ROV at Depth Water Sampler Sensor
Gloucester High School, Gloucester, MA, 2010
Instructor: Mr. Lichtenwald (a.k.a Coach L.)
Students: Sarah Taylor, Bobby Lowe

PURPOSE: To engineer a water sampler to be attached to an ROV that will take samples at depth.

Materials:
- 1 - 35 cc Syringe (or water sprinkler)
- 6 in - Green Tube
- Butyl Rubber Tape (Monkey Dung)
- 1 – 12V Solenoid
- 1 – Female Luer
- 1 – Hammer
- 1 – Nail (or punch)
- 1 – Power Drill
- 2 – Stainless Steel Screws [or anything stainless steel or plastic]
PROCEDURE:

1. Obtain materials needed to build the water sampler.

2. Take the solenoid, whose wiring you want to water proof. Use the butyl rubber tape (monkey dung). Place the monkey dung anywhere water is able to seep into the inside of the solenoid.

3. Cut green tube to desired length. [The length of the tube will determine the placement of your sampler, so cut accordingly.]

4. Now you want to take your 35 cc syringe and drill two holes in the part that pulls out. Within these holes you will place stainless steel pins (anything stainless steel or plastic). [See picture]. In doing this, you will be able to obtain a larger quantity of water for sampling.

5. To drill the holes, you want them to be above the part of the syringe that the water will flow into. [On some there are two dots placed on it already. A pair on each side, you want to use the ones above the water compartment.]

6. When you have marked your holes, use a nail and hammer (or punch) to make a small
dent in the center of your marks. Doing this will make the drill bit have a place to grip to so it doesn’t slip (move around) once you start drilling.

7. When you have made the starter holes, take a drill, using the size drill bit you desire so that the stainless steel screws fit in the holes.

8. Place the screws in the holes and you are ready to assemble the rest.

9. Take your female luer, (a female luer connects a hose to your syringe) it will twist on to the top of your syringe, do this.

10. Now you want to attach one end of the green tube to the female luer. You need to use a little force here, and push it in until you feel a click.

11. The other end of the green tube will attach to the male hose adaptor on the solenoid.
12. Your water sampler is now finished, it will attach to a quick release button.

QUICK RELEASE BUTTON

The Water Sampler will now attach to a quick release button wired into your ROV control box. In doing this with the touch of a button, the water will be “vacuumed” up into the syringe, thus, making it able to obtain a sample of 35cc.

1. Attach both wires coming off the solenoid onto the cat 5 wire. In our example we use blue and blue white from cat 5. Blue represents water. Take solid blue cat 5 wire, which now is in control box and attach it to one side of momentary contact switch. Other side connects to positive side of battery. Blue white cat 5 attach to negative side of battery.

CONCLUSION:

Our design allows for large samples at depth. Future applications could be the following: checking water samples at depth, temperature at depth, and turbidity and salinity at depth, as well as other experiments that would require a large sample. With this design you are able to obtain up to 35 cc of water at depth off the ROV. Low pressure (vacuum) in the syringe and a higher pressure in water allows for a greater sample size (Pressure differential). Understanding the physics concept that things always go from high to low we are able to extract a larger volume sample. This sensor would be perfect for checking for contaminants in the water at certain depths (i.e. oil levels from an oil spill sometimes called oil plumes). These are very hard to track and/or study and this sensor is the perfect, inexpensive way of solving this problem.

MODIFICATIONS:

For a water sample that is just as efficient but easier on the wallet here is a simple modification. A 12 Volt water sprinkler control valve (solenoid)(Rain Bird is the name brand that we used) from Lowe’s will do the same job as the more expensive solenoid used in the above descriptions. It costs approximately $15.00. Follow the procedure above just use the sprinkler instead. The silver piece is an aluminum attachment we added as a coupling. You can devise your own step down devise for the syringe attachment.