



Guglatech Rally Raid Shield 4 Air Filters The World's First Wet/Dry Air Filter

Guglatech makes fuel filters for most bikes, AND they make also make air filters for the BMW 800 and 1200 bikes, and for the KTM 1190/1290. Their air filters are pretty darn special. Keep reading to find out why.



Airbox from a BMW 800GS. This is the intake side of the system. A proper filter will prevent all that crud from going into the motor.

What does an air filter do? Its job is simple - it strains out dirt and crud, preventing them from going into your engine. Without proper air filtration your engine will be damaged.

Your engine needs good clean air, and plenty of it. Every bike comes with a filter... well almost all of them do. Drag bikes don't use air filters because they would slow the flow of air and horsepower would suffer. Drag bikes operate in a relatively clean and controlled environment where dirt and dust aren't present. All other bikes require an air filter because they operate on roads and trails where your bike will naturally pick up of contamination in the form of bugs, sand, dirt, and dust.

A clogged filter prevents air flow, and that affects engine performance. A reduction in airflow leads to a rich condition in the combustion chamber. Some bikes have computers to compensate for rich/lean air mix, but there comes a point where technology can't overcome a badly clogged filter, and what you get is a strangulation of the motor's air supply. No air = no go.

Any good air filter should do two things: 1.) filter out any dirt or dust to protect the engine, and 2.) allow as much air to get to the engine so you get maximum performance and fuel efficiency.

Air filters use different materials to strain out the dirt and crud that goes into the airbox. Those materials include foam, paper, and cloth. (There's also another material that's superior to the others – the Guglatech matrix)

Foam and cloth filters require that they first be oiled. Dirt sticks to the oil as the air passes through, and your engine gets clean air. Think of the fibers that comprise these types of filters as nothing more than stands of flypaper, trapping the fly (in this case



Oiled foam and cloth filters are the equivalent of fly paper for dirt

dirt) in the sticky oil used to treat the filter. They work great for a while, but when the flypaper gets too many flies it stops working because there's no room for another fly. At some point both foam and cloth filters reach a where they become clogged with dirt and can't pass enough air to satisfy your engine.

Most foam and cloth filters can be cleaned when they get dirty. That's a messy job involving chemical solvents or kerosene. This is a dirty job, just ask me how I know. Once cleaned they must be re-oiled for them to work properly. Normally you don't carry the solvents with you on the bike, so an air filter cleaning isn't something you typically do in the field.

Paper filters don't require oiling to make them work. They use the same technology as the Hoover Elite Limited Edition vacuum cleaner I keep in the closet. Its paper filter is porous

enough to allow good air flow when it's new, but it quickly gets clogged by dirt and that's when performance declines. As the bag gets full, the vacuum can hardly suck up those stray Cheerios hiding beneath the couch. And because of the qualities of that paper filter, an additional HEPA filter is needed to keep residual dust from blowing back into the room.

A clogged air filter can result in two conditions and neither one is good:

- 1.) Air flow declines, leading to a rich fuel/air mix, declined performance and increased fuel consumption, or
- 2.) In a worst-case scenario, because the engine is sucking air into the cylinders at such high volume, the filter physically breaks apart and the filter and all the contamination are sucked into the motor.



Hoover Type-S Vacuum Bag
A typical paper filter.

BMW and many other motorcycle manufacturers use paper filters in their motorcycles. The paper is folded into an accordion-type bellows to maximize the amount of paper that is exposed to the dirty air.

But, just like the filter on my Hoover Elite vacuum, motorcycle paper filters quickly become clogged with dirt and that's when performance declines.

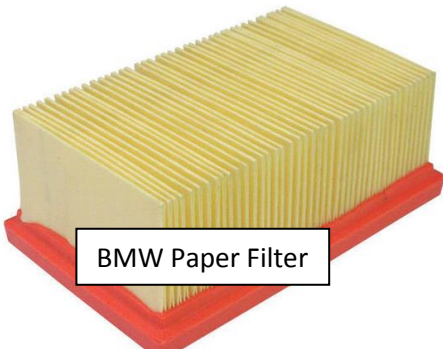
Another drawback to paper filters is that they can't be cleaned. Yes, you can clunk them on the bench and knock loose the bugs and bigger things, then blow them out with an air hose, but when you do that you're probably damaging the paper, opening up holes,

and creating large passages that allows dirt to pass through to your engine. (Personally, I used to go through at least two paper filters every season. I ride a lot of dirt so my bike's exposure may be higher than yours. Today I never replace my air filters because I'm using a Guglatech which can be cleaned).

If you want to learn more about the performance characteristics of foam, cloth, and paper filters, check the BestRest website. <https://bestrestproducts.com/guglatech-air-filter-technical-report/> . It gives performance figures for each type. In that blog we also talk about the First Generation Guglatech Air Filter, which has since been replaced with the new Rally Raid Wet/Dry Air filter.

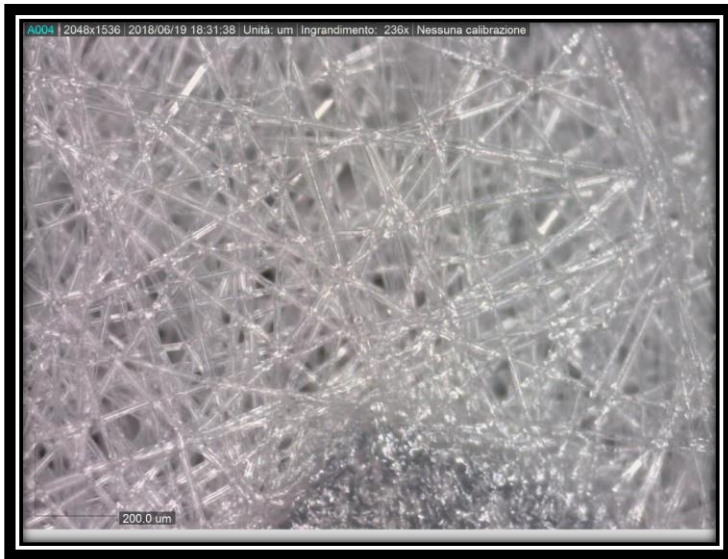
Now we get down to the subject of this article ... the Guglatech Rally Raid Wet/Dry Air Filter. These are available for BMW 800 and 1200 bikes, as well as the KTM 1190/1290. What's so special about them?

Italy wasn't satisfied with their 1st generation air filter, even though it out-performed all other types of filters in every respect. They went back to the drawing board and came up with a better material that gave improved filtration PLUS it increased air flow to the engine. That statement seems contradictory, doesn't it? "Better air flow" and "better filtration" are marketing promises made by every air filter company. The ugly truth is that you can't have your cake and eat it too, at least when you're talking air filters. In order to get good air flow you need to minimize filtering media. But if you want better filtration, you need to increase the amount of filtering material that will trap contaminants.



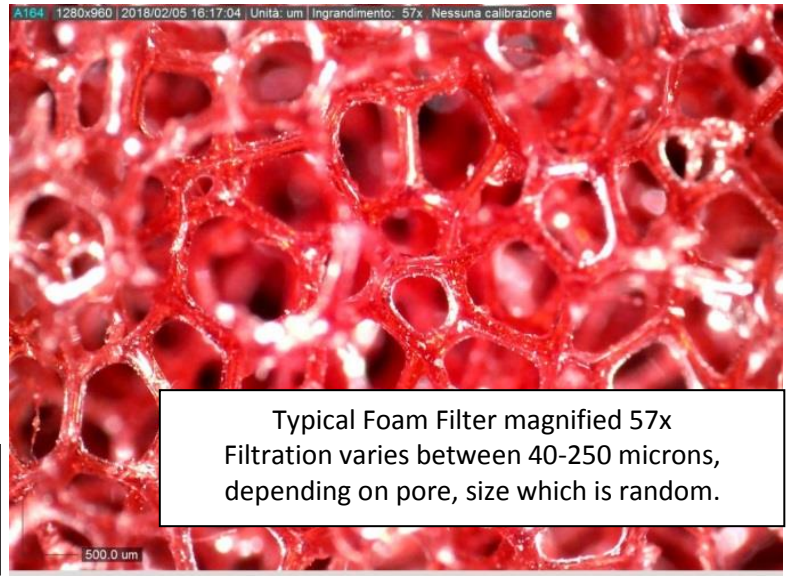
BMW Paper Filter

So how did Guglatech crack this air filter conundrum? They came up with a matrix material that was perfectly UNIFORM. The strands of synthetic fibers (shown below at 236 magnification) have a tight, uniform weave that traps contaminants. There aren't any big holes like you find in foam, cloth, or other styles of filters. Improved filtering has been accomplished.



Guglatech Rally Raid Filter magnified 236x
Filtration is 30 microns when used "dry", but that number goes down to 10 microns when air filter oil is used.

By comparison, here's what a foam filter looks like under magnification. It has large holes and small holes. There's no uniformity.



Typical Foam Filter magnified 57x
Filtration varies between 40-250 microns, depending on pore, size which is random.

Here's a paper filter under the microscope. Much of the filter surface is blocked by the randomly placed wood fibers, which form a solid mat in places, and where that occurs that means there's no air flow. There are a few big holes visible here and there, and that's where all the air passes through. Big holes = air contamination = engine wear.



Typical Paper Filter magnified 55x
Filtration varies between 40-80 microns at the points where the fibers have not formed a solid mass

Note that the magnifications for these images are different. The Guglatech was magnified 236x, while the other two were magnified 55x and 57x. Why is that? Unless the Guglatech was magnified 5x more than the others, you couldn't see the features of the matrix. We're not playing games with the images, instead we're showing you the UNIFORMITY of the Guglatech matrix, because that's very important.

Does the close weave of the Guglatech filter somehow prevent air flow? Does it decrease engine performance? Does it cause an overly-rich fuel mixture?

The answer to all these questions is NO.

Because the Guglatech matrix is uniform, and the strands are closer together than the other types of filters, air can easily pass through the entire filter at every point. There are no inherent

obstructions like you see in the other filters. If one portion of the Guglatech filter gets filled with dirt, the rest of the filter takes on the task of allowing air to pass. And because the matrix is so tightly woven, it traps contaminants at a higher rate (smaller micron size).

To prove this point, and to prove that air flow isn't affected, Guglatech created a special testing platform called the RATS Machine. They tested all styles of filters using this setup – paper, foam, cloth, and the Guglatech. They replicated the abuse you'd get from 10 years on the road, but compressed the time down to just a few minutes, all in the comfort of their testing lab. Using an airbox from a BMW F800GS, they created the same vacuum levels the engine would create at highway speeds, then

they introduced dirt and sand into the input snorkels. That report is eye-opening. Guglatech kicked sand in the face of all the other filters. You can read the report on their Rage Against The Sand HAVOC Machine by clicking here:

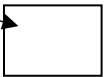
<https://bestrestproducts.com/guglatech-air-filters-rats-machine/>

The Guglatech Rally Raid Shield 4 filter can be cleaned with soap and water in the field, then reinstalled and used over, and over, and over again. Basically, it's a lifetime filter that provides superior filtration AND superior air flow.

The Rally Raid can be used DRY, meaning it needs no oiling before it can be put into service. That's how I use them in my own bikes. I take them out of the box and put 'em in the bike. When they get dirty I wash them with soap and water and reinstall. In this DRY configuration the Guglatech will filter at the 30 micron level, which beats every other filter, hands down.

BUT... if you want to increase filtration even more, you can use a very light spray of air filter oil on the upper surface (where the air first comes into the airbox). We call this the WET system. By using a light spray of air filter oil, the filter will now screen particulates down to 10 microns. The presence of that oil will improve filtration because oil on the strands acts like flypaper to the dust particles. Unlike foam and cloth, the uniformity of the Guglatech matrix means that oil won't cause the filter to clog and reduce air flow. How do we know this? Field testing and real-life experiences.

In case you're wondering, a micron is 1 millionth of a meter. According to engine experts, particles measuring anything over 20 microns will cause engine wear). This photo shows a 20 micron dust particle: Look closely, it's in there.



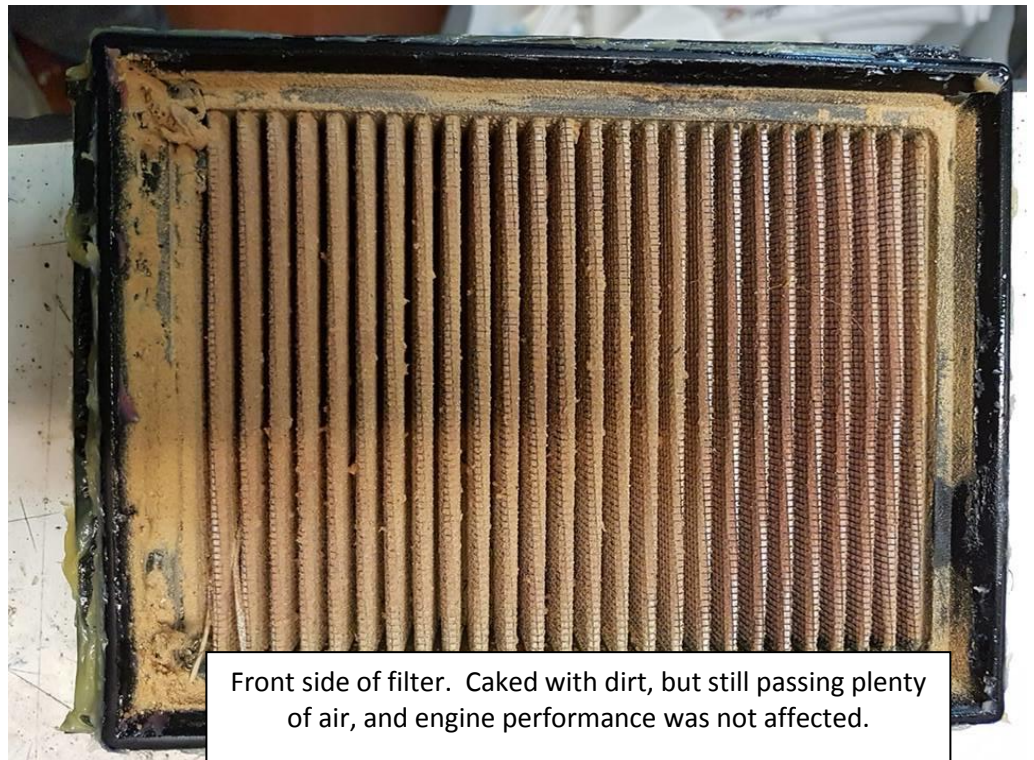
Enough with this technical talk, how about a real-life scenario?

The next series of photos were taken by Fabio Gani, who was riding a KTM Adventure 1090 R in Tunisia . He rode for 10 days in full desert mode, dune crossing, column riding, sand storms, etc. He rode in the worst conditions possible, something most of us will never do. Everybody hates riding in sand. And everybody hates eating dust from the guy in front of you.

Before he began his ride, he installed a Guglatech filter. It was lightly oiled with K&N air filter oil on the intake side only. (Although K&N brand was used, it could have been any brand of air filter oil.)

During his ride the bike performed flawlessly, and there was no decrease in power, performance, or fuel consumption. The bike pulled cleanly and strongly, with no issues. (This was not the case with his riding partners who suffered with airbox and air filter issues.)

When he returned home to Italy, he pulled out his Guglatech filter. This is what he found – the intake side of the filter was absolutely filthy; it was caked with dust and dirt and other ugly bits courtesy of the Tunisian desert.



Front side of filter. Caked with dirt, but still passing plenty of air, and engine performance was not affected.



This is what the filter looked like on the BACK SIDE. There's no dirt visible. You can see a very light red coloring, which is the result of the air filter oil that soaked through from the front.



Back side of filter showing how clean it was.

At right is a photo of his airbox after the filter was removed. Not a single speck of dust entered the airbox or the motor.



The inside of his airbox was sparkling clean – no dirt in the engine!

Below is a photo showing the dirt that was knocked off the back side of the filter, by banging it on a hard surface.



This shows the dirt that was knocked loose from Fabio's filter

To order a Guglatech Rally Raid Ultra 4 Air Filter for your BMW or KTM, click here:
<https://bestrestproducts.com/product-category/guglatech-fuel-and-air-filters/>

On a personal note, I've been using Guglatech air filters on my own bikes since they were first introduced. It's my philosophy that if I'm not willing to use a product in my own bikes, then I'm not going to sell that product.

(I also have Guglatech fuel filters on all my bikes.)

The other day I pulled an air filter to see how it's performing. I'd used this filter on a 1200 mile off road ride, including a jaunt on the North West Passage Adventure Route.

<https://bestrestproducts.com/product-category/northwest-passage-nwp/>



My BMW F800GS filter. A nice collection of bugs and vegetation.

My filter didn't have as much dirt as Fabio's, but it did have an interesting collection of bugs and vegetation.

The inside of my airbox was clean as a whistle, which wasn't always the case when I was using a stock BMW paper filter. I replaced those on a semi-annual basis, and I would always see a light layer of dust on the plastic intake housing. Clearly those paper filters left much to be desired. And when I added up the costs of paper filters, they were more than the Guglatech.



Cleaning the filter with soap and water.

I washed the Guglatech with soap and water, and when I did the bottom of the sink was stained dark brown from all the dirt the filter had trapped. (The Wife caught me doing this in her spotless kitchen sink, which resulted in me doing KP for a month.)

I allowed it to dry, then reinstalled it. Easy-peasy, no muss, no fuss, no oily chemicals, and no need to buy another air filter for as long as I own the motorcycle.

From my perspective, the Guglatech Rally Raid Shield 4 air filter is a win-win. Actually, it's more of a win-win-win.

PS. Check out our YouTube Channel where test Guglatech filters. That's also where we show product installations, tire repair and tire changing tricks, and where we inform and entertain with motorcycle related films.

<https://www.youtube.com/channel/UCKzVwHox3Z90018k61B2KYw/videos>

We'll see you on the trail.

David Petersen

Mr. BestRest

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