

your global specialist

## Availability under extreme conditions.

Speciality lubricants for oil refineries  
and petrochemical plants





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# The speciality lubricant – a key component in oil refinery operation

In any refinery, the reliability of “rotating” equipment is crucial to efficient, cost-effective production. This includes, for example, gas and air compressors, ball valves, centrifugal pumps, mechanical seals, gearboxes and screw connections.

Any standstill or even just impeded performance of one of these critical components will significantly affect the profitability of your plant.

A major contribution to the functional performance of your rotating equipment is provided by the lubricant. This contribution may be small in size – but it has a substantial effect, as optimised component lubrication can increase the safety and efficiency of your plant operation. This applies not only to older plants – optimised lubrication can also make new, advanced facilities significantly more efficient.

## Facts on refineries

A large refinery can convert up to 16 million tons of crude oil per year into a wide variety of products.

The booming Asian refinery sector combined with the continued growth of Europe’s petrochemical industry in recent years has led to a much higher demand for high-performance lubricants.

The petrochemical industry provides the link between the mineral oil industry and the chemical industry. The crude gasoline produced in the refineries is converted into products such as ethylene and propylene, which are then used in the production of plastics, cleaning agents, paints, colorants and synthetic fibres. Crude gasoline can also be processed into aromatic compounds, i.e. hydrocarbons such as benzene, toluene and xylene, which are used in the production of plastics or insecticides.

## High-quality speciality lubricants and ...

Ambient conditions in refineries are taxing and include extreme temperatures, strong effects stemming from chemicals and high physical requirements.

Klüber Lubrication has developed speciality lubricants for these demanding conditions. Depending on their application, they offer the following benefits:

- **Higher productivity due to longer equipment service life**
- **Longer component life due to excellent wear protection**
- **Reliable plant operation as lubricants are resistant to media**

On the following pages you will find a selection of products that have been tried and tested for the lubrication of components in oil refineries with consistent success.

## ... services providing you with added value

Numerous companies have been using our professional services in addition to the high-quality lubricants to benefit from considerable added value.

We offer, for example, oil condition analyses to find out if a particular lubricant is still fit for use. In addition, we offer appropriate training on lubrication and tribology for your staff.

Our service module KlüberEnergy can help you tap savings potential and reduce energy costs.

# Speciality lubricants for process gas compressors

Each individual compressor in your refinery makes a valuable contribution to your annual production result. Compressors are the most critical and cost-intensive element in your plant and require heightened maintenance attention.

Two factors are of decisive importance when selecting a compressor oil:

The right oil	The right viscosity
The base oil must match the composition of gases to prevent most interaction between the compressor oil and gas flow. This is a factor that is often neglected in refineries, leading to very short maintenance intervals and high wear, for example on plain bearings.	Another factor to be determined is optimum oil viscosity, which depends on the operating conditions as well as on gas composition. Based on these parameters, the specialists from our Compressor Competence Centre determine optimum oil viscosity.

To give you a first overview, this table contains the most important compressor oils for use in oil refineries. In-depth consultation with our experts is essential to ensure selection of the perfect oil.

Product	Base oil	Kinematic viscosity DIN 51562-1 at 40 °C, [mm <sup>2</sup> /s] approx.	Notes and benefits
Klüber Summit NGSH-68 NGSH-100 NGSH-150 NGSH-220	Synthetic hydrocarbon	68 100 150 220	<ul style="list-style-type: none"> <li>– For lubrication of reciprocating and screw-type compressors for natural gas</li> <li>– Good anticorrosive characteristics</li> <li>– Effective corrosion protection also with sour gas (hydrogen sulphide)</li> </ul>
Klüber Summit PGS 68 PGS 2 PGS 100 PGS 150	Polyglycol oil	68 85 100 150	<ul style="list-style-type: none"> <li>– For lubrication of reciprocating, screw-type and rotary vane compressors for natural and process gas</li> <li>– Compared to mineral oils, the products are very resistant to dilution and absorption by hydrocarbon gases</li> </ul>
Klüber Summit PGI 68 PGI 100 PGI 150	Polyglycol oil	68 100 150	<ul style="list-style-type: none"> <li>– For lubrication of propane gas compressors, e.g. refrigeration compressors</li> <li>– Compared to mineral oils, the products are very resistant to dilution and absorption by hydrocarbon gases</li> </ul>
Klüber Summit NGL 444 NGL 555 NGL 777 NGL 888	Polyglycol oil	79 100 150 220	<ul style="list-style-type: none"> <li>– For high-pressure reciprocating compressors compressing natural gas, carbon dioxide or process gas</li> <li>– Highly resistant to dilution and absorption by gases containing hydrocarbon and good chemical resistance to process gases</li> <li>– Very high viscosity index and, thus, small viscosity change over a wide temperature range</li> <li>– Very good wear protection leading to longer component life</li> </ul>
Klüber Summit DSL-100 XM DSL-125 XM	Ester oil	100 125	<ul style="list-style-type: none"> <li>– For process gas compression without damage to downstream metal catalysts</li> <li>– Approval for hydrogen compression at U.O.P., USA</li> </ul>



## An investment that pays off

Switching over to a high-performance speciality lubricant pays off: although purchasing costs may seem higher at first, less maintenance and longer compressor life may already mean less strain on your budget in the medium term.

### Example:

Following thorough consultation with our experts, a well-known refinery operator decided to switch his compressors over to Klüber Summit PGS 100. This enabled him to save approx. 127,400 EUR per year with a single screw-type compressor.

	Before changeover	After changeover to Klüber Summit PGS 100
<b>Lubricant costs</b>	5,900 EUR	12,800 EUR
– per oil change	12 × 5,900 EUR	1 × 12,800 EUR
– per year	<b>= 70,800 EUR</b>	<b>= 12,800 EUR</b>
<b>Maintenance per year</b>	160 hrs	65 hrs
<b>Maintenance cost per year</b>	160 hrs × 40 EUR <b>= 6,400 EUR</b>	65 hrs × 40 EUR <b>= 2,600 EUR</b>
<b>Spare parts and backup compressor, cost per year</b>	<b>12,000 EUR</b>	<b>2,400 EUR</b> (assumed service life 40,000 op. hrs.)
<b>Loss of production</b>	700,000 m <sup>3</sup> gas per year	140,000 m <sup>3</sup> gas per year
<b>Cost of production loss</b>	700,000 m <sup>3</sup> × 0.1 EUR/m <sup>3</sup> <b>= 70,000 EUR</b>	140,000 m <sup>3</sup> × 0.1 EUR/m <sup>3</sup> <b>= 14,000 EUR</b>
<b>Total cost</b>	<b>159,200 EUR</b>	<b>31,800 EUR</b>
<b>Cost saved</b>	–	<b>127,400 EUR</b>

# Speciality lubricants for other applications

## Air compressors

Product	Base oil	Kinematic viscosity DIN 51562-1 at 40 °C, [mm <sup>2</sup> /s] approx.	Notes and benefits
Klüber Summit SH 32 SH 46 SH 68 SH 100	Synthetic hydrocarbon	32 46 68 100	<ul style="list-style-type: none"> <li>– Low maintenance and operating costs due to long oil change intervals of up to 10,000 operating hours in oil-injected screw-type compressors</li> <li>– Easy changeover from mineral oils due to neutral behaviour of the oil towards seals</li> <li>– Low evaporation rate leading to clean compressed air and clean compressed air lines. Prevention of unnecessary cleaning expenses and pneumatic valve downtime due to gumming</li> <li>– Low formation of oxidation residues in the oil circuit enabling low operating costs due to long oil filter and oil separator lifetimes</li> </ul>
Klüber Summit Supra 32 Supra Coolant	Polyglycol oil	38 55	<ul style="list-style-type: none"> <li>– Easier switchover of compressors that were previously running with polyglycol oils due to good oil miscibility</li> <li>– Low maintenance and operating costs due to long oil change intervals of up to 8,000 operating hours in oil-injected screw-type compressors</li> <li>– Good soil dissolving properties due to the ester content keeping the oil circuit clean and preventing cleaning costs</li> <li>– Low formation of oxidation residues in the oil circuit leading to low operating costs due to long oil filter and oil separator life</li> </ul>

## Synthetic cleaning concentrate for compressors, hydraulic systems, gearboxes and other oil circulation systems

Product	Product characteristics	Notes and benefits
Klüber Summit Varnasolv	Synthetic	<ul style="list-style-type: none"> <li>– Low maintenance and cleaning costs due to effective cleaning of varnish and carbon build-up without disassembly of the compressor unit</li> <li>– Application during operation, hence no compressor shutdown required for cleaning</li> <li>– Easy application Klüber Summit Varnasolv is neutral towards seals when mixed with oil at a concentration of 10 %</li> <li>– Cost-saving operation and maintenance of the cleaned compressor unit due to higher equipment efficiency or longer oil life</li> </ul>



## Screw connections

Product	Product characteristics	Notes and benefits
Klüberpaste HS 91-21	Black, easy-to-spread high-temperature paste with a new type of combination of solid lubricants for the assembly lubrication of screw connections	<ul style="list-style-type: none"> <li>– Efficient assembly due to constant preload forces for screws of different sizes and materials</li> <li>– Screws easy to undo even when subject to high temperatures for a long time</li> <li>– High purity means less strain on the screw connection as product is virtually free from chlorine, fluorine and sulphur</li> </ul>

## Valves and fittings

Product	Product characteristics	Notes and benefits
Klübersynth VA 62-253 G	Base oil: ester Thickener: silicate NLGI grade 3	<ul style="list-style-type: none"> <li>– Very good resistance to hydrocarbons such as propane, butane, ethane</li> <li>– Good adhesion to the friction point</li> <li>– High thermal stability</li> <li>– Neutral towards copper and its alloys</li> <li>– Very good load-carrying capacity with solid lubricants</li> </ul>
UNISILKON L 641	Base oil: silicone oil Thickener: PTFE	<ul style="list-style-type: none"> <li>– Very good wetting</li> <li>– Operational smoothness due to the good viscosity-temperature behaviour</li> <li>– Very good resistance to cold and hot water and steam</li> <li>– High thermal stability</li> <li>– Good sealing effect</li> <li>– Neutral behaviour towards metal, elastomers and plastics</li> </ul>
Klüberalfa YV 93-302/93-1202	PFPE/PTFE grease NLGI grade 2	<ul style="list-style-type: none"> <li>– High operational reliability in facilities and components used with gaseous oxygen               <ul style="list-style-type: none"> <li>– due to wide compatibility with customary materials</li> <li>– due to wide service temperature range</li> </ul> </li> <li>– Multiple uses as sliding agent for industrial processes involving oxygen, air, carbon dioxide, inert and other gases as well as their condensates</li> <li>– May also be used for liquid-oxygen equipment</li> <li>– Individual batch BAM certificates</li> </ul>

# Speciality lubricants for other applications

## Chemical pumps – rolling bearings

Product	Product characteristics	Notes and benefits
Klüberplex BEM 41-132	Synthetic hydrocarbon oil/ mineral oil, special lithium soap NLGI grade 2	<ul style="list-style-type: none"> <li>– Longer service life due to antiwear additives matching roller bearing requirements</li> <li>– Low maintenance effort</li> <li>– Highly versatile grease due to wide service temperature range and optimised oil release</li> </ul>
BARRIERTA KM 192	PFPE/PTFE grease NLGI grade 2	<ul style="list-style-type: none"> <li>– Higher component availability over wide service temperature ranges where there is contact with aggressive chemicals due to long grease life</li> <li>– Improved component performance                             <ul style="list-style-type: none"> <li>– due to low start-up torques even at low temperatures</li> <li>– due to good speed compatibility</li> <li>– as friction coefficients are largely unaffected by temperature</li> </ul> </li> </ul>

## Mechanical shaft seals

Product	Base oil	Kinematic viscosity DIN 51562-1 at 40 °C, [mm <sup>2</sup> /s] approx.	Notes and benefits
Klüberfluid NH1 4-005	Synthetic hydrocarbon oil	5	<ul style="list-style-type: none"> <li>– Higher process reliability as product has been tested and is recommended by Eagle Burgmann, the industrial sealing technology expert</li> </ul>
PARALIQ P 12	White oil	20.5	
Klüberöl 4 UH1-15 AF	Synthetic hydrocarbon oil	18	
Klüber Summit DSL 32	Ester oil	32	
Klüber Summit PGS 10 A	Polyglycol oil	8	

## Gears

Product	Base oil	Kinematic viscosity DIN 51562-1 at 40 °C, [mm <sup>2</sup> /s] approx.	Notes and benefits
Klübersynth GEM 4-100 N GEM 4-150 N GEM 4-220 N GEM 4-320 N GEM 4-460 N GEM 4-680 N GEM 4-1000 N	Synthetic hydrocarbon oil	150 220 320 460 680 1000	<ul style="list-style-type: none"> <li>– Synthetic high-performance gear oils</li> <li>– Strong protection of gear teeth and rolling bearings</li> <li>– Energy savings due to optimised friction behaviour</li> <li>– Very good corrosion protection</li> <li>– Extended oil change intervals</li> <li>– Combined with our KlüberEnergy service, the gear oil series Klübersynth GEM 4 enables significant savings relating to energy costs in your gearbox application</li> </ul>





## Desulphurisation systems

Sulphur removed from crude oil is solidified into pastilles by means of a Rotoform system. The rolling bearings used in this system require a high-temperature grease that is resistant to sulphuric components.

Product	Product characteristics	Notes and benefits
BARRIERTA L 55/2	PFPE/PTFE grease NLGI grade 2	<ul style="list-style-type: none"> <li>– Higher plant availability and less maintenance</li> <li>– at very high operating temperatures up to 260 °C</li> <li>– when exposed to aggressive chemicals and vapours</li> </ul>

## Products for maintenance

Product	Product characteristics	Notes and benefits
Klüberbio Z 2-5	Fully synthetic, highly liquid rust remover with strong penetrating effect	<ul style="list-style-type: none"> <li>– Eco-friendly due to biodegradability</li> <li>– Easy handling as product is supplied ready for use and easy to spray</li> <li>– Reduces need for cleaning, as product is fully synthetic and shows no tendency to gumming</li> <li>– Less maintenance required as product combines cleaning, lubricating and anticorrosive effects</li> </ul>

## Oil Condition Analysis

Product	Product characteristics	Notes and benefits
KlüberMonitor – Oil Condition Analysis	Lab analysis to determine the condition of a used lubricating oil	<ul style="list-style-type: none"> <li>– Oil Condition Analysis provides information on the current condition of an oil</li> <li>– Reliable: if performed regularly, the analysis reduces the risk of expensive components or systems breaking down</li> <li>– Highly effective: useful lubricant life is maximised</li> <li>– Convenient use: set supplied for sampling and shipment; standardised, easy-to-read and comprehensible report with recommendations</li> <li>– Detailed product expertise available at Klüber Lubrication: professional interpretation of results</li> </ul>

# The right lubricant at the right place at the right time

## Systems for automatic lubrication

We at Klüber Lubrication understand ourselves as a solution provider. We not only supply high-performance oils and greases, but also “intelligent packages” for automatic lubrication of your machines and components. Selected lubricants covering a wide range of typical applications are available in automatic lubricant dispensers for single-point lubrication. These tried-and-tested systems based on electromechanical or electrochemical

technology are available with standard, long-term or high-pressure greases, standard or high-temperature chain oils and special oils and greases for the food-processing industry. We are also able to supply other lubricants in automatic dispensers on request and for higher order volumes, provided they have been tested and approved for use – please contact your Klüber Lubrication consultant for details.

## Your benefits at a glance

### Profitability

Continuous production processes and predictable maintenance intervals reduce production losses to a minimum. Consistently high lubricant quality ensures continuous, maintenance-free long-term lubrication for high plant availability. Continuous supply of fresh lubricant to the lubrication points keeps friction low and reduces energy costs.

→ **Lubrication with Klübermatic can reduce costs by up to 25 %**

### Safety

Longer lubrication intervals reduce the frequency of maintenance work and the need for your staff to work in danger zones. Lubrication systems from Klüber Lubrication can therefore considerably reduce occupational safety risks in work areas that are difficult to access. **Klübermatic FLEX and NOVA carry Ex certificates.** For details, please ask your contact at Klüber Lubrication.

→ **Lubrication with Klübermatic can decrease the risk of accidents by up to 90 %**

### Reliability





Automatic lubrication systems from Klüber Lubrication ensure reliable, clean and precise lubrication around the clock. Plant availability is ensured by continuous relubrication of the application.

→ **Lubrication with Klübermatic may help to prevent up to 55 % of rolling bearing failures**

### From low-cost to high-tech – automatic systems for all requirements

Klüber Lubrication offers you the following technological solutions:

- freely adjustable lubrication increments between 1 and 12 months
- range of speciality lubricants
- self-contained or machine-controlled lubrication systems (time control with programmable controller)
- combination of tried-and-tested Klüber Lubrication lubricants with proven automatic lubricant dispensers

Klübermatic FLEX	Klübermatic NOVA	Klübermatic STAR VARIO	Klübermatic STAR CONTROL
			
Flexible use – and for lubrication points with high requirements	For applications subject to wide temperature fluctuations	Precise and adjustable lubricant metering	Externally controlled single-point relubrication



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## Klüber Lubrication – your global specialist

Innovative tribological solutions are our passion. Through personal contact and consultation, we help our customers to be successful worldwide, in all industries and markets. With our ambitious technical concepts and experienced, competent staff we have been fulfilling increasingly demanding requirements by manufacturing efficient high-performance lubricants for more than 85 years.