

Some Comments on Filtration © [Anthony Fischinger](#)

Many of us have raised our guppies using mostly air driven box filters for a long time.

I would think that most of us have an individual filter or filters of some sort in every tank. The basic designs are cheap and provide good biofiltration, but they do have drawbacks, airstones eventually clog in the brands that use them.

Another problem is noise. Depending on how much air is used, the brand of box filter and type of air supply, there are definite differences in the amount of noise put out. I got a phone call about guppies recently and I could tell what brand of filters he was running just by the background noise. (Penn Plax economy bubbler type without airstone) the sound is like a form of water torture to me.

I have enough noise in my life with 3 children under 10 years of age running amok and occasionally killing my fish. They haven't broken a tank yet, but I am sure it is only a matter of time. A little peace and quiet is nice, my guppies are a soothing escape when I get to watch them, and airstone equipped box filters are quieter (but not silent) than those that discharge larger bubbles. A fishroom full of non airstone box filters can be a noisy place. I guess that can be said of any filters that use air from diaphragm type pumps. I don't have experience with the more expensive types of air pumps. I would hope they are quieter for the extra money but the added capacity makes me unsure of that. Another drawback to air driven filters is that there is a significant amount of spray that can damage or cause hard water film deposits on light hoods or adjacent tanks or walls over time. This is mostly a problem if you use planted tanks or have a few tanks with light hoods as display tanks. The spray deposits are a pain to clean and they reduce the amount of light that the tanks receive. If your room is set up with rows of tanks in close proximity, I would advise quarantine tanks for new arrivals in a separate room so diseases can't be spread by tiny droplets of spray.

Box filters tend to get unsightly and the filter body gets nasty looking over time and they are a pain to clean. I get pillow stuffing from Wal-Mart and use dolomite or aragonite gravel or lava rock with a few pebbles to weigh them down. They are hands down the cheapest and longest lasting filter type, so that is in their favor. Box filters also tend to be low flow filters. Even with some corydoras cats or plecostomus to stir up sediment, I still wished they would flow better. You can boost the air supply and get more flow, but more noise and more spray are the tradeoff. They are less than ideal in 2.5 gal tanks due to height issues, evaporation can lower the water level to where the filter doesn't flow within about a week in such a tank if humidity is low in the room. If power fails, the biofilter is still immersed in the tank water even if flow stops, so there is some degree of safety compared with external filters.

Lee medium size triple flow filters will take 1" thinwall undergravel filter tubing that helps boost flow, and Penn Plax elbows connected to the tubing do cut down on spray. If you fit the elbows, lower water levels resulting from just a few days' evaporation can really cut or eliminate flow as water levels have to be just right to maximize flow if you use them. I still use some Lee mediums with a piece of thinwall tubing that ends a few inches below water level in larger deeper tanks that don't have light hoods or lights, I think it is the best way to use air driven box filters pretty much as designed but with a performance boost. The virtues of box filters still outweigh their shortcomings in my opinion.

I think undergravel filters don't actually do much in the way of mechanical filtration, I feel a gravel layer an inch deep in a tank will provide a good amount of failsafe/supplemental biofiltration as long as there is some water movement in the tank from other filter sources or an airstone. I think in the case of undergravel filters, it is the filter type bacteria in the sediment in the gravel, and some growing on the gravel that does the work, not the actual filter and lift tubes.

Back when undergravel filters were more popular, I witnessed many tanks that did great with them over a period of years, but now I think it was the bacteria in the gravel and sediment and not the plastic filter itself that were responsible for its effectiveness. The bacteria and protozoans would have been there breaking down waste just as happily without the filter. As long as the gravel layer is not too deep to get anerobic, just keeping gravel in the tanks (3/4 to an inch maximum deep) might give as much benefit as adding the actual undergravel filter. The smaller the particle size of the gravel, the more surface area for

bacteria to grow, but sand sized particles don't let enough oxygen down to the tank bottom if layered too deep. I think medium sized gravel is a good compromise. I think it doesn't really matter if the filter bacteria are in a box filter or a sponge or in sediment in the gravel, as long as they are somewhere in the tank.

Canister filters are great at providing ultra clear water in larger tanks, especially diatom filters, but they are expensive and need a fair amount of maintenance. Their other disadvantage is they are external in case of power outage. Likewise with central filtration systems serving many tanks. I envy guys with central systems every day the power is on, but I wouldn't want to be in their shoes with bare bottom tanks during an extended power outage. If I ever get to the point of setting up such a system I would still have some plants/gravel in the individual tanks as a backup. I would have my own automatic backup generator too if I had a fishroom that big.

Sponge filters have their virtues and drawbacks as well. They share the same air related drawbacks of low flow, noise and spray that box filters do. They tend to be a few dollars more per filter, but most are set up out of the box to function without airstones. They are also immersed in the tank water like box filters, so if power goes out there is some safety margin. It is easy to fit airstones to them if you desire, you might be restricted to a fairly small one depending on the available space inside the filter. There are coarse and fine types of foam sponge available for some brands, and some people even make their own, but some sources of foam might be treated with chemicals that aren't good for the fish. If you try to make your own out of some foam you have around, use caution and try them out on cull tanks first for a while. Fine foam sponges polish water to better clarity faster than coarse, but aren't too good at mechanical filtration. They also tend to clog faster. Coarse filters hold more but don't quite give the crystal water clarity a fine foam sponge will until at least partially plugged up. Maintenance is lower with either type of sponge filter than a box filter, just a few good squeezes in a bucket of tank temperature water and they are ready to go back into the tank. If you go with sponge filters, a combination of one coarse and one fine in a tank might be the best compromise. I don't think sponge filters last quite as long as box filters, eventually the sponges break down. It is more difficult to disinfect a sponge filter if you have a disease outbreak that requires it, and bleach may damage the sponge if the solution is too strong or left to soak too long. Depending on brand, replacement sponges may or may not be readily available. Some sponge filters have slate bottoms, it is obviously harder to replace a sponge that is glued to slate. I have never removed and replaced a sponge from a slate base, but I read somewhere that silicone is used. I personally favor the larger sponges, I prefer overkill on filtration to not enough of it. I would rather buy bigger filters and cheat some on water changes. Snails can work their way deep into coarse sponges and ruin them over time. Once they get in they seem to get stuck and die. They also infest box filters, but at least they can be removed when cleaning a box filter. Looking at it from a purely logical and maintenance viewpoint, I would have to give at least a slight edge to sponge filters over box filters. I still am sentimental about box filters, and have a few around, I grew up with Metaframe big bubble up filters and actual metal frame tanks with slate bottoms. It seems Lee has the rights to those filters nowadays, they are marketed as triple flows....

Hang on back filters are OK I guess, I have some and will continue to use them until they die, but to me their disadvantages outweigh their good points, so I won't be buying any more. Their best point is that they are relatively quiet, some nearly silent, when they are new. As they age their impellers get progressively noisier. In theory it should be easy to replace the impellers, but try finding a replacement impeller for a specific filter model and you will understand my meaning. I have tried several brands, most work well for about 6 months, then give a year to another 18 months of noisier and noisier operation before complete failure. They are more expensive for equivalent filtration than box or sponge filters. They are external to the tank, which is good when they are working, but you have to plan for a few inches behind the tank for clearance, and in the event of filter or power failure you might have a tank of dead fish before long. They clog easier, it can get expensive constantly replacing cartridges, I long ago

switched to filter floss or pieces of sponge filter type foam in them. If the filter media or cartridge is plugged, water then spills over the overflow back into the tank instead of getting filtered. If the intakes, impeller, or lift tubes get plugged, the flow of water can slow to a trickle or stop. If it was always a gradual decrease in flow, that might be acceptable, but at times it can be sudden. The filters can suck fish into the intakes, killing them. They also get a lot of gunk buildup that clogs the impellers and the lift tubes can get unsightly as well. Snails make clogging problems worse. Small snails enter the filter and eventually get big and clog things up. These filters also tend to suck plants into their intakes. There are sponge filter type prefilters that can be added to most to prevent that and protect fish, but flow is reduced somewhat. I even successfully mated an ATI hydrosponge IV filter to a large whisper hang on back filter, I put it on the lift tube and plugged the hole in the bottom of the sponge. That at least put the bulk of biofiltration in the tank in case of a power failure.

Mating the sponge filter to a hang on back filter gave me a better idea. Since that hybrid filter worked pretty well until I couldn't stand the noisy worn impeller anymore, I figured I might try to make a different type of hybrid filter. I tried mating powerheads to both sponge and box filters, and I am very excited with the results. I used 3 brands of filters in my tests. Lee triple flow filters in both medium and large sizes were modified slightly to allow use of a powerhead. I prefer the large size but had a few mediums I had used previously, air driven in 2.5 gal tanks as they are shorter. If you have some of these filters around and want to try one with a powerhead, they require some slight modification. There are three plastic prongs cast into the filter near the top of the filter body that require removal to fit the powerhead into the filter. They can be carefully removed with a dremel type tool, a file, or a knife. You must be very careful, patience is required, don't use too much brute force on the prongs or you might crack the filter body. I left just a tiny bit of the prongs and got a nice press fit with a JBJ sp-1300 powerhead. (240 gallons per hour). That powerhead comes with both dual and single water outlets, you can choose which one to attach. That particular filter combo I put together cost under 15 dollars.

I got the stuff to build mine from Kensfish. Floss sold as pillow stuffing is so cheap it is essentially almost free, I don't use carbon... Come to think of it, I probably could have left out the usual rocks in the filter to use more floss inside as the powerhead is enough weight to hold it down. On second thought, the dolomite or aragonite gravel I use in the filter to keep the pH from drifting too low from my infrequent water changes needs to stay.

The combo provides plenty of filtration and circulation and almost too much current in a bare 10 gal. If the output angle is adjusted to aim at a corner, it can be made to work nicely in a 10 gal, especially if there are some plants to act as a current break. I think this combo would be ideal for a 20 long or a 29 gal if you prefer box filters to sponge. There seems to be less restriction and more water output than the same powerhead used with a sponge filter. If you like bubbles, most powerheads have an aeration feature that can be enabled or disabled. The combination filter I set up is silent and totally splash and bubble free.

I also experimented with adapting powerheads to sponge filters and the results were also excellent. There is inherently more flow restriction with sponge filters, and more so with fine pore sponges. This reduces flow output of a powerhead somewhat. 10-25%? I didn't try to make measurements, but a severely clogged filter might seem to flow 50% less than a clean one, and a sponge may begin to pucker inwards. I generally wait until flow seems to be impeded in any type of filter before I do any cleaning of it. When the time finally does come, just squeeze it out and clean it up a bit. I tried a LMS (low maintenance sponge) filter from Angelsplus with several different powerheads. This filter is square, about 4 inches with a slate bottom. There is a hole at the top roughly a half inch in size that will expand a bit to hold a powerhead and a cavity the size of a small egg inside near the bottom that allows a powerhead to draw water easily. That is an important feature. No modification is needed with this filter, just stick the powerhead down inside for a press fit instead of using the airline and lift

tube. Some powerheads with smaller inlets can retain the lift tube if desired. Super Easy. It seemed just right for a 10 gal with a penguin 160 GPH powerhead. I am sure flow would be reduced more and clogging more frequent with a fine pore version of the same basic filter, possibly to the point of not enough flow to be workable. Worth a try, anyway, it would only cost someone a few bucks to find out.

ATI hydro sponge filters were also tested with powerheads. To adapt a powerhead to these, simply remove the top two plastic pieces of the filter and the powerhead will press fit into the internal strainer on the lower half of the filter. The hole in the center of these filters is larger, you might need to shim up the powerhead with a rubber band or something to get a tight fit depending on brand. I prefer the largest size of this brand filter, the ATI hydro sponge V in all tank sizes. A fine pore version will work with powerheads and provides excellent water clarity, but of course food particles stick to it rather than going into the pores. This is not a problem if you have scavenger fish in the tank. I use mostly coarse pore versions since they go longer before clogging. The cost to put one of these together is about 20 dollars at the time I write this. The advantage these filters have is size, they are physically bigger and have a high capacity, the largest size is supposed to handle tanks to sizes up to 80 gallons and I use them in 10 gallon tanks on up. Filtration overkill helps me stretch time between water changes. There is some method to my madness on doing water changes as infrequently as possible. These filters can also be stacked one on top of one another, I use a stacked set of ATI V coarse filters with a 290 GPH JBJ powerhead as the sole powered filter for my 55 gallon holding tank with a several hundred fish in it, it performs nicely and is nearly silent. Not bad for less than 30 dollars at the time I write this. I have several powerheads of various brands, some I have had for several years, and all have remained silent, no problems, none have yet even clogged and snails have never caused one to fail yet for me. One additional thing about I have noticed about powerheads is that they will raise the temperature of tanks slightly above ambient temperature. If it draws 15-20 watts continuously, that waste heat warms the water a bit. It may be several fahrenheit degrees for a 10 gallon or smaller tank. In most climates this can be a positive in the colder months. In a 20 gallon or larger tank with one powerhead you might not notice any difference. If I had to pick only one filter to use in the future in all but the largest tanks it would be the LMS sponge filter/ 160-240 GPH powerhead, and for 55 gal or larger tanks, stacked ATI coarse hydro sponges/ 290 GPH powerhead.



Bacteria and protozoans really do most of the heavy lifting in filtration, there are just a lot of different ways to contain them in filters. When you really think about it, filters are mostly there to increase the holding capacity of aquariums. An aquarium with just a shallow gravel layer, live plants and an airstone for some circulation might support a fraction of the fish a tank with a powered filter can. (but the number of fish it could support like this without an actual filter might surprise many of us) Plants also help purify the water by absorbing excess nutrients that might otherwise pollute the water.

I guess I use the terms filter and filtration a bit too loosely, sometimes I would be more correct referring to purification of water. I think the fish are happier in planted tanks, at least I enjoy watching them more that way. In my situation, I use gravel, live plants and an overkill amount of filtration to cut way down on my tank maintenance so I can spend more time enjoying my fish and less time being a slave to their care. They seem healthier and hardier to boot kept this way.

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