Wind Energy Design Challenge

PURPOSE

Your challenge is to design and construct, using the materials supplied, blades for a wind turbine that will produce the greatest amount of energy possible. Each group will have set parameters (height of tower and gear ratio) and modify factors (blade angle, blade design and number of blades) to see who can produce the most voltage. Voltage will be measured using a multimeter.

Students are to work in groups of 2 and must follow the design process. Those steps are as follows:

- Brainstorm and research ideas
- Submit a rough draft of your design
- Submit a good set of orthographic drawings
- Submit a Bill of Materials
- Construct your blades
- Test the blades for maximum energy output and make modifications as necessary
- Compete in the energy competition
- Submit a summary of the project (use the project feedback sheet)

Each group will not move on to the next step until the previous step is complete.

MATERIALS

The following is a list of supplies that groups will receive at the beginning of the project. Each group may use some or all of the materials listed.

- Dowels (to attach to the hub)
- Cardboard
- Wood
- Styrofoam bowls
- Pie pans
- Paper and plastic cups
- Duct tape
- White glue
- Hot glue gun and glue

Remember: The most important part of any project is proper planning and teamwork. It does not matter if your project comes in first, but whether or not you followed the steps and worked cooperatively together.

PROCEDURE

To make blades, cut out or carve different materials into various blade shapes. Attach them securely to a dowel and place the dowel in the turbine hub. Make sure the blades are equally balanced around the hub to prevent vibrations. Measure the voltage output using the multimeter. Modify the blades until you obtain the highest energy output possible. Enter your blade designs in the energy output competition when you are satisfied with your results.

Things to consider:

- blade strike: if the pitch is very strong, the blades may hit the side of the turbine
- varying the pitch from the tip to the end of the blade (twist in the blade)
- bade shape: length, width (may vary from tip to shaft)
- shape of blade edge: airfoil drag and lift
- number of blades
- smooth surfaces (less drag)
- blade weight
- how close to the hub is the base of your blade (length of shaft)
- are the blades the same size and weight (balance)
- are the blades equally distributed around the hub

Note: For safety reasons, make sure the blades are securely fastened to the hub and to the dowels. They make fly off at high speeds of not properly fastened. Also, do not make blades out of sharp metal or very hard plastics as these could cause severe injury if dislodged from the dowel. Wear safety goggles when testing blades. Make sure no one is in the path where a blade may fly if dislodged during the test phase.

Continue to test and improve your blades.