

Vessel lubrication management e-book

As a leading global provider of reliable rotation solutions, SKF can help you increase operational and human safety at sea while improving uptime, efficiency, and sustainability.



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Executive summary

The marine industry has always overcome the obstacles it has faced. In this e-book, you'll find frank discussions of various industry concerns related to malfunctioning machinery and safety, and you'll learn about several solutions that support critical machinery and promote safety at sea.

Reducing breakdowns is a central challenge – perhaps the central challenge – for the marine industry. According to an analysis by the insurance company Allianz, more than a third of all global marine incidents between 2009 and 2018 were the result of machinery breakdowns.

Breakdowns are costly, both in terms of lost time and revenue. They are also dangerous. An engine failure can be life threatening for everyone on board. And the hundred-plus lubrication points on an average vessel go far beyond the engine room. Some equipment

can be hard to reach. Other equipment, like cranes and heavy winches, can be dangerous to service should something go wrong. In bad weather conditions, even a small problem can become an emergency.

Reliable, Safe, Smart

We at SKF understand this. We also recognize that one of the most crucial aspects in terms of machine reliability is lubrication. Properly lubricated machinery operates more efficiently, breaks down less often, and results in better safety for the crew. We offer services

and solutions that can help vessels run better, safer, more efficiently, and more sustainably.

As a leading global partner focused on rotating equipment for the marine industry and beyond. SKF has a unique understanding of the challenges that ship owners, operators, and crew face every day. Our colleagues and service providers are available around the world for installation and maintenance services, to answer questions, offer consultations, and provide expert guidance.

We look forward to hearing from you.

Part 1: Marine industry challenges

Safety at sea



At sea, machinery damage accounts for more unwanted incidents than anything else – 40 percent, according to one study. These incidents are often the result of insufficient maintenance, and inevitably some of them result in crew casualties (injuries or fatalities).



A 2014 incident in the port of Hamburg is a good example. A Hong Kong-flagged vessel was conducting safety drills when a wire rope hoisting a lifeboat broke. An investigation revealed the rope had become highly corroded.



Reducing equipment and machinery related problems, through proper training, maintenance, and lubrication, is directly related to safety. Properly maintained equipment is less dangerous. And when people spend less time in harm's way, they're less likely to be injured. It's as simple as that.



2018 saw an increase in the number of very serious casualties suffered by mariners in European waters, compared to the five-year average. These incidents rose 14.5 percent in 2018. Compared to the five-year average, serious casualties also increased in 2018 by 2.5 percent.

— The European Maritime Safety Agency's Annual Overview of Marine Casualties and Incidents 2019

Reducing vessel downtime

Nowhere is the adage “time is money” truer than in the global shipping industry, which is involved in around 90 percent of the world’s trade. According to an analysis by the insurance company Allianz, claims from incidents resulting from damaged machinery were over a billion dollars between 2013 and 2018. (Those figures don’t include collisions and sinking incidents.) What’s more, the problem isn’t going away. In fact, according to Allianz, machinery damage incidents increased by more than 30 percent between 2008 and 2018.

A proper approach to maintenance could reduce these numbers. For ship owners, higher profit margins can also come through better, more effective machine maintenance.



25 PERCENT OF
CONDITION-BASED
MONITORING ACTIONS
ARE RELATED TO
LUBRICATION

“Machinery damage is already the most common cause of shipping incidents, and preventative measures are often among the first shipboard expenses to suffer. — Allianz Safety & Shipping Review 2016”

Improving operating efficiency



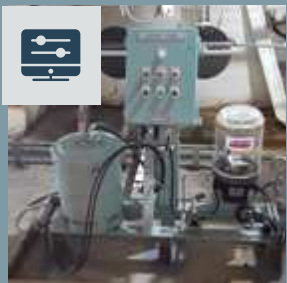
When working by hand, a person can grease about a half meter of wire rope a minute, on average. Wouldn't it be great if your people could spend their time more efficiently?

0.5 m



An automatic rope lubricator can cover over 30 meters of rope in the same amount of time, and that's just one example. A typical vessel might have hundreds of other lubrication points! Many of them are blocked by other machines and housings or even corroded due to harsh operating conditions.

30 m



Over the past several years, the industry has seen a number of new, automatic lubrication systems that can help with the tasks that were once done by hand. They offer maximum accuracy with minimal manual effort. That freedom results in more operational efficiency, better overall maintenance, and less personal risk to your on-board personnel.

auto

Promoting sustainability

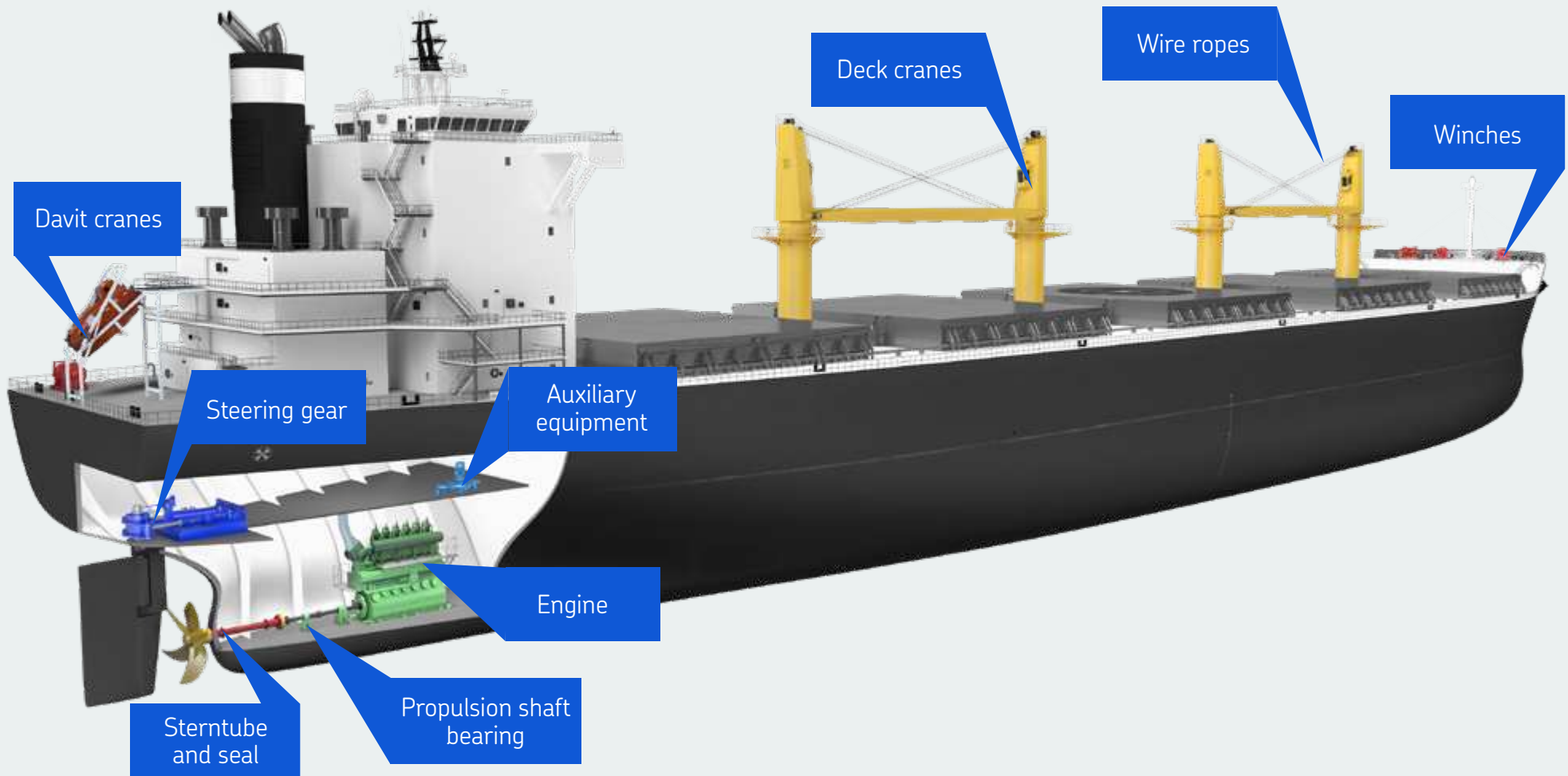


In 2015, a Dutch environmental organization estimated that the international shipping industry accounted for a whopping 2.2 percent of annual greenhouse gas emissions globally – equivalent to Germany's entire yearly emissions.

But increasing marine sustainability does not end with emissions. There are other ways that vessels can reduce waste and become greener, such as using lubricants more efficiently. Doing so limits the amount of chemicals that eventually find their way into our oceans. It also indirectly lowers a vessel's carbon footprint by limiting the CO₂-intensive processes in the lubricant production cycle.

Part 2: A guide to vessel lubrication

One ship, hundreds of lubrication points

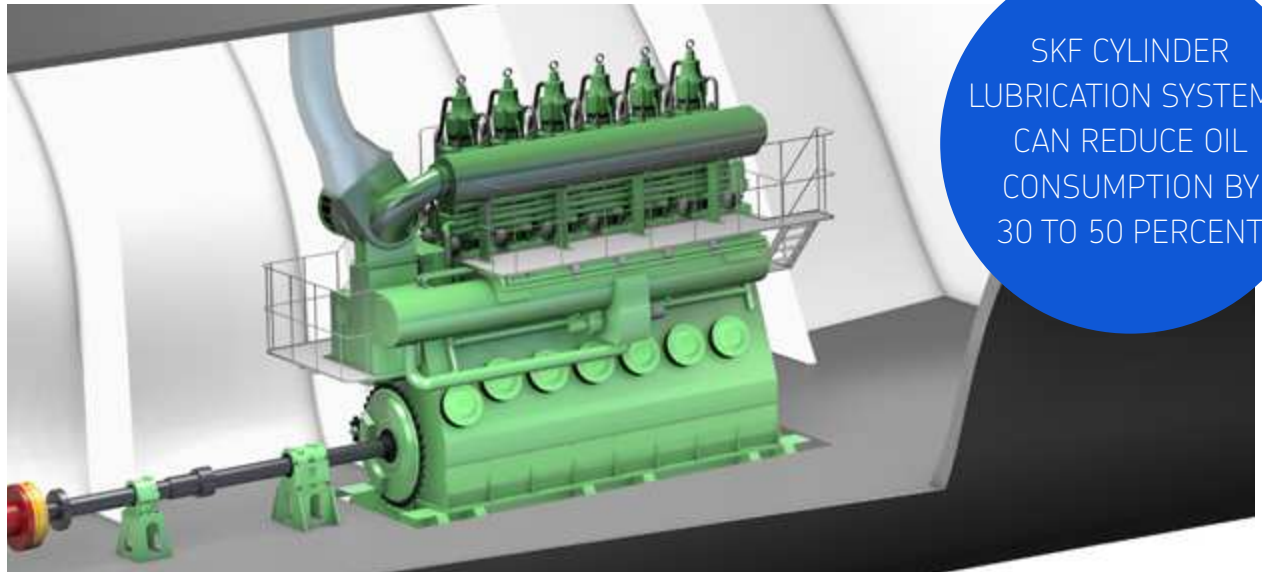


Engine lubrication



The large, two-stroke crosshead diesel engines typically found in large vessels require significant lubrication. The oil is expensive, but so is the cost of repair should a cylinder liner become damaged.

Specially designed lubrication pumps, like SKF's CLU4, can help. They meter out the cylinder oil according to the engine's load, independent of changes in temperature and viscosity. They also help ensure adequate lubrication while guarding against over lubrication, which can be expensive. According to OEM regulations, these pumps must be reconditioned every 30 to 35 thousand hours, or about every five years. The performance contracts offered to CLU customers are therefore practical, supporting reconditioning and helping to minimize downtime.



SKF CYLINDER
LUBRICATION SYSTEMS
CAN REDUCE OIL
CONSUMPTION BY
30 TO 50 PERCENT



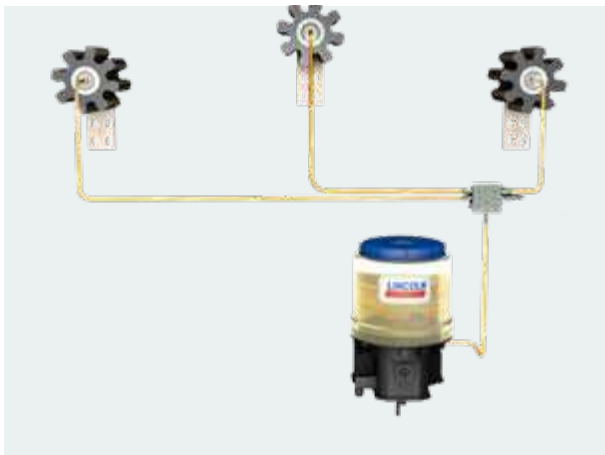
Deck cranes

Like winches, deck cranes are subject to rapid corrosion in the salt air. They're also quite dangerous to lubricate. Not only does lubrication require crew to climb high above the deck, but because cranes are typically in use when in port, the crew must perform maintenance at sea, adding to the danger. Poor lubrication can lead to damage to the slewing bearing and, in extreme cases, have led to entire cranes breaking off.

Many customers use lubrication pinions to keep slewing bearing in working order. For hard-to-reach applications like jib bearings and sheaves, automatic lubricators work well.



Reliable lubrication,
minimized risk.



Wire ropes

Keeping a wire rope in working order is difficult and dangerous. Servicing them can mean climbing high on the boom, but even when the work can be done on deck, it's hard on the hands and time consuming. Many crews don't use rope-specific grease, and some don't lubricate ropes at all.

A groove cleaner can get rid of old grease, extending a ropes service life. And a wire rope lubricator penetrates a rope better than manual application. It's also much faster and can reduce the time a crew member must work in dangerous conditions.



FAST AND
EFFICIENT – REDUCES
LUBRICATION TIME
BY UP TO 90 PERCENT
VS. MANUAL
LUBRICATION



Davit cranes for life boats



The International Convention of Safety of Life at Sea stipulates that lifeboats must be ready for use at all times. For this level of readiness, lifeboats demand frequent service to ensure the harsh deck conditions don't cause breakdowns in the davit cranes or problems with the wire ropes that lifeboats depend on for quick deployment in an emergency.

The wire rope lubricator is faster and produces better results than hand greasing, while an automatic lubricator helps to ensure the lubrication points on a davit crane stay lubricated, protected, and ready to use in the event of an emergency.



Auxiliary equipment



The bearings in motors, fans, and pumps often require grease. Greasing by hand, however, comes with some drawbacks. Did the crew follow the correct lubrication process? Did it perform the lubrication at the correct time? Did it hit all the lubrication points? Answering no to the above risks lower bearing lifetime, decreased motor reliability, and even physical danger.

Customers often upgrade to a battery-powered grease gun or a semi- or fully-automated lubrication system – such as a single-point lubricator – to better manage motors, fans, and pumps. Performance contracts are also available with SKF bearings.

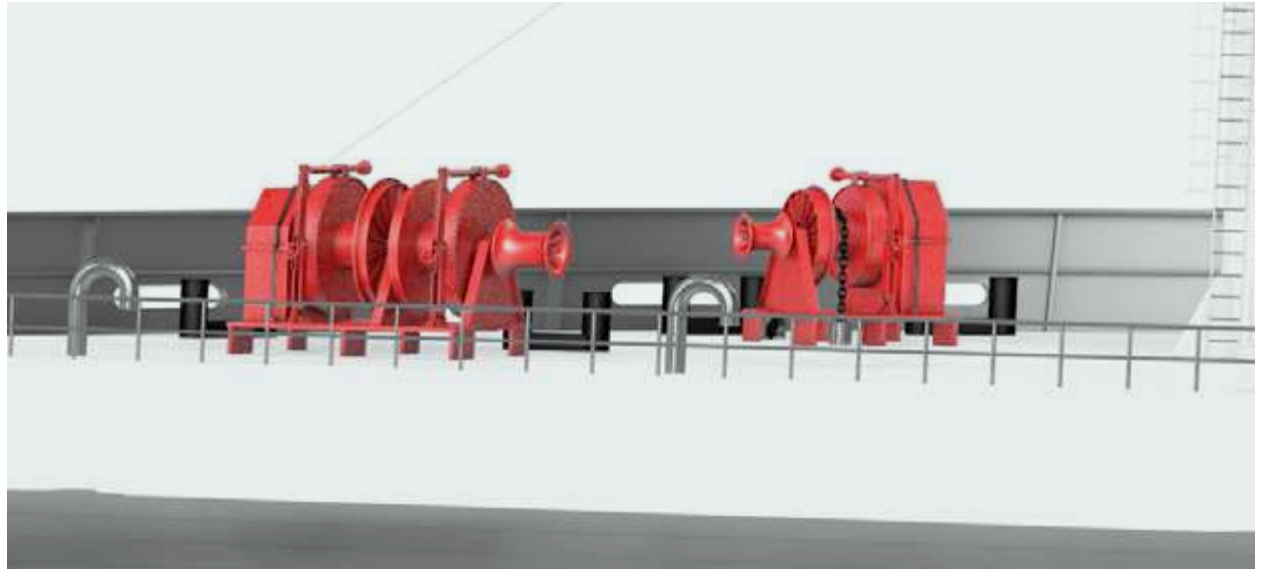


Winches



Like other deck equipment, winches must contend with corrosion from salt and water in addition to standard wear and tear. They are typically lubricated by hand, but without the right understanding of the winch's lubrication needs, crews might misapply grease, or fail to cover all the critical points.

To better care for winches, protect them from the elements by covering as many exposed lubrication points as possible and then keep those points lubricated. The progressive or multi-line lubrication systems maintain regular, precisely distributed lubricants on individual lubrication points. More wide-ranging automatic options are also available, depending on your needs.



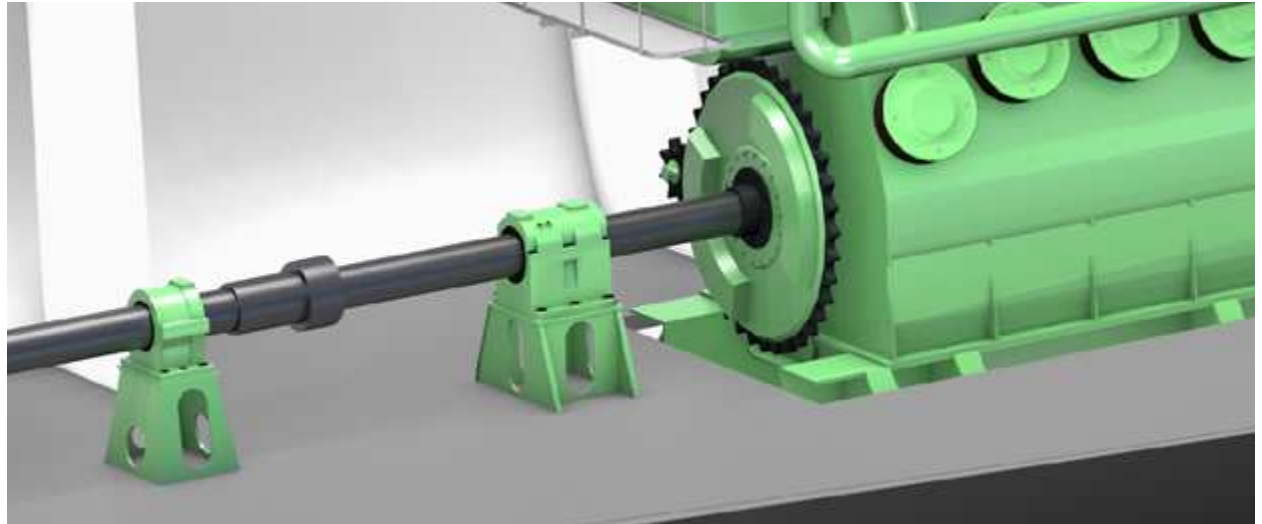
Propulsion shaft bearing



A problem with the propulsion shaft can be a safety issue for everyone aboard. Keeping the bearings in working order is paramount. Many propulsion shaft bearings are lubricated with grease, however too much grease can add to a bearing's load and cause damage. It is therefore equally important to guard against both over-greasing and insufficient lubrication.

An automatic lubrication system can help ensure the proper amount of grease makes it into your critical bearings, avoiding over-greasing. To cover all lubrication points SKF recommends a multi-line lubrication system.

While many bearings are lubricated with grease, shaft line bearings can be lubricated with oil-circulation systems. A circulation system maintains operating efficiency by promoting cooling and by flushing unwanted contaminants from the bearings.

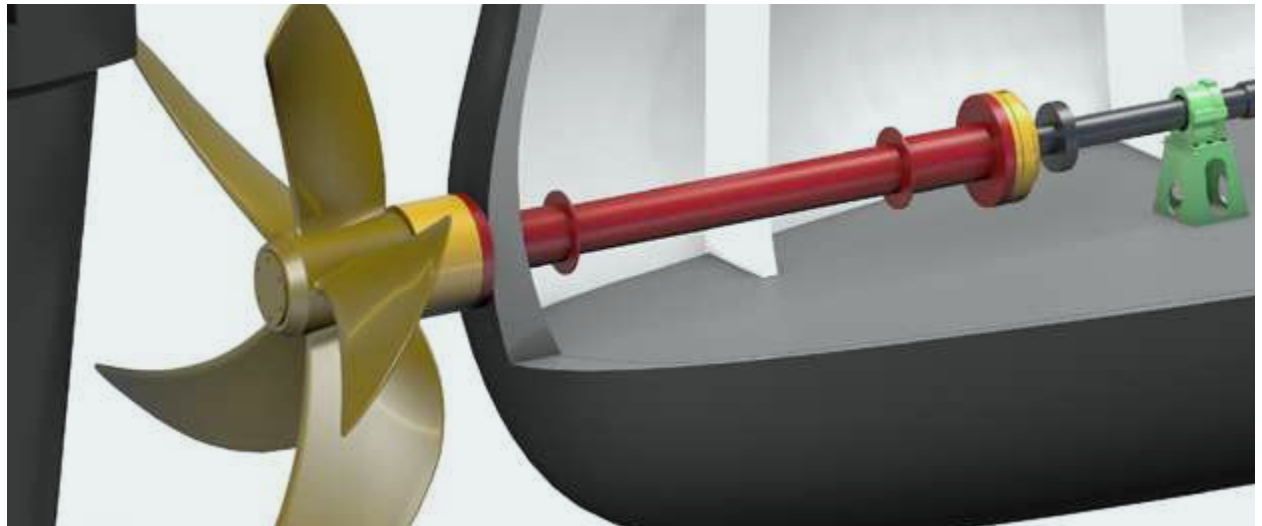


Sterntube and seal



Like the propulsion shaft, the sterntube is at the heart of any vessel. Failure could be, simply put, catastrophic. Lubrication is important to avoid wear on the shaft or unnecessary friction.

An oil circulation system is one way that crews can better monitor the oil in the sterntube, and a tail shaft monitoring system can provide information about bush wear and help crews plan for replacement. Don't forget that stern-tube oil in certain jurisdictions, like US coastal waters, must meet strict environmental regulations.



Steering gear / rudder stock



A final piece of equipment whose failure can be catastrophic. The lubrication points of the steering gear are difficult to access. Rudders can have multiple hidden lubrication points that are easy to overlook.

SKF recommends a fixed lubrication system that is either automatic or semi-automatic. These systems are set up to lubricate at an appropriate frequency and with the right quantity. Perfect for hard to reach lubrication points.



Part 3: Lubrication management for the marine industry

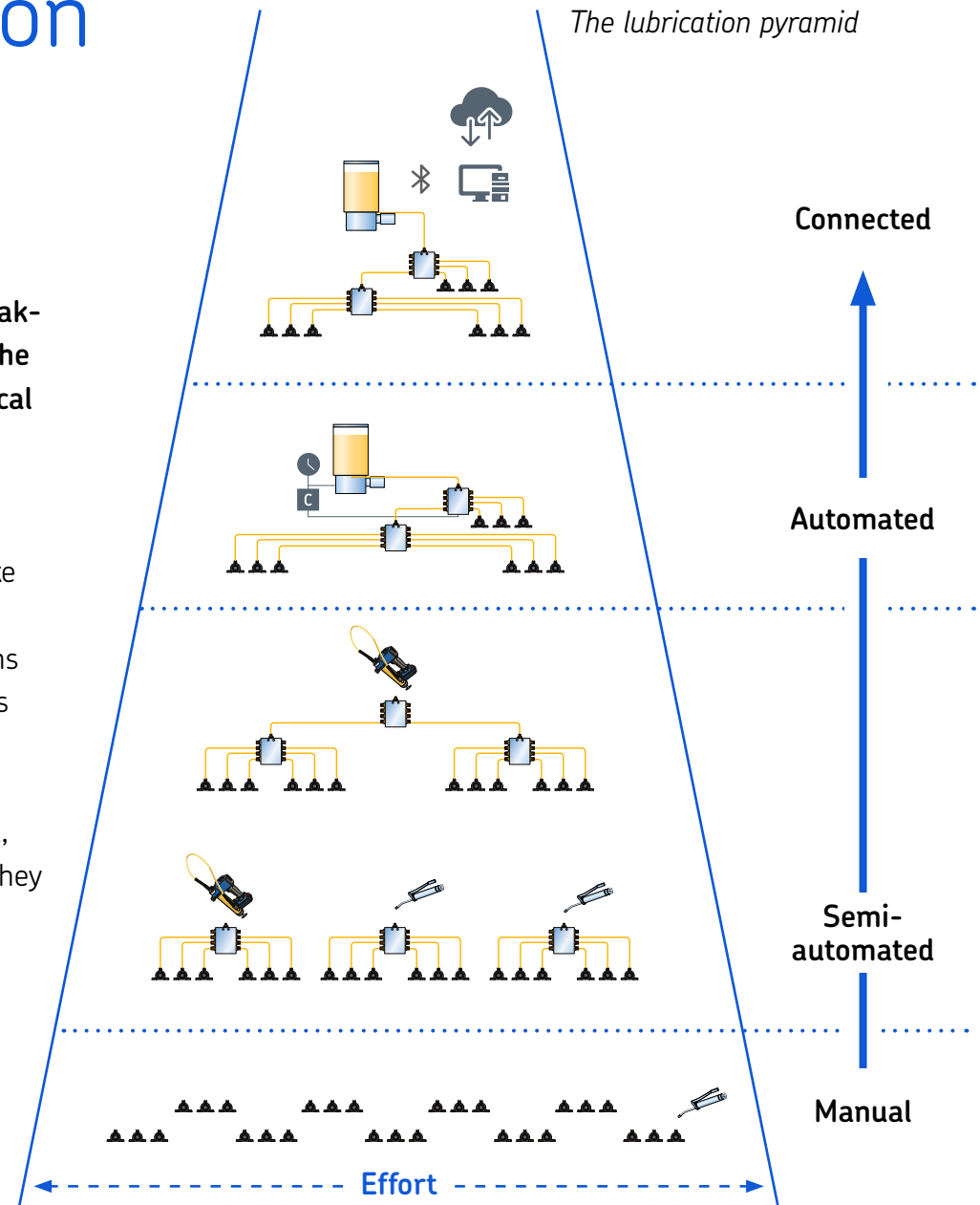
A full range of lubrication solutions

SKF's lubrication solutions adhere to a performance-based approach. With proper lubrication, vessels operate with fewer breakdowns, improved safety, more cost effectively, and less risk to the environment. And with hundreds of lubrication points on a typical vessel, there are plenty of opportunities to improve operations and build in new efficiencies.

These systems fall into four broad categories that can be thought of like a pyramid. Manual, point-by-point lubrication makes up the base of this pyramid. At the very top are fully automatic lubrication systems with remote monitoring. Between the two are lubrication solutions that increase in automation.

In the pages that follow, we'll go through the pyramid in more detail, showing examples of SKF's various lubrication systems and where they might fit into your overall lubrication strategy.

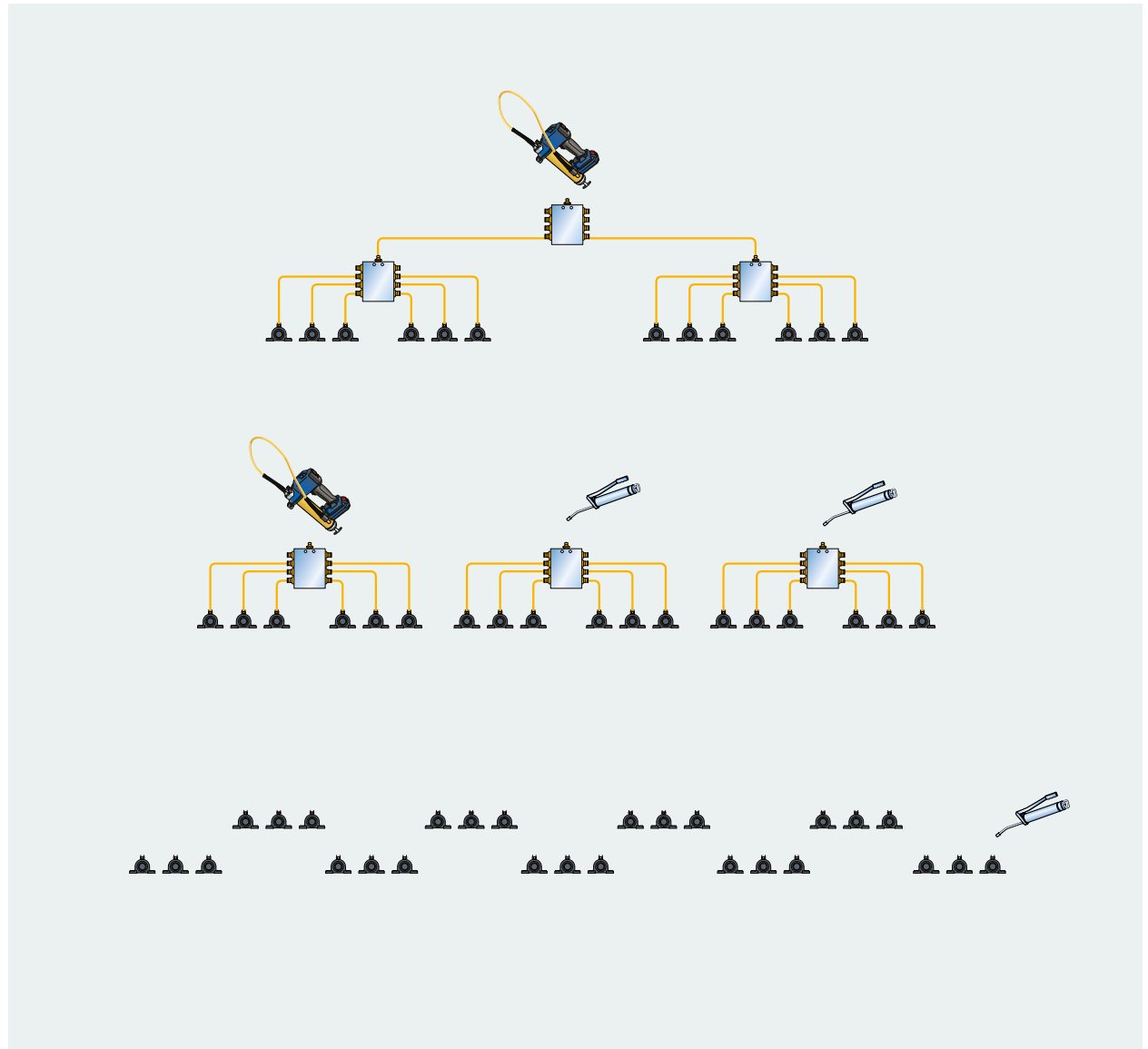
To [contact an SKF expert](#) and learn more about the solutions found in this e-book, call or send an email.



Manual and semi-automatic lubrication

When discussed alongside automatic lubrication, manual can seem somehow outdated or old fashioned. But this isn't always the case. In fact, in many areas of a ship, manual lubrication is a legitimate option.

SKF offers a wide range of manual lubrication options, including grease transfer pumps and a full line of grease guns. The new connected grease gun adds an accessory module to the standard grease gun, wirelessly connecting the device to the SKF cloud. The connected grease gun can help ensure no lubrication points are missed and that they all receive the correct amount of lubricant.

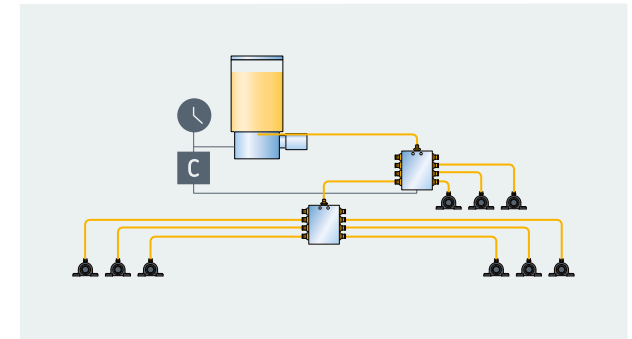


Automatic lubrication

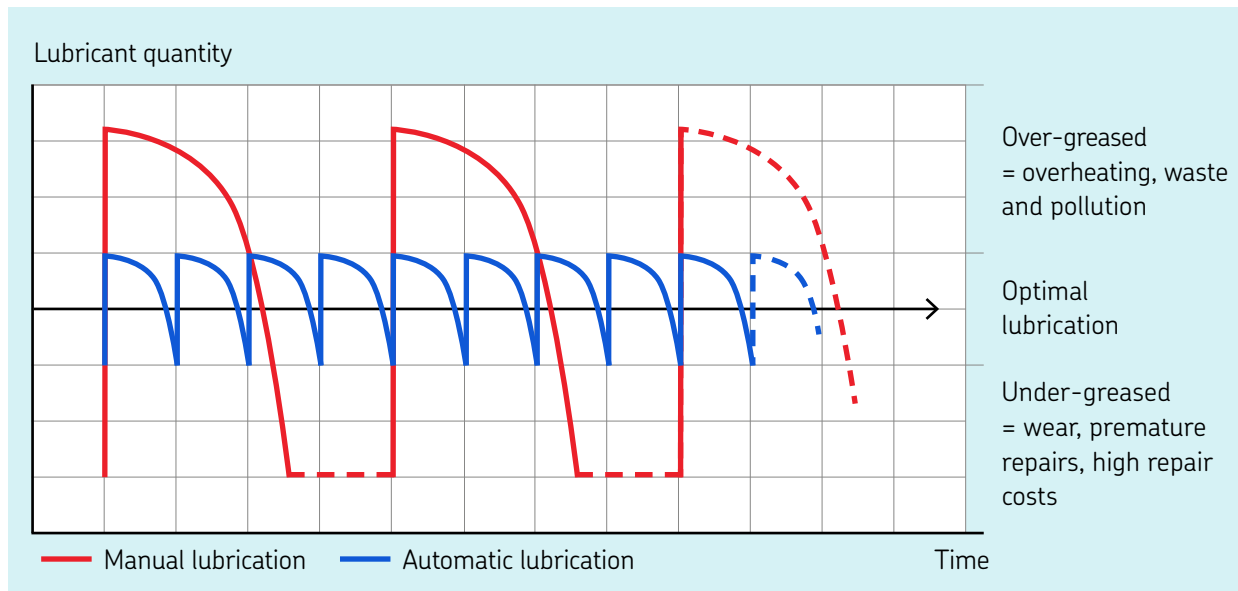
Automatic and semi-automatic lubrication solutions are excellent for pieces of machinery with difficult-to-reach lubrication points, like those in the steering gear, or on equipment that's difficult or dangerous to access, like a deck crane.

There are a number of automatic and semi-automatic lubrication solutions to choose from, from single-line systems to progressive lubrication systems. Oil circulation systems are also

available for applications such as a sterntube or gearboxes. For more information about which solution works best for your application, contact a member of the SKF service team.



Automatic lubrication system



Reduce the risk of failure



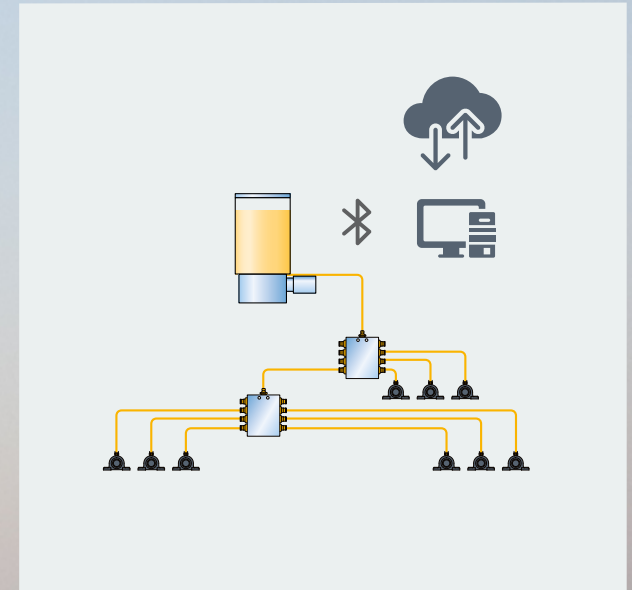
SKF SYSTEM 24 single-point automatic lubricator

Connected lubrication

At the top of the lubrication pyramid, connected lubrication systems are the most advanced tools available. They function similarly to their automatic or manual sister products, but they come with the added digitalized benefits and are connected to the SKF Enlight Centre.

These connected systems offer several advantages, depending on the system. They can allow for remote control, the monitoring of lubrication pressure, and quantity, and they can keep track of the number of lubrication cycles

on a particular application. As such, they offer insights into how well the systems are working, helping you make decisions about maintenance requirements.



Connected, automatic lubrication solutions

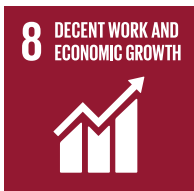
In support of sustainable development

As much as **40 percent** of the oceans are heavily affected by pollution, depleted fisheries, loss of coastal habitats, and other human activities. SKF lubrication solutions offer operators the chance to limit their use of oil and grease.

What's more, up to 96 percent of marine accidents involve human error. Our services and solutions support reliability, predictability, and safety in a number of ways. By implementing the right lubrication practices SKF helps to improve safety on board.

Discover how SKF addresses further challenges related to safety and sustainability:

www.skf.com/sustainability



Environmentally friendly solutions

Advanced lubrication solutions bring value beyond operational performance. Compared to manual lubrication, SKF's automatic solutions can reduce grease consumption by as much as 33 percent, equivalent to about 2.2 kg of CO₂ per kg of lubricating grease.

Customers operating in areas with special environmental protection, like US coast waters or in the Arctic, require environmentally acceptable lubricants (EALs). To meet those customers' needs, SKF recently launched its EU Ecolabel grease LGTE 2/18. Suitable for wire ropes, plain bearings, and bushings, the Ecolabel grease has excellent surface adhesion and water resistance.

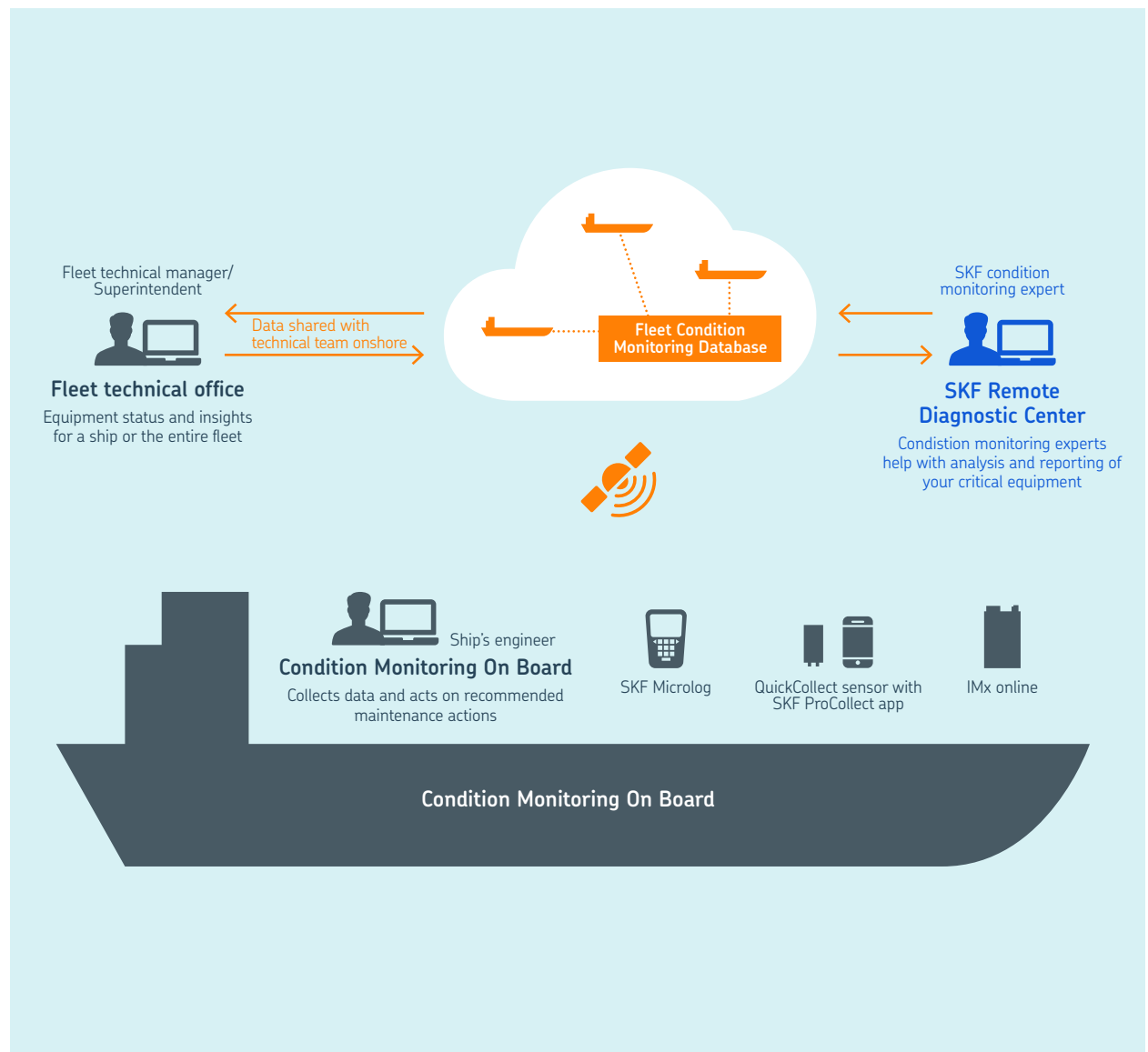


*Environmentally
acceptable
lubricants*

SKF lifecycle management

Even with careful attention to your vessel's lubrication needs, there comes a time when components must be replaced. But the process of replacing a worn-out part is no longer about simply buying a new one and installing it. A number of services can help prolong the life of your components and offer environmentally friendly, cost conscious options for replacement.

Certain components on a vessel – including many of the bearings found in electric motors, fans, and pumps – can be covered by condition-based maintenance (CBM) contracts. Such contracts leverage sensor and Internet of Things technology to predict the expected lifecycle of components. This can help ensure you have replacements on hand, ready to be installed, when the time does come. And when it comes to replacement, many bearings can now be remanufactured as part of SKF's Rotating Equipment Performance (REP) service – a solution that can reduce both waste and maintenance costs.



SKF lubrication management and support

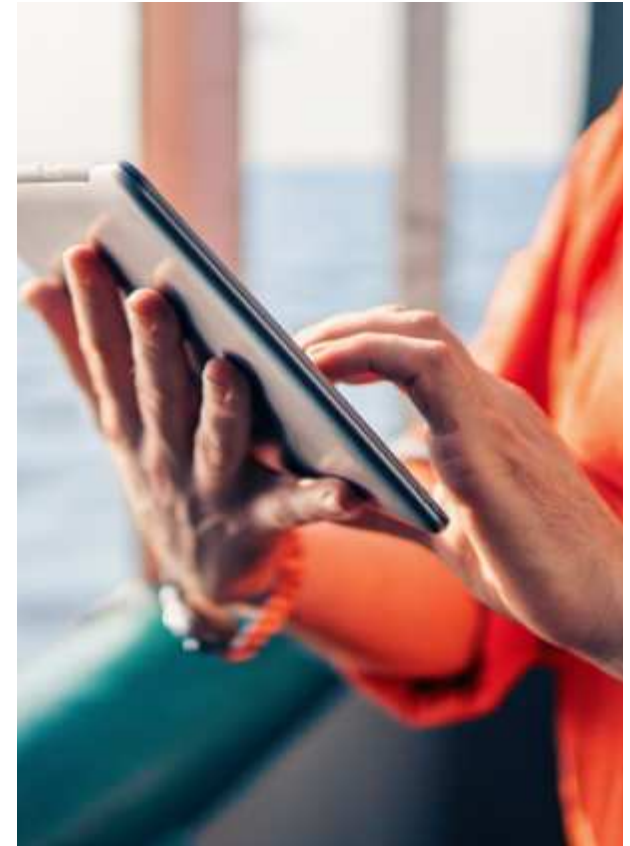
Lubrication management is a general term which covers all areas of the lubrication cycle – from selecting the lubricant, to method, storage, and disposal. Proper lubrication management brings multiple benefits to your operation. It reduces waste, which is good for the environment and your bottom line. It keeps your machinery protected and functioning with greater efficiency and reduced downtime, giving you a better return on your investment. And with less frequent breakdowns and reduced maintenance efforts, the people you depend on to maintain and service your equipment will spend less time in hazardous conditions, reducing injury and associated work stoppages.

SKF can help you select a lubrication system – and a lubricant – that is specifically suited to your machinery and the unique operating conditions your equipment and people face every day.



In addition to helping educate you on how best to approach your own lubrication challenges and choose the most appropriate products, we can help you troubleshoot lubricant contamination and chemical degradation, and train your personnel on proper lubrication and maintenance.

After performing an audit to better understand your unique needs, an SKF Lubrication Management team will provide you with a personalized improvement proposal. This will be followed by a design and implementation timeline. We are confident that our service will reveal a number of improvement opportunities and ultimately optimize your equipment.



Lubrication management checklist



Identify all lubrication points on the vessel.



Take inventory of the different kinds of lubricants (greases and oils) on the vessel and their applications.



Review the standards and best practices for lubrication and cleanliness procedures (ISO 4406, etc.)



Review lubrication analyses used for RCFA.



Create or update a vessel lubrication plan covering lubrication targets, re-lubrication intervals, lubrication quantities, and application methods, etc., for all machinery on board.



Useful links and resources

[SKF Lubrication Management](#)

[SKF Sustainability Goals](#)

Marine specific content

[Engineering at sea](#)

[Lubrication management for the marine industry](#)

[Engine lubrication](#)

[Crane lubrication](#)

[Wire Rope Lubrication](#)

Automatic lubrication systems and products

[Progressive lubrication systems](#)

[Multi-line lubrication systems](#)

[Oil circulation lubrication systems](#)

[Electrically operated multi-line pump P215](#)

[Electrically operated lubrication pump FB](#)

[Mechanically or electrically operated piston pump RA ... M / RA B](#)

Manual lubrication

[SKF Battery Driven Grease Gun TLGB20](#)

Semi-automatic lubrication

[Single-point automatic lubricator SKF System 24](#)

[Automatic lubricant dispenser TLMR series](#)

Specific products

[Lubrication pinion](#)

[EU Ecolabel grease LGTE 2](#)

With optimization comes improved safety, prolonged uptime, and better environmental sustainability. We look forward to hearing from you.

[Click here for more](#)

**For information concerning lubrication solutions,
please visit:**



SKF.com/lubrication

<https://www.skf.com/group/industries/marine/lubrication-systems>

www.skf.com

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