



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

Name(s) Kelby B. Kramer	Project Number J0118
Project Title Ocean Current Energy: Angling for the Future	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my experiment was to determine the optimal blade angle for an ocean current turbine in different current speeds. I suspected that a 45° blade angle would produce the most volts because it had an ample surface area and still had a gap for the water to flow through.</p> <p>Methods/Materials I created a gravity fed pipe system to run my tests. I tested 5 different angles: 15°, 30°, 45°, 60°, and 75°. The different angled blades were placed into the pipe system which was then filled with water. The cap at the bottom was pulled and I would measure the peak output of the blade. This process was repeated five times before a new blade of a different angle was placed into the pipe. Once all five blade angles had been tested in this manner I changed the outflow size to increase the current speed and repeated the experiment.</p> <p>Results For the smaller one inch outflow, the 30° blade angle proved to be the most productive (3.5V). However, all the different blade angles hardly twitched when running them in the smaller outflow size. The water flow may have been so slow that the blade rotation could not overcome the friction on the shaft. In my second test with a larger two inch outflow there was a consistent trend that the lower angles produced more energy with the 15° blade being the most productive (15+V).</p> <p>Conclusions/Discussion Contrary to my original hypothesis a 45° blade angle was not the best. In fact lower angle blades worked better. The optimal blade angle is either 15° or 30° depending on the velocity of the water flow. My data was inconclusive. At the faster water rate, the 15° blade was optimal perhaps because the greater surface area of the blade allowed more water to hit it and thus spin faster. The 30° blade was best at a slower water rate. I do not know if this is caused by my apparatus's limitations (friction, etc.) or if it is actually correct that 30° was better. Therefore to understand if the optimal blade angle varies depending on water flow speed, I would have needed to do a third experimental run at a different current speed.</p>	
Summary Statement My ocean current energy experiment uses a gravity fed water system at two different current speeds to test for the optimal turbine blade angle that generates the most power.	
Help Received My dad supervised me when using power tools and drove me to get supplies. I went to the California Academy of Science's naturalist desk and they gave me a contact in Oregon. I emailed some questions to Noah Weaverdyck in Portland who was my main scientific support.	