CSI 'PEGLEG' CONE SKIMMER KIT

***Skill Level**: Beginner to Intermediate*
***Tools Required**: Two books or heavy pieces of wood, razor blade*
***Other Materials:** Teflon tape*
***Time to Build:** Approximately 2 hours not including drying time*
***Version**: 2011 'Pegleg'; pump-underneath ver 1.3, 9/29/11*

Congratulations on your purchase of an AVAST Cone Skimmer kit! With just a few hours of your time and by following these simple instructions, you can be the proud builder of a new protein skimmer that would retail for more than twice as much as this easy to build kit.

Design Goals

Our primary design goal with this project was to create a high performance cone protein skimmer yet keep the price affordable without sacrificing quality. We also wanted to keep it simple enough to remain accessible to a beginner builder.

Additionally, we wanted to make the CS1 modifiable, so that more advanced builders could try out different pumps, pump placement, and various other performance tuning and modifications. The optional PSK-1000 pump has a replaceable venturi intake nozzle, so advanced users can modify this critical part in order to tune air/water draw.

Lastly, we wanted to size the skimmer so it could be used on a wide variety of tank sizes for various applications. We feel this model will comfortably handle 200 gallons of total system volume, but would not be overkill for a 75 gallon aquarium.

Material and Parts Selection

Based on the above design goals, we opted to use a combination of off the shelf parts combined with CNC milled components to keep the cost reasonable. One of these key choices is the use of the Uniseal gasket in the base plate penetration for the pump. We feel that compared to a glued hard plastic pump connection, this is easy to install, prevents leaks, and allows flexibility in pipe size in case the builder decides to use a different pump or plumbing approach. Additionally, the elasticity of gasket allows for some wiggle room when orienting the pump and reduces vibration and noise from the pump. This will allow the builder a variety of installation possibilities.

The inner bubble diffuser chamber is mechanically joined using a threaded rod rather than glued together. Combined with a removable skimmer base, the entire skimmer can be disassembled down to simple components, making periodic maintenance easy.

We also opted to eliminate the pre-manufactured gate valve in favor of a custom-built valve that allows much finer adjustments requiring very little finger torque. This means no hands in the water to adjust the water height in the skimmer, and better control over foam production.

Final Thoughts

The end result of this project is a great skimmer that you can be proud of building yourself. There are likely a few variations the experienced builder could add to improve the design. Assembly time is pretty quick and can be completed in a few hours over the course of 2 days. We tried to write the assembly instructions with as much detail as possible so while it may seem intimidating at first glance, we suggest running through the instructions the first time with just dry fitting all the parts together, then after you are familiar with the steps and how everything fits together you can focus on lining everything up perfectly and getting nice glue joints. We hope you enjoy building this kit as much as we enjoyed putting it together! If you have any questions or comments please do not hesitate to contact us.

Dan Lichens and Justin Casp,

Captains

Avast Marine Works

Preface: General assembly and solvent gluing tips

1. Test fit all parts prior to application of glue. Light sanding of some inside edges of holes may be necessary to make a snug but not overly tight fit.

2. Prep all surfaces by wiping with a damp, lint free cloth then drying prior to application of glue.

Part 1. Collection Cup assembly

1. Wrap barbed elbow (20) with teflon tape and screw into collection cup base (23). Turn fitting outwards or sideways so it does not intersect the neck tube's hole.

2. Use the lid ring (3) as a spacer to set height of cup bottom. Place lid ring on table, then the neck tube assembly inside, and slide cup base (23) over neck tube until it touches the lid ring. This is a snug fit and may require some force to push the cup base down into position. **Make sure the groove for the collection cup's tube is facing up!**

3. Run a bead of glue between the cup base and neck, allow to dry for 1 hour.

4. Glue neck stop (31) into grey PVC neck collar (9). The neck stop groove should fit over the internal ridge in the collar, and the rounded side should face down, away from the o-ring groove. Allow to dry for 1 hour.

   ***STOP. GO TO PART 2 BEFORE CONTINUING WITH COLLECTION CUP ASSEMBLY**

5. Run a bead of glue in cup base groove, then insert collection cup tube (24). Run a second bead around the seam for a nice joint.

6. After this has dried 1 hour, flip the cup and run a second bead of glue on the joint between the base of cup and neck.

7. Place glue inside lid ring groove on collection cup lid (19), insert lid ring (3), bead around seam.

Part 2. Cone Assembly

1. You will be using the 6” tube of the collection cup (24) for this step.

2. Slip bottom flange (5) over cone (4), then 6” collection cup (24), then neck collar (9) onto cone top. This is the cone clamping setup for gluing. Press firmly on the bottom flange so the cone is seated flush all the way around. The neck collar can be tricky to snap into place. Position the cone's seam towards you and place the neck collar over the seam first, then push down and out with your thumbs on the neck collar, while pressing in with your fingers on the cone to flex it into the top flange. Finally, push down on 6” collection cup tube to eliminate any remaining gap in cone seam.

3. Lay cone on side between two books or blocks of wood, with the large end facing you. Run a bead of glue on the inside seam starting from narrow end and moving towards you (big end) in one smooth motion. Try to apply a consistent width bead of glue with no breaks in order to have a nice seam. Practice on a sheet of paper if desired, in order to get a feel for laying a clean bead of glue.

4. Allow to dry for 2 hours before removing 6" tube (other parts should stay on).

5. Make sure neck collar (9) and bottom flange (5) are mated flush to the ends of the cone then run a bead of glue around the bottom flange, joining the cone and the flange. Allow to dry 1 hour and flip over, glue the neck collar (9) to the cone in the same manner.

6. Run a second bead of glue on the outside of the cone seam, again concentrating on applying a consistent bead in one smooth motion.

7. Allow completed cone to dry 24 hours before beginning part 3.

*RETURN TO STEP 6 COLLECTION CUP ASSEMBLY

Part 3. Base, bubble chamber, gate valve, and silencer

1. Glue the bubble chamber ring (12) to the top of the bubble plate (10). The groove of the bubble plate should be facing down and the beveled edge of the bubble chamber ring (12) should be facing up. You are simply gluing the bubble chamber ring to the face of the bubble plate, not the grooved side. Allow to dry 1 hour.

2. Use the long threaded rods (21) to attach the bubble chamber (13) and bubble plate assembly to the skimmer base (2). The order from the bottom follows: nut, skimmer base, bubble chamber, assembled bubble plate (threaded).

3. Insert uniseal (14) into center hole of base plate (2)

4. Glue a short segment of 1" PVC pipe (27) into the base plate (2). Pipe segment should be flush with the inside of base plate, i.e., not protruding up into the skimmer body. This will be the attachment point for the effluent pipe.

5. Assemble the gate valve by adding a dot of glue to one end of the short threaded rod (26) and screwing it into the gate valve body (28). Make sure to thread the rod through the silencer top plate (6), then glue the textured valve knob (25) to the threaded rod in the same way.

6. Build effluent pipe assembly. We do not recommend gluing the PVC parts if possible, this preserves future configurability. The assembly order is: permanent segment in base, 90 ell (16) , short segment (27), 90 ell (turns up), long riser pipe (15), tee (1), valve assembly. The valve assembly must be glued to the top of the tee.

7. Build silencer assembly. Glue silencer tube (7) into silencer top (6). Press one of the rigid air tubes (8) into the silencer top and glue. Press the second air tube into the silencer bottom (11) and glue. Note that the holes for the silencer tube may seem too small- you will need to sand a slight bevel on the tube to start them in the hole, then tap them in to create a very snug fit. You can also use a 3/8" drill bit to wallow out the holes just a tiny bit. Both air tubes should extend outside of the silencer ends about 1/2"-3/4". Before gluing the bottom to the silencer

body tube, insert the foam pieces (30) in between the air tubes. Try to work them around so they completely fill the silencer body tube.

Part 4. Final Assembly

1. Place cone body on skimmer base plate.

2. Assemble peg leg stand. Screw 1/4-20 thumbscrews (29) through bottom flange into base plate. Screw peg legs (17) on alternating screws underneath flange. Wait to install the peg leg base (22) until the pump is in place.

3. Attach air tubing to barb fitting on pump. Press pump output nozzle directly into uniseal. Orient pump so that it doesn't occlude the effluent pipe stem. Press the effluent pipe assembly onto the glued pipe stem. Again, this should not be glued unless you wish; not gluing it allows you to reorient in the future.

4. Once pump and effluent pipe are in place, press the peg leg stand base (22) over the legs. This should only be friction fit, and can be pressed up until it touches the effluent pipe elbows. The stand base will help keep the effluent pipe in place if you decide not to glue it.

5. Place o-ring (34) into neck collar groove and put cup onto skimmer.

6. Attach airline from skimmer pump to the silencer.

7. Place lid on collection cup.

   Your skimmer is now complete! Please take a few minutes to disassemble and thoroughly clean all components using hot water and/or vinegar before placing into your aquarium. This will help remove all residual oils from the acrylic manufacturing and residual solvent contaminants.

Part 5. Operation and maintenance

1. We recommend running the skimmer in 6”-8” of water for best air draw results, with 7” being the ideal depth. Deeper sump water will result in less air draw, therefore if you have a high bioload, 6-7” depth is probably best. Feel free to experiment with what works best for your particular system.

2. Use the gate valve to adjust the water level inside the skimmer. We suggest keeping the water level at the base of the neck collar to start, and adjusting from there based on your bioload and skimmer performance.

3. Clean pump every six months by removing and running for a few hours in a bucket of strong vinegar water solution.