Speedfit Hydrophone

I stumbled across this idea when considering designing a cheap alternative to a purposefully designed hydrophone. In considering several applications that a hydrophone could be used for in ecology research, I couldn't believe my luck when I discovered this method, and the hydrophone design comes in at about £15. Add a cheap signal amplifier to the equation and the whole project came in for approximately £23.

Theoretically the design should be good for a 120 bar pressure, and the variety in different design combinations and application could be the basis for a research project in its self. With the possibility to design a hydrophone array, which could be unobtrusive, or even self-suspending, at a reasonable price, could make the difference in how the methodology of underwater ecological studies could be implemented worldwide.

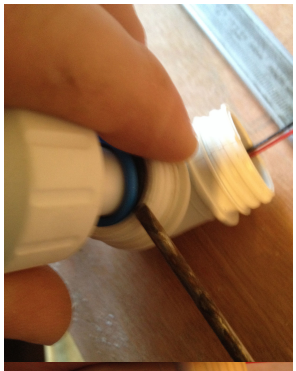
The main difference with this design and other hydrophones is that the piezo is immersed in water, which should give rise to a clearer image.
Given that all the parts to make this project could bought at a hardware store makes it a design which becomes accessible to all world wide, which in itself would promote the study of marine anthrophony, biophony, and geophony. It too could make light work for a traveling recording engineer, who can virtually design and build an array on sight for specific investigations. I have yet to consider the full application of this basic design, but I am excited by the possibilities that this might bring together some fascinating studies.

My first design was a simple hydrophone on the end of a pipe. Not very interesting for a how to! And didn't really show the possibilities. So I decided to make a sudo stereo array that I could use for many applications. Remember that this is not a true stereo as the propagation of sound underwater cannot portray a true stereo field, therefore it is a sudo stereo image that you will receive as in separate left and right channels.

A. Drill a small hole in line with the casing of your 90°. Don't go all the way to the second recess, the piezo disc has a negative wire which is soldered right on the edge of the of the disc, and needs to have this hole to feed its way out. Be gentile with the disc if you are not used to them, as the wires are very easy to come away. Once drilled feed the wires through the 90° bend and place the piezo flat on the recess, with the negative wire lined up with this hole.

B. Now get a small length of pipe, and place the plastic washer and the ‘o’ ring on it ready to insert. You have to take a little time doing this as it is a very easy to crush the piezo crystal.

C. Feed the pipe into the opening where the piezo is based, and gently with a screwdriver you can squeeze the ‘o’ ring into the opening.



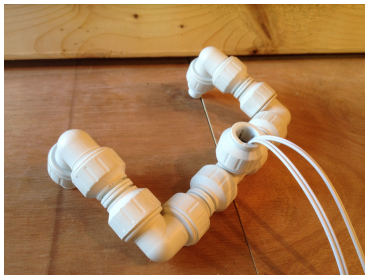
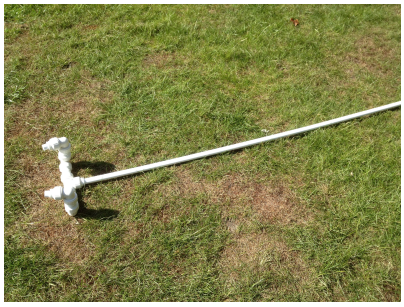
D. Screw on the cap till tight then release with half a turn, and very slowly squeeze the pipe in holding the release washer as you go. You will feel the pipe seated. Cut the pipe to your desired length.

E. For this project I soldered a 1.5m length of speaker cable, then I double notted imidiatly after the solder. I needed some way of of allowing some slack in the wires after the piezo to allow for twisting and turning etc. The little blue coloured insert on the right of the picture was ideal for this. Pushing the nott into the pipe would give some space inbetween the joints for the wire, and then feeding the soldered end into the 90° bend. I havent used these inserts anywhere else, as I don’t intent for this hydrophone to be under any real pressure.

F. Screw on the cap, and there we have one complete hydrophone module. I made another one with exactly the same metheod, so we can now begin to put together the array.

G. The building can now begin to move on a little as it's the modules which take most of the time. The pipes which hold the different connectors together are 60mm exactly without insert. This allows for the connectors to butt up against each other. If you are adding an insert both sided of the pipe, then follow the markings on the pipe.

H. From this……to this…….and finally this.

I. Test, for leakages by blowing down the pipe, or submerge in water keeping a lookout for bubbles.

The reason I designed it like this was it was essentially a flat tripod. Here you can see I have used some steps to simulate a riverbank, and with the heads being fully adjustable the angle of the bank can be accommodated.
Here are just a few angles of direction.





Electronics

To have this as an all in one unit I decided to incorporate a preamp into the unit, and decided to use a Valeman Mk 136 super stereo preamp.

http://cpc.farnell.com/unbranded/mk136/mk136-super-stereo-amplifier-kit/dp/HK00815?ost=Valeman+Super+Stereo&categoryId=700000008037

It's a fairly compact design, but comes in kit form that you solder together. At £7.49 per unit made it an affordable choice and has scope for improvement if you fancy some more tinkering.

I bolted some 15mm pipe clamps on the back of an enclosure, and pushed on a wire feed compression fitting on the end of the pipe. Two 3.5 jack connectors on the wires that then plug into the enclosure.

Parts

4 x 90˚ 15mm Speedfit connectors
1 x T connector 15mm
3m length of Speedfit pipe
1.5m speaker cable
2 x 15mm piezo discs
2 x speedfit inserts
3.5mm Jack connectors for head
Preamp for Piezo

Optional

1 x inline 15mm connector - to dismantle the handle for packing.
Steel rod or length of bamboo to stiffen up the handle.

Electronics Parts

Box Enclosure
Valeman Mk 136 Super Stereo Mic Pre Amp Kit
Compression fitting for Wires
2 x 15mm Pipe Clamp Fittings
2 x 3.5 Jack Connectors
2 x 3.5 Jack Sockets
Button for Gain Control