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Maintenance, reliability and asset optimization

Technologies and services from SKF





Reaping the rewards of reliability with SKF knowledge



What is the value of asset reliability? If you could effectively predict, plan, and prevent downtime, what would it mean to you – in monetary terms – for operations, maintenance, and plant management?

At SKF, our experience has confirmed that when maintenance activities are conducted more efficiently and effectively, value is created at all levels of an organization. By extending the life of critical assets, inventory and parts costs go down, resulting in significant savings. Depending on market conditions, these savings can be dwarfed by increased revenues resulting from greater machine availability and elimination of unanticipated downtime.

As the world leader in bearing technology for more than 100 years, SKF has a unique understanding of rotating equipment and how machine components and industrial processes are interrelated. This knowledge – coupled with our expertise in sealing solutions, lubrication systems, mechatronics and services – enables us to deliver real-world solutions for optimum machine reliability.

For example, moving from reactive to proactive maintenance results in labor cost savings from contractors and overtime, and enables the reallocation of maintenance personnel to spend more time on higher value tasks. Additional potential savings from reduced energy and lubricant usage help you reduce total cost of asset ownership and quickly recoup the cost of your reliability investment.

Through a proven methodology we call Asset Efficiency Optimization (AEO), SKF delivers solutions that make your assets more productive, producing more without increasing capital spending on new equipment, ultimately increasing your Return on Assets (ROA).



Through our global SKF Reliability Systems organization, SKF provides a range of tools, technologies and support services that is unmatched by any other company.



edge, expertise and experience

- **Over 100 years of experience in rotating equipment**

As a component supplier and design partner to manufacturers of industrial equipment, we know how your machinery works and how to make it work more efficiently.

- **Decades of application experience**

SKF application engineers and/or industrial specialists understand the processes that drive your business and how to balance throughput demands with long-term asset management goals.

- **Leadership in condition monitoring technology**

SKF has pioneered many of the world's leading condition monitoring tools and technologies, proven on the job in thousands of industrial facilities worldwide.

- **Integrated hardware and software solutions**

We offer a complete range of condition monitoring solutions, both handheld and online, as well as integrated software that enables optimum use of data, enterprise-wide.

- **A full range of mechanical services**

SKF can perform expert balancing, alignment, spindle repair, bearing installation and remanufacturing, and other critical services to optimize your machinery and your manpower resources.

- **Machine upgrades**

SKF engineers can analyze your most critical equipment and processes, and offer recommendations for machine upgrades that can extend service life and improve reliability.

- **Expert training and technical support**

SKF offers dedicated technical support and a range of training courses to help your team develop best-in-class practices for long-term machine reliability and profitability. We also provide remote condition monitoring services, supported by expert data analysis and internet-based communications capabilities.

- **Asset management consulting services**

Close working partnerships with our customers have given us a unique understanding of the processes and challenges specific to every major industry. Drawing on our experience with other companies in your sector, SKF can help you plan and execute a successful asset management program in line with your overall business objectives.

- **Energy and sustainability and environmental services**

SKF offers a range of tools and services that can help uncover opportunities for improved energy efficiency and reduced environmental impact.

- **A global footprint**

With operations in more than 130 countries across Europe, the Americas, Asia and Africa, our global infrastructure supports your needs internationally.



A pioneer in the condition monitoring field since its inception, SKF has continued to lead the way with new products, systems and services that enable industrial facilities to shift from traditional repair-focused maintenance to a proactive, reliability- and risk-focused process

Asset Efficiency Optimization (AEO)

A proven methodology for effective asset lifecycle management



The AEO process begins with identifying opportunities for improvement throughout an operation or enterprise. Our consultants work to understand your business goals, application challenges and plant culture to create a road map for improving reliability and profitability.

The Asset Efficiency Optimization (AEO) methodology combines the in-depth knowledge, broad industrial experience and global service and consulting capabilities from SKF with our world class products and technologies. The end result is a clear understanding of our customers' business goals, and an ability that is unmatched in industry to offer unique solutions that deliver real value.

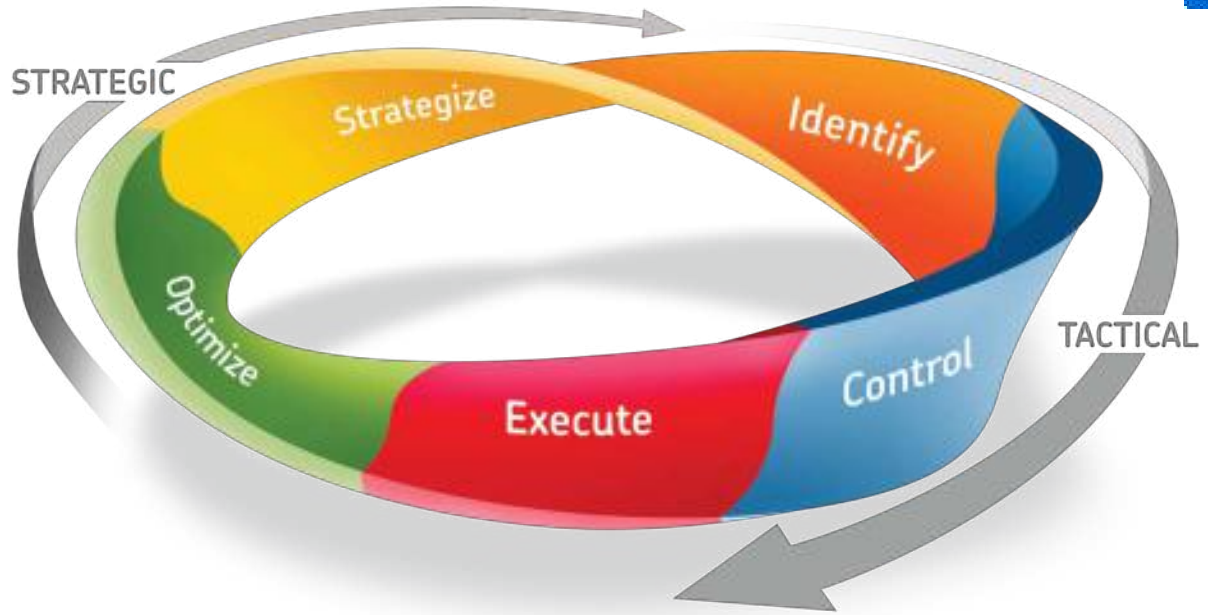
Implementing AEO effectively requires being able to ask and answer the following five questions routinely, accurately, at the same time, and across your unique organization:

- What must I do?
- Why must I do it?
- Who must do it, when?
- How must I do it?
- What must I do next time?

The Asset Efficiency Optimization methodology combines a broad range of strategic and tactical tools to help you answer these questions to achieve maximum effectiveness and efficiency to reduce your Total Cost of Ownership (TCO).

SKF will work with you to define areas of focus in order to get the fastest return on your investment. Your customized AEO programme can include everything from training and logistics, to a full predictive maintenance (PdM) service contract with qualified manpower and technology to help maintain your plant – even remotely.

SKF expertise in machinery maintenance and operational efficiency can help you reduce your energy usage and improve the sustainability footprint of your plant.





Strategize
“Why”

Defining and measuring success

This phase involves evaluating work activities and defining parameters by which success will ultimately be measured. Key to success is identifying the most critical assets, and then moving from reactive to predictive maintenance strategies. It is important to decide what is the optimum maintenance strategy for each asset including the frequency, type and combination of inspections.



Identify
“What”

Identifying asset performance

Based upon the strategy tied to your unique business goals, appropriate inspections are conducted, using advanced condition monitoring tools linked to your facility’s maintenance management system. Decision-making is optimized via plant-wide integration of information, enabling problems to be identified before consequences grow.



Control
“When and Who”

Controlling work logistics

The control phase defines who must do what, when, and establishes standard procedures for planning and scheduling work identified via your maintenance management system. Tasks are organized and based on a range of pre-ranked factors, such as criticality, redundancy and safety. Supply process and logistics, including your spare parts program, are optimized.



Execute
“How”

Executing maintenance tasks

This phase is all about how best to execute the work tasks identified earlier. It involves developing “precision” skills needed to perform maintenance optimally, and applying root cause analysis to correct recurring programs and drive improvements during strategy review. Expert SKF services are available, if needed, to make machine improvements or upgrades to improve machine reliability and availability.



Optimize
“What’s next?”

Leveraging what you have learned

This phase closes the loop of Asset Efficiency Optimization. Post-maintenance testing data is used to evaluate success, based on previously established benchmarks. New insights are used to refine each phase of the process. By applying and leveraging what has been learned, the value of your investment in AEO is continuously multiplied.



Power plants

Working with a large utility, SKF developed a Proactive Maintenance Programme for key systems across 27 coal and gas-fired units in 15 plants. Following a 30-month assessment and implementation period, the utility reported a 30% reduction in equivalent forced outage rate, a 7% increase in peak period reliability and 30-40% reductions in high priority corrective work.



Oil refineries

At a major refinery in Bulgaria, SKF analysts developed and put into practice an optimized reliability-based maintenance strategy, as well as a Risk-Based Inspection (RBI) study on mechanical integrity. Pleased with the overall results and noting positive cultural changes in medium-level engineers, management asked SKF to complete an additional programme for three more units.

SKF Asset Management Services

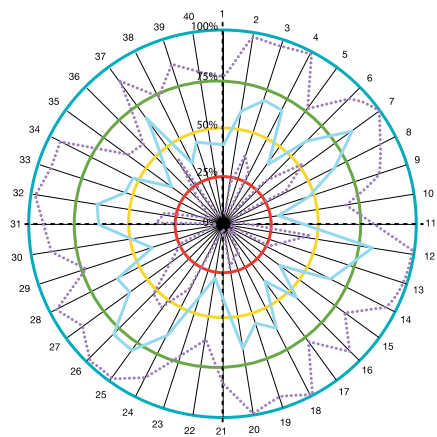
The people, processes and technology to optimize asset efficiency

With SKF Asset Management Services, we apply our Asset Efficiency Optimization (AEO) process to your operation. First, our Consultancy service experts help you identify improvement opportunities and develop plans to achieve them. SKF can then implement and execute your plan, or train your team to do so. SKF works with you to do whatever is best for your bottom line.



Consultancy services

Starting with our Client Needs Analysis (CNA), we apply our AEO methodology to uncover asset performance issues. The CNA results help us identify areas for improving plant reliability that can yield bottom-line results.



SKF Client Needs Analysis

Conducted with key members of your organization and a team of SKF professionals, the Client Needs Analysis provides a progressive, structured approach to assessment. A "spider chart" illustrating a micro-level assessment helps you gain a unique perspective on your reliability programme.

SKF Client Needs Analysis – Asset Management

Conducted between key members of your organization and SKF, the Client Needs Analysis begins with a 40-question survey that provides a snapshot of your plant's maintenance situation. SKF also considers several other industry-specific maintenance and reliability aspects, in order to develop an analysis tailored to your needs.



Maintenance Strategy Review

This process helps ensure that you are performing the right maintenance, on the right equipment, at the right time, with the right people, for the right reasons. Ultimate goals include reducing equipment damage and losses, increasing availability and reliability, and reducing overall maintenance costs.



Spares Optimization and Management

SKF Spares Optimization and Management can help plants reduce inventory costs and the risk of running out of stock. By providing a justifiable basis for carrying a given inventory, plus linking spare parts levels to asset criticality, SKF can help you cut purchasing, supply and inventory costs while maintaining your optimum spare parts inventory.



Root Cause Analysis

Root Cause Analysis (RCA) is a process that identifies the events responsible for machine failures and uses that information to help prevent future failures. After investigating three basic types of failure causes – physical or technical, human errors of omission or commission, and those related to an organization’s systems, operating procedures and decision making – SKF delivers a report on failure causes and effects, plus a comprehensive plan of corrective actions to prevent recurrence.



HPI, Oil and Gas

Recurring fan failures were costing a chemical manufacturing facility an average of \$7 500 in repairs per fan. After pinpointing the root cause of the failures, SKF used the Proactive Reliability Maintenance process to implement and maintain reliability improvements. By eliminating the unplanned downtime, the programme saved the company more than \$2,5 million annually.

Planned Maintenance Routines

When asset management is business-critical for your organization, look to SKF to configure, support, interface to and help deploy a planned maintenance routine. Benefits of a planned maintenance routine include increased maintenance productivity, greater reliability of existing capacity, improvement in uptime, and enhanced personnel satisfaction by meeting production targets and business goals. Effective planning and scheduling results in efficient Planned Maintenance Routines that can be incorporated into new or existing Computerized Maintenance Management Systems (CMMS) or Enterprise Asset Management Systems (EAM).

Software modules – AMST

Asset Management Support Tool (AMST) software from SKF evaluates your facility and systems, determines criticality and formulates a maintenance strategy to meet your specific needs.



Service contracts

Once we have assessed your situation and developed an asset management plan for success, you can choose to have SKF implement and/or manage it with one of our following Service contracts.

Predictive Maintenance

Predictive Maintenance programmes try to detect machine conditions that will lead to failure and estimate the amount of time before that failure occurs. In addition to these PdM basics, an SKF Predictive Maintenance service contract also includes a determination of which proactive tasks can help extend machine life.



Metals

Asset management services provided by SKF helped an integrated mill in Brazil raise output by 2, 240 tonnes and save \$402 000 over a 3-year period. By addressing mechanical failures of intermediate gearboxes, the plant reduced downtime of the rolling mill by over 50%.

Proactive Reliability Maintenance

An SKF PRM service contract applies best practice predictive maintenance activities and other processes to diagnose root causes of failures systematically. SKF then takes steps to help eliminate reoccurrences. The process includes using performance indicators and operational reviews to help you reach industry benchmarks.



SKF Integrated Maintenance Solutions

An SKF Integrated Maintenance Solution (IMS) is a performance-based partnership agreement. SKF creates and implements your asset management strategy, then your organization and SKF share the positive results. IMS contracts are customized to address your unique operation and business goals, but typically include assessment, inventory management, maintenance strategy, proactive reliability maintenance and more.



Integrated condition monitoring

Industry-leading tools and technologies for optimized machine maintenance



Cement Industry

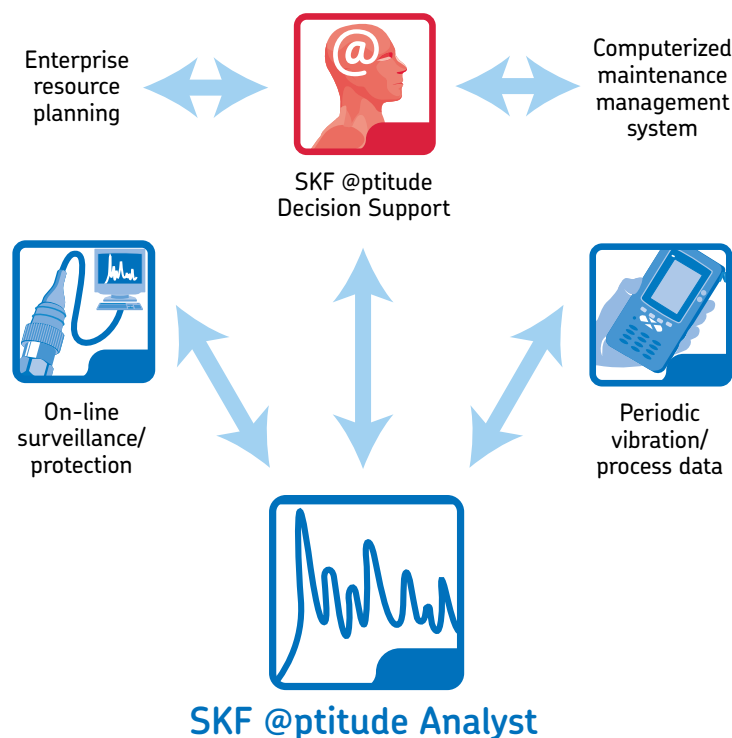
Reliability problems resolved by SKF analysis and services in a cement plant's horizontal grinding mill doubled the repair interval and reduced energy consumption up to 2%. Total savings per grinding mill were almost \$26 000 per year based on SKF's use of thermography, vibration analysis, and alignment.

From pens to protection, SKF provides a complete, integrated suite of enabling technologies to help you achieve overall equipment effectiveness. We call it the SKF @ptitude asset management system.

Designed to work seamlessly together and with a facility's CMMS, ERP or other plant-wide system, SKF @ptitude hardware and software components make it easier to collect, analyze, use and share machine condition data to:

- Improve operational efficiency and eliminate unplanned downtime
- Reduce maintenance costs and optimize manpower resources
- Integrate all machine condition data into one common program
- Share data seamlessly across functional lines
- Avoid long learning curves and software platform compatibility issues
- Replicate your success at other facilities
- Build the expertise of your knowledgeable people into your decision support software

Whether your programme is just getting off the ground or you want to take it to the next level, SKF condition monitoring solutions can help.



With one software platform that supports cross-communication, SKF @ptitude enables collaboration between your maintenance and operations departments, ultimately allowing a more effective, comprehensive asset management programme.



Basic handheld tools

SKF handheld condition monitoring tools put the benefits of condition-based maintenance within reach for experts and novices alike. This basic equipment range allows users to spot-check critical machines and establish trends needed to identify problems early on, before they result in costly downtime.



Portable data collectors and analyzers

The SKF Microlog series of portable data collectors and analyzers can handle all tasks needed to perform predictive maintenance and on the spot analysis of rotating machinery. Units in the series are supported by SKF @ptitude software.



Pulp and Paper

An integrated SKF condition monitoring programme enabled a major UK paper and board manufacturer running five shifts to avoid damaged product and costly downtime. The programme included a full SKF online condition monitoring surveillance system incorporating 18 SKF Local Monitoring Units (LMUs), which log and process machine data for felt rolls, drying cylinders and press rolls.



On-line surveillance and protection

The SKF Multilog series of on-line monitoring systems use permanently installed sensors to alert plant personnel to deteriorating machine condition changes. Ideal for unsafe or hard-to-reach locations, SKF Multilog systems transmit data to a host computer running SKF @ptitude Monitoring Suite software.



Wind energy

SKF WindCon, an on-line surveillance system, enabled a United Kingdom-based wind farm to continuously monitor the damaged gearbox of a turbine. The ability to postpone replacement of the gearbox for nearly twelve months enabled the operator to accrue interest on the money needed for the overhaul, which was almost enough to pay for the SKF WindCon installation.

Integrated condition monitoring, cont'd



Electrical motor test equipment

Part of SKF since 2007, Baker Instrument Company is the industry leader in electrical motor test equipment for condition monitoring, predictive maintenance, motor manufacturing and repair. Baker Instrument solutions include a wide range of products for static testing and dynamic motor monitoring designed to help plants avoid unexpected downtime and electric motor failures.



Power plants

Using advanced Baker Instrument Company electrical analysis tools, SKF helped a North American coal-fired power plant verify that one of its submerged circulating water pumps was in risk of imminent failure. The timely intervention on that first pump helped the plant save \$3,5 million in lost generation revenue when a second pump broke a shaft and required five weeks worth of repairs.



Operator Driven Reliability (ODR) tools

Equipment operators are usually the first to detect even the smallest changes in machine conditions. The SKF Microlog Inspector series of handheld mobile computers allows operators to communicate findings and initiate timely corrective actions. These SKF tools also facilitate communication between departments, making it easier to implement and run an ODR program.



Food and Beverage

Through an Operator Driven Reliability programme from SKF, a chocolate manufacturer with 2000 inspection points was able to reduce maintenance administration by one man day per week and achieve a one percent reduced production loss for an annual production increase of 250 000 tons. SKF supplied the necessary hardware, software, installation service and employee training.

SKF @ptitude Decision Support

This dedicated decision support software links with a range of data sources including ERP and EAM/CMMS to facilitate accurate, timely, and consistent decision making and work order notification – within a single plant or across multiple facilities. By fusing knowledge from diverse sources, the software provides information essential to effective machine and process analysis, diagnosis, reporting and corrective action. Overall plant efficiency is improved by replacing labour-intensive data analysis with an automated process that identifies the probability of specific faults within an asset or process and then prescribes appropriate action.



Lubrication Management

Set the stage for achieving a world-class lubrication programme

Poor lubrication accounts for more than 36% of premature bearing failures. Include bearing contamination, and this number rises to well above 50%. Clearly, optimum lubrication is key to bearing service life.

Consultancy services

- **SKF Client Needs Analysis – Lubrication Management** will highlight your plant's maturity with regards to lubrication practices. Within a day, you will get a snapshot of you plant's situation based on forty questions.
- **SKF Lubrication Audit** is an in-depth analysis of your plant's lubrication programme, taking several days to complete. You will get a report including the strengths and weaknesses, your improvement opportunities and a proposal for improvement projects with a return on investment calculation.



Although lubrication is often one of the major causes of failure, inadequate attention is paid to it. This is typically reflected in the budget allocated to lubrication.

Lubrication services

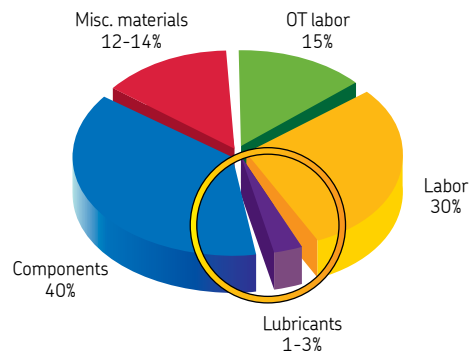
- Installation and start-up of centralized lubrication systems
- Services of the existing centralized lubrication systems
- Lubricant suitability test for a centralized lubrication system
- Oil analysis
- Training

Lubrication software

- **SKF Lube Select** can assist you in determining the most suitable grease for your bearings and working conditions.
- **SKF DialSet** helps establish optimal relubrication intervals and lubricant quantities for any application. It also determines proper automatic lubrication system settings.
- **SKF Lubrication Planner** helps you to develop and follow up your lubrication plan.

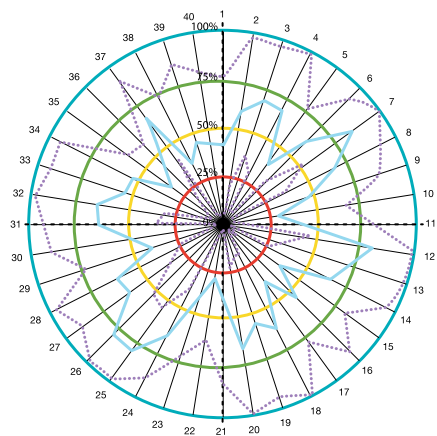


Typical maintenance budget divisions



Energy and Sustainability Management Solutions

Optimizing asset efficiency saves energy, reduces emissions, and cuts waste



SKF Client Needs Analysis – Energy and Sustainability

Identifies opportunities for improvement and establishes benchmarks against your industry

By applying AEO and condition monitoring technologies to improve asset reliability and optimize efficiency, improvements can also be made in the areas of energy efficiency and sustainability.

The first step is the SKF Client Needs Analysis – Energy and Sustainability. This is a comprehensive assessment which examines energy usage, chemical treatments, lubrication use and other operating processes that could be improved to reduce environmental impacts within a facility.

The assessment, conducted jointly by SKF and key plant personnel, typically focuses on these four key areas:

- Energy and environmental management
- Energy efficient tools
- Energy efficient operations
- Environmental controls

The outcome is a detailed report highlighting the areas where improvements can be made. Solutions can be far ranging, from upgrading equipment with energy-saving components to converting entire production processes to more efficient technologies. Many have been implemented – and proven effective – in SKF’s own manufacturing plants.



Cement industry

Reliability problems resolved by SKF analysis and services in a horizontal grinding mill doubled the repair interval and reduced energy consumption up to 2%. Total savings per grinding mill was almost \$26 000 per year based on SKF’s use of thermography, vibration analysis, and alignment.

SKF Client Needs Analysis – Energy and Sustainability

This extensive assessment tool helps operations uncover opportunities for energy efficiency improvements. It also examines chemical treatments, lubrication use and other operating processes that could be improved to reduce your facility’s environmental impact.



Energy Monitoring Services – Compressed Air Systems

According to US Department of Energy assessments, up to 30% of compressed air system capacity can be lost to leaks. This SKF program helps plants prevent such losses, cutting CO₂ emissions and costs in the process. Services can be executed by SKF or with internal staff trained by SKF.



Energy Monitoring Services – Pump Systems

This comprehensive energy management program helps plants identify opportunities to reduce pump-related energy costs. By using your plant staff (trained by SKF), or SKF experts to carry out routine measurements and monitor pump energy efficiency, you can determine when it is most cost-effective to repair a worn pump.



Energy Monitoring Service – Fan Systems

Many assessments suggest that energy costs for fan systems can be reduced by 20% or more, simply by improving fan and system efficiency. By using plant staff (trained by SKF), or contracting with SKF to carry out routine measurements and monitor fan energy efficiency, you can determine when it is cost effective to repair a worn or damaged fan.



Shopfloor Awareness Cards

Along with presenting specific topics in easy-to-understand, non-technical terms, Shopfloor Awareness cards from SKF encourage employees to come up with ideas for saving energy and money across the plant. Increasing energy awareness in your plant or facility is the first step in making progress, and often has the largest payback.



Energy-saving components and products

From SKF E2 bearings – a family of performance class bearings that operate with 30% less friction than standard SKF bearings – to low-friction lubricants that help minimize lubricant and energy use, SKF offers many energy-saving components and products. Solutions include power transmission products – belts, pulleys, chains, sprockets, couplings, bushings and hubs – all designed to cut energy consumption.

Energy and Sustainability Management training

The energy and sustainability management (ESM) energy monitoring service solutions are all accompanied by a comprehensive training course that can prepare clients to confidently deliver energy monitoring services for pumps, fans, and compressed air systems.



Pulp and paper

SKF helped a pulp and paper mill determine why its production-critical roof fans were failing regularly. The problem? High belt tension and pulley misalignment. SKF corrected these issues by recalculating the drive, creating mounting and tensioning guidelines, and ensuring proper belt tension and pulley alignment. The result? The mill cut its energy consumption by 6% and boosted overall reliability.



SKF factory

A Client Needs Analysis – Energy and Sustainability performed at one of SKF’s own factories identified leaks in a compressed air system. Addressing the problem improved air compressor operation and resulted in energy savings estimated at \$38 000 per year.

Maintenance Products

A wide range of tools and technologies for maximizing the bearing life cycle



Laser shaft alignment tools

Shaft misalignment is responsible for up to 50% of all costs related to rotating machinery breakdowns. To help save costs and ensure proper shaft alignment, SKF offers a range of high precision, easy-to-use laser shaft alignment tools. The SKF TKSA 60 and TKSA 80 Shaft Alignment Systems incorporate wireless technology and provide expert guidance from preparation, inspection and evaluation through correction, reporting and analysis.



While every bearing has a pre-calculated service lifetime, research shows that not every bearing achieves it. When bearings fail to last for as long as they should, it is generally due to improper maintenance during key stages of the bearing life cycle. These can have a major impact on a bearing service lifetime, and include mounting, lubrication, alignment, basic condition monitoring and dismantling.

Organized according to these five bearing life cycle stages, SKF Maintenance products reflect the range of maintenance tasks required for each stage. By applying the right maintenance practices and using the right tools, you can considerably extend your bearing's service life and increase plant productivity and efficiency.



Mounting

Includes mechanical fitting tools, induction heaters and hydraulic equipment.

Lubrication

Includes bearing greases, manual and automatic lubricators, and lubrication accessories.

Alignment

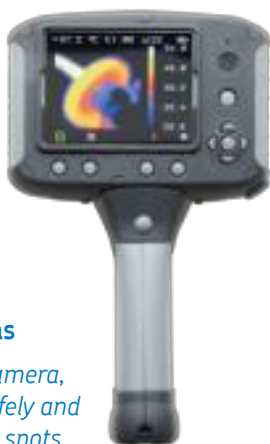
Includes shaft alignment tools, belt alignment tools and machinery shims.

Basic condition monitoring

Includes temperature, sound, visual inspection, speed, electrical discharge and vibration measuring instruments.

Dismantling

Includes mechanical and hydraulic pullers, induction heaters and hydraulic equipment.



Thermal cameras

With a thermal camera, you can easily, safely and quickly detect hot spots before they can cause machine failure. To help detect trouble in an early stage, SKF offers a range of thermal cameras.

SKF Authorized Distributor Services

Supporting customer resources with expert maintenance and repair services



Today, maintenance managers face a difficult task: Although their staff may be very good, they have a large group of machines to look after and may not be able to follow precision maintenance practices. Recognizing the need for supplemental resources, SKF offers a broad range of maintenance services to help companies achieve their maintenance goals. These include bearing mounting and dismounting, shaft balancing and alignment, lubrication services and more.



SKF Certified Maintenance Partners

In addition, industrial facilities can contract for specialized services with SKF Certified Maintenance Partners (CMP) – SKF Authorized Distributors who have received advanced machine reliability training. Using a range of proprietary SKF tools and analysis software, SKF Certified Maintenance Partners can help customers monitor machine operation, predict machine failures and uncover hidden cost-saving opportunities. Your SKF Certified Maintenance Partner can also help you implement a range of upgrades and replacement components, all supported by the global resources of SKF.



Mining machine data

Depending on your goals and your plant's specific needs, your SKF Certified Maintenance Partner will collect and analyze a much broader range of data than most predictive-maintenance service providers.



SKF Certified Electric Motor Rebuilders

Electric motors are among the highest in reliability incident reports, and 40% to 70% of motor failures are related to bearings. The SKF Certified Rebuilder Programme enables industrial facilities to partner with a local repair shop that offers the right experience and expertise to quickly, efficiently, and effectively diagnose and fix electric motors. To earn the designation of SKF Certified Rebuilder, shop technicians must complete extensive training in electric motor analysis, bearing installation, lubrication systems, and condition monitoring technologies. This translates into longer, more reliable motor service life and, ultimately, higher productivity and profitability.



SKF Machine Tool Precision Services

Improving overall equipment effectiveness for machine tool users



Benefits include:

- Extended operating life cycle of machine tools
- Lower overall maintenance cost
- Reduced life cycle cost
- Enhanced reliability, maximum uptime
- Reduced likelihood of failures
- Improved overall asset reliability



Keeping machine tool assets running in peak condition is vital to manufacturing operations. At the heart of this equipment is the spindle – so important to overall productivity, quality and efficiency that SKF has developed a specialized service programme just to manage this critical plant asset.

SKF is the world's largest provider of spindle reconditioning services, delivering a wide range of highly specialized expert services – from engineering upgrades to spindle analysis and reconditioning of all brands and models of spindles. SKF condition monitoring capabilities make it possible to know well in advance when spindle bearings will require servicing.

SKF customers have access to on- and off-site services based on a global network of dedicated service centres and a reliability engineering force armed with the latest knowledge, technologies and equipment. In addition, SKF can provide expert consultancy and asset management services to optimize Overall Equipment Effectiveness.



Spindle reconditioning

At SKF Spindle Service Centres, spindles go through a rigorous reconditioning process that includes damage identification and estimated cause of spindle failure and, if appropriate, recommendations for modifications and upgrades. Reconditioning is followed by a total condition and functional review as well as comprehensive testing prior to delivery.

On-site services

SKF offers an on-site spindle condition check that includes suggestions to help customers evaluate the spindle condition as a base for predictive maintenance services (PdM). SKF experts use sophisticated condition monitoring equipment to assess and identify developing problems with spindles, helping to eliminate costly unplanned shutdowns.

Spindle Hotel and spare parts inventory

The Spindle Hotel provides proper storage of refurbished spindles to guarantee readiness and instant shipment when needed. This secured storage can include scheduled test runs and extended warranties. SKF can also maintain an inventory of essential spares such as super-precision bearings, ball screws, guides, and lubrication units. A worldwide network of SKF Authorized distributors assures timely delivery.

Bearing remanufacturing services

Extend bearing lifecycles to reduce total cost of ownership



For operations using large bore bearings, replacing them is an expensive proposition, both in new bearing costs and lost productivity. SKF has a far more affordable, sustainable alternative. Today, we routinely take bearings slated for scrapping and remanufacture them, reinstating the theoretical remaining life capacity and performance for extended service.

Bearing remanufacturing services from SKF enable you to save your sizeable investment in large bore bearings by revitalizing the valuable materials, energy and skills that originally created each bearing.

The process requires up to 90% less energy than manufacturing a new bearing, producing significantly less CO₂ while avoiding the scrapping of components and the unnecessary use of new natural resources.

The resulting benefits can help facilities with large bore bearings:

- Extend bearing lifecycles
- Substantial cost savings compared to a new bearing
- Improve uptime by increasing machine availability

Through root cause failure analysis (RCFA), it is often possible to determine the cause of a bearing's failure. In addition to performing this service, SKF can recommend actions to eliminate the problem in the future to extend bearing life.



Bearing remanufacturing candidates

Bearings with a 250 mm (10") outer diameter and larger are generally more economical to remanufacture. However, smaller bearings can be remanufactured upon request, as can bearings produced by other manufacturers.

A service level for every need

From minimal repairs to extensive rebuilds, SKF offers a range of service levels to return your bearings to the theoretical remaining life capacity and performance quickly and cost-effectively.



Power plants

A 1,000 MW coal-fired power station identified six pulverizer roll wheel bearings that required overhaul before the pulverizer could return to service. SKF remanufacturing services saved the plant \$9 827 in new bearing purchases and related costs, plus five months of potential reduced power production worth over an estimated \$1,2 million in lost revenue.



Mining

Already familiar with the benefits of remanufacturing the bearings in its conveyor drive drums, an opencast lignite mine asked SKF to analyze opportunities for savings in other applications. SKF was able to remanufacture half of the mine's dismantled bearings, as well, resulting in savings of €605 000 through reduced replacement and warehousing costs.

Training and Knowledge Management

Onsite or on-line, training opportunities for management and maintenance personnel



SKF offers a wide scope of training opportunities to customers, from upper management and operations to maintenance personnel. Venues range from training conducted at customer locations or regional sites, to hands-on sessions at SKF Solution Factories.



The SKF Reliability Maintenance Institute offers a comprehensive range of training courses designed to help plants eliminate machinery problems and achieve maximum reliability and productivity. The course portfolio has been designed around the Asset Efficiency Optimization (AEO) workflow process, and has been created to allow participants to gain knowledge and expertise through a structured development path. Course categories include introductory, intermediate and advanced level training.



The introductory courses, considered the pre-requisites for the more advanced classroom courses, familiarise students with basic terms and offer basic training on subjects such as bearings, lubrication, thermography, and more. These courses are self learning and are taken at an individual's own plant through SKF's web-based Reliability Maintenance Institute online modules and interactive computer media training known as SKF Self-Learning Tools. The RMI On-line E-learning modules are delivered on-line, 24/7, at SKF @ptitude Exchange.



Condition Monitoring Training

Through a real-life practical approach, these courses are designed for engineers and technicians whose responsibilities require proficiency in the use of SKF condition monitoring products. Product training courses focus on specific SKF condition monitoring products, while technology courses cover the techniques and skills required to implement and utilize condition monitoring technologies.

On-line courses are ideal for many companies, in that the self-learning modules enable students to learn at their own pace and on their own timetable, including evenings and weekends

SmartStart courses

SmartStart is an on-site product start-up service that focuses on a specific product and is designed to get that product up and running, implement your programme quickly and effectively, and train your employees in the use of that product. This training takes the form of mentoring rather than classroom instruction, with the site instructor providing guidance in applicable product and/or database optimization and functionality. Benefits of SmartStart training include: small class size, individual instruction, field exercises on your plant's machinery and standardized plant-wide procedures.

For the full schedule of classroom and e-learning courses in your area, please contact your local SKF Representative.

The SKF Solution Factory

One source for a wide range of integrated, knowledge-engineered solutions



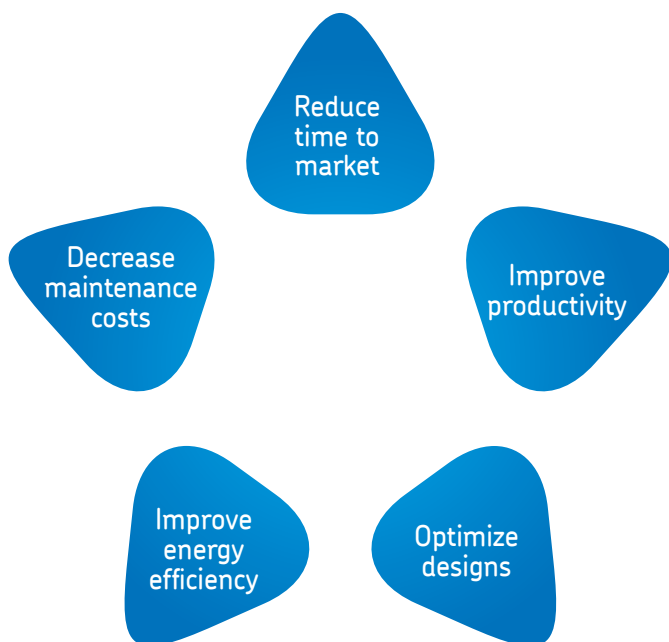
To provide our customers with direct access to SKF's global capabilities, SKF has created a unique concept: the SKF Solution Factory. Here, under one roof, we offer a wide range of specialized services that draw on all of our core competencies and industry-specific knowledge.

The SKF Solution Factory is a place where customers can come to solve difficult application

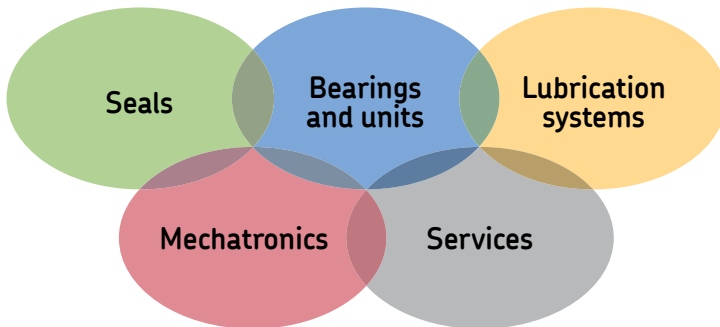
challenges, consult with lubrication specialists, have a custom machined seal designed and manufactured on the spot, or explore design options with SKF engineers using knowledge-engineered software that functions as a virtual test rig.

Typically an SKF Solution Factory also offers bearing remanufacturing and spindle repair services, training, and total shaft solutions including expert mounting, alignment and balancing. And depending on location, customers can also take advantage of remote condition monitoring and expert diagnostics.

By combining multiple areas of expertise, an SKF Solution Factory is able to provide integrated, value-added solutions to customers, whether they are designing a new piece of equipment or working to optimize plant asset efficiency. The network of SKF Solution Factories is continually expanding, making customized SKF services and solutions available to more customers worldwide.



The SKF Solution Factory is a valuable component of Asset Efficiency Optimization, providing unique solutions to both equipment manufacturers and the industrial aftermarket.



The Power of Knowledge Engineering

Drawing on five areas of competence and application-specific expertise amassed over more than 100 years, SKF brings innovative solutions to OEMs and production facilities in every major industry worldwide. These five competence areas include bearings and units; seals, lubrication systems, mechatronics (combining mechanics and electronics into intelligent systems), and a wide range of services, from 3-D computer modelling to advanced condition monitoring and reliability and asset management services. A global presence provides SKF customers uniform quality standards and universal product availability.

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