

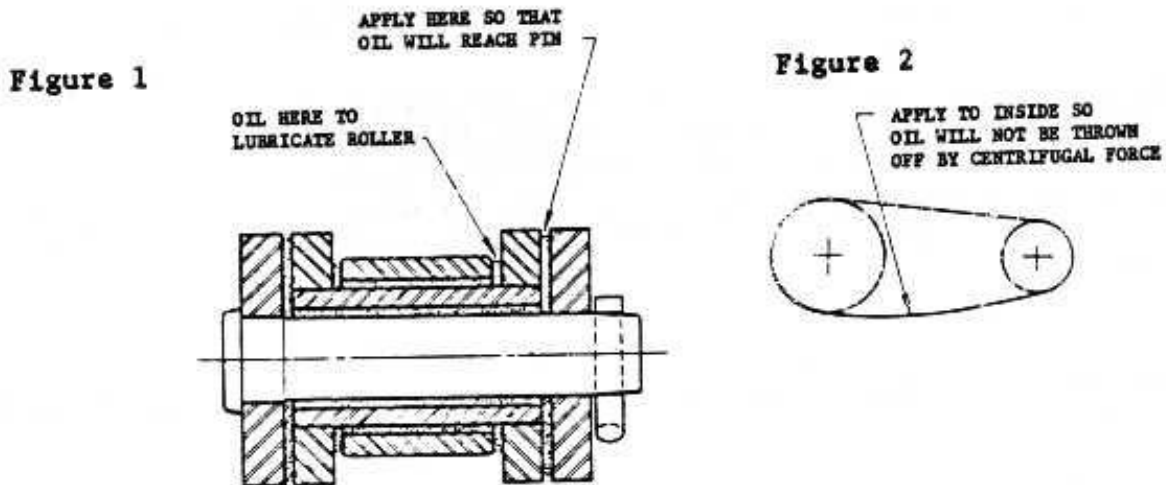


## CHAIN - PART 4: Lubrication and Maintenance PA NOTE

### LUBRICATION

Proper lubrication of chain drives is as important for proper drive life and performance as tension is in a belt drive. When selecting chain for an application, the method of lubrication is as important as all other drive design factors. Chain manufacturers estimate that 90-95% of all chain drives are improperly lubricated.

The primary objective of chain lubrication is to lubricate the pin and bushing bearing surfaces to prevent wear and help cushion shock loads. The lubricant should be applied on the pin/roller and roller/bushing interfaces, and where any relative movement of the chain components exists. Proper lubrication prevents wear by helping protect the chain and sprocket surfaces, and reduces damage from shock loads. The chain industry estimates that chain drives running unlubricated wear approximately 300 times faster than similar lubricated drives. Although not specifically qualified by the chain manufacturers, practical experience by some users will claim better life with unlubricated chain in dirty environments. The oil attracts dirt, yielding even quicker wear than unlubricated chain. Chain should be lubricated on its inside so that the lubricant will not be thrown off.

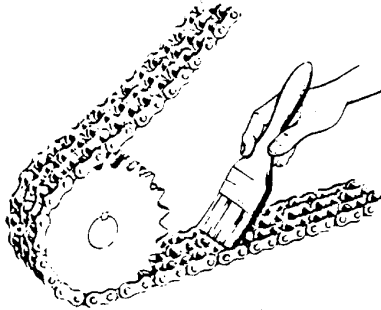


There are three methods of lubrication.

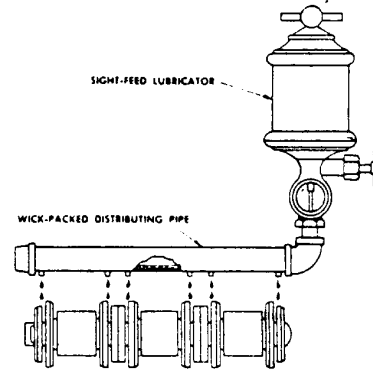
1. Type I - Drip or manual lubrication
2. Type II - Bath
3. Type II - Steam



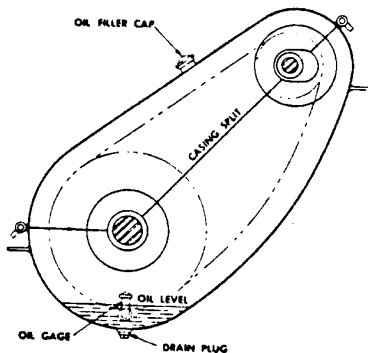
Figure 3



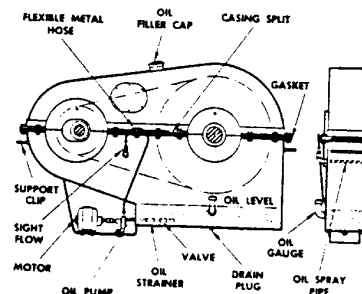
Type I - Manual



Type I - Drip



Type II - Bath



Type III - Stream

Types II and III both require some form of housing which generally costs more than the drive itself. Here again, a Poly Chain® belt drive may show significant cost savings as it requires no housing for lubrication.

Lubed for life (LL) chain uses a roller on an Oilite bushing (oil impregnated, permanently lubricated bushing) to eliminate lubrication maintenance. While maintenance is required, the life is also reduced to approximately one-half that of properly lubricated chain. Lubed for life chain has a 200 degree F. maximum operating temperature, since at higher temperatures the oil will be "cooked" out of the bushing.

## MAINTENANCE

Proper lubrication, alignment, and tension maintenance is essential for optimum chain performance.

Since most chain has minimal side-to-side flexibility, proper alignment of the sprockets is very important. Misalignment will lead to wear on the inside of the link plates and corresponding wear on the side of the sprocket teeth. The load will not be carried equally by the side plates since the load is unevenly distributed. If misalignment is severe enough, shock loading can result due to the roller link plate binding against the pin link plate.

Tension must be maintained in the chain to prevent shock loads. An under-tensioned chain will ride out on the sprocket, and as the chain elongates, it can slip a tooth causing extremely high loads in the drive. Over tensioning



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will lead to excessive bearing loads and rapid chain wear due to high pressure between the roller and pin and between the roller and sprocket.

Chain replacement is recommended when the chain has elongated approximately 3%. At 3% elongation, the case hardened surface of the pin and bushing has worn away, and failure is imminent. By way of example, consider a 100" long chain, V-belt and Poly Chain synchronous belt. Over the life of the chain, it will elongate 3" (3% elongation), or require 1.5" of center distance take up. Depending upon the cross section, a V-belt would require 1.5" to 2" of center distance take up. In contrast, the Poly Chain belt only requires .04" of center distance take up over the life of the belt.

While the same sprockets could be used for a drive using a second replacement chain, the replacement chain's life will be reduced by approximately one-half. Manufacturers recommend that the sprockets be replaced with each new chain. V-belt sheave and synchronous pulley/sprocket wear is also critical, and as with chain, must be closely monitored. However, field experience would indicate both sheave and pulley/sprocket wear to be generally better than chain sprockets due to no steel on steel contact. If the sprockets are heat treated, chain life can be doubled and sprocket life is 7 times that of non-heat treated sprockets. Due to cost and availability, only 5% of chain drives use heat treated sprockets.

The fifth and final installment of this series will conclude with a discussion of advantages and disadvantages of chain drives.