

SKF

FOCUS

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Long life for sealed spherical roller bearings



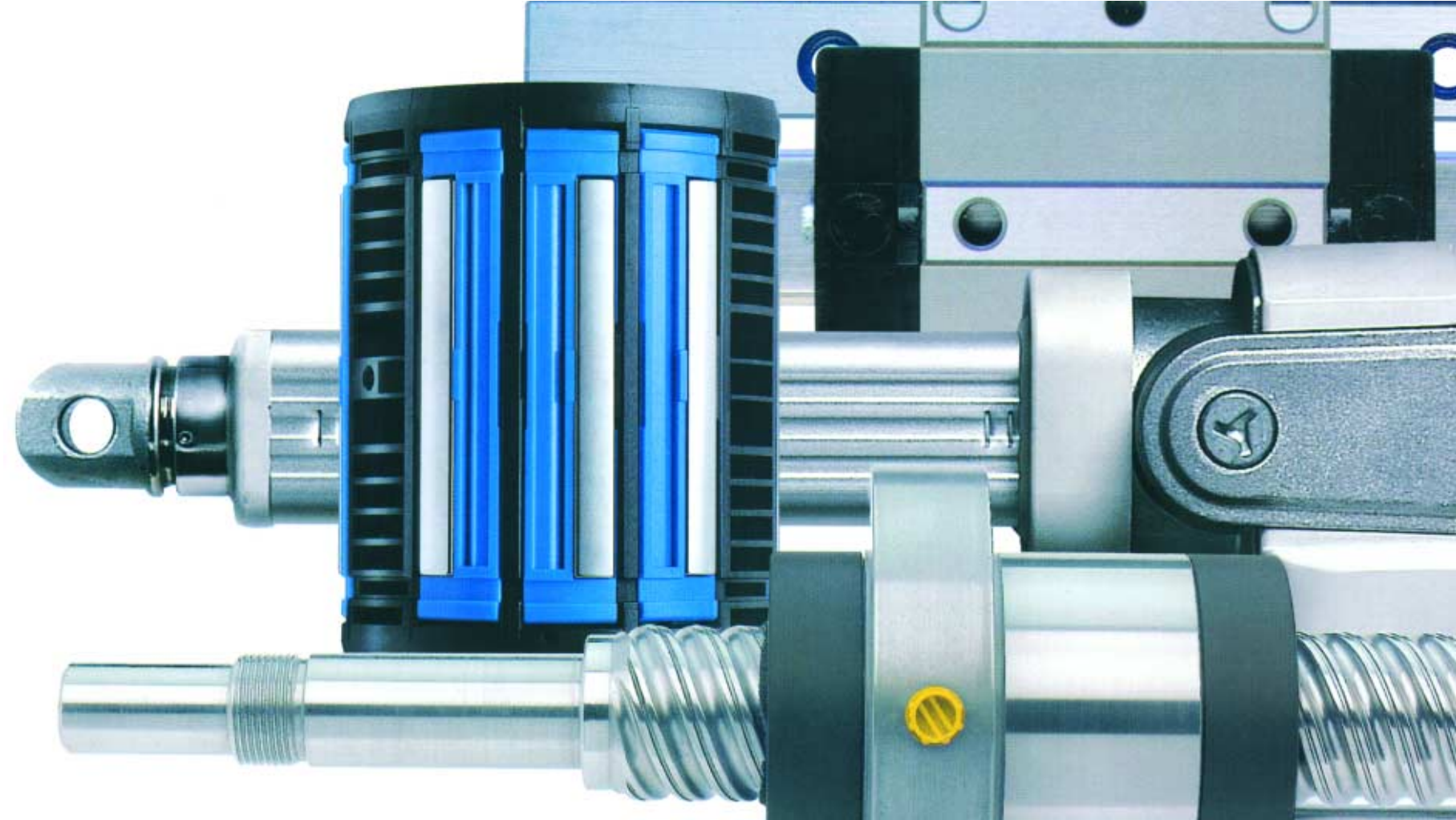
On the straight and narrow with laser alignment



Cut out cage creep with Anti-Creep System



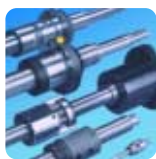
 Farnborough
INTERNATIONAL
AIRSHOW
17 - 23 July - 2006



Linear motion



Guiding



Driving



Actuating



Positioning

Linear motion from SKF is a business unit specialising in the manufacturing and sales of a wide range of high precision components, units and systems for linear movement – providing solutions for guiding, driving, actuating and positioning.

- Guiding - shaft guides, profile rail guides, precision rail guides and cam-roller guides
- Driving - ball screws, roller screws and ground ball screws
- Actuating - linear actuators, telescopic pillars, rotary actuators and control units
- Positioning - miniature slides, standard slides, precision slides and complete systems



For a free 170-page catalogue contact SKF today.

Editorial comment

At SKF, we're working hard both to respond to the rapidly changing needs of our customers in the global marketplace and to develop a new generation of technologies that break through the existing boundaries for product and system performance, functionality and reliability.

SKF has always been renowned for the excellence of its products, with an unrivalled reputation for innovation and exciting new technical ideas.

Today, the company is undergoing a dramatic global transformation, growing both organically and through acquisition; just as importantly we are changing our focus to develop, manufacture and support technology solutions that add real technical and commercial value to individual customers, and to the market as a whole.

In practice, we are rapidly moving from being predominantly product focussed to a position where our skills, experience, resources and technologies can be integrated to create complete solutions; solutions that match the precise needs of our customers, both today and tomorrow, as they face the challenges of an increasingly competitive global marketplace.

Ultimately, our goal is to be recognised as a truly global knowledge engineering company and, in this issue of FOCUS magazine, you will find articles that reflect our steadily emerging long term strategy, plus items on the latest corporate developments, new products and technology in action.



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PUBLISHER SKF (U.K.) Limited
EDITOR Phil Burge
EDITORIAL Nick Brooks - 4 Creative Marketing
DESIGN Samantha Carberry

CONTRIBUTORS
 Nick Brooker, Peter Culkin, Gilles Labouret, Chris Munday
 Alison McConnach, Colin Roberts and Gerald Rolfe

CONTACTING SKF
MAIL
 SKF (U.K.) Limited
 Sundon Park Road, Luton, Bedfordshire LU3 3BL

TEL +44 (0)1582 490049
FAX +44 (0)1582 848091

EMAIL marketing.uk@skf.com
WEB www.skf.co.uk
 www.linearmotion.skf.com



INVESTOR IN PEOPLE



Note: Investors In People accreditation has only been awarded to the SKF Industrial Sales & Service Divisions

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Growth and investment

MacroTech Polyseal, a North American manufacturer of injection moulded polyurethane and PTFE seals for use in fluid power and process equipment; and an agreement to acquire 100 % of the shares in Norwegian company RC DEI Norge AS, which specialises in condition based maintenance for the North Sea oil and gas industry.

In addition, the Aberdeen based branch of SKF Reliability Systems, formerly called DEI, has recently been rebranded as SKF Asset Management Services, with the full integration into SKF being a natural evolution and a significant step forward in the development of the company.

DEI was established in 1981 to serve the needs of the North Sea oil and gas industry. Over the past twenty five years, the company has expanded to provide reliability management services to the oil and gas industry worldwide, along with a number of other industries, including utilities, distilleries and paper mills.

SKF Asset Management Services will

combine DEI with two other SKF subsidiaries: the US-based company ERIN Engineering and Delta Consult which are based in Holland. The amalgamation of these three units into one will allow a broader range of services to be provided to clients throughout the world.

Speaking of the development of the new unit, Jim Marnoch, General Manager of SKF Asset Management Services Aberdeen, said, *"This is an extremely exciting time for our business unit. The transition to SKF Asset Management Services will further strengthen our position enabling both our team and clients to benefit from access to a huge range of global resources and skills. This will support our ambitions for the company's growth as we aim to provide a full range of proactive reliability management services to our clients."*

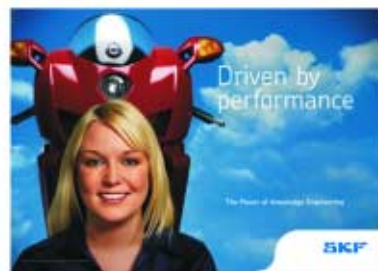
For more information please visit:

www.deinorge.com	RC DEI Norge AS
www.polyseal.com	MacroTech Polyseal
www.skf.co.uk	SKF Asset Management Services

■ At SKF we're constantly searching for ways to improve still further the range of products and services we offer to every customer. As part of this process we have a long term programme of investment and expansion, through both organic growth and a programme of strategic acquisitions.

The latest developments in this programme include an agreement to acquire a 100 % shareholding in SNFA, the leading French manufacturer of bearings (see separate story); the purchase of a majority shareholding in

New corporate advertising campaign breaks



■ An exciting new corporate advertising campaign is breaking this Spring, with high profile adverts in some of the world's leading business press, including both the Financial Times and The Economist, and will be seen by over 250 million people around the world.

This is the first time in over 10 years that we have run such a major global campaign and it is designed both to underline our rapidly

emerging position as a world leading global knowledge engineering company, and to highlight our goal of becoming a strategic technology partner to all our customers.

Based on a number of related themes, the long running campaign will graphically portray our core knowledge engineering strategy, showing how we deliver unique, integrated solutions that deliver step changes in function-

ality, performance and reliability to keep our customers at the leading edge of technology.

Perhaps as importantly, the new campaign will feature members of our SKF teams, from locations around the world, demonstrating that no matter how advanced or outstanding our technology, it is still our people that deliver the real difference to our customers, day after day, year after year.

Teaming up with Wyko



Left to right: Alan Whetstone and Steve Askins from Wyko, Gerald Rolfe from SKF

■ SKF and WYKO Industrial Services have signed a major agreement, designed to help selected WYKO branches and repair workshops to improve still further the service that they provide to their customers.

Under the terms of the three-year agreement selected WYKO locations will become Certified Maintenance Partners (CMPs), giving them training, expertise and additional staff resource to help them develop, promote and support SKF's Asset Efficiency Optimisation (AEO) programme.

AEO picks up where traditional plant asset management programmes typically stop, enabling plant managers to reduce operating costs and increase productivity. The programmes within the AEO concept maximise the efficiency of plant machinery and equipment assets, and include @ptitude, a new asset knowledge system, which provides a structured decision process and model for optimal management of an asset.

Our Certified Maintenance Partners work closely with end users, linking their predictive maintenance programmes, including vibration,

temperature and process measurements, as well as visual inspection data, to our extensive experience and knowledge of machinery optimisation. In particular, each CMP will carry out a preliminary assessment, prepare a concise report containing a summary of the readings and recommendations for all problem areas and then work with each customer to implement and manage effective predictive and preventative maintenance programmes, designing out recurring machine failures and reduce maintenance costs.

The Certified Maintenance Partner programme will give WYKO and its customers access to our unmatched experience and knowledge of rotating machinery. Just as importantly, our two companies will be working closely together to provide end users with the local resources and global support that enables them to optimise their plant and machinery assets for increased productivity and profitability.

For more information please visit:
www.wyko.co.uk



Magnificent men in their flying machines!

■ Aerospace technology can literally jolt the senses. Most are moved by the spectacle of these silver birds as the sheer thunder of a jet engine at close quarters moves the whole body. Similarly, the disorientation of seeing a fighter sweep past at low altitude, a seeming eternity before the deafening roar hits the eardrums.

You can experience aircraft and aerospace technology at the Farnborough International Airshow, which takes place from Monday 17 to Sunday 23 July 2006. With over 1300 exhibitors from each vital sector of the aerospace industry, there's lots to see and do around the air displays.

This year SKF showcases its products and services from Aeroengine, Airframe and Seals with an exclusive platform that brings our business to a global audience.

Visitors will be able to view a full range our product developments and designs. These include components for aircraft engines, all-important bearings and critical seals, together with gear boxes and airframe subsystems for fly-by-wire solutions.

Aircraft will take to the skies every afternoon at Farnborough so that exhibitors can demonstrate the impact of their technology in action. Futuristic military designs, interactive space demonstrations and the most recent aerospace advances will all form part of the collection that is Farnborough International.

www.farnborough.com



www.railways.skf.com

Major order for Pendolino tilting trains

■ We have recently won an order from Alstom for approximately 1,500 axleboxes equipped with SKF compact tapered roller bearing units, with each bearing unit also incorporating SKF sensors to monitor the bearing temperature as well as speed and train positioning. These signals are used for the European ETCS train control system. It was the total solution of bearing units and mechatronics that made Alstom decide on the SKF proposition.

Alstom in Italy will build a new generation of 26 Pendolino tilting train sets. Fourteen trains

will be used by Cisalpino for the railway connection of Italy and Germany via Switzerland. A further 12 trains designed for the high-speed lines of the Italian railway system will be operated by Trenitalia.

The new Pendolino trains will mark an important stage in the process of modernisation of Trenitalia's fleet. They can run on the networks of other European Union countries. The new Pendolino generation is the fourth generation of trains based on tilting technology, which are equipped with SKF bearing solutions.

Economos brings new seals



■ SKF has just signed an agreement with Salzer Holding GmbH, the owners of the Austrian industrial seals company Economos Austria GmbH, to acquire

100 % of the shares in Economos.

Founded in 1976, Economos today employs almost 900 people, in countries throughout Europe and has sales of over £50 million. The company specialises in the development and manufacture of hydraulic and pneumatic seals and engineered plastics, for the oil and gas, food and beverage, pulp and paper, mining and steel industries.

Although the company's main manufacturing site is in Austria it also machines seals in key local markets. This approach has made Economos successful in the quick-delivery machined seals market, through more than 20 subsidiaries around the world and its distributor network.

The acquisition brings new technologies to SKF and a range of products that complement our existing seals. In addition, access to Economos' market channels and presence in key segments will create strong synergies and strengthen our market position in industrial seals and in creating value propositions for these segments.

www.economos.co.uk

New solutions and orders at Wind Energy Fair



■ At this year's Hamburg Wind Energy Fair we launched two new bearing designs, plus an automatic lubrication kit, and announced a major order for wind turbine monitoring equipment.

The new bearings include an innovative hybrid design that solves the problems caused by electrical currents passing through bearings in turbine generators, and a high capacity cylindrical roller bearing for wind turbine gearboxes.

The new automatic lubrication kit allows turbine operators to ensure that all critical lubrication points receive the correct amount of lubricant at the right time, minimising downtime and maintenance costs.

The new order from REpower Systems AG is for 100 SKF WindCon condition monitoring systems for wind turbines, plus four separate WindCon systems for use with the company's 5mW turbines, which are among the biggest in the world.

Working towards zero accidents



■ Since the introduction of our Group-wide "Zero Accidents" initiative in 2000, we have cut the accident rate for the Group by some 75 %. Just as importantly, more than one hundred of our business units have achieved the SKF 'Zero Accidents Award', an internal award for business units that achieve a minimum of one year without a work-related accident. The UK Service Division was the first business unit to achieve five consecutive years without a work-related injury.

SNFA acquisition brings new products and expertise

■ We have signed an agreement to acquire a 100 % shareholding in SNFA, the leading French manufacturer of bearings. This is a vital step forward as the company is a strong player in both the machine tool and aerospace sectors.

Perhaps as importantly, SNFA's products complement those already available from SKF, enabling us to offer customers an ever greater choice of dedicated solutions.

For example, we will now be able to provide an even wider range of high precision angular

contact ball bearings and cylindrical roller bearings for use in all machine tools, while in the aerospace sector we will be offering an extensive choice of bearings for engine, gearbox, helicopter and airframe applications.

In each case, customers will benefit from the combined technical and commercial strengths of SKF and SNFA, providing the resources, skills and experience to build effective long term partnerships.

In 2004 SNFA sales were over £47 million, with approximately half of the company's



business being in the aerospace sector. SNFA currently employs around 700 people at its manufacturing plant for aerospace bearings located at Valenciennes, outside Paris, and its two plants for manufacturing high precision bearings, located at Turin in Italy and Charfield in the UK.

www.snfa.com

Long life for sealed spherical roller bearings

Our range of ready to mount, sealed spherical roller bearings (SRB) has now been extended still further with the introduction of eight new sizes. The new sealed units have been developed to reduce operating costs and environmental damage, especially in high temperature applications, and are simple to fit, with virtually no maintenance being required in many areas.

The latest spherical roller bearings are fully sealed against contamination from particles and moisture, using specially developed steel-reinforced double lip seals to extend operating life still further; similarly, the seals also prevent bearing grease contaminating the surrounding environment.

Just as importantly, the entire range has been developed to withstand harsh conditions, high temperatures and are capable of handling heavy loads, including shockloads. They will also tolerate static and dynamic shaft misalignment without adversely affecting performance.

Additionally, in many applications, the use of sealed bearings eliminate the need for external seals, enabling the overall unit size to be reduced.

Each bearing features patented self-guiding rollers, with a floating guide ring channelling two rows of rollers axially through the load zone to minimise friction and the generation of heat and noise. The rollers position themselves automatically so that the load is evenly distributed, resulting in high radial and axial load carrying capacity, which is unaffected by angular misalignment or shaft alignment errors.

Sealed spherical roller bearings also incorporate stable and wear-resistant, window-type steel cages, which take up minimal space so that an ample supply of lubricating grease can be retained in the bearing. Two types of grease are available: one for normal operating temperatures with nitrile seals and one for high temperatures with fluoro-rubber seals.

The latest range includes bearings with cylindrical bores, for shaft diameters from 25 to 220mm, with typical applications including gearboxes, motors and conveyors in mines, paper mills and manufacturing plants.

Sealed spherical roller bearings in action

These bearings are used throughout industry; here a few just examples to demonstrate the exceptional levels of performance and reliability that can be achieved.

In print ...

Müller Martini is one of the world's largest manufacturers of print finishing systems, including a special flexi-roll system where magazines and newspapers are stored on large rollers. This system uses our sealed bearings as part of an integrated unit, with the bearings helping to increase machine uptime, while reducing maintenance and unit build costs.

In pumps ...

Spaans Babcock, a leading manufacturer of screw pumps, has replaced traditional bushes, which allowed grease to leak through seals and required regular maintenance, with sealed spherical roller bearings. These are sealed for life and, in addition to high levels of efficiency, have enabled the company to offer its customers considerable savings in operating costs by reducing the need for maintenance, the volume of lubricants used and the power required to drive each pump.

In robotics ...

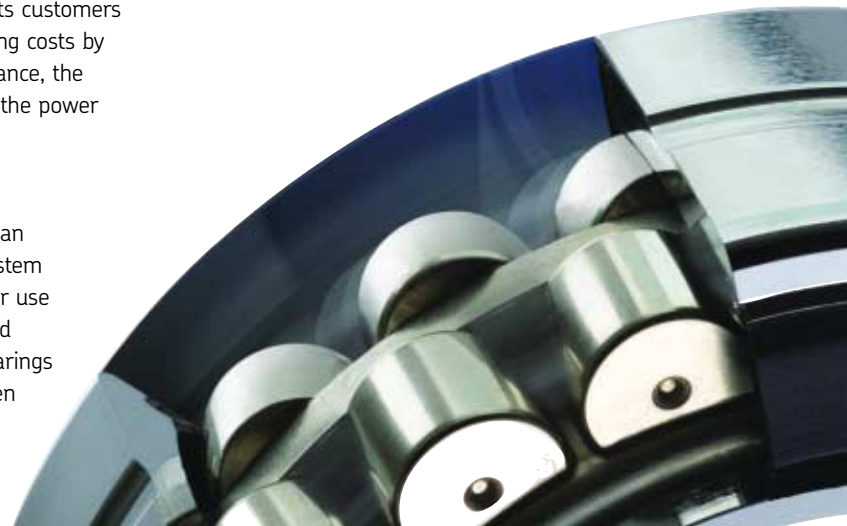
Our sealed bearings feature in an innovative robotic balancing system developed by KUKA Robotics for use in automotive, warehousing and palletising applications. The bearings have replaced conventional open spherical roller units and enable the company to standardise on an easily



mountable/dismountable unit that cuts assembly time and stock holding, while improving reliability and operating efficiency for end users.

And in winches ...

Mannesmann Dematic manufactures a range of open winches and has been able to reduce the distance between bearings on the wire drums in process cranes by around 40 %, and shaft diameters by 20 %, without affecting load carrying capacity through the use of our sealed bearings. In particular the bearings remove the need for extra covers and seals and, as importantly, provide the ability to withstand misalignment and shaft deflection, with excellent shock loading and resistance to vibration.





Reducing the cost per passenger is a major goal for all aircraft manufacturers, with developments being concentrated on the need to minimise all-up weight by using advanced materials and methods of construction, and improve aircraft efficiency through fly-by-wire systems that reduce both fuel consumption and environmental damage.

Lowering cost per aircraft passenger

The need to lower operating costs while extending the operational life of each aircraft still further has led to increased integration and collaboration between companies in the aerospace sector, in an attempt to minimise development costs, shorten the time to market and enhance the performance, reliability and functionality of airframe components and systems.

Any company competing in the global aerospace sector needs to have both technical competence and a support network that can reach around the world. At SKF, for example, we have a dedicated aerospace group, which offer integrated solutions for current and future aircraft designs.

In particular we have focussed on three key areas of development:

- Metallic and composite rods and struts for structural, flight control applications and facilities.
- Ball, roller and spherical plain bearings for landing gears, flight controls, wings and engine links.
- Mechatronics, including position and force transducer units, and linear and rotary actuators for cockpit, flight control and utilities equipment.

Airframe

Applications for airframe rods, both metallic and composite, include flight control actuation, landing gear actuation and wingboxes. The latter are integral to each fuselage, are held in position by front and rear spars and are subject to tensile as well as compressive loads. Additionally, each wingbox also acts as a fuel tank, so the rods, which support the structure, are saturated with kerosene fuel.

Following extensive testing using composites as well as aluminium, our engineers found that the use of composite rods as struts in the wingbox can produce a 40 % weight saving without

affecting structural integrity. As a result we are currently developing a range of solutions for the aircraft sector.

Bearings

In 2004 we announced the development of a range of lightweight, titanium plain bearings that offer a weight saving of up to 40 %, with applications in landing gears, pylon attractions and wing assemblies. Since then our engineers have identified 10 different applications, including a pylon-to-wing attachment bearing, a spigot bearing and, for aileron reaction, a strut rod end.

The first application of this bearing is in the new Airbus A380. By adopting this design, the A380 will achieve a 45 kg weight saving per landing gear and 110 kg weight saving per aircraft, including the nose landing gear.

The introduction of the bearing involved adapting the surface properties of titanium to overcome the difficulties of working with titanium. This resulted in a certain amount of re-engineering work, a new manufacturing process and the use of advanced coating and alloys, coming to create an innovative, patented split ball bearing design.





Fly-by-wire

Our fly-by-wire technology has already been used for the flight controls for the Airbus A320 and can provide a range of functions including:

- Acting as the interface between the pilot and the flight-control computers
- Control of the aircraft during taxiing, take-off and landing
- Forward and reverse thrust power control of each engine
- Spoiler and speedbrake operation
- Utilities actuation, such as controlling doors and air cooling

The products that we use to realise these applications include a range of advanced position and force transducer units, and linear and rotary actuators. For example, our plug-and-play throttle control unit is designed to transmit a pilot's control movements to the engine, and combines analogue and digital control technology, interfacing with the engine control computer and monitoring systems.

At the tail ...

Similarly, the A380 features a horizontal tail plane system, which is part of the tail assembly and enables the tail to be adjusted from +2 ° to -10 ° to maintain aircraft stability. The system consists of a bearing assembly that provides the hinge, and attachment points for the trimmable horizontal stabiliser, which in turn controls the horizontal attitude, or pitch, of the aircraft.

An actuator controls the hinge in rotation slowly, to adjust the angle of the horizontal stabiliser to trim out any deflection of the elevator in response to commands from the pilot or autopilot. When this happens, the horizontal stabiliser pivots on the two horizontal spherical plain bearings.

The bearing assembly for the horizontal tail plane consists of a fail-safe hinge assembly and a metal-to-metal spherical plain bearing, while the main body of the fail-safe hinge assembly is manufactured from titanium and is anodised for protection against galvanic corrosion. It must withstand compressive radial loads, tensile axial loads and fatigue due to these loads, with the maximum load for the outer hinge being 1,300 kN, and the axial load for the hinge rod 500 kN.

As this horizontal tail plane system plays a vital

role in the stability and safety of the aircraft, a fail-safe system has been incorporated to enable a dual load path for the hinge assembly and the spherical bearing.

And at the nose of the aircraft...

The Airbus A320 and A330/340 employ an SKF developed nose wheel steering control unit, which is used to steer the aircraft before take off and after landing on the runway and replaces a mechanical system. The wire control is more accurate and offers weight saving because it eliminates the mechanical link between the cockpit and the hydraulic system.

There are two control units per aircraft, transmitting the hand wheel position to the braking and steering computer system, which controls the servo hydraulic actuators that drive the nose wheel. For the A330/340 family, our engineers also developed a damping version that reduces lateral tail movements, which otherwise would make the ride uncomfortable for passengers as the aircraft moves along the ground.

Helicopter bearings

A specially developed spherical plain bearing, which incorporates a ceramic-coated inner ring, has been introduced for use in helicopter main rotor applications where it is already helping to improve operating life and reduce maintenance costs.

The Ampep XLNT ceramic-coated inner ring spherical plain bearings are manufactured from stainless and corrosion-resistant steels and are self-lubricating and maintenance free. They are compact and have an extremely high load-carrying capacity to weight ratio, and are used in primary and secondary flight-control systems.

The inner ring is through-hardened with the spherical surface being ceramic-coated. The outer ring is cold formed around the inner ring and has a woven PTFE/glass composite liner bonded to its inner spherical surface.

The Ampep XLNT is the latest in a line of developments in spherical plain bearings for aerospace applications aimed at giving extended operating life. One such application for these bearings is to change constantly the pitch angle of helicopter main rotor blades as the main rotor rotates.



For further information a brochure is available by request.



Reduce bearing installation time

■ At SKF we've over 25 years experience in developing, manufacturing and distributing induction heaters for bearing applications, and our latest TIH 100 heaters are among the best available anywhere in the world.

In particular, they have been designed to help you minimise the time it takes to install bearings, while cutting energy costs. This has been achieved by positioning the induction coil outside the heater housing, allowing each bearing to be placed around the coil. This can reduce heating time and power consumption by up to 80 %, ultimately saving up to 70 % on heating costs.

The latest range of TIH 100 heaters are easy to setup and use, feature a simple operator interface and magnetic probe for precise temperature measurement, and are available with a number of options including handling tools and gloves.

Housings help bearings last longer

SONL bearing housings allow users to enjoy all of the benefits of oil lubrication including virtually unlimited bearing life with none of the problems traditionally associated with oil-lubricated bearings.

A key feature of the new housings is an oil pick-up ring that hangs loosely next to the bearing, and dips into an oil reservoir within the housing. As the shaft turns, so does the pick-up ring, transferring oil to the bearing exactly where it is needed. With this proven system, lubrication performance is unaffected by variations in the oil level in the reservoir, removing one of the biggest drawbacks of using oil for bearing lubrication.

SONL housings also incorporate efficient seals against the ingress of contaminants, providing effective protection against the most common cause of premature bearing failure. Sealing is achieved by means of side plates that are integrated within the top and bottom of the housings.

In addition to guarding against contamination, the elimination of separate side plates in the SONL bearing housings virtually eliminates lubricant leakage, making the housings easy to keep clean. As an additional bonus, this novel design speeds the installation of the housings, since the numerous fixing screws associated with separate side plates are no longer required.

Further aids to installation include a perpendicular base that makes alignment easy, and cast markings that show the centre of the bearing without the need for measuring and



scribing. The housings are supplied with the cap bolts pre-loosened to save time, and the bottom half of each housing has a clear mark showing the recommended oil level. Oil can therefore be added quickly and easily while the housing is still open.

To simplify selection and stocking, we have designed SONL bearing housings so that the same model is suitable for use with locating and non-locating bearings, and in through - or end-shaft applications. The housings are also compatible with circulating oil as well as oil bath lubrication, and they are fully interchangeable with standard SOFN housings, allowing fast, easy and cost-effective upgrading of existing equipment.



Reliability and availability key for gearbox seals

A new generation of radial shaft seals has been launched to improve the reliability of both off-the-shelf gearboxes and standard helical and bevel-helical gear units. The HMS5 and HMSA10 seals are manufactured using a specially formulated compound, which provides twice the working life of traditional NBR seals, and feature a unique design of spring and sealing lip to produce the optimum radial load under all operating conditions.

The new seals are compatible with all industrial gearbox oils and provide excellent pumping characteristics, to ensure that oil collecting around the seal is returned back into the gearbox. In addition, the HMS5 and HMSA10 seals are available through our worldwide distribution network, in most cases ex-stock, and can be supplied as a dedicated package of seal and bearing products to enable customers to reduce inventory and sourcing costs.

Measure more, align less!



Recently launched at the Maintec exhibition, the new Fixturlaser XA is the first in a new generation of laser alignment instruments designed to help plant, production and maintenance engineers minimise the time required for shaft alignment, by providing an accurate, repeatable and reliable method of measurement.

The Fixturlaser XA consists of a handheld computer unit and two sensor heads, using the latest laser technology to make set-up and initial

alignment easier, while the receiver units are constructed from CCD elements. These digital devices replace traditional PSDs and provide far higher levels of linearity and overall quality.

The sensors are smaller and lighter than those used previously yet offer a larger detector area. Similarly, the handheld computer has a large colour touch screen, for the measurement and alignment process and uses animated graphics to simplify operation still further.

Battery powered lubrication system for remote plant



The latest Vogel centralised lubrication system has been developed to provide cost-effective and reliable lubrication in remote areas of factories, in inaccessible plant, mobile equipment or other applications where a local power supply is unavailable. Designated the KFAS1-B, the new battery powered system is quick and simple to install, and can be used to feed up to 20 lubrication points from a single unit; perhaps as importantly, the new system can help both OEMs and end users alike reduce the cost of installing lubrication systems and improve the reliability and operating life of moving components and machinery.

To date, lubrication devices used in remote or inaccessible areas have either been powered by

batteries or gas cells and, in each case, have generally been single-point devices that eventually require replacement. Additionally, these devices tend only to operate at low pressures and, as the grease or oil reservoir is situated at the remote location, can easily be affected by local changes in temperature, which adversely affects the consistent flow of lubricant.

By comparison, the new KFAS1-B system uses an efficient centralised battery pack, running at 18VDC, to power a control unit and lubricant distribution and pump unit that is capable of supplying multiple lubrication points for extended periods. The system is designed to supply grease or oil from a single 1.0 litre reservoir at pressures of up to 150 bar, ensuring a consistent flow of lubricant even at extremely low operating temperatures.

To maximise battery life and improve overall efficiency, the KFAS1-B system operates only at pre-determined intervals, which can easily be set and stored via the control unit, with a three-digit LED providing feedback on system operating status. Depending on application, the battery life can be up to 24 months, with the system being suitable for use with all NLGI grade 1 and 2 lubricants; selected GLPI grade 3 lubricants can also be handled.

The KFAS1-B battery powered lubrication system is part of an extensive range of Vogel centralised lubrication solutions available and supported by SKF worldwide.

IS vibration analysis



Our new Microlog CMXA 51-IS data collector /analyser has been specifically developed to enable process, plant and maintenance engineers to take multi-parameter vibration measurements in hazardous operating environments. Based on our proven Microlog CMXA 50, the new intrinsically safe unit is ideal for use in a wide range of applications within the offshore, petrochemical and chemical sectors.

The Microlog CMXA 51-IS is rated intrinsically safe in accordance with the European Union's Explosive Atmospheres (ATEX) directive for use in Zone 0 conditions, equipment designation II 1G, Eex ia IIC T4, and enables vibration, process and dynamic data to be collected quickly and easily, to identify possible problems with rotating components in gearboxes, motors, fans and pumps.

The Microlog CMXA 51-IS is easy to setup and use, features a large, backlit and easy to read display, and has a single data acquisition channel, plus a single phase channel, making it compatible for use with all ICP accelerometers, velocity transducers, temperature sensors, photo-optical pickups and DC inputs; data can also be input manually.

The unit operates using a Windows CE platform with 16 MB Flash memory and 8 MB Flash extended memory for optimum flexibility, scalability and data-storage capacity, while a 400 Mhz X-Scale Intel processor ensures exceptionally fast data capture. The Microlog CMXA 51-IS also provides up to eight hours battery life for longer field operation.

Lubrication is key

Effective lubrication of moving surfaces is essential in almost all industrial applications, ranging from conveyors, chains, shafts and cables to steering axles, pivot arms and lift points. Although a large number of systems and component sets are supplied as maintenance-free or sealed for life, there are many more devices that need regular lubrication to ensure that they operate effectively over the long term.

Unfortunately, lubrication is often carried out inefficiently by plant operators, who at best over-lubricate equipment, wasting materials and polluting the surrounding area, or at worst lubricate moving parts at irregular intervals or, if they are particularly inaccessible, do not add lubrication at all. Indeed, it is worth noting that, for example, over 36 % of all bearing failures result from incorrect specification and inadequate application of the lubricant.

To overcome these problems, a new generation of automated lubrication systems is now available. These include centralised systems for use on production lines, printing presses, machine tools and mobile plant and equipment; combined oil and grease units for materials handling robots and automation systems, and dry lubricant sprays for the surface of conveyors and guide rails.

A centralised lubrication system is designed to enable multiple lubrication points or groups of points to be supplied with varying amounts of precisely metered lubricant from one central reservoir.

This type of system ensures that every lubrication point, especially those that are difficult to access, receives an exact and carefully programmed level of oil or grease at the appropriate intervals and, if necessary, in the appropriate

sequence, while eliminating the risk of contamination due to over lubrication. Perhaps as importantly, as a centralised lubrication system functions automatically while machinery is still running and bearings, shafts or conveyors are moving it is possible to ensure that oil and grease are distributed consistently across all moving surfaces, so that wear and tear, and associated downtime, repair and maintenance costs can be significantly reduced; indeed, the service life of bearings can be increased by a factor of at least four in most applications.

In addition, routine maintenance of a centralised lubrication system is generally minimal, being limited to topping up the lubricant reservoir and an occasional inspection of the lubrication points. Moreover, by comparison with manual lubrication procedures, a centralised lubrication system can reduce the use of oils and greases by as much as 90 % due to the precise, demand-orientated metering rates.

There are various types of centralised lubrication systems for use in a wide range of applications. For example, single-line systems, such as might be used on printing machines typically feature piston distributors to feed metered quantities of lubricant to bearings, cams, gears and power trains. Generally based on modular construction, single-line systems can easily be extended by adding additional lubrication points as the needs of the application change, and can serve up to several hundred lube points from a single supply unit and dedicated control mechanism.

Other types of centralised lubrication include circulating-oil systems that are used both to provide a constant supply of oil and for cooling purposes, with the oil or grease being collected after it leaves each lubrication point and is then





filtered and re-circulated; this type of system is ideal for lubricating standard bearings and can be particularly cost effective in large power plants, sawmills or cement factories. By comparison, progressive and zoned lubrication systems are designed to provide a sequential and metered supply of

lubricant to individual components or parts of a production line, such as might be found in food and beverage filling plants, where there is typically an extensive network of sterilising, filling and capping machines situated along lengthy conveyor belts. Finally, travelling lubricators are ideal for use with moving conveyor chains on assembly lines, or painting and coating lines to ensure that every chain link is effectively lubricated as it moves; indeed, the latest travelling lubricators can work with chain conveyors moving at speeds of up to 2m/s.

It is also important to select the correct type of lubricant for each application, taking into account factors that may affect the long term chemical and physical characteristics of the oil or grease and thus its ability to protect moving parts. Typically, these factors include high operating temperatures, fast line speeds, heavy bearing loads or the use of steam cleaning systems, each of which can degrade the performance of lubricants.

The value and importance of correct lubrication should never be underestimated. By selecting both the correct method of lubrication and type of grease or oil for each specific application plant and production engineers can achieve long term, trouble free operation, with the minimum of maintenance and downtime, as well as increased line or machine performance.

For more information please visit:
www.mapro.skf.com and www.vogel.com



For further information catalogues are available by request.

Automatic 24x7 lubrication



We have recently introduced an improved version of SYSTEM 24, our single-point lubricator, designed to extend significantly the operating life of bearings in a wide range of applications, while reducing maintenance time and costs. The lubricator is fully automatic, simple in design, easy to fit and maintenance-free; just as importantly, it is cost-effective, environmentally friendly and has Ex approval for use in hazardous areas.

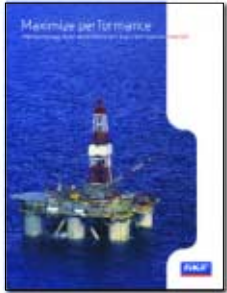
Each SYSTEM 24 unit is constructed from a tough, circular polyamide plastic cartridge, which is hermetically sealed to prevent the ingress of dust

or moisture and is also transparent so that lubricant levels can easily be checked. Incorporated in the head of the cartridge is a patented design of gas cell that releases inert hydrogen at controlled intervals to pressurise a piston which, in turn, forces lubricant through neck of the cartridge; the cartridge neck is threaded externally to allow it to be easily screwed into bearing housings or other lubrication points, while a non-return valve eliminates the risk of leakage.

The piston and internal cartridge surfaces are shaped to ensure that all the lubricant is thoroughly dispensed, while the rate at which lubricant is distributed is accurately controlled by an integrated timer, which can be adjusted on-site, allowing oil or grease to be distributed at intervals of between one and 12 months and at rates that can be as low as 4.5 g/month.

SYSTEM 24 can easily be installed by hand, is available in two standard sizes, with either a 125 ml or 60 ml capacity to reduce stockholding requirements, and can be supplied with a choice of bearing greases and oils, plus a wide range of accessories including adaptor nipples, tubes and brushes.

Mud motor bearings cut rig downtime



For further information a brochure is available by request.



Developed after extensive research, our new mud motor bearings for applications in oil and gas drilling rigs not only offer an operating life up to 50 % longer than that of conventional products, but also deliver an improvement in mean time between failures (MTBF) of up to 30 %. As a result, the frequency of bearing replacement can be dramatically reduced and, with downtime in the region of £130,000 per day, this means that substantial cost savings can be achieved.

The key to the enhanced performance of the new mud bearings is an innovative computer model, based on our unique knowledge of bearing behaviour in a wide range of applications, and our specialised knowledge of advanced engineering materials.

This is the first time that such a comprehensive model has been achieved and accurately defines the behaviour of a mud motor bearing stack, so that our engineers can carry out virtual tests to minimise stress levels and optimise load carrying capacity.

As a result of this work, our new mud motor bearings incorporate special steels for all load carrying components and have a configuration that has been refined to offer improved wear resistance, increased load carrying capacity and even greater strength. In addition, the new design virtually eliminates the factors which lead to cracked rings and sheared balls two of the most common causes of failure in mud motor bearings.

Our mud motor bearings are customised to suit the precise requirements of each application, with typical configuration being between eight and twelve rows of bearings.

In each case, the bearings are constructed so that when new, the majority of the load is carried by the first four or five rows but, as each row starts to wear, the load is shifted to the next row, until all the rows are worn equally. At this point, the load shifts back to the earlier rows, and the process repeats until the bearing reaches the end of its useful life. This arrangement allows a long service life to be achieved, in spite of the extremely harsh downhole operating conditions that bearings normally have to endure.

Easy bearing mounting



For further information a brochure is available by request.



Our latest SensorMount has been developed to help customers simplify the process of mounting large bearings, helping to minimise the time required and improve the accuracy with which bearings are aligned.

Traditionally, mounting large bearings is time consuming, requiring specially trained personnel, and can be unreliable as the expansion of the inner ring is controlled indirectly by measuring axial displacement of the ring, rather than the expansion of the inner ring itself.

The SensorMount comprises a sensor integrated with the bearing, and a dedicated hand-held indicator, which allows large spherical roller and CARB bearings on tapered seatings to be

mounted quickly and accurately. As the system is designed to measure the exact expansion of the inner ring, the interface fit between the bearing and the shaft can be achieved precisely. As no complex calculations are required, the need for specially trained personnel is reduced, and the overall mounting process is faster, more reliable and cost-effective.

SensorMount is quick and simple to fit using standard mounting tools, with the bearing being placed on the tapered seating with a hydraulic nut. The SensorMount indicator can then be connected to the bearing flange, while a pump is connected to the hydraulic nut. The clearance reduction can be directly measured on the SensorMount indicator once pumping has started. When the required clearance reduction has been achieved, the pressure can be released and the hydraulic nut can be removed.

The clearance reduction shown on the indicator is independent on how the bearing is mounted. It makes no difference if the bearings are mounted on shafts or sleeves, or with shafts that are solid or hollow.



Find your bearings

If anything helps make the wheels of industry run smoothly it has to be today's bearing technology. However, it's not just industry's wheels that rely on modern bearings for their reliable operation. Virtually every rotating element in plant and machinery will be supported by some type of bearing to ensure its smooth running and long service life. In fact, so ubiquitous is the modern bearing that it is generally considered as little more than a commodity product, to be kept in the stores until needed for routine maintenance. But the reason so many bearings bought as spares can be found languishing on those store shelves is in itself a tribute to the significant developments made in bearing technology developments that have kept pace with the rapid changes in production and process systems brought about by the growing demands for greater productivity, reliability and performance.

Not far behind bearings in heading up most plants' inventories of parts or components would be the humble electric motor, which naturally needs its own bearings. The most common type of bearing in very large electric motors is a combination of hydrodynamic bearings and housings. This can be an expensive option, with the bearings and jacks possibly representing some 7-8 % of the total machine cost, so in applications where hydrodynamic bearing technology is not absolutely necessary an alternative solution from SKF provides a cost-effective and reliable option. This is a shaft system consisting of two flanged housings, each equipped with a roller bearing, and offering a good price/performance ratio.

Electric motors are often the prime movers for the heavy-duty process pumps used in industries such as refining and petrochemicals. These continuous process plants require the highest levels of reliability, especially from bearings that have to support the hydraulic loads imposed by

the pump impeller, the mass of the impeller itself and its drive shaft, and the loads from the drive components.

Depending on the operating conditions, the pump may experience cavitation whereby pockets of gas trapped in the liquid medium implode as they are drawn through the impeller, resulting in increased bearing loads, impeller damage, increased vibration and shaft deflections. However, in most pump applications poor lubrication and contamination are the two main reasons for reduced bearing service life.

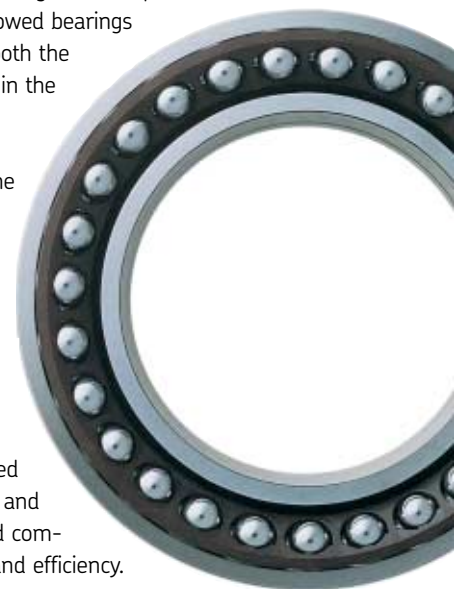
SKF's Explorer deep groove ball bearings, for example, can handle light to moderate radial and thrust loads at very high speeds with very low friction, a combination of benefits that is ideally suited to centrifugal pumps. Simple in design, they are available with either a metal or polyamide cage for the balls, and with or without seals or shields. The sealed versions use a nitrile rubber or synthetic seal to protect the bearing from contaminants and retain the lubricant, which is normally formulated with anti-corrosion additives and designed to withstand a wide range of operating temperatures.

A recent trend among pump operators has been the use of variable speed drives (VSDs) to control motor speed. These offer the benefits of energy efficiency, since the motor no longer needs to run flat out, and better process control with flow being controlled by pump speed rather than control valves in the pipeline. But VSDs, or inverter drives as they are also known, can generate stray electric currents that flow through the motor shaft and pass through the bearing, causing damage. Imperceptible at first, this damage shows up as micro-cratering in the bearing raceway and on the surfaces of the rolling elements. The arcing effect of the current can also affect the lubricant, causing an increased rate of degra-

ation. Once started, the damage will result in increased noise levels from the bearings, reduced effectiveness from the lubricant, increased heat and excessive vibration all contributing to a drastically reduced service life.

Initially the trade-off in using a VSD might have been between improved pump performance and reduced bearing life, but again the bearing designers have risen to the challenge with insulated bearings. SKF, for example, manufactures an extensive range of such bearings and provides engineering consultancy services on problems related to stray currents. For small motors, the solution is a hybrid bearing consisting of rings made from bearing steel and rolling elements made from bearing grade silicon nitride, an electrically insulating ceramic. For larger duties, the company's INSOCOAT bearing also offers electrical insulation, via a coating of aluminium oxide applied to the outer surface of the inner or outer ring of the bearing.

Hybrid bearings have also opened up the possibility of oil-free operation of the centrifugal refrigerant compressors used in heating, ventilating and air conditioning. Wet compressor technology has allowed bearings to be exposed to both the refrigerant and oil in the system, but hybrid bearings offer the potential to take the oil out of the system completely and use the refrigerant itself to lubricate the bearings. With no filters and pumps needed for the oil, the result is reduced system complexity and cost, and improved compressor reliability and efficiency.

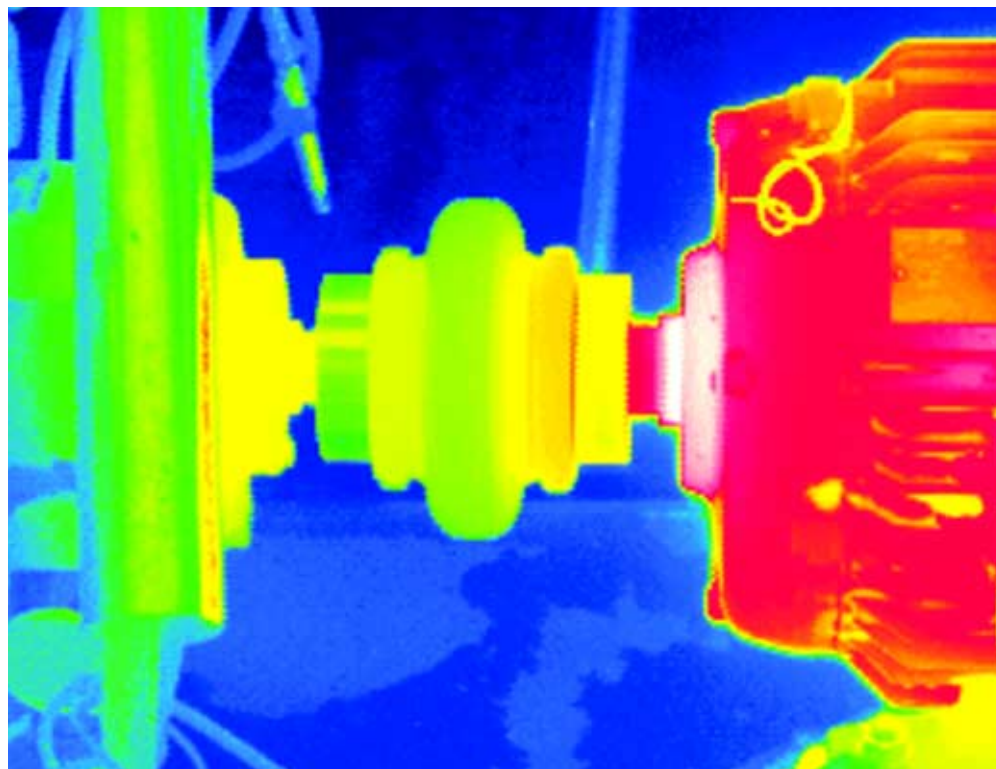




Pictures left to right: shaft alignment in action, bearing failure and gear damage.



On the straight and narrow



It is estimated that up to 50% of breakdowns in rotating machinery are caused by misalignment of the drive shafts between components.

This can be due to misalignment during installation and to changes in operating conditions, such as fluctuating temperatures that over time cause previously perfectly aligned components to move gradually out of alignment. Whatever the cause, incorrect alignment will place greater loads on components, causing increased friction and vibration levels. Perhaps as importantly, energy consumption will rise, there will be increased wear and tear on bearings and, eventually, there will be a breakdown.

Misalignment can, however, be easily eliminated through careful installation procedures and preventative maintenance procedures during operation. The problem really centres on which techniques are employed to ensure correct alignment at each stages.

Traditional alignment methods, for example using a straight edge and feeler gauge, although

still in common use, often fail to produce the positional accuracy required of much of today's precision machinery. Similarly, more accurate methods such as dial indicators may give the required result, but are generally time consuming and require specialised and thus expensive operators to get the best result. Unfortunately, under the constant pressure of optimising costs, many companies have now had to call time on the use of such experienced contractors and now need ways of correctly aligning machinery that are both accurate and quick and easy to use.

Laser alignment technology can fill both of these requirements but first, as with any alignment technique, some understanding of the problem of misalignment is needed before it can be corrected. Put simply, misalignment occurs when the centre lines of rotation of two machinery shafts out of alignment with each other.

This might seem self-evident, but there are in fact two types of misalignment that have to be taken into consideration.

Parallel, or offset, misalignment is the distance between the shaft centres of rotation measured at the plane of power transmission from the driving unit to the driven unit. Typically measured at the coupling centre, it is usually expressed in millimetres.

Angular misalignment, on the other hand, is the difference in the slope of one shaft, usually of the movable machine or component, as compared to the slope of the other, stationary, machine's shaft. As with indicating the slope of a hill, the units for angular misalignment refer to the 'rise' - that is, the actual separation of the shaft centre lines - at a particular distance along the shaft, both measured in mm. The distance along the shaft to which the displacement is referenced is often set to 100 mm, so angular misalignment is thus expressed as mm/100 mm or in degrees (the angle between the shafts).

In most cases, machine misalignment can be attributed to a combination of both these types of misalignment; a the situation becomes more complex when you consider the problem in three dimensions. In reality, there are two planes of potential misalignment: the horizontal (or side to side), and the vertical (up and down). Each alignment plane has its own parallel and angular components, so there are actually four alignment parameters to be measured and corrected: horizontal angularity, horizontal offset, vertical angularity and vertical offset.

Although some flexible couplings can withstand the forces resulting from as much as 3° of angular misalignment and 2 mm of offset or parallel misalignment, under most normal operating conditions excessive shaft misalignment - more than, say, 0.05 mm on a 3600 rpm machine - will generate large forces on the machine bearings, causing excessive wear on the shaft seals. In extreme cases of misalignment, the bending stresses applied to the shaft can cause it to fracture and break.



*Pictures left to right:
Shaft alignment tool TMEA 2, Belt
alignment tool BeltAlign TMEB 2 and
Fixturlaser Shaft 200 System.*



Not all cases of misalignment will be as catastrophic in their consequences, but nevertheless the advantages of ensuring proper alignment can be summed up as: longer bearing life; less stress on couplings, reduced risk of overheating; less wear on seals, minimised risk of contamination and lubricant leakage; lower energy consumption; less vibration and noise; and, perhaps most importantly, increased uptime of machinery.

So, how does laser technology offer these advantages? As a bearing manufacturer, we know all too well the negative effect that shaft misalignment can have on bearing service life. That is why we introduced our laser-based alignment system, the SKF shaft alignment tool TMEA series of measuring devices, complemented by all the accessories needed to correct any misalignments detected.

The devices in the TMEA 1 Series tool set provide a three-step process for correcting alignment: measuring, aligning and documenting.

There are three versions of the TMEA 1, including an intrinsically safe model for use in hazardous areas, but all comprise two self-contained measuring units. These are mounted opposite each other on the shafts being checked, and transmit laser beams from one to the other. A separate handheld LCD display unit is wired to the laser units and provides all the information needed to carry out the alignment check.

The principle of operation is straightforward. Just three machinery dimensions need to be measured and entered into the display unit; these are the distances between the two laser units, the distance from the first laser on the motor shaft to the front motor foot, and the distance between front and rear motor feet. With these parameters loaded and with feedback from the laser units, the display unit can then be used to calculate the actual alignment status. Measurements are taken with the shafts rotated to three different positions, 90 ° apart, to measure both the parallel and angular alignment.

After calculating the current alignment status, the display unit shows the actual values needed to correct the alignment. As this is done,

usually by inserting a variety of shims under the machinery feet, the numbers shown on the display unit decrease to zero, which indicates that proper alignment has been achieved. The process is carried out vertically and horizontally for both parallel and angular alignment.

These types of measurement are all that is required for correcting the alignment of relatively simple coupled systems, such as a motor and pump, or motor and fan, for example.

For larger systems, however, the situation can be rather more complicated. In many factories a complex machine train can be a vital part of the production process, and it's obviously crucial that all parts of the complete train are correctly lined up with each other. Starting at one end and working through machine by machine is one way of doing this, but can be very time consuming and makes the assumption that the first machine is the 'stationary' reference in the train, against which all others are aligned.

We also use another laser alignment tool, the Fixturlaser Shaft 200 system, to speed up this process. After taking measurements at every coupling in the train, the system determines the position of each machine in the train relative to the others, and selects the reference machine before any actual work starts. When the reference machine - which may be any one in the train, not necessarily the first one - has been selected, the laser system is then used in the normal way to align the rest of the train with that machine.

The advantage of allowing the measuring system to determine which element of the train should be considered as the reference machine is that bolt-bound and base-bound situations - in which a machine cannot be adjusted sideways or up and down - can easily be avoided.

Another important maintenance task that can benefit from laser technology is the alignment of belts and pulleys. Like drive shafts, belts can suffer from different types of misalignment - vertical angle, horizontal angle and parallel angle - often in combination. Some correction methods rely on aligning the faces of the pulleys, but our laser-based BeltAlign TMEB2 system actually aligns the grooves of the pulleys in which the belt runs, substantially increasing the accuracy of alignment irrespective of the thickness, make or type of pulley.

Documentation obviously plays an important part in improving reliability and many laser alignment systems feature ways of recording alignment settings and adjustments to show that a machine has been aligned to within its allowed tolerances.

Documentary evidence of correct machine alignment forms part of any good maintenance management practice, but the best record of all will be shown in the improved reliability and reduced downtime of correctly aligned machinery.



Cut out creep!

Linear motion devices, including slides and precision guides, are used throughout industry and are especially common in x-y-z positioning systems, where speed, acceleration and repeatability of movement, often within extremely tight tolerances, are essential for maximising the performance of production and process equipment.

Many of these devices use non-recirculating rolling elements, contained within a cage, as the mechanism for moving and positioning a load-bearing block or carriage along a flat or V-shaped track or guide rail. Although this method of construction is generally efficient and reliable, the rolling elements can suffer from a condition known as cage creep, which can gradually reduce the positional accuracy, repeatability and travel of the guide, eventually reaching a stage where it has to be repaired or replaced.

In a caged roller guide, the rollers are mounted between the block and rail and circulate within a metal or plastic cage, with the cage being used to separate the individual rollers to prevent rubbing, friction and drag, and in conjunction with a series of plates to ensure that rollers are held in the correct alignment; rollers are typically arranged to provide a contact angle of 45 ° for optimum efficiency and can also be constructed in a cross-roller arrangement to increase load carrying capacities.

These caged roller units have a number of benefits; for example, as lubricating grease is contained within each cage it can be applied evenly across the face of individual rollers and retained between rollers at all times, enabling operating life to be significantly extended. Similarly, caged systems can offer far higher levels of radial and lateral stiffness, compared with conventional roller bearings, can be used to move and position far higher loads and exhibit lower levels of friction, heat and operating noise.

Caged roller units can, however, suffer from a phenomenon known as cage creep. This can be especially prevalent in crossed-roller devices and is often found in systems where linear guides are in continuous use, are mounted vertically or misaligned, or where there are high levels of acceleration and variations in payloads.



Cage creep is caused by the fact that the weight bearing retainer and its ball or roller components are designed to move separately to provide smooth, low-friction motion; this is not an issue under normal operating conditions but as stresses on the mechanism increase it is possible for the lack of synchronisation between the different components to move the balls or rollers slowly from their centred position in the cage housing. This eventually results in the end of the housing making contact with the end stops of the guide rail; at this point, the individual rolling elements will begin to skid, rather than roll, thus reducing the effective stroke length, operation and lifespan of the rail guide assembly. In addition, as the cage moves further from its centred position levels of friction increase exponentially at the limits of each stroke, resulting in uneven movement and making the condition difficult to diagnose.

Indeed, cage creep is rarely recognised by end users and is often mistaken for insufficient motor torque or guide misalignment, resulting in unnecessary downtime or system modifications in an effort to resolve the problem. Even where the phenomenon is understood it is still necessary over time to re-centre the cage components, requiring either system shut down for cage repositioning or the use of larger and more expensive drive motors to deliver the necessary power to reset the cage to the centred position.

Manufacturers have developed different mechanisms to overcome the problem, with one of the most effective being the use of a simple rack and pinion mechanism that keeps cages permanently centred by synchronising the movement of the cage and roller assembly. In the system developed by SKF, the plastic moulding that forms each individual cage cell also features a small plastic toothed sprocket at its centre, with corresponding tiny notches being machined in each side of the V-shaped guide rails. As the block moves, the roller cage automatically meshes with the rail, ensuring that each set of cage components synchronise, keeping the complete cage unit correctly aligned for the lifetime of the guide and eliminating the need for recentring or replacement.

Perhaps as importantly, as the anti-cage creep mechanism is integrated within the roller cage structure, there is no increase in the overall size or weight of the linear guide; similarly, it is possible to extend the application of these devices into areas where vertical orientation, high acceleration of varying payloads would previously have caused problems.

Stainless steel for tough jobs

It is worth noting that the rack and pinion mechanisms are used only to guide and synchronise the cage components and are not load bearing as this is the function of the balls or rollers. As a result, although some older systems use metal sprockets most modern units utilise the latest high performance engineering plastics as these are lighter, less expensive to produce and, provided they are correctly designed, will provide an exceptionally long operating life with almost zero friction or noise.

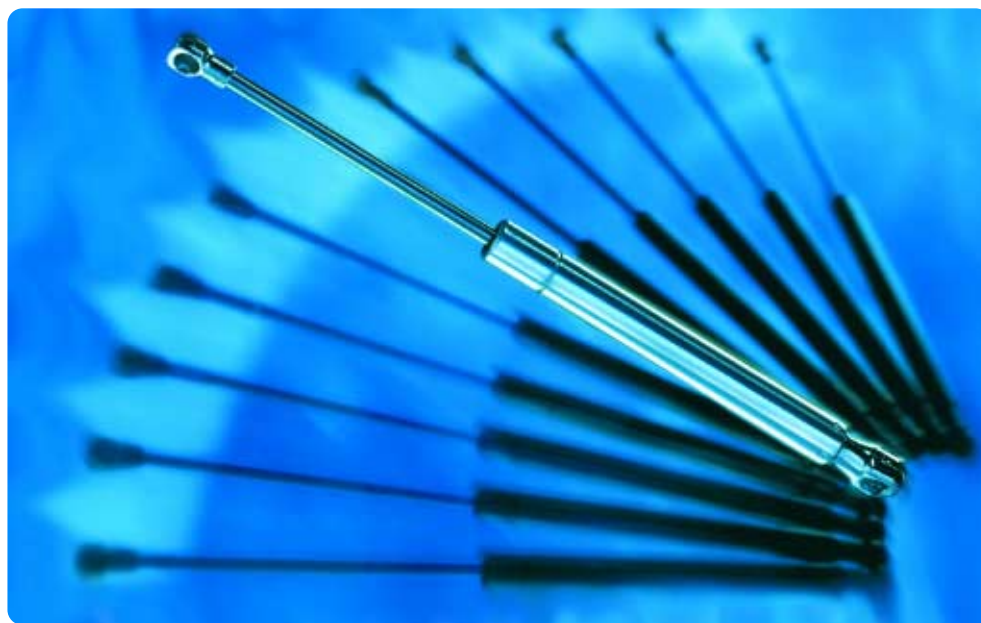
Linear roller guides offer machine builders and end users alike an extremely efficient, reliable and cost effective method of moving and positioning workloads and tool pieces, but have often been restricted in use due to the problems associated with cage creep. Now, with the addition of the latest anti-creep technology, it is possible to expand significantly the use of these devices into an even wider range of applications.

Cage creep technology

Our Anti-Creep System (ACS) completely eliminates the problem of cage creep by synchronising the movement of the cage and roller assembly, using the plastic moulded cage to enclose a small plastic sprocket in its centre. This meshes with tiny notches machined in the bottom of each of the V-shaped guide way, creating a low-duty rack and pinion drive that automatically optimises the cage position throughout the stroke of the rail.

The ACS technology has been introduced with our modular range of LWRE precision linear guideways to provide the option of direct interchangeability within the three standard cross-section dimensions of 18 x 8 mm, 31 x 15 mm and 44 x 22 mm.

The LWRE Cross Roller Series has already achieved considerable application success. When compared with a traditional linear rail design that utilises only about 40 % of the roller length, the LWRE optimises internal geometry in conjunction with larger rollers to enable a 100 % increase in stiffness with a five-fold increase in load carrying capacity, while maintaining the same cross-sectional dimensions. These higher performance characteristics not only ensure better performance with increased wear resistance, but also give you the choice to upgrade the specification and capability, or downsize the assembly to a more compact unit.



The latest Stabilus INOX stainless steel gas springs have been introduced for use in demanding industrial, process and marine applications, where they provide excellent resistance to harsh use and aggressive environments. In addition, the latest Stabilus products are iron-free, so they do not interfere with magnetic fields, making them ideal for use in scanners and medical equipment, and use only environmentally friendly oils that are biodegradable and are therefore safe for use in the water industry.

INOX gas springs offer proven and reliable method of counterbalancing large covers and of lifting, lowering and positioning heavy or

cumbersome objects. They are far more versatile than mechanical springs, as they provide speed-controlled dampening, cushioned end motion, simple mounting, compact size, flat force curve, and a wide range of available forces.

INOX gas springs incorporate hydropneumatic adjusting elements, consisting of a pressure tube, a piston rod with piston and appropriate connection fittings. Each tube is filled with compressed nitrogen, which acts with equal pressure on differently dimensioned cross-sectional areas of the piston. This produces a force in the extension direction, which can be precisely controlled by careful selection of the filling pressure.

High load ball screws

Designed to bridge the gap between conventional ball screws and precision roller screws, our new family of High Load ball screws offers OEMs and end-users alike an alternative to traditional hydraulic or pneumatic systems in an extensive range of applications.

Ideal for use where standard ball screws have insufficient load carrying capacity, but where the high acceleration and deceleration capabilities of precision roller screws are not needed, High Load ball screws are available in 10 sizes for use with static loads up to 3320 kN.

The enhanced load capacity of these innovative and economically priced products is achieved by the use of larger balls than standard ball screws, combined with high precision shaft and nut assemblies.





Global monitoring for the QM2

Queen Mary 2 is the largest, longest, widest and most expensive passenger vessel ever built, she also has the biggest and most powerful pod propulsion system to date, with each pod constantly being checked by a condition monitoring system that includes remote monitoring by satellite.



For anyone familiar with conventional ship propulsion systems the Rolls-Royce Mermaid™ pod propulsion system fitted to the QM 2 comes as quite a surprise. Instead of the usual large diesel

engine driving a shaft and propeller, four pods are suspended below the ship's hull: two are fixed and two can rotate 360°.

Each pod contains an electric motor with a small shaft that projects from the pod to provide the propeller mounting. Four diesel engines and two gas turbines drive the generators that provide 118 MW of electrical power - enough to power a city of 300,000 people. The propulsion system takes more than two thirds of this power with each pod drawing 21.5 MW during full power, to produce a top speed of 30 knots. The diesel engines operate at constant speed, with the speed of the pod motors being controlled through transformers and frequency converters.

This means that the QM 2 never emits huge clouds of sooty black smoke whenever it has to accelerate during a cruise, eliminating the

clouds of unburnt fuel and smoke that are often associated with the acceleration of large diesels. Another surprising feature is that the QM 2 has no rudder or stern thrusters. Steering and manoeuvring of the ship are achieved by swivelling the two rotating pods. This significantly improves the ship's turning ability and gives unparalleled manoeuvring potential in tight channels or ports.

Pod propulsion provides other benefits that please passengers and ship owners. For passengers the ship seems much quieter than a ship with diesel, shaft and propeller propulsion, with a noticeable lack of vibration, even when approaching speeds of 30 knots. For the ship owner there is more space for cabins, cargo or equipment, together with significant savings in fuel.

To detect and give an early warning of any future mechanical problem in any of the four propulsion pods, an on-line condition monitoring system based on the SKF MasCon48 has been installed.

The system is designed to measure vibration, temperature, speed and other significant parameters. It then relays the presence of any anomalies to maintenance personnel on board,

together with advice for correcting any existing or impending condition. At the same time, the data is relayed via satellite to the SKF Condition Monitoring Centre in Luleå or to the Rolls-Royce Control Centre in Kristinehamn, Sweden. Alarms are presented as clear text messages to the maintenance crew on board together with additional information showing the condition of different pod components such as a bent shaft, cavitation, bearing condition and electrical faults.

One special problem that the MasCon48 system had to overcome was the pod operating environment. Signals from a pod have to be transmitted using slip rings; however, whenever the ship performs some manoeuvre such as increasing speed or changing course, the pod vibration pattern changes from the normal pattern recorded when cruising. This disturbance of the vibration pattern continues for some time after the manoeuvre and must be taken into account by the monitoring system. To do this the system is designed with rule-based diagnostics and a special gating system that checks the ship's speed, shaft speed and steering angle, before calculating when conditions are stable enough for normal monitoring to be resumed, eliminating the possibility of false alarms.

The latest catalogues for engineering professionals

On this page you'll 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.

SNL plummer block housings



A 84-page catalogue outlining SKF's range of SNL bearing housings. These are mainly intended for self-aligning ball bearings, spherical roller bearings and CARB bearings.

Ref. 4403/III E

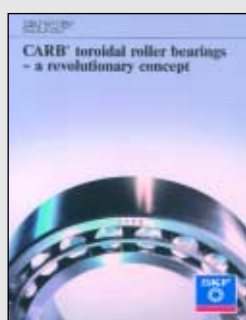
Plain bearings and rod ends



This 136-page catalogue contains technical information on plain bearings and rod ends which are used in a variety of applications in almost all sectors of industry.

Ref. 4407 E

CARB toroidal roller bearings



A 84-page catalogue profiles the CARB toroidal roller bearings. This revolutionary bearing design offers considerable application benefits such as high load carrying capacity, increased performance or downsizing and reduced vibration.

Ref. 5102 E

Linear motion product range



This 170-page catalogue provides an overview of SKF's full range of products, systems and solutions available from its Linear Motion and Precision Technologies business unit.

Ref. 4664/3 E

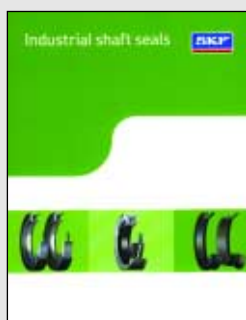
ConCentra ball bearing units



A 28-page brochure profiling the range of ready-to-install mounted products. Typically used where there are high speeds and moderate loads, and where vibration, low noise and minimal maintenance are key operating parameters.

Ref. 6107 EN

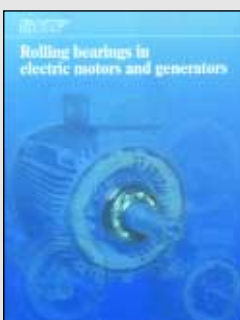
Industrial shaft seals



This 380-page catalogue contains seals intended for the sealing of openings between a rotating and a stationary component or between two components in relative motion.

Ref. 5300 EN

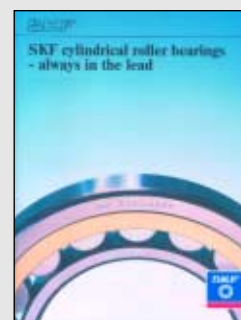
Rolling bearings in electric motors



This 114-page handbook is designed for both industrial designers and end-users involved with bearing selection in electric motors and generators.

Ref. 5230 E

Cylindrical roller bearings



This 68-page catalogue profiles the range of SKF cylindrical roller bearings. Typical applications include industrial gearboxes, electric motors, pumps and compressors, and material handling equipment.

Ref. 5108 E

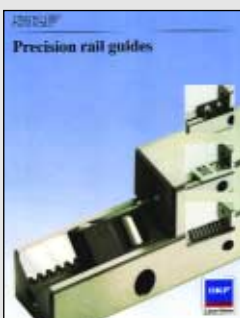
Slewing bearings



This 40-page catalogue lists the SKF slewing bearings stock range, including the L-shape range plus other standard items.

Ref. 4031 E

Precision rail guides



This 52-page catalogue profiles the SKF modular range of precision rail guides. Contents include technical characteristics, dimensional accuracy, grading and selection criteria.

Ref. 4183/XIV E

Composite plain bearings



A 60-page catalogue detailing the range of compact and maintenance-free plain bearings. Range included plain and flanged bushings, thrust washers and strips in both PTFE and POM composite.

Ref. 6110 EN



Flawless arguments for SKF tapered roller bearings



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Reader reply service

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