# FOAM FRACTIONATORS

Also Known As

## Phoam Phraxtionators

## Protein Skimmers

## Air Strippers

Do you have bubbles on your water surface? Do you have algae problems, either floating or string? Do you have water clarity or quality problems? If the answer is yes, you may very well benefit from installing a foam fractionator (FF).

In simplest terms a FF is a device to generate foam and a way to remove that foam from the water column.

Foam is composed of dissolved organic compounds (DOC) which bind together on the outside of an air bubble. These DOC's have a sticky surface which will attract minute detritus. DOC's exist in our ponds primarily because of fish waste, uneaten fish food, decaying plant material and organic soils. If you have had a fish spawn, you will have an overload of DOC's! DOC's are difficult to eliminate through mechanical filtration. There is some elimination through biological means either by plants in your pond, including algae, or your biological filters. One way to substantially reduce DOC's is by water changes, preferably having a surface skimmer draining to waste, but your water bill may go up substantially. One of the most effective ways to substantially reduce DOC's is with a foam fractionator.

There are two basic design principals.

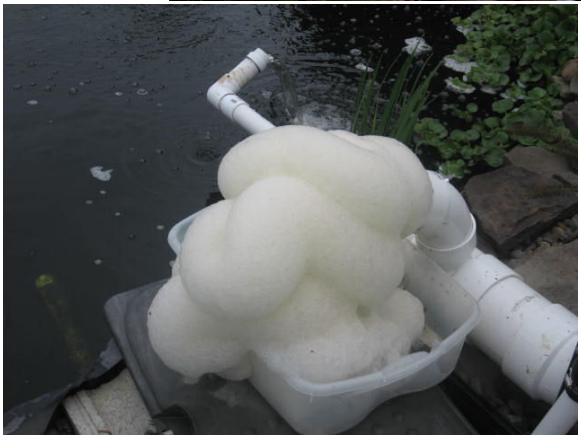
The first uses an air diffuser at the bottom of a container. The air rising through the water creates the foam which is them removed from the top of the container. There are several variations of these but generally are of two types, direct-current and counter-current. With the direct current, water enters the container at the bottom and rises with the air bubbles, similar to an air-lift pump. With the counter-current type, air again is induced at the bottom, and the water enters near the top of the container and exits at the bottom. These type of FF's work best in salt water and at a higher pH. In fresh water the results are generally mediocre to poor. Accordingly, I am not going into any more depth on these.

The second design forces water down into a container filled with water where the falling water entraps air causing foam to form. This is just like the principal of the foam forming in your pond at the base of your waterfall. The water, with bubbles, exits the container. The bubbles are then captured and removed via an opening in the pond return piping. Some very clever

Norwegians developed and patented this design, “The Clarity Protein Skimmer”, several years ago. This type of FF was a breakthrough in using FF’s with fresh water. The Clarity Protein Skimmer also incorporates a shower filter for additional degassing and bio-filtration. See Appendix B for additional information on the Clarity.

Several years ago, Ethan Beckler developed a do-it-yourself version of the Clarity, the Phaom Phraxtionator. The remainder of this presentation will concentrate on his DIY designs and some modifications by me.

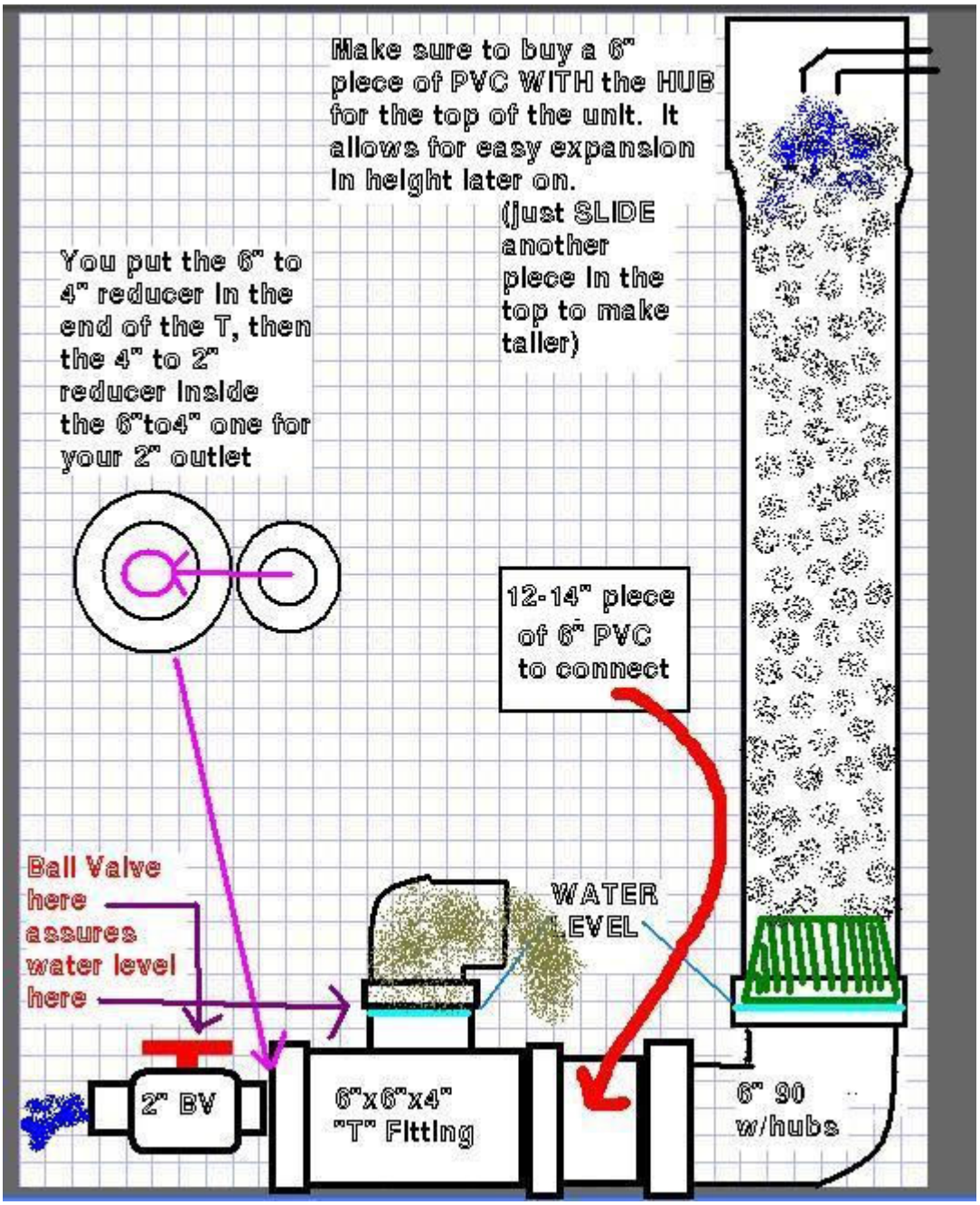
Here are some pictures of the foam produced by foam fractionators.



Please note the color of the foam. The whiter the foam, the cleaner your water. The darker foam is caused by very small suspended particles attaching to the foam. Your goal should be to have white foam. Eventually, as the DOC’s are removed, you should have very little or no foam.

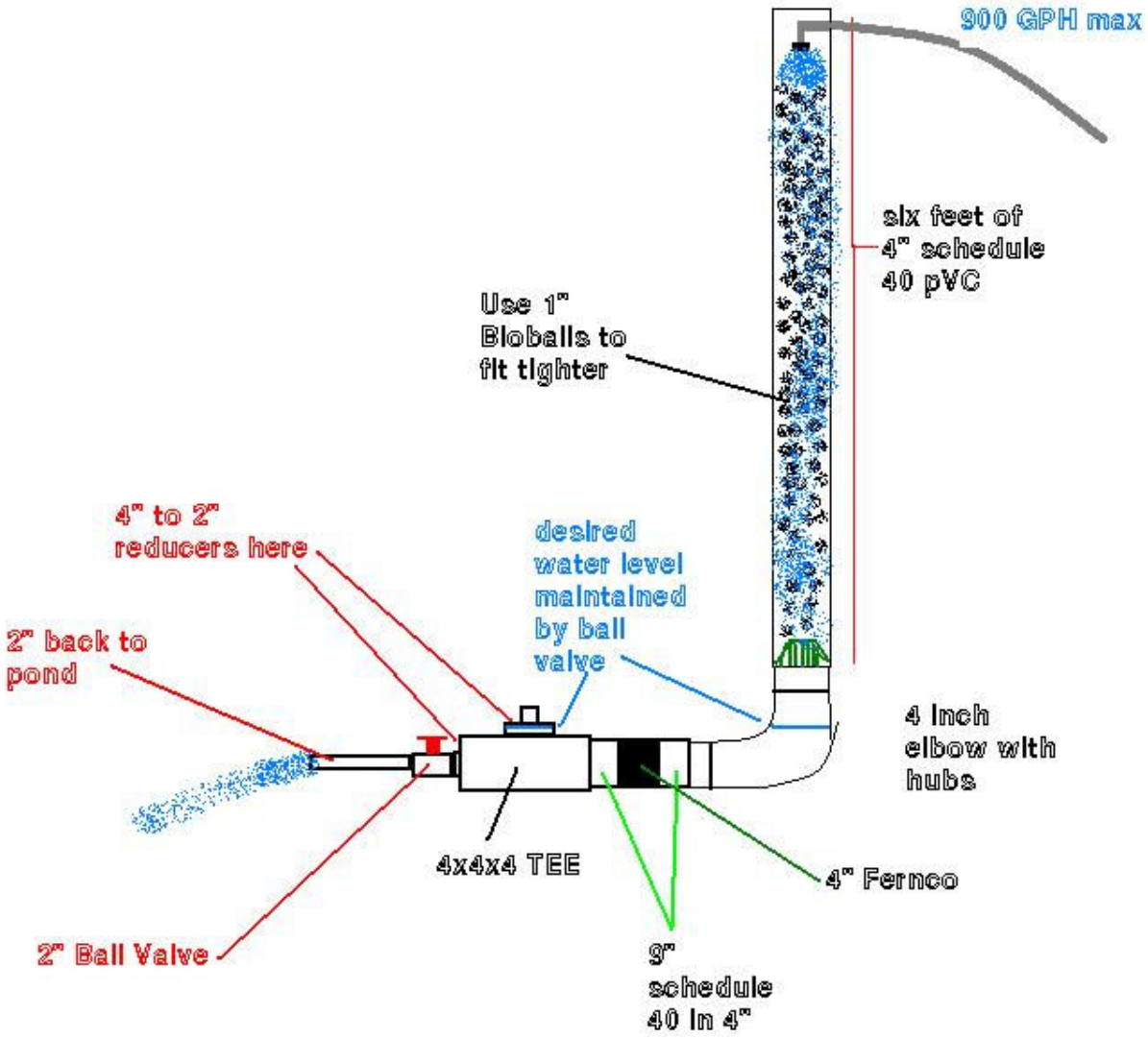
Plan for a 6” Phoam Phraxtionator

Flow rate should be 1,500 to 1,700 gph. Those grey blobs in the tower are 1 ½” or 2” bio balls or barrels. The green strainer at the bottom of the tower is an atrium grate to keep the bio balls from exiting the tower. You will have to trim the flange of the grate to fit.




See parts list in Appendix A

Plan for a 4” Phoam Phractionator



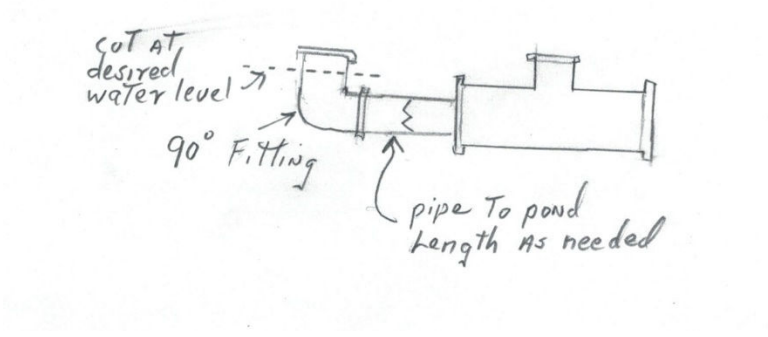

See parts list in Appendix A

John's Observations

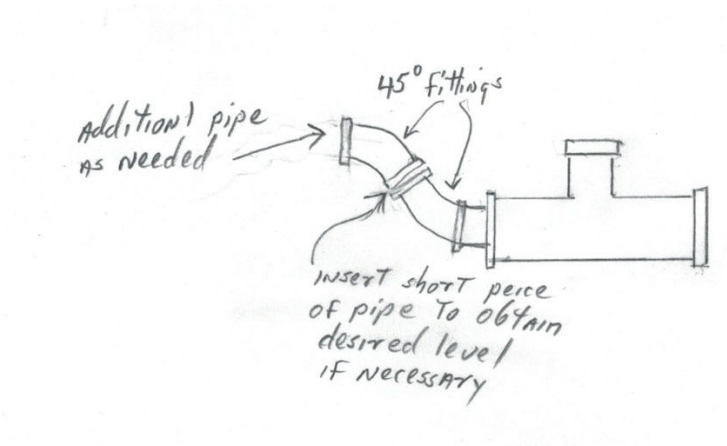
1. The ball valve is very difficult to control the level of the water flow. With a very small degree of opening adjustment, either the water level will be too low and the foam will be dumped back into the pond or the water level will be too high and the pond will overflow through the foam outlet. Also your pumping situation may affect this such as the pond level dropping or debris collecting in the pump strainer.
2. The water level in the exit pipe from the bubble formation unit needs to be at the top or slightly higher than the inside top of the exit pipe. This exit pipe needs to be as level as possible. In an ideal world, the water level should be slightly lower to facilitate foam removal but, after the foam exits, the reminder of the exit pipe would have to be lower.
3. The small diameter pipe exiting from the "T" greatly restricts the amount of water that can be flowed through this system.
4. The tower portion of the FF is a shower filter. While I totally believe in shower filters, this one may be undersized and have some design flaws.
5. This FF calls for using PVC schedule 40. There is no pressure on this FF. Therefore, less expensive materials can be used provided fittings can be found.

John's fixes to above

1. Do not use a valve. Keep the water level constant by using piping. There are two ways to do this:
    a. If you have a short distance to the pond, waterfall etc., use return piping the same size as the "T" or reduce to one size smaller. At the discharge point, add a 90 degree fitting with the exit facing up. Cut the upright portion of the fitting to give you the desired water level height in the "T". You can use the same size pipe and 90° as the "T" or go a size smaller. <u>Remember, all this will have to be level.</u>



b. At the exit from the “T” add a 45° fitting pointing up, then another 45° fitting pointing horizontal. The inside bottom of the second fitting should be the minimum level of water you want in the “T”. For either a 6” or 4” “T” I would use either a 4” or 3” fittings. It may be necessary to put a short piece of pipe between the 45° fittings to get the right elevation. I would not use 2” fittings as they restrict the flow too much. Use additional pipe to direct return water to wherever you like. Additional pipe must be lower than exit from the 45° fitting.




2. Add a piece of plastic to the down-stream side of the foam exit on the “T”. This should extend an inch or more into the “T”. This will help the bubbles escape through the foam exit and, by forcing the water to take a lower route, will help insure that the foam is not dumped back into the pond. For this piece you might use a small section of pipe, cut lengthwise to form a channel. Or use a piece of plastic cut from the side of a bucket or plastic container.
3. Use larger exit pipes. Please see fix #1 above.
4. Shower filters are another subject not covered in detail here. Most shower filters can be adapted to have a FF at the exit. Consider using a plastic 55 gallon barrel instead of the vertical pipe or constructing shower filter with trays etc. Do not use small filter media such as Kaldness K-1 or smaller lava rock as these will clog quickly. It is best to use a media large enough that allows the free flow of water without a chance of clogging. As with any shower filter, the incoming water should be pre-filtered to remove as much debris as possible.
5. Look at thin wall PVC used for sewers, drain fields and low pressure applications. Use ABS. Use any other inexpensive pipe you can find that has some rigidity and necessary fittings.

John's future ideas for the Phoam Phraxtionator.

1. Eliminate the shower filter portion of this FF. Instead create foam by injecting water with force into the 90° fitting. A nozzle may be necessary to create sufficient force.
2. If the shower portion is eliminated, a bucket or other larger container, fitted with appropriate bulk heads, may be substituted for the 90° fitting.
3. With or without the shower portion, consider using a "T" in place of the 90° fitting. Add pipe to the bottom of the "T" and cap off the bottom. This will give greater depth to the foam generating portion of FF. Consider adding a drain at the lower end of the "T" for draining in the winter and for cleaning any sediment that might occur.
4. Retrofit my existing air lifts/moving Kaldness bed filters to accommodate foam removal. In my original construction this would have relatively easy; the retrofit will not be easy and my not be possible.

John's experience

I have used the 6" Phoam Phraxtionator on my lily pond when it held koi. With the modification of the two 45° fittings, I was very happy with the unit and it produced a lot of foam. Currently I am installing two 4" Phoam Phraxtionators on the two large shower filters I am building. On my next filtration addition, planned for summer 2014, I will also be adding a FF.

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(Please email or call me if you have questions.)

**Appendix A – Parts list for 6” and 4” Phoam Phraxtionators**
Sourced from Koi Phen Forum

(There are several lengthy threads on this forum regarding the Phoam Phraxtionator. Look for comments by “Ethan25”.)
(Also there is an article in Koi USA , May/June 2012 “Phraxionating Phoam 101” by Ethan Beckler)
1. wanted to start a brand new thread with everything in the first few pages for some folks who wanted to know how I created my phoam phraxionator.
I have made one that will flow around 3,000 gph out of 8" PVC, and also, one out of 6" PVC. Others have also made the one out of 6" PVC and have experienced wonderful results.
These are instructions for the smaller, 6" unit.
First, you need to find the following pieces:
(1) 5-6' section of 6" schedule 40 PVC, preferably with the "hub" on one end
(2) 1' sections of 2" PVC
(1) 90 degree six inch elbow with hubs on each end
(1) 6x6x4 inch "tee" fitting
(1) 6 to 4 inch reducer fitting
(1) 4 to 2 inch reducer fitting (you can get 6 to 2 inch bushings to replace having to buy both of these)
(1) 2" economy ball valve
(1) 6" fernco coupling
(1) 1.5 inch hole saw
(1) 6" green drain screen from Lowes (atrium grate)
(1) cubic foot of bio balls or bio barrels
also needed
1500 gph of flow, able to be regulated and relatively clean water
PVC cement and primer
pipe to get to top of phoam phraxionator from pump
Here's what I got. I think that many people have struggled with the schedule 40 six inch PVC and fittings. It is heavy, expensive, but definitely perfect for the original unit. With the 6" stuff, you can easily flow 1500-1700 gph through it, gravity feeding back to the pond with a 2" exit.
Here's what I want to suggest. I haven't tried it yet, but here's how it would be done. The original phoam phraxionator works by bubbles being formed through the crashing down through bio balls. Then, they "settle" out in the bottom chamber, trying to rise up as far as possible. If enough "dwell time" is maintained in that bottom chamber, the bubbles will reach up and out of the exit port which is the top of the "tee".
Here are the plans for doing a 4" unit. It is between $150-$175 to build a 6" PVC unit that will flow that 1500-1700 gph. I suppose that with 4" PVC, and a total gallonage of 3 gallons for the base of the unit (TEE, 18" run of 4" PVC and part of the 90 elbow), you could get around 8-12 seconds of "dwell time" in that bottom chamber for the bubbles to rise up and out.
Here's what I have so far, all items purchased at Lowes:
$9.32 10 foot section of schedule 40, 4" PVC (for tower and base)
$3.47 green gutter trap (4") (atrium grate) to keep bio balls in position above elbow
$9.57 4" schedule 40 long sweep elbow
$11.57 4"x4"x4" schedule 40 TEE fitting
$5.50 2" cheap schedule 40 ball valve
$4.52 2" PVC to go back to pond
$6.50 Fernco fitting to join bottom to top
$8.00 (2) 4" to 2" reducers

$50.00 approximate cost for the bioballs to fill the thing
$108.45
this SHOULD flow 800-900 gph pretty easily. I wouldn't flow more just because you want to assure dwell time in the unit.

Appendix B – Clarity Protein Skimmer

Selected pages from *Clarifications*, A newsletter for Clarity Water Treatment Systems AS, Fall 2007* were included with the original presentation.

Conversions:

Liters X 0.26417 = US gallons

Centimeters X 0.3937 = inches

The Clarity Protein Skimmer is available from select dealers in the USA. One dealer's prices are:

| | |
|---|---|
| Model CL3 | $1.395.00 |
| Model CL10 | $2,095.00 |

For information on the Clarity Protein Skimmer:

http://www.clarity-wts.com/koi/

On this page click on the headers that interest you.

*For the full *Clarifications.* Click on Home, then References, then Newsletter or

http://www.clarity-wts.com/reference/ then click on Newsletter