

your global specialist

Optimum lubrication for a long service life.

Speciality lubricants for chains





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Reduce wear on your chains

Your chains have to function reliably even under considerable strain. You also expect them to last a long time with only a minimum of downtime. Selecting the right lubricant is therefore paramount – for the initial lubrication by the chain manufacturer as well as for relubrication during operation. Lubricant represents only a minor investment, but its effects can be tremendous. The right lubricant helps protect your chains effectively against premature wear and attain a longer chain life.

Chains serve a wide range of uses, e.g. as transport, drive, control or lifting chains. Depending on the intended use, they come in different designs, e.g. as roller, bush, pin or inverted toothed chains. The roller chain is the most common chain design due to its versatility.

The chain as a tribo-system: specific requirements

The motion of a chain follows a specific pattern (see roller chain links in illustration below) that poses a particular challenge for lubricants:

- Oscillating friction bodies mean permanent mixed friction.
- Linear contact between pins, bushes and rollers leads to high specific surface pressures.
- Shock loads arise due to engaging sprocket teeth or the polygon effect.
- Friction points are hard to access.

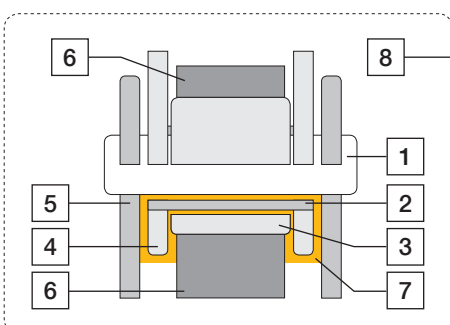
Linear contact leads to high surface pressures



Bushes, pins and rollers have linear contact (see arrows).

As pins, bushes and rollers are cylindrically shaped, contact between them is linear, which causes very high surface pressures. Pins and bushes are under particular strain as they always touch at the same points. Rollers on the other hand constantly change position.

Design and friction bodies of a roller chain



- 1 Chain pin
- 2 Bush
- 3 Roller
- 4 Inner link plate
- 5 Outer link plate
- 6 Sprocket tooth
- 7 Intermediate substance
- 8 Ambient medium

Friction bodies in the chain:

- Pin 1 – bush 2
- Bush 2 – roller 3
- Roller 3 – inner link plate 4
- Inner link plate 4 – outer link plate 5
- Roller 3 – sprocket tooth 6
- Sprocket tooth 6 – inner link plate 4

Protect your chains ...

Chain life depends on lubrication condition

The main symptom of wear is material erosion from the pins and bushes connecting the chain links. This causes chains to become longer over the course of their service life. Alongside friction and the lubrication condition in the chain links, parameters determining the speed at which roller chains suffer wear include the amount of surface pressure between pin and bush, chain speed, wear resistance of pin and bush materials, and the geometry of the chain drive (pitch, number of sprocket teeth, transmission ratio, centre distance).

The oscillating motion in combination with the rather low relative speed of the friction bodies prevents the formation of a separating lubricant film.

Therefore, mixed friction occurs between the friction bodies. Wear is higher under mixed friction than under hydrodynamic friction, but can still be controlled. This is known as "permissible wear".

What does a good lubricant do?

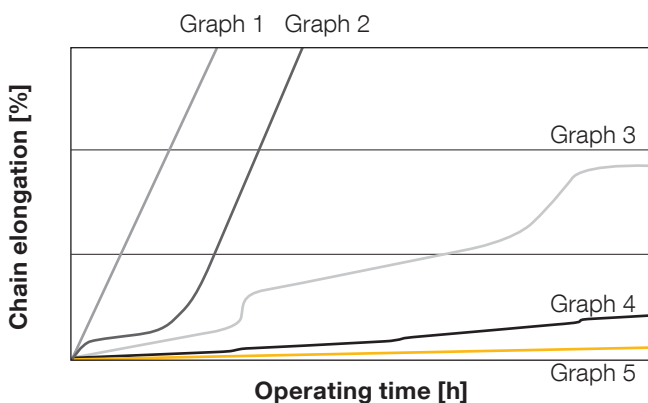
In view of these challenges, lubricants for chains must have a high pressure absorption capacity and especially effective antiwear characteristics so wear can be kept to a permissible minimum despite the prevailing mixed friction conditions. Depending on their specific application, chain lubricants are expected to provide:

- Corrosion protection
- Good wetting and spreading characteristics
- High adhesiveness
- High thermal resistance
- Ability to dissolve used lubricant
- Low carbonisation tendency
- Usability at low temperatures
- Media resistance

Additional selection criteria may include:

- Food-grade requirements (H1, ISO 21469)
- Eco-compatibility (rapidly biodegradable)
- Noise damping

Chain elongation as a function of lubrication and service duration



- Graph 1: Chain running dry (no initial or relubrication)
- Graph 2: Initial lubrication by chain manufacturer, no relubrication. Wear is prevented until the (initial) lubricant is used up; then the chain runs dry.
- Graph 3: Temporary dry-running; delayed relubrication leads to stepped graph.
- Graph 4: Insufficient lubrication, e.g. due to inappropriate/low-quality lubricant or insufficient quantities of lubricant.
- Graph 5: Optimal lubrication; low wear-induced chain elongation.

... by using the right lubricant

Important: proper application

Friction points in chains are hard to access. For the lubricant to be effective, it has to penetrate into the chain link. It is therefore advisable to apply the lubricant directly into the gap between the inner and outer link plates.

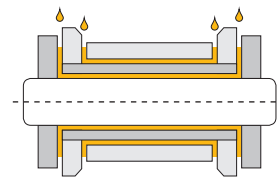
How the lubricant is applied is also crucial: the aim is to deliver the correct amount of lubricant to the friction points to ensure that they are continuously supplied with lubricant but not overlubricated. Notes on selecting an application technique for roller chains can be found in the DIN ISO 10823 standard.

Monitoring the lubricating condition

The following methods have proven useful for monitoring the lubrication condition in steel chains:

- **Direct inspection of the chain pins:** This involves stopping your machinery and disassembling the chain. Sufficient lubricant supply is indicated by an oil film that fully coats the chain pins and shows no discolouration. The loaded side of the bolt should be completely smooth and no tempering colour should be visible on link components. Both the chain links and the rollers should move without effort. Note: tempering colour is the result of excessive temperatures in the chain link, while oil discolouration is caused by abrasion and cracking.
- **Indirect inspection by monitoring the power consumption of the drive motor:**
This method makes sense only in continuous processes with constant driving power. Its advantage is that it can be performed during operation. Lubricant starvation allows friction to increase and consequently leads to power loss. The motor then has to compensate for this loss by consuming more power.
- **Indirect inspection by monitoring the noise generated by the chain:**
Properly lubricated chains with low wear produce fairly little noise. This damping effect depends on a sufficient amount of lubricant.

Lubrication of the chain link



The lubricant must be able to penetrate into the chain link. This means it should be applied directly into the gap between the inner and outer link plate.

Developed especially for chains

Klüber Lubrication has been developing and producing special chain lubricants for many years. We use our own chain test rigs to test parameters such as antiwear effect, lubricant lifetime and the lubricant's usability at high temperature under realistic operating conditions.

Our product range covers almost all applications and requirements. You will find several examples in the product overview below. We are happy to advise you on how to find the right lubricant for your application and optimise lubrication of your chains. Our experts are available around the world. As a partner to chain manufacturers we will support you in developing new products right from the start. That's why our lubricants are the first choice for many chain OEMs and operators.

Your benefits at a glance:

- Optimum chain lifetime with the right speciality lubricant
- Higher efficiency due to lower friction
- Increased machine uptime due to reduced maintenance
- Cost savings due to reduced lubricant consumption

Selected speciality lubricants for chains

Industry	Upper service temperature, approx.	Selection criteria	Speciality lubricant from Klüber Lubrication
Food-processing and pharmaceutical industries	650 °C	High-temperature chain oil with white solid lubricants, NSF H1-registered and ISO 21460-certified. ¹⁾ For applications at temperatures from 250 °C (e.g. plate carrier chains in baking ovens).	Klüberfood NH1 CH 6-120 SUPREME
	250 °C	High-temperature chain oil, NSF H1-registered and ISO 21469-certified. ¹⁾	Klüberfood NH1 CH 2-220 Plus
		Special high-temperature chain oil for conveyor chains in the baking industry. NSF H1 registration and ISO 21469 certification. ¹⁾	Klüberfood NH1 CH2-460
	120 °C	Semi-synthetic chain oil for very wet areas in the food-processing industry, NSF H1 registration and ISO 21460 certification. ¹⁾	Klüberfood NH1 C8-80
		NSF H1 registration and ISO 21469 certification. For normal temperatures. ¹⁾	Klüberoil 4 UH1-32, 46, 68, 100, 150, 220, 320, 460 N
Other industries	1,000 °C	Solid lubricant suspension, e.g. for chain in burning, annealing or melting furnaces For applications from a service temperature of 250 °C. Note: from approx. 200 °C dry lubrication.	WOLFRAKOTE TOP FLUID
	500 °C	High-temperature chain oil containing solid matters. Also for plate carrier chains in baking ovens. For applications from a service temperature of 250 °C. Note: from approx. 200 °C dry lubrication.	Klüberoil YF 100
		Aqueous graphite suspension for chains subject to high thermal stress, free from solvents, low nuisance through smoke or odour.	Klüberplus S01-004
	250 °C	Conveyor systems with drying oven (e.g. powder coating). Conveyor chains in hardening furnaces (e.g. mineral wool and plasterboard production).	Klübersynth CHM 2 series, Klübersynth CH 2-100 N or other viscosities of the Klübersynth CH 2 series
		High-temperature oil used in car body painting.	Klübersynth CHX 2-220
		For continuous fibreboard presses. Mainly for conveyor belt lubrication.	HOTEMP SUPER N PLUS
		Lubrication of chains and bolts (ContiRoll presses).	HOTEMP SUPER CH 2-100
		Cleaning oil for chains/pins of continuous fibreboard presses.	Klübertherm CH 2-140
		Especially for fabric conveyor chain in textile finishing machines.	Klübersynth CTH 2-260
		For conveyor chains in biaxial film stretchers, especially for high and very high chain speeds and stretching temperatures. Approved by Messrs. Brückner Maschinenbau, Lindauer-Dornier, Andritz-Biax and ESOPP.	Klübersynth CH 2-280, Klübersynth CFH 2-400, Klübersynth CHZ 2-225, PRIMIUM SUPER M93
		Special oil for lubricating and cleaning chain systems of film stretchers in one work step.	Klübersynth CZ 2-85
	120 °C	Chain lubricant based on mineral oil, also for conveyor chains operating in wet areas.	STRUCTOVIS HD series; especially STRUCTOVIS FHD and STRUCTOVIS EHD
		Lubricating wax for chains, quasi-dry lubricating film up to 70 - 80 °C, especially for initial lubrication by the chain manufacturer.	Klüberplus SK 11-299
	100 °C	Biodegradable chain oils.	Klüberbio EG 2 series
	80 °C	Biodegradable chain oil especially for outdoor escalators.	Klüberbio C 2-46

¹⁾This lubricant is NSF H1-registered and therefore complies with FDA 21 CFR § 178.3570. The lubricant was developed for incidental contact with products and packaging materials in the food-processing, cosmetics, pharmaceutical or animal feed industries. The use of this lubricant can contribute to increase reliability of your production processes. Nevertheless it is recommended to conduct an additional risk analysis, e.g. HACCP.



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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.