

Tested, approved, recommended

Meet maximum requirements: Klüber speciality lubricants for open gears at sea

The open gears of anchor winches have to defy extreme loads and environmental influences. Operational reliability is regarded a top priority as any equipment failure can have grave consequences. One of the world's leading manufacturers of a wide variety of products and systems used in the shipping industry is well aware of the eminent importance high-performance lubricants have in this context. Many years of positive experience are the reason why running-in and operating lubricants from Klüber Lubrication have been chosen for the lubrication of their open anchor winch drives.



The positioning of oil rigs and their anchors is the job of anchor handling tug supply (AHTS) ships. In all kinds of weather, these special vessels drop and weigh the rigs' anchors with their powerful winches, or they tow the platforms to new positions. Furthermore they supply the rig crews with all materials and equipment needed for offshore operation, and in emergencies they also serve as emergency rescue and recovery vessels (ERRV).

Lubricant performance plays a decisive role

Anchor winches are required to operate with utmost reliability, which inevitably includes also their lubricants. Any anchor winch failure on an AHTS vessel can have a number of severe

consequences for the operator. Damage to the gear teeth is fatal since it is hardly ever possible to replace a gear rim while the ship is at sea. The vessel has to visit a shipyard to have a damaged gear rim or pinion replaced, which is extremely costly. Replacement gear rims, or winch drums with the gear rim welded on, have to be specifically manufactured because most winches are custom-made. This often entails very long delivery times. While the ship is not in use, or can be used only to a limited extent, charter rates amounting to several 10 000 US dollars a day may be lost. In some cases the operator will also be liable to provide a replacement vessel.

If the reliable operation of an AHTS vessel cannot be ensured, there is a risk that expensive equipment may be damaged or, worse still, crew members may be hurt. At the end of the day, the operator's image may suffer when contracts and agreements cannot be met due to technical defects.

Experience has shown that conventional standard lubricants are not always able to meet the stringent requirements posed by large anchor winches and can therefore give rise

to major problems such as wear, fretting or corrosion with consequential gear failure.

Recommendation for Klüber Lubrication

Based on many years of experience and backed by extensive research, Klüber Lubrication has developed adhesive lubricants precisely tuned to the operating conditions prevailing in open girth gear drives. A leading Scandinavian ship equipment OEM has gained very positive experience with Klüber's special lubricants for open winch drives and recommends these lubricants to its customers. This recommendation pertains to GRAFLOSCON B-SG 00 Ultra, a running-in lubricant, and Klüberfluid C-F 3 Ultra as operating lubricant up to an ambient temperature of 30 °C, or Klüberfluid C-F 3 M Ultra for temperatures above 30 °C as are typical of tropical regions.

Expertise wanted

The selection of the lubricant for open winch gears is influenced by a number of design- and application considerations.

Upon manufacture, the gear flanks still show a high degree of surface roughness. This, and the fact that the gear rim and pinion are often not perfectly parallel-aligned, is the cause why the load carrying area is often no more than 50 or 60 %. When in mesh, the load-bearing tooth flanks may therefore suffer partial overloading, which in turn can lead to excessive wear and tooth flank damage. Running-in lubrication plays a vital role in this context

Running-in lubrication forms the basis

New girth-gear drives are usually subjected to a specific running-in process, for example with GRAFLOSCON B-SG 00 Ultra, depending on the winch design. During loaded operation, controlled micro-wear is intentionally provoked to smoothen the tooth flanks. The consequence is a higher load-carrying area of approx. 80 %, which helps to avoid overloading and gear damage.

Running-in lubricants may only be applied over a limited time and must be replaced by the operating lubricant when running-in is completed. Klüber's running-in lubricants and Klüber's operating lubricants have been designed such that

conversion to the operating lubricant can be done without cleaning the gears. It has been successfully accomplished many times in practice and helps to save time and costs.

Challenges encountered during operation

1. Large open winch drives on AHTS vessels are subject to strong tensile loads at the anchor chains and shock loads with a high surface pressure. As peripheral speeds are usually low, the drives run frequently under mixed friction conditions. A sufficient hydrodynamic lubricant film is therefore not generated, so the tooth flank surfaces are partly in direct contact. The consequences can be excessive wear and damage to the tooth flanks in the form of pitting. Pitting is caused when the permissible load on the gear material is exceeded locally. Micro-cracks form near the surface, leading eventually to spalling. This diminishes the load-carrying area of the tooth flanks, encouraging further pitting. A suitable lubricant is therefore one that builds up a load-bearing reaction layer also at low peripheral speeds and high surface pressure to protect the pinion and gear rim flanks reliably against wear.



Anchor handling winches work under extreme loads

- The winches are often operated only for a short time during hauling or anchor handling. The gear lubricant is applied by means of transfer lubrication, i.e. only while the drive is in motion. This has to suffice to reliably protect the tooth flanks against corrosion as the open gears are permanently exposed to the aggressive salty air and spray water. It is therefore essential that the lubricant spreads well, adheres firmly to the components and does not drop off.
- AHTS ships operate in a wide variety of climates. The lubricants used have to be pumpable by means of the lubricating systems installed at all temperatures.

Reliable and cost-saving

As an operational lubricant, Klüber Lubrication developed Klüberfluid C-F 3 Ultra for ambient temperatures up to + 30 °C, and Klüberfluid C-F 3 M Ultra for ambient temperatures above + 30 °C.

The lubricants of the Klüberfluid series are transparent, highly viscous adhesive lubricants with good tooth-flank-, wear- and corrosion-protection properties aimed at a long component life. Thanks to their high viscosity, hydrodynamic lubrication is attained even at low peripheral speeds. Their good adhesion makes for a long-lasting lubricant film and



Intermittent lubrication with long intervals is the standard method for large open gears



The long-fibred, homogeneous texture of the adhesive lubricant causes a stretching effect, ensuring reliable lubrication also with long intervals



consequently lower costs due to lower lubricant consumption. Reliable lubrication can be attained with 50 % less lubricant than with graphite-containing products. Other than the lubricants that contain graphite, the transparent products allow easy visual inspection of the tooth flank condition at any time, without prior cleaning. Klüberfluid products are free of bitumen, heavy metals, solvent- or chlorine-containing raw materials. This results in less costs and legal obligations for the disposal of used and old lubricants.

The running-in- and operating lubricants GRAFLOSCON B-SG 00 Ultra and Klüberfluid C-F 3 Ultra / Klüberfluid C-F 3M Ultra, respectively, have proven to offer maximum performance when used in combination. The gear life in large anchor winches is increased, lubricant consumption volumes are reduced considerably and service intervals extended. This adds up to significant cost reduction for the ship operator.

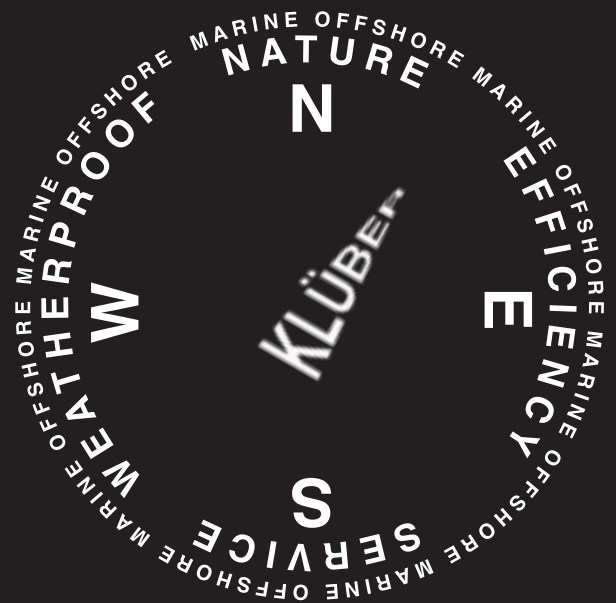
Comprehensive product range for winches

Adhesive lubricants from Klüber for open gears have proven effective on ships for many years. Besides a set of matching priming-, running-in- and operating lubricants, Klüber offers also repair lubricants. The repair lubricant Klüberfluid D-F 1 Ultra, for instance, can be used to remedy minor damage to tooth flanks in an inexpensive way by causing intentional wear and thus increasing the load-carrying area. The winch can continue to be used without replacing pinion or gear rim. This saves the operator shipyard costs and reduces periods of idleness.

For the lubrication of small open gears as well as heavily loaded, slowly rotating rolling- and plain bearings in winches, sliding surfaces and transport chains in coiling equipment, Klüber offers the white speciality lubricant Klüberplex AG 11-462. It offers very good protection against wear and corrosion, even after prolonged standstill, and excels in terms of load-bearing capacity and adhesion.

For the reduction gears between the hydraulic motor and the drive pinion, Klüber offers rapidly biodegradable CLP gear oils: the Klübersynth GEM 2 oils based on synthetic ester oils, with a viscosity of either 220 or 320 mm²/s. Biodegradability as determined in the CEC-L-33-A-93 test is above 70 % after 21 days.

All Klüber products are manufactured using the latest technical processes and can be obtained with the same high quality level around the world.



With speciality lubricants made by Klüber, you'll hold your course

As a competent partner to the shipping sector, Klüber offers you the range of lubricants needed for critical applications under rough conditions at sea – whether for gears, propellers, bearings or many other: Klüber offers you maximum quality helping to significantly extend the maintenance intervals and service life of components. Set course for reliable operation, our experts will be pleased to provide consulting and service wherever you are!



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