

Improve fleet reliability, sustainability and safety

With SKF Lincoln Lubrication Management



LINCOLN[®]

40%

OF INCIDENTS AT
SEA ARE RELATED TO
MACHINE DAMAGE

“Machinery damage is already the most common cause of shipping incidents, and preventive measures are often among the first shipboard expenses to suffer.”

Allianz Safety & Shipping Review 2016



Simplify maintenance tasks and reduce operating costs

Efficiency and safety are key in the marine industry. Ship operators need to maximize productivity, reduce maintenance costs and provide a safe working environment for the crew while at sea. At the same time, vibration, high mechanical loads, contamination and moisture are all threats to bearing and gear service life. Like any mechanical system, moving parts in engines, gear boxes, propeller shafts, steering gears, winch drives, deck cranes or other auxiliary equipment require proper lubrication to function optimally.

Increase safety

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. Reducing manual lubrication results in fewer potential accidents, and crew members can be utilized for other tasks.

Maximize availability

Automatic lubrication reduces downtime, so your equipment is available when you need it. In addition to helping increase reliability and availability, lubrication systems help to extend service life, reduce operational and lubricant costs and minimize environmental impact by avoiding over-lubrication. Precise automatic lubrication provides a significant benefit for operators. Reliably delivering lubricant from a central source to all of the connected friction points, SKF Lincoln automatic lubrication systems help prevent bearing damage and unscheduled machine downtime, while optimizing manpower resources.

Reduce operating costs

Utilizing high-quality SKF and Lincoln automatic lubrication systems pays off in many ways. When a system is installed, it will function virtually maintenance free, reducing total cost of operation. Automatic lubrication can reduce lubricant consumption significantly and is much cleaner than manual lubrication, resulting in less lubricant to affect the environment.

All of this means reduced operating costs and, ultimately, improved fleet profitability.

Maintenance benefits

- Minimizes labor required for lubrication
- Extends repair intervals
- Reduces consumable costs
- Reduces wear and corrosion

Operational benefits

- Helps to ensure that equipment is properly lubricated
- Eliminates over- and under-lubrication
- Increases reliability
- Improves profitability

Safety benefits

- Eliminates manual lubrication of difficult-to-access points or in explosion-protected areas
- Reduces risk of slips and falls when compared to manual lubrication
- Fewer accidents

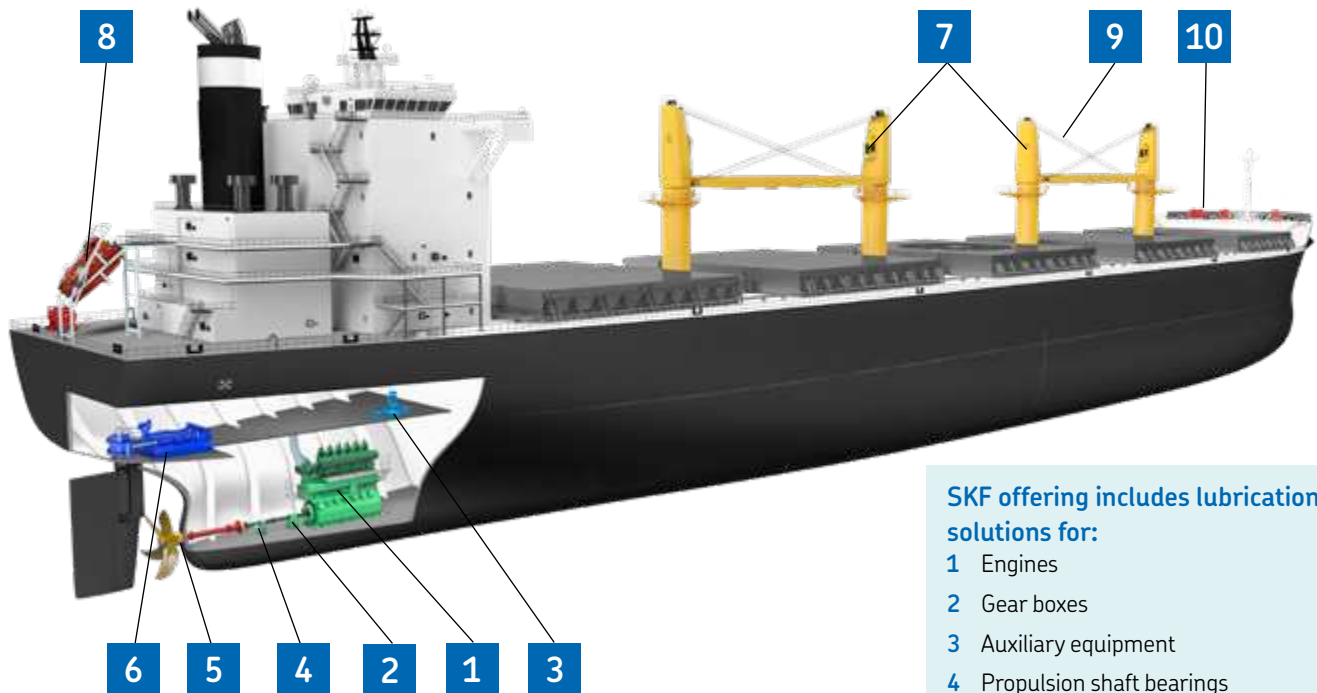
Solutions for challenging applications

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. Our lubrication products and solutions are available for any type of vessel. In fact, many lubrication applications on a ship can be completed more efficiently and safely with lubrication systems.

SKF provides product solutions for the proper lubrication of propeller shaft bearings and steering gears, as well as winch drives, ropes and cables. In addition, grease and oil spraying systems are available for jacking systems and open gears.

Oil is the lubricant of choice for heavily loaded bearings in gear boxes or stern tube seals. It lubricates and cools the lubrication points and removes contaminants from the oil cycle.

SKF also offers efficient lubrication solutions for diesel engines that help to reduce cylinder lubricant consumption. Class-approved and ATEX- or ICE-certified products for all applications are available upon request.



SKF offering includes lubrication solutions for:

- 1 Engines
- 2 Gear boxes
- 3 Auxiliary equipment
- 4 Propulsion shaft bearings
- 5 Sterntube and seal
- 6 Steering gears
- 7 Deck cranes
- 8 David cranes
- 9 Wire ropes and cables
- 10 Winch drives



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

Cylinder lubrication systems for diesel engines

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.

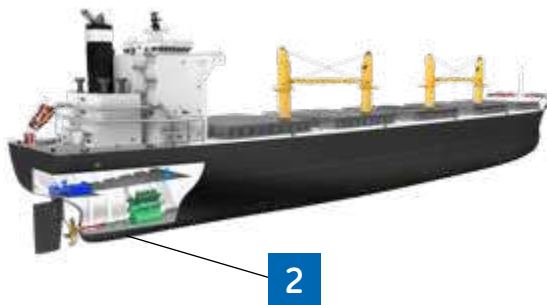
Specially designed lubrication pumps, like SKF's CLU4, can help. They meter out the cylinder oil according to the engine's load, independent of changes in temperature and viscosity. They also help ensure adequate lubrication while guarding against over lubrication, which can be expensive.

According to OEM regulations, these cylinder lubrication pumps must be reconditioned every 30 to 35 thousand hours, or about every five years. The performance contracts offered to CLU4/CLU4-C customers support reconditioning and help to minimize downtime.

Benefits include:

- Reduces cylinder lubrication oil consumption by 30 to 50 percent
- Minimizes CO₂ and solid particle emissions
- Enables lubrication system servicing while the engine is running
- Meets highest fire safety standards
- Performance contracts support reconditioning





Gear box lubrication systems

Heavily loaded bearings and gear boxes require special attention. The solution is a circulating oil lubrication system that controls the gear box temperature, separates dirt particles, air bubbles or foam and water from the oil. A pressurized oil system transports the lubricant to the individually adjustable flow meters.

These customer-specific solutions consist of compact units in a pump-cooler arrangement that supply the lubrication points with the right amount of tempered lubricating oil. Durable materials help ensure that even extreme ambient conditions have no negative effect on the system's functionality.

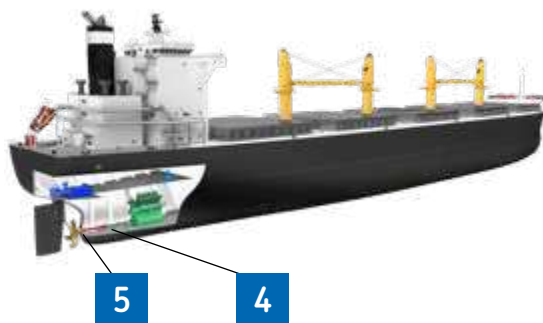
Actual delivery rates can be monitored visually or electronically, and multiple warning levels are available for condition-based maintenance. SKF CircOil systems are offered in a wide range of tailored and ready-to-use solutions for volumetric flows.

The number and type of units are determined by the lubricant used and its viscosity index, the required volume and the required pressure. Gear, gerotor and screw pumps often are used with these systems.

SKF circulating oil lubrication systems can be used in explosive atmospheres, up to ATEX zone 1, or in compliance with relevant standards such as the American Petroleum Institute's (API) Standard 614.



Renk Tunnel Gear Box SHH



Propeller shaft and thruster lubrication

Propeller shafts and thrusters are vital elements with a high mechanical stress factor. The application, power rating and design determine whether grease or oil circulating systems are required.

SKF CircOil lubrication is preferred for high-torque requirements involving heat removal. Conditioned oil is fed from the oil supply system to the bearings by ordinary throttles or flow limiter systems, which are pressure and viscosity compensated.

SKF Multi-line grease lubricators, often in combination with progressive feeders, are designed to handle the stiff greases even during harsh winter conditions.

Stern tube seal lubrication

This important seal keeps sea water out of the ship and protects the propeller shaft bearing from premature failures. Stern tube seal lubrication protects the seal arrangement and helps to avoid leakage.

Precise oil metering and monitoring systems provide the optimum sealing pressure using clean oil. A simple and reliable positive displacement pump, such as SKF series RA, are suitable for small continuous flow rates of one liter (0.26 gal) per day.

Approvals of the classification societies are available upon request.

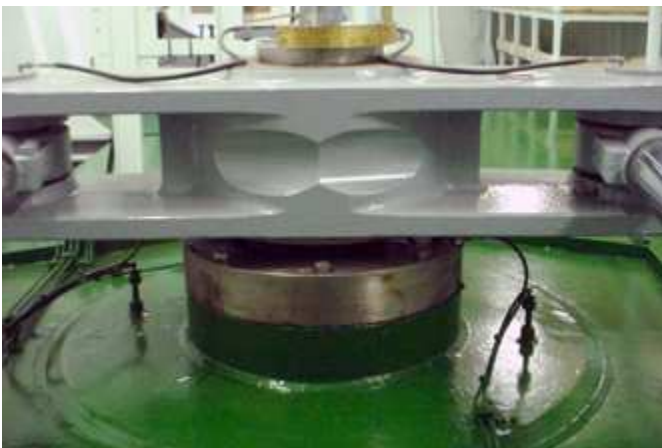


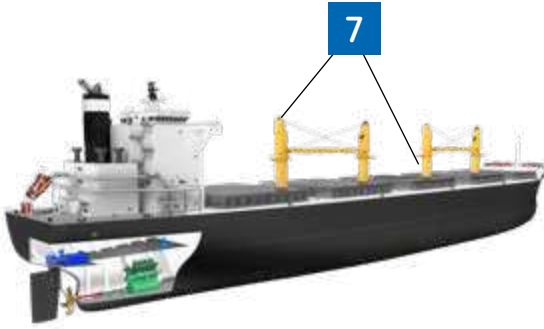


Steering gear lubrication

Steering gears and rudder shocks are exposed to vibration and high mechanical loads and must be lubricated properly.

Multi-line grease lubrication systems provide a pre-defined amount of lubricant in order to avoid over- and under lubrication. These reliable systems utilize pumps with up to 30 lubricant outlets and can be connected directly to the lubrication points. When used in combination with progressive metering devices, a multi-line system can be monitored easily. Featuring impeller technology, the system's pumps can handle heavy grease up to NLGI Grade 2 at freezing temperatures.





Deck cranes

Slewing bearings for deck cranes are large in diameter. The loads are very high, and they operate under extreme conditions. To avoid excess wear and corrosion, and to make sure the crane is ready to work, these bearings must be lubricated frequently. Doing this manually takes up to half an hour each time and can create serious safety issues.

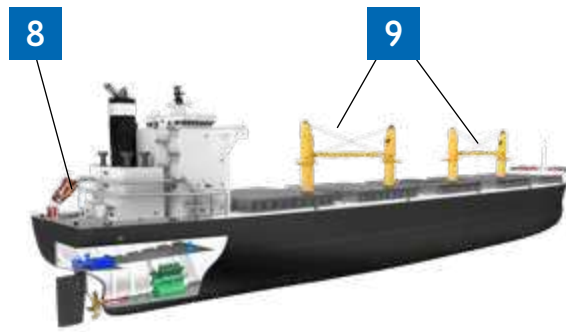
Automatic lubrication systems provide a consistent supply of grease to these difficult-to-reach lubrication points. Maintenance technicians no longer need to climb to each lubrication point, thereby increasing safety. Also automatic lubrication systems help to reduce corrosion, wear and down time.

SKF offers a wide range of lubrication solutions for off-shore cranes. These automated lubrication systems deliver pre-defined amounts of lubricant to avoid over- and under-lubrication and help to ensure that the equipment is ready to use.

For sizeable applications, a dual-line lubrication system can supply numerous lubrication points from a single pump unit source. In addition, the parallel setup allows for a simple system design.

Lubrication pinions also help to ensure that the gear slewing remains optimally lubricated during operation. Sophisticated technology distributes the lubricant evenly on the entire tooth flank.





Davit cranes

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.

Wire ropes and cables

Additional options are available to lubricate ropes and cables. Spraying systems for open gears and cables are designed for oil and grease. They can be driven with a multi-line pump, which feeds the lubricant to the spraying nozzles. These nozzles deliver a consistent lubricant film to the component's surface. Because oil can penetrate the ropes, it helps to minimize corrosion as well as wear.

Wire rope lubricators clasp the rope and penetrate it directly with grease. Also, air-operated barrel pumps are available to handle special rope lubricant with high MoS2 or graphite content.





Winch drives

Automatic lubrication systems deliver a consistent supply of grease to winch drive lubrication points while the winch is operating. Also, an automatic lubrication system helps to reduce corrosion, wear and unplanned downtime.

Multi-line pumps, in combination with progressive metering devices, can be connected directly to the lubrication points. In addition, SKF offers explosion-approved solutions as part of our product portfolio.

Additional marine equipment applications

Other applications on vessels that would benefit from automatic lubrication systems include:

- Genset bearings
- Stabilizers
- Folding gates on Ro-Ro-ferries
- Fire-fighting equipment
- Pump units

Wherever moving components are exposed to harsh conditions, automatic lubrication systems can help to minimize wear and corrosion, reduce manpower hours and keep your fleet on the water.





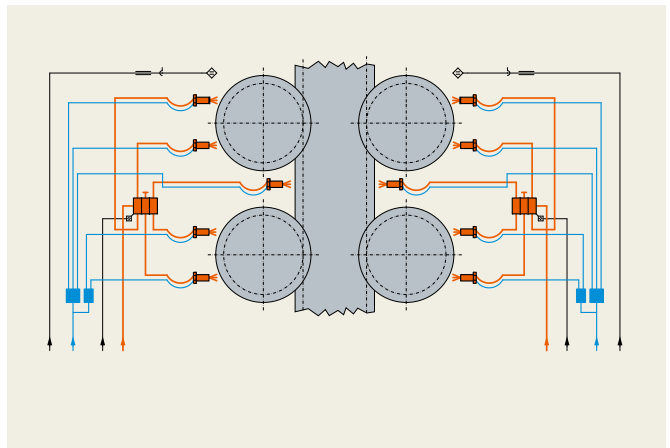
Lubricating tooth by tooth

Jacking systems on off-shore industry vessels work under extreme environmental conditions, so proper lubrication with the right lubricant is essential to reduce drive pinion and tooth flange wear.

The jacking process can take several hours. During this procedure, the system must be lubricated tooth by tooth. Using an automatic lubrication system can save a significant amount of time each day and improve worker safety.

Options include connecting the pinions directly to an automatic lubrication system or using a multi-line / progressive system to feed lubricant to a lubricating pinion. SKF's offering includes electric, hydraulic and air-operated pump units.

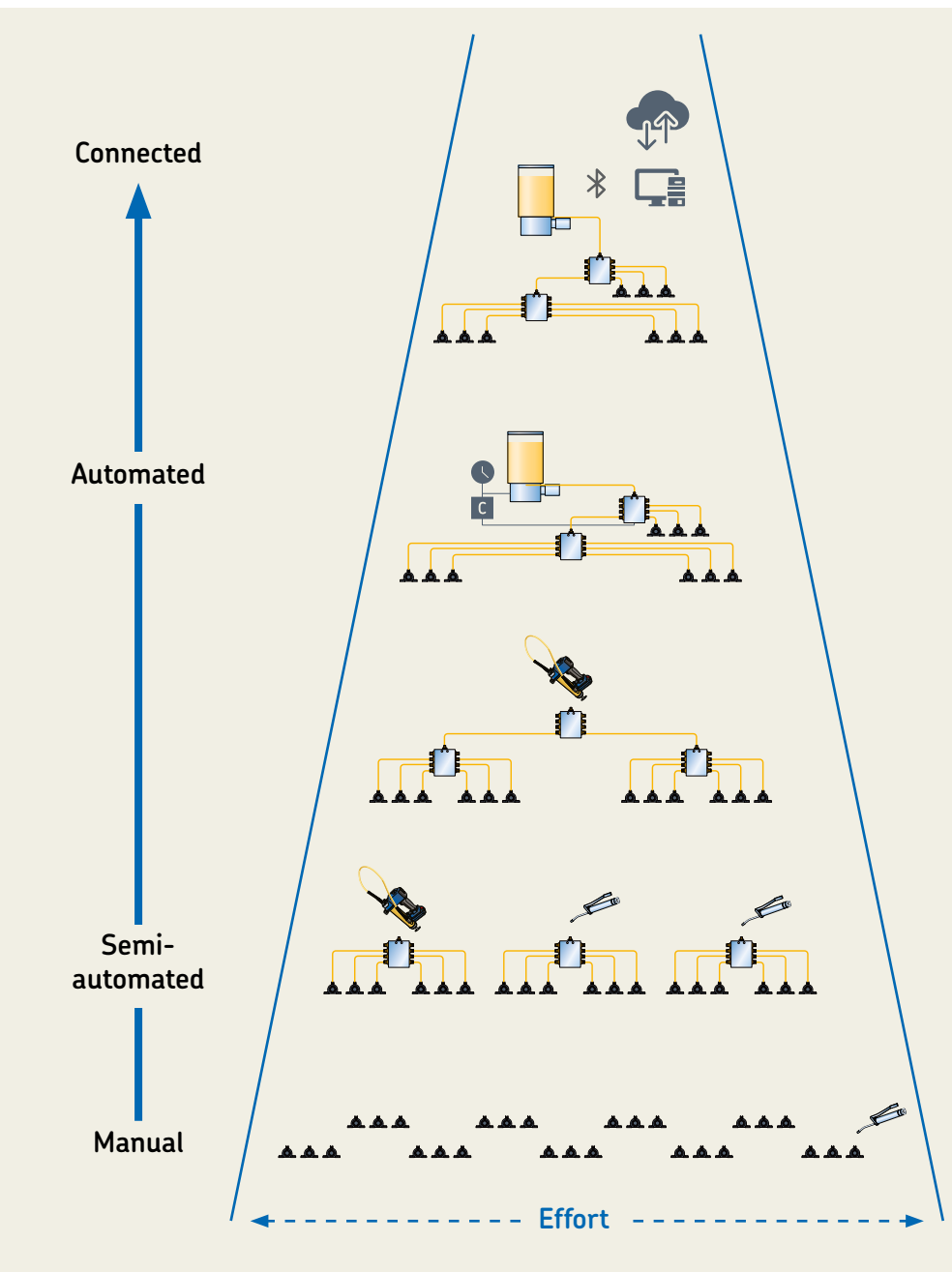
In addition, SKF offers a grease spraying system to lubricate the gear rack of a jacking system. The system features a stainless steel design that withstands harsh environments. The electrically, hydraulically or pneumatically driven spray nozzles provide an adjustable spray pattern up to 150 mm (6 in). Electrically monitored nozzles are available upon request.





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.



Vibration, high mechanical loads, contamination and moisture are all threats to bearing and gear service life. Like any mechanical system, moving parts in engines, gear boxes, propeller shafts, steering gears, winch drives, deck cranes or other auxiliary equipment require proper lubrication to function optimally.

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.

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.

Manual and semi-automatic lubrication

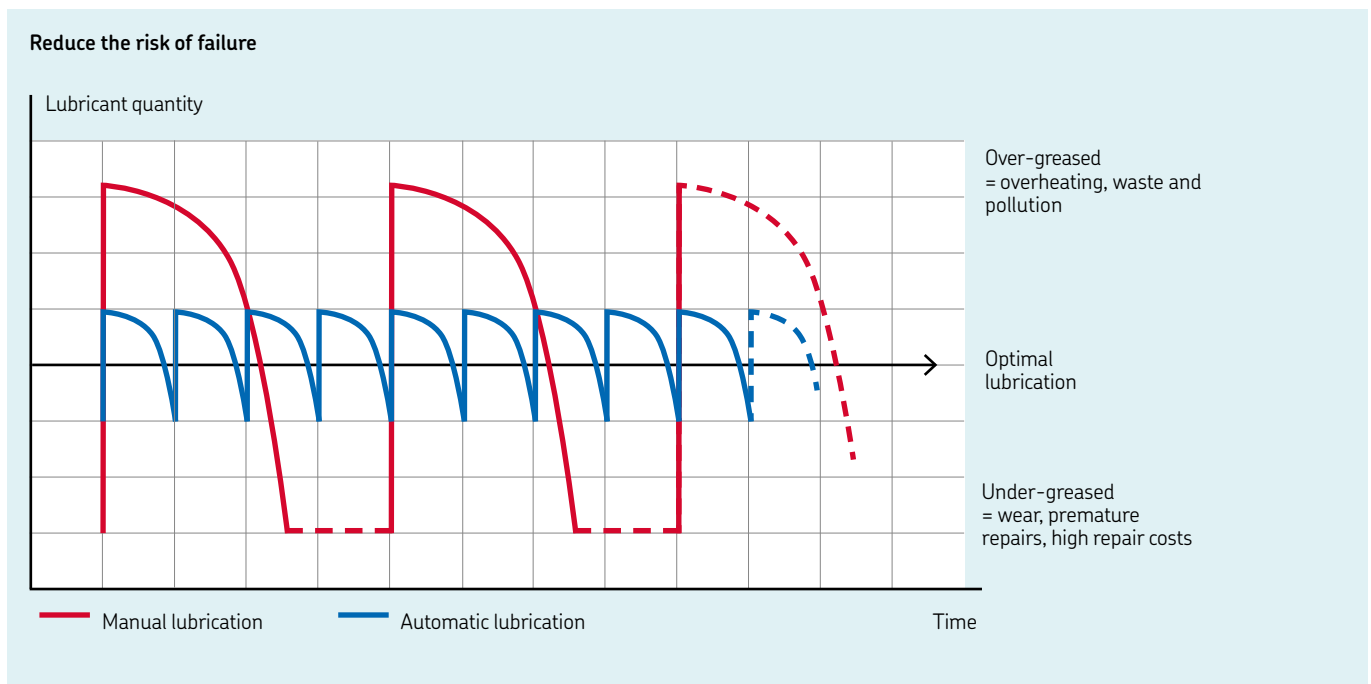
When discussed alongside automatic lubrication, manual can seem somehow outdated or old fashioned. But this isn't always the case. In fact, in many areas of a ship, manual lubrication is a legitimate option.

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 gear-boxes. For more information about which solution works best for your application, contact a member of the SKF service team.



Comprehensive range of lubrication components

No matter which lubrication system best suits the application, SKF offers a comprehensive range of quality lubrication pumps, metering devices, control and monitoring units and all necessary accessories. Individual components are coated for protection against corrosion (corrosion class C5 M) and combined with stainless steel components for long life. Also, explosion-approved and class-certified components are available upon request.

Lubrication pumps

SKF's portfolio ranges from single-point, automatic lubricators and pump units with integrated grease reservoirs for single-, dual- or multi-line and progressive lubrication systems to tailored solutions for circulating oil systems.

SKF offers mechanically, electrically, hydraulically and pneumatically driven pumps. All pump housings are weather-resistant, and saltwater-resistant versions are available. In addition, the pumps are suitable for oil and standard greases up to and including NLGI Grade 3, as well as for use in low working temperatures.

Criteria, such as ambient conditions, required delivery rates, lubricants employed and service intervals, determine which lubrication pump should be selected. Pumps are available with various control and monitoring options.

Lubricant metering devices

Different lubrication systems require different metering devices. All SKF Lincoln lubricant metering devices are high-precision components, available in special materials for various climates. Several designs are suitable for high-pressure applications, and system operation can be verified easily through electronic or visual monitoring.

SKF's offering is completed by additional system components such as spraying nozzles or lubricating pinions for open gear lubrication.



Monitoring

Monitoring and control are essential to the efficient operation of lubrication systems. Installed in conjunction with intelligent monitoring devices, automatic lubrication systems can facilitate economical and optimal lubrication.

With the instruments we provide, you have access to all values important for controlling your system – temperature, pressure, volumetric flow and fill level – whether visually or with digital or analog signal, time or load-dependent settings.



SKF has developed many of our products specifically for use in potentially explosive atmospheres. We meet numerous requirements, including the European Union Directive 94/9/EC. To comply with this so-called “ATEX” Directive, we follow both the requirements for electrical and non-electrical equipment according to the related EN standards. Furthermore, we can provide some products in which all electrical parts have IECEx certification.

Most products are available for explosion group IIC/IIIC (flammable vapors and gases) and equipment protection level (EPL) Gb/Db (see IEC / EN 60079-0).



Environmentally friendly solutions

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.

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.



SKF lubrication management and support

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.

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.

A network of experienced partners support you with:

- Customized lubrication system design
- System installation and start up
- Service and repair
- Lubrication analysis and testing
- Lubrication management training
- Warranty support
- System maintenance contracts
- Vessel surveys and recommendations
- Return-on-investment (ROI) analysis
- Guidance on safety and environmental issues
- Pre-assembled lubrication kits for easy retrofitting



