First Roger: The Turning Turbine

Team Energy

Goal:

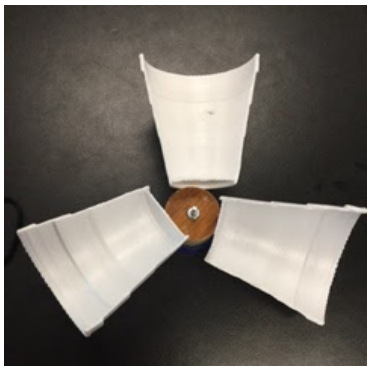
The goal for this project was to create a wind turbine that converts air from a fan into electricity. In this project only the blades were constructed. We had to use recycled materials to create the blades. The blades had to be small enough not to touch the floor; no longer than 10 inches, they had to be attached to a wooden hub and a juice cap, and they could not be made of a metal or glass material. The materials used had to be low cost and easy to put together.

Explore:

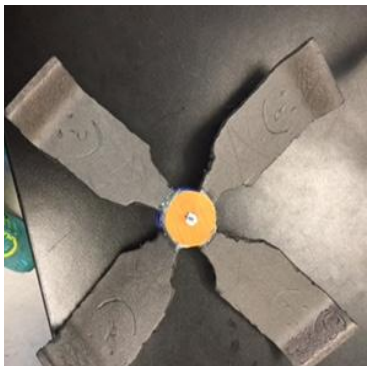
To begin this project, examples from previous classes were inspected as well as the basic structures of both a fan and windmill. After looking at these examples, design A was constructed.

Brainstorm:

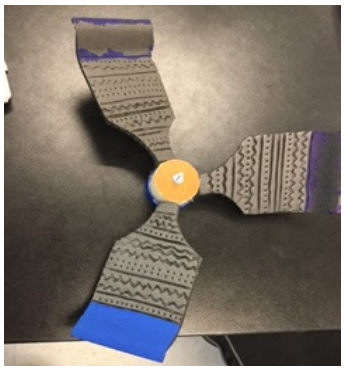
While brainstorming three-blade design ideas were made. These blade designs enabled the turbine to convert wind into energy. We also thought of what the blades were going to be made of and we decided that it should be Styrofoam. We also decided that the blades should be at a 25 degree angle. At first we put the cups at a 20-degree angle but later decided that it would be the 25 degrees that we thought of while brainstorming.



Turbine A



Turbine B



Turbine C:

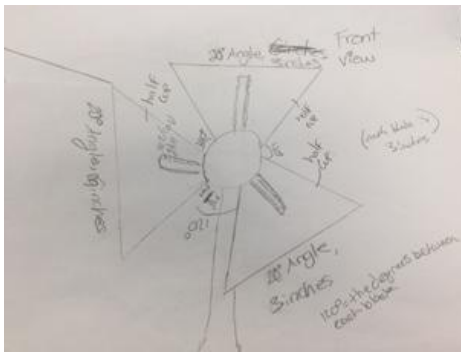
Building Process:

To make design A we took a bottle cap and used hot glue to attach a wooden hub that had three holes 120 degrees apart. We used hot glue again to glue wooden dowels into the three

holes in the hub. Then we cut four Styrofoam cups in half and took three of the halves and glued them to the wooden dowels.

Design A:

In design A, we used Styrofoam cups cut in half as the blades. There were three blades on the hub with the cup on a 20 degree angle. The blades were 3 1/2 inches long and 3 inches wide. This design did not work because the wind would hit the blade and curve back into the fan because of the shape of the Styrofoam cups.

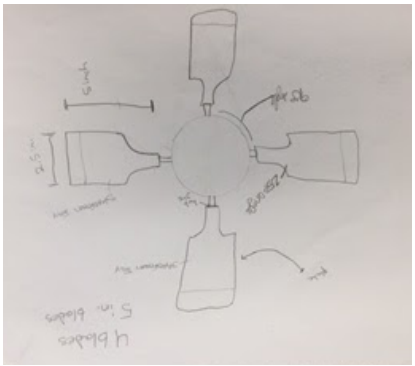


Design A Drawing

Outcome: The average power of the turbine was .00066 watts so the blades didn't move very fast because the wind got caught but it curved and the wind was getting blown back toward the fan. The turbine was slower than the other two turbines.

Design B:

In design B the turbine would be changed from Styrofoam cups (because they caught the wind and pushed the wind back toward the fan and didn't spin very fast.) to Styrofoam tray cut outs shaped like an oar. There would also be four blades instead of three because it could spin more efficiently and catch more wind because there are more blades. The blades would be 5 inches by 2.5 inches at a 25 degree angle. They can have the wind blow past them and make them move better than the Styrofoam cups.

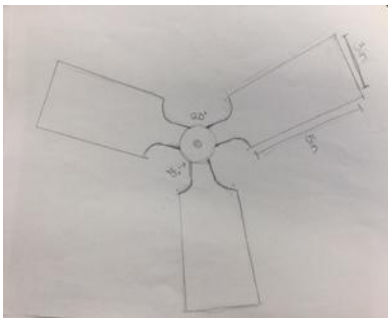


Design B Drawing

Outcome: Unlike the turbine in design A the air did not push back into the fan. This is because we put the blades at a 25 degree angle for design B. Because we did this the air was instead pushed into the blade enabling the fan to move faster. Design B created an average power of .005794 watts.

Design C:

In design C, the turbine was changed so the blades were bigger and more angled to catch more wind. We kept the blades at 5 inches long but changed the width from 2.5 inches to 3 inches. The angle of the blade in design C was kept the same as in design B. We decided to only use 3 blades in design C so that it would weigh less and spin faster to create more power.



Design C Drawing

Outcome: Design C created an average power of .0059983 watts. This was the most power created by any of our turbines. The wind moved past the blades and created a better outcome then design A because we used more of an angle for the blades.

Plan:

Design C was the chosen prototype because it produced the most energy and was easy to build. It was also strong and low cost.

Materials needed for the construction of the design were:
Styrofoam
Hot Glue
Wooden Hub
Juice Cap
Wooden Dowel
Paint

The tools required:
Hot Glue Gun
X-ACTO Knife
Scissors
Pencil
Ruler
Brush

Tests:

We tested each design 3 times to make sure that the data that we got would be close every time that we used the design. We picked design C because it produced the most power output and that's the reason that turbines are made in the real world. All of the tests that we did for each turbine were close and it showed that each of the designs would be consistent and be just as good every time that the turbine would be used.

Energy Conversions:

Mechanical ----->	Mechanical ----->	Mechanical ----->	Mechanical ----->	Mechanical ----->	Electrical
Wind	*Blade*	*High Axle*	*Gear Box*	*Low Axle*	*Generator*

Conclusion:

Design C was the most successful of the three designs. It created the most power of the three designs and was very quick and easy to make. This design was also the most appealing out of all of the designs. We cut the sides better than design B and design A. The efficiency of design C was also the best out of the 3 turbines that our group designed. The efficiency of the design C is 0.0006%. It would take 13,333,333 turbines to power a house for 24 hours.

Resources:

"Windmill+blade+design - Google Search." *Windmill+blade+design - Google Search*. N.p., n.d. Web. 12 Apr. 2016. <http://www.globalsources.com/si/AS/Shunde-KLD/6008826840632/pdtl/16-inch-Fan-Blade/1053429535.htm>

Mogielnicki, J., D. Harmon, J. Kramer, D. Lyons, D. Lentine, D. Taylor, and MC Baker. *Power in the Wind*. *Create It Lab*. N.p., n.d. Web. Mar.-Apr. 2016. <http://createitlab.org/static/pdf/PinWind_V29Sb_L.pdf>.

"*EXAMPLE!ISSUE," SEPTEMBER,2014, Contents,* (n.d.): n. pag. Web. <http://joyd.createitlab.org/static/pdf/J0/J0.pdf >