2010
MASSACHUSETTS CLEAN TECHNOLOGY AWARDS

A Program from The Foresight Project Inc; www.theforesightproject.org

Region IV: Northeastern Massachusetts

Dylan Cole: Lowell Catholic High School, Lowell

Clean Tech: "Propeller Power"

About Me

My name is Dylan Cole. I'm from Lowell, MA and am a senior at Lowell Catholic High School. I live with my father and younger sister Brenna, and have an older sister, Kindra. I have always loved science, and always asking my dad about how and why things worked. He answered my questions in a way that made me want to learn more about technology, although sometimes he was annoyed by my constant questions! I am so grateful to my family; they have made me the person that I am today. I've gotten so far both in life and with my project because of their advice, and I'll always love them for that.

I don't play and sports (trust me, I'm not all that coordinated), but make up for that by participating in other school activities. I am co-president of LCHS's Recycling Club, which I helped to found during my freshman year. I love to help at school functions — including the Prom, which was an awesome way to make my voice heard during my senior year.

This fall I will be going to the Polytechnic Institute of New York University, majoring in Chemical and Biological Engineering. I'm very excited, since New York has such limitless opportunities. (But I'll still stay loyal to all of my Massachusetts roots and sports teams.) I hope to be a successful engineer in the future, and I would love to work on my project further and figure out more efficient ways of building generators. I know I have a long road ahead, but I know it will be a fun journey!

My Project

My project was on hydroelectric power. I wanted to find a connection between the number of blades on the propeller of a hydroelectric generator and its resulting power output. I became interested in this topic after thinking about hydropower and its deep roots in my hometown of Lowell.

I constructed a model hydroelectric generator (using the instructions from **www.re-energy.ca/t-i_waterbuild-1.shtml**) which I fit over a dishpan. Propellers were made out of large corks and plastic spoons, each with an increasing number of blades (2, 4, 6, 8, etc).

My hypothesis was that the power would peak between 8 and 10 blades. For my experiment, I inserted a propeller into the generator. I released one gallon on water into the spout of the generator for each propeller. I recorded the current and voltage produced by each propeller at various time intervals, then multiplied and averaged to calculate each propeller's total average power (watts).

After I concluded my initial testing, I realized that the power continued to rise with a 10-blade propeller, disproving the hypothesis. Therefore, I tested a 12-bladed and 14-bladed propeller under the same conditions. The power still rose at 12 blades, but dropped at 14 blades. I then tried 13 blades, in order to find the exact limit.

Once tested, the power dropped at 13 blades, proving that the limit for optimum power production occurred with the 12-bladed propeller. While the original hypothesis was slightly flawed, a limit *did* eventually occur when the blade-number of the propellers increased. This happened because each additional spoon added more weight to the cork, until it inhibited the maximum spinning of the propeller (at 13 blades). In addition, the spaces between the spoons became too tight for the majority of the water to hit the blades.

This experiment can be very useful in determining the optimum blade-number for the propellers of large-scale generators. When engineers use prototypes to plan building a generator, they end up understanding the project much more thoroughly as they work their way up to building the real thing. While the limit in question is reliant on the size of the generator, understanding the limits on how many blades should go onto propellers help to increase the efficiency for a generator.

[Editor's note: For more information on small hydropower, go to www.communityhydro.biz, and Hydroworld, an industry journal, http://www.hydroworld.com/index.html. And, according to Professor William Moomaw, Norway is now getting 97% of its electricity from hydro, almost all small dams.]