

Sorting Through Filtration Options

There are dozens of manufacturers producing hundreds of filters. Each month a new filter gets thrown onto the market. Which one is best? What's the difference in them? What do you need to know if someone else asks you about the differences? Here we'll try to untangle the tangled mess of filters on the market, and make you an expert in the field of **pond filtration**.

The Three Types of Pond Filtration

The three types of pond filters include biological, mechanical, and chemical / sterilizer filters. Biological filtration works by using bacteria to break down **pond** wastes, converting them into harmless particles that can be used as **aquatic plant** fertilizers. Mechanical filters work by trapping and removing debris and sediment, thus cleaning the pond water. Skimmers and pre-filters for pumps are two examples of mechanical filters.

Water sterilizers, such as ultraviolet or ozone generators, destroy all living organisms that they contact. They are higher maintenance, and should be left for pools and spas.

Many filters overlap into more than one category. For example, our BIOFALLS has large amounts of surface area for biological filtration, while the filter mats help with the removal of fine to medium sized particles, which is a mechanical variety of **pond filtration**.

Biological Filtration

There are many types of nutrients found in a pond system - fish waste, uneaten fish food, leaves and runoff from lawns to name a few. High levels of ammonia (a form of nitrogen) are highly toxic to fish and are a major contributor to prolific algae growth. In **pond construction**, the primary nutrient that biological filtration utilizes and renders usable is nitrogen.

How it works.

In biological filtration, certain bacteria, known as facultative bacteria, absorb ammonia, and turn nitrites into nitrates, which are not as dangerous. These bacteria require oxygen to live, so it's important for the pump to run 24 hours a day, 7 days a week. If the pump shuts down, the bacteria can quickly use up all of the oxygen and die.

Nitrates are removed from the pond by another biological filtration method known as denitrification. This process occurs only in anaerobic (without oxygen) areas of the pond. That's why it's not necessarily bad for some areas of your pond to experience minimal water flow (such as on the bottom of the pond an inch or so beneath the gravel). The bacteria that live in this area of the pond turn nitrates into nitrogen gas, which is released into the atmosphere.

For any biological filtration to work, there literally needs to be billions and billions of bacteria working to purify the pond. They prefer to anchor on to things, which is why surface area is so important. More surface area means more bacteria, and more bacteria means better biological filtration. (**Water Garden Plants** are great biological filters).

A complete pond filtration system.

A good biological filtration system, teamed up with a mechanical filter (such as a skimmer) to remove solids before the water enters the biological filtration unit, is the most effective way to filter water. As the water enters the biological filter, there should also be a swirl chamber designed to avoid channeling, and to allow more solids to settle.

Next, the water should flow up evenly through the filter media. Any number of materials could be used as long as they have a high amount of surface area. We've found lava rock to be a very effective material. The final factor in a good biological filtration method is that the water is well oxygenated on its return to the pond. This happens most naturally and most easily through a **waterfall** or a stream.

Mechanical Pond Filtration

Mechanical filters rid ponds of larger particles, waste, and sediment. There are many types of commercial filters designed to perform this task. Because they remove larger waste particles in the pond, and because they work so effectively, some need to be cleaned quite frequently.

Sedimentation Filters

Sedimentation filters allow particles that are heavier than water to drop to the bottom of the **pond**, where they are removed through a filter that is hooked up to a bottom drain. They only remove the larger particles, and have to be installed where they can be fed by gravity.

Skimmer Filters

There are two main types of skimmers - box skimmers and floating skimmers. Both types filter the water by removing floating debris and waste before it's had a chance to move to the bottom of the pond. The box skimmer is the predominant type of skimmer on the market today because it's easy to maintain.

Box style filters come with either vertical or horizontal skimmer mats. Aquascape pioneered the horizontal filter mats, which prove to be the most effective, while providing the least amount of maintenance.

Vertical Filter Mats

The vertical filter mat was the hottest new design on the market in 1997. This mat was designed after the horizontal mat had established itself on the market, to signal the pond

owner when the mat needed to be cleaned, and to provide easy access to the mat, by putting it in a pull out tray.

Design liabilities of the vertical filter mat:

The tray that supports the filter mat becomes distorted and very difficult to push in or pull out, especially once the ground around the skimmer has settled, and the walls of the skimmer have bowed inward.

After the mat has collected smaller particles, it gets heavy and loses its durability / shape. The vertical filter mat creates two chambers in the skimmer, one for the net and filter mat and the other for the pump. Once the mat accumulates some waste material, the water flows through it so slowly that it creates a false water level in the pump chamber, exposing the submersible pump to air.

The vertical mat design disallows an automatic water fill valve to be used effectively. Because the water level of the pump chamber fluctuates constantly, it's possible that the automatic fill valve will run continuously flooding the pond's edges.

Maintenance of the vertical filter mat:

Frequent cleaning of the mat.

Constant monitoring of the filter mat to make sure there is enough water in the pump chamber for the pump to operate properly.

If an automatic water fill valve is installed, checking to make sure it's not running continuously.

Horizontal Filter Mats

The horizontal mat design was created in the field as the first professional pond skimmer. It's breezed through the test of time, showing why it's still the #1 selling skimmer on the market today. Now entering its 7th generation, the horizontal design is still standing at the top of the mountain, and here's why:

Design benefits of the horizontal filter mat:

Allows water to pass evenly through the mat.

Made of sturdy materials and evenly balanced on the support rack.

Traps all smaller debris that passes through the net.

Lays flat so there is no snagging or early wear and tear.

Never clogs to the point of preventing water from passing through, so the pump chamber does not run dry.

An automatic water fill valve can be used without the worry of excess water being introduced into the system.

Maintenance of the horizontal filter mat:

Cleaning once a month if needed.

May have to replace the mat every three years.

Field Testing

There are an abundance of skimmers being advertised, they all look great on paper, but how will they perform in the field? That's the question. When installing the vertical mat

skimmer, we immediately noticed that the mat was creating a problem by blocking the flow of water to the pump. Before installing the automatic water fill valve, we determined that if the pump chamber behind the vertical filter mat was constantly low, then the auto fill valve would constantly run.

When considering skimmers, always try to find out if and how they've been field tested. Realistically speaking, what insurance do you have that this skimmer is going to stand the test of time, and be maintenance free as the manufacturer claims?

Filter Construction Methods and Materials

The major difference between filters has mostly to do with the way they're constructed. There are four common filter manufacturing techniques, including rotational molded plastic, fiberglass, blow molded plastic, and vacuum forming. All skimmers and BIOFALLS used by The Mustard Seed are made of rotational molded polyethylene. Rotational molding uses uniform distribution of plastic throughout the mold, which insures that the product will be extremely durable and not contain any weak points. It also has a certain degree of flexibility which allows the filter to expand and contract in the ground without cracking from the freeze / thaw cycles of the earth.

Biological Pond Filtration

Every conventional water gardening, Koi, or pond magazine that you read will advertise a dozen different kinds of filter media. The main purpose of filter media is to provide surface area where bacteria can grow and serve as your biological filter. While all will basically do the job, some do it better and simpler than others.

Bio Balls

Bio Balls are small plastic balls with different ridges and shapes that are purely used as bacterial surface area. The more sides and protrusions the bio balls have, the more surface area they have. While they do have the surface area that we require, they're also very costly.

Brushes

Brushes usually hang down from a bracket or stem somewhere in the filter. They have large amounts of surface area to encourage bacteria growth, but they can only be used in a small percentage of filters. To adequately filter a pond of any size with only brush filters, the amount of brushes required may be unfeasible, while they're mainly intended to provide surface area for bacteria, they do an adequate job of removing medium to large size bacteria as well.

Ribbon

The ribbon used as filtration material is very similar to the plastic straps that you sometimes find wrapped around boxes for packaging. These ribbons are lightweight, but don't have a large amount of surface area. Therefore, a large quantity of ribbons would be required to accomplish a large amount of filtration.

Foam

The main goal of foam is to remove small to medium sized waste particles. The vast amount of surface area also creates a good surface for bacteria. Because the pores in foam are small, they clog fairly quickly, and are less than conducive to large particles.

Ceramic Media

Ceramic is one of the most expensive forms of filtration media on the market today. As its name implies, it's made of fired ceramic and contains many pores designed to create surface area for bacteria colonization. While it's a good form of media, the cost far outweighs the benefit.

Lava Rock

We've found, dollar for dollar, that lava rock is the best filter media on the market. Lava rock not only has numerous pores creating excellent breeding area for bacteria, but also acts as a mechanical filter by removing medium to large-sized waste particles as well. It's by far, the least expensive and most cost effective of all filter media.

Sterilizing Pond Filtration

Ultraviolet Filters

Ultraviolet clarifiers, sterilizers, and filters are accessories designed to control green water algae, which leads to pea soup colored pond water. This filtration is accomplished by passing water through a tube that houses an ultraviolet light bulb. The light kills the living microscopic particles in the water, but unfortunately, the UV filter also kills all beneficial bacteria and microorganisms it comes in contact with too.

Commonly Asked Questions

What effect does UV light have on pond water?

Ultraviolet light damages the algae cells, preventing them from normally multiplying. It also alters the proteins on the surfaces of bacteria cells and other fine debris particles, encouraging them to flocculate into larger particles. The mechanical filters then remove these larger particles more easily. To be fully effective, a UV filter should be used in conjunction with a biological and mechanical filter.

Will UV control hair algae or string algae?

No, they will not control hair algae or string algae. A UV filter does not affect anything that does not pass directly under the ultraviolet light. They also have no effect on fish and plant waste, even though some manufacturers claim they do.

Why does Aquascape Designs actively discourage the use of UV filtration?

UV filters treat water with radiation to kill algae, but that radiation also kills beneficial bacteria. Would you rather treat your pond with bacteria and natural biological filtration, or with unnatural and ultimately harmful, radiation? We prefer to treat the pond naturally.

An ultraviolet filter is a very expensive item. Besides the initial expense, the bulbs in the filter need to be replaced every six months in order to be effective. These replacement bulbs are expensive all by themselves.

External Pond Filtration

External filters are probably the most talked about filters in the pond industry. They have a popular past, mostly because there were so few options at the time. Let's take a look at the mechanical and biological workings of the external filters available in our industry today.

External filters evolved from the swimming pool industry, where noise and camouflaged filters are inconsequential (people aren't expecting a natural look), and where maintenance is required because the water is chemically controlled and filtered. The external filter was designed for swimming pools where the chemicals are required for swimming safety.

Whether it was a sand filter or a diatomaceous earth filter, the word filter in the name encouraged pond hobbyists to retrofit pool filters for ponds, thinking they'd solve their daily maintenance problem. The fact of the matter is, a chemically controlled filter works poorly with a biological environment. Think about it for a minute...is the chemical filter designed to filter fish poop...is it designed to filter dead, decomposing lily leaves? Probably not? Instead it's designed to work with chlorine and other chemicals right?

The bottom line is ... pool installers don't use our biological filters to keep their pools clean, and we suggest you avoid using their chemical filters to clean your pond. Here are some other filters derived from the pool industry that you can easily find on the market.

Bubble Bead Filter

This external biological filter is a molded PVC canister that contains plastic beads. The water flows through the beads, and is then flushed back into the pond. A UV clarifier is sometimes used with this system. This has to be regularly back flushed for it to function properly. These types of filters are very large, expensive, and impossible to hide outside of a natural pond.

Sand Filter

This mechanical filtration system is used primarily in the pool industry. The filter acts like a net or filter cloth that allows the liquid to pass, but not the solids. It needs to be backwashed regularly for it to function properly because of fish waste and solid organics that build up in the sand. If it's not backwashed, then the waste will cure inside the sand, causing it to turn anaerobic and harden.

Vortex Filter

In this external filter, the water flows by gravity or forced pressure into a pump that's shaped like a cone. After reaching this cavity, the water is directed into a rotational spin. This forces solids to fall to the bottom of the filter, while suspended particles get caught

in a strainer-like filter that must be periodically washed. The filtered water passes into a spray bar that leads back into the pond.

Canister Filters

These non-professional types of filters come in all sizes, shapes, and styles. Generally, this type of filter is targeted toward do-it-yourselfers with a very limited budget. Ponds that have this filter are generally the smallest backyard ponds (around 200 to 1000 gallons). These filters clog easily and frequently and, quite frankly, are ugly to look at sitting next to the pond.

Filtration Problems to Avoid

Floating Skimmers

A few manufacturers are currently producing floating skimmers. They float on the pond's surface and are connected to the pump by a section of pipe. The pump re-circulates the water and draws any debris floating on the water surface. Debris is then caught in a sieve type container, which is only meant to handle small pieces of floating material. Floating skimmers are only effective in very small ponds, and because of their size and the sieve through which the water enters the pipe or pump, they must be entered frequently. It's not as easy, and it's certainly not leisurely or relaxing...it's work!

Pump Pre-filters

Pump pre-filters are made of foam that traps small particles of debris. They are usually attached directly to the pump, and connected to a fountain pipe that leads to a waterfall. As the foam filter becomes saturated with debris, there will be a constant noticeable decrease in the water volume, which will require frequent cleaning of the filter. Remember the previous problems? Well in this case, you're looking at the same problem with a different style of filter.

Submersible Filters

This is a pre-filter for the pump, where the water is drawn down through the filter foam and pumped up to a fountain or other water feature. It mechanically clears the water by removing small particles of algae and organic debris. Biologically it cleans the water by removing ammonia caused by fish waste. Beneficial bacteria live in the filter and convert ammonia to harmless nitrates. These filters also require lots of maintenance to maintain the water flow to the waterfall or fountain.

Magnets

Magnets are a new item in the pond industry, what they claim to do is alter the magnetic fields of minerals in the water. The manufacturers claim that these minerals, if left unchecked, cause string algae in ponds and lime scale in an ultraviolet filter.

Bottom Drains

The only reason that we've included bottom drains in the water filtration section is that many filters rely solely on water that's circulated from the bottom of the **pond**. With older filtration systems, the water that was near the bottom contained everything that

settled, including fish and plant waste. This contaminated water was then transferred into the filter system that was intended to eliminate wastes. Bottom drains represent one of yesteryear's **pond construction** techniques. With modern pond filtration techniques, a bottom drain is not only unnecessary, but counterproductive. The rocks and gravel on the bottom of the pond are covered with billions of tiny bacterium that break these wastes down and convert them to useful plant fertilizers. When installing most bottom drains, a hole needs to be made in the lowest part of the water garden. If the seal around the bottom drain fails, all your water will drain out of your pond leaving your fish high and dry. The risks involved in bottom drain installations outweigh any potential benefits that they may have.

And in the end...

After learning about all the different filtration techniques, it still all boils down to one thing ... what's best for you to install? The greatest attribute that we bring to the table is that the filters you install from us have been thoroughly tested in the field. They are currently being installed by our very own construction crews, as well as thousands of other crews across America every single day of the week. They're tested and we know they work before you ever get your hands on them.