tools of the trade

Freshwater Filtration

When setting up a new tank, many hobbyists get caught up in the excitement of decorating and choosing its inhabitants. Unfortunately, many aquarists put so much time and effort into the aesthetics of their aquarium that they often overlook the basics. Filtration is the key to success with any freshwater setup, large or small, so it's not a minor detail to gloss over. If you want a freshwater aquarium to cycle properly and its water to stay clean and clear, then you need to take the time to select the right filtration system.

Freshwater Filtration Basics

Even if you are an experienced aquarist, it's easy to be overwhelmed by the number of freshwater filtration options. Walking down the aquarium aisle at your local pet store, you'll see dozens of different filters from a variety of brands. But what sets one filter apart from another?

First, let's consider the purpose of aquarium filtration. It needs to accomplish two things: circulate the water to prevent stagnation and maintain optimal oxygen levels, and remove potentially harmful substances from the water to promote stable water chemistry and high water quality.

Next, we'll look at how filters accomplish these functions. Aquarium filtration systems come in many forms, but they all provide one or more of these three types of filtration: mechanical, chemical, and biological. Mechanical filtration, the most basic type, physically removes solid waste from the water. Chemical filtration removes both dissolved waste and potentially harmful substances. Biological filtration uses beneficial bacteria and helps establish and maintain the nitrogen cycle in a tank, ultimately converting harmful nitrogenous compounds into more benign forms and ensuring a clean and stable environment for an aquarium's inhabitants.

Types of Filters

Internal Filters

Internal filters are installed inside the tank and come in a variety of sizes. They are usually designed for smaller tanks under 20 gallons (76 liters) in capacity. Internal filters facilitate water movement and can provide all three types of filtration, depending on the model. One of the most popular types is a corner box filter, which fit into the corner of the tank and can be filled with your choice of filter media.

Sponge Filters

Perhaps the simplest of aquarium filters is a sponge filter. This is an internal filter consisting of a powerhead connected to a length of tubing with a sponge on the end. The powerhead produces suction, which draws aquarium water up the tube, passing it through a sponge to remove solid waste

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■ The right filtration system for freshwater aquariums depends on the size of the tank and the species and plants that are being kept.

particles before returning the water to the tank. It also serves as a site for beneficial bacteria to grow.

Undergravel Filters

Another type of internal filter is an undergravel filter, which provides mechanical filtration. An undergravel filter features a slotted plate that is installed on the bottom of the aquarium and covered with substrate. The plate is connected to two tubes, one of which is connected to a powerhead. The powerhead creates suction, drawing aquarium water down through the substrate and releasing it back into the tank through the outlet tube.

Power Filters

Power filters are among the most popular filtration systems and come in a variety of sizes and shapes. Power filters typically have a plastic housing with an impeller that draws aquarium water up through an intake tube, passes it through various types of filter media, and releases it back into the tank as a waterfall. Depending on the filter media used, these devices can provide different types of filtration.

Canister Filters

Canister filters are also a popular form of filtration. They are self-contained units that can be located outside the tank or hidden from view in an aquarium cabinet. A canister connected to the tank through a tubing system houses the filter, which draws aquarium water in through one tube, passes it through the filter media, and releases it back into the tank through another tube.

Wet/Dry Filter

A wet/dry filter is a type of external filtration system that can be housed beneath the aquarium, often in a sump system. The filter media is exposed to water and air (hence, the label "wet/dry") to facilitate biological filtration and to remove potentially harmful substances from the tank water.

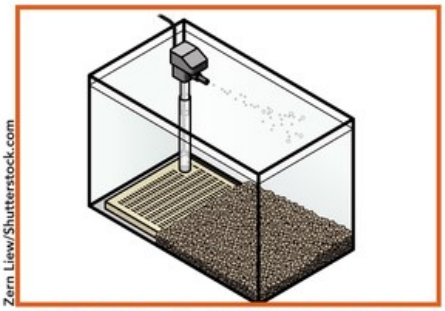
Internal vs. External Filters

When it comes to freshwater aquarium filtration options, the simplest way to categorize the systems is internal versus external. Both have their benefits and drawbacks. Internal filtration systems are great if you want to save space, but the downside is that they offer limited benefits for filtration. Both sponge filters and undergravel filters provide mechanical filtration, as well as some biological filtration, and provide space for beneficial bacteria to proliferate. However, they do not provide chemical filtration, so neither will be able to keep a large freshwater aquarium healthy and clean. Internal filters can provide three-stage filtration (mechanical, chemical, and biological), but they are only likely to be effective in small aquariums under 20 gallons (76 liters) in capacity.

Where internal filtration systems are found lacking, external filtration systems excel. For example, sponge filters and undergravel filters primarily offer mechanical filtration. External filters, on the other hand, almost always offer both mechanical and chemical filtration, and many offer biological filtration as well. Also, while internal filters are usually small, external filters come in a wide range of sizes to accommodate the filtration needs of both small and large aquariums. Finally, unlike internal filters, external filters feature more options to employ different types of filter media.

Options by Tank Size

When starting a new tank, its size is one of the most important decisions to make. Many experienced aquarium hobbyists will tell you that "bigger is better" in terms of maintenance and stability. However, the filtration system you choose has the greatest influence in determining the maintenance



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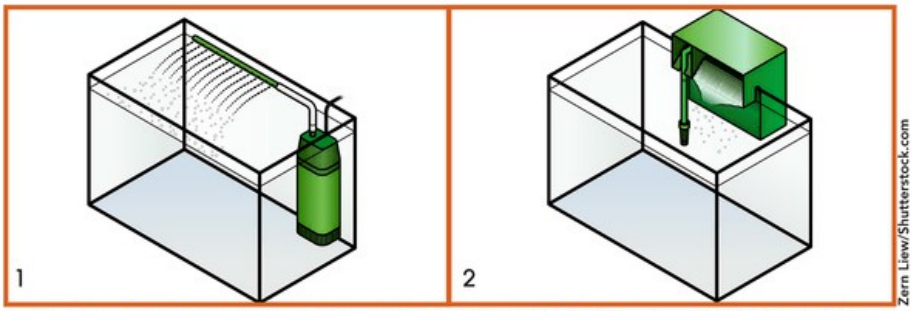
■ Illustration of an undergravel filter with a powerhead.



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■ Illustrations of (1) an internal box filter with a spray bar, and (2) an external hanging box filter.

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■ Because of the low volume of water, smaller freshwater tanks require an efficient filtration system that removes harmful substances before they affect the overall health of the tank.

requirements for your tank. If you have a large filter with multiple types of filter media, then your tank will be cleaner and easier to maintain than if you use a small external filter. Because tank size and optimal filter type go hand in hand, you should consider both factors in conjunction when shopping around for an aquarium filtration system.

Small Tanks

For small freshwater aquariums of 55 gallons (208 liters) or less, your main concern is having adequate circulation and strong filtration to remove potentially harmful substances from the water column before they become a problem. With small aquariums, toxins and other harmful substances have a greater effect on water chemistry and quality because there is less water to dilute them; this is the main reason why larger tanks are easier to maintain.

To keep the conditions in a small aquarium stable, consider a three-stage internal filter, a power filter, or a small canister filter. Internal filters are designed with small tanks in mind, but power filters and canister filters offer stronger filtration and more customization options.

Large Tanks

Large freshwater aquariums of 90 gallons (340 liters) or more have different filtration requirements. In large tanks, water circulation is just as important as filtration, and this is where external filtration systems like power filters and canister filters excel. Power filters come in a wide range of sizes, and the larger models are designed with stronger pumps to ensure proper circulation in larger tanks.

Another important benefit of power filters for large tanks is that they are incredibly easy to set up and maintain—all you have to do is replace the filter media every three to four weeks, depending on the biological load of the tank.

Although power filters are a great choice for large aquariums, many experienced aquarium hobbyists prefer canister filters, which are widely regarded as one of the most efficient freshwater filtration methods available. These can be customized with an aquarist's choice of filter media to meet the specific needs of a tank.

Canister filters require a little more work to set up and maintain than power filters, but they come in a wide range of sizes and can be combined with other inline devices, such as inline heaters, UV sterilizers, and additional inline filtration units.

Filtration by Tank Type and Inhabitants

Fish-Only

When shopping for a freshwater filtration system, tank size is important, but you should also consider the type of tank (fish-only, planted, etc.) you're planning along with the specific needs of its future inhabitants. For fish-only aquariums, you need three-stage filtration system provided by either a power filter, canister filter, or wet/dry filter. This is because when fish produce waste, it accumulates in the substrate of the tank along with any uneaten fish food. This detritus needs to be removed from the water column before it decomposes. Densely populated fish-only tanks require a larger, stronger filtration system than tanks with only a few fish.

Planted Tanks

When it comes to planted tanks, filtration requirements are a little different, as aquarium plants absorb nutrients from the tank water. The filtration system needs to provide a gentle flow to ensure that your live plants have access to these nutrients and help keep the accumulation of detritus in the tank under control. Live plants do draw some of their nutrients from biological waste, but too much in the tank can lead to unbalanced ammonia

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■ Large freshwater aquariums of 90 gallons (340 liters) or more require power filters with strong pumps to provide enough water circulation.

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■ Planted tanks need a filtration system that will prevent detritus buildup but not remove all biological waste from the water.

levels, which will have a negative effect on your plants.

Ideally, you should choose a three-stage filtration system, such as a power filter, canister filter, or wet/dry filter, for a planted tank. These options are also sufficient for a tank housing both live plants and fish.

Filtration for Fry

If your freshwater aquarium houses small or delicate tank inhabitants, such as newly hatched fry, you'll want to go with a gentle filtration system. A sponge filter is a good choice for this because it provides mechanical filtration to help keep the water clean but does not produce enough suction to put the fry at risk. Sponge filters also provide biological filtration, which will help maintain water quality in your fry tank between water changes.

A sponge filter or a small internal filter is also a good option for hospital tanks, where maintaining water quality is important but water movement and suction need to be kept at a minimum.

Filtering Out

Selecting a filtration system for your freshwater aquarium may seem like a simple task, but you'll be surprised by how much there is to consider if you take the time to look at all the choices. The right filtration system depends on the size and type of tank you choose to cultivate, along with the specific species and number of aquarium inhabitants. If you consider all of these factors and carefully weigh your options, it should become clear which type of filtration is best for your freshwater tank.

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■ A gentle filtration system, such as a sponge filter or internal filter, is best for a tank housing newly hatched fry.

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