Do It Yourself - Koi Pond Trickle Tower

by Ray Jordan

I started building a large trickle tower filter this past week to provide additional bio-filtration to my koi pond. I also felt a TT would help keep the water cooler during the summer months due to increasing the evaporation rate. Martha promptly named my project the ***"green monster."*** I found a scrap piece of 18 inch diameter heavy walled PVC pipe about six feet long to serve as the actual tower vessel. I used 3/8 inch PVC sheet material to cut out the shelves, bottom, and top for the tower. I also used this same material to fabricate drip plates for the top of the tower to assure even distribution of water to saturate all the media completely and a bottom drip plate to support the media and prevent it from flowing out the outlet at the bottom of the tower. Additionally I used 4 in, 2in, and ¾ in threaded nipples for the connections through the tower itself to complete the plumbing. The Trickle Tower will hold about 10 cubic feet of media.

I connected the green monster at the end of my skimmer, bubble bead filter, UV plumbing circuit. I choose this connection because surface water will be heavier in organic compounds (foam you may see floating on your pond on in your skimmer) Water will be pumped through the bubble bead to have any particulates removed and through the UV to the top of the tower where it will then trickle down through the bio ball plastic media and return via gravity flow to the pond. I intend to flow about 30 GPM through this circuit. This circuit originally returned to the pond through my waterfall (Which also has a bypass that I can use in cold weather). I used a three way valve which will allow me to vary the amount of flow to the TT or the pond waterfall as needed. The Trickle Tower will use water already pumped through the bubble bead so there is no need for additional water pump. I am connecting a 200 liter per minute linear air pump to blow air into the bottom of the tower that will exit at the top of the tower. This air will counter flow upwards against the falling water and exit at the top of the tower to insure maximum gas exchange and humidity within the tower.

Here is a list of materials and cost to build my Trickle Tower:

Trickle Filter Materials		Cost
1 - 7 ft piece of scrap 18 in diameter heavy walled PVC pipe		$55.00
1 - 2 ft X 8 ft 3/8 in. thick PVC sheet		$60.00
6 - pints of two part PVC epoxy		$40.00
1- 3/4 in pvc nipple 2 inches long		$1.00
1- 2 in pvc nipple 4 inches long		$2.00
1- 4 in pvc nipple 8 inches long		$5.00
Assorted - PVC pipe & fittings		$20.00
10 CF Bio Balls -Plastic media		$300
200 lpm - Linear air pump		$600
4 - Japanese fence panels to hide the Green Monster		$260
Totals		$1,223.00

No doubt this same project could be built for 60-70% less using cheaper media, air pump and decorations.

DIY Trickle Tower construction directions:

1. Cut two ¾ in thick "ring" sections from the end of your 18 in. diameter PVC pipe. This will give you material to make a lip to epoxy inside the tower to support the top and bottom drip plates. I used a reciprocal saw to make these cuts.
2. Cut two circles from your 3/8 in pvc sheet to fit inside pipe. I used a jigsaw to cut out these drip plates. Drill ¼ in. holes about ¾ in. apart in a marked grid to cover these plates.
3. Cut a small section (about 3 in.) from the " ring" sections to allow them to bend into a smaller circle and slip snugly inside the pipe. Epoxy one support about 9 inches from the bottom and the other about 6 inches from the top. These "ring" sections will support your drip plates.
4. Use a 4 in. and a 3/4 in. hole saw to cut two holes in the side of the bottom of your tower for the 4 in threaded nipple that will connect to your outlet drain pipe and the ¾ in nipple for the air pump. Also a 2 in. hole for the 2 in nipple at the top of the TT for your inlet flow pipe. Be sure to think through the location of these holes/fittings in relation to your pond plumbing needs and location.
5. Glue a 4 inch PVC 90 degree elbow inside the TT. Place the elbow pointing downward with the end of the 90 parallel to TT. This is to create a p-drain type effect and allow the water level below your bottom drip plate, to rise above the exit pipe and will force the air flow to exit via the top of the tower vs the drain pipe.
6. Stand your tower on the pvc sheet and draw a circle around the outside tower on the sheet. Also draw a circle about 1 in bigger than the circumference of your towers base. Use a jigsaw to cut out this outside circle which will become the bottom cover of your tower. Apply a liberal amount of the PVC epoxy approximately 1in. inch wide inside the inner circle on the sheet. Stand the tower on this epoxy circle and then apply a ½ bead of epoxy around the outside bottom joint of the tower and the bottom cover. Let this cure 24 hours.
7. Connect the flow inlet at the top of your tower to your plumbing. I fabricated a manifold using a two in 4-way fitting and end caps. I drilled 1/4 in holes every 3/4 inch along the bottom and also about 1/2 up each side of the bottom of the fitting to create a shower head.
8. Connect the outlet plumbing so that it will drain into your pond.
9. Drop in your bottom drip plate. Do not glue in place
10. Rotate the three way valve to direct water into the tower. Observe the water flow in the tower while looking from the top. You want to insure that all the water flow drains out the bottom and does not back up and submerge the bottom drip plate. If your drainage is too slow you will flood the bottom part of the tower and submerge the media which will reduce the desired TT result and could even cause the tower to overflow out the top. If necessary drill additional holes in the drip plate to insure adequate drainage.

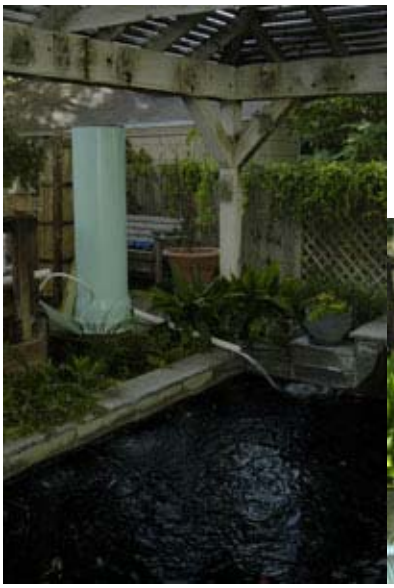
11. Drop in the top drip plate. Do not glue into place. Turn water back on and make sure the drainage does not back up on the top drip plate and overflow the tower. Drill more holes if necessary.
12. Cut out the top cover from the remaining PVC sheet approximately ½ inch bigger than the outside diameter of the tower. Epoxy 3-4 small 1 in. pieces of the left over pipe "ring" sections to the bottom of the cover so that they will fit snugly inside the tower and keep the top cover from falling off. You want to allow air to flow out the top of the tower so be sure there is plenty of breathing room.
13. Fill the tower with media and fit and adjust the "shower head" to be level and spread water evenly over the entire surface of the drip plate. Only the media with water trickling over it constantly will be active and working as bio-filtration. This is an important step take your time.
14. Turn the supply water back on and enjoy the benefits of additional trickle tower bio-filtration. It will take 4-12 weeks for the media to become well colonized with bio-film depending on water temperature.
15. If you live in a colder climate you may want to insulate your TT. In warmer areas you might want to reduce the flow during colder spells to keep from chilling your pond water to quickly.

Top of tower with out drip plate to show fabrication of shower head and water distribution

Close up of top of tower with drip plate

Completed TT with Bamboo enclosure (door open)

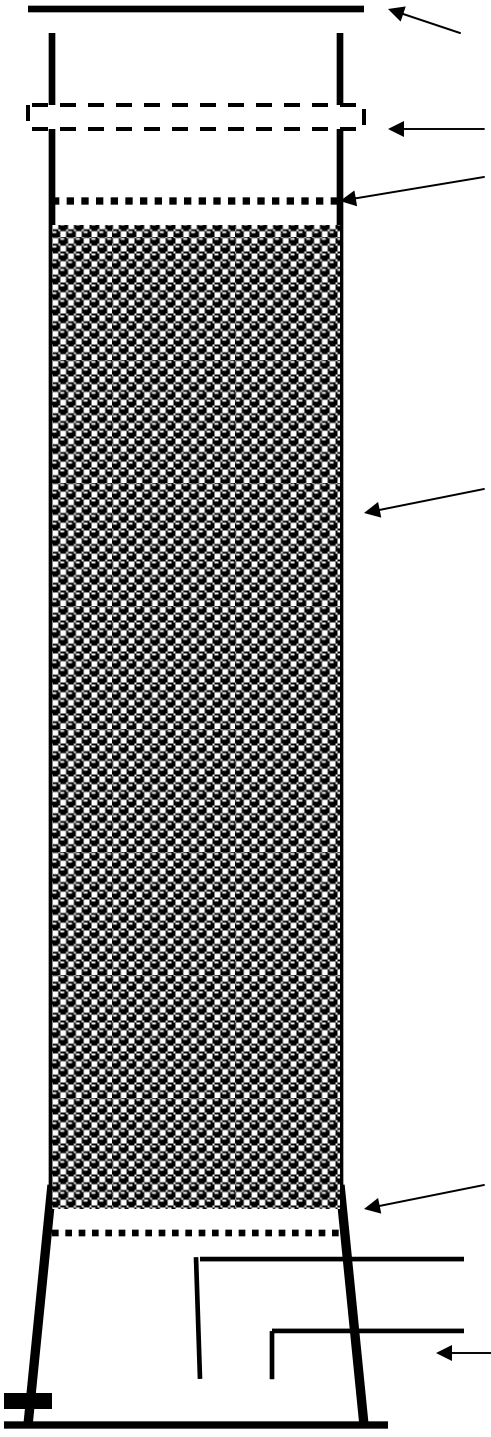
Completed TT with Bamboo enclosure (door closed)



with out bamboo enclosure

Koi pond with TT hidden behind bamboo enclosure

Here is a drawing of the “Green Monster!”



Top cover cut from 3/8 in. sheet PVC

2 in. inlet pipe from filter

Top drip plate 3/8 sheet PVC drilled with ¼ in holes

Tower is thick walled PVC 18inches in diameter and seven feet long filled with 12 cubic feet of plastic media

Bottom drip plate 3/8 sheet PVC drilled with ¼ in holes.

¾ in nipple for counter airflow pump and flush drain if needed

Outlet to pond - 4 in PVC pipe with internal degree 90 elbow to prevent air from leaving through bottom drain.