

TESTING WIND TURBINES

(Level: primary school to high school)

SUBJECT: ENERGY
EXPERIMENTS TO DO IN CLASS

1. THE QUESTION

Cécile: “How is electricity made using the wind?”

To answer this question, association Planète Sciences suggests the following experiment.

2. MATERIAL

- 2 or 3 small motors
- 1 clean transparent plastic bottle (soda bottle)
- Some corks
- Ruler, cutter, scissors
- Copper wires and crocodile clips
- Voltmeter
- Hair dryer
- 1 resistor

3. EXPERIMENT

1. Make a windmill: with a cutter, slice a cork in half, then cut slits in the sides of a half-cork. Cut out fins from the plastic bottle and slide these into the slits. Push the center of the cork onto the axle of the motor.
2. Make an electric circuit by hooking up the voltmeter to the motor. Switch the voltmeter to read “direct current”, 2-20 volts and connect the “V” plug to the (+) terminal of the motor. Test the circuit by blowing air on the windmill.
3. Find out how to increase or decrease the measured voltage.
4. Do the same experiment but use the multi-meter to read current and add a resistor in the circuit to measure output supplied by the wind turbine. Attention: the current measurements should be made in series, i.e. the terminal “mA” of the multi-meter should be connected to the (-) plug of the wind turbine.
5. The electric power supplied by the wind turbine is calculated by multiplying the 2 measured values: **$P = E \times I$**
6. Test different forms, numbers and lengths of fins.

4. GOING FURTHER

The wind pushes against the fins, connected to the motor’s axle, which produces electricity in the motor. By using the same principle, it is possible to make hydraulic turbines whose fins are turned by a water current or waterfall. The advantage of these energy sources is their “renewability”, i.e. energy sources naturally replenished during a human life-span, in contrast to fossil energy like coal or oil (see also the Experiment on Solar Energy). In addition, these renewable energy sources don’t emit CO₂, the principal greenhouse gas. In 2008, high school students worked on the possibility of equipping Tara’s hull with a hydraulic turbine, driven by water currents and the boat’s movement to supply renewable energy to the crew.

This experiment was designed by the association Planète Sciences.