



Scott oiler®

Knowledge Workshop:

**UNDERSTANDING
MOTORCYCLE CHAIN
WEAR, MAINTENANCE
AND LUBRICATION**



INTRODUCTION

Hello and welcome fellow biker,

You may just have started riding or you may have been riding since you were big enough to get on a bike, but whichever type of rider you are you can always learn more about our shared passion: motorcycles!

It is a trait of the motorcycle community to share knowledge and experiences and make motorcycling better for everyone. In this spirit it is our mission to explore in depth the technical aspects of motorcycling and explain the issues affecting modern motorcycle chains, the process of chain wear, and the benefits of automatic chain lubrication.

We will also explain the difference between traditional spray lubrication and continuous chain lubrication, the method my father, Fraser Scott, invented in the 1970s. Since then I have taken over as Scottoiler Managing Director and thanks to our loyal customers (and my Dad's invention) we have grown the business to be a worldwide brand.

If you want to learn more about Scottoiler pay a visit to our website www.scottoiler.com, email or call. We are happy to answer all your questions.



Fiona Scott Thomson
Managing Director

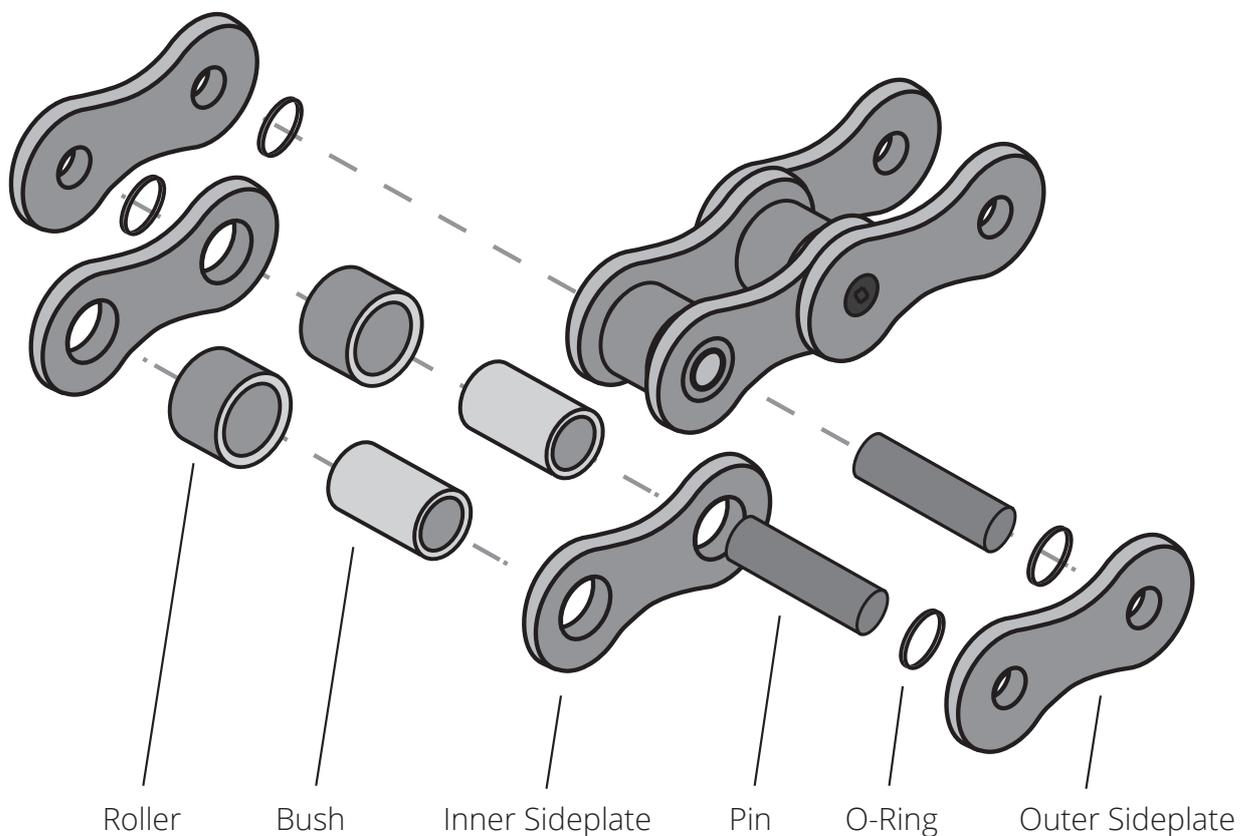
MOTORCYCLE CHAINS

Final drive power transmission on motorcycles is currently dominated by three big concepts: chain drives, belt drives and shaft drives. Both belt and shaft drives have some major disadvantages so chain drive is still the most popular power transmission system fitted on motorcycles today. Chains are lightweight, robust, easy to install and adjust, and highly efficient.

However, just like any other form of transmission, they do require care and maintenance for best results. The good news is that chain maintenance is easy and a properly cared for chain can last a long time. The bad news is that a neglected chain can become inefficient very quickly and fail early, resulting in a costly replacement bill.

CHAIN COMPONENTS

A typical motorcycle chain consists of approximately 500 pieces and is responsible for the power transfer from the gearbox to the wheel. Without a chain your bike is just a very heavy pushbike. Nevertheless motorcycle chains lead a very unglamorous life and are often neglected. Once you delve deeper into the mechanics of chains and sprockets you will realise how incredible chains are and how important they are for your bike.



You probably know by now that chains need proper lubrication at regular intervals to function properly and to prevent wear. If you have a chain driven bike you know that sometimes chain adjustments have to be made, pushing the rear wheel further back to take up the slack of the chain. So how do chains actually wear?

WHY AND HOW DO CHAINS WEAR?

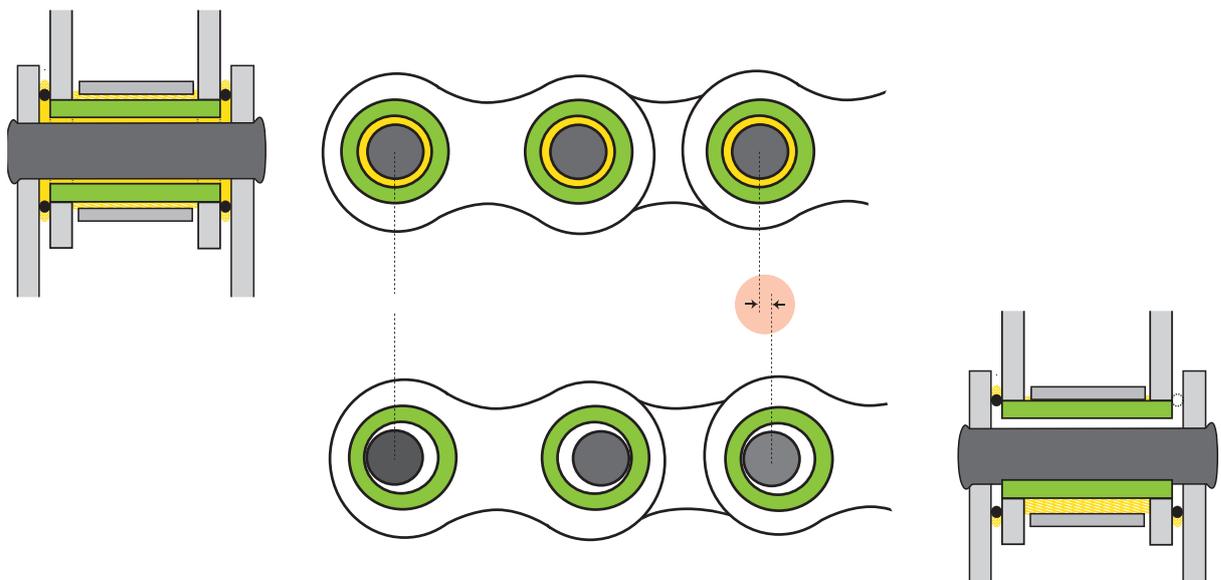
Chain wear is affected a variety of factors:

- Riding conditions and other environmental impacts
- Chain tension
- Riding style and type of motorcycle engine
- Quality of chain and sprockets
- Other factors such as mechanical issues, etc.

While chain wear is absolutely normal, correct maintenance reduces the impact of these factors and dramatically increases chain life.

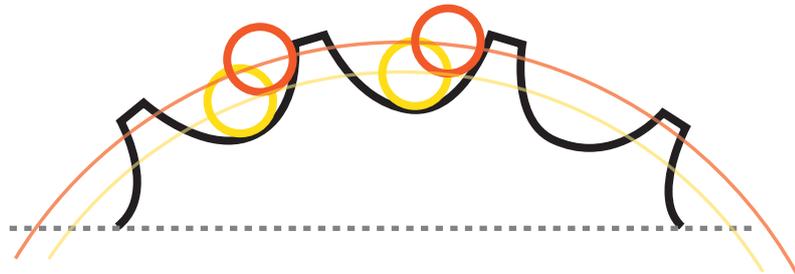
Chain wear does not mean that the chain stretches and gets longer in the sense that material stretches. When you compare a worn chain against a brand new chain it will be difficult to see a difference until you put them under a load. Suddenly the worn chain will be longer than the new chain.

Chains wear at the point where inner and outer side plates are connected by the pin. While the pin is connected to the outer plate, the bush is connected to the inner plate. Through the rolling action of the chain pin and bush constantly rub against each other. If this contact point is not sufficiently lubricated the pin will wear into the bush, thus allowing it to sit deeper in the bush. As this usually happens over many links of a chain the chain physically becomes longer, up to the point where adjustment is no longer possible.

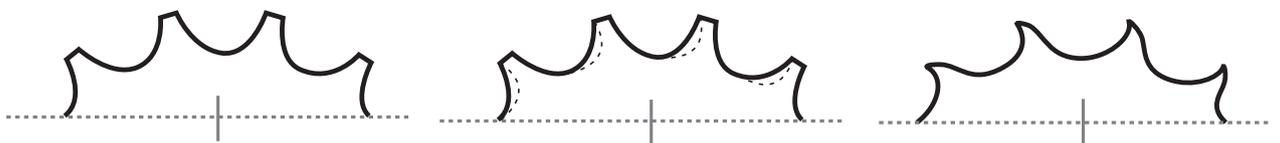


However a chain is only as strong as its weakest link and will also fail quickly if just one chain link is subject to excessive wear, possibly due to a quality error or lack of lubrication. Your chain and sprockets rely on a delicate interplay to transfer power efficiently.

If just one chain link elongates this link will bear the entire load of the chain as it articulates around the sprocket, instead of sharing the load among all the chain links being in contact with the sprocket. This is called a spacing issue. Both chains and sprockets have pre-defined spacing to match each other. The chain pitch is the distance between valleys of the sprocket teeth. If one chain link wears it changes its spacing and becomes mismatched to the sprocket.



Due to the different spacing the other links will not actually make correct contact with the sprocket teeth. As the chain wears the spacing increases and the chain rides higher on the sprocket teeth, causing them to wear. The sprocket teeth often start to shape into a wave pattern. This causes chain and sprocket to wear unevenly. In an attempt to balance out the chain stretch the sprocket wears and adopts to the new spacing of the chain, which in turn will accelerate the stretch of chain links that are not yet worn.



Usually chain wear is not a linear function that can be measured and calculated. If one link starts to wear and “stretch” chain wear is accelerated throughout the chain and follows an exponential curve.

Hence sprockets should also always be replaced when a new chain is installed, even if the sprocket seemingly shows no signs of wear. If a new chain is installed on an already worn sprocket the chain will wear quicker as it tries to adjust to the existing wear and spacing pattern on the sprocket.

To reduce or eliminate chain wear and chain spacing the pin-bush articulation always has to be lubricated to prevent metal-to-metal contact. Almost all motorcycles today are equipped with sealed chains that have factory applied lubricant held in place by O-rings to protect this important contact point.

O-RING CHAINS: THE BIGGEST INNOVATION FOR MOTORCYCLE CHAINS IN DECADES

Before the introduction of sealed chains motorcyclists had to constantly strip down the chain from the bike and cook it in a grease-pan before hanging it up to dry. This would allow the lubricant to reach the inside of the chain, the pins and bushings where it was desperately needed. A filthy job and a real time-suck when you just wanted to go out for a quick ride.

Luckily, modern motorcycle chains are equipped with O-ring (or X- or Z-ring) seals. These seals are intended to keep a lubricant sealed inside the chain, between the pin and bush, exactly where it's needed, and keep dirt and grit out of this important contact area. The lubricant is sealed in for the entire life of the chain and does not need to be changed.

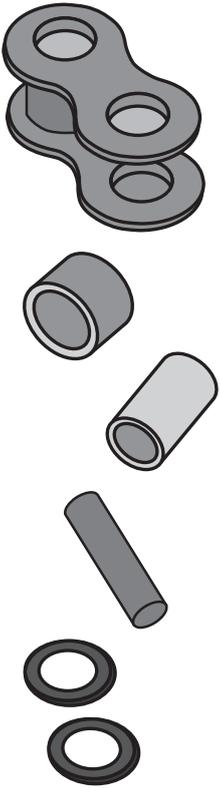
Modern sealed chains can last a long time. Possible reasons for chains to be replaced include quality issues, physical damage to the chain or just physical wear and elongation of the chain past the point of adjustment. However the main reason for modern chains to fail is the loss of seal integrity.

DO I STILL NEED TO LUBRICATE MY CHAIN IF IT HAS O-RING SEALS?

A common misconception is that with an O-ring chain no more lubrication is necessary. While the inside rolling action of the chain is now lubricated and sealed, your chain still needs regular maintenance. O-rings are made of rubber which has a high coefficient of friction and are very sensitive to any damage. Unless the surfaces are kept moist, the rubber will harden and crack, exposing the link-pin to dirt and wear. When O-ring seals crack and fail they let the lubricant seep out. Without internal lubrication the chain link will quickly wear and the chain will reach the end of its life prematurely.

So the answer is yes; even modern, sealed chains need lubrication.

O-rings can fail for a variety of reasons:



- Unless the surfaces are kept moist, the rubber will harden and crack, exposing the link-pin to dirt and wear. The resulting 'tight spot' makes chain adjustment impossible and will accelerate wear of the entire chain.
- The O-ring itself can be damaged or worn away through sand, dirt and grit getting into the rotating motion of the chain. Tacky spray lube combined with the rotation of the chain creates a grinding paste-like substance that can seriously damage the rubber O-rings.
- O-rings are made of rubber, which has a high coefficient of friction. Two kilowatts of power can be converted to heat by seal friction on O-ring chains. Lubrication helps by keeping the O-rings moist and reduces the friction generated through the chain movement.
- Ozone and direct sunlight can also harden the O-rings. Additionally only specific chemicals and cleaners should be used when working on your chain. Make sure that all fluids are suitable to use on O-ring chains.
- When cleaning chains make sure you use brushes that are specifically made for O-ring chains. A wire brush can physically damage the seals.

To extend the life of your chain and sprockets always make sure that the chain is properly lubricated and free of sand, dirt and other contamination.

The quick guide to proper chain maintenance

- Clean the chain at regular intervals to extend chain life.
- Make sure the chain is adjusted, not too loose but also not too tight.
- Consult your owner's manual for the recommended amount of chain slack.
- Be careful: never clean or lubricate your chain while the engine is running.
- Check that your cleaner is safe to use on O-ring chains.
- Always make sure that your chain is properly lubricated.
- Check for correct alignment of front and rear sprocket.
- Check for tight spots, missing O-rings, excessive play, and misalignment.

UNDERSTANDING CHAIN LUBRICATION

The first step to better chain maintenance is understanding chain lubrication. You now know how and why chains wear and why lubrication is essential. But there are so many different forms of lubrication, so which one to choose?

THE PROBLEM WITH TRADITIONAL SPRAY LUBRICATION

Most bikers use traditional spray lube from a spray can. Just spray it on your chain and you're good to go. Manufacturer recommendations are typically to use spray lube every 300 miles... so that may be every second time you stop for gas/petrol.

Additionally most manuals state to clean your chain with a proper chain cleaner before you apply the chain lube... so let's just assume you do that. Down on your knees with a can of chain cleaner and a brush, fighting the dirt and grime that has accumulated over the last 300 miles. Oh, and you should also wait until the cleaner has evaporated BEFORE you re-lube your chain.

Only then re-spray the chain. When you spray your chain make sure not to get overspray on your tyre or brake disc... but at the same time make sure to cover all links. Lucky you if you have a centre stand! Only have a side stand? You know the score: roll your bike half a meter, spray, roll, spray, roll, spray... Remember: don't use too much because it will just fling off and stick to your luggage or jacket. So then wipe off the excess, remembering to keep your fingers well away from the sprocket chain interface. Then... wait around for 20 minutes, until the solvent has evaporated and the lube is in place and eventually you are ready to go!

Easy? Not really. A seemingly easy process quickly becomes a complete pain.

No one likes chain maintenance: it's dirty, it's tedious, and it's time consuming and can be dangerous. So we all put it off... you too... admit it!

We want you to think about this seemingly easy process and show you how much hassle and time it takes to lubricate your chain using traditional chain spray. Unfortunately the result you will have achieved is not great for your chain. In a standard spray lube the lubricant is very tacky; it has to be able to stay on the chain until the next maintenance interval (typically every 300 miles).

This tacky substance does not just stick to the chain... it goes both ways and so all the dirt and grit from the road will stick to your tacky chain. Through the rotation of the chain and the constant contact with both front and rear sprocket the combination of dirt, grit and tacky spray lube will amalgamate to form a grinding paste. This grinding paste will harm the O-Rings and, like sandpaper, abrasion will slowly damage the seals with every rotation of the chain.

This is why chain manufacturers recommend thoroughly cleaning your chain of all existing chain lube at every maintenance interval and/or before applying new lubrication... every 300 miles. Do you do it?

Recommended lubrication interval according to manual

D.I.D.:
300-400 miles

EK Chain:
300-350 miles

Tsubaki:
300 miles

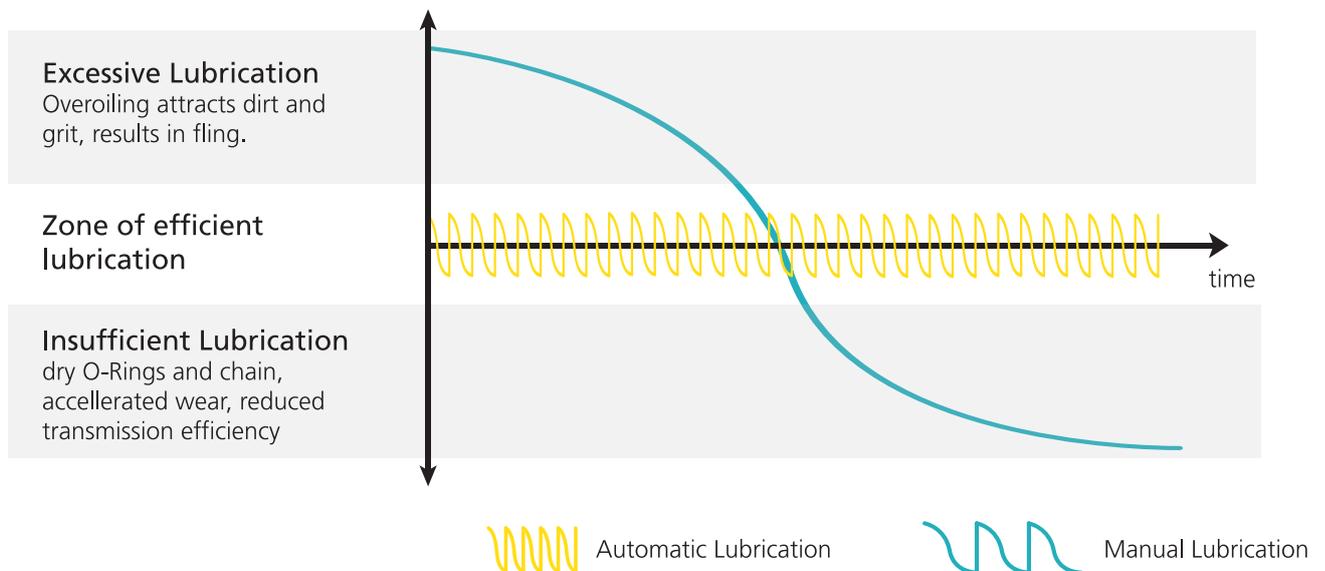
AUTOMATIC CHAIN LUBRICATION

So why is continuous lubrication better than traditional spray lubrication?

Automatic chain lubrication significantly increases chain and sprocket life and saves you money on replacement parts. Remember the sticky mess that you create with traditional, tacky spray lube? This is the main reason why chains wear prematurely. If you could avoid the sticky, tacky lube you could increase your chain life dramatically. Continuous lubrication will lubricate your chain every mile of the road, eliminating the need for tacky lube that is only applied every 300 miles. This means the correct amount of lubrication at any given time. Exactly where it's needed, when it's needed.

Think about this: interval lubrication requires you to replenish it after 300 miles. During your ride the lubricant will attract dirt and grit from the road or will be washed off by the rain. This means that after 300 miles you no longer have a sufficient amount of lubrication on your chain that will guarantee proper lubrication.

Automatic lubrication on the other hand lubricates the chain continuously while the bike is in use. This allows the use of a much less viscous or sticky lubricant. This will ultimately get thrown from the chain as excess oil builds up on the outer surfaces. This used oil will have passed through the chain, collecting dust, grit and dirt and carrying them from the chain. When this oil is flung from the chain it takes the contaminants with it. The lubricating film on the chain is then replenished with fresh oil delivered by the automatic oiler. This total-loss, self-cleaning system leads to a cleaner and much more efficient transmission and guarantees perfect lubrication of chain and sprockets at all times.



In a recent customer survey Scottoilier users reported, on average, a 2.98 times longer chain life with their automatic chain oiler. With the cost for a basic set of chain and sprockets exceeding more than £100/\$150, not including workshop time, a Scottoilier will have paid for itself after your first set of chain and sprockets.

AUTOMATIC CHAIN LUBRICATION

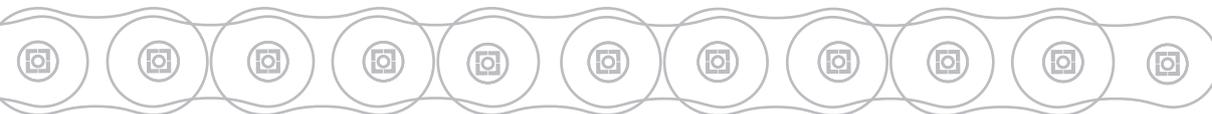


INCREASES DRIVE TRAIN EFFICIENCY

A properly lubricated chain is much more efficient than an insufficiently lubricated chain. The seal between the side plates is a tight fit. It creates additional friction that the chain has to overcome in order to bend around the sprocket. Scottoiler systems keep the O- and X-rings supple, protected from the grinding paste and also lubricate the seal, reducing friction.

This means that Scottoiler lubricated chains are cleaner and more efficient which results in improvements in performance and petrol efficiency. The extent of these improvements will depend heavily on a variety of factors such as riding style (20-30%), tyre pressure (up to 20%), weight of driver/load and other factors.

Continuous lubrication of the chain can improve machine efficiency by 2% on average.



SIGNIFICANTLY REDUCES THE TIME AND HASSLE OF MAINTAINING YOUR CHAIN

Forget about getting on your knees and manually cleaning and lubricating your chain. Check your Scottoiler from time to time and refill the reservoir when it's running low on oil. Job done - chain maintenance covered!

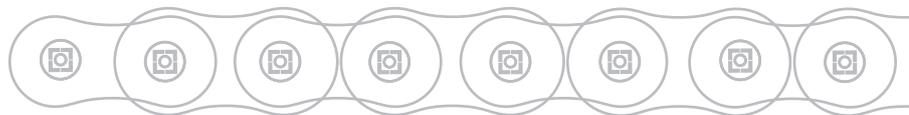
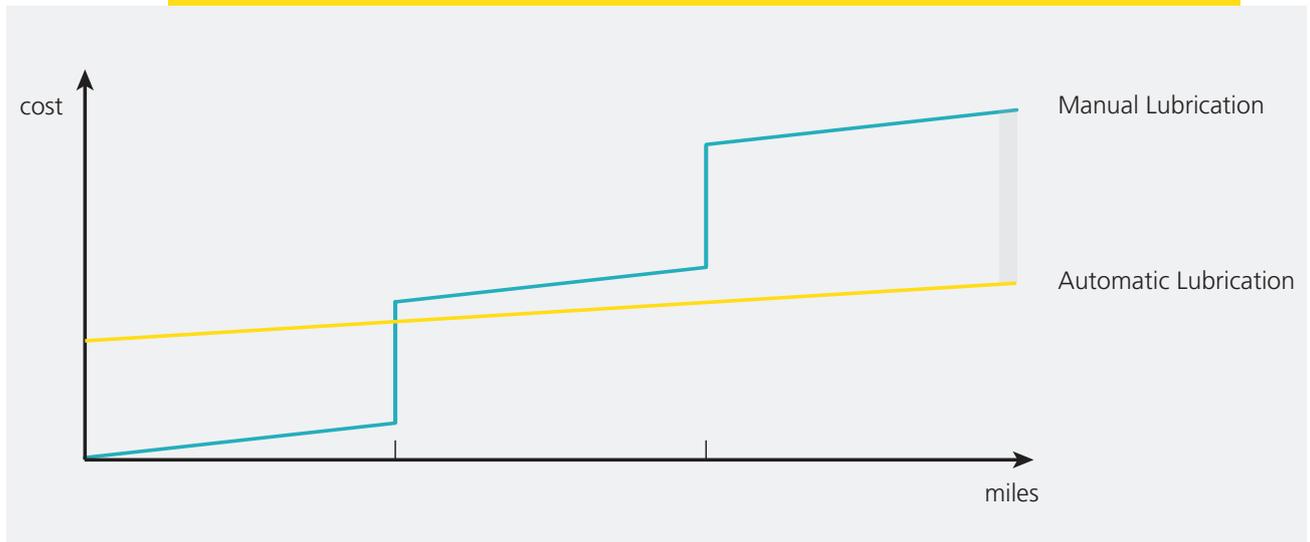
Compare that to your usual routine. Get the bike, all the utensils, cleaning products and your spray lube out, clean, lube ... lets say 5 minutes? Over your average 10.000 miles a year that is almost 3 hours of your life you spend lubricating your chain per year!



CLEANER TRANSMISSION

If a Scottoiler is correctly installed and the flow rate adjusted properly it does not create more mess than a spray lube. The low amount of tack additives allow less dirt to stick to the chain. Any dirt on the chain will be picked up by the oil as it travels across the metal surfaces, eventually reaching the outer surfaces and being thrown off by the centrifugal forces generated by the rotating sprockets. The chain will look much cleaner than with any other form of lubrication!

When it comes to cleaning your bike it is much easier to clean your chain, chain-guard and rear wheel because Scottoil is a light mineral oil and does not contain the same amount of tack additives as a conventional spray lube. Trying to clean the front sprocket cover, chain run and rear wheel after using spray lube can be a pain.



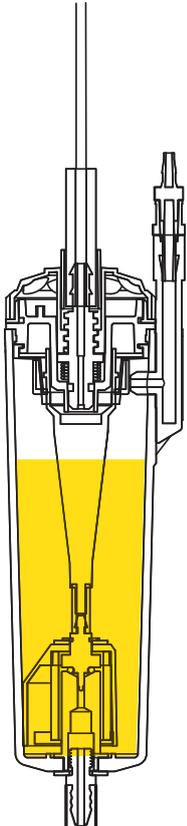
ENJOY YOUR RIDE, WE LOOK AFTER YOUR CHAIN

When was the last time you used spray lube on your chain? Did you follow the manufacturer guidelines and clean the chain? Has it been 300 miles yet? Did you pack that bottle of spray lube for your big trip?

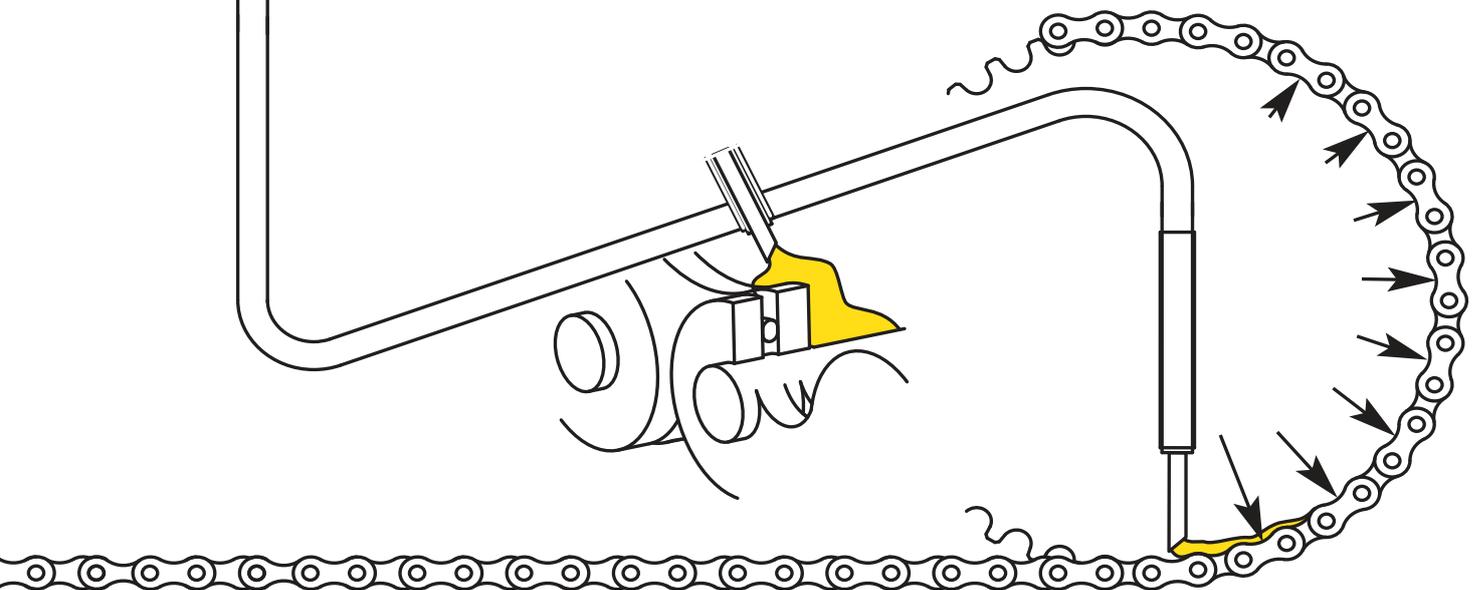
With a Scottoiler installed you know that your chain is properly maintained at any time. Enjoy the road instead of cleaning and lubricating your chain every 300 miles.

AUTOMATIC CHAIN LUBRICATION

The Scottoilier automatic chain oilers all work with the same basic principle.



- A reservoir stores the lubricant for continuous lubrication during your ride. The standard reservoir holds enough lubricant for up to 1500 miles of riding. The range can be extended with extra capacity reservoirs.
- The flow rate of the oil can be controlled to allow for different settings. Wet, cold climate? Higher flowrate will guarantee proper lubrication. Dry, warm climate? Lower flowrate is best.
- Oil delivery lines can be routed behind the fairing and along the swingarm, making an installation almost invisible.
- The lubricant is injected into the chain via the rear sprocket. The injector feeds the oil on the side of the sprocket face. Here the lubricant gets picked up by the rotation of the sprocket as a thin film. The centrifugal forces push the oil into the chain, exactly where it's needed.



WHY SCOTTOILER?

A Scottoiler system will take care of your chain maintenance for you and ensure your chain is well cared for, every mile of the road.

Scottoiler systems are the benchmark for motorcycle chain oilers and are used by bikers all around the world. Fraser Scott introduced the first chain oiler to the public in 1984 and since then we have been continuously improving and developing the product. Now, 30 years later, Scottoiler is the global expert for automatic motorcycle chain lubrication.

Scottoiler offers first-class customer service and wherever you are we will be there to help you improve your motorcycling experience. You enjoy the road, we look after your chain.. **You enjoy the road, we will look after your chain.**

SCOTTOILER TIME LINE

- 1979** Fraser has the idea for vacuum operated chain oiler while traveling from Glasgow to Manchester.
- 1984** Fraser launches the Scottoiler system at the Motorcycle Live show.
- 1986** Fraser begins trading as Scottoiler. We still trade under this name today. Fiona implements plan to scale up the production operation.
- 1999** Scottoiler purchases current HQ in Milngavie.
- 2000** Introduction of award winning FS365 corrosion protector spray.
- 2003** Scottish legend Robbie Allan completes 3000 miles on 1 chain in the Dakar using a Scottoiler chain oiler.
- 2007** Launch of special kits for BMW and KTM models.
- 2009** Launch of state of the art electronic oiler the Scottoiler 'eSystem'.
- 2009** Scottoiler and Globebusters travel from London to Mount Everest basecamp with one chain and no adjustments.
- 2011** Scottoiler enters into partnership with BMW Motorrad.
- 2015** Scottoiler celebrating 30 years in business.

SCOTTOILER CUSTOMER SURVEY

- **1 in 10 bikes in the UK has a Scottoiler installed.**
- **Top 3 Scottoiler bikes:**
 - Triumph Sprint ST 1050
 - Honda Blackbird
 - Honda VFR800
- **70% of Scottoiler users install the kit themselves. 23% get a workshop to fit it and 7% got a Scottoiler kit already installed on their bike when they buy it.**
- **Customer satisfaction is currently at 95.8% - Thank you!**
- **40% of Scottoiler users have been converted to the chain oiler systems by family or friends.**

WHY SCOTTOILER?

eSystem

- Electronic pump system
- Increases chain and sprockets life by up to 7 times
- Activates only when bike is moving
- Installation directly to the battery
- Handlebar display to control the flow rate on the move



vSystem

- Vacuum operated system
- Increases life of chain and sprockets by up to 7 times
- Activates only when engine is running
- Easy installation on most bikes thanks to bike specific guides



- Scottailer offers an extensive range of refill lubricants, expansion tanks and additional accessories.
- Also try out our award-winning corrosion protector FS365. Easy spray-on protection for your entire bike.

**"THANKS! My chain kit is now
60.000km old and still near mint
condition."**

Frederik, France / Suzuki Bandit 1200

**"Thanks to Scottoiler I have the original
chain and sprocket on my Hayabusa
from the year 2000. And now I have
40,000 miles on the clock... :-)"**

Harri, Finland / Suzuki Hayabusa

**"30,000 miles on the original chain
and sprockets on a 1000cc bike. What
more can I say... except I have only
adjusted the chain twice!"**

Phil, UK / Kawasaki KLV1000

Learn more about Scottoiler motorcycle chain oilers on

www.scottoiler.com