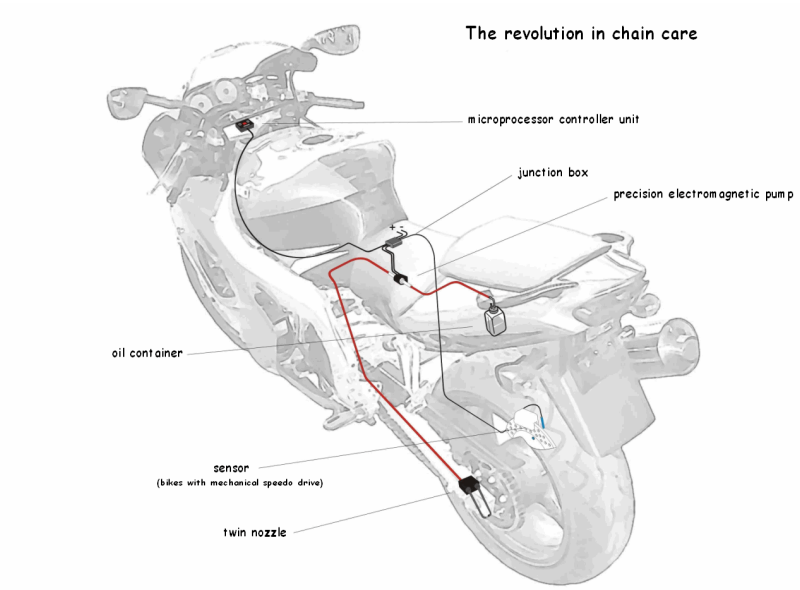
PRO-OILER



General FAQ

v3.02.2

The General FAQ contains sections with background and general information - about PRO-OILER in particular, and chain lubrication in general.

Do I ***have*** to read it?
No...

Will I get more out of my PRO-OILER, and get a better understanding of some of the issues?
Yes!

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In this section you can find more details about items covered in the **Installation Manual.**

You can look at it like this; it is information which, whilst useful, would make the installation manual too bulky.

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General FAQ

1. Background info

1.1 What's the problem with spray-on lubricants?

A spray-on lubricant has to satisfy two conflicting requirements:

- it needs to be sticky to adhere to the chain for the 500km (or more) between applications
- it needs to get to the contact areas of the bushings and rollers - and ***stay*** there, doing a lubricating job, whilst being contaminated with road grit.

Being sticky means that road dirt and grit adheres to it - and this gets crunched into a ***grinding paste*** - which just kills your chain.

You've probably heard the expression "clean and lubricate the chain".

The cleaning part is actually almost as important as lubricating - this means cleaning out the caked-on abrasive gunge from the contact areas - ***before*** applying a new layer of lubricant.

Only the most fanatical owners actually clean the chain with a specialized chain cleaner or paraffin before applying the next dose of chain lube. It's a really dirty and time-consuming job.

Some spray-on chain lubricants are dry and waxy - which helps somewhat to prevent grit adhering to the chain and getting turned into a grinding paste. But they still don't solve the issue of keeping lubricant where it's needed in the contact areas.

Next, the lubricant suspended in solvent needs to penetrate into the bushing/roller contact area, and then evaporate fully. So you need to lube the chain quite some time before riding off - in practice this means doing it when you get back in from a ride.

If you manually clean and lubricate the chain every few kilometers, then you could begin to ***approach*** the performance of a continuous lubrication system - but this is just impractical.

The PRO-OILER gives your chain a regular shot of oil every few kms, which

- keeps the contact areas of the chain ***permanently lubricated***
- keeps the chain ***clean*** by flushing out and shedding the grit.

So, the fundamental problem with spray-on lubricants is that they simply do not lubricate the chain as ***effectively*** as an automatic continuous oiler.

- The chain has a much shorter life.
- You need to adjust the chain much more frequently.

1.2 Why are "classic gravity-feed" chain oilers so difficult to adjust?

For two reasons:

- the oil viscosity changes dramatically with temperature
- they take no account of distance travelled

Oil viscosity

As you probably know, oil viscosity changes with temperature.

The higher the temperature, the thinner and more fluid the oil becomes.

But what you may find surprising is just by ***how much*** viscosity changes.

Broadly speaking in typical ambient temperatures, oil viscosity changes by ***over 30% per 5C step temperature change!***

Let's say the temperature is 10C, and before you set out, you have set your gravity-feed system to give 1 drop per minute.

The day gets warmer...

- at 15C - your oiler will now be giving 1 drop per 44 secs. (+37% = 1.37 x more oil)
- at 20C - that becomes 1 drop per 32 secs (+85% = 1.85x)
- at 25C - 1 drop per 24 secs (+146% = 2.46x)
- at 30C - 1 drop per 18 secs (+224% = 3.24x)

Yes, that's right:
At 30C, that same setting on a classic gravity-feed oiler gives over 3x more oil!

That's a serious mess, and it's a real issue

To see the scale of the problem, have a look at the table and graph on the right.

What does this mean in practice?

Unless the temperature stays constant (and it seldom does!), you will have massive variations in oil delivery from even the smallest changes in temperature. Even on a normal day where the temperature changes by 10C, that means your gravity feed oiler will cause the oil delivery to the chain to vary by at least 60% - ***all by itself!***

The PRO-OILER is completely ***unaffected*** by temperature.
It pumps exactly the same dose of oil at -10C as it does at +40C.

And unlike with a classic gravity-feed system, there's no need to change to a ***thinner oil*** for winter to stop the oiler from blocking up.

As you can see from the graph and table, the viscosity changes at an ever increasing rate as the temperature falls. So, in winter you have a real problem:

You set up the gravity-feed oiler at 10C to give 1 drop per minute, and the temperature drops to 0C.

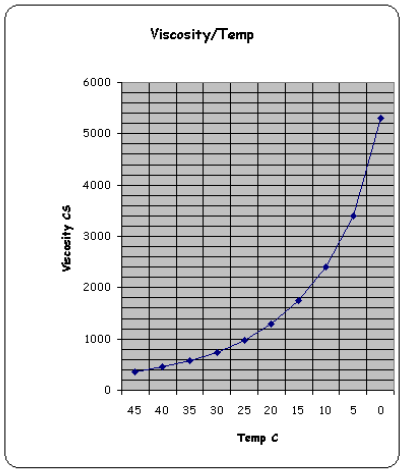
So what happens?
Bad news: you will now have only 40% of the oil delivered to the chain that you had planned!
The chain will just dry out and suffer abnormal wear unless you do something about it quickly.

Viscosity/Temperature example - fully synthetic oil

To read the table: select a temperature, then read along the line to see the viscosity change per step of 5C

Example: to see the difference between 10C and 30C, look at the 10C line, then read across to +20C
Result: oil is 3.24x more fluid at 30C than at 10C
or in other words, 3.24x more oil flows at 30C than at 10C

Deg C	Viscosity Centistokes	step +5C	step +10C	step +15C	step +20C	step +25C	step +30C
45	360						
40	450	1.25					
35	570	1.27	1.58				
30	740	1.30	1.64	2.06			
25	975	1.32	1.71	2.17	2.71		
20	1300	1.33	1.76	2.28	2.89	3.61	
15	1750	1.35	1.79	2.36	3.07	3.89	4.86
10	2400	1.37	1.85	2.46	3.24	4.21	5.33
5	3400	1.42	1.94	2.62	3.49	4.59	5.96
0	5300	1.56	2.21	3.03	4.08	5.44	7.16



Distance travelled

The PRO-OILER's oil delivery is not just ***temperature-independent***, it's also linked strictly to the ***distance you have travelled***.

Why is this important?

A typical big bike with a 530 chain may be running a setting of 1 pump pulse per 6km.

- If you're riding in heavy city traffic, this 6km could take you 15 minutes.
- On the open road at around 150km/h you will cover the same 6km in just 2:30 minutes

It's not the ***time*** that counts - it's the ***distance***.

With a classic gravity-feed system (even forgetting temperature and viscosity issues for a moment), you also need to work out what ***average speeds*** you are doing.

A setting which gives 1 drop per minute may be ok at a constant 80km/h, but it's ***2x too rich at 40km/h*** - and yet it only delivers ***50% of what you need at 160km/h!***

Anyone who has used a classic gravity-feed system will recognize these problems. In practice the only solution is to run a conservative, rich setting all the time to avoid running dry.

Then add to this the fact that you can't even adjust the setting while riding...

Now you see why the PRO-OILER's pumped, temperature-independent and distance-related delivery is such an advantage:

- you can ensure constant lubrication of the chain with the minimum of fling-off
- you set your oil delivery rate so there is just enough to lubricate the chain - without soaking it and having unnecessary fling-off

1.3 Does continuous lubrication increase chain life?

Yes. Always.

From the chain's point of view, the ideal environment is an oil bath - like so many industrial drive-chain systems, or the cam-chain and primary chains inside an engine.

But an oil-bath is unworkable in practice for a motorcycle final drive-chain - even though a couple of manufacturers have tried it in the past.

So we are left with exposed chains.

With the introduction of O-ring chains in the late 1970's, there was a gigantic leap forward in chain-life. The sealed-in lubricant between the pins and bushings solved a major problem.

But there are still the contact areas between the bushings and rollers which need lubrication, as well as the rollers and sprocket teeth - and the O-rings themselves need some lubrication too.

Even if you are absolutely fanatical about cleaning and lubricating your chain, you will not be be able to match the performance of a continuous lubrication system.

How much increase in chain life depends on what you are comparing it to.
- Compared to a chain which is seldom or never lubricated, the increase can be 5x.
- For a normally well-maintained chain, the increase is typically 2-3x.

The clearest evidence comes from people who have a partly-worn chain, and then fit an oiler.
Suddenly, the chain's wear-rate is almost stopped in its tracks.
This comment comes back again and again:

"Since fitting my chain-oiler, I hardly ever have to adjust the chain any more"

The crucial question: how long will my chain last?

It's difficult to say "your chain will last xx,000 km":
- chains vary greatly in quality - as do sprockets
- some bikes are harder on chains than others (rule of thumb, 4-cylinder bikes are easiest on the chain)
- riding style also plays a part

However, what we ***can*** say is that a chain will last typically 2-5x longer with continuous lubrication.

Important note on sprockets:

Continuous lubrication increases the life of sprockets - but not as much as it does the life of the chain itself.

It is a popular myth that you ***need*** to change chains and sprockets at the same time.

This myth comes about because with spray-on lubricants, the chain and sprockets come to the end of their life at approximately the same time.

With an oiler, this is just not the case!

The rule is this:
- If you fit a ***new chain***, you must also fit new sprockets – otherwise the worn sprockets will cause accelerated wear to the chain.
- But you can fit new sprockets with a used chain ***as often as you like***. In fact, waiting till the sprocket teeth become hooked is a false economy.

Keep an eye on your front sprocket, as this item has a very hard time, and is best changed every 12-20.000km - a worn one can seriously damage the chain. Front sprockets are cheap - it's really worth changing it 3 or more times during the life of the chain.

1.4 What about fling-off?

There will always be some fling-off.

It's a "total-loss" lubrication system; so what goes onto the chain also comes off it.

The objective is to reduce the oil delivery until any less oil would mean a dry chain - this is the juggling act that the PRO-OILER does so well:

Continuous lubrication - but with the minimum amount of oil.

To visualize the PRO-OILER consumption - it's a small sugar lump of oil per 100km for a typical big bike!

1.5 If I have a lean setting, what happens when it rains or the roads are dusty?

The PRO-OILER is designed to run as lean and precisely as possible in dry and clean conditions.

Of course, in the real world, some of the time it rains, and the roads are sometimes dirtier or dustier than we would like.

So the controller unit up front - with its [+/-] buttons and LED display - allows you to adjust the oil flow for the conditions while you are riding.

- If the road is wet you can increase the flow - all the way up to 650% more, which keeps the chain lubricated even in monsoon conditions. In "typical" rain conditions increasing the supply 50-100% will do the job.
- In dusty conditions, the dirt absorbs the oil. So increasing delivery will keep the chain lubricated - and clean it too as the dust is flung off. 10-20% extra oil delivery usually takes care of this.

When conditions get back to "normal", then you just reduce the delivery with the [-] button back to your normal dry/clean road setting.

1.6 I don't ride much, so what benefit can I get from a PRO-OILER?

The higher your annual mileage, the more obvious the benefit of running a PRO-OILER.

But it's not just a financial issue - it's the sheer ***convenience factor***.

There are an increasing number of riders who now have the option of buying a chain-drive bike because the PRO-OILER can virtually eliminate chain-care problems.

"I want a chain-drive bike, but I don't want to bother with chain maintenance between dealer services".

The PRO-OILER allows riders to basically fit-and-forget - where they might otherwise have no option but to buy a shaft of belt-drive bike.

2. Settings - using the Pro-Oiler

2.1 Quick Start - the basics

If you read nothing else, please just read the advice below!

It *will* make a difference to how your PRO-OILER performs...

- Select the table and setting that gives you ***stable lubrication*** in normal road conditions.
  The chain always looks the same - it doesn't get wetter or drier as you ride.

  This is the Holy Grail of chain lubrication – it's where you want to be!
- Aim to run on setting **3** in normal mode.
  This way you keep maximum flexibilty to change your settings on the move.
- Running ***too rich*** (wet) does no harm, but just creates more fling-off.
  Choose a "leaner" table.
- Running ***too lean*** (dry) damages the chain.
  Choose a "richer" table, and run **Prime** to get the chain quickly to a properly lubricated condition.

Tactics when you are on the move

- Your normal setting is ok, but you are currently on a ***dirty*** stretch of road. The chain will pick up dust and start to dry out.
  Run **Prime** a few times to get the chain back to normal, and use a richer setting temporarily.
- The road is ***wet***.
  Look at the water being thrown up by the tyres of the vehicle in front.
  This tells you how much your chain is being washed.
- ***Do not hesitate*** to turn your delivery right up to maximum **10** if there is a lot of standing water.
  This is approx. 6x more oil, but it can prove necessary.
- If the road is wet, but not swimming, try **8** - approx 2x more oil.
- Play safe, it's better to over-lubricate than to run dry.
- As you gain experience with your PRO-OILER you will get a feel for how and when to change your settings to match the road conditions.
- On a typical dry conditions setting, you will be doing more than 6km per pump pulse.
  Small changes in your settings will not produce an immediately visible result - so give it a while (at least 150km) before coming to any conclusions.
- On maximum setting **10** on a dry clean road, from completely dry chain to completely soaked is max. 25km. The chain should be ok at around 15km.
- Keep the plastified sheet with the tables and basic instructions under your saddle!

See **Manual**: *3.3 Tables and settings* for how to change table.

2.2 How to find the best setting for your bike

2.2.1 When you first run with the PRO-OILER fitted

If your biking career to date has been spent using spray-on chain-lubricants or with shaft-drive, then in the beginning you may find it difficult to judge the state of lubrication just by *looking* at the chain.

Start by selecting the table recommended for your bike.

Here are some basic pointers:

The finger test: rub a finger over the outside of the chain so you get "tram-line" marks.

- Wet, oily, transparent = too rich
- Graphite, light grey = in the ballpark
- Dry, sooty, black = too lean

Lift the chain slightly off the sprocket, then spin one of the rollers with your finger, and move it from side to side.
It should feel smooth, free and lubricated – if not, then the chain is definitely too dry.

Visual clues:

- The chain is wet, clean, the o-rings are shining and there may be heavy streaks of fling-off on the tyre wall. = too rich
- The chain looks clean, but is not glistening, the o-rings are satin = in the ballpark
- The chain looks dry and dusty, the o-rings are matt black/grey = too lean

If you suspect the chain is too dry, do not hesistate:
Turn up the delivery. Running too dry damages the chain.

At first, until you get used to judging the lubrication, it is ***safest to run a bit rich***.

Later, as you get a feel for it, you can ***lean off progressively*** until you hit the "sweet spot"

On your first ride with the PRO-OILER, it really is best not to just jump on the bike and ride 250km non-stop. It's wise to stop and check that you are not severely over- or under-oiling.

The PRO-OILER is so precise that you will be able to detect differences in delivery down to 2-3% (that's one setting)

Important:
When you are close to your ideal setting, small differences in delivery will not be immediately visible - it may take a few hundred kms before you can be sure you have the right setting.

2.2.2 When you've built up some experience with your PRO-OILER

The main reason you would want to lean off the oil delivery is to limit fling-off.

Less oil delivered to the chain = less oil to fling off.

But there ***is*** a point where the chain has too little lubrication.

This point could:

- be leaner than you might *suspect*
- though it could also be leaner than you feel *comfortable* approaching

Running close to the limit has obvious risks:

- You will find that when you have the leanest viable setting, even one setting leaner will dry out the chain. In other words, the dividing line between ***lean but sufficient lubrication*** and ***a dry chain*** is ***narrow.***
- If you ride in road conditions that change frequently, you should maybe stay on the rich side.

Once the chain has ***sufficient*** lubrication, it is mainly a question of ***personal preference*** and experience as to where you set your ***own*** "comfort zone"

A common "missed opportunity" is not to find out where the leanest setting really is - the result is that you may be running permanently richer than you need to.

Of course, running on the rich side may be fine for your own personal taste - in which case it is not a "mistake"!

So, when setting up the PRO-OILER for your own circumstances and preferences, don't be afraid to lean off the delivery in a controlled experiment.

2.2.3 The controlled experiment

When doing this excercise, you should stop and check the chain frequently - say every 25 km. Don't just jump on the bike and ride 250km non-stop - not only will you not be able to draw any conclusions, but you will also be harming your chain if it ***is*** too dry!

When the chain dries out, it will do so ***quickly*** - within 50km you will already see this happening.

So, when you see the chain is getting too dry, you will know you have ***already passed the leanest viable setting***.

What you are looking for is this:

The ***o-rings*** are the key indicator.

- The nozzle system deposits oil onto the sprocket, from where it is centrifuged out into the rollers/bushings.
- Oil reaches the o-rings by a combination of aerodynamic turbulence spreading oil droplets, and capillary action.
- If the o-rings have sufficient lubrication, then this means – ***automatically*** - the rollers/bushings have sufficient lubrication too.

The o-rings are the ***acid test*** - they should be lightly oiled.
It may be that the o-rings have a fine layer of dust – run your finger over the outside of an o-ring:

- if you determine that there is a ***thin film of oil underneath***, then you are ***ok***
- if it looks or feels like ***dry rubber***, then you need to run ***richer***.

2.2.4 Bottom line

If you have the time and desire to experiment, it can pay dividends.

Running leaner means:

Pros: less fling-off
Cons: you need to be more vigilant, and respond more pro-actively to changing road conditions.

2.3 Tactics in daily use

The PRO-OILER is pretty much fit-and-forget, but you do get the best results if you put a little thought into how you respond to changing road conditions

Example 1.

It's started to rain - turn the oil delivery up straight away.

How wet is wet?

- damp, dirty, but not much standing water: try settings **5** or **6**
- it's wet, some standing water, some spray coming off the vehicle in front: try **7** to **10**
- full wet conditions, plenty of standing water: don't hesitate, go for **10**

Turn down the delivery when/as road conditions improve.

Example 2.

It just rained, you turned up the delivery, and now the roads are dry again - but you forgot to turn down the delivery back to **3**

The chain is now too wet. This is just a temporary situation, so you could reduce the delivery to **1** or **2** for a while.

Q: Why not simply turn it off (**--**)?

A: You *could* turn it off, but the risk is you may not "time" your return to the normal setting **3** correctly, and you could run dry. This is as just likely to happen as forgetting to turn the delivery back down after the rain!

At least on setting **1** or **2**, the chain's condition will stabilize steadily.

Example 3.

You see the roads are getting dusty or dirty and the dirt is sticking to the chain, drying it out. Now you have a choice

You could turn up the delivery a bit to **4** or **5** and see if this does the job.

But if these conditions are going to go on for some time (let's say it's a seasonal problem, or you're riding dusty mountain roads), then you could move to a richer table, and then go back to setting **3**.

Example 4.

You have just ridden along an unmade dusty road, and the dust has stuck to the chain, drying it out. Again you have a choice:

The obvious one is to run **Prime** a few times, and leave the settings as they are.

But, you could turn up the delivery to max for a short while - or both (don't forget to turn the delivery back down!)

Example 5.

You've just washed the bike with a power hose, (of course you wouldn't clean the chain like that, would you?) so you want to give the chain a quick shot. Run **Prime** a couple of times while on the move.

2.4 About modes

The PRO-OILER has 2 "Modes" - Calibration and Emergency.

Calibration Mode is the "normal" mode (10 settings - **1**..**10**)

See **Manual**: *3.3 Tables and settings*

Emergency Mode is used in case of no signal from the reed switch, lost magnet, disconnected reed switch or speedo sensor - or for use off-road where distance travelled is not an issue.

In Emergency mode you select your setting based on the ***time interval*** between pump strokes.

This allows lubrication even when there is no signal. You can switch to this mode when on a trip and you lose the signal. Emergency mode has 19 settings from **E1**..**E9**, **1E**..**9E**, **EE**

3. Oils

3.1 What oil should I use in the PRO-OILER?

The quick answer is: use any ***clean new motor oil***.
Mineral, semi-synthetic, fully synthetic... it doesn't really matter.

But motor oil is not the only type of oil that can be used successfully in the PRO-OILER, so please read on.

We have carried out extensive tests with various different classes of oils, and each has its pro's and con's
See *Oil types*

Required qualites

The PRO-OILER is a "total-loss" lubrication system - the old dirty oil eventually flings off as it's replaced by new oil ("self-regeneration").

If the chain is ***washed*** in oil (as with imprecise "classic gravity-feed" or manual systems), then the choice of oil is not so critical – they are so imprecise that fine-tuning the viscosity selection fairly pointless.

One of the PRO-OILER's trump cards is that it can run ***very lean settings***. But this does mean that the small quantity of oil that does get used ***must do the whole job***.

The oil has to have the following qualities:

- Good ***coverage*** ("wetting power")
  - Essential because the oil has to get to all parts of the chain without using excessively rich settings (for example, the outside of the side-plates for corrosion protection)
  - Rule of thumb: ***thinner*** = ***better wetting power*** = ***lower consumption*** = ***less fling-off***
- Good ***lubrication qualities***
  - Many oils have a string of attractive features, but have poor EP (Extreme Pressure) qualities. A motorcycle drive chain is technically speaking a low-speed EP application.
  - Example: silicone-based chain oils are used where low toxicity is required - as in the food industry. Silicone oils have excellent *lubricity* (= they are very slippery), but they have extremely poor EP qualities and are not suitable for motorcycle chain lubrication. Banana skins also have good lubricity – but that doesn't make them a good chain lubricant!
- 100% guaranteed ***compatibility with NBR*** - the rubber used in the chain's o-rings and pump's seals.

Oil types

Motor oil

Pro's:
- Excellent lubrication and qualities
- Great wetting power (spreads well on the chain = good hydro-capillary characteristics)
- Self-regenerating (not sticky, so dirt and dirty oil remains do not stick to the chain)
- Produces low consumption
- 100% guaranteed compatibility with NBR seals in the pump and chain's o-rings
- Easily available

Con's:
- Relatively low adhesion means it flings off easily. However, this also keeps the chain clean: you need less oil = lower consumption = less fling off than with heavier or tacky oil
- Delivery has to be turned up more quickly when the roads are wet (that's to say, it is not as resistant to the washing action as other more adhesive oils - but this isn't a problem for the highly-adjustable PRO-OILER!)

Conclusion:
Some of motor oil's cocktail of special additives have little to do with exposed chain lubrication.
However, it does have a mix of characteristics which make it an ***excellent compromise*** for use in the pumped PRO-OILER, and it is 100% compatible with the o-rings.

ATF (automatic transmission fluid) and petroleum-based hydraulic oils

Pro's and con's broadly similar to motor oil.
Also tend to have have similar viscosity to the thinnest motor oils (like arctic 0W-20 types) – so you can run leaner settings.

Conclusion:
Viable alternative.

Gear oil

Pro's and con's broadly similar to motor oil. ***Thin*** gear oil (eg. 75w90) is a viable alternative

Pro's:
- Excellent EP (Extreme Pressure) characteristics

Con's:
- Wetting power not as good as motor oil (typically has higher viscosity), so you need a somewhat richer setting

Conclusion:
Viable alternative.

Chainsaw bar oil

Pro's:
- Inexpensive – somewhat irrelevant with the PRO-OILER's low consumption

Con's
- Tackiness is counter-productive in continuous lubrication systems such as motorcycle chain-oilers.
- Wetting power is significantly inferior to motor/gearbox/ATF oils, so much richer settings are required = higher consumption = more fling off
- Picks up and retains dirt due to tackiness, and so re-introduces the disadvantages of sticky spray-on lube which we are trying to escape from with a continuous oiler!
- Not guaranteed compatible with NBR seals and o-rings because NBR-compatibility is not part of the design brief for a chainsaw bar oil! We have encountered chainsaw bar oils which have attacked the seals.
- No EP (extreme pressure) additives (not required for chainsaws)
- Not easy to find the right type of oil (mineral, not bio-degradable which can rot in the lines and pump)

Conclusion:
Chainsaw bar oil is great… for chainsaws, where there is a constant wiping action.
But its one special characteristic, tackiness, is a disadvantage in motorcycle chain-oiler applications. Added to the list of other disadvantages, this makes chainsaw oil a poor choice compared to motor, hydraulic or gear oils.

Specialized industrial chain oils

Pro's:
- Great lubrication qualities
- Self-regenerating
- Hydro-capillary qualities (penetrate quickly)
- …and probably others too, depending on the target environment

Con's:
- Many are ***not guaranteed compatible*** with NBR seals in the pump and chain's o-rings – note: they may well in fact ***be*** compatible, but the manufacturers do not ***guarantee*** compatibility when it's not required.
- Often expensive... can be up to Eur 30 per litre

Conclusion:
Potential minefield.

Silicone oils

Pro's:
- Lubricity
- Low environmental impact
- NBR-compatible

Con's:
- Very poor EP qualities, which rules them out for motorcycle drive-chain lubrication

Conclusion:
Superficially attractive – but in fact unsuitable.

WARNING:
Do not use ***biodegradable oil*** in the PRO-OILER!
It may eventually start to break down in the pump and oil lines, affecting perfomance and even potentially destroying it.

The misunderstanding about tacky oil

It is simply not the case that a continuous chain-oiler like the PRO-OILER needs ***tacky oil***.
The longer the interval between applications of lubricant, the tackier the lubricant needs to be to stay on the chain till the next dose. By definition this does not apply to a PRO-OILER!

In fact the "tacky oil is best" dogma nearly caught us out.

Want proof?
During initial testing and calibration, PRO-OILER used Stihl semi-synthetic chainsaw bar oil, and the values of the tables were matched to this oil.
Later, when testing motor oils, the consumption ***decreased by close to 20%***. In fact, all the richer tables became completely redundant, and have now been dropped - this is why the PRO-OILER's tables start with table 6!

- Yes, engine oil flings off more easily - ***but you need less of it***
- Tacky oils are for environments:
  - where there is infrequent or irregular lubrication
  - and preferably there is no dirt to stick to the oil

Bottom Line:

Motor oil is by happy coincidence an oil type that delivers low consumption, and low fling-off.
Gear oil, and especially ATF/hydraulic oils are also valid choices.

3.2 Do I need thinner oil in winter, like in gravity feed systems?

No!

The PRO-OILER's oil delivery is not affected by temperature. It's been lab and road-tested down to -10C and performs consistently without even needing changed settings.

3.3 Can I use penetrating oil like WD40?

Unfortunately, no.

WD40 is 80% petroleum naphtha – the solvent that gives WD40 it's characteristic superb penetrating power. But those qualities that make penetrating oils like WD40 so good at their job, also mean the oil runs past the pump's seals, and leaks out of every joint in the lines, and evaporates from the oil container!

This is quite apart from the poorer intrinsic lubricating qualities compared to motor/ATF/gear oils - WD40 is 15% mineral oil, so it is literally "light oil"

The real killer is this: petroleum naphtha is not suitable for prolonged exposure to NBR.
The pump's seals are made from NBR and swell after a few days in continuous contact.
Note: the chain also uses NBR o-rings, but the big difference is that out in the open, the petroleum naphtha evaporates quickly leaving just the oil. WD40 can, in practice, be safely used to clean the chain.

4. Maintenance

4.1 System maintenance

The PRO-OILER system itself needs no scheduled maintenance.

Maintenance is limited to visually checking from time to time that:

- the nozzle system is undamaged and correctly aligned
- the oil lines are securely in place, and not being chafed or crushed
- the breather is not blocked

Keep an eye on the the oil level, and refill the container when required.

It is best not to wait until the container is almost empty.

As the oil sloshes around with the bike's acceleration and braking, the chance of the pump drawing air instead of oil increases.

4.2 Chain maintenance

If you are used to cleaning your chain and then lubricating it with spray-on grease on a regular (or irregular!) basis, life with a PRO-OILER will come as a big surprise.

You don't actually need to ***do*** anything any more!

Simply look at the chain from time to time, say at fuel stops.

As you become familiar with the PRO-OILER's behaviour, you will know how the chain is supposed to look when the PRO-OILER is adjusted according to your preferences, and everything is working as it should be.

If you find the chain is unexpectedly dry or wet, then consider whether:

- road conditions have changed, and you should maybe adjust your setting
- the oil level is low
- there may be a problem with the nozzle system, or other part of the PRO-OILER system.
  See **Troubleshooting** for more information

4.3 Some general maintenance tips

If your preference is to run on the rich side

When using oil (instead of tacky spray-on grease), the chain is ***self-cleaning***; that is to say, the oil ***flings off*** taking the dirt particles with it.

The richer your general setting, the more pronounced the self-cleaning effect, and there comes a point where the chain always looks clean, shiny and new.

For many PRO-OILER owners, this is the perfect scenario – the only downside is a bit more fling-off.

The fling-off is just oil, not a sticky gunge as with spray-on lubricants, so it is ***easy to clean off***.

To remove fling-off, you can:

- wash the surfaces with standard detergent products suitable for automotive use
- spray the surfaces with WD40 or similar, then wipe off with a paper towel or rag
- spray WD40 onto a paper towel or rag, then wipe the surfaces clean
- or of course, whatever favourite method you have developed…

If your preference is to run on the lean side

You can also run the PRO-OILER using leaner settings, where the chain's rollers/bushings are fully lubricated, and the o-rings have enough coverage, but where the quantity of oil coming onto the chain is not sufficient to ***wash*** it in oil, and so the outside chain plates can dry out and collect a thin layer of dust.

There will still be some fling-off - what goes onto the chain also comes off it, but just less of it.

Remove the fling-off simply using one of the techniques mentioned above.

But in addition, you may wish to wipe down the chain itself:
Spray WD40 or similar onto a paper towel or rag. This takes just one or two passes of the chain – no rubbing is needed, just wipe.

Never wipe the chain down with the bike on a stand and the engine running in gear. This is just as (or maybe even more) likely to remove your fingers as being careless with a chainsaw or circular saw.

Anti-corrosion tips

Oil is not tacky like chain-grease, so it can eventually wash off when left standing out in the rain.

If you will be leaving the bike out in wet conditions, you could do one of the following quick fixes:

- Crank up the oil delivery for a while before you reach your destination, either by selecting setting **12**/**S5**, or by running **prime** a few times to soak the chain.
- Wipe the chain with a well-oiled rag

But there is another type of solution:
Apply a dedicated anti-corrosion oil to the chain.
There are many anti-corrosion products on the market, each with their pro's and con's – and some of these may be suitable for use on an o-ring chain – but others may attack the o-rings.

One product we know for certain is highly effective and guaranteed harmless is **ACF-50** from Lear Chemicals – do an Internet search to find out how it works.

We ourselves, and a number of our customers, have tested ACF-50 with success – and in fact we have several bikes running with 10% ACF-50 mixed into the lubricating oil.

Important: ACF-50 is 100% compatible with both the chain's o-rings and the pump's seals

5. Environmental Info

Q: The PRO-OILER is a total loss lubrication system - surely this is harmful to the environment?

In theory yes. 1L of oil enters the eco-system every 70,000km

But in reality:

A: The net environmental effect of fitting a PRO-OILER is very firmly positive

Let's consider the following points:

Per 10.000km a "typical" motorcycle has consumed approximately

- motor oil (burnt/vented and unburned): 1L (if your engine consumes 100ml/1,000km)
- motor oil (oil changes): 5L (at 3.5L per oil change at 6,000km)
- fuel: 700L (at 7L/100km consumption)
- spray-on lube + solvent: 2L (at 100ml per application each 500km)

Over 10,000km a PRO-OILER will consume approx ***0.15L*** of oil.
The PRO-OILER's consumption works out at around 70,000km/L for a typical 530 chain, and even less than that for the smaller sizes.

The one ***crucial*** point when considering the PRO-OILER's environmental impact is this:

Being a continuous lubrication system, PRO-OILER leads to a reduction of emissions because a poorly lubricated chain can easily consume 5% of engine power - or put another way, use 5% more fuel for the same distance and speed.

The power consumption of poorly lubed chains has been proven countless thousands of times on dynomometers worldwide. In fact, in especially tough environments like moto-cross, the chain can cost 5-10% of power by the end of a *single race!*

Let's be really conservative, and say that a PRO-OILER can improve your efficiency by 3% on average, then per 10.000km, for the 0.15L oil used in the PRO-OILER you would:

- use 21L less fuel
- reduce emissions of CO2, CO, and Nox correspondingly
- save 2L of lubricant suspended in volatile solvent
- due to the much extended life of the chain and sprockets, save the energy required in steel production and fabrication, pro-rata

Installation FAQ

1. Speedo/Distance signal

1.1 Why does the PRO-OILER need a speed/distance signal?

What matters to the chain is not the length of ***time*** you have been riding, but how ***far*** you you have travelled.

The PRO-OILER's operating system thinks in terms of "wheel revolutions per pump stroke".
All settings are expressed in this way - for example, table 10 setting 3 = 2992 wheel revolutions per pump stroke.

See **FAQ**: ***Background info***

1.2 Do I need the reed switch + magnet or the electronic speedo connection?

*If your bike has a **mechanical** (cable-driven) speedometer:*

You need the ***reed switch + magnet*** to generate a signal.
There is no electronic signal to tap into, so the PRO-OILER needs to generate its own signal to register the distance covered.

However, since the mid-90's more and more bikes are being fitted with electronic speedometer drives, and currently most large and middleweight bikes have one.

*If your bike has an **electronic** speedometer drive,*

Under normal circumstances, you would be best off configuring the PRO-OILER for ***speedo-sensor*** operation.

The main reason is that, whilst quality reed switches like those used by PRO-OILER are in and of themselves very reliable, there's a range of every-day hazards - like pulling on the wires or knocking the switch out of position at wheel-change time.

Once the electrical connection is made by tapping the electronic speedo signal wire, then that's it - so the electronic speedo version is potentially more reliable.

Last but not least, tapping the speedometer signal wire is easier than installing the reed switch and magnet combo.

1.3 I already have a PRO-OILER with a reed switch + magnet setup - can I swap to the speedometer sensor version?

If your bike has a mechanical speedometer drive, no.

If you have an electronic speedometer drive, then yes, you can swap.

Versions 2.05, 2.06 up to November 2004

If you have controller version 2.05 or 2.06 (up to November 2004) you would need to upgrade the controller unit. PRO-OILER operates a part-exchange scheme to allow you to upgrade - see the SHOP on the PRO-OILER website for details.

Do you need to swap?

No - it just depends how you feel about the reed switch setup, and whether you are affected by cosmetic considerations.

If you are changing bike, and your new one has an electronic speedo, then this probably would be the time to swap.

Versions 2.07, 2.08 , 2.09

From version 2.07 (November 2004) onwards, you do not need a new controller:

- connect up the correct wires
- select “electronic speedo” operation
- programme the Correction Factor

Important:

If you have been using the reed switch + magnet, and now wish to use the electronic speedo connection (for example, you bought a new bike with an electronic speedo drive):

You must remove the capacitor which connects blocks 1+2 in the junction box.

This is necessary because this capacitor can filter the electronic speedo signal.

For details on how to do this, see ***Manual***: *2.3.2 Junction Box*

1.4 What are the differences in operation between using the speedo sensor vs the reed switch?

In operation, there is ***no difference*** at all between the two.
So, your settings and tables are all strictly the same.

However, what you need to understand is that the PRO-OILER has ***2x completely separate circuits*** for dealing with the incoming signals.

For reed switch operation:

Connect the ***white wire*** on block #4 in the junction box.

The PRO-OILER controller provides the power for the reed switch. The 2 wires connected on blocks 1+2 in the junction box are for signal and earth.

For speedo sensor operation:

Connect the ***blue wire*** on block #4 in the junction box.

Most speedo sensors are the “Hall effect” type. The bike's own computer provides the power and earth. Only the ***signal wire*** is connected in the junction box (on block #1) – block #2 is unused.

There are many different voltages in use, so the PRO-OILER is configured deal with any + voltage up to 12V

- any voltage difference greater than 1.5 between on/off is treated as a signal.
- negative voltages are corrected to 0V

The PRO-OILER does not in any way modify the signal, as this could affect the speedometer.

1.5 What is the "Correction Factor"?

The PRO-OILER's operating system thinks in terms of "wheel revolutions per pump stroke".

In the reed switch + magnet case, it’s automatically 1x wheel revolution = 1x signal = 1:1 ratio

However, for the speedo signal, there are a huge range of possible signals per wheel revolution, ranging from 2 (2001 Bandit 1200) to 92 (Fazer 1000).

We need a Correction Factor to bring everything back to our 1x signal per wheel revolution.

Example 1: sensor placed at the back wheel, reading off the disc bolts.

There may be 6x signals per revolution – we need a CF of 6.

Example 2: sensor placed at the gearbox sprocket.

Here there's many variations, but there's also the bikes gearing to think about.

The typical front sprocket spins approx 3x faster that the rear sprocket. If there are 6x signals per front sprocket revolution, and the gearing is 16F:43R, this gives:

6 x 43/16 = 6 x 2.69 = 16.14

Don't worry, you don't need to know how many signals the sensor generates, or even know your bikes gearing!

You use the PRO-OILER's built-in ***signal-counting mode*** to work out how many signals there are per wheel revolution.

Turn the wheel 5x by hand (the more turns the more precise the result), then simply divide the figure shown on the controller's display by the number of turns - this is your "correction factor"

In example 2, we need to programme the correction factor of 16.14 into the controller, so we can come back to our 1:1 ratio.

See **Manual**: *3.2 Configuring the speedometer signal*

Notes:

- Manufacturers do not normally reveal the specification for the sensors signal - so most of the time there's no way of knowing how many pulses there are per revolution without actually counting them.
- Because the manufacturers can (and do) change the pulses per revolution generated by their speedo sensors (even during the life of a single bike model), PRO-OILER cannot assume anything.
- This is the reason it's essential to do the pulse-counting exercise!

2. *Reed switch + magnet*

2.1 Does it matter if I fit the switch to the front or the rear wheel?

The "recommended" location for the reed switch would be the rear wheel, purely and simply because it's ***easier*** on ***most*** bikes.

- There's no ***technical*** problem at all with fitting to the front, though the routing the wiring is a little trickier than when fitted to the rear wheel.
- There are some bikes where a rear wheel fitment is not possible, or very difficult - mainly older single-sided swingarm machines like the Honda 90-93 VFR RC36 I

However…

- Most bikes have "solid" rear discs, as opposed to "floating" discs which are normally found on the front. The carriers and bolts on floating discs run far cooler than those of solid discs
- Magnets can lose their magnetism when subjected to excessive heat (>80C), which can lead to a loss of the signal.
- The solid rear disc carrier and disc bolts can get very hot when used hard - for example on mountain passes. If you ride in these environments, then consider fitting the reed switch and magnet to the front wheel

2.2 Does the position of the reed switch matter?

As long as it works, not really!

Here are some do's and don'ts:

- If possible, glue the switch to the caliper carrier (if fitting to the rear wheel)
- Place the magnet in the socket head of a disc bolt
- Keep the path of the magnet as close as possible to 90 degrees past the reed switch
- The reed switch is more sensitive in the two outer 1/3 than in the middle (see dia. 1)

- Do not bend the switch; this can break it
- If you fix it with a cable-tie, do not over-tighten the tie
- Do not glue the magnet to a solid disc rotor - the glue will not hold due to the heat
- Do not pass the magnet along the *length* of the switch (see dia 2)

It's best not to place the reed switch on a surface which moves relative to the magnet, for example on the swing-arm itself.

- As you adjust the chain, the magnet may move out of range, resulting in a loss of signal.
- Having said this, if you do mount the switch on the swing-arm, just check for a signal when you have adjusted the chain - or use a bracket with an elongated hole

Anyway, as you are using a PRO-OILER, you will not need to adjust your chain very often!

- It's worth putting some thought into placement of the reed switch - there will often be more than one workable location.
- Think about how vulnerable the switch will be at wheel-change time. This is a major factor in deciding on a location

2.3 The magnet

The magnet supplied is a powerful neodymium 6mm dia x 4mm high button (or 5x4 or 6x6 mm depending on the bike model)

Many bikes have M8 socket head (allen) brake rotor fixing bolts, and the ideal is to fit the magnet into the bolt head. The magnet will stay in the bolt head without need for any form of glue.

If you have M6 (rather than M8) socket head bolts, and you did not specify which bike you have at the time of ordering, PRO-OILER will post you a smaller 5x4mm magnet free of charge

If you have conventional hexagonal set-bolts, consider swapping one of the bolts for an allen disc mounting bolt. There is no technical problem with this - however...

- Make sure there is enough ***clearance*** - allen bolts usually have taller heads!
- Otherwise, glue the magnet to an aluminium bracket fixed by a disc bolt

Do not glue the magnet directly to the brake rotor!

There is no glue available that can withstand the heat generated by a solid brake rotor. However, you may be able to glue the magnet to the disc ***carrier*** of a ***floating*** disc, as these stay cool.

To remove the magnet from the bolt head, use a magnetized screwdriver or another magnet.

2.4 I already have a Sigma bicycle computer reed switch and magnet fitted to the front wheel. Can I tap into this wiring for the Pro-Oiler?

You can use the Sigma's magnet, but not share the wiring.
The reason is that the Sigma can upset the PRO-OILER - and vice versa.

That's the "official" explanation. Some users *have* successfully used the Sigma's reed switch for the PRO-OILER.

Whatever, you will still need to check that you have a good signal, and that there is no interference!

3. Nozzles

3.1 How important is nozzle location?

Critical!

Delivering the oil to the chain is not just a question of pointing a tube somewhere near the chain, and firing the pump!

Correct placement and alignment makes a ***real*** difference to performance.
In fact, nozzle positioning is as important to the PRO-OILER's performance as tyre pressure is to your bike's handling.

Golden Rule:

The nozzle tips must be touching the sprocket, so that the oil is smeared onto the sprocket face.

As the oil slides outwards with centrifugal force it is collected by the chain's rollers - and by contact with the inside face of the inner chain links.

If the nozzle outlets are pointing into thin air, it's a pure ***lottery*** - some, or even most of the oil will be blown away in the airstream without ever getting to the chain.

This is not just inefficient, it also makes the oil deposition on the chain unpredictable - at some speeds more oil will happen to hit the chain than at others - the pattern of air turbulence around the sprocket area changes with speed.

The PRO-OILER's nozzle system has been steadily developed and refined as a result of careful research and testing - it would be fair to say that the nozzle design and construction has been the single most challenging area of the whole system.

Along the way, we have questioned and dispelled a popular misconception:
"The nozzles have to meet the sprocket at around the 6 o'clock position"
"Surely, if the nozzles are not at the 6 or 7 o'clock position the oil will get flung off before it reaches the chain?"
But actually, that's not so.

Consider this:

- the oil from a single pump pulse takes up to 15 seconds to all come out of the nozzles
- at 100km/hr, with the wheel turning at 14 revs per second, that's roughly 200 wheel revolutions
- that's the equivalent of 4 drops of oil is being smeared in a very thin film over a period of 200 revs
- the difference between 8 o'clock and 6.30 is miniscule - it's approx 1/100 second

This is why it is irrelevant whether the nozzle meets the sprocket at 8 o'clock or at 6-7 o'clock.

Originally, up until mid-2004, we used designs with long arms, depositing as per "convention" at around the 6.30 position.

The reasons we abandoned the long arm type in favour of the short arm nozzle design are many - and simple:

- The long arms required to reach the 6.30 position need to be substantial in order to hold their position firmly. Floppy arms are no good...
- The long arms magnify any misalignment and so make adjustment trickier
- Long arms are a serious problem where the sprocket bolts are widely-spaced and therefore close to the outside of the sprocket (eg. all single-sided swingarm models, and a number of specific bikes too). This leaves no room to place the nozzle tips in the narrow space left over.
- It's a similar problem with many current sports bikes which have a lightweight sprocket with a narrow lip holding the teeth, and weight-saving cutouts right up to the edge of the teeth.
- If the nozzle block rotates up or down, even slightly, this results in contact with either the chain or the sprocket holes/bolts - both of which scenarios can quickly destroy a nozzle.

The short-arm nozzle avoids all of these disadvantages.

It is clearly the way to go - subject to one thing: how does it perform?

With the PRO-OILER's precise metering, it was easy to test whether there was any difference in efficiency - which would show up by requiring a change in settings.

The result was crystal clear - ***no difference whatsoever!***

This has been confirmed systematically by comparing the settings used by individual bike models fitted with both types, and the results from those who have upgraded to the short-arm type.

3.2 Why is a twin nozzle better than a single nozzle?

This is a BIG issue!

To explain this you need to bear in mind that there are basically 3 aspects to lubing a chain:

1. The most important point is to get the oil into the ***bushings and rollers***.

   This is the area where the wear occurs, resulting in so-called chain "stretch" - the play between the inside of the rollers and the bushing increases. Lack of lubrication here is damaging to the chain - and is the main reason why spray-on lubricants can't match the performance of continuous lubrication from a chain-oiler.

2. The ***o-rings*** also need lubricating to reduce heat build-up through friction at the outer contact area with the sideplates, and also to prevent degradation from UV radiation and chemicals in road grit which are aggressive to NBR rubber.

   To test the amount of resistance o-rings can generate on their own, here's an easy and safe experiment:

   - Spin the wheel by hand when the chain is dry and feel the resistance. This can often be so strong that it needs a lot of effort to do.
   - Then take a can of WD40 and quickly spray the chain o-rings on each side (not the rollers - we want to isolate the effect of friction in the o-rings here).
   -

   The wheel will ***instantly*** turn more freely - due entirely to the reduced friction between the o-rings and the plates. Dry rubber rings cause a ***lot*** of friction and heat build-up.

   Don't worry, WD40 is 100% compatible with NBR o-ring seals!

3. ***Corrosion protection*** for the side-plates. In reality more of a cosmetic issue, but still a point - a rusty chain is not a pretty sight!

Gravity feed chain-oilers have been using a ***single*** nozzle for years, so what's the problem?

- A single nozzle setup lubricates ***one side*** of the chain ***better*** than the other.
- *Important:* the main job of getting oil into the bushing/roller area is achieved just as effectively by single as by twin nozzles - the oil is sucked into the bushing and roller area by capillary action.
- This is the main job - but it is *not* the only one!
- The pair of outer plates and o-rings (the ones furthest from the wheel) will also be lubed because you are depositing the oil onto the outside face of the sprocket. However, the plates on the chain run next to the wheel may not be receiving enough oil to provide any corrosion protection, and much more serious - not even lubricate the o-rings.
- The only way a single nozzle setup can get oil to the plates and o-rings next to the wheel is by being set up to run ***rich*** - then the oil gets to this area by means of aerodynamic turbulence - the swirling air literally does the job of coating the chain with oil. Fling-off is being left to do the job – and you need *more* fling-off!
- On a classic gravity feed system the oil deposition is varying all the time with temperature and speed changes - at high temperatures more oil is flowing, and at low speeds one and the same setting will be too rich
- This rich running is all part of life with a gravity feed system, but it does mean that on average the inside links and o-ring should be well lubed - but the price of this is a lot of fling-off
- The PRO-OILER's delivery does not vary in this way, so a single nozzle on a PRO-OILER needs to be set rich enough so that turbulence gets the oil to the inner links and o-rings. This somewhat defeats the advantages of the PRO-OILER's efficient delivery!!
- The double disadvantage here is that if you run a PRO-OILER with a single nozzle at low speeds, there won't be enough turbulence to distribute oil to the inside o-rings and plates of the chain - this "distribution" will only occur at higher speeds.
- A very simple experiment can demonstrate this (using a PRO-OILER with a single nozzle - or a twin nozzle with the inside opening blocked tgemporarily by grease):
- Run the chain fairly dry at low speeds for 50+ kms (so that you can see a clear difference between the condition of the outer and inner plates and o-rings)
- Then go out on the open road at 120km/h or more for 50kms. You will see the chain is more evenly lubed after running at higher speed.

The answer to the whole problem is to use a ***twin nozzle*** setup

- Then a ***lean setting*** can be used
- The entire chain gets ***just enough*** oil to lube and protect it, but with a minimum of fling-off. Turbulence plays a much smaller part in getting the oil to where it needs to be - it's only really a factor in coating the outside of the outer links.

Advantages all round, and the reason that PRO-OILER ***strongly*** encourages wherever possible the fitting of a twin nozzle setup - and why the twin nozzle is included as part of the system.

3.3 Can I place the nozzle on the front sprocket?

In principle yes, but there are some practical disadvantages:

- It's inconvenient to get access to the nozzle
  - for maintenance
  - or even just to check it
  - or see the oil coming out when you prime the lines
- To check the nozzle's condition you may have to take the cover off, and on some bikes that can mean removing the fairing.
- Bear in mind the nozzle must be placed either
  - above the lower run of the chain - the top run is not viable because the oil will fling off straight away as it goes round the sprocket.
  - or depositing oil on the rear face of the front sprocket, and from there it gets centrifuged into the chain.

However, for bikes used off-road, there can be very good reasons to fit the nozzle(s) at the front sprocket. The setup may be less efficient, but:

- A nozzle setup on the rear sprocket in hard off-road use can be vulnerable to damage from all sorts of sources, whilst up front the nozzle is better protected
- In particular, if you ride in deep mud, or through brush, then in fact the front sprocket may be the only option

3.4 Does the nozzle material matter? Can I use a brass or aluminium tube?

Yes, the material does matter. ***A lot!***

Metal nozzles may look attractive initially, but they have ***serious disadvantages*** in practice.

- Thin-gauge brass and aluminium tubing is extremely ***fragile***.

  The slightest contact can bend, deform, or clamp the nozzle tube shut. And once deformed, because of the poor elasticity, they may be permanently damaged and need replacement. Potential disaster when away on a trip.
- The reinforced polyamid tubing used by PRO-OILER has ***proven ability*** as nozzle material
  - firm enough to hold its shape and position.
  - flexible enough to survive rough handling – for example at tyre-changing time
  - significant wear resistance - the nozzle opening seldom deforms.

3.5 What about wheel changing with the nozzle in position?

Wheel change time can literally be ***crunch-time*** for the nozzle - and this applies whether you have a PRO-OILER twin or single nozzle, or the nozzle from a previous oiler

From experience, this is when most nozzle damage occurs.

- If you have the PRO-OILER Twin Nozzle, undo the M5 spindle bolt and move the nozzle assembly out of the way.
- In other cases... just be extra careful, and if someone else is doing the wheel-change - make them aware of the nozzle system.

Don't forget to re-fit and check alignment of the nozzle assembly afterwards!

Tip: If you are using a Twin Nozzle and going away on a long trip, you could take along a spare. Losing your nozzle could be a "show-stopper"...

3.6 Single-sided and specific or unusual swing-arm issues

Bikes with single-sided swing-arms present special difficulties for nozzle fitment because they all have the sprocket bolts very close to outside edge of the sprocket.

Then there's little space left to fit a nozzle outlet against the sprocket.

Most such bikes are catered for with a model-specific nozzle assembly (VFR all years, Triumph, Ducati, Aprilia) Please check *www.pro-oiler.com* to see which ones.

There are a small number of bikes where the shape of the swingarm (or fittings and brackets) means that the universal PRO-OILER nozzle assembly cannot be used without special adapters.

Adapters exist for many such machines like the Honda Africa Twin, Transalp, Aprilia RSV's all types, KTM's, sports-bikes with bracing under the main swing-arm member (eg. 05 R1) - and there various others.

4. Oil Container

4.1 What's the best position for the container?

The key points are these:

- The breather notch must be at the highest point of the container – not submerged in oil
- The more vertical the container, the more oil it can take

In order of preference, with marks out of 10:

- Vertical: 10/10
- On its *narrow* side: 9/10 - the more vertical, the better.
- On its *wide* side, angled up at more than 60deg: 9/10
- On its *wide* side, angled up at between approx 60 down to 20 deg: 9/10 down to 4/10
- Anything less than approx 20deg: 3/10 – this means you need to limit the oil volume to say 60%, and also keep a higher minumum oil level

Cap pointing downwards: **0/10**

There is no reason to have the cap pointing downwards – just turn the bottle around.

This is a serious safety issue.

- If the cap comes off, then all the oil will pour out instantly.
- If the notch is submerged, this can lead to a syphon action, emptying the container in minutes.
- If all this oil hits the back wheel it can lead to an accident.

4.2 What is the maximum oil level in the container?

The container should not be overfilled. This means:

- When the bike is vertical or on the side-stand, the oil level should be min. 10mm below the outlet connection.
- The more vertical the container is positioned, the greater the quantity of oil that can go in.

In addition, the more vertical the container, the lower the oil level can be allowed to get before needing a refill.

Why?

The oil will slosh about in the container with acceleration and braking

- When the container is fairly full it's not so critical
- But when the container is only 20% full, then the scavenge can draw air instead of oil if the pump stroke happens when all the oil is at the other end of the container due to these forces. In the worst case scenario, this could lead to the chain drying out if too many pump strokes draw air

Rules of thumb:

4.3 Can the container be mounted with the cap pointing downwards?

Never!
See warning in point 1. above

4.4 Can I locate the container on its side?

Yes, however, see point 1. above

Both container types: you will need an effective breather arrangement as the breather outlet will be frequently submerged - play safe. (see Breather)

Bear in mind the usable capacity of the container will be significantly reduced - you need to keep the container more topped up, and the maximum fill is reduced (see point 2)

4.5 What's the best way to refill the container?

Screw-cap type:

- Unscrew the cap and refill...

Older, plug type:

Pull the brass tube out from the silicone tube connecting it to the feed line to the pump (make sure the outlet of the tube from the pump is higher than the pump itself - otherwise, the tube can drain)

~~If necessary, rem~~ove the container from the bike

With a small flat-head screwdriver, turn the screw out in the top 1/2 a turn at a time, pulling/twisting the plug with steady force until it starts to move. Repeat until it does move before wiggling it out of the neck.

~~The reason for d~~oing it one-step-at-a-time is that the nut on the inside can (and will) drop off into the oil if you turn the screw too far!

Fill the bottle, though no more than about 75%

Use an old-fashioned pumped oil can.

Line up the marks on the bottle and top, push/wiggle the top back in and re-tighten the screw

Trying to fill the bottle through the breather is messy.

It can be done, but cyanide kills you quicker!

4.6 Why do I need a breather notch ?

- As the oil is consumed, the container needs to take in air to compensate.
- Air in the container expands and contracts with temperature changes - which can be significant if the container is mounted in the typical underseat area.
- If the air in the container can't expand and contract freely then this may cause sealing problems in the oil line connectors.
- If the breather notch is blocked and the air in the container expands with the heat, this could pressurize the pumps intake valve - if it opens, this could result in a leak.
- If the pump is forced to suck too hard, this can reduce its effective output make the oil delivery unpredictable - or even halt it altogether.

5. Oil Lines + priming

5.1 I already have a chain-oiler. Do I need to replace those lines with ones provided?

Yes.

The Pro-Oiler system is ***pumped***, which means:

- It's able to push oil through much smaller ID tubing (1.8mm) than gravity feed systems (which typically use 5mm OD x 3mm ID polyurethane tubing)
- Keeping the quantity of oil in the lines as low as possible is a ***major plus*** all round, because:
  - The lower the oil volume in the line, the quicker the lines fill when priming. See **FAQ**: *Priming*
  - 1m of 3mm ID line contains 7.07ml of fluid
  - 1m of 1.8mm ID line contains 2.54ml - just over 1/3 as much
  - On a normal "dry" setting, it takes about 170km to ***pump*** the contents of a 1m length of 1.8mm ID line, but... about ***470km*** of 3mm ID line!
- Last but not least; the large diameter tubing of the gravity feed system increases the weight of the column of oil in the line – this pulls on the pump's seals and can cause the an oil drip when the system is off.

5.2 I have air bubbles in the line. Is this a problem?

That depends.

It is critically important to work out ***why*** the air is there.

Air in the lines can be an indication of one of the following:

- Small air bubbles (up to 5mm long) in the lines after ***priming*** empty oil lines
  - harmless
- ***Low oil level***, or scavenge in the oil container is/has been stuck out of the oil and ***drawn air***
  - easily fixed by topping up the oil level. See **FAQ**:*Oil Container* for more info on the oil level
- An air leak in the tubing ***upstream*** of the pump
  - serious, can disrupt or halt lubrication
- An air leak in the tubing ***downstream*** of the pump
  - critical, the line can drain while the system is off, and disrupt or halt lubrication

See **Troubleshooting** for more information on air in the oil lines.

5.3 There is a trace of oil at a junction between a line and connector. Is this a problem?

- If there is any air in the lines downstream, then this may be the point at which the air is entering. In this case, yes it is a problem
- If there is no air in the lines, then it is not essential to fix the problem.

5.4 I'd like to use brake-line or brass tubing instead of the lines provided. Is that a problem?

Functionally no. However there is an important issue:

- If there is any air in the lines, then you will not be able see it.
  - This is a major problem for troubleshooting oil delivery issues
  - It makes priming hit and miss.
- If you wish to create a fixed and convoluted section (for example, to follow the contours of the inside of the swing-arm), then consider using the provided 3mm od tubing with a wire insert to give it the required shape. You can also lightly heat the polyamide tubing to form it - practice first on a spare piece!

5.5 Priming

To run a Prime cycle:

- press and hold [+] until the Prime cycle is triggered - you will see the pulses flashing up on the display
- once the Prime cycle has started, you can release the button.

When the oil lines are connected, place a container or paper towel under the nozzles to catch the oil coming out.

Run Prime until you see oil coming out of the nozzles, and the line contains no air bubbles longer than 5mm.

It can take 10-20 cycles before the oil from the container reaches the pump, and another 10-20 cycles once the oil has filled the pump.

The pump needs 12V to operate.
If your battery is even a little bit flat, then the pump may not be getting enough juice to fire.
Note: the controller only needs 5.5V to run
Start the engine – then the voltage should rise to over 13V

You must fill the oil lines downstream from the pump. Unlike a gravity feed system, the lines ***will not fill themselves*** - the oil needs to be ***pumped***.

1m of oil line contains 2.54ml of oil - that can be 200km of riding before oil reaches the chain!

If necessary, go to **Troubleshooting** for more info.

Note: the pump can make quite a lot of noise when it's pumping air, and also get very warm. This is normal and harmless.