

Zero Friction Cycling



Ultrasonic Guide and race chain guide.

Not needed for initial solvent cleaning of chains.

If you have one, it will have a slight advantage over container method if used properly.

It will remove tiny particles of metal from manufacture that container will not.

- You do need to degas (refer final page in doc).
- Solvent – use outdoor especially cheap ultrasonic as flammable vapours and open electronics.
- Aqueous safer – more expensive.
- Check what power your ultrasonic is per litre.

****DEDICATED RACE CHAIN – General;**

- If you race, you should absolutely, definitely, no ifs nor buts about it, have a dedicated race chain.
- This does not mean you have to buy a fully optimized race chain, or try to fully optimize up one yourself, just having a chain reserved for races only is very, very smart and cheap way to save watts on race day.
- You will not see a racer at any decent level rock up to an important race on same chain they have just hammered out last few thousand km's of last training block.
- Even on best lubricants known, your chain just does so, so much work with so many moving parts under very high load, exposed to outside

contamination – loss of efficiency is inevitable as the thousands of km's clock up from training.

- It costs no more to have a dedicated race chain. Sooner or later you always need another chain, so you are just pre buying your next chain. When training chain is moved on as at 0.5% wear, race chain moves over to be next training chain, buy one new chain as per normal to be dedicated race chain.
- Same for immersive waxers with wax pot. For the big price of one more \$20 slow cooker pot, and pre buying your next bag of wax – you will have a dedicated race wax pot.
- As you will be following below instructions to keep dedicated race chain mint between races, the wax in race pot will remain 99.9% contamination free and fastest possible.
- Again, when it is time to move on training wax, race wax moves over to training pot, fresh bag into race pot. Easy, costs no more other than one more \$20 slow cooker, super super smart vs putting race chain into wax that may have seen 20 to 30 re-waxes and the contamination that comes in with it from your training chain that will not have an optimization clean between each re-wax (not viable, do not do the below for training chains – race chains only).

Quick step out of race chains for a moment – Ultrasonic cleaning general guide For general maintenance – wet lubes.

- If using wet lubes ultrasonic can be a brilliant periodic maintenance tool.
- Will clean contamination from nooks & crannies and fissures that agitated container cleaning will not.
- Do heavy lifting first with solvent and agitated container
- Ultrasonic is for final rounds only – if you use to start and solvent goes black after 20 seconds, what good cleaning is happening after that if what is cleaning chain is dirty?

- Rip through bulk clean first with agitated container baths, then move to ultrasonic to get into tiny nooks, crannies & fissures that container bath cleaning will not
- You need to degas solvent / cleaning solution, then give a good run (degas instructions on final page of this guide). Hence a proper ultrasonic round takes about 30 mins. Hence using for initial rounds is extremely time inefficient. Clean bulk of contamination first with agitated solvent baths, then move to ultrasonic for final round/s.

For wax chains / wax lubes.

- Used to need temp control ultrasonic with specific ultrasonic solution.
- Now we have UFO clean – so effective cleaning of wax chains is much easier.
- Boiling water rinse first to do heavy lifting
- Then UFO clean in ultrasonic.
- Don't forget to degas
- Boiling water rinse to finish
- Dry, rewax / re wax lube.

Race chains – Initial Optimisation

- Break in – clean conditions– moderate power – ergo is best.
- Vary chain line angles and full articulation.
- Short break in for shimano, medium for YBN / Campy, long for sram.
- Agitated container baths first, then multiple rounds in ultrasonic – typically 3.
- Rinse and dry chain between each round.

- Wax with fresh wax or in dedicated race chain pot, or chosen lube (UFO, Graphene etc)
- Ultrasonic wax / Graphene in if you have temp control ultrasonic and a high power ultrasonic, if you don't have temp control or sufficient power – just swish in pot.
- Do not ultrasonic UFO drip in, as it goes too dry afterwards. Apply as per instructions.
- Wax break in run – 20 mins, vary to full chain line angles and full articulation (small / small ring & cogs)
- Fully optimized chains are usually about 1w faster vs just ultrasonic clean and wax
 - **Deeper information re ultrasonics is covered in re-optimisation section below – pls head to re-optimisation with ultrasonic for full detail re ultrasonic operation.
- May not sound like much, but it takes a lot more effort to extract that extra speed from an already very fast chain in having and ultrasonic cleaned and wax chain.
- It will stay lower friction over its lifespan.

RE-Optimising race chains.

If you do not have Ultrasonic

Wet lubes;

- Fully solvent flush clean until solvents come out as clear as went in.
- 1 to 2 x methylated spirits to ensure no film left from cleaning so clear chain metal for lube to bond to.
- Dry chain (heat gun / hair dryer / air compressor / hang for 4ish hrs).

- re lube – either as per mfg instructions ensuring full work in of lube in small / small gearing for maximum articulation & big / big for maximum separation of parts to aid penetration to pin.
- Thoroughly wipe all excess off chain with microfibre cloth. Lube needs to be inside chain, outside attracts contamination
- *(*Hence gimmicks like Muc-Offs UV light to ensure outside of chain fully coated in wet lube is a horrific idea. Beware of mfg's who recommend horrific things to do to your drivetrain. In my opinion – not stated as fact. (For the legal department) ;)*
- Consider if lubricant should be applied via immersive application to be 100% safe re penetration – noting this will entail a lot more work removing excess from outside of chain. Most wet lubricants do not need immersive at all, but some lubricants one may class as wet such as Squirt / Smoove / Grax / Tru tension tungsten all weather – immersive application is of great benefit.

Immersive Wax chains (mspeedwax / Silca hot melt) and chain coating lubricants (UFO drip, Silca SS drip, AB Graphene Lube.

*(**Note ZFC does not recommend Graphenwax at this time – refer to detail review)*

- Boiling water rinses x 3 in open container
- UFO clean soak in spare bidon for 5 to 10 mins - shake
- boiling water rinses until water goes from white to clear,
- dry with heat gun or hairdryer on high for 2 mins.
- methylated spirits rinses x 2
- dry with heat gun or hairdryer on high for 2 mins.
- Re-wax (preferably dedicated race wax pot) or
- Re -lube – take note of immersive application for Graphene lube. Ss drip has no penetration issues but still can benefit from soak and shake in 500ml screw top tub to get more lubrication in.

- SS drip can benefit from layer – so lube, allow full 24hr set, repeat / repeat – each application is around half carrier so further applications after initial application set can ensure greater amount of the actual lubricant inside chain.
- Applying UFO / SS drip on bike - ensuring full work in of lube in small / small gearing for maximum articulation & big / big for maximum separation of parts to aid penetration to pin.
- Thoroughly wipe all excess off chain with microfibre cloth. Lube needs to be inside chain, outside attracts contamination
- ****DO NOT IMMERSIVE APPLY UFO DRIP – the air exposure will make too viscous for future applications – it has no penetration issues. It will also benefit from a second layering application.**

TOP WAX EMULSION LUBRICANTS SUCH AS;

Smoove

Squirt

Tru Tension Tungsten All weather

To some extent – Allied grax – did not test as well as Smoove / squirt.

- > You are basically doing the cleaning parts of both the wet lubes and the wax lubes as boiling water will not melt off these waxes, but solvents often don't full clean either.
- > Solvent clean as per wet lube.
- > Ufo clean soak 5 to 10 mins in spare bidon / shake.
- > Boiling water flush rinses until water goes from white to clear.
- > Dry with hairdryer / heatgun for 2 mins
- > 2 x methylated spirits rinse to ensure no film
- > Dry with hairdryer / heatgun for 2 mins
- > **STRONGLY RECOMMEND APPLY IMMERSIVE FOR RACE CHAINS**

- > THESE LUBRICANTS HAVE BEEN TESTED 6 ways from Sunday and have been double blind tested multiple times and have significant penetration issues. If you apply as per mfg instructions, chain will feel great, but pin will not have sufficient lubrication.
- > Immersive application is the only way to negate penetration issues with these lubricants (and likely any other similar wax emulsion lubricants not yet tested).
- > 500ml screw top container from supermarket makes this very easy.
 - Pour any lubricants back into original containers after ultrasonic for less air exposure – especially Graphenlube due to price.

With ultrasonic - clean

- Basically same.
- Do container method first with either solvents or boiling water (depending on lube choice) to do initial heavy lifting clean
- Then move to ultrasonic – either with solvent or UFO clean.
- Degas ultrasonic cleaning solution for 10 mins.
- Clean for approx. 20 mins
- If used UFO clean – rinse with boiling water post clean until water goes from white to clear.
- 2 x methylated spirits rounds – 10 mins degas – 10 mins run in
- Re-wax preferably with dedicated race wax pot.

With ultrasonic – applying wax / lube.

- If planning to ultrasonic wax in, you will need temp control ultrasonic and set to 80dg. Melt wax in pot first then either pour into ultrasonic or into glass container that fits into ultrasonic.
- Clean any residual wax from ultrasonic with boiling water.
- Ultrasonic run the wax for a good 10 mins. Not much degas is needed as very low air absorption when pour in.
- If ultrasonic in wet lube/ wax emulsion lube – then you want a temp of around 30dg. This can be attained by using 500ml screw top container for lube, and mixing boiling + cold water to surround it.
- If you have to use water – account temp drop for a 10 min degas run. Not degassing water will greatly reduce ultrasonic power that reaches your lubricant container.
- If not wax – depending on lube you may be able to ultrasonic in, ie graphene lube, silca ss drip / Smoove
- To effectively ultrasonic in lubricants / wax – you do want a decently powerful ultrasonic – at least 30w ultrasonic power per litre – 50 is great. Beware cheap ultrasonics with temp often claim heating element power as part of ultrasonic power. This is not so, heating element may use 200w, leaving little US power per litre.

- You get what you pay for with ultrasonics. Beware seemingly powerful ultrasonics but have large tank (ie 6l, or 10l – they will have low power per litre).
- The ultrasonic picture at top of this guide is \$508 usd, has degas function and power boost function as well as temp control, and is a perfect size for chains. The power boost function helps ensure friction modifiers (moly / ws₂) particles in lubricant are fully distributed through lubricant / wax. I have 2 of the above as well as another ultrasonic well over 1k that has pulse and sweep wave to vary frequency and high power for ultrasonic waxing to ensure complete distribution though wax of friction modifiers. You do not need that level (I do as I am providing a professional service making worlds fastest race chains), but just know that a \$60 ultrasonic from Aliexpress will be maybe (maybe...) ok for cleaning, but may be very limited in its ability to effectively ultrasonic lubricant in vs a good swishing in wax pot or good shake in container for case of other lubricants.
- https://www.luxemed.com.au/products/gt-ultrasonic-cleaner?variant=39577563758776¤cy=AUD&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&utm_campaign=gs-2021-06-02&utm_source=google&utm_medium=smart_campaign&gclid=CjwKCAjwvuGJBhB1EiwACU1Aia8NEPTS50RGSqX3dcJ3xZiF1FMFc8aFYHHvQWDVDAAKKuKS4WpVRoCH-UQAvD_BwE
- Pour any lubricants back into original containers after ultrasonic for less air exposure – especially Graphenlube due to price.

- **Cannot ultrasonic apply UFO drip as it will dry out too much and not effectively be able to be used for future applications.**
- IF mspeedwax / Silca hot melt – wax break in run 20 mins to 30 mins light ergo to have in optimal zone pre race.

How to Degas Your Ultrasonic Cleaner Solution

Air and other gases contained in a freshly filled ultrasonic cleaning bath interfere with the cleaning performance of the ultrasonic cleaner. Evidence of these gases can be seen as bubbles that form on the inside of a standing glass of warm water. Ultrasonic cleaning is accomplished by the energy released from the violent collapse of tiny vacuum-filled bubbles. Air bubbles and dissolved air in the cleaning liquid absorb ultrasonic energy and inhibit the implosion of these cavitation bubbles, significantly reducing the cleaning effect.

Air can also be introduced as bubbles clinging to objects immersed in the ultrasonic bath.

Entrapped air can be removed two ways. Simply by running the ultrasonic cleaner a “degassing” occurs as heat and cavitation drive the air to the surface in the form of bubbles. If products to be cleaned are in the ultrasonic tank during this operation, the cleaning process is lengthened because a portion of the ultrasonic energy is diverted to the degassing operation.

A more practical and energy-efficient solution is to use an ultrasonic cleaner equipped with a [degas](#) function and carry out the process in advance of ultrasonic cleaning operations. A degas mode accelerates the removal of gas contained in cleaning solutions by pulsing, or introducing short breaks in the ultrasonic operating cycle which allows coalesced gas bubbles to rise to the surface and burst.

A degassing operation in degas mode usually lasts about 10 minutes, but depends on several factors. These include the amount of gas in the liquid, the volume of liquid being degassed, and the ultrasonic power employed.

In summary a degas mode available in certain ultrasonic cleaners such as manufactured by [Elma](#) greatly increases the speed of the degassing operation. This allows normal operations to start within 10 minutes rather than using ultrasonic cleaning action to accomplish degassing of fresh cleaning fluid. If an ultrasonic cleaner does not have a degas feature, each time the tank is filled with fresh solution

the degassing effect can add 30 minutes or more to the cleaning cycle. When a shop or lab uses a set cleaning cycle time for a specific application, it is imperative to degas the fresh solution before the cleaning process begins or the cycle time will be lengthened each time the tank is refilled.