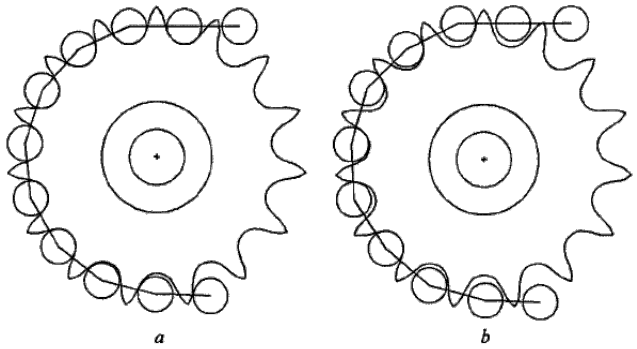
Chains, Chain Cleaning
and Lubrication

The bicycle chain is one of those parts on the bicycle that is essential to the enjoyment of our sport, but we often tend to conveniently overlook its importance when purchasing and maintaining it. We may see an entirely new shaft drive system in the near future, if crowd funding gets Driven™ off the ground. But, for the time being, we need to respect and take better care of our chain drive.

Before we get into the maintenance of the humble bicycle chain, we need to answer one question. When we go looking for a replacement chain – are more expensive chains worth the added cost? The short answer is yes, more expensive chains when properly cared for offer significantly longer wear over inexpensive chains. The reason is that the added cost goes into the internal components that you can't necessarily see. Pins become stronger hollow pins. Pins, rollers and side plates are case hardened and plated. Then all of the components may receive a friction reducing and corrosion resisting treatment such as Titanium Nitride. You may say "so what - I'll just replace my chain with an inexpensive chain more often and save some money." That can cost you big dollars, especially if you leave the chain replacement a little too long.

When the chain wears just 0.5% most chain manufacturers will recommend that the chain be replaced. Once the chain wears to just 0.75% the cassette sprockets and chainrings begin to wear excessively. Often referred to as "*chain stretch*" this condition causes the valley areas, the area between the teeth, of the gears to become elongated. Left long enough the chain, chain rings, derailleur pulleys and cassette will need to be replaced because if a new chain is installed on excessively worn gears the chain rollers will not land in the proper place (b) on the gear and skipping and dropped chains will result. In this period of 10, 11, 12 and 13 speed cassettes replacing them can cost you upwards of $600 and if the chainrings and derailleur pulleys need replacement you can easily be looking at $1000 to $1200. For every minute of pedaling at 90 rpm the chain experiences 320,000 instances of sliding friction, so it is essential that you keep a close eye on how worn your chain is and take good care of it!



I often see cyclists lubricating a dirty chain and I know that they will be looking at big dollars in the near future. The first rule of looking after your chain drive system is to clean it **before** lubricating it. Lubricating a dirty chain just thins the abrasive paste that's on the chain, so that it flows into the tight spaces within the chain, further accelerating wear.

Using a chain box type cleaner is the most practical way of cleaning the chain for most people, and it does do a reasonably good job. The ultimate way to clean a chain, is to remove it and clean it in an ultrasonic bath – don't laugh they actually exist. But we want to spend more time riding than cleaning - so the chain box works best. You can use petroleum solvents (quicker) or water-based degreasers (slower) such as Simple Green™ or diluted Dawn™ dish soap in them. Usually, I find that two baths of degreaser followed by a Methyl Hydrate rinse works well. Don't forget to clean and dry the chainrings, cassette and derailleur pully wheels. Solvent/degreaser in combination with an old toothbrush works well. Be careful not to use too much solvent when cleaning the cassette - excess solvent can find its way into hub bearings and freehub bodies.

Now to lubricants. They can be broken down into two broad categories based upon how the lubricated chain looks and feels when you're finished.

Dry lubricants finish dry and work very well in dry conditions, as they don't tend to attract road dust - so the chain remains cleaner longer. However, dry lubes will often wash out of a chain in extended wet conditions and don't offer much protection from corrosion

Wet lubricants don't tend to evaporate much and remain wet to the touch. These tend to attract dust from just about everywhere but are more durable in wet conditions and offer good protection from corrosion.

Advantages of Dry Lubricants (paraffin wax based)

- Offers unmatched lubrication internally where it counts and excellent power transfer.
- Extends service life to 400 – 500 maintenance free kilometres between cleaning/rewaxing in dry conditions
- Finishes dry to the touch and remains cleaner longer.
- Drip-on products have made servicing much more convenient.
- Due to the superior lubrication all of the drivetrain components last longer.

Disadvantages of Dry Lubricants (paraffin wax based)

- Requires more work when cleaning drivetrain components, although hot water rinses are quite effective and convenient.
- Hot-melt products require removing the chain.
- Wax tends to wash out in extended periods of rain.
- Top tier products are quite pricey (balanced out by reduced wear on components).
- Most products require a set-up time that can range from 8 to 24 hours before bicycle use.

Advantages of Wet Lubricants (oil based petroleum or vegetable based)

- Can offer good lubrication in both dry and wet conditions.
- Convenient to use and the bicycle can be used immediately after servicing
- Prices of the products are often less.

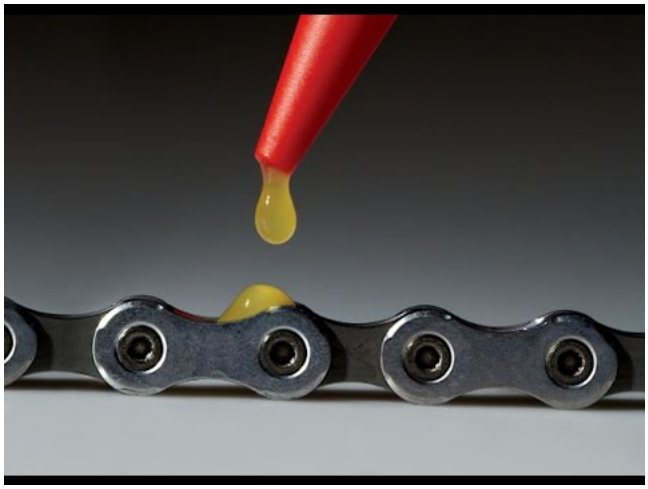
Disadvantages of Wet Lubricants (oil based petroleum or vegetable based)

- Quality of lubrication varies widely – don't trust the claims on the bottle. Websites like *Zero Friction Cycling* and *Ceramic Speed* do empirical testing and the results are quite surprising.
- The viscosity (thickness) doesn't necessarily equate with the quality of lubrication.
- Oils attract dust like crazy. You will spend more time cleaning.
- Service intervals (cleaning/re-lubrication) in some dry dusty or muddy wet conditions may be daily.

So now to the actual act of applying the lubricant – here are some tips.

- Be sure that your driveline components are clean and dry – I can't stress this enough.
- Avoid products that are not made for bicycle chain lubrication – WD-40 (Penetrating/Water Displacement Oil), Chainsaw chain oil, motor oil, 3 in 1 Oil etc.
- Apply the lubricant to each individual roller and side plate pivot point.

- Don’t over apply the product. You want to get lubricant **in** the chain not on the chain.
- Start and finish at the master pin/link.
- Run the chain first cross-chained small cog/small chainring then big cog/big chainring. This flexes the chain laterally and gets lubricant into the side plates.
- Run the chain through all the gears/chainrings a couple of times.
- With wax – leave the wax to set up.
- With oil, take a rag and wrap it around the chain, then back-pedal the chain through the rag. There will be a very thin film of oil on the side plates.



- Take some isopropyl alcohol or brake cleaner and thoroughly clean the brake tracks on the wheels or clean your discs if you have disc brakes. Even the tiniest amount of oil/wax will contaminate brake pads and brake noise will be the result.
- Chain wax will generally last 400 to 500 dry condition kilometres without any maintenance whatsoever. With wax, if you get caught in the rain, boil up a kettle of hot water and rinse the chain when you get home. Run the chain through a methyl hydrate rinse in your chain box. When the chain dries reapply the drip on wax and leave it to set up.
- Oils will begin picking up dust immediately. In my experience you can extend the clean and re-oil intervals by back-pedaling the chain through a rag to take as much contaminated oil off as possible. Then apply a very small amount of oil to the rollers/side plate pivots. Remove excess oil again by back pedaling through a rag. This should be done after every ride for best results – it only takes 2 to 3 minutes. The chain should be completely cleaned and oiled every 200 kilometres
- **Keep in mind that the work you go to in maintaining your drive line will save you in component replacement costs down the road.**
- For every 3 chains that you replace you will usually replace 1 cassette. For every 2 cassettes that you replace you will usually replace a set of chainrings. These general guidelines are based on good driveline maintenance in average conditions.
- **Remember for a Road Bike** – **Cassettes** - Shimano R9100 Dura Ace 357.99/Campagnolo Super Record $488.99. **Chains** – Shimano Dura Ace R9100 $71.49/Campagnolo Record $71.49. **Chainrings (2)** Shimano $553.00 Campagnolo 11 speed Record $260.00. Complete component replacement costs without derailleur pulley wheels or labour – Shimano $532.48 / Campagnolo $784.48.
- **For Mountain Bike** – **Cassettes** – Shimano XTR 11 spd. $434.99 / SRAM XG – 1295 Eagle $550.00. **Chains** – Shimano 11 Speed – $62.99 / SRAM Eagle – 121.00. **Chainring (One-by)** Shimano XTR - $179.00 SRAM Eagle $159.00. Complete component replacement costs without derailleur pulley wheels or labour – Shimano $676.98 / SRAM $830.00

These prices are for higher end components, but the take-away is the same regardless of the level of components that you have on your bike – Maintenance is way less expensive than repair/replace. So, check your chain for wear often and clean and lubricate it on a regular basis.