润滑选择
Selection of lubrication

■ 链条传动的润滑取决于使用场合、温度、链条线速度等。

1.使用场合影响

开式传动如各类联合收割机、割晒机等链条应采用油脂润滑。

闭式传动如手扶拖拉机链条传动箱，应采用机油润滑。

2.温度影响

一般推荐在-5℃~+60℃范围内使用润滑。

冬季采用粘度小的机油，夏季采用粘度大的机油。

3.线速度影响

润滑方式直接与链条线速度有关，可参照下图选择润滑方式。

■ Lubrication of chain depends on the working environment, temperature, chain speed and so on.

1. Influence of working environment

For open drive such as combine chain, swather chain etc., grease lubrication is recommended.

For closed drive such as walking tractor chain transmission case etc., oil lubrication is recommended.

2. Influence of temperature

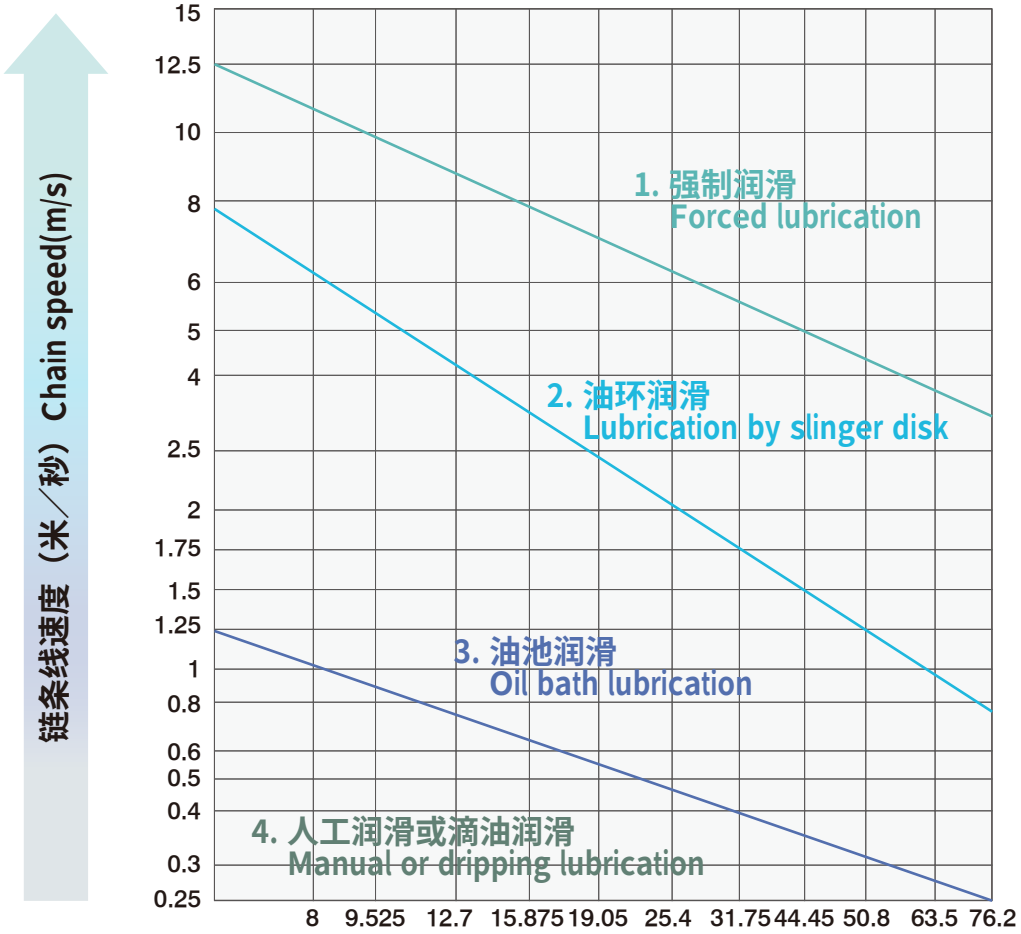
Application in the temperature range of -5℃ to +60℃ is recommended.

In winter, lower viscosity oil is recommended; But in summer, higher viscosity oil is recommended.

3. Influence of chain speed

The lubrication method is related to chain speed.

Refer to the following chart for details, please.



润滑选择
Selection of lubrication

■ 链传动的润滑

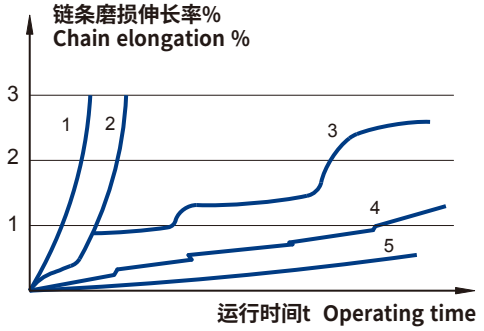
运行在链轮上的链条由于销轴处铰链的相对回转而产生磨损。因此有效的润滑就显得至关重要，其不仅可以有效降低磨损且能降低功率损耗和噪音。

■ Lubrication

Wear is mainly caused by bearing pressure, angle-sliding movements of the pins and rotation of the rollers etc.. Effective lubrication of the chain hinges is utmost important for reducing wear, power loss and noise etc. effectively.

曲线1：
干摩擦；链条由于干摩擦引起严重磨损而致使其短时间内迅速磨损失效
曲线2：
仅有初始润滑；链条因仅有初始润滑，故其磨损在润滑剂用完迅速增加
曲线3：
人工润滑；链条因人工润滑而频繁产生间歇性干摩擦，特别是在人工润滑不能符合润滑周期要求时
曲线4：
不恰当的润滑；链条被使用了不恰当的润滑，比如劣等、脏的、不合适的粘度或不足的润滑剂，而引起的链条不均匀摩擦
曲线5：
正确的润滑；可以看出其对链条使用寿命的至关重要性

Curve 1:
Without lubrication. Chain would be worn out and destroyed within a very short time.
Curve 2:
Optimum initial lubrication only. High wear would occur within a short time after the lubricant has been used up.
Curve 3:
Manual lubrication. Intermittent dry rub frequently occurs, especially when regular periodical relubrication is not well implemented.
Curve 4:
Incorrect lubrication. Uneven chain wear results from incorrect lubrication.
Curve 5:
Correct lubrication. The right lubrication is the utmost important to obtain a optimum service life.



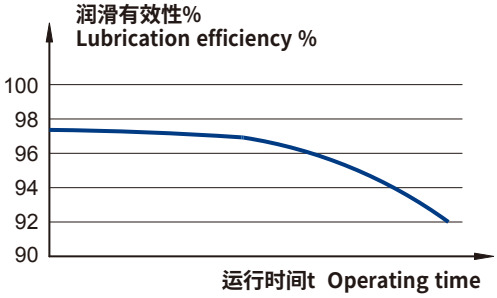
■ 润滑和有效性

当摩擦副表面变色时表明润滑已失效，在此之前应进行再次润滑。

具体的润滑失效间隔时间应依据特定的工况和运行条件进行试验测定。

■ Lubrication and efficiency

Relubrication shall be done before discoloration of the rub surface which indicates the lubrication failure of the former lubrication.The specific lubrication intervals shall be determined by tests based on specific conditions and running conditions.



右图显示了润滑有效性随运行时间的变化

The right graph shows the efficiency of lubrication decrease with operating time.

润滑选择
Selection of lubrication

■ 润滑剂

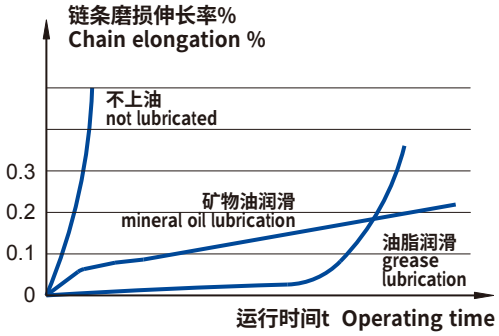
润滑剂的选择首先取决于润滑方式。

如右图所示，低粘度的矿物油特别适合链传动

■ Lubricant

First of all, the selection of an appropriate lubricant depends on the type of lubrication.

Just as the right diagram shows, low viscosity mineral oils are particularly suitable for chain drives.



■ 推荐的不同工作温度下的润滑剂应具备的粘度 Recommended viscosity

环境温度 Ambient temperature ℃	润滑剂粘度 Viscosity of lubricant
-5℃～+25℃	N100 (ISO VG 100)
+25℃～+45℃	N150 (ISO VG 150)
+45℃～+60℃	N220 (ISO VG 220)

若使用温度更高（如炉箱链）或使用环境很恶劣、泥浆四溅等开式或重载低速链传动时，二硫化物（MoS_2，WS_2）或硒化物（$MoSe_2$，WSe_2）无论是用作添加剂还是直接喷润都能提高润滑性能。

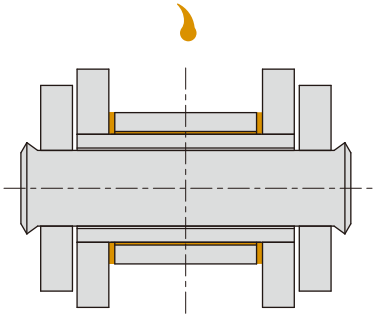
低粘度或滴点在70℃左右的润滑脂同样适用于人工润滑。在某些特殊的场合使用液化的润滑脂进行喷润。不稳定的物质挥发完后即可开始工作。

无论采用何种润滑剂和润滑方式，最重要的问题是使润滑剂能及时充分均匀的分布到构成摩擦副的链节铰链处的间隙中（销轴–套筒之间，套筒–滚子之间）。

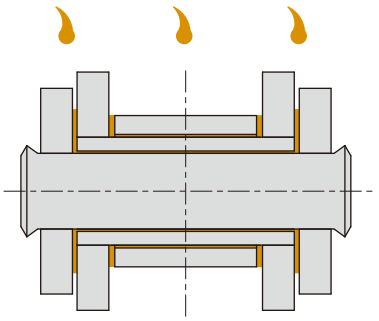
For higher temperatures (e.g. furnace chains) or severe operating conditions, mud spattering open-type etc. or heavy-duty low speed chains, graphite or molybdenum disulfide (MoS_2) applied either as additive or spray will improve lubrication performance.

Low-viscosity or the grease products with a drop point of 70°C are also suitable for manual lubrication. Liquidized grease may be sprayed on the chains in special conditions and chains can start running immediately after the evaporation of the volatile carrier substance.

No matter which kind of lubricants and lubrication methods choosed, the most important issue is to ensure the lubricant flow into evenly (between pin and bush, between bush and roller).



a) 错误的给油方式
Incorrect method



b) 正确的给油方式
Correct method

润滑选择
Selection of lubrication

■ 润滑方式选择

常见的润滑方式大约有以下5种：

1.人工润滑

用刷子或油壶定期在链条松边内外链板间隙处加油。这种方式可靠性不高，因此仅适用于非经常工作的链条或低速二级传动中。至少应每天充分润滑一次（若条件允许，应每隔8小时注油一次），应尽可能避免产生润滑剂的变色现象。

2. 滴油润滑

用油芯加油器，针阀式注油杯或滴油油杯加油，这种方式仅适用于低轴压比的传动，应尽可能避免产生润滑剂的变色现象。

3. 油池润滑（亦称油浴润滑）

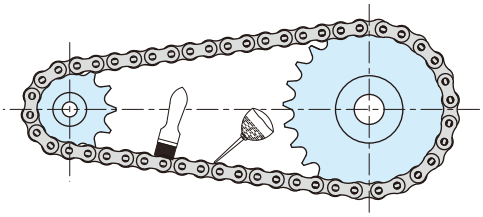
在一个大小合适的链箱中（使用过的已磨损伸长的链条不应能撞击到箱边）拥有足够的润滑油以使链板边至滚子或套筒处能浸入，但浸入不宜过浅或过深。浸入过浅则润滑不可靠；浸入过深则油易发热氧化变质且搅油损失大。

■ Selection of lubrication method

Normally, there are five lubrication methods as below:

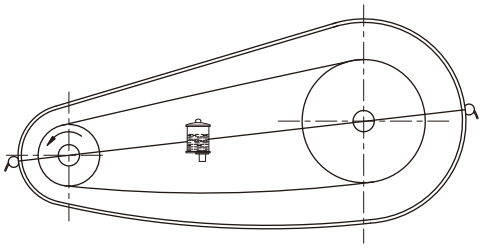
1. Manual lubrication

This type of lubrication by means of oil can and brush, which adding lubricant into the gap between outer and inner link plate of chain loose side periodically is not very safe and therefore this type lubrication only suitable for those chains with occasional operation or for those secondary drives and low chain speeds. Sufficient lubrication should take place at least once a day (if possible once every 8 running hours). Lubricant colouration should be avoided as far as possible.



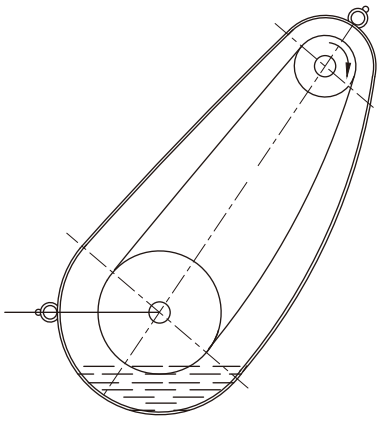
2. Drip lubrication

Drip lubrication by means of wick oilers, needle oilers or drip oilers is only suitable for low bearing pressure drives. Lubricant colouration should be avoided as far as possible.



3. Oil bath lubrication (submerged lubrication)

There is just enough oil in a proper chain box for preventing the worn and elongated chain knocking against the casing wall to allow the chain plates to submerge into the bath up to the rollers or the bushings respectively. But immersion should not be too deep or too shallow .Too shallow immersion lubrication is not reliable. Too deep immersion may cause the oil to heat up and lead to untimely oxidation of the oil.



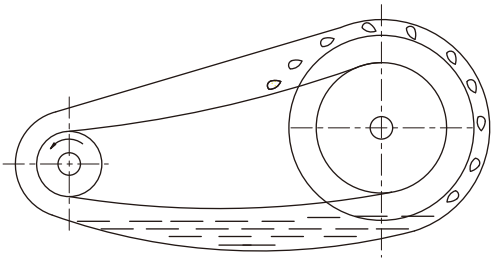
润滑选择
Selection of lubrication

4. 油环润滑（亦称飞溅润滑）

链条运行在油面上方。一个能浸入到油中约12.7mm～25.4mm的甩油盘利用离心力将油飞溅起来并利用箱体上的集油装置持续不断的导流到链条上。甩油盘的圆周速度应大于3m/s，一般不超过12.5m/s,最大不应超过40m/s。当链条宽度超过127mm时，应在链轮两侧都装甩油盘。

4. Oil-ring lubrication (splash lubrication)

With this type of lubrication, the chain operates above oil level. A disk submerging into the lower oil level, the depth is about 12.7mm-25.4mm, Peripheral velocity between min. 3m/s and max. 40m/s, normally not bigger than 12.5m/s, centrifuges oil against the casing walls from where it continuously runs down onto the chain via drip rails. The disk should be mounted on both sides of sprocket when the chain width above 127mm.



5. 强制润滑（亦称压力润滑）

此润滑方式适用于高速重载型传动。通过油泵和注油管强制供油润滑并起到循环冷却链条的效果。喷油嘴应布置在链条与链轮的啮入处且数目应比链条排数多一个以使其对准每列链板的间隙处。

5. Force feed lubrication (pressure lubrication)

This type of lubrication is suitable for high-speed and heavy-duty type drives. Force feed lubrication is carried out to realize the circulating cooling of chains by means of oil pump and oil feeding pipe .The spray nozzles should be situated near the gearing places of chain and sprocket, and the nozzle number should be one more than the chain strands number to make them aim at the gap of each row link plate.