Lubrication solutions help to increase safety and improve risk management… Choosing the right lubricants can be crucial for saving energy and costs

In the marine, oil and gas sector components have to withstand harsh conditions and have to work effectively to reduce downtime and save costs. One aspect which helps to ensure this is the use of the right lubricant. Speciality lubricants from Klüber Lubrication help to maximize the output of equipment and critical assets whether floating or fixed.

Acknowledged as the global market leader, Klüber Lubrication is a trusted partner of marine, oil and gas operators' worldwide and meet approval for use by leading original equipment manufacturers (OEMs). With a portfolio of over 2,500 speciality lubricants designed to perform in the harsh conditions of the oil and gas environment - especially offshore - Klüber Lubrication has for over 85 years continually provided greater product durability, delivered higher energy efficiencies and are increasingly called upon to solve the most challenging lubrication problems of modern-day equipment when traditional solutions fail.

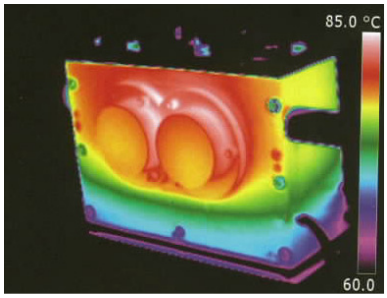
Cost effective lubrication – A small investment that can make a big difference

How can valves or fittings open and close smoothly and reliably in aggressive environments? How can greases function at ultra-high or low temperatures where other lubricants fail? How can a lubricant be so eco-compatible that it is fully biodegradable? When addressing these questions the word "speciality" takes on a whole new meaning, and to counter prevailing beliefs regarding the limited benefits of upgrading to speciality lubricants, Klüber Lubrication have been instrumental in lowering NPT, facilitating higher HP/HT capability, increasing MTTF/MTBF, and reducing purchase frequency and inventory through improved durability and service life.

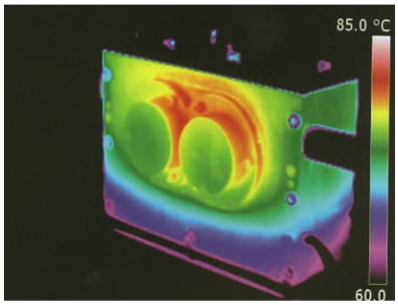
Synthetic gear oils for example offer a significantly higher efficiency than standard gear oil based on mineral oil, resulting in a lower friction which reduces temperature and lowers energy costs.

Insert Image: Gear Oil Temperature

Standard gear oil
(mineral oil, ISO VG 220)



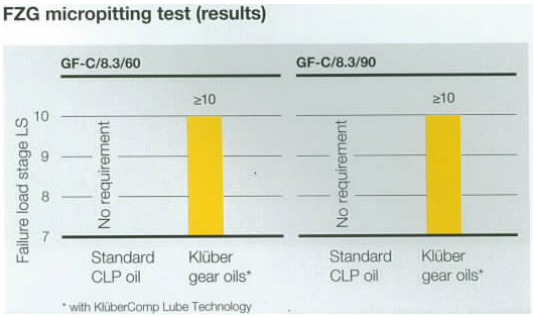
Klübersynth GEM 4-220 N

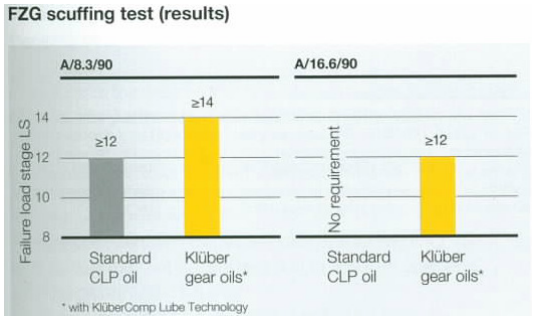


Lower mesh temperatures often prevail in industrial gears when being run up, operating with a stop-start function, below full-load capacity or at reduced speed than would normally be generated in a fully loaded gearbox. Under these conditions gear failure or premature damage often results from micro-pitting wear in slow to medium circumferential speeds, whereas with very slow circumferential speeds the result is abrasive wear. To reliably protect gear flanks and bearings against damage, advanced, high performance, properly additivated gear oils are essential.

Our tests have shown that Klüber Lubrication advanced additive technologies can react at the surface of the tooth flank even at low oil temperatures to assure protection across the widest range of operating conditions as well as assuring the most durable service life and transmission efficiency.

Insert Graphs





Meeting the toughest of standards – Keeping pace with growing populations

Insert Image: Ship in the Arctic

Drilling at extreme depths in regions of the world previously considered unreachable, in hostile environments – artic cold, tropical heat, rain, wind, salty air and seawater – places an extra strain on operating equipment, increasing the likelihood of failure. In these harsher environments the differences between conventional and speciality lubricants will be quickly revealed - whether on deck equipment or propulsion systems, on vessels or topside, subsea or the downhole demands of offshore installations, FPSOs, Jack-ups and semi-submersibles - the necessity to select the right lubricant has a vital role to play in the fulfilment of tasks on time. Speciality efficiency-boosting oils, greases, pastes, waxes, coatings and anti-corrosion products developed to endure the elements faced in the oil and gas sector is one way of tackling these challenges.

Speciality lubricants for cranes and winches

Open gears used for driving winches and rotating cranes offshore, on ships, or in harbours are exposed to enormous stresses and strains. For this reason the lubricants role is a crucial one - it has to provide reliable protection against corrosion and not drip, or be washed off by sea water, if not the consequences include increased wear of gear teeth, corrosion and in the end complete gear failure resulting in high repair costs, which is why one of the world's leading manufacturers of anchor handling winches: Rolls Royce recommend Klüber Lubrication. The Klüberfluid C-F and Klüberplex AG ranges of lubricants provide substantial cost savings due to the proven protection against corrosion and wear, but also because of the lubricants good adhesive properties which is free from bitumen, heavy metals, chlorine and solvents, disposal is much less costly. These products are suitable in all climatic conditions and the difference compared to conventional lubricants is immediately visible, as these lubricants are transparent or white rather than black making monitoring of tooth flanks possible.

A major manufacturer of flexible and rigid pipes for the Offshore Industry producing approximately one third of worldwide production wanted to reduce maintenance costs on-board several of their cable layers. Using a VLS (vertical laying system) to guide and install the undersea pipe the company used extensive steel wire ropes up to 3,000m long and 120mm in diameter. The ropes were used on average 150 times per year and were immersed in sea water during every operation. The company was using a competitor product which offered a good penetration in the rope, but the water and corrosion resistance was not appropriate for sea immersions.

In consultation with their engineering department Klüberplex AG 11-462 was tested and demonstrated:

- Excellent adhesion
- Excellent corrosion protection
- Water resistance
- Excellent wear protection

Rope re-greasing was extended to 4 months - the grease consumption for lubrication of the entire rope can be around 200kg for small ropes and 1,200kg for bigger ropes. Klüberplex AG 11-462 offered excellent corrosion protection, thus increasing the life time of the ropes. This manufacture owned 8 vessels with one rope each and with costs varying from €300,000 to €600,000 to change one rope depending on the size the benefits of excellent wear protection and water resistance were clear.

Insert image of wire ropes

Wire rope after 6 months and 37 immersions between 150m and 500m

Matching the right lubricant with the right elastomer seal

Most vessels are propeller-driven, and almost all propeller shafts whether a stern tube or thruster share one characteristic - they are lubricated with oil. The propeller shaft seal is in place to prevent oil from leaking into the sea and sea water from entering the stern tube or thruster gear, therefore the advantages of speciality lubricants for applications with a “lube and seal” requirement cannot be ignored. Working with Merkel Freudenberg one of the world’s leading manufacturers of elastomer seals, Klüber Lubrication have successfully developed biodegradable gear oils for propellers and thrusters, fulfilling all requirements for environmental protection, functionality and seal compatibility. Klüberbio EG 2 gear oils, offer an alternative to mineral oil for thrusters and rudder propellers based on synthetic ester oil - these synthetic ester oils contain more than 90% of renewable raw material, bear the European Eco-label and comply with the requirements of the 2013 Vessel General Permit defined by the Environmental Protection Agency (EPA) for classification as an Environmentally Acceptable Lubricant (EAL). As well as being eco-friendly, Klüberbio EG 2 oils offer a high scuffing load capacity to protect the gear teeth against damage even at high peak load.

Klüber Summit Gas Compressor Simulator

With the development of a gas compressor simulation system, Klüber Lubrication can exactly match an operational compressor fluid to the prevailing gas stream to significantly guard against gas wash and dilution effects in compressors where process fluid and oil are in contact, thus reducing wastage, maintenance time, and production losses, as well as improving reliability and increasing uptime.

As an insight into what difference referencing a gas stream can make, a North Sea installation showed significant improvement and lowered the cost of operation of a Low Pressure Vapour Recovery (LPVR) compressor recovering offgas from the LP Separator vessel. This gas was the one source of fuel gas for various turbines on the platform - when the compressor was shut down the offgas flared to the atmosphere.

The compressor package had a history of unreliability, from compressor seizure to failure of lube oil pumps. A new compressor normally lasted approximately 8000hrs before requiring overhaul or replacement due to failed bearings or seizure - the compressor here had to have monthly oil changes as hydrocarbon condensate diluted the oil, reducing its viscosity and flash point; this reduction in viscosity had a detrimental effect on bearings and other moving parts.

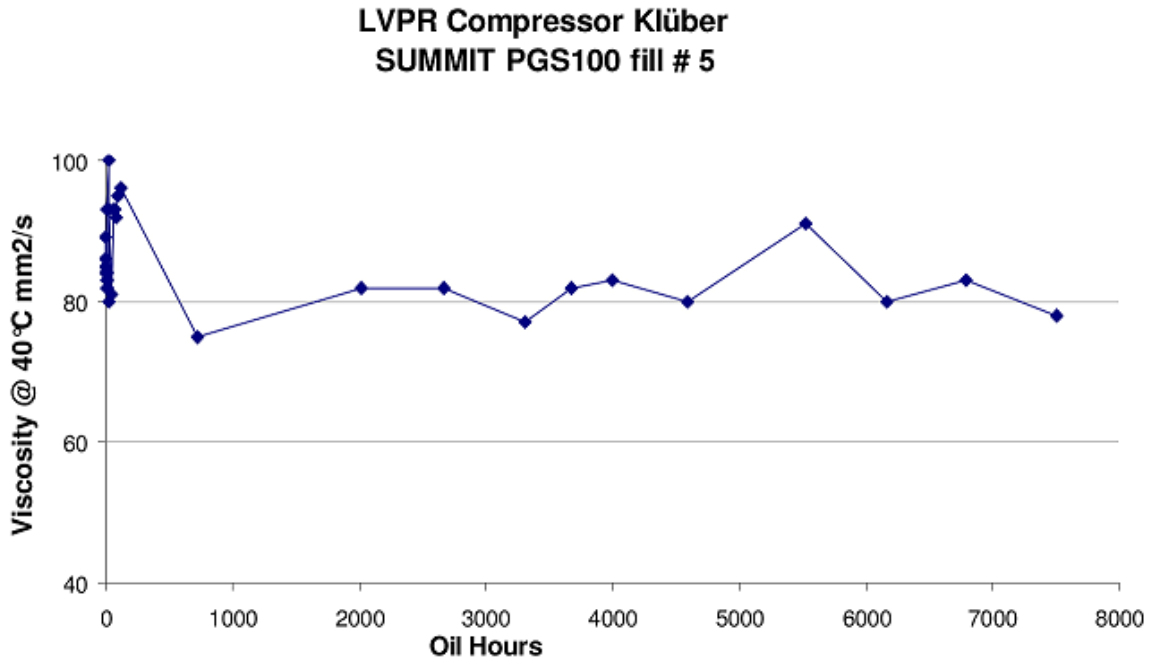
- Number of new/overhauled compressors used: **6**
- Number of oil changes: **61**
- Compressor downtime due to compressor failure: **35 weeks (approximately)**
- Amount of gas flared to atmosphere: **4900000m³ (approximately) at 20000m³/day**
- Man hours: **840hrs**
- Prior to changeover, the compressor was running on synthetic oil.

Following years of unreliable performance using several unsuitable grades of oil (mineral and synthetic) recommended by their oil supplier, it was decided that a new supplier who could supply the correct type of oil as indicated in the manufacturers O&M manual be found. Only one company manufactured the required grade of oil as standard and using the Summit Compressor Simulator, the correct oil, Klüber Summit PGS-100 was selected according to the gas stream analysis ensuring that the oil viscosity was maintained when the gas was

dissolved. The minimum operational viscosity was calculated to be 40mm/s² at 40°C. The compressor oil was changed when a new compressor was fitted.

Since installation of Klüber Summit PGS 100 the company have made the following annualised savings in maintenance time, environmental flaring and direct expenditure:

- Oil savings: 22 x 5000 (number of oil changes x cost of oil change [£]) = **£110,000**
- Number of new/overhauled compressors that would have been used with original oil: 1 x £15,000 = **£15,000**
- There has also been a reduction in flared gas by at least **21,3326m³**.
- Man-hour saving – **256hrs in 25 months**



Environmentally compatible biodegradable lubricants – We have the solution

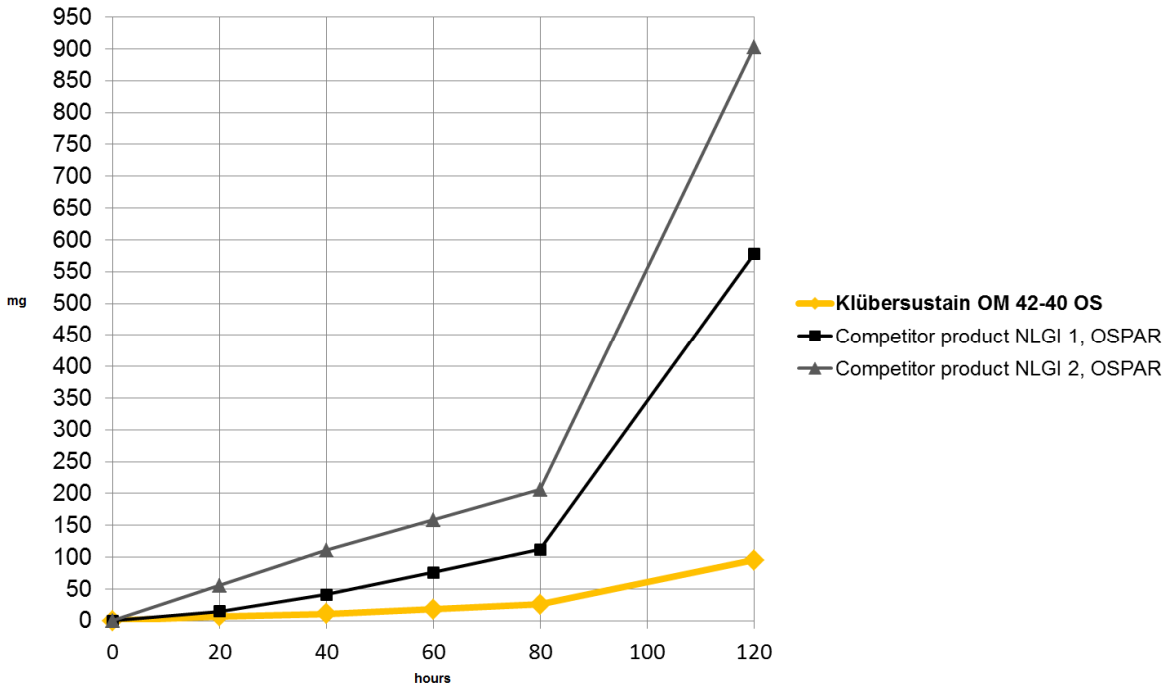
The effects of marine pollution has reached dramatic proportions, particularly in coastal regions with high industrial density and along much-frequented shipping routes, but with the demand for hydrocarbon resources expected to grow by 30% over the next 20 years the challenge for modern-day oil and gas exploration to economically find, revisit and exploit reserves will only increase – and as marine traffic intensifies so too will the potential problems for the marine environment. Environmentally, the marine, oil and gas sector is under the auspices of tight regulations concerning chemical discharges, losses, leaks and pollution and as such have been calling for an eco-compatible alternative to mineral-oil based products for years, but any alternative had to be equal to mineral oils in terms of performance and lubrication requirements. Working closely with leading thruster manufacturers in Germany, Holland, Norway and Finland, Klüber Lubrication were able to determine the requirements and oil specifications needed to protect gear teeth; reduce maintenance costs and extend the service life of oil and seals in thrusters and rudder propellers, creating readily biodegradable oils which not only met regulatory and market demands for environmental sustainability, but were also a genuine alternative to mineral oils launching the Klüberbio EG 2 gear oil series in 2012.

OSPAR plus High Performance - Comparison of wear behaviour of open gear lubricants

Meeting environmental objectives without compromising efficiency of your operations to comply with OSPAR regulations in oil and gas applications poses a challenge, but with a reputation for outstanding technical performance Klüber Lubrication now bring this expertise to new OSPAR compliant products - Klübersustain SA 42-41 OS Thread Compound, and Klübersustain OM 42-40 OS, for Jack-up rack & pinions can help you meet regulatory and market demands without compromising on performance.

Utilizing another simulation rig to replicate the parameters on open gears in Jack-ups it was possible to determine the gear wear characteristics, according to DGMK 377-01. With a special gear set, this slow speed test ran for cycles of 4 x 20 hours at 0.05m/s, then faster for the last 40 hours running at 0.57m/s, after each cycle the gears were weighed to determine the wear. Comparing the performance of Klübersustain OM 42-40 OS with competitor's OSPAR greases it was possible to prove that the new Klüber Lubrication product showed 1/9 of the wear compared to the NLGI 2 grease, and less than 1/5 of the wear compared to the NLGI 1 grease thus illustrating the excellent wear protection provided by Klübersustain SA 42-41 OS products, ensuring they deliver on OSPAR requirements as well as high performance.

Oil & Gas Product Portfolio – NEW Product Testing with Jack-up Products



Pushing the Limits – the future of speciality lubricants

Reducing the impact of mineral oil-based lubricants entering the oceans, bays, harbours and inland waters is incumbent on everyone to deliver higher levels of sustainability and work together to protect the environment we operate in, which is why we have developed a test bay that is un-paralleled in the industry to simulate the exact loads lubricants are subject to in various applications, fluctuating temperatures, high surface pressure, micro-movements and/or (salt) water to ensure the lubricant maximizes output whilst minimizing operational and environmental costs. Our biodegradable gear oils and stern tube oils, as well as our hydraulic fluids for thrusters, controllable pitch propeller (CPP) propulsion units, stern tubes and deck equipment, are approved for use by leading equipment and seal system OEMs, have independent assurance from the EU Eco-label Program and meet the US EPA's requirements for environmentally acceptable lubricant (EAL) classification.

As an independent supplier of speciality lubricants we excel at driving improvement measures even when “problems” don’t exist to deliver on overall uptime and productivity aims and we are proud to have major oil companies as customers, as well as large and small shipping companies, contractors, and service providers. Through our technology, expertise and by working in close collaboration with leading OEMs, Klüber Lubrication continue to push the limits of efficiency and performance - via our global network of production, sales and distribution partners we are able to supply the right lubricant for the right application wherever you are in the world - helping you to achieve the best operational practices that combine economic saving with environmental benefits.

Author: Martine Jagger, Marketing Communications Manager, Klüber Lubrication Great Britain