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## Proper and Timely Maintenance

A roller chain drive requires proper and timely maintenance to deliver satisfactory performance and service life. It is assumed that the shafts, bearings, and supports; the chain and sprockets; and the lubrication type have been properly selected and installed.

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## Maintenance Program

A maintenance program must be established to make sure that:

1. The drive is correctly lubricated.
2. Drive interferences are eliminated.
3. Damaged chains or sprockets are replaced.
4. Worn chains or sprockets are replaced.
5. The sprockets are properly aligned.
6. The chain is correctly tensioned.
7. Guarding is in good condition and is properly installed.

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## Inspection Intervals

A roller chain drive should be inspected after the first 50 hours of operation. After that, drives subject to heavy shock loads or severe operating conditions should be inspected after each 200 hours of operation, while more ordinary drives may be inspected after each 500 hours of operation. Experience may indicate a longer or shorter interval between inspections.

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## Drive Interferences

Inspect for any evidence of interference between the drive components and other parts of the equipment. If any is found, correct it immediately. Rubbing between the chain or sprockets and other parts of the machine can cause abnormal wear and damage. Impact between the chain link plates and a rigid object can cause link plate fatigue and chain failure.

Also inspect for and eliminate any buildup of debris or foreign material between the chain and sprockets. A relatively small amount of debris in the sprocket roller seat can cause tensile loads great enough to break the chain if forced through the drive.

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## Damaged Chain or Sprockets

Inspect the chain for cracked, broken, deformed, or corroded parts; and for tight joints or turned pins. If any are found, find and correct the cause of the damage, and **replace the entire chain**. Even though the rest of the chain appears to be in good condition, it very probably has been damaged and more failures are likely to occur in a short time.

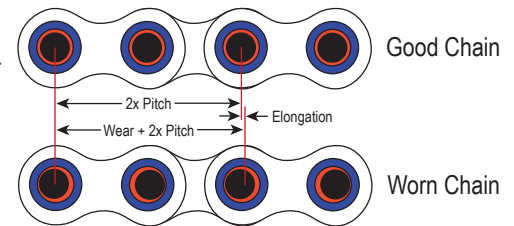
Inspect sprockets for chipped, broken, or deformed teeth. If any are found, find and correct the cause of the damage and **replace the sprocket**. Sprockets normally are stronger and less sensitive to damage than chain, but running a worn chain on new sprockets can ruin the sprockets in a short period of time. A worn chain rides very high on the sprocket teeth and wears the sprocket teeth in an abnormal pattern.

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## Chain Wear

In most roller chain drives, the chain is considered worn out when it has reached 3% wear elongation. With 3% wear, the chain does not engage the sprocket properly and can cause sprocket damage or chain breakage. On drives with large sprockets (more than 66 teeth), allowable wear is limited to  $200/N$  ( $N$  = number of teeth on largest sprocket) and may be substantially less than 3%. On fixed-center, non-adjustable drives, allowable wear elongation is limited to about one-half of one chain pitch.

Measure a representative section of chain. If wear elongation exceeds 3% of the functional limit, replace the entire chain. Do not connect a new section of chain to a worn section because it may run rough and damage the drive.



## Sprocket Wear

A worn out sprocket is not nearly as well defined as a worn out chain. However, there are some sprocket characteristics that indicate when a sprocket should be replaced. Check for roughness or binding when a new chain engages or disengages the sprocket. Inspect for reduced tooth thickness and hooked tooth tips. If any of these conditions are present, the sprocket teeth are excessively worn and the sprocket should be replaced.

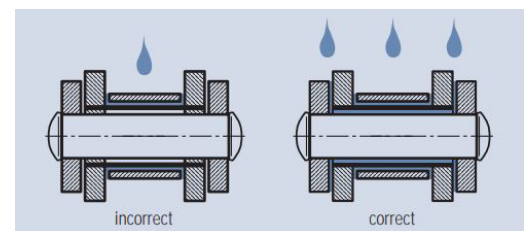
Do not run new chain on worn out sprockets because it can cause the chain to wear rapidly. The pitch of the new chain is much shorter than the effective pitch of the worn sprocket, so the total chain load is concentrated on the final sprocket tooth before disengagement. Then, when the chain disengages from the sprocket, the roller is jerked out of the hooked portion of the sprocket tooth and that results in a shock load on the chain as the load is transferred from one tooth to the next.

## Lubrication

Each joint in a roller chain is a journal bearing. It is essential that the bearing receives an adequate amount of the proper lubrication to achieve maximum wear life. Most roller chain drives must be periodically or continuously re-oiled to obtain full potential service life. In addition to resisting wear between the pins and bushings, an adequate flow of oil smooths the engagement of the chain rollers with the sprocket, cushions the roller to sprocket impacts, dissipates heat, flushes away wear debris and foreign materials, and retards rust.

Applying oil to the pin and bushing surfaces that articulate under load is most important, but some oil between the roller and bushing is also necessary. To reach all of these surfaces, the lubricant should be applied to the upper edges of the link plates on the lower strand of the chain

shortly before the chain engages a sprocket. Then, as the chain travels around the sprocket, the lubricant is carried by centrifugal force into the clearances between the pins and the bushings. Spillage over the link plates supplies lubricant to the interior and the end surfaces of the rollers.





## Lubricant Characteristics

1. Sufficiently low viscosity to penetrate into the critical internal surfaces.
2. Sufficiently high viscosity to maintain the lubricating film under the prevailing bearing pressures.
3. Clean and free of corrodents.
4. Capability to maintain lubricating qualities under the prevailing operating conditions.

These requirements usually are met by a good grade of non-detergent, petroleum-based oil. Detergents normally are not necessary, but anti-foam, anti-rust, and film strength improving additives often are beneficial.

- Avoid low-grade or impure oils. Low-grade oils can not provide effective lubrication. The acids or abrasive particles in the oil can damage the chain beyond repair.
- Avoid heavy oils or greases. These are too thick to penetrate into the internal surfaces of the chain.

## Recommended Grade Oil

| Recommended Grade | Temperature Range             |
|-------------------|-------------------------------|
| SAE 5             | -50°F to 50°F (-46°C to 10°C) |
| SAE 10            | -20°F to 80°F (-29°C to 27°C) |
| SAE 20            | 10°F to 110°F (-12°C to 43°C) |
| SAE 30            | 20°F to 130°F (-7°C to 54°C)  |
| SAE 40            | 30°F to 140°F (-1°C to 60°C)  |
| SAE 50            | 40°F to 150°F (4°C to 66°C)   |

### NOTE

*When the temperature range permits a choice, the heavier grade should be used.*

## Types of Lubrication

ANSI Standards B29.1 list three types of lubrication for roller chain drives.

- Type A Manual or drip lubrication
- Type B Oil bath or slinger disc lubrication
- Type C Oil stream or pressure spray lubrication

ANSI Standards B29.3 list three types of lubrication for roller chain drives.

- Type I Manual, slow drip (4 to 10 drops per minute), or shallow bath lubrication
- Type II Rapid drip (20 or more drops per minute), oil bath, or slinger disc lubrication
- Type III Continuous lubrication with slinger disc or circulating pump

The recommended type of lubrication shown in the horsepower tables in the respective standards. Type A and Type I are the minimum requirements. Chain speed and the amount of horsepower being transmitted influence the recommended type of lubrication. Lubrication has a significant effect on chain wear life. It is vital to follow the lubrication recommendations found in the horsepower rating tables. Consult a chain manufacturer if a lubrication type other than that recommended by the ANSI Standards is being considered.



## Manual Lubrication

**NOTE** *Manual lubrication is to be done only when the drive is stopped and power to the drive is disconnected per LOTO procedures.*

For manual lubrication, oil is applied periodically with a brush or a spout can. Be sure that the lubrication schedule is being followed and the correct grade of oil is being used. If the chain is dirty, clean it with kerosene or a nonflammable solvent and re-lubricate it. The volume and frequency of oil application must be sufficient to prevent a red-brown (rust) discoloration of the oil in the joints. The red-brown discoloration indicates that the oil in the joints is inadequate. When the rust discoloration is found, remove, clean, re-lubricate, and re-install the chain before continuing operation.

## Drip Lubrication

For drip lubrication, oil is dripped between the link plate edges using a drip lubricator. Review the flow rate and be sure that the oil is being directed into the chain correctly. Care must be taken to prevent windage from misdirecting the oil drops. Drip rates range from four to 20 or more drops per minute, depending on the chain speed. The drip rate of oil application must be sufficient to prevent a reddish brown (rust) discoloration of the oil in the joints. The reddish brown discoloration indicates that the oil in the joints is inadequate. When the rust discoloration is found, remove, clean, re-lubricate, and re-install the chain before continuing operation. Make sure the oil level in the reservoir is adequate. Review the oil level after eight hours of operation and refill the reservoir when needed.

## Brush Lubrication

In brush lubrication, oil is continuously brushed on the lower span of the chain from the inside of the loop. The amount of oil and the frequency of its application must be adequate to prevent the formation of a reddish brown discoloration in the chain joints.

## Oil Bath, Slinger Disc, or Oil Stream

In oil bath lubrication, a short section of the chain runs through the oil in the bottom of the chain casing. The oil level should extend only to the pitch-line of the chain at its lowest operation point. Having long sections of chain run through the oil bath can cause oil foaming and overheating. For oil bath, slinger disc, or oil stream lubrication, be sure that all orifices are clear and that the oil is being directed onto the chain correctly. Change the oil after the first 50 hours of operation and after each 500 hours thereafter (200 hours in severe service).