

Select Aquatics of Erie, CO.

# Creating an Automatic Water Changing System for Your Fishroom

**\*No Drilling of tanks!**

## **This is an Automatic Water Change System that Requires:**

No Pumps  
No drilling  
No Air  
Little Maintenance

### **Because of this:**

You never need to risk breaking a tank to drill it.  
Moving tanks around is no problem.  
System can be modified easily to add or delete tanks.

### **This system will not:**

Pass water between tanks  
Spread diseases or pathogens

### **Water being added is:**

Oxygenated  
Proper temperature  
Evenly distributed between tanks

### **However, the system requires:**

- Being gravity (siphon) dependant, tanks must be at least 12" off ground.
- You will need a nearby sink to both fill and drain, OR a reservoir and a drain holding temperature controlled, aged water. (Where you will then need to pump the water from the reservoir)
- Using water from the tap will work without dechlorination, as you will only be adding up to about 20% tank volume at a time.

-Obtaining and Working with PVC and PVC glue

### **Pros-**

- No drilling tanks, leaking drain portholes, pumps, motors or moving water with air or powered means that can fail
- No need to turn anything off or disrupt fish to change water
- No need to add dechlor
- Can do changes regularly, at any percentage, as often as you like
- What used to take me 3-4 hours on Saturday of carrying buckets I can now do daily, with no effort, in 40 minutes.
- Temperature shock is avoided with frequent, small changes
- You can spend more time cleaning tanks and doing other work
- No backflow siphon issues
- Water does not mix between tanks
- Fish are healthier, bigger, and breed more frequently.
- Plants do far better
- Periods of inactivity (vacations, etc.), are less stressful on the fish because water changes continue.
- Diseases are far less frequent (I may have had a case of ich once in 5 years, and nothing else).
- Though I cannot drain water from individual tanks with the system, I can easily fill whenever I clean by turning on that zone for as long as I need manually. I can turn off the other tanks in that zone if I do not want to change any water.

### **Cons-**

- If you need to empty a tank you must still do it by hand
- You are committed to the water parameters that come from your water supply. unless a tank is taken off of the water change system, it must do well at the pH and hardness of your source water.
- At times there can be a fair amount of working with PVC glue
- Tanks must be observed regularly to restart a drain siphon if it stops
- You should be aware of internal water pressure within the PVC system (Do not turn water on full when valves are open if water is turned off into tanks.)

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### **Changes made to my fishkeeping to best adapt to the system.**

1. My fishroom is primarily bare bottomed tanks. The system does not clean up mulm or vacuum the bottoms of tanks
2. Most of my fish are well adapted to the water quality that comes from my tap. My Ph is about 7.4, Hardness is low, at 90ppm.
3. I am experiementing with doing a 4 minute change daily, rather than 10 minutes every other day (which equals about 15% in 10 gal. tanks from my tap).
4. I am not concerned when they are occasionally overfed, but have strived to keep the bottoms free from mulm buildup. However, water changes can be frequent enough to prevent ammonia buildup, encouraging the cultivation of infusoria for fry- so I leave a thin layer of mulm in my fry tanks

(particularly the smaller egg layers). When a tank appears stressed, I first look at temperature, knowing that water quality will less likely be a factor.

5. Whenever I do any work that involves draining a tank more than an inch or two I always ensure that the drain siphon has not stopped working.

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## Materials needed for installation:

Pad and paper- everything is written out before hand

A 2, 4 or 6 zone control box and sprinkler valves - depending on the size of your room, that are available at any Home Depot, Lowe's etc. A lawn sprinkler control box costs about \$30, and a valve for each zone is about \$10.

System can be done entirely manually with lines splitting into separate zone lines from sink, and changes are then done by turning on water by hand, rotating from zone to zone. You must be sure to have a zone open when turning the water on, and open next zone before turning current zone off so that PVC setup isn't forced to hold entire tap water pressure (though it should be able to).

PVC- get to know the guys at Home depot. They will wonder what you are doing after buying up all their  $\frac{1}{2}$ " valves half a dozen times. Your planning on paper will tell roughly how much PVC, fittings and valves you will need. PVC materials are bizarre cheap. 10 feet of half inch PVC costs under \$2.00.

You will be using  $\frac{1}{2}$  inch PVC tubing (for all filling lines),  $\frac{3}{4}$  inch (for all drain setups from each tank) and 1 inch section lengths that will collect water from the tank drains and connect to the main sink drain.

I highly recommend at least one hand-held PVC cutter (about \$10.00).

PVC glue- I just use the simple clear stuff in the gold can. Use your own judgement. You **MUST** glue all fill lines, for they hold pressure from the tap. I don't glue most drain lines once the water has drained from the tanks, and I prefer knowing it can be torn down or changed easily, but I do encounter occasional dripping. However, drain setups at each tank **MUST** be glued until the water gets to the main drain, or air will get into the setup where it should not, and the siphon can stop. PVC glue runs about \$2.50 a can.

Angles, Ts, Valves etc.- Each tank's fill and drain line setups will require a certain number, then multiply out. They are also affordable- "contractor" packs- packs of 10- are also generally under \$2. Valves are the greatest expense. Each tank has one, and a few more valves will control where water goes based on the size of your setup. They run about \$3 apiece. As a rule (depending on your room) you'll be using 90 degree pieces in  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" sizes. Also connectors, tees, and end caps and in all three sizes, reducers will be  $\frac{3}{4}$ " to  $\frac{1}{2}$ " and 1" to  $\frac{3}{4}$ ", but you will only using  $\frac{1}{2}$ " valves. Again, try to determine how many you will need ahead of time to keep visits to the hardware store to a minimum.

Electrical Ties- I use these to help hold and stabilize the lines against the racks and each other. 8 or 11 inch ties work best, and they can be connected to one another to create longer pieces if needed. Bags of 100 are about \$9.

## You will also need:

About a weekend to do this, depending on the number of tanks you have.

A ventilated area

A drill with a 1/16th inch or so bit

A Tape measure

2 pairs of pliers to easily disconnect joints not yet glued

Clothes you don't mind getting wet, and possibly stained with PVC glue.

Best way to do it:

Be aware that it will be 1 week after building this system before being able to use it.

The PVC glue must be fully cured and dissipated before water running through the PVC cleans off the glued joints. Introduced water pressure will move any glue residue into the tanks with the fish. I have lost fish that died as a result of my running water into a tank through a line containing new glue that hadn't dried thoroughly.

## Steps:

**1.** Ensure that all tanks are where you want them to be. Have tanks placed to provide easy access behind them, and set up in straight lines when possible. The bottom tanks must be at least 12 inches from the ground and above the drain used to collect the water that drains out.

**2.** Build all of the drain setups for each tank from 3/4" inch tubing. Observe attached drain siphon setup photos. Keep in mind the size of the tank each will be used on, and where the main drain line will be located that it will be draining into. All fill lines will be 1/2" inch and drain lines 3/4" inch. You want to be sure that water never fills faster than it can drain. All drain lines collect to a 1 inch line so that it will not back up.

You will see that where the drain T is placed within the drain setup apparatus determines the water level in the tank. Always keep at least 2 inches "headroom" from the surface of the water to the top of the tank to prevent overflowing if the drain setup loses its siphon (from having worked on the tank where it was drained down, etc.)

I built one for each size of tank (all 10s, 20s etc.), didn't glue them, took them each back apart, then made each piece multiplied out to number of tanks. Then I put them together and glued them, then set aside.

The most time intensive part is drilling all of the little holes into the in-tank drain ends so that any fry are not sucked out.

The connection where this drain setup drains into the 1" drain line will NEVER be glued into the 1" line. You will need to use this joint to restart the siphon if it stops. (which happens very rarely- maybe once every other month on one or two tanks in my 60 tank fishroom, and can always be traced to my working on it or it being drained down too far, and I didn't check it afterward)

**3.** Now build the 1/2" fill lines for each tank. Drill a 1/16th inch hole into the middle of each end cap. Each fill PVC line must be made specifically for each tank. Keep in mind where the light sits, so that water flows into tank unobstructed. I use the white plastic honeycomb light grating to cover tanks that need to be covered, they don't obstruct water flow from the fill lines.

Do not make them so that drilled caps sit in the water, water should enter from cap ideally 2-3" from surface to provide aeration and prevent back siphoning into other tanks when the flow stops.

**4.** Glue fill line setups together, keeping knobs so that they are easy to access and knobs can move freely from open to fully closed.

**5.** Begin to conceive where the  $\frac{1}{2}$ " fill line from the sprinkler valve back at the sink will be placed, and how the fill line will best lay against the back of the tanks and attach to the rack, while next to the drain setups.

-I installed my fill lines first, then had the drain sit lines against them. See attached top rack PVC photo.

-Keep in mind that the fill lines will hold pressure, so keep turns, etc. with the fill lines to a minimum.

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Keep in mind that everything you do until step 10 will be disconnected and re-built outside or in a well ventilated area to be glued together in sections. The sections will then be glued together in the fishroom as they are put in their final place on the tanks.

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**6.** Lay out 1" drain line tubing behind tanks and begin to put in the 90 degree angles etc. to fit the lines to the angles of your room.

-There needs to be a 1" line for each row of tanks that will then drain into the single 1" line out to the sink drain.

-Temporarily attach this line to the rack, or support it as you will want it. (Nothing will be permanently attached until after everything is glued in a ventilated area and brought back to the fishroom. I do not glue the 1" drain lines, so they can be roughly put in place.)

-If you are really organized and somewhat good at this, gently slope the 1" drain line toward the sink drain from far point of the room. This will help to avoid any standing water within the setup.

**7.** Determine how you will tap into the sink drain line.

I put a "Y" piece in below the fishroom sink so that both the sink and the fishroom water go out of the house together.

In one fishroom, instead of draining to the city sewer I drained into a plastic garbage can with a pump that then moved the water out into the yard and garden.

**8.** Run the fill line from the sink to the sprinkler valves mounted nearby.

Hook valves up to control box.

Have fun and be creative with all the new PVC you just bought, and end up with a line from each valve to a designated portion of the fishroom.

**9.** Hang the already made drain lines from the tanks.

The tanks of each row will drain into their own 1" drain line that will then T into the 1" line that goes to the sink drain. Put a tee into the 1" line, then you will need a 1" to  $\frac{3}{4}$ " reducer to connect the  $\frac{3}{4}$ " individual tank setups into the 1" line. Do not allow a tank to somehow drain into a tank below. Each tank row drains into the same 1" drain line that goes down to the main drain line and out to the main drain. This will prevent water mixing between tanks. (This can be seen on photo of back of tanks, attached)

To prevent vacuums within the 1" drain lines from developing, causing siphoning to start where it is not intended, I put a T into the lowest 1" drain lines with an open  $\frac{3}{4}$ " line of PVC rising straight up to above the room's water level, allowing air to enter the drain lines as they head to the end drain. This opens up the flow, prevents siphoning and helps keep water from building up within the drain system. In my room of 6 zones, I have put in 4 of them spaced equally throughout the room.

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**10.** Begin cutting tubing for both fill and drain lines that will be connected to already built fill and drain setups and put it all together. Build as it will be in final form with light hoods placed in, etc. Do not glue anything yet.

**11.** Divide up when finished into sections that can be brought to a well-ventilated area to glue. Obviously, keep all angles of each connection as it should be- I have used a marker, putting a line over the joints that needed to be angled, then simply matched them up when outside. Completed drain setups can be left on tanks, they will never be glued into drain lines for they need to be disconnected to start or restart the siphon.

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PVC glue and its fumes are toxic to fish. Always allow any freshly glued area to dry thoroughly- days, not hours, before running water into the tanks from newly glued areas.

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**12.** Glue sections together. Let dry and air out THOROUGHLY. Keep all valves in the open position to assist air flow through the PVC when drying.

\*Nearly all of the times I have encountered problems with drain siphons has been due to spots I'd missed gluing at this stage of the process.

Be aware to keep structure in small enough pieces when finally placed on the tanks in the fishroom so that it can be put together and glued easily, without any force or tension.

**13.** Carry back into fishroom and place on tanks, aware of where sections need to be connected. Do one section at a time, make sure every connection is glued that needs to be when putting the system together. See attached back of rack photo.

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**Remember:**

It is only PVC. As long as you have one or two connectors and a little glue you can cut a line

(As long as the water is off. This may sound stupid. I've done it. More than once.) and change whatever you'd like. Put it back together and voila, good as new.

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**14.** When all is in place and glued marvel at your work and try to forget about it for at least 3 days, a week is best. Leave all valves on tanks open to assist air flow through system. Then after a wait of 3-7 days...

**15.** Make a "Siphon Starter". Observe siphon starter photos attached. You will need two pieces of  $\frac{3}{4}$ " PVC, one maybe a foot long, the other about 18". Connect with a 90 degree elbow, then put 2nd 90 degree elbow on other end of shorter piece.

**16.** Start the siphon in each drain setup structure for each tank:

To start the drain siphon loop for each tank: Be sure the tank is filled slightly above where the T in the drain setup will drain down to the 1" drain line. Gently connect the 90 degree elbow (because it will need to come off quickly) on the shorter end of your siphon starter over end of the line going down to the 1" main drain line. Place finger over hole in top of drain setup and inhale firmly to begin siphon in outer loop. Then connect to the 1" drain line placed to take water from that tank while trying to get as little water on your shoes as possible. See attached Siphon Starter photos.

**17.** Now go around the room and check that all of the valves on the fill lines into each tank are open about halfway. ALWAYS be aware to keep system "open". Closing off many or all of the valves could cause a crack or a blowout in the system over time.

**18.** Now the fun begins. GENTLY turn on the water about 1/3 to half the strength you want to eventually expect to use.

You are looking for:

- Leaks, Drips

- Water going where it should not. This sounds silly, but if you have more than 10 or 20 tanks, you may find that a drain line taking too many tanks too soon is causing another tank in an odd place to fill rather than drain. In my room of about 60 tanks I had two of those spots to fix.

- How evenly is water being distributed? Begin to turn some fill valves up, some down depending on flow to adjust the flow into each tank. If no immediate problems, turn up flow of water slightly, continuing to adjust. Tanks closest to water source will be at greater flow than tanks later in line and tend to fill faster, etc.

- Watch for some tanks filling faster than others. This could be water going in, but it is more likely that the siphon hasn't started properly in the drain setup, and needs to be restarted.

- Water flow from the nozzles hitting light hoods, causing any problems.

- Watch for water going into tanks causing too much disruption, and adjust accordingly.

**19.** Let it run for up to 10 minutes, possibly adding an antichlorine agent- you do not yet know how much water is actually being added. Gradually increase the pressure to the desired flow, watching for any of the problems listed above.

**20.** Turn off. Then set timers at control box. I would keep the water changes gradual at first- I have been doing 15% every other day for 4 years (about 10 minutes on a 10 gallon tank with water pressure at about 2/3rds full strength.). At first, I would start at about half that, increasing as you wish, keeping in mind that too much can bring chlorine and chloramine issues. **UPDATE-** Since this article was written, I have since settled into a 15% water change daily.

At some point you may want to find out exactly how much water is being changed. To do this I divert the fill stream from a tank at about mid distance from the sink into a bucket, measuring the amount of water in the bucket at specific time intervals, keeping track of where the knobs are placed where the water is turned on. Full strength with both hot and cold turned up could end up too hot, and far more water than you need.

**Maintenance:** This for me is simply looking for puddles, locating the leak and fixing it, usually by replacing or simply gluing the offending joint. As well, due to joints weakly glued initially or missed having been glued altogether, a drain setup will lose its siphon- in my room it will happen on one tank about every 3 months. Because the water levels in each tank are set where the "T" is placed going down to the 1" drain line, a 15% addition during water change will not overflow the tank, but can be spotted and fixed before the next water change.

**UPDATE-** Since this article was written I have seen that the eventual loss of siphon on a tank can often be spotted days before it actually happens. But more often, I have had problems from turning off a tank to restart the siphon at a later time, (because I had drained the tank working on it, or it looked liked it needed to be restarted) and then forgetting about it- resulting in the tank going a period without water changes. So I have put a 1/4 inch strip of red electrical tape on every tank, marking where the water level of that tank is when the drain siphon is working properly. When a drain line begins to lose its siphon it will sometimes go gradually- over a few days, and the tape will show the water level rising in the tank. If it has been turned off or is not filling for any reason, the water level in the tank will then evaporate down.

The room now has close to 1000 ft. of tubing. I have tanks from each zone spread throughout the room (all 30's fill at same time wherever they are located in the room, etc). This is simply because the system evolved over time, and I did not move tanks, as I probably should have, to accommodate the system. That is not the easiest, nor the most sane way to do it. Hopefully, yours will be set up more cleanly and less prone to the occasional repair. With my system of hundreds of connections and joints, I fix about 5-6 a year, usually in one or two quick sessions.

On the rare times a drain siphon loses its siphon it is usually because I had worked on the tank and drained the tank too far, then forgot to restart the siphon. When this happens it will not drain- Obvious because the tank is fuller than the other tanks. (the reason for the "headroom" mentioned earlier.) If you are only changing 10% or 15% each change, then the tank will not overflow.

Sometimes a joint had simply been forgotten to be glued, and at other times it may just need to be restarted. Of dozens of weekends and vacations of up to a week away I have never had a siphon lose its siphon when I was gone.

#### **When I have had any problems:**

Over the 6 years of using this or a similar system, problems have been rare, but here is a rundown:

1. A sprinkler valve once malfunctioned, and a section kept refilling and draining,



eventually killing all of the fish in that zone. That was the single biggest disaster I have ever had. I now spend the extra buck and get better quality valves. There has never been another instance similar to that. Preventable.

\*\*\*\*\* UPDATE- When putting in the sprinkler controller, most will provide an option for a valve that will come on before zone 1 and turn off just before the last zone finishes. This way the longest a broken valve can cause the water to flow into tanks is the maximum length of time all of the zones you are using take to fill- preventing losses. Today I use that "master valve" setup, and would never consider the system being set up without it.

2. Twice I lost tanks of fish to water changing too soon after a repair and fumes wiped out the fish. Not all fish were affected. In both instances 3 or 4 tanks were affected, but in both instances it was only the tiger limias that all died. Again, preventable.

3. Twice I put water in that was too warm, but I was only changing 15%. I would never have known, except that in both instances I wiped out my A. toweri that seem particularly sensitive to warm water, while affecting no one else. Also preventable.

And the last of those problems happened over 4 years ago. Good Luck!

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Automatic Water Change System

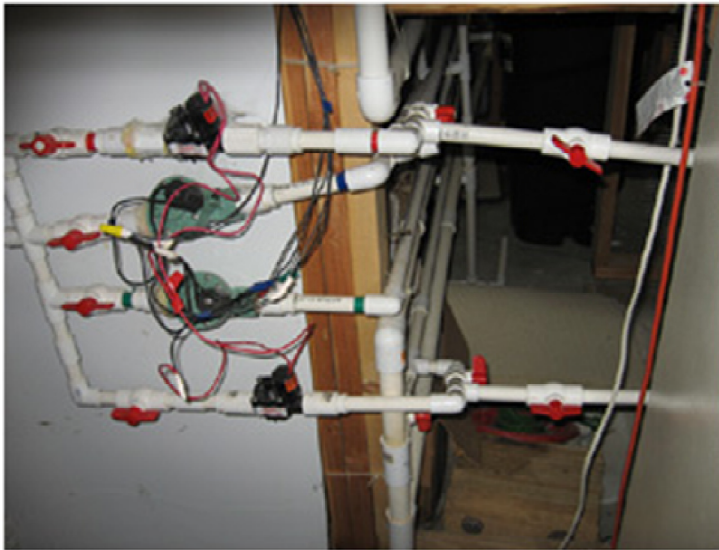
gregsage@mesanetworks.net



Fill Lines



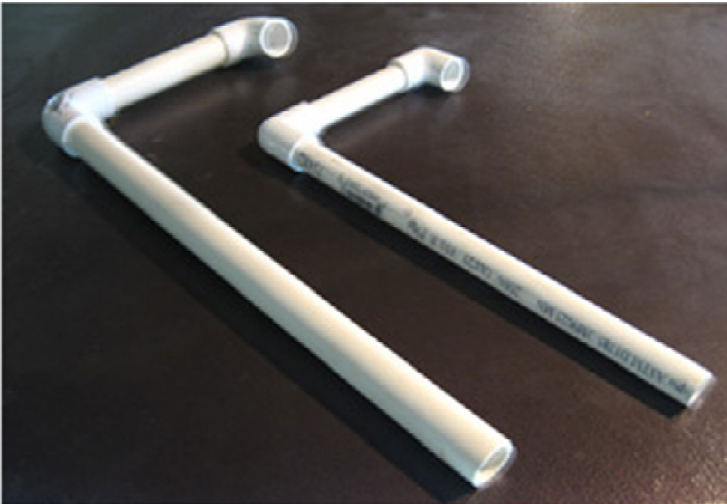
Drain out to sewer



Sprinkler Valves



Setup Suggestion



**Siphon Starters**

**Using Starter**



## Drain Setup