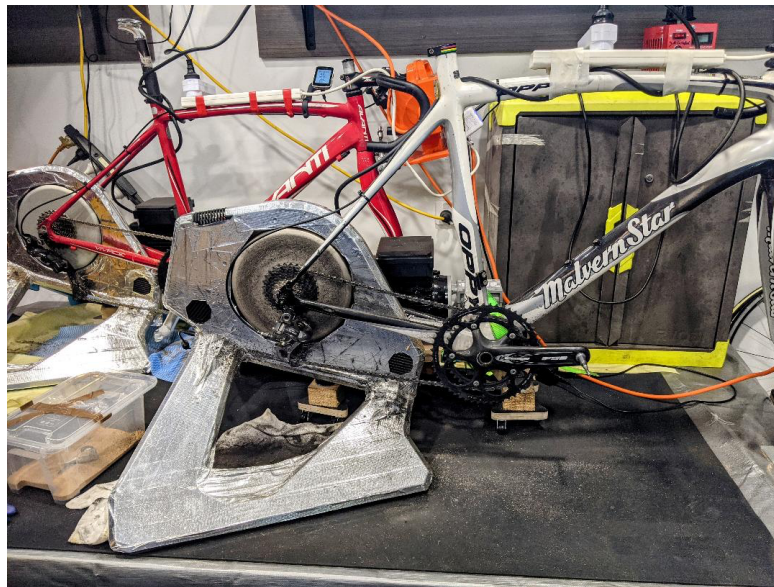


# Zero Friction Cycling

*Worlds most exhaustive independent bicycle chain lubricant and chain testing – over 300,000km of controlled testing to date.*



**Video demonstration ZFC test contamination**

<https://www.youtube.com/watch?v=2soU9J0Z7hk>

## Lubricant On Test : Rex Black Diamond

\*(And race day spray / drip)

Cost: \$59.90

Size – 50ml



Photo :

## **Manufacturers Description on package;**

Black diamond particles ultrasonically treated in REX R&D lab

Reduced friction and wear

Rain proof formula

Optimal combination of dry and wet weather lubrication performance

Wax based

Solvent free and non vaporizing

Silent and smooth drivetrain

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Race day liquid / spray;

Dirt and water repellent chain optimisation treatment. Improves lubrication longevity in dirty conditions. Keeps your drivetrain efficient until the finish line. Unique hydrophobic perfluorocarbon ptfe formula. Minimises chain wear – ultra long lasting lubrication

## **Manufacturers Description on website**

# BLACK DIAMOND

## ULTRASONICALLY TREATED IN REX R&D LAB

The secret of our new lube are the Black Diamond particles that are mixed into the lube in a time-consuming ultrasonication process at our factory's Racing Service lab.

The Black Diamond particles significantly improve the properties of the lube: Lower friction, lower wear and increased rain resistance.

In continuous metal-to-metal contact that occurs in drivetrain while riding, the particles form an ultra-thin and hard layer that minimizes friction and wear, and is also waterproof.

Best lubrication performance and longevity will be achieved after 3–4 applications, when the lube has completely penetrated into the chain.

# BECAUSE A CLEAN DRIVETRAIN IS AN EFFICIENT DRIVETRAIN

## UNMATCHED DIRT REPELLENCY WITH UNIQUE HYDROPHOBIC PERFLUOROCARBON PTFE FORMULA.

Rex Race Day Spray is a unique product for treating your chain and cassette by yourself, for extremely low friction and maximal dirt repellency.

Rex is an expert in fluorocarbon coatings and we have decades worth of expertise in manufacturing products for cross-country race skiing. Now, we are the first in the world to bring the same technology into cycling. Together with our Domestique Chain Lube, Race Day Spray forms a lubrication solution with unmatched longevity and dirt repellency.

The research and development for Race Day Spray was done together with the best athletes and world-known independent testing labs, to make sure the product meets Rex quality standards. Rex Race Day is manufactured at our factory in Hartola, Finland.



# THE TOUGHER THE CONDITIONS, MORE YOU BENEFIT.

**INDEPENDENT LAB TESTED AND PARIS-ROUBAIX PROVEN.**

In tests conducted by *Wheel Energy* testing laboratories, Race Day Spray produced impressive results:

- Drivetrain noise and friction are lower from the beginning of application. (-1dB.) Drivetrain noise stayed -1dB lower during the 5h dyno test.
- A Race Day Spray -treated chain that had been ridden for 7 hours in “spring classics” weather, (dusty, wet gravel, asphalt), gained only 0,5 watts friction when measured post-race and appeared completely clean!

- Chains that are treated with competing optimisation solutions like *UltraFast* process, typically gain 2.07 W from pre-race to post-race, even in shorter races. ( *As measured by Friction Facts in 2012* )
- Compared to a chain that has lost its lubrication in race, the advantage when using Rex Race Day Spray is **three extra watts in finish line sprint.**

## DO IT YOURSELF CHAIN OPTIMISATION

**WITHOUT EVEN REMOVING THE CHAIN FROM YOUR BIKE.  
THE ONLY PRODUCT THAT YOU CAN ALSO APPLY ON CASSETTE.**

Until now, optimising your chain has required purchasing a pre-optimised expensive chain, which becomes a normal chain when the optimisation wears off.

With Rex Race Day Spray, you can apply the optimisation treatment yourself without even removing the chain from bike. Instead of optimising only the chain, you can also treat the cassette for improved shifting and dirt repellency in extreme conditions.

In addition it is also economical: A single can of Race Day Spray gives you up to six chain treatments for a lower price than one readily optimised chain! For 2020. Race Day Spray has been upgraded with a more ample 85ml container, while the price remains the same.

**DOWNLOAD A PDF ABOUT REX RACE DAY SPRAY:**



# RACE DAY SPRAY FAQ:

## HOW LONG DOES THE TREATMENT LAST?

The effect of *Race Day Spray* coating lasts for hundreds of kilometers. When the chain starts to sound dry, you can apply more Rex chain lube. Before applying *Race Day Spray* again, clean the chain completely.

## CAN I USE RACE DAY SPRAY TOGETHER WITH AN ANOTHER CHAIN LUBE THAN REX DOMESTIQUE?

The formula of *Race Day Spray* has been developed to work together with our Domestique and Black Diamond chain lubes, and their ingredients are designed to complement each other. We do not recommend using it with an another brand chain lube. Please note that *Race Day Spray* is a coating and not a lubricant itself, and requires the use of Rex lube.

## CAN I APPLY IT ON MY MOUNTAIN BIKE?

Rex *Race Day Spray* is designed to be used in all cycling disciplines. In MTB use, the dirt repellency capabilities of *Race Day Spray* keep the drivetrain cleaner in extreme race conditions, reduce drivetrain wear, and ensure good shifting performance. Perfect for 24-hour races in muddy conditions, and amazingly easy to clean afterwards just by wiping with a dry cloth.

### HOW DOES IT COMPARE TO ALTERNATIVE PRODUCTS?

- Rex Race Day Spray is the only product that can be applied also onto rear cassette also. This is a big benefit in rainy, dusty and muddy conditions. The drivetrain stays efficient longer and shifting quality is better.
- Competing chain optimisation solutions are not meant for wet and muddy conditions, but to minimise friction in laboratory setting.  
But no one races in laboratory!
- Optimising your chain just got a whole lot cheaper, and you can use your favourite chain too. The recommended retail price is **79,90€**.  
For that you get up to six application times. No more purchasing an optimised chain for every race!

## APPLICATION INSTRUCTIONS:

- Degrease the chain for example with a chain cleaner tool. If the chain is brand new, remove stock grease completely.
- Apply Rex Domestique or Black Diamond generously (2-3 applications). This way we can make sure there is enough lubricant in the freshly degreased chain. Follow the instructions on the chain lube label.



- Use fingers to smoothen out and work the lube into rollers while back—————pedaling at least 3-4 revolutions.  
Repeat applying 1 drop per roller, using the same method————— as above. Lightly wipe off excess lube from the surface of the chain.
- Shake the Race Day Spray well before use.
- Spray onto chain from ~2 cm distance for a couple seconds while spinning the cranks backwards quickly, until the chain has rotated around once.
- Repeat also on the inner surface of chain near the top derailleur pulley.
- Let dry until chain appears white.
- When raining, apply also onto cassette. If you have disc brakes, protect the rotor.

After drying, (about 10 min.) the chain and cassette appear completely white. What you see on the surface is an unique blend of perfluorinated waxes and PTFE. The quickly drying liquid carrier solvent makes the coating go inside the chain links very effectively.

## ZFC REVIEW

**Here we go!!!**

Ha every time I go plan to get stuck into next detail review I'm telling myself I have to get more efficient as I am soooooo behind I need to get them done shorter and sharper – and yet it seems each detail review has a ton of stuff I need to cover for that review that I just cannot really skip.

Same is for this one – simply the testing for Rex on this was really involved, as we first tested black diamond in single application longevity test protocol, and it smashed some exciting new longevity records.

Then we tested black diamond + race day spray, and that smashed a very impressive new record in dry contamination conditions longevity.

Then we moved to main test, and to try to get best result we decided to do test of Black Diamond + Race day spray, but we found the test confirmed that a) Their instructions that race day spray works once on a black diamond treatment are correct, applying again just doesn't work, and b) Black diamond lube is so, so long lasting that following the standard test protocol ended up in the chain being way over lubricated which gave a worse wear result due to gathering more contamination vs the single application longevity result.

So the main test was re - run again without the race day spray, and with just one application per 1000km in clean test blocks + dry contamination test block, and 1 application per 500km in wet contamination test block. This meant for the main test black diamond only needed to be applied 7 times in total – for other lubricants going as deep into test by same period they would have had 23 applications across that 5000km of testing.

So we will have a little bit to unpack on all the groovy details we learned about Black diamond and race spray, how to best use, who it suits, and its key strengths.

### Lets get cracking on Rex Black Diamond Performance.

Here is where I will try to be more swift than usual – let’s see if I can put all this together relatively concisely considering the amount of testing done! Due to the variety of testing for BD / BD +RDS as we learnt what worked best and what didn’t, the structure of this review will not be set to my new (hopefully faster) detail review template, I am just going to need to cover everything part by part as we went along the journey – but the key takeaways for each section should be easy to obtain.

Firstly – Single application longevity results – this test is to see the effective treatment lifespan of a lubricant – when a jump in wear occurs, it is effectively done. The first test is a dry road cycling simulation, and black diamond just smashes everything tested to date – treatment longevity really is just such an amazing attribute of Black Diamond (for further information on the test and the adjusted results go to lubricant test page on ZFC website and download full file).

Lubricant	Km's to Jump Point	Km's to Wear allowance	Real world KM's Adjusted - Jump Point	Real World Km's to Wear allowance
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Rex Black Diamond	5,602	5602	1,867	1867
Revolubes	3,416	3416	1,139	1139
Rex Black Diamond + Race Day Spray	3,415	3415	1,138	1138
AB Graphene Lube	3,254	3254	1,000	1085
Rex Domestique	3,210	3210	1,067	1067
Mspeedwax New Formula	1,800	3063	600	1021
Silca Synergetic	2,333	2333	778	778
Allied Grax	2,089	2089	696	696
Silca Hot Melt	1,300	1595	433	531
UFO Drip V2	900	1182	300	394
AB Graphene Wax	300	420	100	140

In short, Black Diamond has practically off the charts treatment longevity. This will really suit cyclists who like to apply a lubricant and then just forget about lubricating their chain for ages and ages and ages. You will know when to re lube (everyone's riding is different and so your km's attained will vary vs test / other riders – but when it goes from silky smooth to noticeably dry – time to re lube. That will be a long time).

This also makes it a brilliant choice for dedicated ergo bikes, unless you are mad keen zwifter – a lot of people would go months to a year of indoor training on a single treatment of super low wear on their chain and drivetrain – handy stuff indeed.

Of course this also means that although a bottle is small, and not cheap – when you are using 1-2 ml per circa 1500km of dry road conditions cycling, that small bottle will last most dry road cyclists well north of 20,000km making black diamond EXTREMELY cheap with regards to just lubricant cost usage cost, with a test modelled cost of only \$18.00 worth of

lubricant use per \$10,000km of cycling. Compared to say rock n roll gold which is popular wet lubricant in the world, whilst a bottle is cheap, you need to use so much more and so much more often that you are looking at north of \$60 of lubricant cost per 10,000km. So just because a bottle is bigger and cheaper does not mean it is cheaper to use at all – and that is before we factor in wear rates which is the cost dominant part of your running costs. If you need to use 5ml of lubricant per application and an application lasts one quarter or one fifth as long as a lubricant where an application is circa 1ml – well, pretty quickly that more expensive bottle is going to slay the cheaper lubricant re cost of use.

I will be going into more detail on cost to run modelling overall that includes component wear rates – but suffice to say black diamond tested very low wear overall, and so again – a cheaper lubricant that wears your lovely components faster is not in fact cheaper to use than a more expensive lubricant that genuinely protects them from wear (*and obviously – you really want to avoid expensive lubricants that eat your components – refer to Muc-Off ludicrous AF detail review*).

**KEY TAKEAWAY 1** – Black Diamond has set a big new record for dry road condition treatment longevity, it is extremely low wear in this condition, it demonstrates no initial penetration issues, and usage amount of Black diamond is extremely low so a bottle lasts a very very long time (expect at least 20,000km per 30ml bottle in dry road riding conditions).

Testing for Black Diamond started very well.

Moving to main test protocol for Block 1 – No contamination, we can see that Black Diamond – whilst coming in at 7<sup>th</sup> position, 2.3% wear for this block is EXTREMELY LOW. Anything under 5% wear is really a top level result, ZFC has simply tested quite a number of the worlds best lubricants now. The result for Black Diamond shows it has ZERO initial penetration issues, which is a key assessment for any lubricant where cyclists are just going to apply and ride.

	Block 1 - No Contamination
Mspeedwax New Formula	0.0%
Molten Speed Wax Original Formula	0.0%
Silca Synergetic	0.0%
Silca Hot Melt	0.3%
Effetto Mariposa Flower power wax	2.3%
Ceramic Spd UFO Drip New Formula	2.3%
Rex Black Diamond	2.3%
Silca Drip Batch 2	2.9%
Revolubes	4.0%
Rex Domestique	5.1%
Tru Tension Tungsten Race - (*D.A)	5.4%
Rock N Roll Gold	8.9%
Muc Off Ludicrous AF	8.9%
Shimano Factory Grease	10.9%
Shimano Factory grease + NFS	10.9%

Shimano Factory grease + RNR Gold	10.9%
Nix Frix Shun	12.6%
Tru Tension Tungsten All Weather	14.0%
Session S-Wax	14.6%
Wolf tooth wt-1	16.9%
Smooove	19.1%
Squirt	19.1%
Allied GRAX	22.0%
AB Graphene Wax	22.0%
Cycle Star Gold	22.3%
White Lightning Epic Ride	22.9%
Muc Off Hydro Dynamic	27.6%
Wend wax 2	35.7%
Muc Off Nano Lube	37.7%

## What happens when contamination is introduced?

If you have been following ZFC for any length of time, you will know that I have been cautioning strongly against using wet lubricants for offroad use – it is just a miss match of use case to product – it is a simple fact that particles of dust stick on contact to wet lubricants, and the average wear rate of the TOP 5 best wet lubricants tested to date is circa TEN TIMES higher than the average wear rate of the TOP 5 non wet lubricants tested (all immersive wax / drip wax lubricants).

Black diamond is a wax lubricant, but unlike others that set to more of a chain coating or paste – black diamond does remain wet – ish.

The first test for just black diamond in the main test protocol BD came in at just over 20% wear for dry contamination block 2. For a wet (ish) lubricant – this was very good, the only wet lubricant ahead of BD was Silca synergetic at 18.6%.

However I knew from the single application longevity testing, that as the wear rate was lower at the 1000km mark on the single application, vs the result attained when BD was re applied during the block as per the test protocol, it was clear (and it was visually and audibly clear as well) that BD was WAY over applied during the main test block following the standard test protocol. This made the chain way more wet, which absorbs more contamination, and the more wet a chain is, this also provides a transport medium for contamination to move from outside the chain to inside chain (a key reason that if using a wet lubricant as much excess as practical should be wiped from outside of chain. For those of you using a uv light to ensure your muc off lubricant is completely coating the OUTSIDE of your chain, that is one of cyclings worst advice ever. In my opinion. And that muc-off R&D who develop their lubricants would absolutely know it is horrific advice. In my opinion).

So on the re test of BD, applying it just the once per 1000km dry block – BD recorded a wear rate of only 11.1%. Whilst this still doesn't quite match the top chain coating lubricants like UFO drip, Silca SS Drip, and the new Effetto Mariposa Flower Power wax, that is a clear new record for a wet lubricant in offroad conditions.



This once again reinforces the previous findings and theories that in offroad conditions, the least wet a wet lubricant may be just really helps, and the more wet a wet lubricant chain is, the higher the wear. Not only does more stick, but more wet just enables the contamination to move inside and abrade against key load and wear surfaces of your chain, wearing your chain oh so much faster, and wearing through hardened steel at a good rate is NOT (hopefully obviously) low friction running.

As such I continue the mission of trying to hammer home that if you ride offroad, avoid clearly wet lubricant options, and avoid companies that are trying to get you to ensure that all of the OUTSIDE of your chain is covered in a very WET lubricant – that is just murder to your drivetrain, and also avoid very wet lubricants that try to assuage you by claiming they “clean as they lubricate” – they do not (wolf tooth wt-1) as evidenced by the wear rate results for such lubricants which are frankly horrendous and your cost to run on such products vs top products is just holy batman so much higher.

Right that usual hammer home point done, back to Black Diamond, this result is forcing me to amend my long time advice of simply avoid wet lubricants if you ride offroad. Black Diamond although officially a wet lubricant is sufficiently contamination resistant that it is still a strong choice if you just do not like waxing / other wax lubricants that you find for you can gunk up or have too short a treatment lifespan.

Block 2 – Dry contamination test results below;

Lube	Block 2 - Dry Cont.
Mspeedwax New Formula	1.1%
Silca Hot Melt	1.7%

Tru Tension Tungsten Race (D.A)	2.0%
Effetto Mariposa Flower power wax	2.3%
Ceramic Spd UFO Drip New Formula	3.4%
Silca Drip Batch 2	4.6%
Session S-wax	5.7%
Tru Tension Tungsten All Weather	10.0%
Rex Black Diamond	11.1%
Molten Speed Wax Original Formula	<b>12.0%</b>
Smooove	<b>17.4%</b>
Allied GRAX	18.3%
Revolubes	18.3%
Silca Synergetic	18.6%
Shimano Factory Grease	20.8%
Squirt	<b>22.0%</b>
Shimano Factory Grease + NFS	27.4%
Nix Frix Shun	27.4%
Rex Domestique	28.6%
Rock N Roll Gold	<b>29.0%</b>
Shimano Factory Grease + RNR gold	29.0%
Cycle Star Gold	<b>30.9%</b>
Wend Wax 2	33.6%
White Lightning Epic Ride	<b>33.7%</b>
AB Graphene Wax	38.3%

Wolf tooth WT-1	52.9%
Muc Off Ludicrous AF	78%
Muc Off Hydro Dynamic	98.9%
Muc Off Nano	107.7%

**KEY TAKEAWAY 2 –** If wet lubricants are just how you roll and you don't like what most wax lubricants have been doing for you – (gunking up / treatment lifespan - one of those two reasons is the usual reason people fall back to a wet lubricant in offroad riding) – then Black Diamond is now the number one recommended wet lubricant for offroad use, and Synergetic is now number 2 recommendation. With black diamond you get still impressively low wear, and exceptional treatment lifespans, ease of application.

A caveat here thought is it is important NOT to overapply. If you do, as per testing, you could double your wear rate in offroad conditions. Black Diamond has shown over and over in testing that a treatment is still protecting chain from wear for long time after it is starting to sound and feel obviously dry. So re lubing when you start to feel treatment is getting dry is the right time, and not re lubing when treatment is still wet / wet-ish, and as should always be done for offroad riding – best practice is to frequently wipe excess from outside - use a microfibre cloth and an alcohol spray to lift surface contamination off and not press into chain – and this should definitely be done for all drip lubricants BEFORE RE LUBING otherwise the fresh lubricant will easily drag contamination sitting outside chain inside the chain where it will then merrily abrade away at key load and wear surfaces.

Used PROPERLY – we really have super easy to use wet lubricant in Black Diamond that can provide great low wear running and exceptional treatment lifespans for offroad cyclists.

Especially for e-mtb riders where the much higher power and offroad conditions is murder for treatment lifespans and wear, the exceptional longevity of black diamond is also making it a top recommendation for this application. Many of the top chain coating lubricants / waxes – they do a brilliant job of minimising wear and are very clean, but have fairly normal treatment lifespans to begin with, something that will be at least halved when using an e-mtb, and this can make for frequent re waxing or re-lubing which just simply does not suit all e-mtb riders. Black diamond delivers still very impressive low wear rates offroad, but with the longest known to date treatment lifespans and the ease of use of a wet lube (no penetration issues, no set times, easy cleaning etc). So if you have an e-bike – Black Diamond should be a top consideration as your lubricant of choice.

Speaking of the extremely impressive treatment longevity of Black Diamond in Dry offroad test conditions, below is the league table for single application longevity;

## DRY CONTAMINATION SINGLE APPLICATION LONGEVITY

Lubricant	Km's to Jump Point	Km's to Wear allowance	Real world KM's Adjusted - Jump Poi	Real World Km's to Wear allowance
Rex Black Diamond + RDS	2,642	3071	880	1023
Mspeedwax New Formula	1,650	1848	550	616
Rex Black Diamond	1,476	1476	489	489
AB Graphene Lube	1,449	1449	483	483
Allied Grax	1,265	1551	421	517
Rex Domestique	1,154	1154	385	385
Revolubes	1,100	1588	367	529
Silca Hot Melt	900	1030	300	343
Silca Synergetic	500	690	167	230
Ufo Drip v2	450	1078	150	360
AB Graphene Wax	300	420	100	140

## Whilst we are talking Contamination – what happens when we use Race Day Spray?

Rex's race day spray is something quite unique. It isn't cheap, and one must take heed that it works ONCE without then doing a full clean reset of chain and new BD + race day spray or race day drip application.

The race day spray / drip affects a chemical change in Black diamond (or Domestique), changing it from a wet lubricant to a dry chain coating lubricant.

What this means for BD is that you now have the contamination resistance like an immersive wax or chain coating wax lubricant, but with the extreme treatment lifespan of Black Diamond.

For long offroad events (Dry conditions) – there just would not be an event I can think of that is going to stress the treatment lifespan of BD + RDS

How practical is it?

I think for training / general riding – it is not super practical as it is a pretty expensive treatment, and it only works like that once – That means you cannot apply more BD when the treatment lifespan is nearing its end, apply more RDS, and get same chain coating result – the subsequent application will not set like the first application. To attain that brilliant super long lasting super contamination resistant treatment you would need to perfectly clean chain, re apply your BD, work in, wipe excess, apply RDS and allow to set. The cost of perfectly cleaning chain and re apply RDS / RDD – even though it is likely to only need to be done every approx. 800 to 1000km of offroad riding (remember dust is pretty variable stuff) – it is still a pretty expensive treatment (mind still cheaper than an immersive re application of Absolute Black Graphene lube which costs about \$50 and a pop!).

Realistically I think this treatment is for race events. If one is comparing to other top products on the market - the case is really only made if the event is going to exceed the effective treatment lifespan for those products – if not – an immersive wax of mspeedwax or hot melt, or an application of UFO Drip or Silca SS Drip, – they will all easily last most pretty decent length mtb or gravel events (not all dust is the same, but typically an immersive wax msw or hot melt will be good for at least 10hrs+, and drip lubes 5hrs +, so it is long events that push past those treatment lifespans). And of course – Black Diamond itself sans the Race day spray is not even going to blink at such event lengths.

If you were already using those products, unless you have a 24hr mtb or you take 15 to 20hrs+ to do unbound gravel – you will rarely need to seek a longer lasting option.

However, if you are a Black diamond user and you have a long offroad event coming up and you just want to keep dust out, you aren't happy with an 11% wear rate over 1000km you want to cut that in half and match the dry dust contamination resistance levels of the best such solid lubricants ever tested – well BD + RDS / RDD gives you that option.

There may not be a huge use case for such a treatment, but personally I think it is pretty cool (and it is very unique) to have a top wet lubricant option with extreme treatment longevity that can be changed from a wet lubricant to a dry chain coating lubricant, and keep its extreme treatment longevity, I have not seen the like of this before, and it was fun and exciting to discover this performance during the extensive testing of BD.

## What happens when things get wet?

Alrighty here we get a section where the review it is a bit messy, as the ZFC test results for wet contamination block are not quite a match with Rex's own testing and marketing claims – however it is possible in this case that the ZFC test is not reflective of actual performance - a couple of in and outs to cover on this – bear with me.

Rex do claim that Black Diamond is water proof and so is an all weather performance lubricant. And I will speak more to this soon, but Rex REALLY have done an exceptional amount of genuine work, investment and testing to prove / back their marketing claims, so they haven't just thrown this claim on because they think it sounds good and many other lubrications make same claim so why not jump on the bandwagon – Rex genuinely believe it and believe they have testing to prove it / back it up).



This performance attribute didn't show as outstanding in ZFC testing however, there are two possibilities why.

Firstly it could simply be that the ZFC wet contamination test protocol is notably more harsh than the wet conditions testing conducted by Rex including extensive field testing – the zfc wet contamination test block is pretty harsh, but it is deliberately so, I really need to put lubricants to the test. I do not want to recommend a lubricant as exceptional in harsh wet conditions, only for a cyclist to take that advice, ride in some harsh wet conditions, and find the lubricant badly wanting. One person riding on roads that are often washed clean by rain is different to one who rides along roads near the coastline that build up a lot of sand, and different to one who is riding on salted roads, or just generally really dirty roads that throw a lot of crap onto the chain when wet. If a lubricant performs well in the ZFC wet contamination block, it has really high odds of performing very well in your wet weather riding.

Secondly we do need to note that BD in this re test was only applied twice throughout this block due to its extreme treatment longevity, if it was tested via normal test protocol it would have had 7 re applications in this test block. The much lower application amount may have negatively impacted the result. Theoretically it doesn't need it due to its treatment lifespan, but more applications in wet riding may give it some chance of clearing out some of the contamination the water is transporting in, for all lubricants there is some small level of flush cleaning on re application, and also there will simply be a higher ratio of lubricant to contamination.

Unlike in the dry contamination test block where too much lubricant can be a major problem, if you are riding in the wet, the water is really doing all the heavy lifting re contamination stuff. There may be no extra penalty for pretty wet chain, or little penalty, and for many lubricants to try to help their treatment lifespan in the wet, it can actually be better overall to

err on slapping more lubricant on vs less – many lubricants have a much shorter treatment lifespan in wet so ensuring there is plenty to start with is fairly normal. So it is definitely possible that another re test using the standard re lube intervals in this test block would deliver lower wear rate results, and results more in line with Rex's own testing and claims.

And of course the result could be a combination of both points one and two.

Alas there are just limited resources to try to conduct a 3<sup>rd</sup> full main test of BD. Each main test takes A LOT of time, and I cannot just re test the wet contamination block in isolation as this would likely give a falsely lower reading vs other lubricant tests. By the nature of the test, all chains / lubes are hitting wet contamination block 4 with some level of contamination in the chain from the previous 3 blocks of testing, and this contamination will be causing wear – the wet contamination block then just adds more wear to whatever amount of wear it would have recorded otherwise throughout the 1000km block. To get a like for like vs synergetic I would need to conduct the main test again from the start, and then increase the re lubrication intervals to standard test protocol amount in block 4 to see if it improved, and at this time I just do not have the resources or machine time to re test this again, all 3 machines are just so backlogged with test bookings well into 2023.

Comparing to the highest performing drip lubricants in wet contamination block – Silca synergetic is numero uno at 27.4%, Nix Frix Shun was very similar at 28.6%, Tru Tension Tungsten all weather as a chain coating wax lubricant at 31%, and new kid on the block effetto mariposa flower power wax at 32%.

Rex black diamond clocked in at 42.6% - and 9<sup>th</sup> place overall for drip lubricants tested – but please bear in mind the caveats above to this result, it genuinely may not be reflective of what BD can deliver if you re apply more frequently if you are riding a lot in the wet.

Lube	Block 4 - Wet cont.
Silca Hot Melt	8.0%
Molten Speed Wax Original Formula	8.0%
Mspeedwax New Formula	9.1%
Silca Synergetic	27.4%
Shimano Factory Grease + NFS	28.6%
Nix Frix Shun	28.6%
Tru Tension Tungsten All Weather	31.0%
Effetto Mariposa Flower power wax	32.0%
Ceramic Spd UFO Drip New Formula	32.3%
Silca Drip Batch 2	36.9%
Tru Tension Tungsten Race (D.A)	38.3%
Allied GRAX	42.0%
Rex Black Diamond	42.6%
Rex Domestique	43.7%
Smoove	45.1%
Squirt	48.9%
Revolubes	61.7%
Cycle Star Gold	61.8%
Rock N Roll Gold	65.0%
Shimano Factory Grease + RNR gold	65.0%
Wend Wax 2	67.2%
White Lightning Epic Ride	67.4%
AB Graphene Wax	103.6%
Muc Off Hydro Dynamic	197.8%
Muc Off Nano	215.4%
Session S-wax	
Shimano Factory Grease	
Wolf tooth WT-1	
Muc Off Ludicrous AF	

**KEY TAKEAWAY 3** – A solid result in harsh wet conditions, but not as impressive a result as its excellent block 1 to 3 test results, and not matching the top drip lubricants tested to date – but take into account for this test BD had a much lower re application rate during the wet test block due to its extreme treatment longevity, and that it is entirely possible the wear rate result in this wet contamination block could be reduced substantially and possibly be a match at least for the top drip lubricants tested if it is applied more frequently in wet weather conditions.

As such ZFC does not find concern with Rex's marketing claims on wet weather performance for Black Diamond.

### **Single Application Longevity performance - Extreme conditions**

Moving from wet contamination test block lets look at the single application treatment longevity test for extreme contamination - here it is possible that there is some backing of the wet block 4 test result in main test protocol being fairly accurate, as black diamond came in with a mid pack result. Whilst this is not poor (most of the lubricants tested in the new-ish single application test protocol have been the higher performing products), it is not the all singing all conquering result for treatment longevity seen in Dry road, or the great result in dry offroad conditions. Overall there is a clear drop from amazing performer to solid performer when the going gets proper wet.

Lubricant	Km's to Jump Point	Km's to Wear allowance	Real world KM's Adjusted - Jump Poi	Real World Km's to Wear allowance
AB Graphene Lube	600	807	200	270
Silca Synergetic	500	690	167	230
Silca Hot Melt	300	637	100	212
Mspeedwax New Formula	300	588	100	196
Rex Black Diamond	300	538	100	179
Rex Black Diamond + RDS	300	525	100	175
Allied Grax	300	450	100	150
Rex Domestique	300	427	100	143
AB Graphene Wax	200	344	66	115
Ufo Drip v2	150	357	50	119

## Quick recap on the Single application longevity overall for BD.

I just want to take an extra beat to reiterate that to date nothing but nothing is matching Black Diamond in dry road conditions. We have had some really impressive results so far for silca synergetic and Absolute Black Graphen lube (note that is the drip lube, NOT the wax, ZFC recommends avoid AB graphen wax as it tested rather terribly), and also relatively new tested Revolubes was also super impressive for road.

But Black Diamond just sets new records for dry road and dry offroad conditions if used with the race day spray / drip, and by pretty huge margins.

I feel like carrying a bottle around in my jersey so that when I pass the cyclist's we all come across where you can hear their squeaking, completely devoid of lubrication for goodness knows how long chain, from 100 meters away - I can pass it to them and say hey, give this a crack – at least it will be a long time before they again start losing 25w of their pedalling effort directly into wearing through their chain, cassette and chain rings every pedal stroke. Especially when they are riding a nice bike hearing those bone dry chains squeaking away – it drives me nuts – use SOMETHING, ANYTHING. Even Muc-Off is better than no lubrication. Heavens to betsy pls try not to drive Mr Low Friction mildly insane – how can they not hear it / feel it and just drip something on..... I need to patent a very long applicator so I can lube their chain whilst riding behind them for moment 😊.

Anyhoo, mini tangent as I have had quite the run of the above lately, I think there are a lot of cyclists who would just really enjoy super long treatment lifespans with a lubricant that delivers them genuinely great low wear rates on their components for such a long time per application.

And it is a super rare wet lubricant that one can use for both their road bike and their mtb / gravel / cx bike and especially on their e-bike. Black Diamond is just a great lubricant product overall, and as such ZFC is now excited to stock and recommend.

## Test wrap conclusions and observations

Overall this was a fun test to run – even though I had to do it twice, and ideally I would do it a third time to confirm wet contamination performance vs other top lubricants tested – alas a lot of testing was done to do both the suite of single application longevity tests (3 tests - dry road, dry off road, extreme contamination) for both BD and BD + RDS, as well as the main test protocol for BD and BD + RDS. That was a solid 4 months+ of one machine's time to get through over 18,000km of testing.

Other general observations - Black diamond rides very smoothly (I do field test lubricants I am impressed with as well).

It is not the cleanest lubricant – it is black after all so it is black from the start – and if you over apply (which may be easy as you will likely under estimate its extreme treatment longevity and apply more often than you need to), then your drivetrain will be more black and you will get some excess build up. If you do not over apply, and you wipe excess thoroughly after application and work in, and wipe excess in general post rides – then things stay looking groovy enough. It is definitely not as clean as the top chain coating lubricants or immersive waxing, but it is definitely still a lot better than more wet drip lubricants – they are always just a black mess.

## Maintenance recommendations

When you do need / want to clean, Black diamond is an easy clean for maintenance as needed. It is easily cleaned off / flushed cleaned with pretty much whatever solvent you have handy to use, so periodic contamination resets for offroad cyclists / post wet rides – this is pretty easy. As very little actual product is applied to chain, there is less to clean off during



maintenance to reset. For dry road riders, maintenance intervals can be very few and far between indeed (circa every 3000km for most would be more than sufficient).

For dry offroad riding - again this really is highly variable as offroad can be anything from hardpack or soft soil dust to harsh rock quarry dust – know your area, track your chain wear and figure out how often you should reset the contamination in your drip lube chain for your riding. Again factor in your power – letting contamination build if you are powerful or riding an ebike wears things a heck of lot faster than if you ride around averaging 100 to 150w. Maybe for your riding every 2000km offroad is fine. Maybe its 1000km if it's a lot of fine and abrasive dust. Being not very wet, and testing really well in the ZFC dry contamination block, I would estimate for majority some level of flush clean reset between 1000km and 2000km is going to be all you need to keep things in a lovely low friction state.

For wet conditions – in general I recommend a chain should be flush cleaned and reset post ANY wet ride, but that is just because I know what is happening when the water runs right through your chain, bringing contamination in with it which will be pressed into your lubricant deep inside chain, and from there – alas just adding more lube... it helps, but unless you remove the contamination the majority of it isn't going to go anywhere and it just gets to merrily grind into and abrade through the high load parts of your chain.

However, I am Mr Low Friction so what I do and recommend may not be practical for most normal people. Also of course re setting post every wet ride just is not practical in some countries in some seasons vs where I am in the world, or simply practical for a lot of cyclists period - so you just have to balance what you can do and when you can do it – the more contamination you remove, the lower your drivetrain wear – so balance the time / cleaning product use cost and wear

rates for how often is practical for you to trying to reset contamination, or even partially reset contamination – partial is better than not at all. Your personal wet weather riding, contamination amount and type, average power etc – your wear will be its own unique case, get to know it and what is the right practical level of maintenance intervention for you.

You would be surprised how much difference small things make. Ie, you get caught in a solid wet ride but do not have time to try to flush clean chain. You apply more lubricant, and your next ride is a coffee cruise, and the next ride after that is a zone 2 aerobic ride. Or, if post the wet ride you next two rides consisted of a high intensity interval session and a group smash fest – the wear from abrasive contamination due to the much higher loads of the latter scenario will make a tangible difference to your chain and component wear rates vs the first scenario.

Just try to remember that lubrication of one's humble bicycle chain in such conditions is actually AN EXTREME lubrication challenge. Few mechanical parts need to be effectively lubricated that have such high pressure loading due to small part size and where these parts & lubricant are COMPLETELY exposed to so much abrasive contamination and water. Post proper wet rides you have to choose to pay the piper one of two ways – with a little time and cleaning agent to flush out and reset contamination, or pay the piper with markedly higher wear rates than baseline for that lubricant even if your next rides are in the sunshine. For car enthusiasts – imagine putting a bunch of abrasive contamination directly into your engine and blocking off oil filter so that it remains part of the engine oil until that oil is changed. Very quickly engine parts are going to suffer notable damage, scratched cylinder walls, rings, wear to bearings and much more. Imagine keeping on adding abrasive contamination amounts over and over again (ie more wet rides without flush clean) and all you are doing is adding a little bit more oil to the system to compensate. Comparatively vs removing the contaminated oil and replacing with fresh uncontaminated lubricant – the first scenario just compares very badly vs the latter for wear and damage, and it is the same for your chain, and then at a point, the rest of your drivetrain.

This is not so important if you are running 10spd tiagra, it becomes pretty important if running dura ace, axs road, eagle gx and above, campy most levels etc etc. It can be some really expensive bits you can either prolong enormously or abrade through quickly – DON'T underestimate just how big the cost to run difference can be, but also – strike a balance for you too and if it is just not practical to try to reset often as your frequently ride in the wet, just do what you can when you can. It is the same golden rule for ALL lubricants post wet rides, this re-iterating of best practice advice is not specific to Black Diamond.

## **Total Cumulative wear end of test at 6000km with 3 x 1000km harsh to extreme contamination blocks.**

Rex Black Diamond was not tested in the final block 6 – Extreme contamination block – in the main test protocol as it had used up most of its wear allowance by the end of block 5 (5000km). This is not a concern, on two drip lubricants to date have made it to the end of block 6.

Ranking at the end of Block 5 has Black Diamond in a solid 10<sup>th</sup> place, with only a the most contamination resistant lubricants tested to date ahead of it, and in a very close race with Silca Synergetic - the only two wet lubricants in the top 10.

## CUMULATIVE WEAR totals at end of each test block.

	Block 1 - No Contamination	Block 2 - Dry Cont.	Block 3 - No Cont.	Block 4 - Wet cont.	Block 5 - No Cont.	Block 6 - Extreme Cont.
Mspeedwax New Formula	0.0%	1.1%	1.7%	10.8%	11.9%	31.6%
Silca Hot Melt	0.3%	2.0%	6.6%	14.6%	19.0%	27.4%
Molten Speed Wax Original Formula	0.0%	12.0%	12.0%	20.0%	20.0%	98.0%
Effetto Mariposa Flower power wax	2.3%	4.6%	4.6%	36.6%	48.0%	80.0%
Ceramic Spd UFO Drip New Formula	2.3%	5.7%	6.3%	38.6%	55.6%	92.2%
Silca Drip Batch 2	2.9%	7.5%	7.5%	44.4%	73.4%	133.0%
Tru Tension Tungsten Race - (*D.A)	5.4%	7.4%	9.7%	48.0%	78.0%	
Tru Tension Tungsten All Weather	14.0%	24.0%	36.0%	67.0%	85.0%	117.0%
Silca Synergetic	0.0%	18.3%	42.6%	70.0%	91.7%	147.0%
Rex Black Diamond	2.3%	13.4%	30.0%	73%	97.1%	
Smoove	19.1%	36.6%	38.6%	87.3%	118.0%	
Revolubes	4.0%	22.3%	39.7%	101.4%	120.0%	
Shimano Factory grease + NFS	10.9%	31.8%	46.1%	74.7%	147.2%	
Nix Frix Shun	12.6%	40.0%	54.3%	82.9%	155.0%	
Rex Domestique	5.1%	33.7%	48.8%	93%		
Rock N Roll Gold	8.9%	37.9%	57.9%	122.0%		
Muc Off Ludicrous AF	8.9%	89.6%				
Shimano Factory Grease	10.9%	31.7%				
Shimano Factory grease + RNR Gold	10.9%	39.0%	59.0%	124%		
Session S-Wax	14.6%	20.3%	25.4%			
Wolf tooth wt-1	16.9%	69.7%	123.7%			
Squirt	19.1%	39.0%	61.0%	109.4%		
Allied GRAX	22.0%	40.3%	59.1%	101.0%		
AB Graphene Wax	22.0%	60.3%	85.1%	188.7%		
Cycle Star Gold	22.3%	53.1%	98.3%			
White Lightning Epic Ride	22.9%	56.5%	160.7%			
Muc Off Hydro Dynamic	27.6%	126.6%				
Wend wax 2	35.7%	69.4%	98.0%			
Muc Off Nano Lube	37.7%	145.4%				

## Cost to run Modelling.

For more detail information on the cost to run modelling as there is a bit to it, read the information on the spreadsheets from the full data file download of lubricant test page on ZFC website.

But in short, the initial cost to run modelling below for Ultegra and Dura Ace 11 components is constructed from the wear rate results combined across blocks 1 through 5 in the main test, so these wear rate results include no contamination blocks, the dry contamination block, and the wet contamination block. If you ride only in dry road conditions, you can expect your component wear to be much lower than modelled for many lubricants, whereas more wet or more dust – expect higher wear and thus higher cost.

The cost to run modelling per 10,000km is factoring in;

- Lubricant Cost
- Lubricant usage rate (so total amount used)
- Chain wear rate
- Component wear rates associated with that level of chain wear

(NOTE - "I.P" = wear rate results impacted by significant initial penetration issues which resulted in very high wear rates in block 1 of test. Wear rate results + cost to run calcs can be much lower if initial penetration issue negated - ie via immersive application vs manufacturer application instructions. "D.A" = lubricant was re applied at double the rate vs standard test protocol intervals due to short treatment lifespan. In the case of immersive waxes, bags of wax used was not doubled, simply the number of re-waxes)

Ultegra 11spd Components	Total Cost to run Per 10,000km	Lubricant Cos	Number of chains worn	Chains Cost	Number of Cassettes Worn	Cassettes Co	Chainrings Worn	Chain rings cost
Mspeedwax New Formula	\$ 101.60	\$ 44.90	0.40	\$ 20.00	0.20	\$ 22.00	0.07	\$ 14.70
Silca Hot Melt	\$ 142.90	\$ 79.90	0.40	\$ 20.00	0.20	\$ 22.00	0.07	\$ 14.70
Effetto Mariposa Flower Power wax	\$ 159.35	\$ 29.90	0.98	\$ 49.00	0.49	\$ 53.90	0.16	\$ 34.02
Ceramic Speed UFO Drip New Formula	\$ 237.73	\$ 84.43	1.10	\$ 55.00	0.60	\$ 60.50	0.20	\$ 37.80
Silca Synergetic	\$ 284.97	\$ 32.97	1.80	\$ 90.00	0.90	\$ 99.00	0.30	\$ 63.00
Rex Black Diamond	\$ 288.89	\$ 17.99	1.94	\$ 97.00	0.97	\$ 106.70	0.32	\$ 67.20
Silca SS Drip	\$ 290.92	\$ 80.92	1.50	\$ 75.00	0.75	\$ 82.50	0.25	\$ 52.50
Tru Tension Tungsten All Weather (I.P)	\$ 305.30	\$ 68.00	1.70	\$ 85.00	0.90	\$ 93.50	0.30	\$ 58.80
Smoove (I.P)	\$ 342.10	\$ 25.00	2.26	\$ 113.00	1.13	\$ 124.30	0.40	\$ 79.80
Rex Domestique	\$ 358.40	\$ 35.00	2.32	\$ 116.00	1.20	\$ 127.60	0.38	\$ 79.80
Squirt - (I.P)	\$ 369.45	\$ 18.75	2.50	\$ 125.00	1.25	\$ 137.50	0.42	\$ 88.20
Nix Frix Shun	\$ 378.15	\$ 14.85	2.60	\$ 130.00	1.30	\$ 143.00	0.43	\$ 90.30
Allied Grax	\$ 379.70	\$ 29.00	2.50	\$ 125.00	1.30	\$ 137.50	0.40	\$ 88.20
Revolubes	\$ 381.00	\$ 45.00	2.40	\$ 120.00	1.20	\$ 132.00	0.40	\$ 84.00
Rock N Roll Gold	\$ 471.90	\$ 67.10	2.90	\$ 145.00	1.45	\$ 159.00	0.48	\$ 100.80
AB Graphene Wax	\$ 552.90	\$ 111.90	3.20	\$ 160.00	1.60	\$ 176.00	0.50	\$ 105.00
Wend wax 2	\$ 574.00	\$ 112.00	3.30	\$ 165.00	1.65	\$ 181.50	0.60	\$ 115.50
Cycle Star Gold	\$ 602.00	\$ 140.00	3.30	\$ 165.00	1.65	\$ 181.50	0.60	\$ 115.50
Tru Tension Tungsten Race (D.A)	\$ 630.84	\$ 399.84	1.60	\$ 80.00	0.80	\$ 88.00	0.30	\$ 63.00
White Lightning Epic Ride	\$ 735.40	\$ 118.00	4.40	\$ 220.00	2.20	\$ 242.00	0.74	\$ 155.40
Muc Off Hydro Dynamic	\$ 799.05	\$ 99.75	5.00	\$ 250.00	2.50	\$ 275.00	0.80	\$ 174.30
Muc Off Ludicrous AF	\$ 898.60	\$ 297.00	4.30	\$ 215.00	2.10	\$ 235.00	0.70	\$ 151.00
Muc Off Nano Lube	\$ 1,222.70	\$ 200.00	7.30	\$ 365.00	3.70	\$ 401.50	1.20	\$ 256.20
Ab Graphene lube - TEST RESULTS LOCKED BY NDA								

Dura Ace 11spd Components	Total Cost Per 10,000km	Lubricant Cost	Number of chains worn	Chains Cost	Number of Cassettes Worn	Cassettes Cost	Chainrings Worn	Chain rings cost
Molten Speed Wax New Formula	\$ 240.90	\$ 44.90	0.40	\$ 36.00	0.40	\$ 132.00	0.07	\$ 28.00
Silca Hot Melt	\$ 275.90	\$ 79.90	0.40	\$ 36.00	0.40	\$ 132.00	0.07	\$ 28.00
Effetto Mariposa Flower Power wax	\$ 498.83	\$ 22.43	0.98	\$ 88.20	0.98	\$ 323.40	0.16	\$ 64.80
Ceramic Speed UFO Drip New Formula	\$ 626.43	\$ 84.43	1.10	\$ 99.00	1.10	\$ 363.00	0.20	\$ 80.00
Silca SS Drip	\$ 810.92	\$ 80.92	1.50	\$ 135.00	1.50	\$ 495.00	0.25	\$ 100.00
Tru Tension Tungsten All Weather (I.P)	\$ 902.00	\$ 68.00	1.70	\$ 153.00	1.70	\$ 561.00	0.30	\$ 120.00
Silca Synergetic	\$ 925.46	\$ 49.46	1.80	\$ 162.00	1.80	\$ 594.00	0.30	\$ 120.00
Rex Black Diamond	\$ 960.79	\$ 17.99	1.94	\$ 174.60	1.94	\$ 640.20	0.32	\$ 128.00
Smooove (I.P)	\$ 1,134.20	\$ 25.00	2.26	\$ 203.40	2.26	\$ 745.80	0.40	\$ 160.00
Rex Domestique	\$ 1,161.00	\$ 35.00	2.32	\$ 208.80	2.32	\$ 765.60	0.38	\$ 152.00
Tru Tension Tungsten Race (D.A)	\$ 1,191.84	\$ 399.84	1.60	\$ 144.00	1.60	\$ 528.00	0.30	\$ 120.00
Revolubes	\$ 1,213.00	\$ 45.00	2.40	\$ 216.00	2.40	\$ 792.00	0.40	\$ 84.00
Squirt - (I.P)	\$ 1,236.75	\$ 18.75	2.50	\$ 225.00	2.50	\$ 825.00	0.42	\$ 168.00
Allied Grax (I.P)	\$ 1,247.00	\$ 29.00	2.50	\$ 225.00	2.50	\$ 825.00	0.40	\$ 168.00
Nix Frix Shun	\$ 1,278.85	\$ 14.85	2.60	\$ 234.00	2.60	\$ 858.00	0.43	\$ 172.00
Rock N Roll Gold	\$ 1,477.10	\$ 67.10	2.90	\$ 261.00	2.90	\$ 957.00	0.48	\$ 192.00
AB Graphene Wax	\$ 1,655.90	\$ 111.90	3.20	\$ 288.00	3.20	\$ 1,056.00	0.50	\$ 200.00
Wend wax 2	\$ 1,738.00	\$ 112.00	3.30	\$ 297.00	3.30	\$ 1,089.00	0.60	\$ 240.00
Cycle Star Gold	\$ 1,766.00	\$ 140.00	3.30	\$ 297.00	3.30	\$ 1,089.00	0.60	\$ 240.00
White Lightning Epic Ride	\$ 2,162.00	\$ 118.00	4.40	\$ 396.00	4.40	\$ 1,452.00	0.74	\$ 196.00
Muc Off Ludicrous AF	\$ 2,391.00	\$ 2,967.00	4.30	\$ 387.00	4.30	\$ 1,419.00	0.70	\$ 288.00
Muc Off Hydro Dynamic	\$ 2,519.75	\$ 99.75	5.00	\$ 450.00	5.00	\$ 1,650.00	0.80	\$ 320.00
Muc Off Nano Lube	\$ 3,754.00	\$ 200.00	7.30	\$ 657.00	7.30	\$ 2,409.00	1.20	\$ 488.00
Ab Graphene lube - TEST RESULTS LOCKED BY NDA								

Again – component wear rate & cost is by far the dominant factor vs lubricant cost IF the lubricant is genuinely delivering low wear rates. If your components are cheaper than above, component cost will be less of a concern. If they are more expensive IE Sram axs Red with a \$700 cassette and \$1500 integrated power meter chain rings and a \$170 chain – then wow component wear rates are like SUPER DUPER important.

We can see that Black Diamond returned solid results here – the main impact for Black Diamond not ranking higher was the relatively high wear rate in wet contamination block 4. If I did the modelling just on block 1 wear rate – so trying to estimate if just riding on perfect dry road conditions (real world will be higher than block 1 as airborne contamination is much higher than my test facility) – then black diamond would rank as one of the top tested products.

### **Dry Offroad Conditions cost to run modelling.**

The below cost to run modelling is taken just from the lubricants performance in dry contamination block 2 and so is applicable for those who frequently ride gravel / mtb.



GRX 810 Components - Dry gravel / Mtb / Cx	Total Cost Per 10,000km	Lubricant Cost	Number of chains worn	Chains Cost	Number of Cassettes Worn	Cassettes Cost	Chainrings Worn	Chain rings cost
Effetto Mariposa Flower Power wax	\$ 119.77	\$ 33.64	0.6	\$ 28.75	0.3	\$ 37.38	0.1	\$ 20.00
Mspeedwax New Formula	\$ 149.85	\$ 67.35	0.5	\$ 25.00	0.3	\$ 32.50	0.1	\$ 25.00
Silca SS Drip	\$ 180.47	\$ 91.72	0.6	\$ 31.25	0.3	\$ 32.50	0.1	\$ 25.00
Silca Hot Melt	\$ 202.35	\$ 119.85	0.5	\$ 25.00	0.3	\$ 32.50	0.1	\$ 25.00
Ceramic Speed UFO Drip New Formula	\$ 226.65	\$ 115.40	0.8	\$ 37.50	0.4	\$ 48.75	0.1	\$ 25.00
Rex Black Diamond	\$ 228.48	\$ 26.98	1.4	\$ 68.75	0.7	\$ 87.75	0.2	\$ 45.00
Tru Tension Tungsten All Weather	\$ 289.75	\$ 96.00	1.3	\$ 62.50	0.6	\$ 81.25	0.3	\$ 50.00
Smoove	\$ 362.50	\$ 35.00	2.1	\$ 106.25	1.1	\$ 146.25	0.4	\$ 75.00
Silca Synergetic	\$ 366.72	\$ 32.97	2.3	\$ 112.50	1.1	\$ 146.25	0.4	\$ 75.00
Allied Grax	\$ 377.25	\$ 43.50	2.3	\$ 112.50	1.1	\$ 146.50	0.4	\$ 75.00
Molten Speed Wax	\$ 390.08	\$ 167.58	1.5	\$ 75.00	0.8	\$ 97.50	0.3	\$ 50.00
Squirt	\$ 443.25	\$ 27.00	2.2	\$ 137.50	1.4	\$ 178.75	0.5	\$ 100.00
Nix Frix Shun	\$ 541.05	\$ 19.80	3.4	\$ 168.75	1.8	\$ 227.50	0.6	\$ 125.00
Rock N Roll Gold	\$ 635.82	\$ 93.94	3.6	\$ 181.25	1.8	\$ 235.63	0.6	\$ 125.00
Tru Tension Tungsten Race (D.A)	\$ 642.28	\$ 559.78	0.5	\$ 25.00	0.3	\$ 32.50	0.1	\$ 25.00
Cycle Star Gold	\$ 758.50	\$ 196.00	4.0	\$ 193.75	1.9	\$ 243.75	0.6	\$ 125.00
Wend wax 2	\$ 792.75	\$ 154.00	4.3	\$ 212.50	2.1	\$ 276.25	0.8	\$ 150.00
Rex Domestique	\$ 797.50	\$ 52.50	5.0	\$ 250.00	2.5	\$ 325.00	0.9	\$ 170.00
Revolubes	\$ 812.50	\$ 67.50	5.0	\$ 250.00	2.5	\$ 325.00	0.9	\$ 170.00
White Lightning Epic Ride	\$ 1,202.25	\$ 166.00	7.1	\$ 356.25	3.5	\$ 455.00	1.1	\$ 225.00
AB Graphene Wax	\$ 1,269.16	\$ 156.66	7.5	\$ 375.00	3.8	\$ 487.50	1.3	\$ 250.00
Muc Off Ludicrous AF (Extrapolated data)	\$ 1,898.00	\$ 445.50	9.9	\$ 493.75	4.9	\$ 633.75	1.6	\$ 325.00
Muc Off Hydro Dynamic (Extrapolated data)	\$ 1,955.00	\$ 140.00	12.4	\$ 618.75	6.1	\$ 796.25	2.0	\$ 400.00
Muc Off Nano Lube (Extrapolated data)	\$ 2,282.50	\$ 280.00	13.5	\$ 675.00	6.8	\$ 877.50	2.3	\$ 450.00
Ab Graphene lube - TEST RESULTS LOCKED BY NDA								

So, above we can see that Black Diamond has moved up a couple of spots to a very impressive 6<sup>th</sup> place, with really on the most contamination resistant lubricants tested to date ahead of it, and it moves into number one spot in this cycling demographic for a wet lubricant. Really very impressive.

Note that the above modelling is using GRX 810 component cost. If you are running Sram Axs Xplr or eagle or xtr 12 or Campy Ekar – again place a much great emphasis on component cost as they parts just cost a bomb. Or a nuclear bomb. The wrong lubricant in the world of dirt and dust and your bikes drivetrain can cost as much to run per 10,000km as a Lamborghini.

### **Wet Conditions cost to run modelling.**

The below cost to run modelling is taken just from the lubricants performance in the wet contamination block 4, and so is applicable for those who frequently ride in wet conditions. This modelling is very approximate – how harsh ones wet riding is varies from full mud to greasy roads. Again some roads can be pretty clean, some can have a lot of sand or similarly abrasive dust to be washed in. Some offroad is nice hardpack that holds up well, other trails not so much.

However the wet contamination block 4 has over double the wear rate average for all lubricants tested vs dry contamination block 2, so all lubricants are impacted more heavily when conditions get wet, and so the lubricants relative performance to other lubricants tested is of very high value if you frequently ride in wet conditions. There is ZERO cleaning of chain in the main test, the wear results are all down to how the lubricant is able to deal with a lot of water and abrasive contamination over that 1000km test block, with only the set re lubrication intervals during that block to help it.

GRX 810 Components - Wet gravel / Mtb / C	Total Cost Per 10,000km	Lubricant Cost	Number of chains worn	Chains Cost	Number of Cassettes Worn	Cassettes Cost	Chainrings Worn	Chain rings cost
Mspeedwax New Formula	\$ 235.35	\$ 67.35	1.2	\$ 48.00	0.6	\$ 78.00	0.21	\$ 42.00
Silca Hot Melt	\$ 275.85	\$ 119.85	1.2	\$ 48.00	0.6	\$ 78.00	0.15	\$ 30.00
Silca Synergetic	\$ 634.46	\$ 49.46	4.1	\$ 162.00	2.1	\$ 273.00	0.8	\$ 150.00
Nix Frix Shun	\$ 642.30	\$ 19.80	4.5	\$ 180.00	2.3	\$ 292.50	0.8	\$ 150.00
Effetto Mariposa Flower Power wax	\$ 693.64	\$ 33.64	4.8	\$ 192.00	2.4	\$ 312.00	0.8	\$ 156.00
Tru Tension Tungsten All Weather	\$ 724.50	\$ 96.00	4.7	\$ 186.00	2.3	\$ 292.50	0.8	\$ 150.00
Ceramic Speed UFO Drip New Formula	\$ 769.40	\$ 115.40	4.8	\$ 192.00	2.4	\$ 312.00	0.8	\$ 150.00
Rex Black Diamond	\$ 804.43	\$ 26.98	6.4	\$ 255.60	3.2	\$ 415.35	0.53	\$ 106.50
Silca SS Drip	\$ 844.72	\$ 91.72	5.6	\$ 222.00	2.7	\$ 351.00	0.9	\$ 180.00
Allied Grax	\$ 915.00	\$ 43.50	6.3	\$ 252.00	3.2	\$ 409.50	1.1	\$ 210.00
Smooove	\$ 993.50	\$ 35.00	6.8	\$ 270.00	3.5	\$ 448.50	1.2	\$ 240.00
Squirt	\$ 1,029.00	\$ 27.00	7.4	\$ 294.00	3.6	\$ 468.00	1.2	\$ 240.00
Tru Tension Tungsten Race (D.A)	\$ 1,338.28	\$ 559.78	5.7	\$ 228.00	2.9	\$ 370.50	0.9	\$ 180.00
Rock N Roll Gold	\$ 1,457.44	\$ 93.94	9.8	\$ 390.00	5.0	\$ 643.50	1.7	\$ 330.00
Cycle Star Gold (Extrapolated Data)	\$ 1,478.50	\$ 196.00	9.5	\$ 378.00	4.7	\$ 604.50	1.5	\$ 300.00
Wend wax 2	\$ 1,529.50	\$ 154.00	10.1	\$ 402.00	5.0	\$ 643.50	1.7	\$ 330.00
Rex Domestique	\$ 1,843.50	\$ 52.50	15.0	\$ 600.00	7.5	\$ 975.00	1.1	\$ 276.00
Revolubes	\$ 1,858.50	\$ 67.50	15.0	\$ 600.00	7.5	\$ 975.00	2.4	\$ 480.00
AB Graphene Wax (Extrapolated data)	\$ 2,304.66	\$ 156.66	15.6	\$ 624.00	7.8	\$ 1,014.00	2.6	\$ 510.00
White Lightning Epic Ride (Extrapolated data)	\$ 2,771.50	\$ 166.00	18.8	\$ 750.00	9.8	\$ 1,225.50	3.2	\$ 630.00
Muc Off Ludicrous AF (Extrapolated data)	\$ 3,714.00	\$ 445.50	23.7	\$ 948.00	11.9	\$ 1,540.50	3.9	\$ 780.00
Muc Off Hydro Dynamic (extrapolated data)	\$ 4,248.50	\$ 140.00	29.7	\$ 1,188.00	14.9	\$ 1,930.50	5.0	\$ 990.00
Muc Off Nano Lube (Extrapolated Data)	\$ 4,420.00	\$ 280.00	30.0	\$ 1,200.00	15.0	\$ 1,950.00	5.0	\$ 990.00
Ab Graphene lube - TEST RESULTS LOCKED BY NDA								

Again the above modelling is using GRX 810, so if your components cost a lot more than that, take that into consideration. Deeply.

## Final wrap

So.... Yup, a fair bit of detail there! I will be working towards (I promise) a set structure for the detail reviews that I hope to be able to pump out the key info and data in a sane length – but again there was just a bit of extra stuff to delve into, explain and cover for this review to do it justice. If I don't do it right here to begin with, I just end up spending all that time and oh so much more with enquiries from around the world delving into the bits I didn't explain or cover properly, so here it all is.

Final thoughts from Zero Friction Cycling are that Black Diamond is a top tier lubricant that will be a brilliant choice for;

- Road cyclists who predominantly ride in dry conditions
- Offroad cyclists who prefer a wet lubricant over wax lubricants (even though this is a wax, it is a wet wax 😊)
- E-Bike riders (road or offroad) as the treatment longevity offers a lot of protection. Higher loads shorten lubricant treatment lifespans and ebike riders are easily caught out with shorter lifespan lubricants.
- Cyclists who want the longest lasting per treatment lubricant tested to date. Especially for road and ergo use, the treatment lifespan is simply unreal.
- Ease of maintenance. Whilst the lubricant is black, periodic maintenance is easy as it is easily cleaned off, it has no penetration issues on re application, it does not need any set time, re application intervals are really really long, and maintenance intervals (except for frequent wet riding) are also really long due to very high contamination resistance.

- And for the right cyclist for the right event – used in conjunction with race day spray / drip – one gets some pretty amazing low wear and treatment longevity in dry offroad conditions, enough to see out any dry offroad event length except for maybe a 7 day stage race!

Overall I was so impressed with a number of the key performance results for Black Diamond, BD + Race day drip that ZFC is now stocking Black Diamond & race day drip, and also offering chains pre prepped with these treatments. Black diamond just really suits a demographic that likes to drip on a wet and ride, ride, ride ,ride, ride, ride and be happy, and for offroad riders who again just really prefer the ease of wet lube, as well as trying to drastically improve the stereotypical e-bike riders drivetrain lifespan which at the moment by and large is horrendous with the majority just adding whatever the LBS sold them directly on top of factory grease.

## Pictures From test

Black Diamond at end of test @ 5000km mark. (sorry it is a bit blurry...)





We can see that after 5000km, black diamond is not exceptionally clean, nor dirty. For a wet lubricant it is pretty good.

**\*\*NOTE** however that for this re test only 7 applications of black diamond were used across the entire 5000km test. Due to its extreme treatment longevity it is likely many users will over apply, and if you over apply, your drivetrain will look more dirty after 5000km than the zfc test drivetrain.

