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## Background on the chain lubrication opportunity

### How are chains used in industry?

#### • Drive (power transmission) chains

Chains are an efficient and cost effective power transmission medium. Chains transmit power in industrial applications just as they do on bicycles or motorcycles. Chain drives are less complex, easier to design and easier to install than gear trains. This is especially true as the distance between shafts grows farther.

Examples:

- Conveyor drive chains
- Agricultural and construction machinery drives
- Miscellaneous rotating machine drives

#### • Lifting chains

convert rotary energy to linear power to overcome heavy loads/forces. Examples:

- Lift trucks
- Lock gates
- Metal forges and rolling mills

#### • Timing or control chains

provide precision positioning of work piece or product for machining or assembly processes. Examples:

- Machine tools
- Automated assembly lines

#### • Transport or conveyor chains

carry product or raw material through or between manufacturing processes and in distribution centers. Examples:

- Auto assembly lines
- Food processing lines
- Stacker-Reclaimers
- Textile Dryers (tenter chains)
- Warehousing and product distribution
- And this list goes on

## What are the various types of chain?

Chains come in a wide range of shapes, sizes and materials, but they can generally be assigned to one of three basic categories:

### Roller and block chains

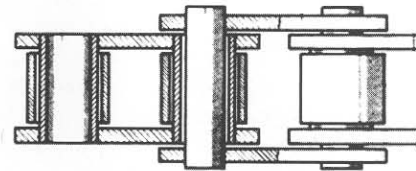
are probably the most common types found in our industrial markets. They feature a wear (bearing) surface suspended on bushings between linking plates. These chains are expensive, have a number of friction and load points, and require frequent lubrication.

#### - Roller chains

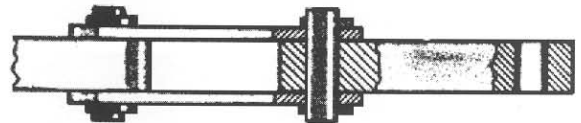
have a cylindrical (roller) wear element riding on the pins and bushings between the connecting plates. They are the most common form of drive chain and are also used in transport applications.

#### - Block chains

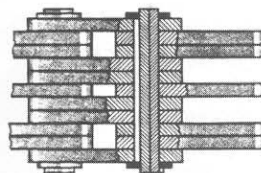
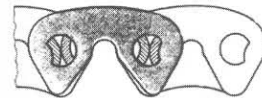
have a rectangular faced wear element between the pins. They are commonly found in the hot, wet, dirty and/or heavy transport (conveyor) chain applications.



Roller Chain



Block Chain



Inverted Tooth Chain

### Silent/inverted tooth chains

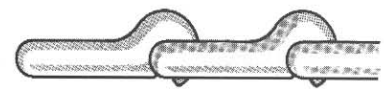
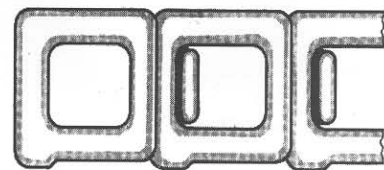
are used with high-speed, closely spaced sprockets. With a concave seat and convex rocker pin arrangement replacing the pin and bushing, properly lubricated inverted tooth chains offer great resistance to wear and noise in high-speed applications.

### Stamped steel or malleable iron chains

are typically low cost chains suitable for low-speed drive and conveyor applications.

#### - Cast (malleable) iron detachable link chains

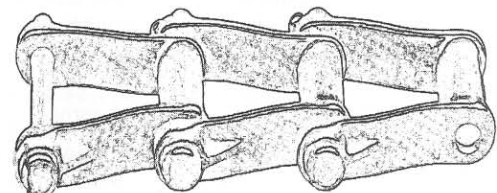
are found in agricultural and low-speed transport applications. They are also used when the chain length is frequently adjusted. Because of the open link design, it is difficult to maintain a clean lubricant film on this chain.



Detachable Link Chain

#### - Pintle chains

have a closed link or pin and are used when a low cost, low speed, but heavier service chain is required. The closed pin provides better lubricant retention than the detachable link type.



Pintle Chain

# Chain Lubrication

## Application and Installation Information

### Where are automated chain lubrication systems used?

- Roller and block chains represent the greatest opportunity for automated lubrication because of their relatively high cost, high speed, and high number of friction points that are susceptible to wear.
- Roller chains are the most widely used drive (power transmission) chains.
- Variations of roller or block chains are used for conveyors (transport) in a broad range of industries.
- Some of these industrial classifications are:

<u>SIC Code</u>	<u>Industrial Category</u>
1011-1099	Metal Mining
1221-1241	Coal Mining
1411-1499	Mining & Quarrying of Non-metallic Minerals, Except Fuels
2000-2099	Food & Kindred Products
2026	Fluid Milk
2043	Cereal Breakfast Foods
2051	Bread, other Bakery Products
2111-2141	Tobacco Products
2211-2299	Textile Mill Products
2611-2699	Paper & Allied Products
3081	Unsupported Plastic Film & Sheet
3211-3231	Glass Products
3221	Glass Containers
3241	Hydraulic Cement
3275	Gypsum Products
3411	Metal Cans
3554	Elevators & Moving Stairways
3711	Motor Vehicles & Passenger Car Bodies
7996	Amusement Parks

- OEMs, whose products use chains also sell or specify chain lubrication systems. These include:

<u>SIC Code</u>	<u>Industrial Category</u>
3567	Industrial Process Furnaces & Ovens
3537-03	Material Handling Equipment Mfr.
3534	Elevators & Moving Stairways
3541-3542	Machine Tools
3535	Conveyors & Conveying Equipment

### What does proper lubrication do for a chain?

- Prevents galling
- Reduces heat caused by friction
- Prevents corrosion
- Flushes friction causing debris from between wear points
- Cushions impact loads
- Reduces noise
- Reduces energy consumption
- Reduces wear on pins, rollers, link plates and sprockets
- Reduces chain elongation
- Maintains proper chain to sprocket engagement

### What are the benefits of automated chain lubrication?

- First, automated lubrication ensures the chain is lubricated. Under heavy loads a properly lubricated chain lasts 3 to 10 times as long as a dry chain. With manual lubrication there is no guarantee the job is being done.
- Automated lubrication is the inexpensive alternative. Most chains require frequent lubrication and to do so manually is a costly process. If the machine you are lubricating, needs to be shut down, and in most cases for safe manual lubrication it must be, then the downtime cost for this routine procedure can be prohibitive.
- With finely tuned automated lubrication the right amount of lubricant is applied on the chain where and when it needs it. Best case manual lubrication is either too much (you spoil product and the environment - and waste oil) or too little (the chain and sprocket wear out prematurely).

## Automated chain lubrication application guide

### Friction points of a chain

The key objective is to maintain a proper lubricant film between the chain friction points. Roller chains are most frequently found in industry; are generally the most complex, and have the most friction points. Applying lubricant to roller chains is made more difficult by the relatively tight clearances and inaccessibility of the friction points. Pintle and detachable link chains have friction points that are generally accessible, but their open clearances pose lubricant retention problems. High-speed inverted tooth chains usually operate within enclosed drives with internal sump type lubrication. Those that are exposed face the same lubrication problems as roller chains.

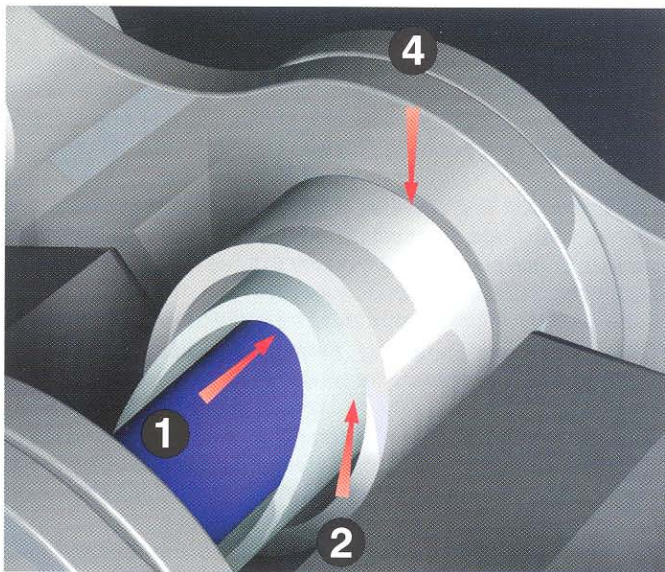
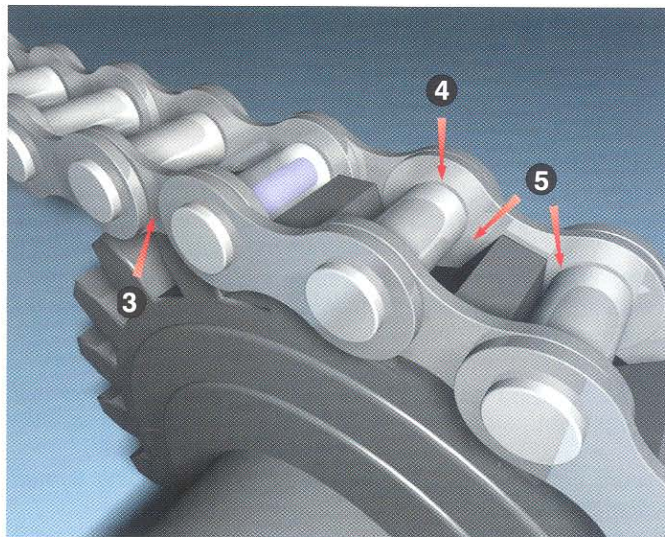
### Applying the lubricant

#### A. ORSCO Series 150 Systems

Lincoln Industrial ORSCO continuous spray systems provide the best overall lubrication solution for the majority of chains. These systems apply a consistent, low volume spray continuously on the chain. The ORSCO system combines low oil volume output (as low as one drop, or 0.030 ml, spread over 4 minutes), and low air pressure (as low as 2-5 psi) to produce a fine non-misting spray to continuously re-supply the chain with fresh lubricant. This method provides superior lubrication of the chains while avoiding the hazards of over-lubrication: product and environmental contamination. Lincoln Industrial ORSCO systems effectively lubricate both low and high-speed chains and perform at chain speeds exceeding 1000' (300 m)/minute.

#### B. Centro-Matic and Lube Cup Brush Systems

Brush systems offer cost effective solutions for some low-speed chains. Lincoln Industrial offers two types of chain lube brush systems: Centro-Matic Injectors feed oil to brushes at timed intervals or Lube Cups (electric or gas operated) dispense oil to the brush over a 1, 3, 6 or 12 month period. Brush life is the limiting factor for these systems. Reasonable brush life can be expected when chain speed is below 20' (6 m)/minute.



1. Friction between bushing/pin.
2. Friction between bushing/roller.
3. Friction between outside/inside plate.
4. Friction between plate/bushing.
5. Friction between sprocket/roller/internal plate.