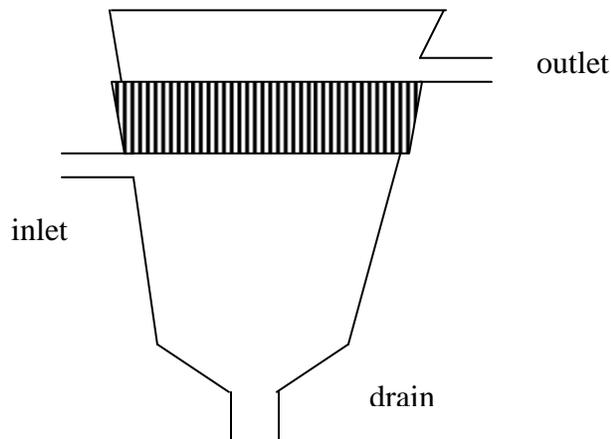


## Conversion of Filter-Chamber from mat type to moving bed filtration

By Ray Jordan

I have been considering ways to upgrade the filter system on my koi pond. Recently I constructed a large DIY trickle tower and wrote an article about that project a few months ago. I also decided to convert two of my bio-filters from Japanese matting to moving bed filtration using kaldnes plastic media. My original biofiltration consisted of two sets of three Nitrotech 911 chambers each gravity fed in sequence from a bottom drain. The first chamber is for mechanical solids settlement and contains brushes to help capture the fine particles in suspension. The next two chambers contained a layer of Japanese matting as media to hold the beneficial bacteria to convert ammonia and fish waste. I wanted to increase my bio-filtration capacity but did not have room for additional filtration chambers. Here is a drawing of one of the bio-filtration chambers with a Japanese matting cartridge.



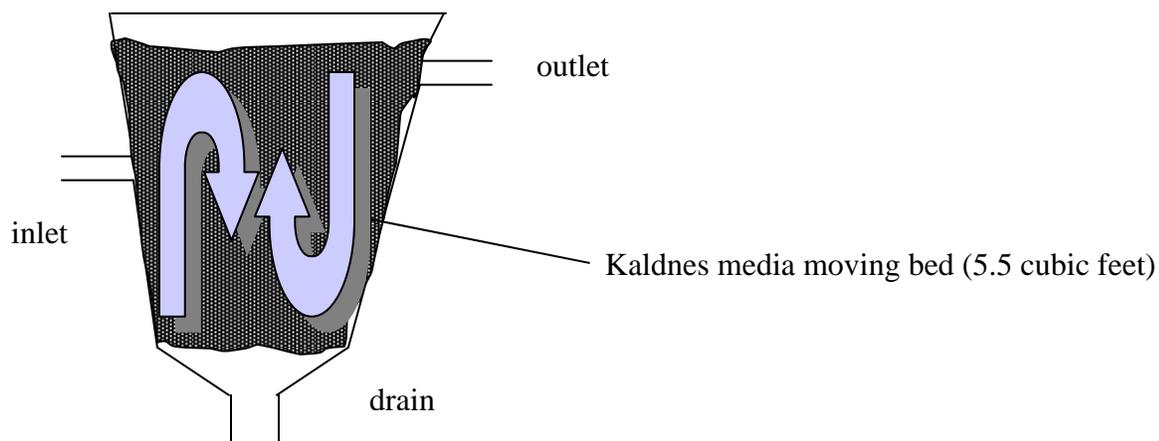
Water enters inlet at an angle below filter matting and causes water in chamber to rotate upwards and exit via the outlet. Solids drop out into bottom of chamber where they can be flushed to waste. Advantages to this design are additional solids removal in addition to bio-filtration. Disadvantage is a relatively small volume of total chamber is allocated to bio-filtration. I calculated the amount of filtration by looking at the volume of filter material (38 inches round by 8 inches deep) at about 1.6 cubic feet of filter capacity. I could not just add more filter material because of the chamber design.

I have seen a another type of filter method called a moving bed. This type of filtration is different than a traditional “fixed filtration media bed. In a traditional fixed bed filter water is pushed through a filter where the good bacteria can convert it to less toxic waste.

In a moving “moving bed” filter small plastic media is circulated through out the entire filter chamber by utilizing strong aeration to “roll” or circulate the media in constant motion through out the chamber. Water from the pond is also circulated with the media and the contact time between the beneficial bacteria on the circulating media and ammonia/nitrite is increased.

The advantages of a moving media bed are greater bioconversion efficiency in a smaller footprint and additional aeration. This additional aeration benefits the entire filtration process by keeping oxygen near total saturation and assisting to off gas carbon dioxide and any other gas that may be present.

The disadvantages of a moving bed is that no solids are removed by this system and if present will pass on through. Moving beds work best positioned after a settlement tank or mechanical strainer and with a traditional submerged fixed bed filter chamber in sequence behind it. This sequence of filters insures good solids removal, effective bio-filtration, and clear healthy pond water. The small loose floating bed bio-media needs to be retained in the moving bed filter chamber. So I had to construct screens to prevent the media from passing out the inlet, outlet, or drain. The use of screens can be an issue as they need to be fine enough to prevent the loss of media but not so small they block too easily. The screens will trap leaves, string algae and can block if not cleaned routinely. So more maintenance can be involved unless the settlement tank is very efficient at removing solids. Commercial moving bed systems have recently become available. One integrated moving bed system is made by Evolution Aqua is called the Nexus™. The Nexus™ uses a internal mechanical power strainer called the Answer™ to insure solids are removed prior to entering the moving bed filter chamber.



The advantages of this filter type is you can add much more media. In my case I am using 5.5 cubic feet of kaldnes media vs 1.6 cubic feet of standard filter cartridge. This equals about a 350% increase in bio-filtration media surface area.