ring centred via a floating ring between the two rows of rollers.

Dr Farahani added: "The bearing units are key to the efficiency and safety with which the span moves. They have to take almost the entire load of the span, which is around 40 tonnes, and withstand the effects of wind forces – which can be particularly high when the span is fully opened. They must also resist extremes of temperature and the effects of both rain and salt water."

Rollers in the High Roller



SKF made great use of modelling and simulation when it was asked to design, supply and assemble the spindle bearing system for the largest observation wheel in the world – the High Roller in Las Vegas.

The wheel rotates on a pair of SKF custom-designed spherical roller bearings, each weighing approximately 8.8 tonnes. Each bearing has an outside diameter of 2,300 mm, a bore of 1,600 mm and a width of 630 mm. The double row spherical roller bearings have 30 rolling elements per row, and the bearings are the largest ever built by SKF at its Gothenburg factory.

A simulation model was used to determine the optimal radial bearing clearance. Specially engineered features include W26 lubrication holes in the inner ring, SKF NoWear-coated

rollers, and PTFE coating in the bore. The system also incorporates advanced automatic lubrication and sealing arrangements.

The structure is based on a 143m diameter tension wheel. As well as the two SKF bearing assemblies, the structure is made up of four steel support legs, a single braced leg, fixed spindle, rotating hub, 2m diameter tubular rim and 112 locked coil cable assemblies as spokes. Passenger cabins are mounted on the wheel's outboard rim and are individually rotated by electric motors to maintain a horizontal cabin floor throughout each full rotation.

SKF has advanced simulation tools developed specifically for the study of rolling bearing applications, that can evaluate the many factors that influence the system behaviour – such as clearance in the assembly, misalignments, supporting structure flexibility and

different boundary conditions.

This is just a selection of some of the civil engineering projects to which SKF has contributed. The bearings may not move very quickly, but they certainly carry a heavy load.



The wheel rotates on a pair of SKF custom-designed spherical roller bearings, each weighing approximately 8.8 tonnes

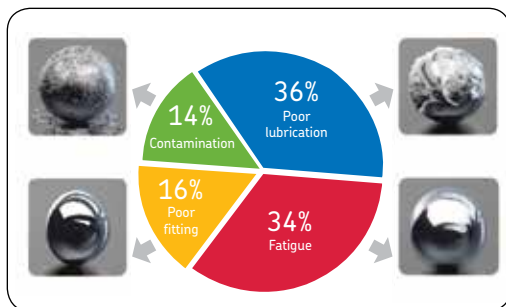




Keeping bearings running smoothly

A whole range of tools and techniques – from correct mounting, to a new method for estimating bearing life – all help to maximise bearing life and prevent premature failure, explains Patricia van der Hulst, Services Platform Manager at SKF.

Every bearing has a certain service life potential. However, research has shown that, for various reasons, not every bearing achieves it. Studies show that 16 percent of failures are due to incorrect fitting, 36 percent to poor lubrication and 14 percent to contamination. Collectively, these problems contribute directly to the remaining 34 percent of failures, which are due to bearing fatigue occurring well before the operating life quoted by manufacturers.



Bearings are very often treated as a commodity purchase, but unplanned downtime caused by the loss of a bearing in service can be costly. Fortunately, thanks to recent developments in tools and measurement technologies, the actions required to dramatically reduce the incidence of in-service bearing failure are neither complicated nor expensive – though they do require attention, the right methods, and appropriate tools to be applied across the full lifecycle of the bearing.

Mounting and dismounting

The process of mounting is a critical moment in the bearing's lifecycle. Choosing the right methods here can be decisive in determining the performance and service life of the bearing, yet many approaches in common use today have been shown to create problems in service.

Small and medium sized bearings are generally cold mounted, for example, and to do this the installer may reach for a hammer and length of old pipe. If that pipe isn't precisely the right size, this approach can lead to installation forces being transmitted through the rolling elements rather than the bearing ring, causing damage to the raceway before the bearing has even turned. Proper installation tools, such as the SKF Bearing Fitting Tool Kit TMFT 36, are designed to have an interference fit that ensures forces are only applied to the retaining ring of the bearing.



In the installation of larger bearings, heat is often used to expand the bearing prior to mounting. Here, the traditional approach is to immerse the bearing in a heated oil bath prior to installation. Unfortunately, this can introduce contamination, shortening the life of the bearing, not to mention the safety hazards associated with handling a hot, slippery component. A better approach is the use of specially designed induction heaters, such as SKF's TIH series, which as well as avoiding contamination or damage due to excessive or uneven heating, also allow the bearing to be heated with greater efficiency, controllability and safety.

An increasing number of bearing applications are being designed specifically to facilitate easier fitting and removal, often using hydraulic techniques. In the SKF oil injection method, for example, shafts are manufactured with special oil ducts and grooves. During installation, oil is injected at high pressure through these ducts, creating a thin film between the shaft and bearing that greatly reduces the force required to push the bearing into place.

At the other end of the bearing lifecycle, removing bearings with the right tools doesn't just save time, it also reduces the chance of damage to shafts and equipment during removal.



SKF manufactures a comprehensive range of hydraulic and mechanical bearing pullers, for example, including special designs for 'blind' applications where bearings are installed with an interference fit on both rings. When used on tapered shafts, the oil injection method described above can even be used to force the bearing off the shaft without the need for a separate bearing puller.

Correct alignment

Rotating shafts need to be correctly aligned in all three dimensions. Poor alignment results in greatly increased friction, driving up energy consumption in equipment and shortening the life of bearings and other components. Traditional shaft alignment techniques include the use of a simple straight edge: quick but inaccurate, or manual dial gauges which are fiddly and time-consuming to set up. Fortunately for installation and maintenance engineers, shaft



alignment technologies have evolved dramatically in recent years and the latest systems are much more accurate, robust, user-friendly and cost-effective than those of the past.

The latest SKF Shaft Alignment Tool TKSA 11, for example, connects directly to a smartphone app that guides the engineer step by step through the whole alignment process. In addition, the device is the first on the market to make use of robust, accurate and inexpensive inductive proximity sensors, making it suitable for every budget.

Effective lubrication

Poor lubrication is the single biggest cause of premature bearing failure. Therefore, an effective lubrication programme lies at the heart of good bearing maintenance. Lubrication management is easy to define: the right amount of the right lubricant should be delivered by the right method to reach the right point at the right time. Making that happen in a real production environment, however, requires a detailed action plan that encompasses the whole lubricant supply chain, from selection to delivery, storage, application and disposal at end of life.

Leading manufacturers such as SKF have developed a wide range of lubricants with characteristics specifically tuned to the needs of different applications. These products range from ultra-low friction greases for energy efficient bearings to high load, high temperature, high viscosity products for the most extreme applications. Some industries, such as food manufacture or environmentally sensitive applications require the use of non-toxic or

biodegradable lubricants.

To help equipment owners manage their lubricant requirements effectively, SKF has developed complete lubrication management services for customers,

which include an audit of the customer's needs followed by the design and implementation of a complete programme for the supply of appropriate tools and materials, and a schedule of activities.

Condition monitoring

Traditionally, operators faced two choices when planning bearing replacement strategies. They could run bearings to failure, and accept the risk of unplanned downtime, or they could change bearings according to fixed schedules, and risk spending more than they needed replacing parts that might have considerable service life remaining. The third alternative, the use of in-service condition monitoring techniques like vibration monitoring or oil analysis, was costly and only suitable for the highest priority applications.



Today, however, maintenance engineers have access to a wide variety of simple, portable measuring systems that can help them build a clearer picture of the performance of a machine in service, allowing them to schedule service interventions

when they are needed most. These basic condition monitoring tools include temperature sensors to identify the tell-tale signs of excess friction, hand held tachometers to spot deviations from desired operating speeds, and stethoscopes and vibration sensors to listen for changes that might indicate wear or damage in rotating components. The availability of robust, inexpensive endoscopes even allows engineers to look inside equipment without the need for disassembly or even shut down.

Accurate life prediction

SKF has developed a new bearing life model that helps engineers calculate bearing rating life more realistically.

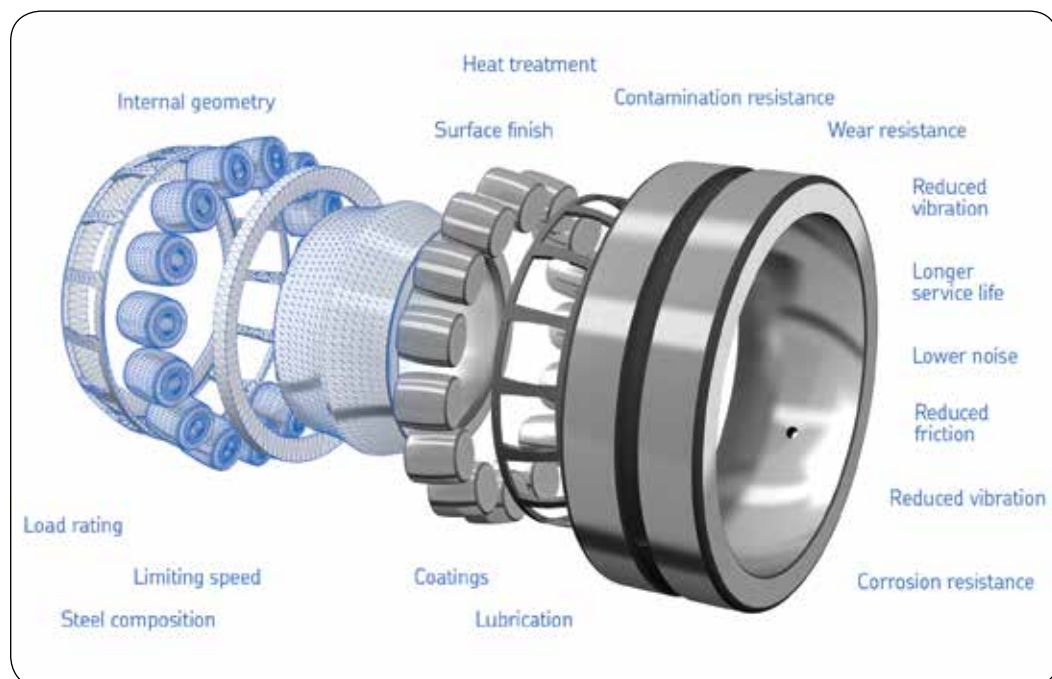
The SKF Generalised Bearing Life Model (GBLM) uses a new way of estimating bearing life. In contrast to earlier methods, it separates the effects related to surface failure from those related to the sub-surface failure. Different physical models can therefore be applied to these two regions: sub-surface rolling contact fatigue can be treated in the usual way; and the treatment of the surface uses more advanced tribological models to take care of complex physical interactions in situations such as lubrication, friction, wear, fatigue and running-in.

The new formulation better represents the tribology of rolling bearings in rating life calculations. It also gives a better knowledge of the surface endurance that dominates the field performance of rolling bearings.

Because the new approach can deal specifically with the degradation mechanisms and tribology of the raceway surface, a more advanced version of the GBLM can be used in bearing product development. SKF engineers will be able to use it to develop improved bearing designs that are targeted at special applications or particular field performance requirements.

The GBLM has been validated against SKF's extensive database of endurance test results – which is constantly increased and updated to follow new bearing technology development.

Economical self-contained sensors, such as the SKF Machine Condition Indicator CMSS 200, can even be left permanently attached to non-critical machines, automatically monitoring basic parameters such as temperature and vibration and alerting operators via a simple LED display when a change in operating conditions suggests further investigation is warranted.



Corrosion resistant bearings minimise risk of contamination



SKF has introduced a new series of food industry compliant bearings which help to minimise the risk of food adulteration and subsequent product recalls. The new range of SKF Food Line stainless steel deep groove ball bearings (VP311) meets two key requirements of the food industry:

- Seals made from synthetic rubber compliant with US Food and Drug Administration (FDA) as well as European Community (EC) requirements, coloured blue for optical detectability should they be damaged
- High quality grease suitable for typical food and beverage application conditions registered as NSF category H1.

The Food Line family includes 19 different standard sizes of stainless steel deep groove ball bearings, in diameters ranging from 8 to 40mm.

Food safety management systems such as HACCP are placing greater importance on safe food production. This means that components used in production should be either food-safe or detectable. Many food product recalls are initiated due to the possible presence of hard or sharp objects so food safety and detectability are high priorities for any components operating close to the food stream. The same is true of lubricants, as food-grade lubricants are increasingly being used on a plant-wide basis to prevent the chance of applying a non-food grease to a critical part.

SKF stainless steel deep groove ball bearings offer high resistance to corrosion, so that they can withstand the aggressive wash down regimes that are necessary in the food industry. The special seal enhances this, helping to retain lubricant and prevent ingress of wash down fluid.

Roller profile rail guide range enables higher machining rates

The new SKF Roller profile rail guide LLU range meets the needs of OEMs that require high stiffness and high load carrying capacity in a compact design.

Featuring four precision-ground raceways and circulation paths for rollers, the new roller profile rail guides are ideal for use in a range of industries, including machine tools, woodworking, plastic injection moulding and material handling applications such as the main guiding systems in cranes, pulp and paper, and printing machines.

High rigidity, high dynamic and static load ratings, exceptional running smoothness and effective sealing of the carriage enable optimum machining rates, as well as enhancing the geometrical accuracy and surface quality of machined work pieces.

The LLU range is available in four precision classes – P001, P01, P1, and P3 – and two preload classes: T2 for high stiffness with average to high loads and variable vibrations, and T3 for maximum stiffness with high impact stresses or vibrations and high loads.

SKF has also developed a range of accessories for its new roller profile rail guides, including rail caps in plastic, brass and steel, and a cap assembly tool. This modular systems approach enables a solution to be designed with high performance for a wide range of application requirements. In addition, the LLU range features various lubrication adaptors and an assembly sleeve for transportation, as well as incredibly effective seals to withstand the ingress of contaminants.



Upgraded small sealed spherical roller bearings

A range of small size sealed SKF Explorer spherical roller bearings has been upgraded, offering even lower friction, reduced operating temperatures, higher limiting speed ratings and reduced maintenance.

This range of bearings uses a novel seal design, given the designation 'RS', which reduces overall friction in the bearing by up to 20 percent. In representative running conditions, this translates into calculated annual energy savings of up to 292kWh. Moreover, reduced friction means they operate at lower temperatures, permitting maximum operating speeds of up to twice those of the existing range of sealed SKF spherical roller bearings that the upgraded range replaces. Lower bearing operating temperatures extend the life of the bearing grease allowing lubrication intervals of up to twice those of current designs, and meaning many more applications can now be considered relubrication-free.

The new RS seal is designed to operate with an optimised lip pressure reducing seal friction by up to 50 percent. In addition, the outer ring groove has been redesigned for reliable sealing and secure retention. RS seals have a rubberised side face that resists scratches and corrosion more effectively than metallic designs.

Sealed spherical roller bearings are widely used in environments where there is a risk of water and/or particulate contamination. The seals resist ingress of contaminants, allowing the longevity of the lubricant to be exploited, extending bearing service life and reducing maintenance costs and downtime. The new RS range includes 37 sizes with outside diameters (OD) of up to approximately 180mm. This range of products replaces the current 'CS' seal design for these sizes.



Next-generation linear ball bearings



SKF has improved the capability of its linear ball bearings, creating a new generation of products with higher load carrying capacity and extended lifetimes.

The LBC, D-series boasts several advantages and refinements compared with the earlier LBC series. These include: higher load ratings; extended lifetimes; reduced friction; capability for self-alignment; and is fully interchangeable with other ISO Series 3 linear ball bearings.

Like its predecessor, the new design allows linear speeds up to 5 m/s and accelerations up to 100 m/s². Reliable operation is maintained at temperatures from -20 to 80 degrees C, so the bearing is suitable for applications under many challenging conditions.

The new bearings can be used in a wide variety

of applications, including automation machinery, pick and place machines, filling machines and screen doors for trains.

By redesigning the bearing cage to have fewer overall components, SKF has created optimised ball tracks and larger rolling elements. This has improved load carrying capacity by up to 15% (depending on bearing size), which helps product designers to downsize their designs or increase loading. At the same time, bearing lifetimes can be 50% longer than before.

The bearings are manufactured according to ISO 10285 dimensions and tolerances, so are interchangeable with previous LBC or ISO Series 3 bearings – making them a drop-in replacement for existing designs.

LBC, D-series bearings are pre-lubricated with the optimum amount of SKF LGEP 2 grease. This makes them 'shaft ready' – which reduces assembly time and mounting mistakes.

Intuitive shaft alignment system



The new SKF Shaft Alignment Tool TKSA 51 is the first instrument designed for intuitive shaft alignments using tablets and smartphones.

The app makes it quick and easy to set up motors, drives, fans, gearboxes, pulleys and couplings, even by operators who are using the instrument for the first time.

Using the versatile shaft brackets, the instrument can be mounted on small machines with limited space, whilst extension chains, rods and magnetic holders are supplied for mounting the tool on large machines.

Connected wirelessly, the app uses real time data to provide a live 3D view of the measuring units. This gives operators the ability to rotate the virtual machine at will, and in all directions making the alignment as intuitive as possible. Measurements are made by a simple touch of a button or by the hands-free

automatic measurement function which just needs the shaft to be rotated to the next measurement position.

The great ease of measurement is just one of the core features of the system, allowing alignments in confined spaces, as measurements can start at any angle and only require a total shaft rotation of 40°. Further alignment adjustments are possible with alignment targets that, for example, can be set to compensate for thermal growth of the machinery.

After each alignment check or correction, a comprehensive report is created that can easily be customised, emailed or uploaded to a cloud service for future reference. To aid the user, notification and helpful guidance menus are displayed if a problem occurs during set up, such as the detector being off centre or the laser beam being too close to the edge of the detector.

Battery-driven grease gun maximises efficiency



Developed to maximise efficiency, the SKF Battery Driven Grease Gun TLGB 20 includes an integrated grease meter to help prevent over- and under-lubrication.

The TLGB 20 grease gun features a durable, ergonomic design with a three-point stand for operator comfort and convenience, and a 20-volt lithium-ion battery for longer service life. The tool's display indicates battery charge level, amount of grease dispensed, pump/motor speed and blocked lubrication points.

Dispensing up to 15 grease cartridges per battery charge, this versatile grease gun provides two flow rates, enabling adjustment to the specific application. In addition, the reliable TLGB 20 can deliver pressures of up to 700 bar (10,000 psi) and features a built-in light to illuminate the work area.

Suitable for a variety of manual lubrication tasks, the TLGB 20 can be used to lubricate bearings and machines in industrial and manufacturing environments, as well as agricultural and construction vehicles. The grease gun is supplied in a sturdy carrying case with a 900 mm, high-pressure hose, rechargeable 20-volt battery and 90-minute charger.

SKF reduces crusher downtime at Aggregate Industries

An innovative engineering solution from SKF is playing an important role in improving the reliability of Pennsylvania rock crushers used by Aggregate Industries at its Torr Works quarry site near Shepton Mallet, Somerset.

Aggregate Industries, part of the Holcim Group, is a major UK quarrying business that makes continuous use of Pennsylvania rock crushers at its Torr Works quarry as part of the process of breaking up around six million tonnes of limestone every year. This material is then used in construction projects around the UK.

Each crusher incorporates a series of hammers mounted along a central rotor shaft to reduce the limestone to the required size. This process is particularly demanding on shaft bearings, seals and drive mechanisms, with considerable quantities of fine dust being generated. Due to the location of each crusher, limited air movement, and the design of the

bearing housing, Aggregate Industries found that machine surfaces became heavily contaminated and that particles of dust were penetrating through the seals. This resulted in severe contamination of shaft and bearing lubricants, which in turn led to increased wear of moving parts, causing unplanned downtime and rising operating costs. The customer's problems were exacerbated by the poor quality of the castings used in the original bearing housings, which were proven to be porous, allowing oil to leak from the arrangement.

Recognising that the solution required a complete refurbishment of the bearing housings and associated parts, Aggregate Industries turned to specialist mechanical engineers, Anstee & Ware. Anstee & Ware partnered with SKF and Antifriction Components, an SKF Authorised Distributor, to provide a custom-engineered solution that enabled the replacement bearing housings and shaft assembly to be manufactured off-site to minimise downtime at the quarry.

SKF supplied new housings, each weighing 500 kg and being fully tested to ensure that all risk of porosity was eliminated, plus replacement bearings and custom-sized adapter sleeves; the latter were required as the machining required to refurbish the rotor shaft had reduced the effective diameter. In addition, SKF designed a new arrangement of labyrinth and V-ring seals to provide a far higher level of shaft protection against the ingress of dust.

Andy Frankham, Sales Manager at Anstee & Ware, explains that, "The refurbished system has now been installed on the Pennsylvania crusher and has been in continuous operation for some months without any problems. As a result,

Aggregate Industries now has a custom-engineered solution that is delivering far greater reliability, efficiency and productivity than ever before. This could not have been achieved without the engineering support and technical knowledge provided by the SKF team in the UK."

Aggregate Industries were so pleased with the solution that they have since placed another order to replace the bearing housings on the remaining Pennsylvania crusher.

www.aggregate.com



Bespoke housing solutions

SKF design application-specific bearing housings using state-of-the-art finite element analysis software. Prior to prototyping, SKF engineers add their bearing and seal expertise, and confirm the integrity of the system on a virtual test rig. Bespoke housing solutions delivered include:

- Main shaft support for wind turbines
- Rudder or drive shaft support for ships
- Rail bound vehicles
- Moveable bridges
- Housings for split bearings

Literature from SKF

Here you will find some of the latest brochures and catalogues available from SKF. To receive your own personal copies simply complete the relevant section of the reader reply service on the inside back cover and return to SKF.

Rolling bearings

Ref no: BU/P1 10000 EN



This 1,400 page catalogue replaces the General catalogue and is generally regarded as the definitive engineer's guide for rolling bearing and accessory design, selection and application. Redesigned for ease of use and tables of contents have been expanded.

Hydraulic seals

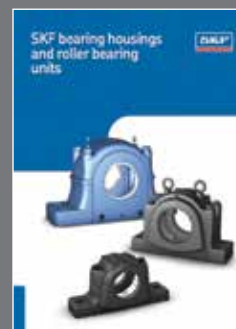
Ref no: SE/P1 12393 EN



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.

Bearing housings and roller bearing units

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.

Linear motion standard range

Ref no: MT/P1 12774 EN



This 252-page catalogue provides an overview of SKF's full range of products, systems and solutions available from its Actuation and Motion Control business unit.

Spherical plain bearings and rod ends

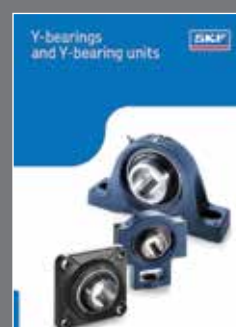
Ref no: BU/P1 06116/1 EN



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

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.

Maintenance and lubrication products

Ref no: MP/P1 03000 EN



This 180-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.

Wear sleeves

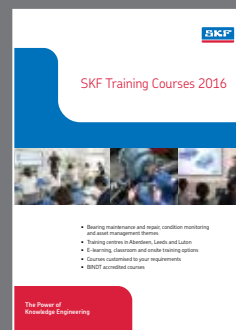
Ref no: SE/P1 11337/I EN



This 44-page catalogue profiles SKF SPEEDI-SLEEVES, a well-proven solution which overcomes the problem of worn shafts, without having to disassemble the shaft or specify a new size of replacement seal, while offering an excellent sealing surface.

Training courses 2016

Ref. no.: SR/T9 14778 EN



This 44-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.



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COMPETITION

After reading the magazine simply tick the three correct answers opposite for your chance to win one of the following prizes. **1st prize: SONY folding headphones**, 2nd prize: x 5 SKF power banks, 3rd prize: x 10 SKF Franklin Covey pens. To enter, please go online or send this page together with your contact details entered overleaf by 30 April 2016 to Tom Jones.



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What percentage of bearing failures are the result of poor lubrication?

- ☐ 14%
- ☐ 16%
- ☐ 36%

A new online tool is now available to help customers select from which range of SKF maintenance products?

- ☐ Bearing Pullers
- ☐ Bearing Fitting Tools
- ☐ Bearing Heaters

Custom designed 4m diameter SKF slewing bearings were used in which major civil engineering project?

- ☐ The Selkirk Wheel
- ☐ The Falkirk Wheel
- ☐ The Dunkirk Wheel

111

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