The Continuous Flow Aquarium

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by

Patrick T. Johnson

1256 York Road, S.W., Alexandria, OH 43001-8722, ptj1256@aol.com

Introduction

Tired of cleaning fish tanks? Ever been frustrated from spectacular native fishes perishing in your tank because of poor water quality, or losing their vivid colors which they had when you collected them?

Ever thought about keeping trout in your tank?

If your only source of water is from chlorinated city lines, you may want to skip this article before you get your hopes up too high. However, if you are fortunate enough to have a well on your property, I will introduce you to a new aquarium maintenance concept which will boost your enthusiasm to a level which you might never have expected.

I am a new member of NANFA and would like to share my continuous flow aquarium concept with other native fish hobbyists. The success of this system is remarkable, and because it constantly feeds off a continuous supply of fresh clean water—just like a stream!

To set up such a system requires the following:

1. A ground water supply system (a typical well with submersible pump).
2. An iron filter to effectively remove staining minerals.
3. Sufficient reserve capacity to draw input of at least 300 gallons of water per day.
4. A drainage plan capable of handling the same daily volume of discharge.
5. Some hands-on experience with plumbing. (Some engineering talent will come into play here, too, as each individual's resources and setting are quite different.)

An ideal home for the continuous flow aquarium is one with two wells, or a home which is located on high terrain so that discharge water can be drained off without turning your backyard into a permanent wetland.

As you may have surmised by now, this system does not recycle the water—but this is its primary feature. My setup draws the water supply from my primary well, which in itself is nothing spectacular. Mine is a typical 80 feet-deep well in central Ohio which produces 15 gallons per minute using a 1/2-horsepower submersible pump. My 85-gallon water storage tank is somewhat larger than normal as I had at one time planned on installing a ground-water geothermal heating system. During this stage of my tinkering, I had a second well drilled for the geothermal water discharge. The geothermal heating system plans never materialized any further, but I later discovered that I had accidentally created a perfect setup for a continuous flow aquarium.

An alternative setup would involve pumping low pressure water into your tank from a nearby stream, but this text will only address the high-powered water injection method. This method will be most beneficial because the water can be super-oxygenated by spraying jet streams into your tank from tiny orifices drilled in your water lines. Also, the ground water supply will be of constant cool temperature and will be crystal clear (mine remains at 58-60°F year round).

Setting Up the Input Lines

To set up the input, shut off your water supply and route a new water line to your fish tank location. Be sure to incorporate a valve in this line. This will be necessary to regulate the input flow and allow for emergency shut off in case of a power outage or line rupture.
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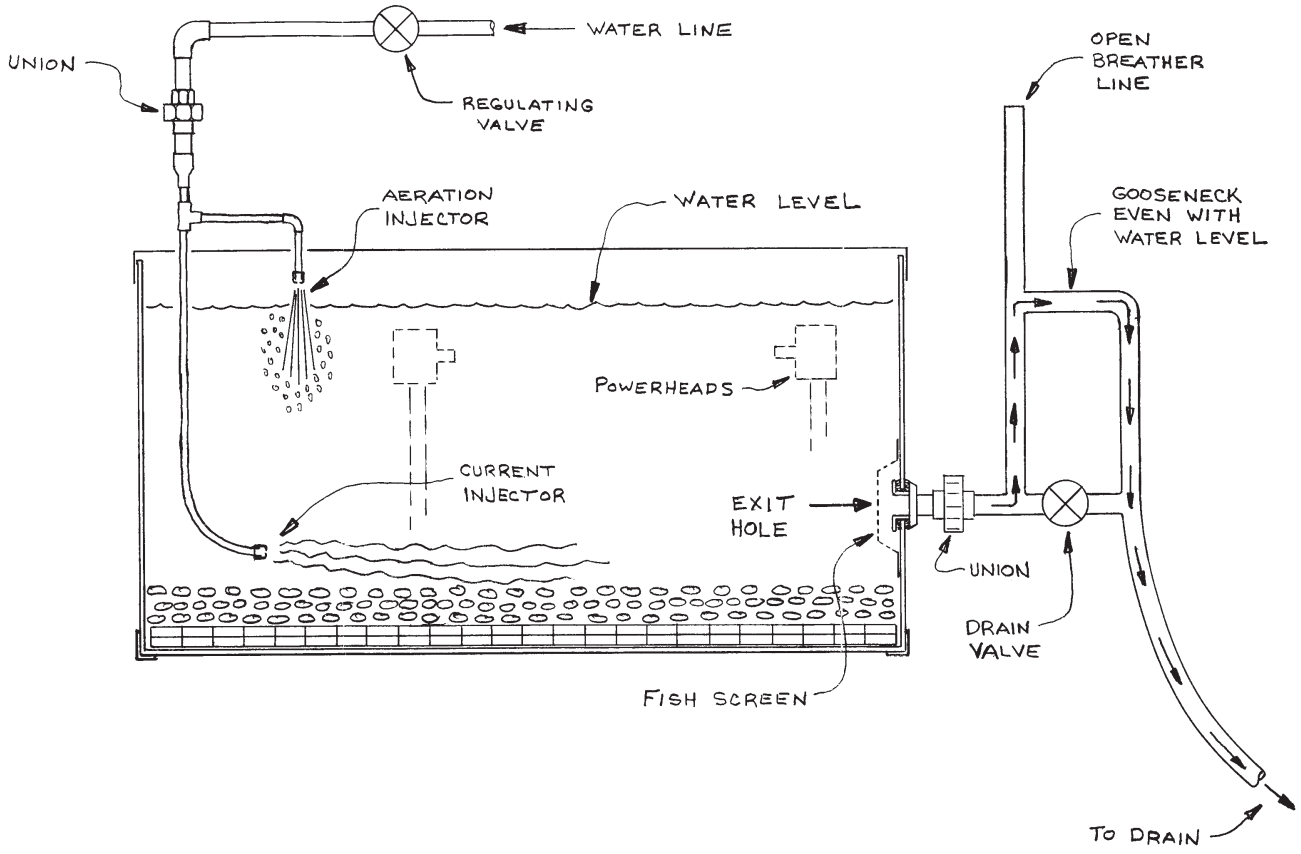

For multiple tanks, you may want to design an input system which uses a separate regulating valve for each tank as well as a master shut-off valve.

Downstream from the valve will be your actual injection line. At this point you can "neck" down standard 1/2" water line to 3/8" or even 1/4" copper tubing.

I have two 1/4" injection lines entering my tank, and they're divided by a simple tee connector. The first injector blasts high pressure water onto the surface through a 1/32" diameter orifice which I drilled in the endcap with a specially purchased drill bit. This jet also produces intense oxygenation since it is positioned about two inches above the water surface.

The second injection line extends down to the bottom of the tank where it curves to horizontal, terminating at another 1/32" diameter orifice. This injector creates an underwater current along the gravel bed, simulating the natural riffle environment of a stream. Some trial and error will most likely be necessary to establish the desired effect for your tank. I recommend a union at this point in the line for easy changeover to a different injection apparatus.

Setting Up the Discharge Line

Setting up the discharge requires drilling a one-inch diameter hole in the side of your tank. This will probably not be possible unless the side pane of glass is removed or replaced. Just about any glass shop can provide you with a new pane of glass, including the hole, and many can actually build a whole tank from scratch for less money than you would pay at a pet shop. The correct location of the hole is near the bottom of the tank to facilitate draining.

The next step is to purchase the type of fixture which seals the water supply line to the bottom of your toilet tank. Most types are now made of plastic, so the unnecessary parts can be easily cut off with a hacksaw. The modified fixture is then sealed to the side of your tank in the same manner as it would be to your toilet. You build on from there to create a loop with a drain valve at the bottom and a gooseneck at the top (placed evenly with the desired water level). Raising or lowering the gooseneck location will adjust the water level in the tank accordingly. At the top of the gooseneck, tee off the

line such that an open breather line extends up higher than the water level. This will prevent a bubble lock from forming in the discharge line (a bubble lock could cause the tank to overflow).

To minimize flow resistance, I recommend a discharge line diameter of one inch (or more).

Some high-quality silicone tube sealant might come in very handy at the water exit, and I recommend only the best. Industrial grades such as Dow 795 or G.E. Silpruf are neutral cure based (no acid vapors) and are used for structural glazing in high-rise construction. This grade of silicone cannot be found at the hardware store, but can be obtained commercially for about $7 per tube. (Try telling your local Dow representative that you are considering their sealant for a new 14-story glass high-rise, but that you need a sample for a preliminary performance test. They will usually jump at the opportunity and give you what you need!) Clean all parts with solvent such as acetone before applying any silicone sealant. Remember, the discharge line must at no point be higher than your desired water level.

The completion of the discharge line could lead to a basement sump, outside drain tile, or a second well (whatever works best in your situation). If draining into a second well, be aware of potential EPA regulations—even though the exit water will be virtually the same as the input water.

Also, don't forget a screen to prevent your fish from escaping through the water exit (I used a plastic hair net for a bathtub drain).

Water Filtration

Most well water contains minerals which will soon stain your tank unless you install an iron filtration system. I did not have one at first, and had a problem with the water coming out cloudy instead of clear. I called the Culligan man, who told me that oxidation was causing the cloudiness. I ended up leasing a Hague green sand filter and the water has been crystal clear ever since. This iron filter uses potassium permanganate to form an ionic bond to the green sand and remove the iron from the water. It also acts as an oxidizing agent for the water prior to the injection lines.

Warning: During the installation of this system, some of the potassium permanganate was used to flush out my household water lines. This turned out to be a disaster. Within five minutes after the installation, all of my fish were dead! The potassium permanganate has had no detrimental effects since then, but if you get this type of filter, be sure to shut the water supply valve prior to installation, or remove the fish until things stabilize.

Results

Setting up a continuous flow tank system is a big project, but the results have been outstanding. I have had this system since February 1998, and see no need to clean the tank. The water is always crystal clear, clean, cold and fresh. (I also have two powerheads which suck any debris down into the gravel bed.)

I presently have about 90 fishes in this 44-gallon tank without any detrimental effects from over-crowding. Fifteen species of darters thrive very well in the underwater current and seem to maintain the same vivid colors they had when I captured them. All are extremely healthy. I have not yet obtained any trout, but I expect they will do quite well. However, I plan to thin out the population and study the breeding responses of the darters in this setup.

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