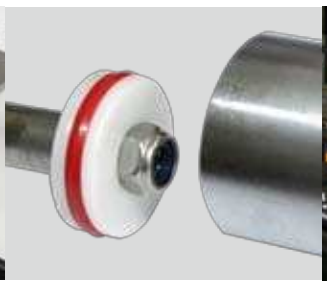
SKF capabilities for the food and beverage industry



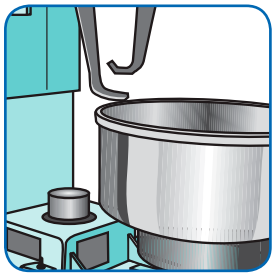



The Power of Knowledge Engineering

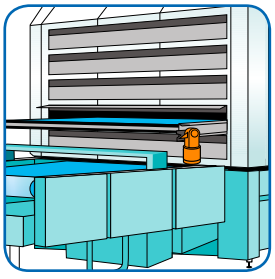
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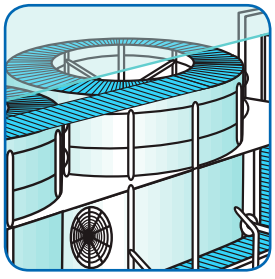
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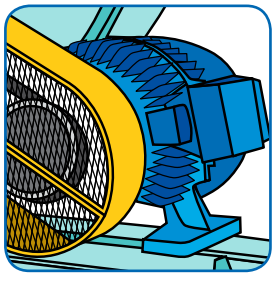
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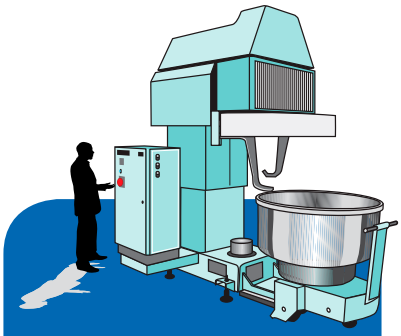


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Efficiency
Productivity
Safety
Hygiene
Manpower
Waste
Energy

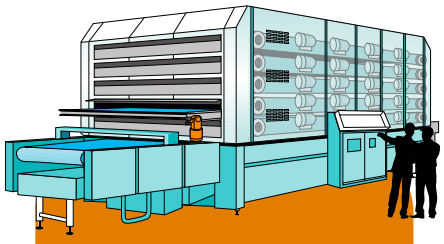
Addressing the industry drivers that impact your plant profitability

Few industrial environments can match the diverse and difficult operating conditions found in the food and beverage processing industries – extreme temperatures and moist, contamination-prone environments; frequent washdowns that degrade equipment and may cause lubricant leakage; repetitive tasks and hazardous work environments.



Preparation

Making food and beverage preparation more reliable? It starts by preparing equipment for the high-volume mix of raw materials, moisture and caustic cleaning agents involved. Solutions from SKF can help make it happen.



Processing food by application of heat

High temperatures in baking, frying and roasting require frequent chains and bearing relubrication. But frequent lubrication drives lubricant and maintenance costs, and involves the risk of grease leaks and contaminated products. SKF solutions can help.



All of these factors combine to make an impact on machinery and productivity. There is continuous pressure to reduce prices and at the same time comply with strict health, safety and environmental regulations. With rising costs for energy and labor, the need is greater than ever to optimize equipment reliability to maximize uptime and productivity.

SKF can help

Combining SKF expertise in bearings, seals, lubrication, mechatronics and services with decades of application experience in the food and beverage industries, SKF provides solutions for every stage in the process: preparation, heating, cooling and post-production packaging. We offer solutions for wet, contaminated and abrasive environments and we can help you optimize performance and maintenance throughout your plant including your ancillary equipment. These solutions can deliver a number of important benefits:

Higher efficiency

Maximize output from equipment by extending mean time between failures and solving challenging application problems.

Improved hygiene, foreign body prevention

Help eliminate conditions that foster food-borne illnesses and meet the requirements in accordance with ISO 22000 on food safety.

Operator safety

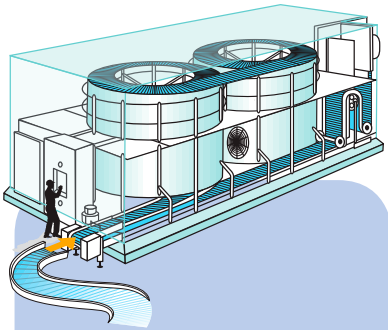
Reduce risk of injuries from repetitive manual tasks, heavy loads, and slippery environments.

Waste reduction

Satisfy tough new environmental regulations by reducing waste, water and lubricant usage, as well as the impact of washdowns on local ecosystems.

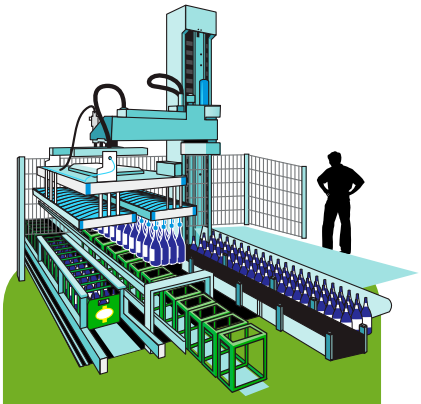
Energy savings

Improve efficiency of machinery and auxiliary equipment, from electric motors and pumps to refrigeration systems.



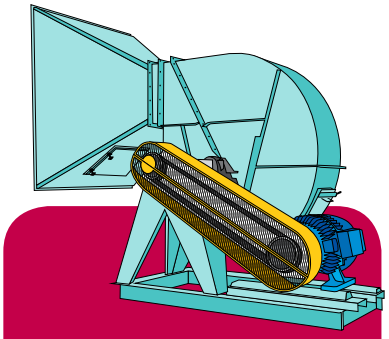
Processing food by removal of heat

The sub-zero temperatures required for freezing, chilling and cooling processes demand frequent maintenance. Rapid temperature changes, frozen water and more can lead to bearing and seal failures and unplanned downtime. SKF low-temperature solutions can help.



Post processing, packaging

Unplanned stops in filling, packaging or palletizing assets can limit efficiencies. Hygienic cleaning can damage seals and cause bearing corrosion. Excessive re-greasing can contaminate products and packaging. SKF solutions can help keep post-processing lines moving reliably.



Maintenance of fluid, air handling and drives

To achieve maximum efficiency, support systems and equipment need a steady flow of cool air, compressed air, steam and electricity. They also require the right lubrication, sealing and condition monitoring approaches. Find out how SKF helped producers apply latest technologies and best suited maintenance activities.

Predictive maintenance approach for reduced unplanned downtime

Early warning of developing problems

Increased confidence in reliable operation of assets in a dairy plant

As reactive maintenance is up to four times more expensive than planned maintenance, the trend is toward a more planned maintenance approach. Predictive techniques enable manufacturers to reduce the incidence of unplanned stops. SKF does not stop at detecting a problem and alerting the likelihood of failure. SKF uses this information as the basis for diagnosing the source of the problem with the ultimate objective of applying the necessary technology to eliminate reoccurrence, thereby achieving an extension of machine life.

Equipment name	Vibration in/s RMS (mm/s RMS)				Correction carried out
	Before		After		
	in/s	mm/s	in/s	mm/s	
Dry mix 1 direct conveyor blower	0.46	11.8	**0.28**	**7.1**	Base looseness correction
Dry mix 2 direct conveyor blower	0.43	11	**0.28**	**7**	Base looseness correction
Exhaust fan 2	0.63	16	**0.30**	**7.5**	Base looseness correction
Fan 2	0.95	24	**0.32**	**8**	Alignment and balancing
Cooling tower pump	0.57	14.4	**0.15**	**3.9**	Motor bearing changed
Exhust fan 3 (only motor)	0.66	16.7	**0.22**	**5.7**	Bearing motor changed
Air mater fan	1.27	32.3	**0.13**	**3.3**	Motor and pulley changing
Line feed pump	0.44	11.1	**0.13**	**3.4**	Unbalance correction
Vacuum pump	0.51	13	**0.23**	**5.9**	Base looseness correction
Labeller machine (gearbox)	1.16	29.4	**0.17**	**4.4**	Base looseness correction



A dairy product manufacturer had a high incidence of unplanned maintenance, resulting in lost production. The customer invited SKF to support a transition from a reactive to a more controlled, predictive maintenance approach.

By performing vibration analysis on a number of assets, several developing issues were immediately identified, including looseness, bearing and pulley drive problems and misalignments. These could have potentially developed into significant incidents.

SKF aided in the correction of the base looseness, alignment and balancing of fans. Drive and bearing components were changed as necessary.

The results provided increased confidence in reliable operation of the plant's blowers, fans, pumps and gearboxes. Additionally, vibration (and resulting noise) was significantly reduced.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.





SKF provided training in the use of the necessary tools and in executing basic maintenance techniques (mounting/dismounting, alignment, lubrication).

SKF offers a range of supporting predictive maintenance tools and techniques to:



1 Monitor vibration with SKF Machine Condition Advisor CMAS 100-SL



3 Perform thermal imaging with SKF Thermal Camera TKTI series



2 Detect air leakages with SKF Ultrasonic Leak Detector CMIN 400



4 Detect electrical discharge with SKF Electrical Discharge Detector pen TKED 1

Development of the maintenance approach from time- to condition-based can increase

Faced with the challenge of improving Overall Equipment Effectiveness (OEE)?

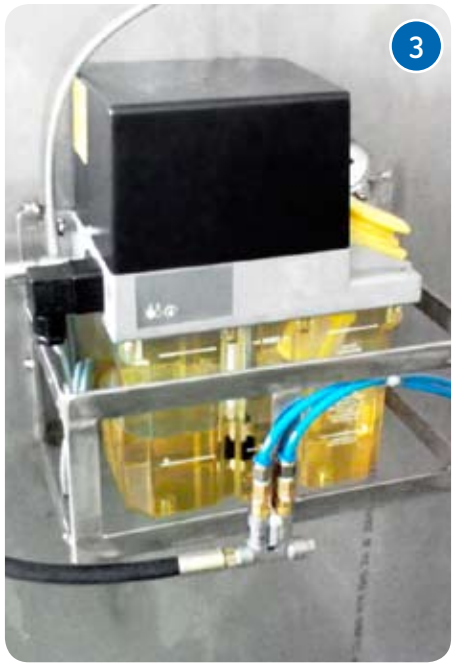
Transition to condition-based maintenance improved the OEE level in a noodle plant

In order to increase OEE, SKF proposes a thorough review of all maintenance activities to provide a better understanding of what maintenance practices are carried out effectively, and where there is room for improvement.

SKF does not stop at detecting a problem and and alerting the likelihood of failure. SKF uses this information as the basis for diagnosing the source of the problem with the ultimate objective of applying the necessary technology to eliminate reoccurrence, thereby achieving an extension of machine life.









A food manufacturing plant experienced poor availability due to unexpected machine failures. In order to improve the overall efficiency of the plant, the organization decided to pilot a study on one of their noodle lines to better understand the origin of the problems.

The agreed-upon approach involved a detailed survey of a noodle line, including:

- **Collection of data regarding bearings, transmission products, power consumption details, and operating environments, including maintenance histories**
- **Review with engineers, collection of drawings**
- **Establishing a baseline of existing lubrication practices and lubricants used**
- **Capturing the current condition of the line through condition monitoring; this enabled detection of misalignment, unbalance, bearing defects, structural looseness and other issues**

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plant availability and efficiencies

The findings of the survey were evaluated in detail, and a set of corrective actions was established.

The survey proved the potential benefits of a condition-based maintenance approach as a number of issues were immediately identified such as: oil leakages; chain breakages; seal, bearing, belt and gear failures.

A number of remedial activities were subsequently carried out (pictured at left):

1 **Laser alignment of belts and couplings**
2 **Balancing**
3 **Changeover from manual to automatic lubrication and lubrication systems upgrades; choice of appropriate lubricants and relubrication intervals**
4 **Upgrade of power transmission systems**

Additional recommendations were suggested to further develop a condition-based maintenance program that supports OEE enhancement:

- **Establishing further vibration measurement routes**
- **Monitoring of asset conditions through:**
  - **thermoghraphy**
  - **ultrasonic detections**
  - **stroboscope**
  - **electric discharge**
- **Implementing motor current analysis**
- **Training: practical bearing maintenance, lubrication, vibration monitoring, power transmission, electrical, basic root cause failure analysis training**



Challenged to reduce spare parts stock value?

As part of a cost cutting initiative, the maintenance team at an ice cream manufacturing facility was tasked with reducing the spare parts inventory. A site criticality assessment was used to determine what critical spares were needed. As a result, 42% of the total number of line items was removed (8% duplicates).

The SKF global network of authorized distributors can help eliminate the potential for counterfeit products. Using the SKF online ordering system ensures SKF standards.



Development of the maintenance approach from time- to condition-based can increase

Maintaining a high Overall Equipment Effectiveness (OEE) level, despite an aging plant?

SKF helped a flour mill keep the OEE level high and reduce the cost of maintenance



The mill was operating at approximately 98% overall availability* – above industry average. While the existing maintenance strategy was working well, the main concern was not to improve availability, but rather to maintain the current operating level as the plant aged.

Based on an existing long-term relationship, SKF was asked to review future challenges in maintenance. The first step involved performing a detailed evaluation of the plant's work flow processes. The SKF Client Needs Analysis (CNA) was chosen because it provided a means to correlate existing positions against food and beverage industry benchmarks.

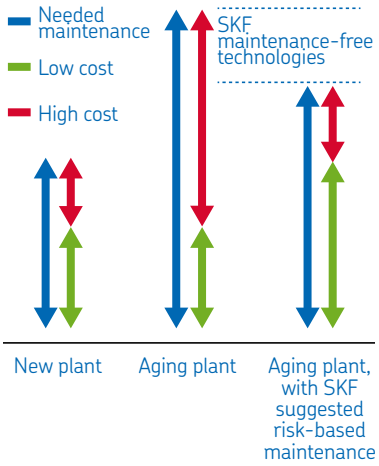
The purpose of the SKF Client Needs Analysis (CNA) is to systematically evaluate the current situation, identify opportunities for improvement and select a suitable road map to achieve plant reliability improvements. The CNA asks 40 simple questions (1/2 day to 1 day) based upon work flow processes in four key areas:

1 Strategy associated with business goals
2 Identification of issues
3 Control of necessary work
4 Optimization of work execution

Comparing the current situation against established benchmarks, the assessment revealed a number of issues:

- **Existing maintenance strategy had delivered significant benefits (high OEE); but because the plant was new, it did not require significant maintenance resources**
- **A high percentage of unplanned maintenance interventions occurred, compared to planned (low predictive maintenance effectiveness)**
- **Asset criticality assessment left room for improvement**
- **Limited number of root cause failure analyses performed**
- **Limited details and depth of asset register**
- **Only a small number of assets had a spare parts list**
- **Low operator empowerment**
- **Technician skills level were in question (not enough training hours)**

Acting on these identified areas, the plant was able to maintain the same level of OEE, but incurred less high cost unplanned maintenance. The increased maintenance requirement of the aging plant was offset by increasing levels of planned activities. Identification of asset problems was improved by the effective use of predictive/condition-based maintenance tools, techniques and skills.



SKF recommended a risk-based maintenance strategy that considered both the consequence itself and the likelihood of incurring that consequence. Based upon the application and determination of the criticality matrix, high criticality assets were given the necessary predictive maintenance techniques. This enabled the plant to confidently predict when issues were developing with critical assets.

** excluding packaging*

plant availability and efficiencies

SKF's unique point-based criticality is a qualitative method to establish and rank equipment criticality, at system and tag level, without considering individual machine failures. The points-based system uses severity and frequency of failures in safety, environment and production, and delivers a relative criticality ranking.

One result of the maintenance strategy review was the development of templates listing asset parts. This allowed the compilation of a more comprehensive spare part list and when set against criticality, the creation of an optimum stock profile.

Lack of root cause failure analysis indicated that the mechanism of failure was not understood. This increased the probability of ineffective and excessive maintenance. Implementation of, and training in, the root cause analysis process enabled full understanding of the failure mode.



As prerequisites for higher operator empowerment, the plant upgraded the computerized maintenance management system. This facilitated the capture and recording of process parameters and general machine performance observations.

The CNA identified that maintenance personnel received relatively few training hours per individual. In response, SKF provided practical training across several maintenance disciplines.

The SKF Reliability Maintenance Institute offers a comprehensive range of classroom and on-line training courses in topics such as condition-based maintenance, mechanical training, bearing basics, lubrication, seals and more.

For more information please visit skf.com/services/trainings



Development of the maintenance approach from time- to condition-based can increase

How to make more time available for continuous improvement?

A beverage plant increased the time available for continuous improvement from 5 to 20%



The plant had a time-based maintenance strategy that resulted in an intrusive strip, inspect and rebuild methodology. The result was an expensive and often unnecessary process that did not address ongoing issues, and prevented plant technicians from focusing on continuous improvement projects.

After purchasing SKF Microlog Inspector equipment the customer asked for support in implementing a condition-based maintenance program.

SKF conducted a review of the existing plant maintenance activities using Failure Modes and Effects Analysis (FMEA) process. Maintenance templates were created, listing potential failure modes and the activities necessary to mitigate them.

Over a period of 18 months, SKF assisted the customer in applying the optimized maintenance activities within a condition-based maintenance program. The customer also implemented front line maintenance activities using the SKF Microlog Inspector with associated software. On-site mechanical and basic vibration analysis training further supported this program.

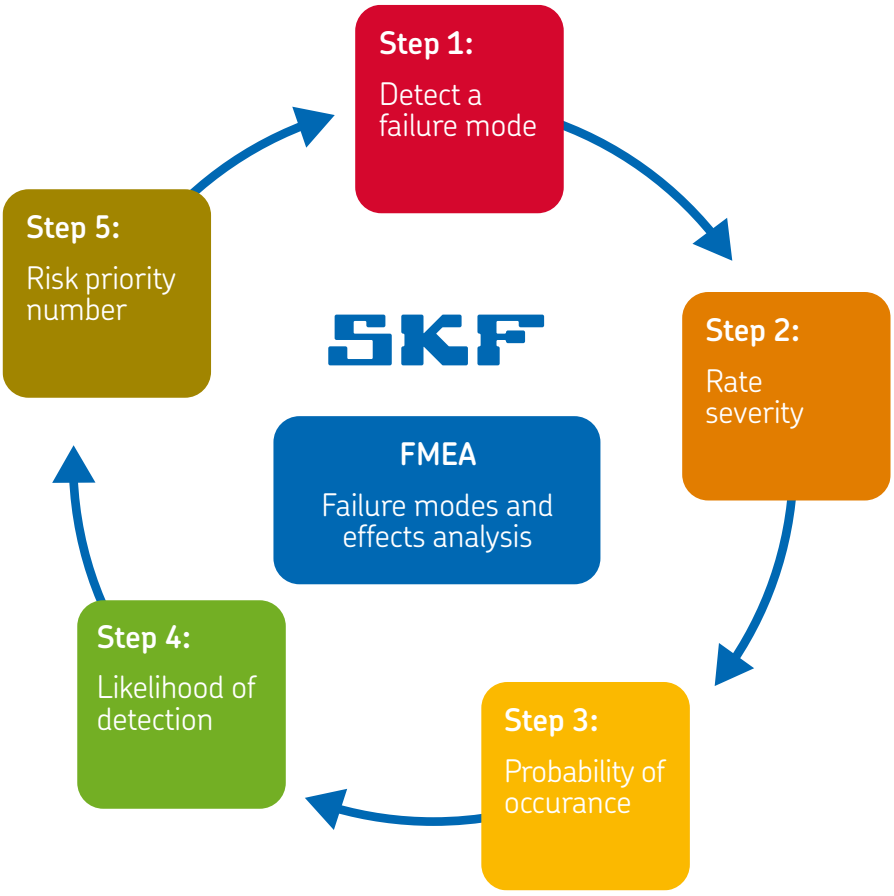
As a result of this implementation, the plant was able to exceed the key target of increasing time available for continuous improvement from 5 to 20% and at the same time plant availability had improved.

The SKF Microlog Inspector is a powerful system developed by SKF for recording inspection data – ideally suited for operational efficiency, process and quality inspections, environmental, safety and regulatory compliance inspections, predictive and preventive/ condition-based maintenance inspections, as well as basic asset care.



For more information about SKF offers, please contact your authorized distributor or local SKF representative.

plant availability and efficiencies









SKF on-site mechanical and basic condition monitoring training

SKF failure modes and effects analysis identifies equipment failures and consequences by examining ways a component or machine can fail, causes for each failure mode, and effects of each failure. Especially useful during the design or operational phases, results are used as input to safety and maintenance engineering, maintainability, logistics service support analysis, and more.

Operator empowerment, within a front-line inspection supported maintenance approach

Front line maintenance contributing to increased efficiencies?

Supporting condition-based maintenance with a program of operator inspections enabled a threefold increase in the number of points being monitored





A manufacturer produced more than 275,577 tons (250,000 tonnes) of chocolate at one plant. The plant's preventive maintenance program was time-consuming and involved more than 2,000 inspection points with up to 500 being measured at a time, an equal number of hours were spent recording the data collected. Furthermore, optimization was made difficult due to a lack of documentation on past corrective measures and trends.

In order to maximize the front line maintenance contribution, SKF recommended an operator driven reliability process. SKF Microlog Inspector and @ptitude software were supplied; monitoring points were established and suitable data collection routes were compiled.

Within a year, the automatic data collection process helped save one man-day per week and achieved greater organizational flexibility because inspections could be performed by a wider number of employees. In addition, production losses were reduced by 1%, while product quality was increased. Due to the success and efficiency of the program, it was decided to increase the number of inspection points to 7,000.

Enhancing equipment efficiency while meeting safety, quality and environmental targets

SKF's operator driven reliability processes and technologies empower front-line operators to monitor the condition of the nominated equipment as part of an ongoing preventive maintenance-based asset management strategy.

SKF condition monitoring, analysis reporting and communication technologies support the Operator Driven Reliability (ODR) process and can enable immediate detection of problems, and sharing of machine condition data. SKF also offers training in ODR processes.



Operator driven reliability can help increase Overall Equipment Effectiveness (OEE) and complements the autonomous maintenance pillar of Total Productive Maintenance (TPM). ODR also supports compliance with food safety standards and regulations by providing the ability to track and record asset events, inspections, process and maintenance parameters.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



Operator observations recorded on paper are being replaced by modern electronic systems

Production operators are a valuable resource, as part of an asset maintenance program. Because of their close proximity to the machinery, operators are often the first to detect changes in process or mechanical condition. Often their observations regarding an abnormal reading, unusual noises or vibration are either unreported, or if reported, are not effectively acted upon.

The ODR process empowers operators to become an integral part of an overall asset management program, providing a platform and supporting technology to proactively communicate findings, initiating timely corrective actions.

Paper based systems have sometimes been applied but have tendency to fail as they do not provide the necessary consistency and alarm capabilities. Modern electronic systems supported by relevant software enable rapid recording, uploading and sharing of data between operations, maintenance, engineering and plant management.

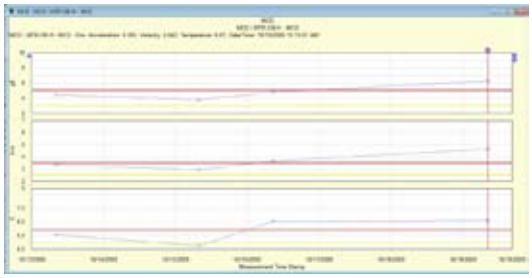
Operator empowerment, within a front line inspection supported maintenance approach

Benefits of the Operator Driven Reliability (ODR) process using SKF technologies – demonstrated in a beverage production line

In a beverage plant, the condition-based maintenance team had been doing vibration monitoring on conveyors. The SKF Microlog Inspector data indicated that one of the conveyors was trending into alarm due to vibration caused by impending bearing failure.

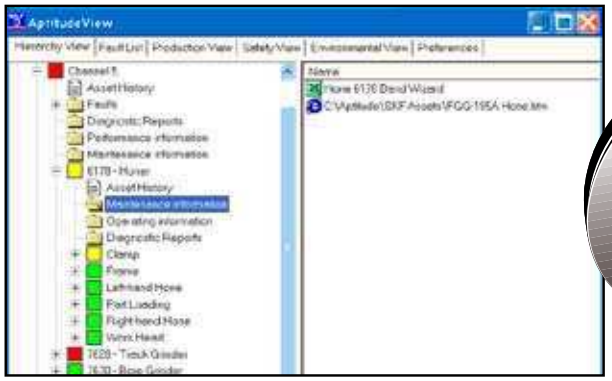
Subsequent relubrication dampened the bearing vibration, but in later checks, the alarm reappeared. As a result, the gearbox was replaced, and a root cause analysis performed, revealing bearing damage caused by a lack of lubrication. To prevent reoccurrence, a planned maintenance activity was implemented for operators to check and replenish the lubricant as required.

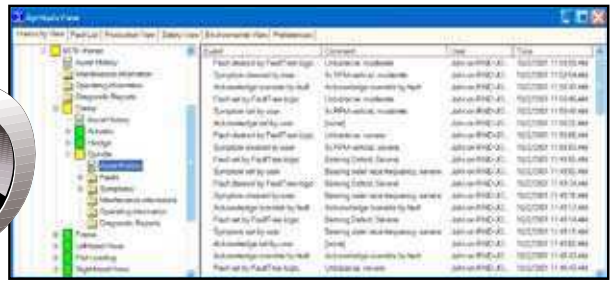






Planned maintenance activity to prevent reoccurrence





SKF @ptidude Inspector software helps keep track and record asset events, inspections, process and maintenance parameters.

The purpose of inspection points on operator routes is to collect data to monitor and track any kind of variation (skids) in the process flow. Subsequent analysis can highlight where this is impacting the process. Thus, if an asset is not functioning to specification, the consequences on performance, efficiency and product quality can be addressed promptly.

For example, in a process area containing multiple pumps, an inspection route could include asset identification with bar codes (or other methods) and execution of the pre-defined instructions such as:





Collection of operational parameters such as pressure gauge readings, leakages, unusual noise, and the derivative point to evaluate pumping flow performance.





Collection of vibration data (also via wireless technology) with a pre-configured alarm that notifies when a level is exceeded.





In addition, data collected by operators can be used as a basis for providing detailed follow-up instructions that can be uploaded to a computerized maintenance management system system allowing the generation of a suitable work order.



Managing lubrication as a preventive approach to food safety

Increased line availability
Reduced maintenance costs

SKF offers a broad range of technology and service offerings dedicated to helping food and beverage processors manage lubrication. This not only helps achieve food safety, but also contributes to improving efficiency and reducing maintenance costs.

As a starting point, SKF applies a systematic methodology to understand the duty and environment of assets, current lubrication needs and procedures:

- **What is being lubricated?**
- **What lubricants are being used?**
- **What are the relubrication schedules?**

Identification of potential negative impacts on Hazard Analysis and Critical Control Points (HACCP) can lead to four areas for improvement:

- **Relubrication-free technologies**
- **High efficiency seals that keep lubricants in and contaminants out**
- **Manual lubrication**
- **Automatic lubrication**



NSF-approved lubricant solutions from SKF

As part of its expertise in providing a full spectrum of technologies and solutions to manage the demanding lubrication requirements of the food industry, SKF offers a range of lubricants approved for use in the food industry.

High efficiency seals

About 14% of bearings fail due to the ingress of contaminants into the bearing enclosure, thus affecting lubricant performance. Because of this, a key element of SKF's approach to managing lubrication is protecting the lubricant through high efficiency seals.

SKF's range of seals includes high performance food grade materials, which provide excellent wear, abrasion and chemical resistance.



Manual lubrication



Reliable operation is achieved through correct lubrication management. It is estimated that about 36% of all bearing failures result from incorrect specification or inadequate application of the lubricant.

Depending on the environmental conditions, use of the correct grease replenished in the correct volume, at the right time, and by right methods, can provide long-term reliable operation.



Relubrication-free technologies

During manual relubrication tasks, a common occurrence is grease purge through the seals. This can lead to potential contamination of food lines, slip hazards and increased waste management costs. SKF has several technologies that virtually eliminate the need to relubricate:

- **Sealed for life bearings**
- **MRC® Marathon® bearing units**

Relubrication-free technologies are enabled by efficient integral seals offering protection in wet areas, such as process and hygienic cleaning.



Relubrication-free technologies

In cases where a specific brand of lubricant or grease fill is needed, SKF offers customized, lubricated-for-life bearing solutions.



Other technologies, such as dry lube and solid oil technologies, can provide relubrication-free operation in challenging environments.





Automatic lubrication

In process environments, or where concerns exist over potential missed lubrication points, SKF automated lubrication solutions provide the means for correct control of lubricant application.



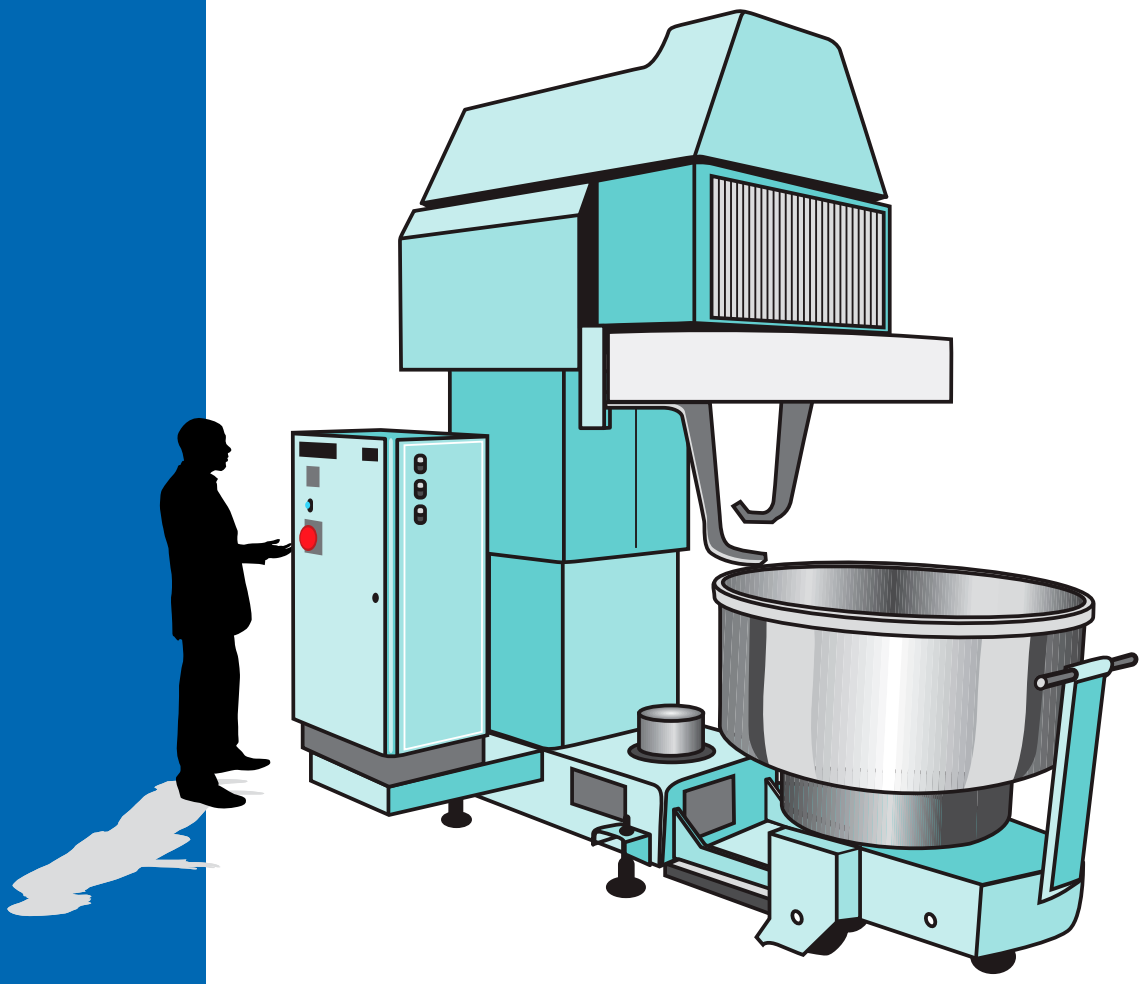


Automatic lubrication

Automated SKF lubrication systems provide clean, accurate and reliable lubricant supply while contributing to operator safety.







Preparation













Typical issues for preparation assets and areas

Various applications for washing, sorting, grading, peeling, separating and blending make preparation areas wet and contaminated. Large amounts of water or other liquids are often required, creating high humidity levels that can severely affect rotating equipment. Process materials can also enter the bearings, as can the water and caustic agents used during washdowns.

Ultimately, these operating conditions can lead to additional costs due to lubrication degradation, lubricant loss and increased maintenance. All of these conditions can also increase safety risks for plant workers.

Because the composition of raw materials can be variable, feeding and load rates can be uneven. This may cause heavy shock loads and wear of rotating parts, as well as high energy consumption and costs.

Many raw materials arrive during limited seasonal timeframes and must be moved quickly. Operating parameters of these assets are pushed to the limit, accelerating wear of rotating components and increasing the risk of unplanned stops.

Large amounts of water and process debris resulting from preparation impact energy consumption and waste treatment costs.

SKF can help with a range of technologies designed to reduce the impact of these conditions.

Areas with high-pressure washdowns and process contaminants

Contamination control and reduced maintenance cost?

MRC® Marathon® bearing units with composite housings
withstand high-pressure washdowns, without the need to relubricate

Suitable for use in conveyors, sorters, sizers, presses, brush washers and all washdown areas, Marathon bearing units feature the industry-proven 2RF seal to provide:

- **Improved foreign body prevention – no dripping grease or purge contamination**
- **Reduced relubrication costs and environmental impact**
- **Reduced risk of premature bearing failure**
- **No risk of missed lubrication points due to human error**
- **Corrosion-resistance under virtually all washdown conditions**
- **Improved bacteria reduction due to solid or filled base design and smooth surface finish**



Increased service life

In an apple processing plant, cast iron pillow blocks had to be replaced every three months due to rust and lubricant washout. Replacing them with Marathon bearing units with stainless steel bearing inserts increased service life to over one year, ensuring full reliability through the season.



Available product range:*
- *Inch: 3/4 in., 1 in., 1 1/8 in., 1 1/16 in., 1 1/4 in., 1 7/16 in., 1 1/2 in., 1 15/16 in. bore sizes*
- *Metric: 20 to 50 mm bore sizes*

*** Please refer to the designation system in the appendix, page 112.**

To see a demonstration of washdown resistance, scan this code or go to the SKF channel on YouTube.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Areas with dust and other process contaminants

Is contamination in heavy duty applications a concern?

SKF Explorer sealed spherical roller bearings
offer long service life

SKF Explorer class sealed spherical roller bearings are factory-filled with high quality grease and feature and effective integral seal. Benefits are:

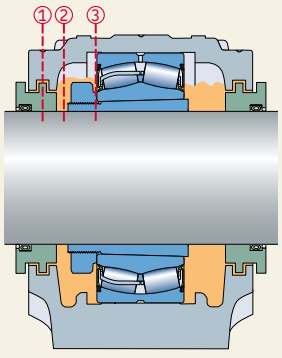
- **High reliability for long service life**
- **Relubrication-free for the life of the bearing in most applications**
- **Help reduce vibration, noise and operating costs.**

When using SKF sealed spherical roller bearings with SKF plummer blocks, the sealing efficiency and flexibility of triple barrier sealing can be considered.



Downtime prevented during season

Due to the ingress of cane juice, plummer block bearings in an intermediate sugar cane carrier had been failing prematurely during every milling season. SKF Explorer sealed spherical roller bearings ended the seasonal failures, increasing replacement interval by two years.



The SKF three-barrier solution, which comprises a sealed spherical roller bearing (3), a housing with a 70 to 90% grease fill (2), and external labyrinth seals (1), is a very efficient sealing solution.



Available product range: 0.98 to 15.75 in (25 to 400 mm) bore sizes depending on series

Increased bearing life, simplified and safe mounting?

SKF ConCentra
provide operational reliability and an innovative concentric locking technology

SKF ConCentra roller bearing units are robust, ready-to-mount bearing units that are assembled, lubricated and sealed at the factory for maximum service life. The spherical roller bearings inside are SKF Explorer quality.

- **High operational reliability**
- **Reduced maintenance, thanks to a robust, high efficiency sealing system**
- **Simplified mounting through a unique stepped sleeve***
- **High load carrying capacity**

Downtime prevented during season

In a sugar cane processing plant where high loads and exposure to raw material ingress were causing bearing failures, installing the SKF ConCentra system improved the mean time between bearing repair from 2.5 months to over 18 months.



SKF ConCentra roller bearing units are available from 1.37 to 2.95 in (35 to 75 mm) bore sizes





** The patented SKF ConCentra stepped sleeve*

Areas with dust and other process contaminants

Is ingress of process material and high humidity causing downtime?

Solid Oil bearings
make relubrication unnecessary while protecting against contaminant ingress

Filled with a polymer matrix saturated with oil rather than conventional grease, these specialized bearings:

- **Reduce risk of contaminants ingress**
- **Resist most chemicals used for washdowns**
- **Eliminate risk of leaking lubricant leading to food contamination**
- **Are available with NSF-approved food grade oil**



Solid Oil bearings can be used in virtually all SKF bearing types with sufficient internal free space.



Increased reliability in bread prover

In a prover for bread, 140 °F (60 °C) temperatures, high humidity and water droplets were leading to corrosion, while grease emulsification in guide wheel bearings was leading to failure. Solid Oil stainless steel deep groove ball bearings provided a relubrication and corrosion free solution, eliminating the grease emulsification issues.

Areas with high humidity

Bearings failing due to corrosion?

SKF stainless steel deep groove ball bearings with food grade grease
are ideal for areas of high humidity and resulting corrosive environments

Featuring stainless steel rings, balls, cages and shields, SKF stainless steel deep groove ball bearings are

- **Relubrication-free for the life of the bearing**
- **Pre-filled with NSF-approved food grade grease**
- **Shielded or sealed on both sides**



Product range is available for bore sizes from 0.24 to 1.97 in (0.6 to 50 mm)

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

*** Please refer to the designation system in the appendix, page 111.**



Applying lubricant and subsequent relubrication the right way requires:

Selection of right grease



Considering standardized, food compliant greases throughout the plant?

SKF LGFP 2

SKF LGFP 2 is a food compliant bearing grease, certified by the NSF for category H1, and is also Halal and Kosher certified. Added benefits include:

- **Full compliance with hygienic regulations**
- **High resistance to water and corrosion**

Grease replenishment points

Concerned about correctly identifying relubrication points?

SKF offers simple solutions to identify the correct type and amount of lubricant for your asset.

Grease fitting caps and tags TLAC 50
help avoid cross-contamination





SKF Lubrication Planner
enables simple administration of lubrication routines*

* *Register and download for free at skf.com/lubrication*

For more information about SKF manual maintenance offers, please visit mapro.skf.com, contact your authorized distributor or SKF representative

Optimum cleanliness when relubricating?

SKF offers a range of manual and air-operated grease pumps for high volume applications and grease filler pumps that provide optimum cleanliness.

SKF Grease Filler Pumps LAGF series



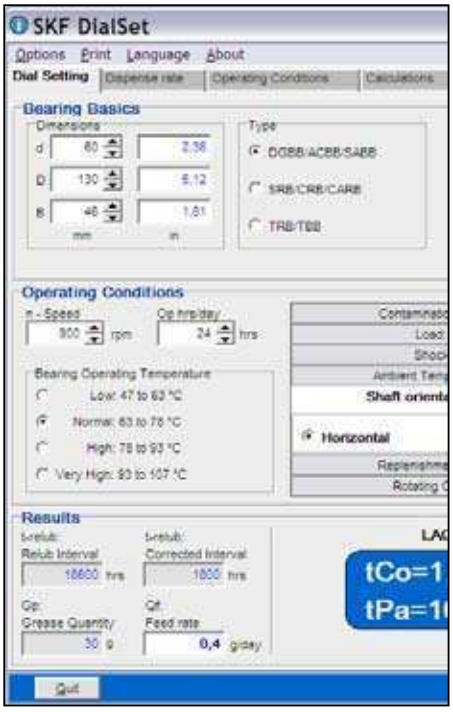


SKF Grease Pumps LAGG series

How often and in what quantity to relubricate?

SKF DialSet

SKF DialSet software helps calculate the correct grease quantity and lubrication interval. These parameters enable the best fit with scheduled relubrication intervals.



SKF DialSet is a quick and reliable tool for relubrication calculation. Download the App for Android or iPhone by scanning this code.

Ingress protection through high efficiency seals in rotating equipment

Customized seals in one to two days?

SKF machined sealing solutions

Designed to withstand washdowns that use aggressive chemicals, processed food and beverage ingress, SKF customized machined sealing solutions are manufactured from both FDA compliant standard materials and SKF proprietary approved sealing materials, such as the ECOPUR range.

- **Short lead times; customized seals can be produced in as little as one to two days**
- **High level of flexibility in design**
- **Resistant to high humidity, hot steam and chemicals* used in hygiene washdown – Clean in Place (CIP)**
- **High wear resistance, including abrasive processing materials**
- **Less unplanned downtime and scrapped production**
- **Extended service life**
- **Reduced friction**



The SKF SEAL JET system helps enable the production of customized machined seals as prototypes, or small to medium series within one to two days. The system is a complete production unit consisting of a computer controlled CNC machine, machining tools optimized for polymeric materials and specialized software.

*** Please refer to the chemical resistance table in the appendix, page 110.**



Dairy plant increased productivity, reduced maintenance costs

Frequent washdowns with caustic soda and acids in a dairy plant's homogenizer eroded sealing materials, contaminating the milk product. The fast reciprocating movement caused additional stress to the sealing system – as did the homogenizing process itself. All of these conditions contributed to the reduced service life of the sealing system with resulting shaft damage. Additionally, particles from the seals and back up ring entered the milk product.

Using FDA approved materials with high resistance to cleaning chemicals, the SKF sealing solution has operated problem-free for 12 months. Today, seals are replaced once a year during annual maintenance shutdown. The result: significantly increased productivity and decreased costs related to maintenance and contaminated products.



SKF seals made with FDA-compliant H-ECOPUR and SKF Ecotal material feature an improved, low-friction profile, reduced stick-slip effect and excellent sealing capabilities.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Standard seals with advanced design options

SKF radial shaft seals
offer improved performance



SKF radial shaft wave seals – CRW series

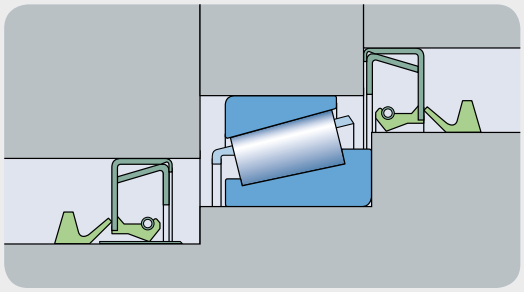
CRW seals feature a metal OD construction that provides positive retention in the housing bore and a suitable running surface for the V-ring. The bore-tite coating on the OD fills in any small imperfections in the housing bore surface.

The wave seal design provides superior sealing and up to 20% less friction – resulting in up to 30% lower temperatures compared to conventional straight edge radial lip seals.



SKF SPEEDI-SLEEVES

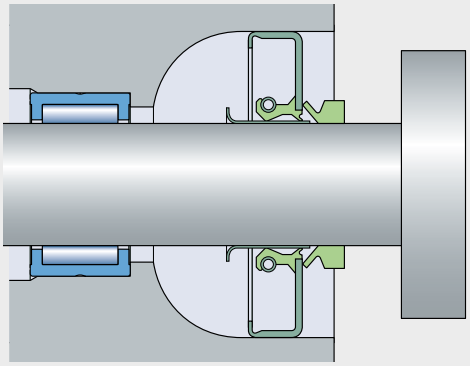
SKF SPEEDI-SLEEVES are designed to fit securely over worn shaft areas – thus limiting the need for machining and drastically reducing costly downtime. In addition, the special sealing function prevents lubricant leakage to minimize environmental impact. SKF SPEEDI-SLEEVES are made of stainless steel as the base material and can be supplied with a titanium nitride coating – suitable for the food and beverage industry.



Effective sealing system protected soybean flaker

Dust and dirt build-up on the outside of a soybean flaking machine infiltrated the sealing lip, causing wear and contaminating the lubricant. Soybean particles from the flaking operation also got caught under the inner sealing lip, causing damage to the bearing.

The SKF solution used CRWH1 nitrile seals to protect the inside and outside of the bearing, and V-rings to prevent contamination buildup around the seals. Applying SKF SPEEDI-SLEEVE on the shaft under the outside seal eliminated the need to take equipment off-line for a full disassembling to repair the damaged shaft.



Reduced downtime in poultry processing equipment

High pressure jets used to clean processing equipment at poultry packaging plants forced water past the lips of the seals, contaminating the lubricant and damaging the bearings. Existing seals also wore grooves into the shafts.

SKF suggested applying V-rings to prevent water and other contaminants from penetrating the seal. SKF SPEEDI-SLEEVES were used to repair the grooved shafts without removing them from the equipment, thus minimizing downtime.

High efficiency plastic parts for rotating and reciprocating equipment



Foreign body detection?

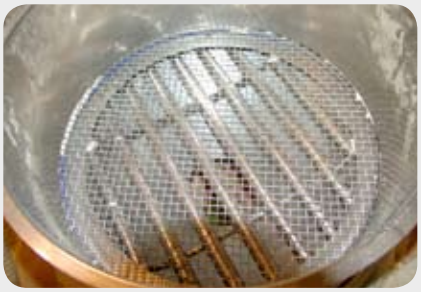
SKF metal detectable sealing solutions

can be applied where potential seals breakdown might result in food line contamination

Several types of elastomers – including nitrile, silicone, EPDM and fluorocarbon – can function as detectable sealing solutions. These materials can be molded or extruded to create a wide range of products including valve seals, O-rings in custom sizes, hygienic seals (RJTs, etc.), lid seals and sealing strips. Detectable silicone is also available in sheet form, so gaskets and profiled items can be waterjet cut to individual requirements.

SKF makes use of detectable plastics such as UHMWPE (PE1000), acetal, POM and PTFE to create a variety of components for production equipment such as wear strips, guide rails, corner wear bends, chain guides, bearings, bushes, scrapers, rollers, idler wheels, liners, general machined parts etc. Operating benefits include:

- **Excellent wear resistance**
- **High impact resistance**
- **Water, acid and chemical resistance**



FDA approved, metals detectable sieve seals offer long service life

In an industrial sieve application, the vibratory action of the sieve was leading to short lifetime of the seal. The potential of seals breakdown and possible contamination from seal fragments led the customer to look for metal detectable sealing solution. SKF proposed a blue metal detectable integrated solution for the sieve screens and magnets made of nitrile, a very durable material that lasts longer than silicone counterparts in dynamic applications.

In the event of seal breakdown, the blue color makes it easier to detect stray fragments. In addition, the special metal detectable properties of the material allow detection by standard metal detection equipment should any small pieces fall into the product mixture.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Improved hygienic design, wear resistance and weight saving

SKF advanced engineered plastics solutions
offer an alternative material selection for a wide range of applications

Temperature extremes, intense pressures, high surface speeds and aggressive chemical cleaning can be better tolerated using SKF FDA-compliant engineered plastic materials.

- **Filled PTFE-based materials** are typically used in higher speed reciprocating and rotary sealing environments. Applications include rotary seals in conveyors; processing equipment, such as mixers; and fluid and air handling equipment. They feature superior self-lubricating properties, as PTFE is a good sliding surface.
- **High strength materials** such as PEEK, PPS, POM, and PETP are frequently used as plain bearings and seals in reciprocating and rotary applications requiring high physical properties to prevent material creep.
- **UHMWPE-based materials (with metals detectable properties)** are utilized as seals and plain bushings for extremely abrasive food products, as well as high pressure applications.

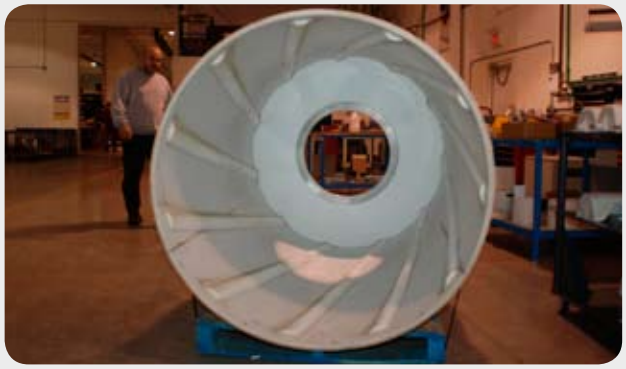




New dye process for meat pies improved production

A dye for meat pies used heavy steel drums, with each pie size needing its own drum. The lack of flexibility meant long changeover periods to modify pie sizes and a difficult cleaning process.

SKF introduced FDA-approved, advanced engineered plastics and specialized machining techniques to create a flexible solution incorporating quick release inserts into the drum design. These improvements helped eliminate complete drum changes and reduced changeover time by three hours.



Improved mixing drum design for cereal production

The design of a food processor's cereal mixing drum had seams that did not run in the direction of rotation. Bacteria buildup resulted and led to wear on the underside.

SKF introduced a new, seamless design using wear resistant FDA materials to overcome bacteria buildup. The solution met HACCP requirements, offering improved hygiene control and lengthened life.

Effective lubrication for reliable operations

Concerned about missed relubrication points?

SKF SYSTEM 24 single point automatic lubricators

serve as a simple, accurate and reliable re-greasing system used commonly for rolling bearing applications, as well as chains, guides, plain bearings, linear bearings, screws, and even gears.



SKF LAGE lubricator units helped improve reliability in cane elevators

Standard single point lubricators in the pillow blocks of a sugar mill's cane elevators failed to provide the required grease feed rate at various points due to temperature conditions and high vibration levels. SKF LAGE 125/250 HB2 lubricator units virtually eliminated the failures, leading to increased reliability and significant cost savings.

The LAGD series, gas driven



The LAGE series, electro-mechanical driven



** Available with NSF approved food grade lubricants*

An easy to install centralized lubrication system?

SKF MultiPoint Automatic Lubricators

provide a user-friendly and cost-effective option when longer distances, high flow or enhanced monitoring is required







Quick calculation of relubrication intervals?

SKF DialSet

The SKF DialSet assists with the correct set-up of the SKF automatic lubricators

Additionally, it provides the grease quantity, corrected lubrication interval and required feed rate. These parameters enable the best fit with scheduled relubrication intervals.

SKF Dialset downloads are available for Android or Iphones free of charge on skf.com/lubrication or by scanning this code.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Unplanned downtime due to inadequate lubrication?

SKF automatic, centralized lubrication systems

simplify lubrication maintenance and improve reliability, productivity and safety

From its centralized lubrication systems, SKF offers a range of flexible automated solutions for bearings, gears or linear motion and adaptable to various asset conditions. All include a pump unit (with optional control unit), distributors/feeders to automatically deliver the lubricant amounts and intervals. Optionally, this can be linked to the machine's Programmable Logic Controller (PLC) indicating possible lubrication system failure.

- **Enhanced productivity through greater machine availability**
- **Simplified maintenance given the modular and standardized lubrication system components**
- **Flexible system – can be adapted to different type of assets, used with a variety of grease and oil types**
- **Extended bearing and gear service life through reduced wear**



Reducing excessive lubricant consumption in a sugar cane mill

Bearings in a sugar cane mill were using large amounts of lubricant. SKF recommended the implementation of the SKF DuoFlex dual-time lubrication system to replace the existing oil lubrication system. The changeover led to a reduction in lubricant consumption from 15 tons (14 tonnes) of oil/year to 4 tons (3.8 tonnes) of grease per year, resulting in both improved machine reliability and availability.



Reducing downtime and maintenance costs for a cereal processor

Inadequate bearing lubrication in a cereal drum dryer led to unplanned downtime. The system needed to operate in a very humid environment and was affected by a blocked line that restricted lubricant flow, and the lack of an alert system to indicate lubrication system failure.

The drum dryer was fitted with an SKF ProFlex progressive lubrication system featuring a digital control and monitoring unit with external alarm. By delivering the correct volumes of grease, the new system cut lubricant consumption by 50%, and reduced both unplanned downtime and environmental impacts involving high grease usage and subsequent disposal. The customer realized a return on investment in eight months.

SKF ProFlex, progressive lubrication systems

For small- and medium-sized machines. The progressive system incorporates a feed pump and flow dividers to progressively serve each outlet with a defined amount of lubricant – generally grease – with the additional possibility to detect plugged lubrication points.

SKF ProFlex system can be used for bearing lubrication of dryers, mills, crushers, mixers, filters and more.

SKF ProFlex system with additional spraying nozzles can be used for pinion drive lubrication in sugar diffuser, mixers, etc.



SKF DuoFlex, dual–line lubrication systems

For medium-to-large machines with many lubrication points, long lines and harsh operating conditions. The dual-line system can supply more than 1,000 lubrication points from a single pump unit source.



SKF DuoFlex system offers numerous advantages for food processing plants, such as sugar mills, for lubrication of plain bearings and gears.

Effective lubrication enhances chain reliability





SKF ChainLube, airless oil projection system with integrated automation, pumping systems and reservoir

Longer service life and reduced maintenance for conveying chains?

SKF ChainLube oil projection systems
are reliable solutions for accurate and automatic chain lubrication

The systems include volumetric piston pumps that precisely deliver a metered volume of lubricant to the points of friction while the chain is in operation. A control unit is preset to the preferred timing for lubricant application. Projection nozzles, having no mechanical contact with the chains, prevent dirt accumulation and applicator wear.

- **Reduced maintenance costs (lubricants and lubrication tasks compared to manual lubrication)**
- **Eliminated risk of lubrication points being missed through human error**
- **Improved productivity by eliminating unplanned stoppages**
- **Longer service life resulting from reduced chain wear**
- **Reduced energy consumption through decreased friction**
- **Enhanced operator safety by reducing intervention for maintenance tasks**
- **Prevents foreign body ingress, thereby helping producers support the HACCP process in producing safe food**
- **Better cleanliness by reducing excess lubricant**



SKF ChainLube systems can be set up with SKF food grade chain lubricants or other type of lubricant used on site.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

SKF can recommend the right oil projection system for specific application needs.

SKF ChainLube, air assisted oil projection system

Best suited to lubricate chains where no pitch detection is possible due to fast movement of chain or when pitch is too small (less than 1.97 in / 50 mm). Regulated carrier air flow is used to project small amount of lubricant, having viscosity up to 1850 SUS (400 cSt) with virtually no mist formation around the projection nozzles.

SKF ChainLube, airless oil projection system

Suitable for accurate lubrication of chains pitch-by-pitch without the need to connect to a compressed air supply. Suitable for lubrication of chains with medium pitch (1.97 in / 50 mm to 11.81 in / 300 mm), where speed is below 2 pitches/second.



Reduced operating costs, downtime and energy use in bread proofer

Manual lubrication practices in a critical conveyor chain, where humidity levels were high, led to friction, chain wear and breakage. This resulted in frequent production downtime, reduced product quality, and frequent chain replacement costs. In addition, oil leakage during manual lubrication led to concerns over operator safety.

SKF ChainLube automatic oil lubrication system helped cut chain replacements by half. Savings were achieved by reducing product losses and labor costs for manual lubrication. In addition, safety and plant hygiene were improved.

Asset customized solutions

Line efficiency affected due to unreliable lubrication?



SKF ChainLube, grease injection system for sugar diffusers

reduces unplanned and planned maintenance downtime

The SKF grease injection system provides an integrated lubrication solution – from greasing units and electronic control unit to pneumatic pump and air treatment plate. In this case, adapted to the tough operating conditions of the diffuser, it ensures optimum grease delivery into the chain pins and roller shafts to avoid chain stoppages.



SKF ChainLube automated lubrication system saved time, money

In a sugar diffuser, a lubrication system was set up to lubricate and protect chain rollers from the effects of corrosion (caused by water and steam ingress to the rollers). However, an inadequate amount of lubricant reaching the chain rollers and shaft led to production stoppages during the seasonal campaign. The maintenance team needed to change the complete chain link, requiring production stoppages of eight hours. SKF proposed a fully monitored grease injection system that enabled reliable lubrication of the chain rollers. Overall grease consumption was reduced, thanks to precise and adjustable volumetric grease delivery.

SKF solutions optimize chain performance

Asset customized solutions

Reduce wear, limit elongation and chain breakage

SKF engineered conveyor chains
serve as a reliable solution for demanding applications

For all the different types of conveyors and chain applications in food and beverage machinery, there is an equally large number of chain configurations and materials available.

The SKF range of conveyor chains includes a variety of chains and chain materials that offer flexibility through customization.

- **Materials: from stainless steel in high grade or high strength composition, to long life material in either hardened or cast steel form**
- **Attachments: designed specifically to suit the process and product**

The result is a solution that provides: extended life, easy installation, less downtime and less maintenance.

Also available from SKF's standard range of chains:

SKF Xtra Strength Chains – XT series

SKF Xtra Strength Chains provide improved productivity for applications with higher shock loads and lower operating speeds. The materials and tolerances of the chain, with an improved heat treatment process, provide superior capabilities over standard chains with the same dimensions. Operating benefits include long life when subjected to shock loads and an enhanced ability to withstand misalignment.



Upgraded chain helped optimize sugar plant production

A sugar plant's loop link chains failed prematurely resulting in unplanned downtime in the main cane carrier. SKF engineered a custom solution involving a chain made of a special steel and needing a specific forging treatment. The chains have operated successfully for over two years without failure, meeting the targeted life expectation and saving significant manpower and preventing lost production.

SKF can offer a wide variety of engineered conveyor chains, custom-made to meet the requirements of each application.



Optimized conveyor drives helped palm oil mill reduce maintenance costs

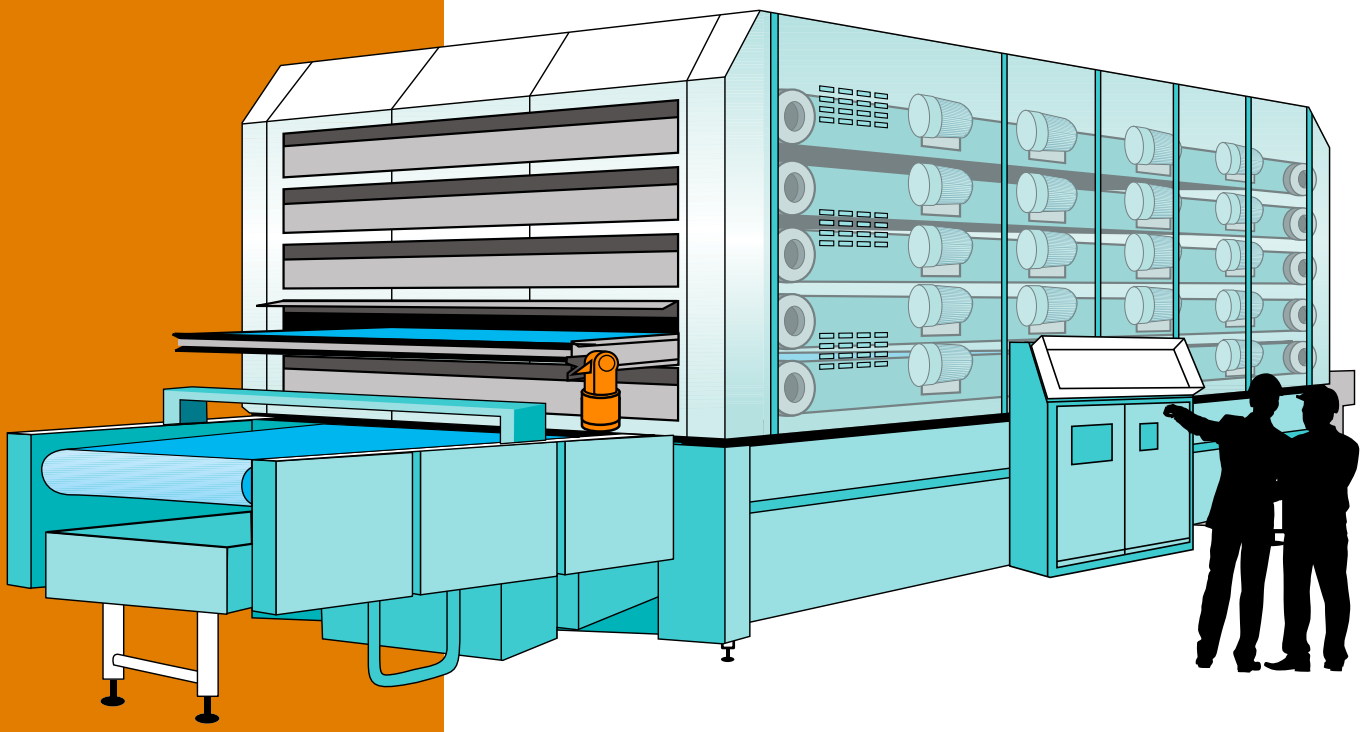
Conveyor drives in a palm oil mill were constantly subjected to extreme conditions. SKF carried out a conveyor chain mapping exercise, resulting in the recommendation of the SKF Xtra Strength solid series with hardened pins to withstand the prevailing conditions. In addition, SKF facilitated training to assist the plant teams to further optimize maintenance operations.

The increased tensile strength helped improve chain life and extend service intervals. In addition, the palm oil plant lowered maintenance costs, and improved machine and conveyor reliability.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



Engineered conveyor chains – wide range, custom made for applications



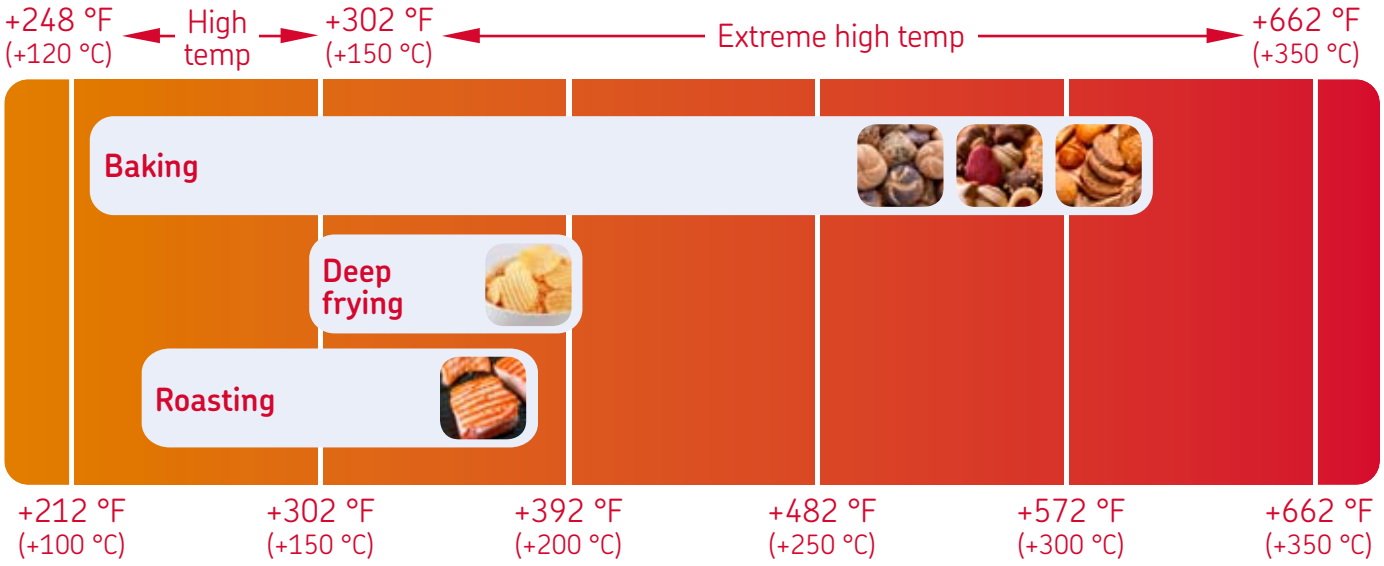
Processing food by application of heat







SKF



Typical issues in hot environments



With temperatures ranging from 248 °F (120 °C) to over 572 °F (300 °C), processes such as baking, frying, and roasting contribute to high operating costs for rotating machinery.

The need for frequent relubrication is expensive, in terms of labor and high-temperature grease costs. Frequent lubrication can result in unhygienic grease leakage, reduce productivity and drive waste management costs. Extreme temperatures may also lead to corroded bearings, unhygienic flaking corrosion, bearing failure and high standstill, replacement costs.

Increased pressure to reduce baking cycle times, increase process temperature and asset speed to maximize production can contribute to higher operating costs for rotating machinery.

Ultimately, the effects of high and extreme temperature processes limit grease performance and line efficiency, increase safety risks, and drive energy and clean-up costs.

SKF has a range of solutions to help in extreme temperature challenges.

Extreme temperature applications: 302 to 662 °F (150 to 350 °C)

Does use of greased bearings involve costly maintenance, put operator safety at risk and potentially limit the increase of productivity?

SKF dry lubrication technology
can offer the right upgrade for your asset

Based on advanced graphite lubrication, SKF DryLube bearing capability includes two different high temperature technologies.

The first features a fully crowned, pure graphite cage for ball bearings (suffix VA228) limited to ≤ 100 r/min applications. The second features a graphite and resin binder for use in virtually all bearing types with increased limiting speeds (suffix VA210 and 260). Both graphite lubrication technologies can offer:

- **Lubrication-free performance**
- **Reliability and long service life**
- **Reduced standstills and lost production**
- **Possibility to raise process temperature up to 662 °F (350 °C)**
- **Reduced friction with low start-up and constant low-running torque**
- **Improved operator safety (no need to relubricate)**



Pure graphite cage

During operation, the pure graphite cage generates minute quantities of graphite – more than enough to lubricate the bearing and enable years of trouble-free operation without maintenance.



An engineered mixture of graphite paste injected and hardened into the bearing fills the free space inside the bearing, providing relubrication-free, long service life.

Is unhygienic grease leakage a concern?

SKF extreme temperature bearings and units*
eliminate the need to re-grease

• ≤ 100 R/MIN APPLICATIONS

Featuring a manganese phosphate surface treatment that enhances running properties, SKF relubrication-free extreme temperature bearings are available in two types: Marathon bearings and deep groove ball bearings.

- **Suitable for operating temperatures up to 662 °F (350 °C)**
- **Enables process temperature increases with no relubrication**
- **Can provide more flexibility for process temperature to maintain or even improve product quality**
- **Extends bearing service life**

Reliability and long service life

In a stone baking oven with an operating temperature of 509 °F (265 °C) and 50 r/min, SKF high temperature bearings with fully crowned pure graphite cages provided reliable, relubrication-free operation. This dry lubrication solution extended bearing lifecycles from nine months to three years, eliminating the demanding manual relubrication.





Deep groove ball bearings in VA228 execution



Longer service life, shorter baking cycle times

Due to poor lubricant selection and fitting practices, the bearings within a tortilla chip oven required excessive relubrication. Ovens were upgraded with SKF high temperature Marathon bearing units. Operators were able to increase oven temperature to 482 °F (250 °C), reducing baking cycle times from 23 to 17 seconds, and enabling increased production. Bearing life cycles improved to over one year in service.



Marathon bearing units in VA228 execution

• ≥ 100 R/MIN APPLICATIONS

Ideal for extreme temperature applications with higher application speeds, SKF DryLube bearings can replace most bearing types.

- **Low start-up torque at any temperature**
- **Low frictional moment during operation**
- **Lubricated for the life of the bearing**
- **Minimal lubricant loss**
- **Suitable for oscillating movements**



SKF DryLube bearings in VA210 execution

*** For selection of the correct bearing type for your application, please contact SKF or your SKF authorized distributor.**

Asset customized solutions

Reduced planned downtime for wafer baking ovens?

SKF wafer oven units*
can provide five years of relubrication-free operation, 24/7

The SKF lubrication-free integral wafer oven units consist of a carrier wheel and a top roller unit for baking tongs. A unique graphite cage acting as lubricant provides an environmentally friendly solution that is HACCP compliant.

- **Increased production with reduced maintenance**
- **Environmentally friendly – no dripping grease**
- **Reduced operating costs – no more relubrication or grease disposal costs**
- **Ease of replacement – quick retro-fit**

Available as stainless steel and manganese phosphate-coated units with shaft sizes of 0.098 in (25 mm) and 1.18 in (30 mm.)





Reduced downtime and lubrication costs

In a wafer baking machine that required costly relubrication at 16-week intervals, SKF wafer units provided five years of relubrication-free operation running 24/7, reducing 150 hours of labor and 88.18 lbs (40 kg) of grease costs per year. Productivity was increased through elimination of 26 hours of planned downtime, but also due to increase of process temperature by 50 °F (10 °C) to 59 °F (15 °C).



Improved reliability

A potato chip fryer was experiencing frequent failures of a housed bearing unit, with each replacement bearing lasting less than 6,000 hours. SKF fryer bearings more than doubled bearing life, achieving more than 16,000 hours of reliable performance with no unplanned stops. Expensive relubrication was eliminated.

Frying oil as bearing lubricant?

SKF fryer bearings*
allow this and can additionally contribute to food safety

Featuring an innovative lubrication solution that allows cooking oil to enter the bearing and act as a lubricant, SKF fryer bearings help to improve fryer reliability. This unique bearing design includes a special high-temperature plastic material cage design, plus stainless steel shield and flinger in a corrosion-resistant housing.

- **Reduction of unplanned stops due to bearing failure and consequent food line contamination**
- **Extended bearing service life**
- **Decreased costs through relubrication operation**
- **Elimination of process oil contamination through grease washout**
- **Excellent corrosion resistance in hostile environments**



Available with cast stainless steel housing, in shaft sizes of 20 to 40 mm and ¾ to 1 ½ in.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Sealed-for-life bearings and units for 248 to 302 °F (120 to 150 °C) environments

Bearings with the correct grease specification for high temperature applications?

SKF double shielded deep groove ball bearings
are lubricated for life and custom grease filled for reliable operation

Designed for particularly aggressive application environments, SKF deep groove ball bearings are pre-filled with a multi-purpose grease based on a fluorinated polyether oil/ PTFE mix. While standard lubricant fill occupies between 25 and 35% of the free space in the bearing, other percentages are available on request.

- **NSF approved grease**
- **Custom grease fill on demand**
- **Extended service life**
- **Wide operating temperature**



Shielded deep groove ball bearings are available from 0.047 in (1.2 mm) to 1.97 in (50 mm) bore size.



SKF can provide custom grease fill (from 10 to 100%)



Reduced downtime and lubrication costs

Problems were being experienced with critical machinery, executing the final sealing function of tea bag production. Due to the proximity of the heating elements, the bearings were exposed to temperatures in excess of 266 °F (130 °C). The customer was using high temperature greased bearings, but still suffering poor reliability. Analysis of failed bearings revealed a number of issues with the lubricant.

An alternative grease and revised bearing specification were recommended. SKF was able to deliver low quantities of the bearing, greased with the recommended lubricant. This, in combination with shaft and housing redesign recommendations, provided a solution that improved reliability of the application.

High temperature bearings up to 482 °F (250 °C)

When high temperature bearings are unable to accommodate corrosive, pressurized environments

SKF polymer bearings*
can improve reliability

SKF polymer bearings feature a versatile selection of standard as well as alternative materials which are able to withstand chemicals, corrosion and high temperatures. Materials can be selected according to operating conditions of the specific application.

- **Self-lubricating, no need for lubricant**
- **High temperature resistance, including hot steam, made possible by a unique material configuration****
- **Flexibility – versatile material combinations****
- **Energy efficiency – low coefficient of friction, reduced weight**



Available with inner diameter range of 0.12 in (3 mm) to 2.36 in (60 mm) for radial polymer ball bearings and 0.39 in (10 mm) to 1.77 in (45 mm) for thrust versions. A variety of these bearings are offered from stock.

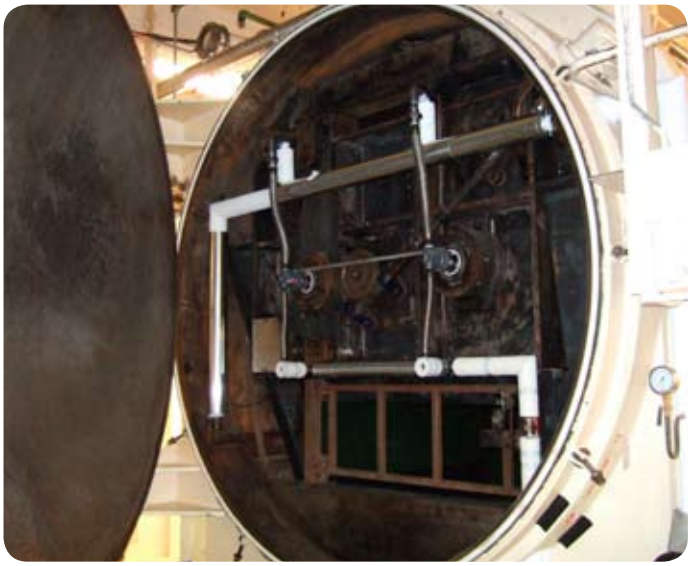


*** Versatile material options for inner and outer rings, balls and cages – customized for requirements of specific applications. PEEK material rings with non-metallic balls are only one option among many bearings especially suitable for food and beverage applications.*

*** For selection of the correct bearing type for your application, please contact SKF or your SKF authorized distributor.**

Suitable lubricant specification, applied in the correct way

Selection of right grease



Selection of lubricants with the right performance parameters may resolve reliability issues

Improved bearing reliability

In a critical vacuum oven for chocolate crumb, poor lubricant performance was leading to bearing failure. Use of SKF LGET2* high temperature grease allowed replacement of the lubrication system, reducing annual grease consumption from 440.92 lb (200 kg) to 8.82 lb (4 kg). Improving reliability of the bearings resulted in lower maintenance costs and a significant improvement in productivity.

** In this case NSF certified, H1 compliant grease was not required.*

Grease replenishment points

Concerned about correctly identifying relubrication points?

SKF offers simple solutions to identify the correct type and amount of lubricant for your asset.

Grease fitting caps and tags TLAC 50
help avoid cross-contamination.





SKF Lubrication Planner
enables simple administration of lubrication routines*.

SKF Lubrication Planner
** Register and download for free at skf.com/lubrication*

For more information about SKF manual maintenance offers, please visit mapro.skf.com, contact your authorized distributor or SKF representative

Simple and accurate manual relubrication?

SKF offers several relubrication tools and accessories, all designed to make manual grease application easier and more precise.

SKF Battery Driven Grease Gun



SKF Grease Meter LAGM 1000E



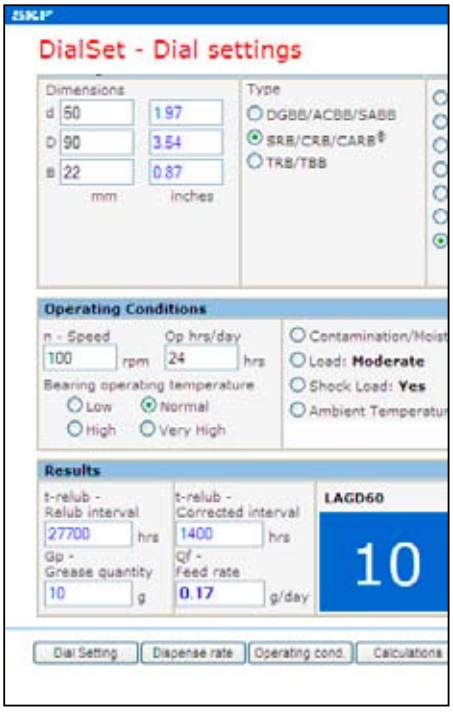
SKF One Hand Operated Grease Gun LAGH 400



How often and in what quantity to relubricate?

SKF DialSet

SKF DialSet software helps calculate the correct grease quantity and lubrication interval. These parameters enable the best fit with scheduled relubrication intervals.



SKF DialSet is a quick and reliable tool for relubrication calculation. Download the App for Android or iPhone by scanning this code.

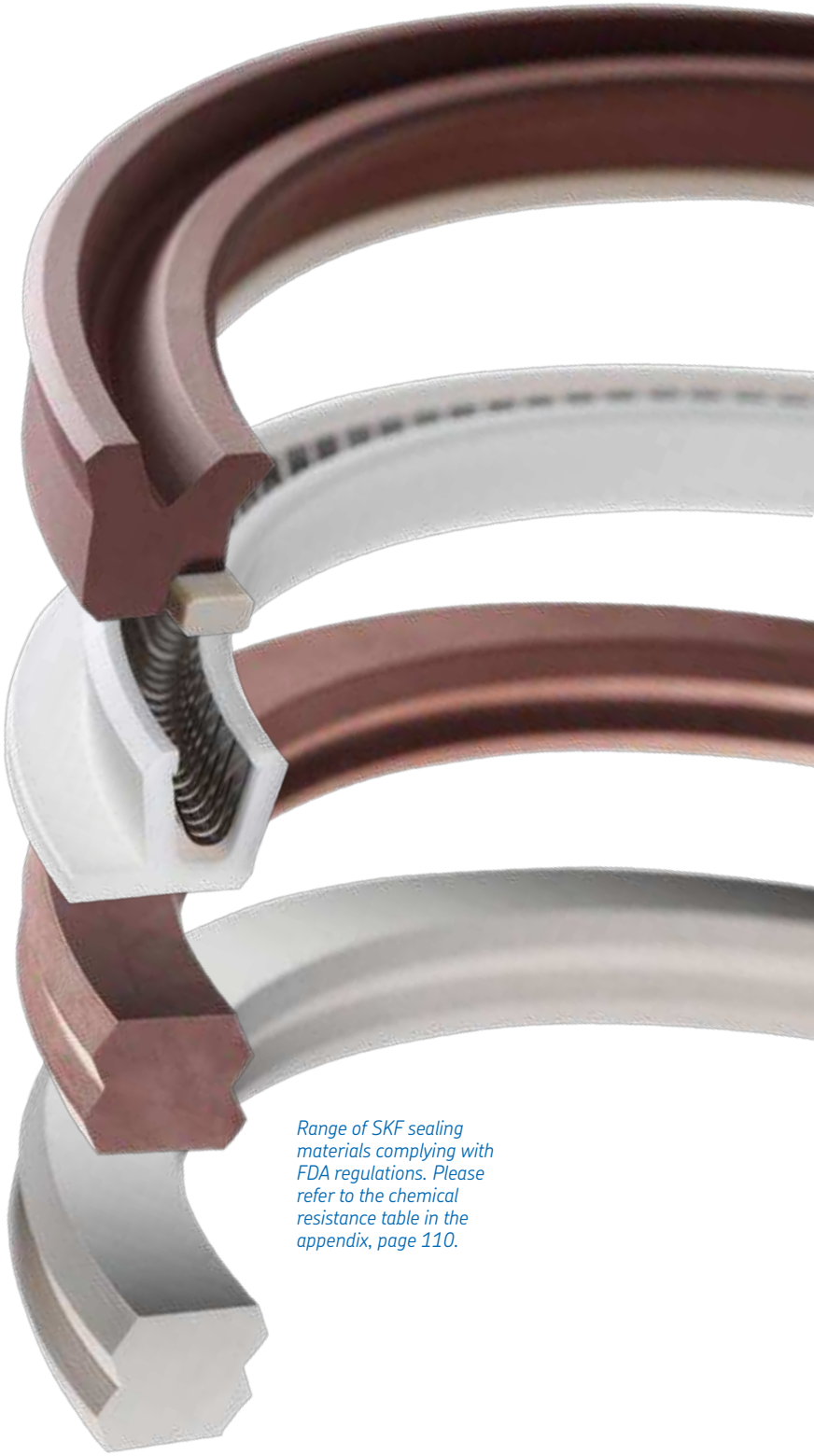
SKF sealing systems offer efficient lubricant protection

Sealing materials that are FDA-compliant and suitable for high temperature applications?

SKF seals for high temperatures
help to ensure optimal functionality and long service life

To manage the combination of heat resistance and thermal expansion, SKF offers a range of seal materials – from fluorocarbon and PTFE to advanced elastomers made of food grade materials. SKF Ecosil, SKF Ecorubber and SKF Ecoflon ranges are some of the SKF proprietary materials resistant to hot water, steam and typical cleaning agents. Benefits include:

- **Increased sealing efficiency and asset life – due to high abrasion resistance**
- **Energy efficiency – reduced friction**



Range of SKF sealing materials complying with FDA regulations. Please refer to the chemical resistance table in the appendix, page 110.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



Extreme temperature applications: 356 to 662 °F (180 to 350 °C)



Improved productivity of pizza baking oven

In a pizza baking oven, manually applied oil lubrication delivered insufficient lubricant to friction areas such as chain links and pin bores; this resulted in excessive wear and subsequent chain slippage. In addition, energy consumption and unplanned downtime were high. An average of 40 to 50 minutes was needed to re-start production, reducing oven availability. The SKF ChainLube oil projection system increased reliability once installed, providing accurate automatic pitch-by-pitch lubrication.

Increased chain reliability, enhanced operator and food safety?

SKF ChainLube, airless oil projection system

is a user-friendly, food-safe and reliable solution for accurate and automatic chain lubrication

The system provides accurate lubrication of chains pitch-by-pitch, without the need to connect to compressed air supply. It is best suited for lubrication of chains with medium pitch (1.97 in / 50 mm to 11.81 in / 350 mm), speed below 2 pitches/second, temperature (nozzles area) up to 428 °F (220 °C). Projection nozzles, having no mechanical contact with the chains prevent dirt accumulation and applicator wear.

- **Reduced maintenance costs (lubricants & lubrication tasks compared to manual lubrication)**
- **Eliminated risk of lubrication points being missed through human error**
- **Improved productivity by eliminating unplanned stoppages**
- **Longer service life resulting from reduced chain wear**
- **Reduced energy consumption through decreased friction**
- **Operator safety by reduced intervention for maintenance tasks**
- **Helps producers support the HACCP process in producing safe food**
- **Better cleanliness by reducing excess lubricant**



SKF ChainLube system can be set up with SKF food grade chain lubricant for high temperature or other type of lubricant used on site.





A compact unit with integrated automation, pumping systems and reservoir makes installation simple and user friendly.

To see a demonstration of the SKF chain lubrication system in action, scan this code or go to the SKF channel on YouTube.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Enhanced service life, no unplanned stops?

SKF grease injection systems for continuous sterilizers
reduces unplanned stops, while enhancing chain service life

Developed for continuous sterilizers for cans and glass containers, this SKF solution automatically injects pressurized lubricant into the chain pin while the chain is moving. Along with the ability to monitor and control lubrication cycles, the system offers:

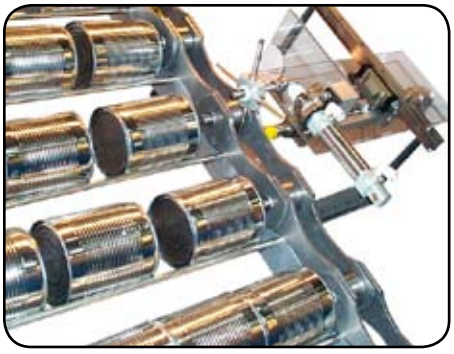
- **Elimination of unplanned downtime caused by improper lubrication**
- **Increased chain service life through precision lubrication**
- **Improved sterilizer efficiency**
- **Reduced grease consumption**
- **Reduced environmental impact**



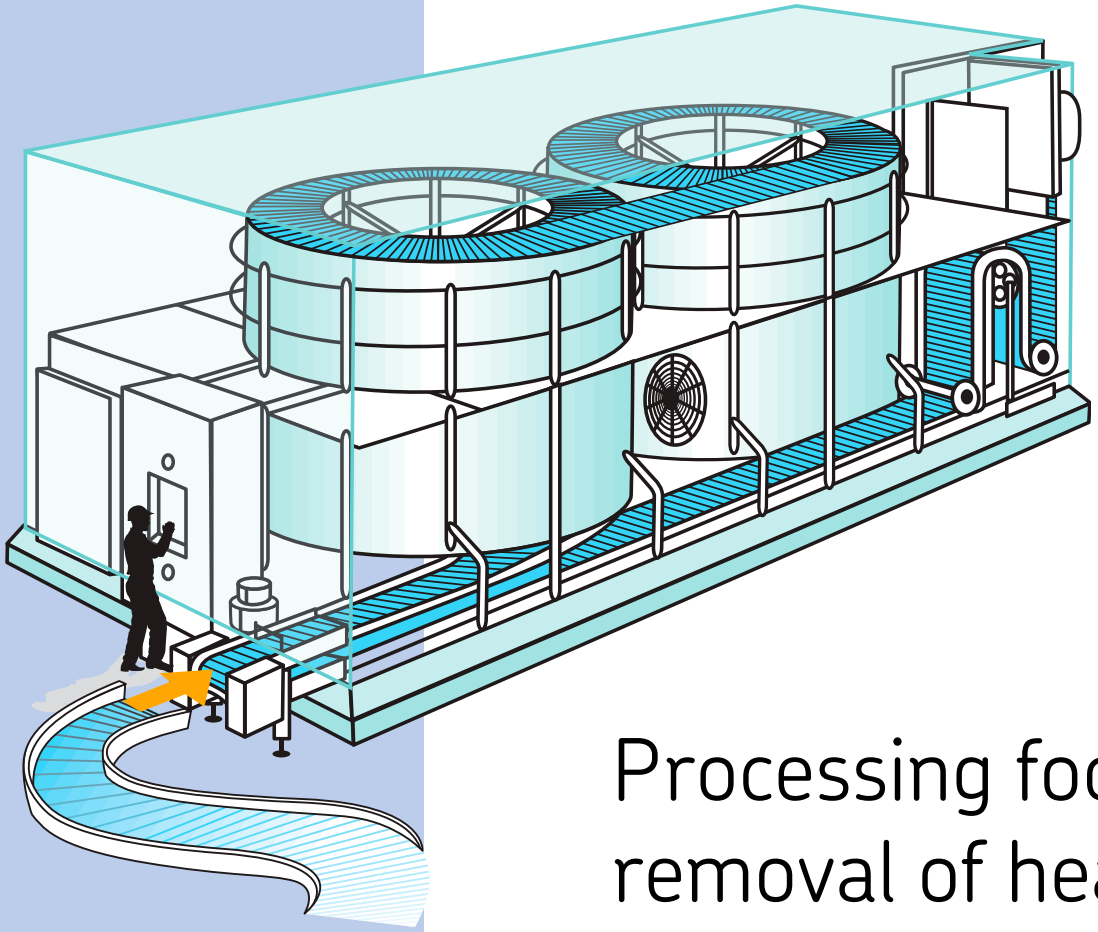
Enhanced service life, no unplanned stops

Using the SKF grease injection system on just one vegetable canning machine, a processor was able to cut labor and repair costs, reduce unplanned downtime, and extend chain service life significantly. Chains in the canning machine are now expected to last 12 to 15 years (compared to six to seven years with conventional systems).





The unit includes one injection head, one chain pick-up system with start wheel and a unit to control and monitor lubrication cycles.



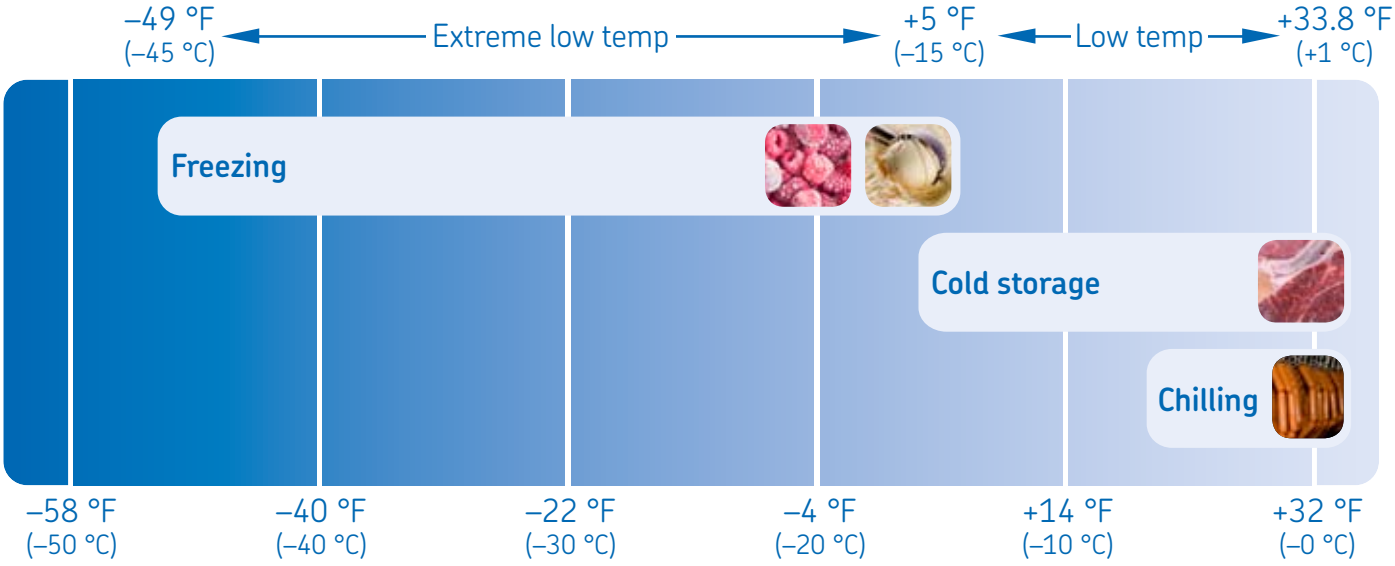
Processing food by removal of heat







SKF



Typical issues in cold environments

Machinery subjected to sub-zero temperatures for freezing, chilling, and cooling processes require frequent maintenance.

During hygienic cleanings, temperatures can change quickly from sub-zero to 95 °F (35 °C), causing air to expand inside the bearings. This causes “breathing” problems and can result in water or moisture entering the bearings, often resulting in corrosion and grease emulsification.

Poor performance of the degraded grease may cause metal to metal contact, raceway distress and high friction, impacting reliability and energy consumption. Relubrication to purge the bearings of moisture can lead to contamination of the product. In extreme cases, ring fractures can result from blocking caused by frozen water or lubricant.

As a consequence, unplanned stoppages, excessive replacement parts with related labor costs may occur. Purging can result in extended use of expensive food grade grease. All this leads to an increase in overall maintenance costs and loss of productivity.

SKF low-temperature solutions can help.



Extreme temperature applications 5 to 49 °F(–15 to –45 °C)

Lubrication technology that can minimize risk of contamination and reduce maintenance costs?

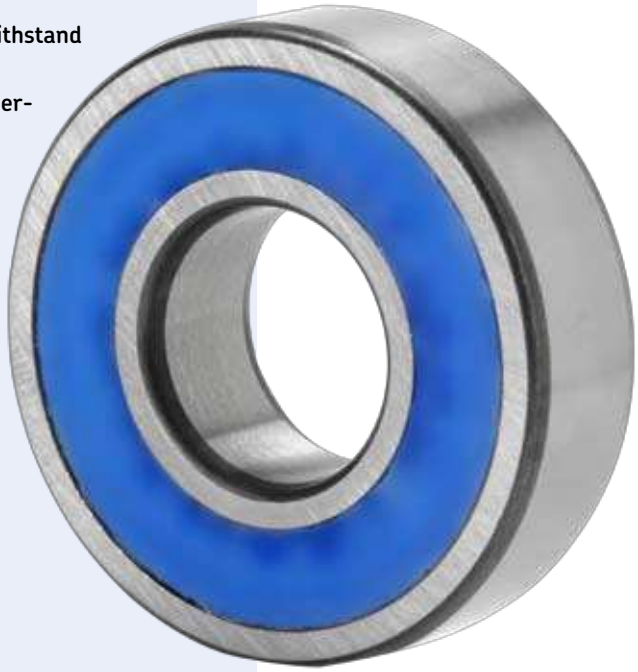
Solid Oil bearing technology

A reliable solution for cold environments

Solid Oil is a polymer matrix saturated with a lubrication oil that completely fills the internal space in a bearing and encapsulates the cage and rolling elements.

The Solid Oil matrix contains two- to four- times more lubricating oil than a corresponding sealed, grease-filled bearing.

- **Relubrication-free**
- **Reliable: eliminates breathing in bearing induced by rapid temperature changes and reduces the risk of corrosion**
- **Keeps contaminants out and resists most chemicals used in wash downs without emulsifying**
- **Food safe**
  - **No leaking and no contamination of the food: Solid Oil can withstand high centrifugal forces**
  - **One of the variants is food grade NSF H1 approved (for temperatures down to –4 °F (–20 °C)**
- **Reduced standstill and lost production**
- **Can be used in hard to reach areas – where manual relubrication is difficult**



The Solid Oil matrix contains two to four times more oil than in conventional greased bearings, this makes relubrication unnecessary.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Hygienic washdowns with sudden temperature shifts leading to bearing failure?

Solid Oil, stainless steel bearings*

Extend service life in challenging environments

Solid Oil filled bearings significantly reduce breathing in the bearing that can occur due to rapid temperature changes, limiting the corrosion effects resulting from hygienic cleanings. The result:

- **Extended bearing life**
- **Reduced downtime and maintenance costs: spare parts, lubricant and labor**





Solid Oil filling can be used in virtually all bearing types with sufficient internal free space.

The standard Solid Oil fill accommodates temperatures down to –40 °F (–40 °C), while the low temperature variant allows temperature as low as 122 °F (–50 °C).

Solid Oil filling is available with NSF approved food grade oil for temperatures as low as –58 °F (–20 °C) (white color).



Increased life, despite wash down regime

In a spiral freezer for fish, chain sprocket bearings had a short service life due to high ingress of water in the bearings and breathing during cleaning cycles (–49 °F / –45 °C to 95 °F / 35 °C). The SKF stainless steel deep groove ball bearing with solid oil (low temperature variant) and a 2RS1 seal provided:

- *Reliable operation by preventing breathing in bearings*
- *Increased bearing life cycles from one to two years*
- *Maintenance cost savings*

To watch a demonstration of SKF freezer solution benefits, scan this code or go to the SKF channel on YouTube.

*** To select the correct bearing type for your specific application conditions, please contact SKF or your SKF authorized distributor.**

Low temperature applications: down to 5 °F (–15 °C)

Reliability issues due to corrosion and grease wash out?

Marathon series bearing units*
offer a relubrication-free solution

Suitable for use in low temperature environments to 5 °F (–15 °C), Marathon bearing units with stainless steel bearing inserts offer:

- **Relubrication-free – no dripping grease or purge contamination**
- **Reduced maintenance costs and environmental impact**
- **Reduced risk of premature bearing failure**
- **Corrosion-resistance**
- **Improved bacteria reduction due to solid or filled base design and smooth surface finish**



Doubled bearing life and reliability

In an ice cream batch tunnel, chain drive support bearing failures were occurring due to corrosion and emulsified grease. The use of Marathon bearing units extended bearing life from six months to more than one year with full reliability during the high season.



Available product range:*
- *Inch: 3/4 in., 1 in., 1 1/8 in., 1 1/16 in., 1 1/4 in., 1 7/16 in., 1 1/2 in., 1 15/16 in. bore sizes*
- *Metric: 20 to 50 mm bore sizes*

*** Please refer to the designation system in the appendix, page 112.**

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



Unable to source bearings with the required grease specification?

SKF lubricated for life, custom grease filled bearings

In cases where a specific brand of lubricant, a specific grease fill or non-standard packaging or markings are needed, SKF offers a customized solution:

- **Wide variety of bearing types available**
- **Seals or shields as required (size dependent)**
- **All grease fills possible (from 10 to 100%)**
- **Any customer specified grease can be used (e.g. if facility is restricted to the use of one grease manufacturer)**
- **Traceability code and new designation laser marking can be added**
- **Vacuum packaging possible on request**



Reliable supply of sealed bearings with non-standard grease types and fills

In a hardening tunnel, the customer wished to use stainless steel bearings filled with a specific low-temperature lubricant that had been proved to perform well in such applications. Suitable bearings were unavailable on short lead times and small quantities. This resulted in delays of overhauls.

SKF was able to supply stainless steel bearings filled with the customer specified lubricant in a small volume and satisfied the lead time requirement.

Applying lubrication and subsequent relubrication in the right way

Correct methods and tools for routine manual relubrication

Can contribute to reducing bearing failures as much as 36%

SKF One Hand Operated Grease Gun LAGH 400



SKF Grease Meter LAGM 1000E



Understanding grease condition will enable the optimization of relubrication schedules



Testing grease condition?

SKF Grease Test Kit TKGT 1

This SKF condition monitoring equipment helps evaluate and monitor grease condition, helping users achieve:

- **Grease savings – relubrication intervals can be adjusted according to real conditions**
- **Reduced risk of undetected grease degradation and contamination**
- **Prevention of failures due to underperforming lubricants**
- **Optimized relubrication routes**
- **Enhanced asset optimization – information can be used for root cause analyses**

For more information about SKF manual maintenance offers, please visit mapro.skf.com, contact your authorized distributor or SKF representative



SKF test kit enables fast, reliable lubricant analysis

A food processing plant relied on an outside lab to analyze lubricant samples taken from the facility's operating equipment. But response time was often delayed, thereby slowing plant managers' decision-making. The SKF TKGT 1 test kit enabled plant maintenance personnel to perform basic tests to assess grease performance in-house, thereby helping empower on-line operators and speeding up the decision-making process. In addition, analysis costs have dropped by 25%.

To see how the SKF Grease Test Kit analyzes grease condition, scan this code or visit the "SKF Maintenance Products Channel" on YouTube.

Grease protection through high efficiency seals and sealing systems

Sealing materials that are FDA compliant and suitable for sub zero temperatures?

SKF seals for low temperatures
help to ensure optimal functionality and long service life

SKF seal materials range from Fluorocarbon rubber and PTFE to advanced elastomers made of food grade materials. SKF Ecosil, SKF Ecoflon, T-ECOPUR and SKF Ecorubber range are just some of the SKF proprietary materials resistant to cleaning fluids and low temperature applications that help achieve:

- **Increased sealing efficiency and asset life, due to high abrasion and wear resistance**
- **Energy efficiency**
- **Reduced friction**



Examples of SKF sealing materials complying with FDA regulations



Doubled mean time between repairs in hardening tunnel gearbox

In a hardening tunnel, annual maintenance was scheduled to avoid catastrophic failure of the main gearbox and chain drive. Gearbox removal carried health and safety risks.

An SKF root cause failure analysis identified corrosion (due to cleaning fluid ingress) and seals "breathing" coupled with incorrect mounting of seals as key problems. SKF suggested the installation of a cartridge with two Ecoflon 4 seals, offering superior chemical, wear and abrasion resistance. On the vertical output shaft, SKF stainless steel deep groove ball bearings filled with solid oil helped prevent corrosion and fluid leaking into the bearing. A simpler flinger sealed the output shaft and kept excess water away when rotating. As a result, mean time between repairs has been extended to 18 months.

Automatic chains lubrication for challenging environments



Extending mean time between failure for conveying chains?

SKF ChainLube, oil projection systems
are reliable solutions for accurate and automatic chain lubrication

The systems include volumetric piston pumps which precisely deliver a metered volume of lubricant to the points of friction while the chain is in operation. A control unit is preset to the preferred timing for lubricant application. Projection nozzles, having no mechanical contact with the chains, prevent dirt accumulation and applicator wear.

- **Reduced maintenance costs (lubricants and lubrication tasks compared to manual lubrication)**
- **Eliminated risk of lubrication points being missed through human error**
- **Improved productivity by reducing unplanned stoppages**
- **Longer service life resulting from reduced chain wear**
- **Reduced energy consumption through decreased friction**
- **Operator safety by reduced intervention for maintenance tasks**
- **Helps producers support the HACCP process in producing safe food (prevent foreign body ingress)**
- **Better cleanliness by reducing excess lubricant**

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

SKF can recommend the right oil projection system for specific application needs

SKF ChainLube, air assisted oil projection system

Is best suited to lubricate chains where no pitch detection is possible due to fast movement of chain or when pitch is too small (less than 1.97 in / 50 mm). Regulated carrier air flow is used to project small amount of lubricant, having viscosity up to 1850 SUS (400 cSt) with virtually no mist formation around the projection nozzles.

SKF ChainLube, airless oil projection system

Suitable for accurate lubrication of chains pitch-by-pitch without the need to connect to a compressed air supply. Suitable for lubrication of chains with medium pitch (1.97 in / 50 mm to 11.81 in / 300 mm), where speed is below 2 pitches/second.



Modular and flexible system to project wide range of viscosity lubricants to several lubrication points (commonly up to 12).





A compact unit with integrated automation, pumping systems and reservoir makes installation simple and user friendly. It serves up to eight lubrication points.





SKF ChainLube oil projection systems can be set up with SKF food grade chain lubricant for low temperature and humid environment or other type of lubricant used on site.

Post processing and packaging









SKF

Typical issues with post processing and packaging assets

From filling, packaging lines to palletizing areas, post-processing applications present many challenges that impact line efficiencies.

SKF can support through managing lubrication, from a range of relubrication-free technologies and effective sealings to automatic lubrication systems.



Where high pressure wash downs are applied, water and detergents can cause contaminant ingress, corrosion, and grease washout in bearings.



The abrasive nature of processing materials and caustic liquids used during the cleaning process can reduce the effectiveness of seals and cause bearings corrosion.



Excessive regreasing, often used to purge the bearing, can lead to possible product/packaging contamination and impact waste treatment costs.



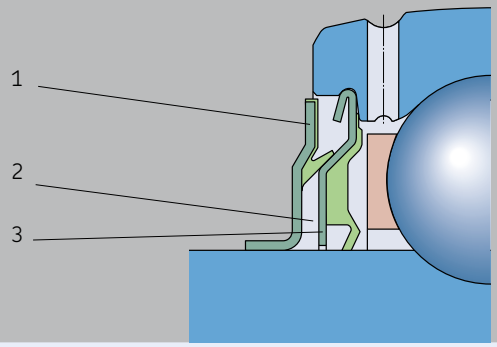
High volumes of a water and soluble lubricant mixture used to lubricate flat top conveyor chains can cause operator accidents due to slippery floors, or package quality issues resulting from organic development and moisture formation.

High-pressure washdowns



Fig. 1

Marathon bearing unit sealing system



Need effective high pressure water exclusion?

SKF 2RF bearing seal technology

Help prevent contamination, retain lubrication

The innovative and effective sealing system consists of a multiple barrier protection which enables longer bearing service life. (→ **fig. 1**).

- The SKF seal arrangement is proven to be highly effective during high pressure wash downs
- The 2RF seal provides excellent protection against detergent penetrating into seal contact areas
- Food compatible materials
  - The flinger and the seal's contacting lips are made of an FDA approved rubber compound
  - The space between the insert seal and the flinger is filled with SKF food grade NSF approved grease

1 The flinger adds mechanical and centrifugal protection against contaminants entering the bearing cavity, and provides a first contacting seal with its rubberized lip acting axially against the gasket seal.

2 The space between the flinger rubberized lip and the gasket seal is filled with SKF food grade grease in order to provide additional protection.

3 Additional sealing efficiency is achieved through the labyrinths created by the flinger's external diameter and the outer ring, plus the metallic seal insert and the inner ring shoulder.

See the SKF 2RF seal in action during a high pressure washdown test. Scan this code or visit the SKF Channel on YouTube.



Significantly increased bearing service life

High pressure wash downs were causing bearing failure and corrosion issues in a dairy packaging conveyor line. The results were costly, bearings had to be routinely replaced every 60 to 90 days. With stainless steel Marathon bearing units, bearing service life increased from 2,000 to 22,000 hours.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Relubrication-free bearing life even with frequent washdowns?

Marathon bearing units
eliminate the wash down related problems of corrosion, premature failure and environmental impact

Featuring the 2RF multiple seal design, Marathon bearing units keep detergent, water and other contaminants out of the bearing cavity, while keeping lubricant inside.

- **Improved foreign body ingress prevention – no dripping grease or purge contamination**
- **Reduced relubrication costs and environmental impact**
- **Reduced risk of premature bearing failure**
- **No risk of missed lubrication points due to human error**
- **Corrosion-resistant under wash down conditions**
- **Improved bacteria reduction due to solid or filled base design and smooth surface finish**

Extensive housing range



Composite



Zinc-coated cast iron



Cast stainless steel

All Marathon bearings units are available in the following bore sizes*:
- *Inch: 3/4 in., 1 in., 1 1/8 in., 1 1/16 in., 1 1/4 in., 1 7/16 in., 1 1/2 in., 1 15/16 in.*
- *Metric: 20 to 50 mm*

Corrosion-resistant insert bearings



Stainless steel execution



Zinc-coated execution

Effective end covers



Tested to withstand 1761 PSI (100 bar) pressure wash without dislocating. Available for the full range.

How much grease can you save from relubrication of 100 bearing positions?

Average 0.53 oz. (15 g) of lubricant per bearing purge, which is equal to:

- **3.3 lb. (1.5 kg)** per weekly maintenance cycle
- **172 lb. (78 kg)** of lubricant per year

With the SKF Documented Solution Program, your SKF representative can show you how much you can reduce cost with Marathon bearing units, based on running data from your own plant.

*** Please refer to the designation system in the appendix, page 112.**

Areas with high humidity

Bearing failure due to corrosion an issue?

SKF stainless steel deep groove ball bearings with food grade grease

are food compliant, sealed for life and corrosion resistant

Featuring stainless steel rings, balls, cages and shields, these deep groove ball bearings are ideal for humid, corrosive environments.

- **Pre-filled with NSF-approved food grade grease**
- **Shielded or sealed on both sides**
- **Corrosion resistant**



SKF stainless steel deep groove ball bearings with NSF approved food grade grease are available for shaft sizes from 0.024 in (0.6 mm) to 1.97 in (50 mm).

Ingress of process material and corrosion?

SKF stainless steel deep groove ball bearing with Solid Oil*

With a solid oil matrix filling the free space within the bearing, the ingress of foreign bodies is significantly reduced

Containing two to four times more oil than conventional greased bearings, SKF stainless steel deep groove ball bearings with solid oil offer relubrication-free life. The solid oil matrix is chemically inert, offering resistance to caustic agents typically used in hygienic cleanings.

- **Significantly reduces ingress of contaminants**
- **Minimizes risk of corrosion**
- **Available with NSF-approved food grade oil for temperatures between–4 °F (–20 °C) and +185 °F (+85 °C) (white color)**



Available for shaft sizes up to 1.97 in (50 mm).*

Doubled bearing service life

On a packing line for ready-to-drink dairy products, hydrogen peroxide and other cleaning agents were causing bearings to corrode and fail prematurely. SKF stainless steel deep groove ball bearings more than doubled original bearing service life.



Reduced grease contamination of packaging



Exposure to chemical cleaning agents and constant humidity were causing standard deep groove ball bearings in a bottle-filling machine to corrode. Excessive relubrication of the original bearings caused contamination to the packaging. A switch to SKF stainless steel deep groove ball bearings filled with solid oil increased bearing service life from three to elevem months, while eliminating lubricant contamination.

Applications exposed to harsh chemical environments?

SKF polymer bearings*

Excellent chemical resistance in challenging environments

Featuring an advanced, self-lubricating polymer material, SKF polymer bearings are capable of running dry, with no relubrication. These bearings have a low coefficient of friction and excellent resistance to wear and fatigue.

- **Self-lubricating, no need for lubricant**
- **Corrosion and chemical-resistant**
- **80% lighter than steel**
- **Quiet running**



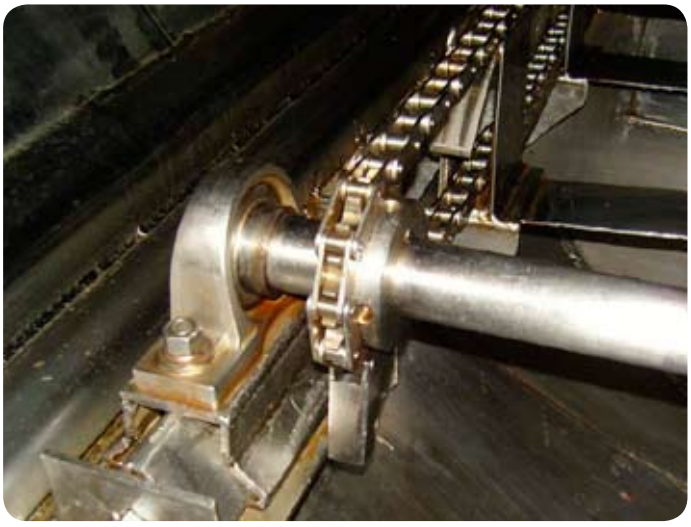
SKF polymer bearings are available in various dimension series for bore diameters ranging from 0.12 in (3 mm) to 2.36 in (60 mm).

Increased asset availability

Corrosive agents (ozone water) and lubricant washouts in a bottle washing machine were causing repeated bearing failures. Installing SKF polymer bearings reduced downtime, improved production and significantly increased bearing life.



Areas with high shock loads



Housing fracture, poor reliability?

Marathon bearing units in stainless steel housings

are most appropriate for applications requiring superior durability

With the ability to accommodate heavy or shock loads, risk of housing failure is significantly reduced. Additionally, an advanced sealing system keeps water and other contaminants out of the bearing and retains the lubricant.

- **Reduced relubrication costs and environmental impact**
- **Reduced risk of premature bearing failure**
- **Corrosion-resistant under virtually all washdown conditions**
- **Improved bacteria reduction due to smooth surface finish**

*** To select the correct bearing type for your specific application conditions, please contact SKF or your SKF authorized distributor.**

Ingress protection through high efficiency seals and sealing systems in rotating



The SKF Seal Jet system helps enable production of customized machined seals as prototypes, or small to medium series within one to two days.

Sealing solutions that are FDA compliant and effective in hostile environments?

SKF machined sealing solutions

are designed to withstand processed food and beverage ingress as well as washdowns that employ aggressive chemicals

SKF sealing solutions use both standard and SKF proprietary, FDA-approved sealing materials. Custom designs can be produced in as little as one to two days, offering:

- **Resistance to high humidity, hot steam and chemicals used in hygiene washdown (CIP)***
- **Superior wear resistance, including abrasive processing materials**
- **Reduced unplanned downtime and scrapped production**
- **Improved service life**
- **Reduced friction**



H-ECOPUR is a thermoplastic polyurethane elastomer that combines the engineering properties of ECOPUR with a high resistance to hydrolysis (degradation of water) and outstanding stability in mineral oil. H-ECOPUR meets FDA standards.

*** Please refer to the chemical resistance table in the appendix, page 110.**

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Asset customized solutions

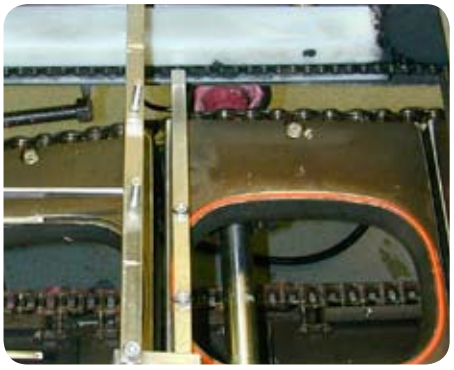
SKF can provide integrated solutions, incorporating engineered plastics parts, optimized seals and more

Increased bearing life in labeling machines



Issues with water penetrating seals, along with high humidity and caustic chemical washdowns led to shortened bearing life in labeling machines. SKF supplied a custom-designed lip seal made of SKF Ecorubber with SKF Ecopaek cassette that increased seals life by four times. Additionally, machine availability and productivity were improved due to a reduction in unplanned stops.





Reduced waste with shrink wrap seal

On a food production line, a standard silicone seal under the tray lip did not seal correctly. This caused misalignment of the tray when the label was heat shrunk to the face of the tray. Incorrect positioning of the labels resulted in scrapped product, high waste costs as well as high maintenance and repair costs.

SKF engineers applied a machined silicone oblong-shaped O-ring to seal correctly under the tray lip, thereby eliminating any movement when pressure was applied to heat shrink the label. Production increased due to consistently aligned labels at 130 units per minute and scrap meals were reduced from 25 to 3%.

Reduced costs, increased reliability for carousel filling station

In a carousel filling station, the original POM (Polyoxy-methyelene) parts reacted to chemicals used in an aggressive cleaning process. This resulted in changes in the color and more importantly the properties of the sealing material.These changes caused an associated bayonet connection to become loose, affecting the integrity of the system.

SKF designed a replacement part with a combination of an engineered plastic part and a machined sealing element made from SKF Ecoflon 1. The life of the sealing system was increased three times with a corresponding increase in production and a reduction in associated maintenance costs.



Asset customized solutions

Improved sealing system reduced downtime in carousel filling stations

In carousel filling machines, seals wear out quickly due to the effect of hot steam sterilization and aggressive CIP solutions, causing unexpected downtime. SKF provided a sealing kit, manufactured from SKF proprietary FDA approved materials.

- **Optimized seal design**
- **Increased reliability, due to good chemical and steam resistance**
- **Local manufacture, delivery within one day**
- **Reduced machine downtime, resulting in reduced costs**
- **Easier replacement, retro-fitting in existing housing**







Improved sealing system durability in bottling machine distributor

In a facility's bottling machines, seals used in rotary distributors used to wear out quickly, causing unexpected downtime. SKF provided an integrated sealing solution, with an optimized seal design using FDA approved material E-ECOPUR and SKF Ecotal. Benefits were:

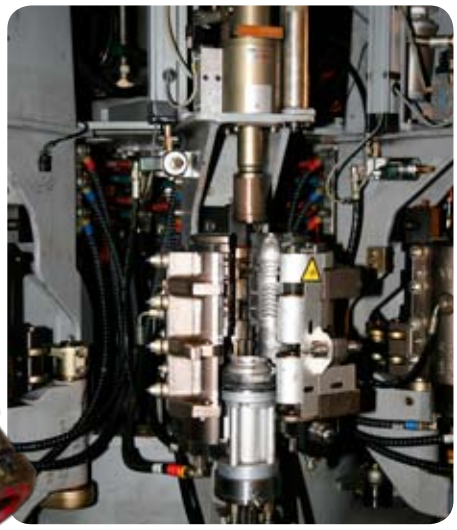
- **Improved chemical resistance against process fluids and CO_2**
- **Increased seal life by 80%, resulting in reduced costs**
- **Machine availability improvement**
- **Easy replacement, retro-fitting in existing housing**



Cost-saving solution for rotation blow molding machine

In a rotational blow molding machine, hot polyethylene-terephthalate (PET) caused major seal wear, leading to unplanned machine downtime. The SKF solution consisted of integrated, sealing and engineered plastic parts, including a bell valve, bell seal and spring retainer. Benefits were:

- **Increased lifetime from two to 12 months**
- **Reduction of over 50% in seal spare parts stock**
- **Related maintenance costs reduced by 30%**







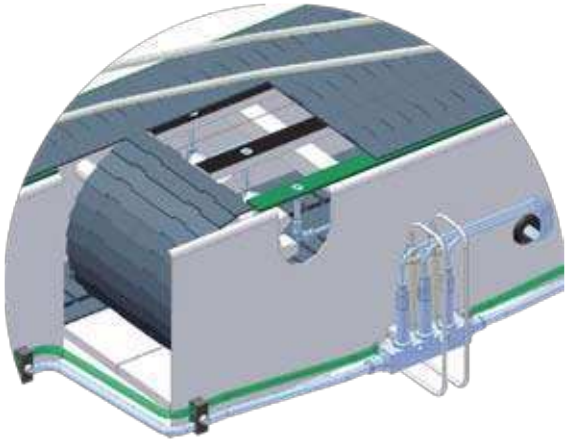
Reduced maintenance costs, increased productivity in can filling station

A poorly performing sealing system in a can filling station led to production standstills every three to four weeks. SKF determined that an inadequate seal design led to a loss of pressure in the cylinder and significant wear of the sealing materials.

The SKF solution involved an improved design that incorporated a guiding function, and a piston seal customized to the technical requirements of the application. Once installed, the solution operated trouble free for one full year. The seals are now replaced once a year during a planned system shutdown when all moving parts are replaced.



Lubrication solution for flat top conveyors



An alternative lubrication to water and soluble lubricant?

SKF Dry Lubrication system for conveyors
reduces waste, brings operator safety benefits and more

Dry lubrication for plastic flat top chain conveyors using PET, carton or can packages, is a flexible and completely automated system which applies a small amount of SKF Dry Film Lubricant (NSF H1 certified) on the conveyor chains and guides. Benefits include:

- **Cost savings by eliminating high volume of water and soluble lubricant**
- **Improved operator safety by reducing slip hazards**
- **Quality of packaging is maintained by elimination of moisture**
- **Enhanced line efficiency by avoiding replacement costs and associated unplanned production stops**
- **Reduced cleaning costs**



Self-contained central unit protects the piston pump, the reservoir, and the programmable control unit.

Improved safety, line efficiency, reduced waste in bottling lines

In a water bottling plant using PET packaging, conveyors were lubricated by spraying large volumes of water mixed with soluble lubricant. This created a highly humid environment and caused related problems including slippery floors, foam formation, plant inefficiencies, energy waste, and the need for frequent cleaning.

The SKF Dry Lubrication system was set up to lubricate 90 flat top chains, with 200 lubrication points. In one lubrication line alone, the system resulted in savings of 84.5 gallons (320 liters) soluble lubricant and 3283 ft^3 (93 m^3) of water per month. Additional benefits were realized in reduced cleaning expenses, enhanced packaging quality and in operator and product safety.



SKF Dry Film Lubricant LDTS 1 is specially developed for automatic lubrication of plastic flat top chain conveyors. LDTS 1 is NSF H1 certified for use where incidental contact with food can not be excluded.

Scan this code to see a video of the SKF dry lubrication system in action or visit the SKF Channel on YouTube

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Automatic systems for simplified lubrication maintenance

Unplanned downtime due to inadequate lubrication?

SKF automatic, centralized lubrication systems
simplify lubrication maintenance and improve reliability, productivity and safety

From its centralized lubrication systems, SKF offers a range of flexible automated solutions for bearings, gears or linear motion, adaptable to various asset conditions. All include a pump unit (with optional control unit), distributors/feeders to automatically deliver the lubricant amounts and intervals. Optionally, this can be linked to the machine's PLC (programmable logic controller) indicating possible lubrication system failure.

- **Enhanced productivity through greater machine availability**
- **Simplified maintenance given the modular and standardized lubrication system components**
- **Flexible system – can be adapted to different type of assets, used with a variety of grease and oil types**
- **Extended bearing and gear service life through reduced wear**



SKF MonoFlex, single-line lubrication systems

Versatile system for small- to medium-sized machines, which dispenses lubricant to individual lubrication points in precise amounts, regardless of changes in viscosity or back pressure.

Can be used advantageously for both bearing and chain lubrication in packaging machines, shrink wrappers, palletizers, etc.



SKF ProFlex, progressive lubrication systems

For small- and medium-sized machines. The progressive system incorporates a feed pump or flow limiter to progressively serve each outlet with a defined amount of lubricant – generally grease – with the additional option of detecting plugged lubrication points.

Can be used for bearing lubrication in packaging machines, palletizers, etc.

Reduced costs, increased reliability for packing machine

In a sterile milk packaging machine with an unreliable oil lubrication system, the installation of an SKF MonoFlex system resulted in savings by streamlining manual lubrication tasks. In addition, the system increased asset reliability as a result of the automatic lubrication of all points.





Reduced planned downtime of packaging operation

A milk cream packaging machine with 133 manual lubrication points required a lengthy time interval for relubrication; there was also a high risk of failure due to the possible omission of some hard to reach lubrication points.

The SKF ProFlex system increased reliability by helping to ensure the lubrication of all points. Benefits were significant, including the reduction of scheduled maintenance for relubrication tasks.

Increased chain reliability by automatic lubrication and ...





For lubrication of chains in packaging machines, palletizers, shrink wrapper, etc.

Longer service life for conveying chains with reduced maintenance?

SKF ChainLube, air assisted oil projection system
are reliable solutions for accurate and automatic chain lubrication

SKF ChainLube is best suited for lubricating chains where no pitch detection is possible due to fast movement of chain or when the pitch is too small (less than 1.97 in / 50 mm). Regulated carrier air flow is used to project small amount of lubricant, with virtually no mist formation around the projection nozzles. Because there is no mechanical contact with the chains, the projection nozzles prevent dirt accumulation and applicator wear.

- **Reduced maintenance costs (lubricants and lubrication tasks compared to manual lubrication)**
- **Eliminated risk of human errors in manual relubrication**
- **Improved productivity by reducing unplanned stoppages**
- **Longer service life resulting from reduced chain wear**
- **Reduced energy consumption through decreased friction**
- **Operator safety by reduced intervention for maintenance tasks**
- **Better cleanliness by reducing excess lubricant**

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

the use of high quality chains and lubricants

Is corrosion an issue for your chains?



SKF Xtra Corrosion Resistant Chain series

Zinc-plated roller chains combine the strength of standard roller chains with the corrosion resistant properties that come from the zinc-plating, thus providing enhanced service life.

Other SKF Xtra Corrosion Resistant Chains include nickel-plated chains, H2-approved and stainless steel for superior corrosion resistance.

Curved conveyors can face frequent chain failure.

SKF Side Bow Chains



SKF Side Bow Chains feature increased flexibility that enable them to bend and twist due to extra clearance between the inner and outer side plates. Their ability to convey product in multiple directions – through radius turns as well as vertically – gives them an added advantage over standard conveyor chains, providing longer service life.

High quality, food grade chain lubricants by SKF.



SKF's range of food grade chain lubricants includes variants for:

- **Low temperature and high humidity**
- **Medium temperature**
- **High temperature**



Improved conveyor chains helped fruit packing plant increase productivity

Chains in a fruit packaging distribution system often failed in less than six months, due to continued exposure to acidic lemon juice and other corrosive materials. The SKF solution involved a special chain with a zinc coating that could resist corrosive environments. The result was longer periods between change-outs, less downtime for chain replacement, and improved productivity.



SKF Side Bow Chains provided longer service life

A canning plant experienced frequent chain failures (twice a month) which led to unscheduled shutdowns and production losses.

SKF analyzed the problem and recommended the SKF Side Bow Chain as a more suitable replacement. The result was an increase in production uptime and significant savings due to the elimination of production stoppages. In addition, the plant realized a return on its investment in two weeks.

SKF linear motion systems

A cost effective and simple shaft guiding system.

SKF linear ball bearings

provide low friction movement with virtually unlimited stroke

With a wide range of linear ball bearings and accessories, SKF can assist in designing and building simple, economical linear guiding systems to suit many different applications.

The bearings are available in two size ranges – compact to ISO 1 standard and heavy duty to ISO 3 standard. In each of these ranges, there are a number of type and design variants that help achieve a variety of operating benefits.

- **Corrosion resistant material for most variants**
- **Improved reliability – self-aligning features accommodate machine inaccuracies**
- **Long life and reduced ingress of contaminants as a result of high sealing performance**
- **Better running accuracy, given adjustable pre-load**



SKF linear ball bearings are available from 0.12 in (3 mm) to 3.15 in (80 mm) as open or sealed variants.



SKF ball and roller screws are available in a wide range of materials and designs.

Driving system with high quality performance and long-term reliability.

SKF ball and roller screws

are optimum solutions for a wide range of applications that require precision driving systems

Screws, guidance systems and many other components can be made from stainless steel and designed to withstand corrosive environments, while providing high quality performance and long-term reliability.

- **Optimized performance through both standard and customized components (e.g., special machining of shaft screw, splines, pre-load adjustments, when necessary as customer request)**
- **Flexibility: different combination of components, screw size and nut flange design**



Improved reliability of screws on chocolate batching line

A chocolate manufacturer had reliability issues on the batching machine, needing to replace the machine's screws every six months. The SKF solution involved a replacement screw with modifications to diameter, improving load performance. This extended the operating life to 24 months.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



SKF offers the profile rail guides LLT series in six sizes (0.59 in / 15 mm, 0.79 in / 20 mm, 0.98 in / 25 mm, 1.18 in / 30 mm, 1.38 in / 35 mm, and 1.77 in / 45 mm) and six carriages.



Miniature profile rail guides are available in four sizes (0.27 in / 7 mm, 0.35 in / 9 mm, 0.47 in / 12 mm, 0.59 in / 15 mm) and 14 carriages.

Need to improve packaging quality and reduce line downtime?

SKF profile rail guides
provide accurate and repeatable cycling

The assortment of SKF profile rail guides includes a range of sizes, carriages and accessories, available in various preload and accuracy classes. In addition, they can operate at virtually unlimited stroke. As a result, there is an SKF profile rail guide available to meet the needs of virtually any application. The operating features and benefits are many, including:

- **Increased performance through optimized carriage design**
- **Extended life thanks to a high performance sealing system**
- **Improved reliability – given the self-aligning capability of the raceways' X arrangement, can accommodate a certain level of misalignment between the rails**
- **Low friction, smooth and stick-slip-free operation**

SKF miniature profile rail guides
offer accurate and repeatable cycling with minimal mounting space

The assortment of SKF profile rail guides includes a range of sizes, carriages and accessories, available in various preload and accuracy classes. In addition, they can operate at virtually unlimited stroke. As a result, there is an SKF profile rail guide available to meet the needs of virtually any application. The operating features and benefits are many, including:

- **Superior performance: high acceleration, preload, stiffness and self-aligning capability result in better service life**
- **Corrosion resistance: all parts of the system are made of stainless steel or plastic material**
- **Ease of maintenance: oil holes in the end caps of the carriage make it easy to relubricate the system**
- **Low friction, smooth and stick-slip-free operation**



Increased service life for date printing machine

In a dairy plant, a non-standard linear system of a date printing machine experienced short life cycles due to high vibration and poor quality components. The problems also resulted in poor printing quality and an excessive scrap rate. The SKF profile rail guide system provided a standard, non-custom solution that extended asset availability from four to 12 months, reduced scrap costs and optimized spare parts needs.

SKF actuation systems



Standard versions of SKF linear actuators can handle loads up to 2,697 lbs (12 kN), as well as deliver speeds up to 7.09 in/s (180 mm/s) and a maximum stroke of 27.56 in (700 mm).

Improve accuracy with reduced operating costs

SKF linear actuators

Electromechanical linear actuators enable precise, controlled, and repeatable push/pull movement in linear drive applications

The modular design and open architecture provide opportunities to integrate components and achieve customized solutions within existing operational parameters.

SKF offers a wide range of standard actuators as a basis for customized system solutions, including accessories such as hall sensors, limit switches, potentiometers, friction clutches and back-up nuts. Additionally, SKF actuators are available with housings made of different materials (e.g., aluminium, zinc, polymer). SKF linear actuators offer several operating benefits, including:

- **Ready-to mount for easy plug-in operation**
- **Virtually maintenance free**
- **Environmentally friendly alternatives to hydraulic types**

SKF linear actuators help increase productivity, improve operator safety

SKF worked with a manufacturer to fit its specially designed chocolate cooling tunnel with SKF linear actuators. The SKF solution contributed in a variety of applications, including header lift, upper covering, conveyor belt centering, an air cooler positioning gantry and adjustable table height.

Results included an improvement in product quality by allowing automatic adjustments of conveyor alignments and cooling mechanism heights; faster resets by allowing a simple repositioning of coolers between batches; and increased operator safety by reducing manual intervention and providing easy access for cleaning.



For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Maintaining the same performance while using less energy

SKF electromechanical cylinders

The power of hydraulics and the velocity of pneumatics combine inside of SKF electromechanical cylinders to create a solution that meets the needs for high loads and long strokes

The electromechanical system features just one energy conversion versus two in a hydraulic system. Set up is much simpler, as the motion controller can be connected to all industrial electrical power supplies and customer interfaces, resulting in reduced installation time. Advantages include:

- **Improved reliability – less wearing parts and virtually maintenance free**
- **Energy savings – due to reduced number of energy conversions**
- **Allows faster operation and long strokes under high load**
- **High acceleration capability, optimizing cycle times**
- **Ease of use and set-up**



SKF electromechanical cylinders can accept nominal loads up to 56,202 lbs (250 kN); maximum linear speeds up to 5.9 in/s (150 mm/s); and maximum stroke of 27.56 in (700 mm). Customization is available upon request.

Reducing compressed air demand

SKF CASM electric cylinders

Improve energy efficiency while providing simple integration into existing systems

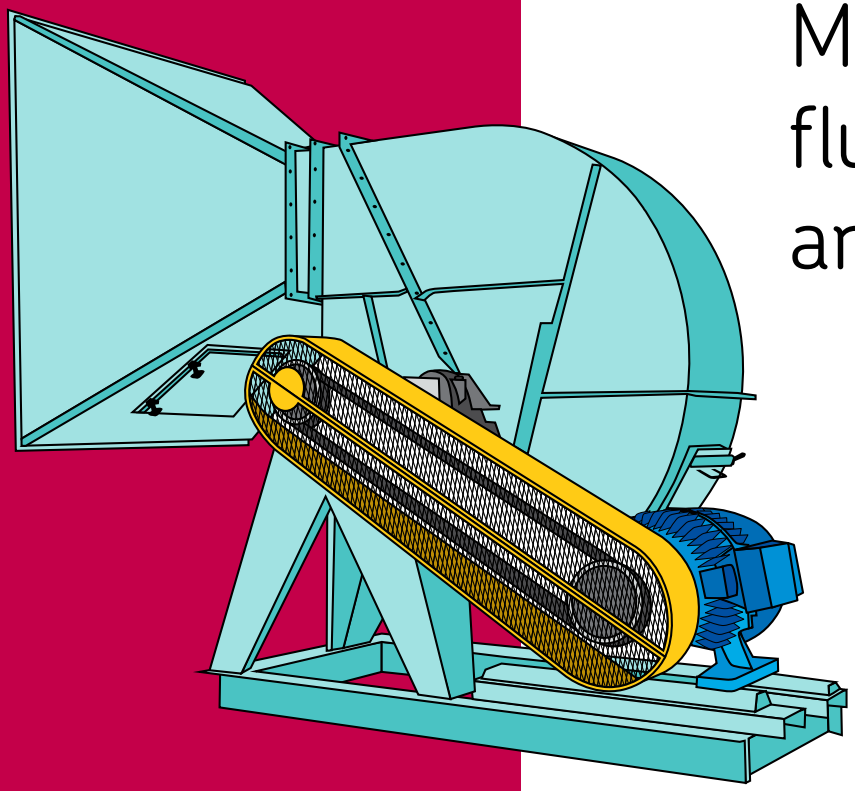
CASM electric cylinders are ideally suited for performing fast and powerful linear movements. The CASM modular concept enables easy connection to motors and control systems. IP54S level protection is provided as a result of an efficient sealing system, high-grade materials and precision assembly. Due to a reduced number of components, the system is more cost-effective than hydraulic and pneumatic systems. Benefits include:

- **Energy savings up to 90%, if replacing a pneumatic system to a fully electric driven one**
- **Fewer contamination risks due to high IP rating**
- **Compact design offers ease of maintenance**
- **Fewer components can lead to reduced inventory and less maintenance complexity**
- **High process stability: CASM actuators are software-controlled, providing accurate synchronization and positioning**
- **Fully interchangeable with pneumatics system due to ISO standard dimensions**



SKF CASM electric cylinders are available in standard ISO sizes: 32, 40 and 63.

Scan this code to see a short video of the CASM electric cylinder or visit the SKF Channel on YouTube



Maintenance of fluid, air handling and drives







SKF

Typical issues with fans and blowers, drives, pumps and compressors



Harsh operating conditions and usage regimes can lead to lubrication issues and bearing failures. The root cause needs to be investigated and fully understood.





Critical drive systems not always accessible or in positions where access means risk to operators safety. Condition is often unkown, with resulting concerns over reliability.





Poor sealing efficiency in gearboxes or pumps can affect drive systems performance, reliability and overall hygienic conditions.

SKF technologies and best suited maintenance activities can help.





Misalignments can result in poor reliability, high energy and spare part consumption.

Fans and blowers life optimization

Fan out-of-balance causing reliability and performance issues?

SKF total fan shaft solution

The SKF total fan shaft solution can significantly improve fan availability, service life and performance

The basis of the solution is a self-aligning bearing system that combines a CARB toroidal roller bearing manufactured to SKF Explorer performance standard in the non-locating bearing position, with an SKF Explorer spherical roller bearing in the locating bearing position. The result:

- **Improved reliability, reduced downtime**
- **Extended service life, less maintenance demand**
- **Reduced friction and vibration levels**
- **Lower energy consumption**
- **Reduced lubricant use and lower operating temperatures**
- **Increased operator safety, by controlling noise and temperature**



After ten years of operation in a sugar mill exhaust fan, this CARB toroidal roller bearing continues to provide superior performance.



The CARB toroidal roller bearing (non-locating position) enables the inner ring to move independently of the outer ring and accommodates axial shaft displacement within the bearing, virtually without friction. This significantly reduces the problem of induced axial loads otherwise created by thermal expansion of the shaft. The SKF spherical roller bearing (locating position) accommodates both radial and axial forces.



The upgraded SE K7 housings help to maximize bearing service life by combining stiffness with highly accurate machined surfaces and a specially designed split seal that reduces friction and heat to accommodate higher speeds.



Automatic systems deliver the correct type and precise amount of lubricant at set intervals.

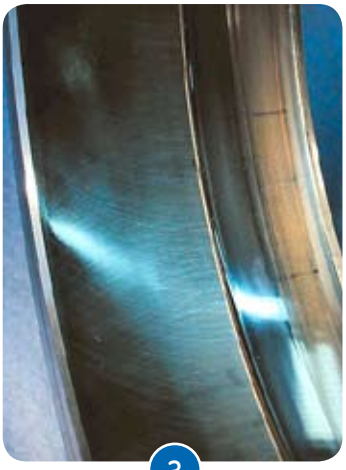
For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Questioning your fan's reliability?

SKF condition monitoring and assessment, upgrade recommendations and installation of upgraded components can maximize reliability in critical fan applications















1 Fans with a history of unplanned stops can be monitored with equipment such as SKF CMAS 100 machine condition advisor. This can simultaneously check temperature, vibration and enveloped acceleration indicating the overall fan health.

2 If high values (compared to built in ISO levels) are recorded on either vibration or enveloped acceleration, the CMAS 100 condition advisor will indicate a danger (D) warning or alarm. A decision can be made whether to conduct further analysis.

3 A root cause analysis of the failed bearing could indicate, for example, high axial loads have led to a failure mode illustrated by the raceway damage (top photo) and outer ring fretting corrosion (bottom photo).

4 The CARB toroidal and spherical roller bearing combination can be selected to resolve the root cause of the indicated damages; in this instance this is likely to be fan imbalance.

5 Use of the SKF Drive-Up method and utilizing specific tools for mounting of the CARB toroidal and spherical roller bearing will help to prevent potential failures due to incorrect mounting. The use of the SKF bearing lock nut spanner TMHN 7 provides an accurate method of mounting, self aligning ball bearings – common in smaller fans.

To see a short instructional film on CARB toroidal roller bearings scan this code or visit the SKF Channel on YouTube.

For a video demonstration of the proper mounting and dismounting of spherical roller bearings with tapered bore, scan this code or visit the SKF Maintenance Products Channel on YouTube.

Fan life optimization through bearing technology upgrade and correct fitting

Dealing with high vibration, imbalance and premature bearing failures?

SKF fans solution based on the self-aligning system proved to be an ideal solution for maximizing bearing life



SKF solution increased reliability of boiler's gas exhaust fan

A food processor experienced unexpected bearing failures in its exhaust gas fan during the production season. These failures reduced the ability of the boiler to provide steam for the process, as well as to generate energy.

The recommendation was to implement the SKF fan solution featuring spherical roller and CARB toroidal roller bearings, SNL housings and SKF SYSTEM 24 automatic lubricators. In addition, routine vibration analysis was introduced.

As a result, mean time between repair increased to four years, resulting in decreased maintenance costs and reliability during the season. The solution helped reduce vibration and temperature levels and eliminated the need for manual relubrication.



Upgrading to the SKF fan solution, based on the self-aligning system, increased mean time between repair for critical fan in coffee plant

A critical exhaust fan in a coffee plant required several repairs over a short period of time, leading to unplanned downtime and related maintenance costs. SKF engineers performed a complete machine reliability assessment. As a result of this, proven SKF fan upgrade solutions were applied. Unnecessary maintenance costs and approximately 66 hours of lost production were saved during the course of a year.



SKF Explorer bearings helped sugar plant eliminate fan breakdowns

A sugar mill's critical fans had frequent unplanned breakdowns due to premature bearing failures; this made it necessary to re-babbit twice a year. The plant maintenance team replaced the babbit bearings in two fans with SKF Explorer spherical roller bearings. Since then, the fans have operated without breakdown through four milling seasons, resulting in substantial cost savings.



For more information about SKF offers, please contact your authorized distributor or local SKF representative.

16% of premature bearing failures are caused by poor fitting. Work to prevent them.









The SKF Reliability Maintenance Institute offers a comprehensive range of classroom and on-line training courses regarding mechanical training, and also other topics such as condition-based maintenance, bearing basics, lubrication, seals and more.

For more information please visit skf.com/services/trainings

Fan life optimization through correct lubrication

Do your fans have hard to reach points that need frequent relubrication?

To avoid bearing failures due to inappropriate lubrication, the use of simple automatic systems from SKF can provide accurate and reliable lubrication of fans

SKF automatic single point lubrication systems



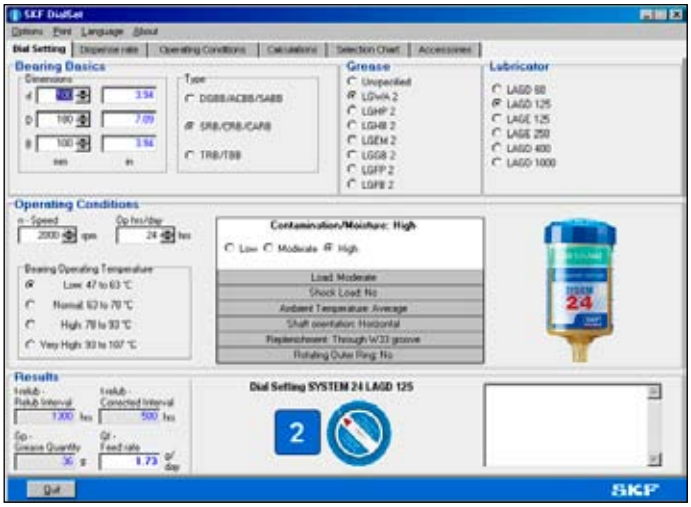
SKF MultiPoint automatic lubrication systems LAGD 400 and LAGD 1000

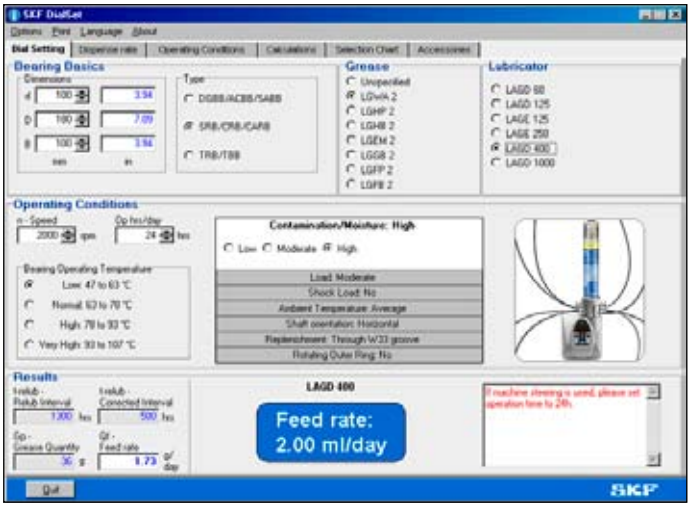


Getting more control over regreasing quantities and intervals

SKF DialSet

can calculate the correct grease dispense rate based on an application's operating conditions*





For more information about SKF offers, please contact your authorized distributor or local SKF representative.

* *Desktop, online and smart phone versions are available free of charge. Visit skf.com/lubrication for more information.*

Operating parameters of your critical fan reaching the limits for grease lubrication?

SKF engineering services recommended a change to oil lubrication to increase reliability of critical fans

In an industrial blower for steam boiler, grease lubricated bearing failures were experienced every milling season due to high ambient temperatures. These conditions posed high demands on both bearings and lubricants.

SKF recommended a change to oil circulation lubricated SNL plummer blocks. The industrial blowers have run for one milling season without any breakdowns since installation. This has increased productivity and reduced maintenance costs (labor, lubricant waste, downtime).





Grease lubrication is the preferred option on many fan applications, due primarily to the simplicity of the housing design, sealing and lubricant retention. Oil lubrication however, is the optimum lubricant and can be essential for applications involving higher speeds and/or temperatures.

SKF oil lubricated housings provide the necessary design features to enable the correct application of oil as a lubricant, providing optimal reliability in more extreme fan applications.

Fan and blower life optimization through power transmission upgrades

Unreliable fan drives causing unplanned downtime, high energy consumption?



Correcting alignment and upgrading belt drives reduced unplanned downtime and extended drive system life

A baking oven's circulatory fan drive went though an unusually large number of V-belts (25 in a month). Each belt replacement took 30 to 45 minutes, resulting in costly unplanned downtime.

SKF was asked to evaluate the drive and proposed a redesign that reduced the number of belts from three to two, and allowed the use of lighter, two-groove, taper-bushed pulleys that had less overhang, reducing the load on the bearings. The results included an extension of belt life (to an average of seven months) as well as significant reductions in belt replacement time (15 minutes). Cost savings were generated from reduced unplanned downtime, spare parts and electricity consumption.



SKF solutions helped to optimize performance of sugar blowers

A manufacturer of sweetened dairy products experienced poor reliability (Mean Time Between Failure (MTBF) of four to six months) on its sugar blowers, with associated high spare parts consumption. An SKF technical assessment led to a new solution that upgraded the existing arrangement to an improved SKF Cogged Raw Edge (CRE) belt type, including belt alignment and belt tension checks.

The SKF solution helped reduce energy consumption on seven blowers by an average of 7%, increasing reliability and MTBF.



SKF Cogged Raw Edge belts

are highly flexible belts that can bend around a smaller pulley without causing undue amounts of stress. They are reliable for use in environments from–22 °F (–30 °C) to 167 °F (75 °C), including tropical climates. Their high energy efficiency construction includes a "raw edge" combined with a "cogged" design that offers:

- **Higher friction, resulting in 25 to 30% more power transmitted**
- **Improved efficiency, leading to less energy consumed**
- **Lower maintenance requirements than for conventional wrapped belts**
- **Less internal heat build up to enhance long term rubber life**

SKF pulleys with taper bushings

offer convenient and easy mounting and dismounting, providing a fast and efficient method to secure the drive system. Benefits include reduced installation time, and less risk of shaft damage and injuries.



Taper bushing



Wedge belt pulleys

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Unplanned blower drive failure in elevated ambient temperature?

Corrections to design, alignment and tensioning of belt drive helped increase efficiency at dairy plant

A dairy company experienced problems with belt drives on the blowers of their dryer. The drive belts operated in a very high ambient temperature (140 °F / 60 °C), leading to short life (four to five weeks), frequent replacements and lost production due to unplanned shutdowns.

A comprehensive evaluation of the belt drive confirmed that failure was due to very high running temperatures that were causing the rubber to cure and harden, resulting in the belts cracking and breaking. Other issues included:

- **The design of the drives made it difficult to maintain tension correctly, adding to the problem of high temperatures**
- **An analysis with the SKF Belt Frequency Meter found the tension to be higher than recommended for this belt type**
- **Misalignment of the motor caused elevated belt temperatures.**



The recommended solution, the SKF Xtra Power belts were able to accomodate higher temperatures and belt stress while maintaining correct tension. The SKF Belt Frequency Meter was used to fit the belts at the correct tension, and SKF belt alignment tools to correctly align the fan and motor pulleys.

A subsequent inspection of the drives found no sign of abnormal wear or heat deterioration, and the tension was within specification. In addition, an infrared image showed that the running temperature of the belts had been reduced by up to 50 °F (10 °C).

Additional benefits included a reduction of unplanned downtime, maintenance costs and increased energy savings from the belt drives running efficiently.



The SKF Belt Frequency Meter

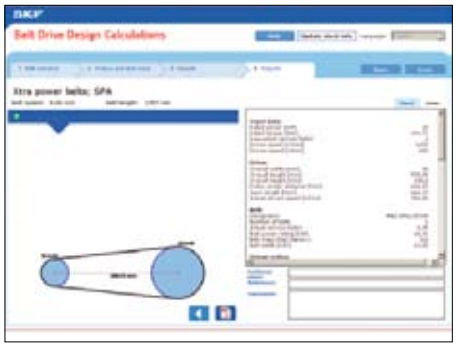
helps achieve quick and accurate tensioning of belt drives by means of belt frequency measurements. Using proven infrared measuring, this tool allows any operator to set the correct belt drive tension.



SKF XtraPower belts

are characterized by high operating efficiency (up to 97%) even in slightly higher temperatures (up to 158 °F / 70 °C); minimal elongation; and an ability to retain optimal tension without constant maintenance. The specially formulated compounds used in the rubber and the tension cords makes the belt more resistant to heat and shock loads.

Determining if existing belts are optimal for applications



SKF belt calculation software*

Using plant application data, the program will select the most efficient and economical belt solution for the application.

**Available free-of charge as an App for smart devices and on skf.com*

Download the App by scanning this code.

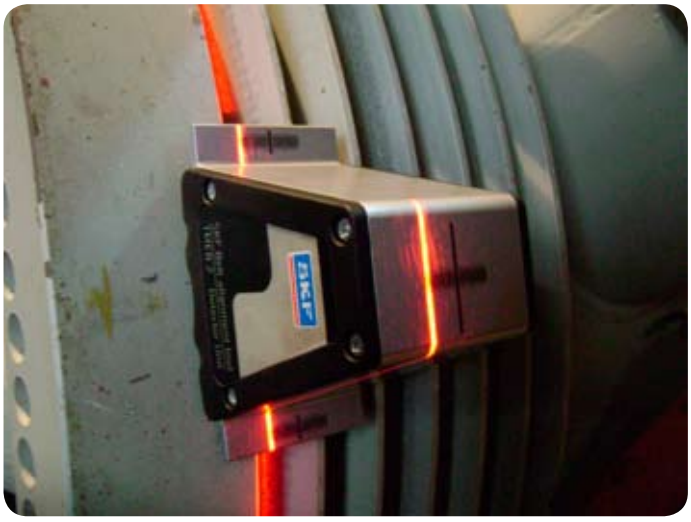
Fan and blower performance optimization and energy savings



1 Operator routine inspections can detect high overall machine vibration using the SKF Machine Condition Advisor, CMAS 100-SL. Energy consumption can also be checked at this stage.



2 Elevated level of the above parameters (vibration and energy) are common indicators of power transmission alignment issues.



3 SKF TMEB 2 belt alignment tool can be used to confirm and correct the identified misalignment; this will support improved fan reliability.



4 Re-checking energy consumption can provide proof of the energy savings.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.



Improved reliability and productivity of dairy fans

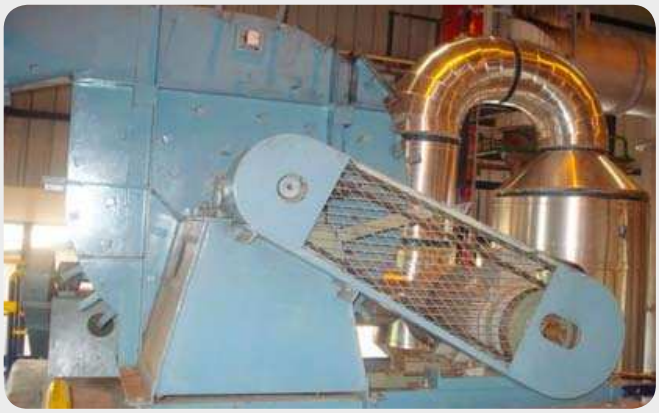
Two high-pressure fans in a dairy plant experienced elevated vibration levels, detected with the SKF Machine Condition Advisor CMAS. Belt alignment was suspected as being an issue, but a closer inspection also revealed issues with the fan foundations. Faults were corrected and SKF belt alignment equipment ensured a correct drive set-up. Fan reliability was improved, with resulting energy savings.

SKF belt alignment helps reduce energy consumption, enhance reliability

Increasing energy consumption was noted on a noodle line roots blower. An operator inspection using the SKF Machine Condition Advisor, model CMAS, detected excessive vibration. Further analysis identified misalignment between the motor and blower pulleys. The misalignment was corrected using the SKF Belt Alignment Tool TMEB 2; subsequent energy consumption measurements confirmed a reduction of almost 30%.

Motor current measurement		Phase A	Phase B	Phase C
Blower	Before maintenance	38.7 A	38.1 A	38.5 A
	After maintenance	**28.0 A**	**28.5 A**	**27.0 A**





SKF Stroboscope and Belt Alignment Tool helps cut energy consumption in utility/incinerator fans

Visual operator inspection using SKF stroboscope identified unusual belt wear in two incinerator fans, also causing increasing energy consumption. Belt misalignment was suspected, then confirmed and corrected using the SKF TMEB2 laser alignment tool. Early correction of the misalignment between pulleys eliminated wear on the belts and contributed to an energy reduction of approximately 20% for each fan.

Motor Current measurement		Phase A	Phase B	Phase C
Fan 1	Before maintenance	12.2 A	13.2 A	12.8 A
Fan 1	After maintenance	**10.6 A**	**10.5 A**	**10.7 A**
Fan 2	Before maintenance	12.2 A	12.8 A	12.7 A
Fan 2	After maintenance	**10.5 A**	**10.5 A**	**10.6 A**

Performance optimization through advanced monitoring, analysis and balancing

When simple measures are insufficient to solve problems such as identifying the source of high vibration levels, SKF can offer expertise and advanced techniques for in-depth analysis

1 Periodic fan condition monitoring program using SKF Microlog Analyzer can collect and perform advanced analysis, share machine condition data.





Periodic data collection with SKF Microlog Analyzer

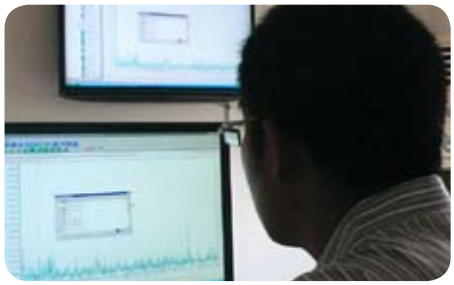
2 SKF on-line machine condition monitoring system is a viable solution for critical fans where access is difficult or user safety is at risk. It allows early fault detection and prevention, automatic recognition to be able to correct existing or impending conditions, and advanced condition-based maintenance to improve machine reliability, availability, and performance.





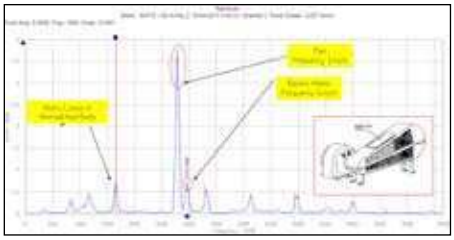


Range of SKF sensors monitoring defined points and SKF IMx online surveillance system



Spectrum analysis with SKF @ptitude software can isolate the different sources of vibration.

3 SKF @ptitude software provides fast, efficient and reliable storage, analysis, and retrieval of complex asset information. This is scalable to specific needs, whether it is on-line or periodic condition monitoring data collection, in-depth vibration analysis and expert advice.





Checking electric motor performance with the SKF Dynamic Motor Analyzer.

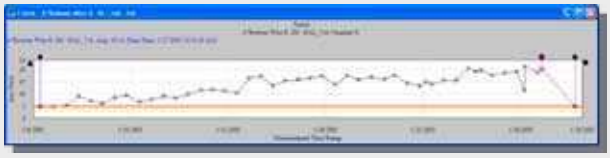
4 SKF engineering can support trouble shooting the identified fan issues, assisted by instruments such as SKF Dynamic Motor Analyzer.





Advanced analysis revealed unexpected causes of fan vibration

High vibrations in a fan motor were detected during periodic condition monitoring using SKF Microlog Analyzer. Plant technicians knew that such vibrations were often due to unbalance and poor ground fitting. However, an SKF spectrum analysis identified a vibration peak inconsistent with the machines frequencies. Further analysis linked the high vibration to a conveyor connected to the fan. Adjustments made as a result of SKF findings reduced the vibration level from an average of 0.43 in/s (11 mm/s) to 0.08 in/s (2 mm/s), thereby enhancing equipment reliability.



SKF @ptitude



SKF condition monitoring helps improve reliability in milk powder plant

A milk powder plant needed to optimize reliability of its critical fans. Machines were located in a critical hygiene area, making it preferable to minimize human intervention. High temperatures and process air pressure increased the risk of manual checks.

SKF recommended a system providing 24/7 online monitoring of the plant's critical processing line assets. The implemented system helped enhance food and operator safety, immediately improving reliability by identifying problems, such as loose covers and bearing defects. This helped to prevent unscheduled stops and loss of production.



Increased fan life in a chocolate plant reduced energy consumption and production losses

High vibration levels were registered in a layering air handling unit responsible for maintaining the temperature and humidity of processing lines.

SKF condition monitoring specialists performed a vibration analysis and identified fan unbalance as the problem. Using the SKF Microlog balancing module the fan impeller unit was dynamically balanced. This helped reduce vibration levels by 78%, resulting in less energy consumption, reduced equipment breakdowns and less risk of production losses.



SKF helped achieve 20% energy savings in exhaust fan

High vibration levels in an exhaust fan were a reliability concern, with the risk of a six-hour unplanned shutdown should a sudden failure occur. To address this, it was decided that SKF specialists perform periodic vibration analysis and field balancing services.

High vibration was also impacting the electrical performance of the motor, this was investigated with the SKF dynamic motor analyzer. An uneven and damaging load ratio across the three phases was detected. After rebalancing, new measurements demonstrated an improved load balance between the three motor phases, resulting in motor life optimization and 20% reduction in energy consumption.

Gearbox performance and life optimization

Increasing service life under poor lubrication and contaminated conditions

Upgraded SKF Explorer bearings with extended service life

last up to twice as long as the original market-leading SKF Explorer performance class bearing

Upgraded SKF Explorer performance class spherical roller bearings provide a number of key performance benefits. The unique engineering, manufacturing and material improvements of the upgraded SKF Explorer bearings have been shown to:

- **Increase uptime**
- **Improve reliability**
- **Increase productivity**
- **Reduce noise and vibration levels**

The upgraded spherical roller bearing provides up to twice the service life of the original SKF Explorer class bearings when operating under marginal lubrication or contaminated conditions. Additionally, once early signs of bearing damage have been detected, the bearing will continue to operate longer, providing more time to plan, order parts and prepare for shutdown, thereby reducing downtime and its related costs.

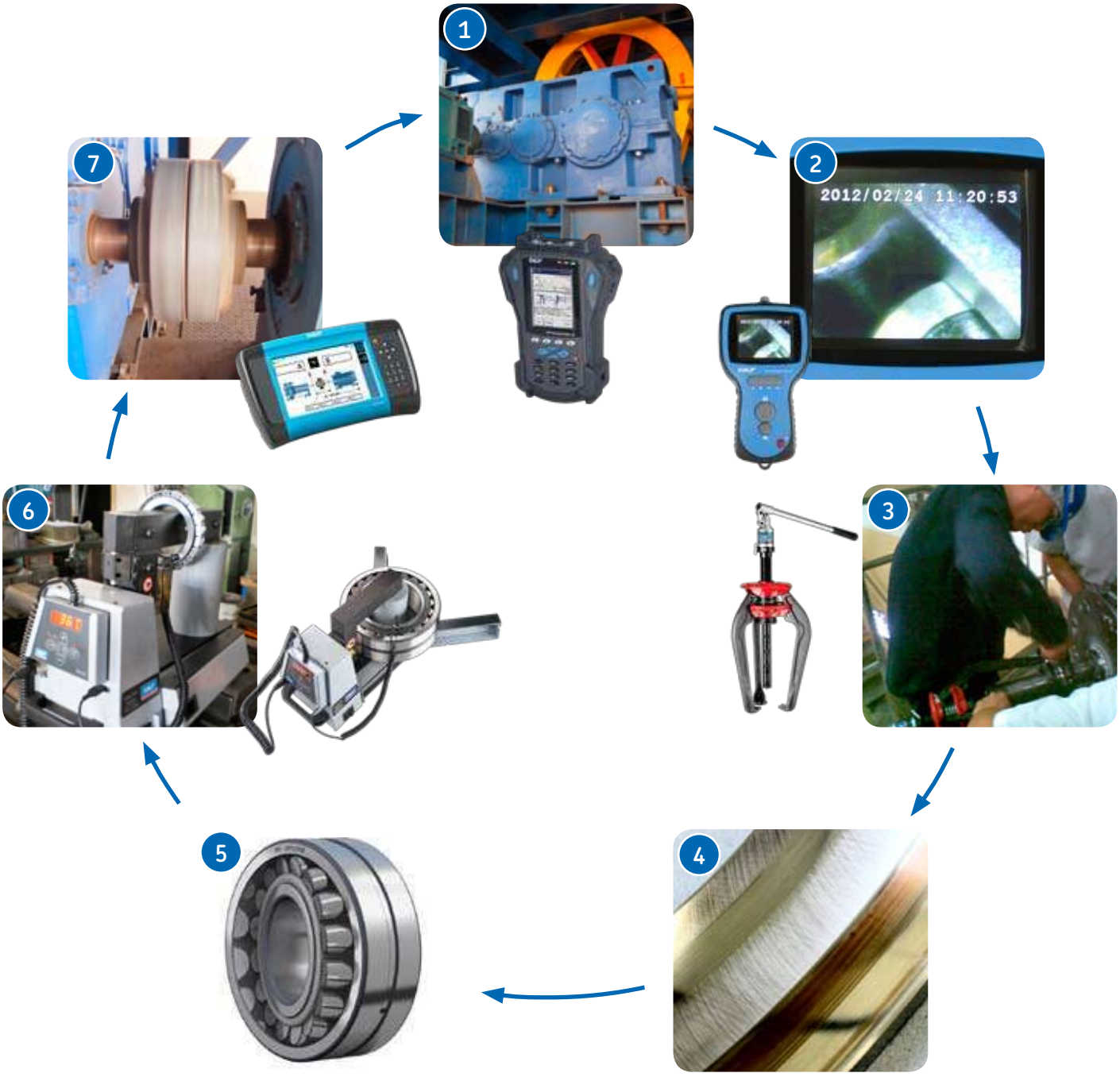


In a sugar beet processing plant, the maintenance team wanted to know the condition of the critical gearbox driving the twin beet pressing shafts. SKF engineering provided an expert analysis service, which revealed that contamination and poor lubrication were contributing towards bearing damages which would have ultimately caused failure.

Replacement of the existing spherical roller bearing with an upgraded SKF Explorer bearing facilitated a like for like replacement that provided improved operation under such conditions, potentially doubling service life.



For more information about SKF offers, please contact your authorized distributor or local SKF representative.



1 Vibration detection using SKF Microlog can indicate alarm condition of the bearing. Downloading bearing frequency data into SKF @ptitude Analyst, can indicate for example, failure on the inner ring.

2 The use of an SKF Endoscope allows an internal visual inspection of the gearbox, providing evidence of damage to justify removal of the gearbox.

3 SKF EasyPull TMMA series allows dismounting of the bearings without damaging shafts and abutments, while at the same time helping to maintain operator safety.

4 Through root cause analysis, SKF can identify if, for example, an issue is related to lubrication. Improving the lubrication system or changing the lubricant could lead to a solution.

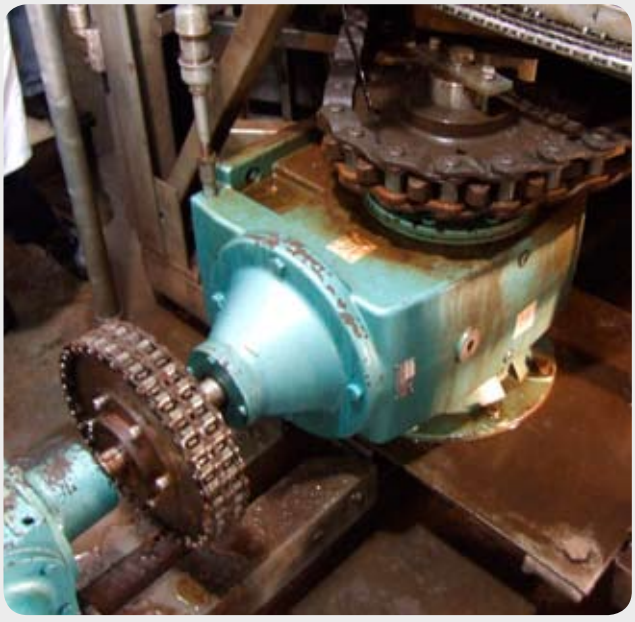
5 Alternatively, replacement with upgraded SKF Explorer spherical roller bearings can provide up to twice the life compared to original SKF Explorer class bearings under poorly lubricated conditions.

6 Mounting bearings with SKF TIH series induction heaters is a safe method of mounting bearings without potential shaft damage.

7 Shaft alignment with SKF TKSA series equipment helps facilitate optimum reliability.

Gearbox performance and life optimization

Extended mean time between repairs with SKF bearings, seals and engineering



In a hardening tunnel, yearly time-based maintenance was scheduled to avoid catastrophic failure of the main gearbox and chain drive. However, removing the gearbox was a difficult operation, involving health and safety risks. Given the need to increase the mean time between repairs to beyond one year, SKF conducted a root cause failure analysis. The results concluded that corrosion (due to ingress of cleaning fluid) and seals "breathing" – coupled with incorrect seal mounting – were the key issues to address.

The solution SKF offered included a cartridge with two seals (avoiding incorrect mounting) made of Ecoflon 4 material, that had superior chemical, wear and abrasion resistance. SKF stainless steel deep groove ball bearings filled with solid oil were installed to avoid corrosion and help offset issues due to ingress of fluid into the bearing. Additionally, a less complex flinger on the output shaft was proposed to seal the shaft and fling excess water away when rotating. As a result, the customer increased mean time between repairs to 18 months.









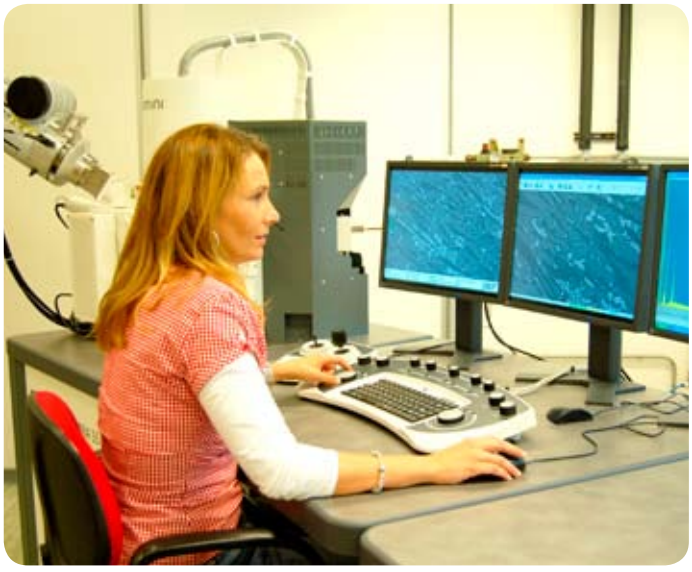




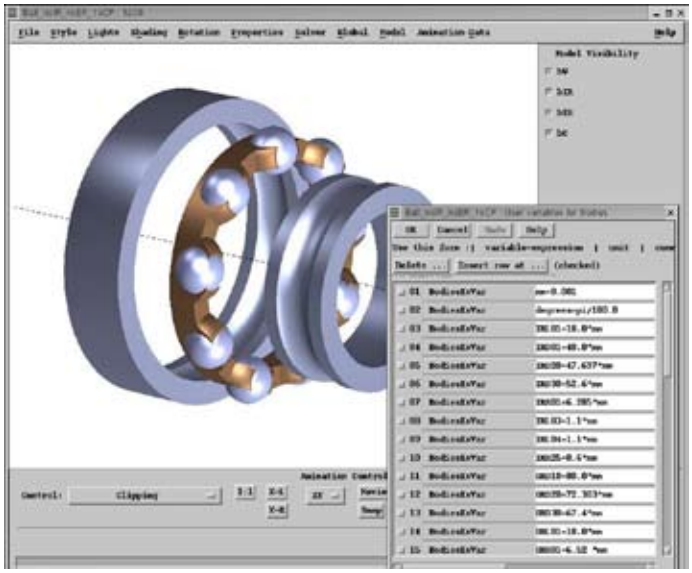
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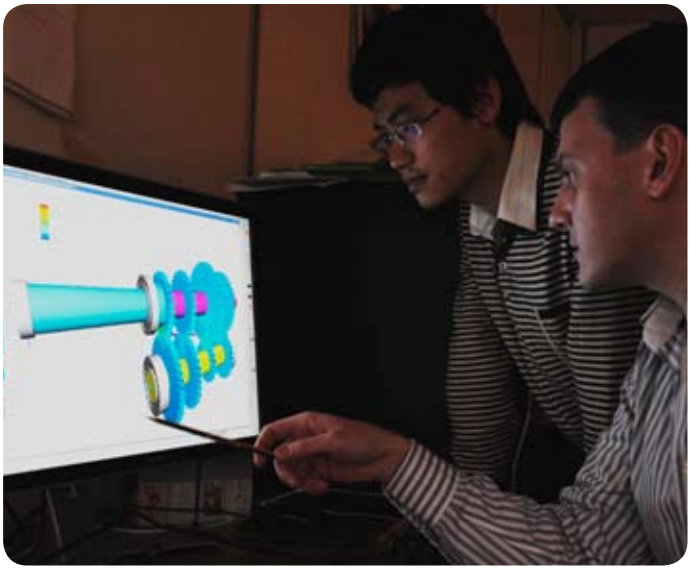












SKF offers a unique combination of competencies from various fields of engineering, including virtual testing using dynamic simulations, lubrication management and determining root cause to rotating machinery problems.

Transmission system life optimization



SKF Xtra Strength Chains contributed to improved machine uptime

A bakery plant was using a high number of chains in its rotary dough molder drive. The chains failed, on average, within 10 days, causing excessive downtime, lost production and high spare parts consumption.

SKF redesigned the complete drive using SKF Xtrapower duplex chains and sprockets as a complete package. Significant improvements in machine uptime were realized, with subsequent increased productivity and reduced consumption of spare parts. The SKF chains have now been running without failures for over one year.



SKF chains helped sugar mill reduce downtime

A sugar mill faced chain failure problems in the drive system of a crushing unit. Chain failure occurred within 30 to 45 days. The requirements of the drive exceeded the capabilities of standard chains. SKF applied a special heavy duty chain to fulfill the drive requirements, extending service life to over three months, fulfilling customer need. Additionally, all chains were manufactured to ISO standards.



SKF FRAS Flex reduces downtime

A food producer experienced problems with a natural rubber coupling that broke soon after being exposed to high temperatures from a nearby oven. SKF replaced the original coupling with a new flex coupling containing chloroprene elements that resist high temperatures. The result was significantly increased coupling life, reducing unplanned downtime and improving line efficiency.



SKF Xtra Strength Chains

SKF Xtra Power chains are ideally suited for applications subjected to high shock loads and low operating speeds. The materials, tolerances and improved heat treatment processes of this chain provide superior capabilities over standard chains with the same dimensions.



SKF ANSI Sprockets

Made from high quality steel and machined to exacting standards (e.g., ISO), increase drive life when used with SKF Xtra Power chains.

SKF Flex Couplings

SKF Flex Couplings are designed to accommodate misalignment, shock loads and to reduce vibration levels. These easy-to-install, maintenance-free couplings are available with either a machined-to-size or tapered bore.

FRAS tyre couplings accomodate higher operating temperatures than standard natural rubber, and are ideal for low maintenance environments. The couplings' fire resistant and anti-static properties offer a solution for applications where standard products are not suitable.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Looking for means to reduce energy consumption, increase reliability?



Sugar producer produced energy consumption and improved centrifuge reliability during season

A sugar processor experienced poor machine reliability in its raw sugar centrifuges caused by sudden accelerations and decelerations, and leakages of syrup and oil. This situation was further aggravated by incorrect maintenance practices.

SKF made an assessment and redesign of the power transmission system, including optimal mounting and precision alignment of SKF pulleys and belts. The SKF solution resulted in a 6.5% reduction of energy consumption in the centrifuge motor (24 MWh saved per year). Unplanned stops of the centrifuge during the production season were eliminated.



SKF engineering services contributed to increased reliability on wet mixer motor

V-belts in a wet mixer motor required frequent replacement (every two months or less), a condition that was further aggravated by incorrect maintenance practices. The SKF solution included a redesign of the power transmission system, including the installation of SKF Cogged Raw Edge belts and pulleys with taper bushings, along with precision laser alignment and correct belt tensioning during mounting.

The solution provided over six months of continuous operation, along with reduced energy consumption.

SKF Cogged Raw Edge belts

SKF Cogged Raw Edge belts are highly flexible belts that can bend around a smaller pulley without causing undue amounts of stress. They are reliable for use in environments from –22 °F (–30 °C) to 167 °F (75 °C), including tropical climates. Their high energy efficiency construction includes a “raw edge” combined with a “cogged” design that offers:

- **Higher friction, resulting in 25 to 30% more transmitted power capacity**
- **Improved efficiency, leading to less energy consumed**
- **Lower maintenance requirements than for conventional wrapped belts**
- **Less internal heat build up to enhance long term rubber life**



Motor life and performance optimization

Protecting against stray electric currents from variable speed drives that can damage bearings

INSOCOAT bearings

protect against the passage of electric current.

INSOCOAT bearings feature a plasma sprayed ceramic coating on the inner or outer ring that insulates the bearing from damaging effects of stray electric currents. Because they have the same boundary dimensions as standard bearings, INSOCOAT bearings do not require special installation procedures or expensive modifications.

- **Extend service life by insulating the bearings**
- **Reduce maintenance and repair costs**
- **Cost-effective solution compared to other insulating methods**





Extended bearing life, reduced maintenance in fan motors

A milk powder plant's fan motor experienced high levels of vibration. The problem was traced to an electric current passing through the fan motor bearings that caused erosion and limited operation to only 2,000 hours. The problem was addressed with INSOCOAT bearings featuring an aluminium oxide film on the surface of the outer ring to provide electrical insulation to the stator. As a result, service life increased from 2,000 to 20,000 hours with considerable cost savings resulting from the reduced maintenance interventions – washing, drying, varnishing, bearing changes, insulation control, etc.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Understand failure modes to prevent re-occurence













Variable speed drives are frequently used for motors, these can increase the risk of stray high frequency electrical currents passing through the bearings. To ensure reliability it is important to monitor such applications, understanding the root cause to prevent premature failures and their reoccurrence.

1 Identifying the presence of stray electric current is made possible with the SKF Electrical Discharge Detector Pen TKED 1.

2 The SKF Machine Condition Advisor CMAS 100 can indicate whether or not the damage has already occurred and its severity.

3 Using the correct bearing dismounting methods and tools (e.g., SKF deep grove ball bearing puller kit TMMD 100) helps prevent damage of corresponding parts.

4 If damage is detected, it is essential to determine the cause. SKF root cause failure analysis can highlight fluting, electrical erosion.

5 If the bearings show any sign of damage, then replacement with INSOCOAT bearings help provide protection against the passage of electrical current.

6 Applying the manual drive-up mounting techniques through the SKF Bearing Fitting Tool TMFT 36 will help prevent premature bearing failure.

Electric motor reliability is a concern when:

It is part of critical equipment



Managing asset availability by understanding machine condition

A plant was experiencing reliability issues in its critical electric motors. The problem was made worse by the lack of electrical status controls for the equipment. SKF recommended condition-based monitoring for the plant's 30 critical electric motors, using the SKF dynamic motor analyzer to monitor power circuits, rotor status and load ratings. Among the benefits were two instances where unscheduled stops were avoided. In the first, current unbalance and a severe voltage drop were detected preventing production losses of 72 hours; in the second, the use of an SKF thermo-graphic camera revealed a broken bar in the motor, avoiding a 120-hour stoppage.

Improved critical motor reliability in a chocolate plant

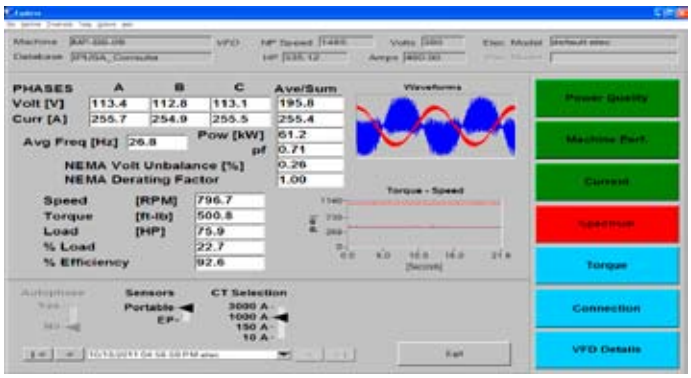


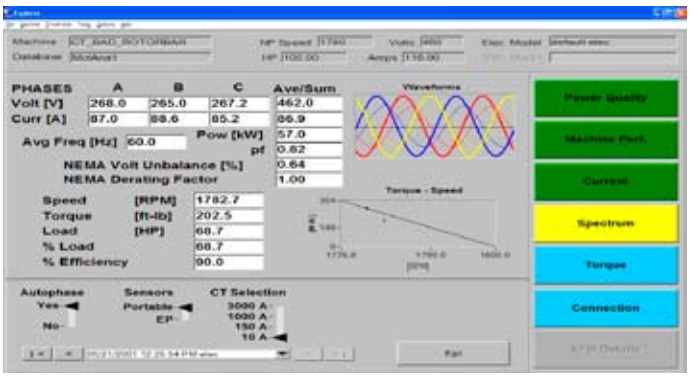
Using the SKF Microlog Analyzer, high vibrations in the motor of a chocolate plant's two-roll refiner were detected. From studying the data using SKF @ptitude Analyst, bearing defects were identified as causing the problem. Bearings were replaced during a planned shut-down avoiding any production losses. As a result, vibrations were reduced from 0.38 in (9.7 mm) to 0.03 in (0.8mm).



SKF Dynamic Motor Analyzer EXP 4000

Designed for in-service monitoring of power circuit issues, motor health, load, and performance, this SKF equipment provides a comprehensive look at overall motor integrity.





Electric motor reliability is a concern when:

Access is difficult for monitoring and maintenance, and is a safety issue



SKF Thermal Cameras can detect from distance overheated motors that can be difficult to access safely. Maintenance efforts and unplanned downtime can therefore be minimized.





With the use of the CMSS sensors range, SKF offers three different methods to collect vibration data where operator access is difficult, and a potential safety issue.

1



SKF Microlog series of portable data collectors and analyzers connected to SKF junction boxes will provide convenient and safe manual access to sensors during periodic collection routes. Together with SKF @ptitude Analyst software, it is possible to perform advanced vibration spectrum analysis.

2



SKF Machine Condition Transmitters provide single channel machine protection, with the option of being controlled remotely by decision control systems.

3



SKF Multilog IMx multi-channel monitoring system provides 24/7 multiple-machine monitoring and advanced vibration analysis through SKF @ptitude Analyst software.

Ingress of cleaning fluids and process material





SKF customized sealing solutions

On a conveyor drive, the seal on the electric motor's output shaft must tolerate high pressure cleaning with washdown fluids. SKF supplied a seal assembly consisting of a radial elastomer lip seal, an L-shaped metal wear sleeve with integral elastomer seal for sealing against the shaft, as well as an elastomer face seal to prevent the ingress of the washdown spray.



Geared motors performance and life optimization

Savings from energy efficient bearings can be significant when many motors are involved

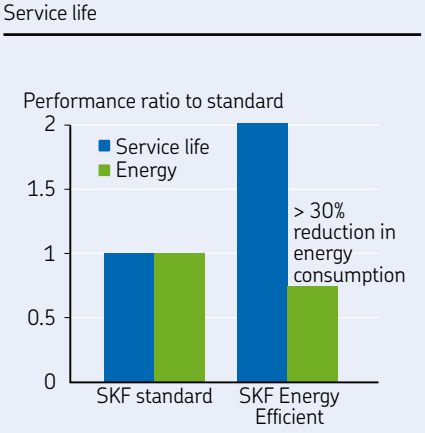
SKF E2 deep groove ball bearing

Reduced friction for reduced energy use

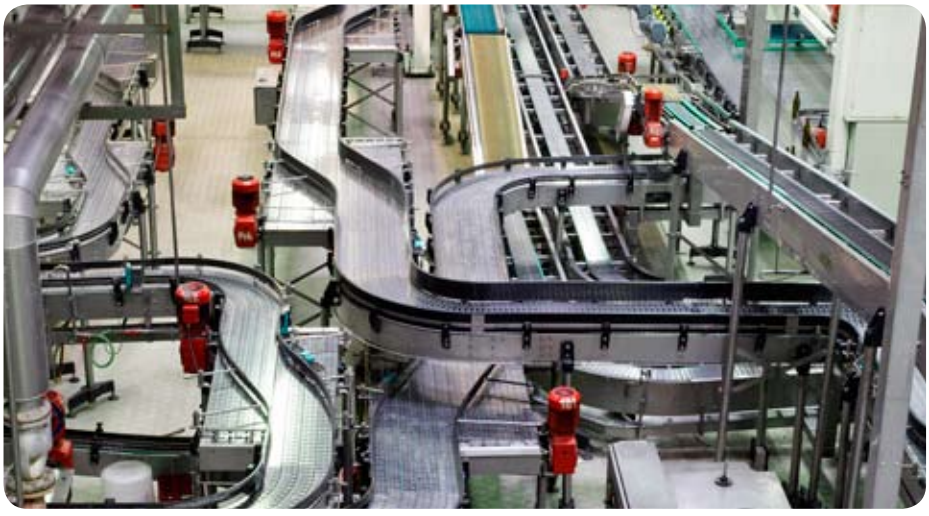
SKF Energy Efficient (E2) bearings feature an optimized design balance between the internal geometry, grease and cage. The bearing is designed to lower friction by 30 to 50% compared with SKF standard bearings, and to offer substantial reductions in cost and energy usage. Bearings conform to standard ISO boundary dimensions. Advantages include:

- **Lower energy consumption through reduced friction**
- **Longer service life, reducing cost of ownership**





How much energy could you save in a plant with 90 geared motors, averaging 3 kW in size, working 24/5?



Replacing SKF standard deep groove ball bearings with SKF Energy Efficient ones can increase bearing life while reducing friction. Under the prevailing operating conditions, minimum bearing life can be more than doubled and bearing friction reduced by about 25%.

In the plant illustrated above,

- **2 W/h in power can be saved for each motor, adding up to 12 kWh/year per motor, or 1 MWh/year for each line with 90 geared motors.***

** With the SKF Documented Solutions Program, your SKF representative can show you how much can be saved with SKF E2 deep groove ball bearings based on running data from your plant.*

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Increased reliability of critical geared motors

Protecting against ingress of cleaning fluids and process material

SKF radial shaft sealing solutions
can offer the right protection



SKF radial shaft wave seals – CRW series

The metal OD construction of the CRW type seal provides positive retention in the housing bore as well as a suitable running surface for the V-ring. The Bore-Tite coating on the OD helps to fill in any small imperfections in the housing bore surface.

The wave seal design provides superior sealing and up to 20% less friction, resulting in up to 30% lower temperatures compared to conventional straight edge radial lip seals.



SKF SPEEDI-SLEEVE

A well-proven solution to repair worn shafts within minutes. They provide an excellent sealing surface without having to disassemble the shaft or change the seal dimensions. The sleeve, combined with an SKF radial shaft seal, provides an enhanced sealing system.



SKF proposed sealing solution for worn nitrile seals in a food processing line

Equipment in a food processing plant was subjected to periodic washdown with a chemical solution of water and chlorine compounds. Over time, the sealing material became swollen and eventually failed. Shaft surfaces grooved, requiring extensive rework to be brought back to a serviceable condition. The application called for a sealing solution that minimized the effects of the chlorine washdown, complemented by a cost-effective shaft repair solution.

The SKF solution employed FKM V-rings as a barrier to isolate the existing nitrile seals from the washdown solution. These V-rings offer resistance to chemicals that commonly damage nitrile, polyacrylates or silicones. Additionally, SKF SPEEDI-SLEEVE was employed to repair the damaged shafts with minimum cost and downtime.



SKF SPEEDI-SLEEVE helped protect shafts against contaminant ingress

In a manufacturer's distribution center, very fine dust from corrugated cartons was creating a problem: the dust covered much of the equipment, working its way past the sealing lips both on the input and output shafts of the conveyor drive. Although the seals were replaced during a rebuild, oil leaks continued. The contamination had caused the shaft to wear under the seal lip, leading to premature seal failure and leaking oil. This could result in a safety hazard and contamination of merchandise.

The solution consisted of SKF SPEEDI-SLEEVES to repair the damaged shaft without rework, along with an SKF CRWA1 Wave seal. The solution also provided effective lubricant retention, minimizing downtime and associated costs.

Increased reliability of critical geared motors

Simple tools and methodologies to more advanced condition monitoring and engineering



Routine front line inspection can provide early indication of impending problems



The SKF CMAS Machine Condition Advisor can simultaneously check temperature, vibration and enveloped acceleration, indicating overall machine health.



An SKF Stroboscope can support in the inspection of external seals. It can highlight impending issues, such as leakages, without stopping the machine.



The SKF Oil Check Monitor TMEH 1 provides front line oil condition assessment, giving a first indication of oil deterioration.



Advanced data collection and analysis can further identify specific issues



An SKF Microlog can be used for effective vibration measurement, allowing the isolation of specific conditions of individual gears and bearings.



An SKF Endoscope enables internal visual inspection – assessing the level of damage of gears and bearings, without dismantling the gearbox.



SKF advanced oil analysis service



Repetitive failures should be investigated to prevent re-occurance



SKF application engineering can provide detailed analysis to identify the root cause of rotating machinery problems.

Overcoming time-consuming and costly repairs

Using the right tools, knowledge and quality components from SKF for motor repair









SKF Energy Efficient and SKF Explorer deep groove ball bearings

provide increased performance and life.



SKF training program*

on subjects such as shaft and housing tolerancing, mounting and dismounting and lubrication provide the highest potential for the bearings to achieve their maximum theoretical life.



SKF Dynamic Motor Analyzer EXP 4000**

Designed for in-service monitoring of power circuit issues, motor health, load and performance, the SKF EXP 4000 provides a comprehensive look at overall motor integrity.

* *For more information on SKF online and class room training, please visit skf.com/services/trainings*

** *Service provided by SKF certified electric motor rebuilder. For more information and to locate a certified rebuilder please visit skf.com/services*

SKF Certified Rebuilder Electric Motors

Pumps life and performance optimization

Optimized bearing configuration to maximize reliability?

MRC PumPac* and SKF “matched”, universally ground angular contact ball bearings

SKF angular contact ball bearings are an effective solution to maximize the bearing performance in centrifugal pump applications subject to thrust load and high speed. Universally ground bearings with suffixes BECBM provide reliable operation, and feature:

- **High precision execution, providing high running accuracy**
- **Controlled ball guidance, due to machined brass cages**
- **Reduced failure potential, given optimized axial clearance**

The MRC PumPac series is an upgraded solution from universally ground angular contact ball bearings. When used in similar pumps, the PumPac series provides even greater benefits to those outlined above, including:

- **Simplified mounting – a “V” etched on the outside diameter facilitates correct mounting**
- **Prevention of process material leakages thanks to improved mechanical sealing integrity – this due to high radial stiffness of the bearing system**
- **Increased life from the use of bearings with different contact angles (40, 15 degrees), which provide additional control of axial clearance in the unloaded bearing**





A customer was experiencing poor reliability resulting from the failure of thrust bearings. Root cause analysis determined that unequal load sharing was the primary reason of failure. Under further investigation, it became clear that unmatched bearings were being used. The application of SKF universally ground angular contact ball bearings with suffix BECBM resolved the issue, and have since provided long-term, reliable operation.

Available in bore sizes of 0.39 to 9.45 in (10 to 240 mm), dependent on bearing series

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

SKF radial shaft sealing solutions
can offer the right protection

SKF machined sealing solutions

provide an optimized seal design and can be made of standard and SKF proprietary FDA approved sealing materials.



H-ECOPUR and SKF Ecowear 1000, featuring improved wear and chemical resistance.



Standard solutions

such as the metric SKF rubber outside diameter radial shaft seals, HMS5 and HMSA10, are designed to provide optimized performance under aggressive and contaminating operating conditions. Additionally they are able to accommodate considerable thermal expansion, high dynamic run out and shaft-to-bore misalignment.

SKF SPEEDI-SLEEVE

is designed to fit securely over worn shaft areas – thus limiting the need for machining and resulting downtime. In addition, the special sealing function can prevent lubricant leakage, minimizing potential environmental impact. SKF SPEEDI-SLEEVE is a well-proven solution to repair worn shafts within minutes. It can provide an excellent sealing surface without having to disassemble the shaft or change the seal dimensions. The sleeve, combined with an SKF radial shaft seal, provides an enhanced sealing system.



Improved energy efficiency of pumps

How much energy can be saved with correct alignment?





A beverage plant documented 180 MWh/year energy savings, while increasing pump reliability

A customer experienced high vibration levels on 12 pumps, resulting in excessive consumption of both spare parts and energy. An SKF condition monitoring program utilizing an SKF Microlog Analyzer showed that the high vibration levels were clearly due to misalignment. Using the SKF TKSA 40 system, technicians were able to accurately realign the pumps. Measuring energy consumption before and after, demonstrated an average of 8% energy savings (as high as 20% in some cases). Reductions in total energy consumption for the 12 pumps was estimated to be 180 MWh/ year; vibration levels also decreased, positively impacting pump reliability.

Enhancing pump performance

Condition inspections and assessments, SKF upgrade recommendations, correct installation of components and final alignment can maximize the reliability of critical pump applications.

1 Operator inspection reveals high noise and leaking fluid from the pump. This is recorded on an SKF Microlog Inspector and downloaded into the Computerized Maintenance Management System (CMMS), resulting in a work order to inspect the pump.

2 The pump is stripped down to determine the cause of the problems. Dismounting tools from SKF can be used to safely and securely remove components to help ensure operator safety and prevent shaft damage.

3 Root cause analysis of components identifies issues such as:
- Seal wear that has reduced sealing efficiency and damaged the shaft
- Incorrect bearing selection – use of unmatched bearings resulting in problems with load sharing
- Bearing seating damage indicating incorrect tolerance class and surface finish

4 SKF solutions to address these root causes include:
- High efficiency standard seals or alternatively machined seals with improved lip profiles, manufactured from high wear resistant FDA approved materials (see previous page)
- SKF SPEEDI-SLEEVE – avoids the need for shaft rework, providing a hard polished seal running surface
- Engineering services recommending correct tolerance classes and optimum surface finish for bearing seating
- Universally matched SKF angular contact ball bearings to improve load sharing and provide optimum performance

5 Safe and secure mounting of the bearings using an SKF TIH 30 Induction Heater prevents potential damage to the shaft.

6 Correct alignment using an SKF TKSA 40 Shaft Alignment System provides reliable operation and helps minimize energy consumption.

To watch an instructional video for the use of the SKF TKSA 40 Shaft Alignment System scan this code or visit the SKF Maintenance Products Channel on YouTube.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.


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Compressed air system optimization

Comprehensive management of a compressed air system involves not only an efficient supply of compressed air, but also awareness of demand issues such as inappropriate use and leak detection.

Reduction of high operating costs?

SKF Energy Monitoring Service – Compressed Air Systems

Optimize the use of compressed air, with resulting energy savings

SKF's comprehensive and standardized approach to energy monitoring includes:

Compressed Air System Monitoring Kit

A basic kit of hardware and associated data collection and analysis software to conduct compressed air system monitoring.

Front line maintenance for compressed air system monitoring

A program developed to monitor the fundamental compressed air system needs and identify compressed air system leaks. An SKF Microlog Inspector and @ptitude software helps the customer to identify and quantify compressor performance.

SKF compressed air system audit

When moving beyond relatively simple leak detection and monitoring to system analysis and improvements, further energy savings can be realized by:

- Analyzing and validating compressed air demand requirements
- Identifying system pressure drops
- Reducing system artificial demands
- Identifying inappropriate uses
- Verifying compressed air storage requirements
- Verifying compressed air quality requirements
- Defining compressor asset management and maintenance approaches for peak performance
- Identifying potential for heat recovery opportunities
- Analyzing compressor controls for optimization opportunities





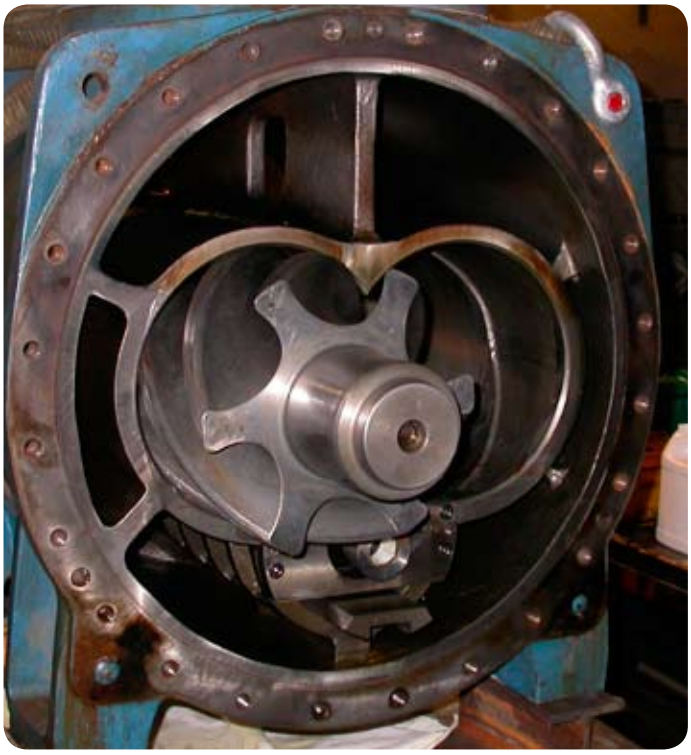
Over 7% energy savings as part of compressed air system monitoring program

In a dairy plant, the customer wished to have a better understanding of and control over the use of compressed air. SKF drafted the layout of the compressed air system and then collected the pressure data for all compressors. From this, the total energy use was calculated. As a next step, a number of compressed air control improvements were implemented (such as pressure/flow controller, appropriate filter regulator lubricator).

Complete air leaks detection on the demand side was performed using the SKF compressed air system monitoring kit. A total of 53 air leaks were identified, resulting in approximately 400 MWh of potential savings alone. Continuous monitoring and improvement programs have now been established.

For more information about SKF offers, please contact your authorized distributor or local SKF representative.

Compressor life cycle costs reduction





Reduced compressor life cycle costs through transition to condition-based maintenance?

Refurbishing compressors using a time based strategy without consideration of asset maintenance history can have a major impact on costs. Intervals between maintenance can be significantly extended by utilizing a condition-based maintenance strategy. This approach is based on invasive maintenance only being needed when one or more indicators show that equipment performance is deteriorating. Benefits include:

- **Reduced maintenance costs**
- **Improved system reliability – decreasing the number of maintenance interventions will reduce the risk of human error**
- **Confidence in machine behavior by gaining knowledge and understanding of compressor operating characteristics**
- **Early detection of problems that can result from overhauls**



Extended mean time between maintenance by 30% utilizing SKF condition-based maintenance

A frozen food plant's ammonia compressor had a Mean Time Between Maintenance (MTBM) of 20,000 hours using a time based program. Moving to a condition-based approach, the plant achieved a 30% increase in the time between maintenance on one of its compressors. When applied across the plants 15 compressors, significant cost savings were realized. As a result, the plant reduced maintenance costs and increased compressor availability.

Appendix

Seals in contact with cleaning chemicals

SKF has wide variety of plastics and polymeric sealing materials which comply with the most important food standards and regulations. In the food and beverage industries, there are a lot of important requirements and parameters which influence the quality of seals and plastic parts.

Standards and regulations for material manufacturers*

- EC regulations
- FDA
- NSF

Requirements for seals

- resistance against chemical cleaning products
- resistance against used CIP media
- sealing surfaces which are easily cleaned and sterilised
- good resistance against abrasion and wear
- non-toxic sealing materials
- installation without any dead spots (spaces)

Compatibility

In addition to these requirements, the following parameters strongly influence the quality of the cleaning process as well as the durability of the seals:

- immersion period
- temperature
- type of cleaning media
- concentration of the cleaning solution

Material	Nitric acid 185 °F (85 °C), 3%	Caustic soda 185 °F (85 °C), 3%	Auqua dest. 212 °F (100 °C)	Steam 284 °F (140 °C)	Sodium hypochlorite solution 158 °F (70 °C), 5%	Sodium sodium hydroxide sodium hypochlorite 158 °F (70 °C), 3%	Sodium sodium hydroxide sodium carbonate 158 °F (70 °C), 3%	Sodium hydrogen peroxide peracetic acid 122 °F (50 °C), 3%	3-A Sanitary standards 18-03
H-ECOPUR	+	+	+	-	+	+	+	+	Class 1,3**
SKF Ecorubber-1	(-)	+	+at 158 °F (70 °C)	(–)	n.d.a.	n.d.a.	n.d.a.	n.d.a.	n.d.a.
SKF Ecorubber-H	(-)	+	+	-	n.d.a.	n.d.a.	+	–	n.d.a.
SKF Ecorubber-2	(o)	o	o	-	o	o	+	+	Class 1
SKF Ecorubber-2 85A-w-FG	o	–	(o)	(–)	o	o	+	+	Class 1
SKF Ecorubber-3	(o)	(o)	+	+	o	o	+	+	Class 2
SKF Ecorubber-3 85-w-FG	o	o	(+)	(+)	o	o	+	+	Class 2
SKF Ecosil	–	(–)	+	(–)	n.d.a.	n.d.a.	+	n.d.a.	n.d.a.

** The data mentioned above is only valid for short-term operations and must be evaluated for longer periods. Please contact our application department for further information.

\+ resistant
o limited resistance
– not resistant
n.d.a. no data available

immersion period: 168 hours

** For detailed information of standards and regulations please contact SKF.*

Designation system for SKF stainless steel deep groove ball bearings

The designations for SKF stainless steel deep groove ball bearings follow the basic SKF designation system except for inch types. However, the prefix "W" has been implemented to indicate that the material is stainless steel.

Supplementary designations

In addition to the designation suffixes that are listed in the SKF General Catalog, the following designation suffixes are relevant for SKF stainlees steel deep groove ball bearings:

W	Stainless steel deep groove ball bearing metric series
D/W	Stainless steel deep groove ball bearing inch series
X	One boundary dimension deviates from ISO standard
BB1	Two or more boundary dimensions deviate from ISO standard
2TS	PTFE seal for stainless steel deep groove ball bearing
2ZS	Shield of pressed sheet steel on both sides of the bearing with retaining ring
R	Flanged outer ring
RZ	Non-contact seal for stainless steel deep groove ball bearing
R-2Z	Shield of pressed sheet steel on both sides of the bearing and flanged outer ring
VT378	Food grade grease with aluminium thickener of consistency 2 to the NLGI Scale for a temperature range –13 to 248 °F (–25 to +120 °C) (normal fill grade)

For additional information, refer to the *SKF General Catalog* or the *SKF Interactive Engineering Catalog* available online at skf.com.



Marathon series nomenclature

CPB 103 ZM

Housing

CPB - Gray composite pillow block
ZPB - ZMaRC-coated cast iron pillow block
SPB - Cast stainless steel pillow block
C2F - Gray composite 2-bolt flange
Z2F - ZMaRC-coated cast iron 2-bolt flange
S2F - Cast stainless steel 2-bolt flange
C4F - Gray composite 4-bolt flange
Z4F - ZMaRC-coated cast iron 4-bolt flange
S4F - Cast stainless steel 4-bolt flange
CTB - Gray composite tapped-base pillow block
ZTB - ZMaRC-coated cast iron tapped-base pillow block
STB - Cast stainless steel tapped-base pillow block
CBF - Gray composite 3-bolt bracket flange
CTN - Gray composite narrow-slot take-up
CTW - Gray composite wide-slot take-up

Shaft size

Inches:

First digit: number of inches

Second and third digits: number of sixteenths of an inch

Example: 103 indicates $1^{3}/_{16}$ (unit)

Metric:

First two digits: number of millimeters

Example: 25 indicates 25 millimeters

Insert bearing

L - Lock collar bearing unit
ZM - ZMaRC coated
SS - Stainless steel
G - Relubricatable bearing unit
ZMR - ZMaRC-coated insert bearing, with a $1^{1}/_{4}$" bore, fitted into a housing that usually accommodates a $1^{3}/_{16}$" insert bearing
SSR - Stainless steel insert bearing, with a $1^{1}/_{4}$" bore, fitted into a housing that usually accommodates a $1^{3}/_{16}$" insert bearing
HT - High temperature plane bearing
SB - Submersible plane bearing
HTR - High temperature insert bearing with a $1^{1}/_{4}$" bore, fitted into a housing that usually accommodates a $1^{3}/_{16}$" insert bearing
SBR - Submersible insert bearing with a $1^{1}/_{4}$" bore, fitted into a housing that usually accommodates a $1^{3}/_{16}$" insert bearing

Marathon series tolerances and dimensional data

Insert bearing bore tolerance and radial clearance

Bearing bore diameter		inch									mm				
		3/4	1	1 1/8	1 1/16	1 1/4	1 3/8	1 7/16	1 1/2	1 15/16	20	25	30	35	40
Bore tolerance -.0000	in	+.0007	+.0007	+.0008	+.0008	+.0008	+.0008	+.0008	+.0008	+.0008	+.0007	+.0007	+.0008	+.0008	+.0008
	mm	+.018	+.018	+.020	+.020	+.020	+.020	+.020	+.020	+.020	+.018	+.018	+.020	+.020	+.020
Radial clearance	in	.0005–.0011		0006–.0013						.007–.0014	.0005–.0011		.0006–.0013		
	mm	.013–.028		.015–.033						.018–.036	.013–.028		.015–.033		

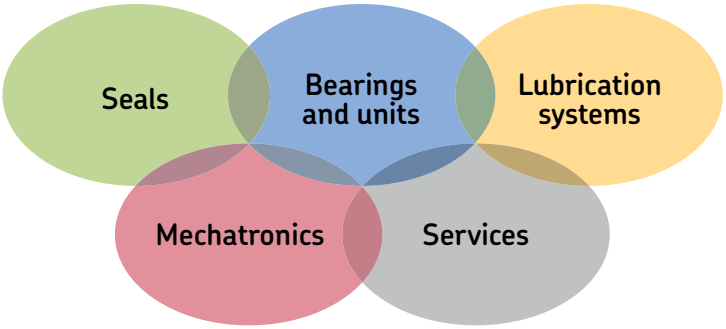
Shaft diameter tolerances

Shaft diameter in.	Tolerance in.
up to $1^{15}/_{16}$	+0.0000 / -0.0005
2–4	+0.0000 / -0.0010

For stainless steel insert bearings (RRH series), the above tolerances are especially critical because of the bearing material properties. Undersized shafting, excessive set-screw tightening, and severe environmental conditions can result in excessive ring distortion which can effect the performance of the bearing. Therefore, it is highly recommended that the proper set-screw torque and shaft diameter tolerance be used.



Notes:



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 worldwide product availability.

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