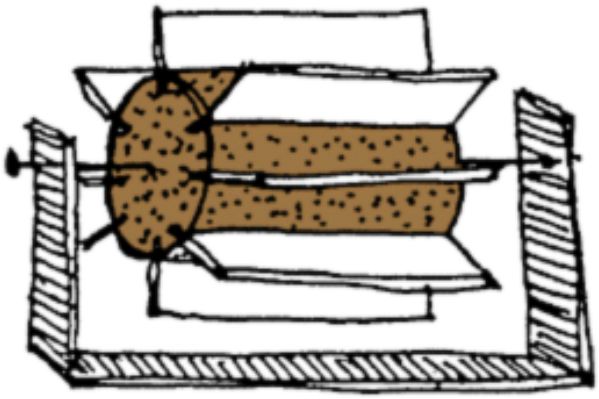
Student Resource page

Explore: Hands On Activity – Build a turbine

Commercial electricity production relies on the turning of a turbine, which turns a generator to create electrical current. The design of a turbine influences how effectively it transfers the kinetic energy of a moving medium to rotational mechanical energy. In this lab you will build and compare your own designs of model turbine.

Materials:

- Cardboard tube (e.g., as used for aluminum wrap or clear wrap)
- Cardboard for holder and fins
- Plastic acetate strips (1 or 2mm thick)
- Cork
- Craft knife
- Faucet
- Household fan (3 speed)
- Large pins
- Marker pen
- Tape
- Timer



http://www.energyquest.ca.gov/projects/waterenergy.html

Procedures:

1. Use the picture below as a guide to how to build your turbine.
2. Push a pin in the ends of the cork to act as axles.
3. Make a U-shaped cardboard holder for it.
4. Use the craft knife to cut slits into the cork.
5. Cut pieces of card to act as fins for the turbine.
6. Place the card the slits made in the cork.
7. Color one of the fins with the marker pen.
8. Place the cork into the holder.
9. Tape the holder to a table or similar surface.
10. Use the fan on the slowest speed setting to create wind to blow at your turbine.

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11. Use the timer to count how many times the colored fin makes a complete turn in one minute. (This is the revolutions per minute, or RPM of your turbine.) Record your data in the worksheet.
12. Repeat steps 9 and 10 using the two additional speeds of the fan.
13. Using a new cork, repeat steps 4 through 11 using the plastic acetate as fins.
14. Set the faucet running at a constant but gentle speed.
15. Place the turbine with cardboard fins under the flowing water. Repeat Step 11.
16. Place the turbine with plastic fins under the flowing water. Repeat Step 11.

Analysis:

1. What is the difference in your turbine RPMs between the slowest and fastest fan speeds with the cardboard fins design?
2. What is the difference in your turbine RPMs between the slowest and fastest fan speeds with the plastic fins design?
3. Was your plastic design an improvement on the cardboard? Explain.
4. In what ways could you improve further on your design?
5. You used wind and water to turn the turbine. What other ways could you use to turn the turbine?
6. Compare the RPMs using the faucet with the RPMs using the fan. Are they faster or slower? Is it fair to compare the speeds? How does wind compare with water as a medium for turning the turbine? Describe how this explains the difference between the size of water turbines used in hydroelectric dams compared with turbines in wind generators.
7. How would you generate electricity with your turbine?

Data Collection Student Worksheet

RPMs of turbine designs at different fan speeds and using the fan

	Fan Speed			Faucet
	Slowest	Medium	Fastest	
Cardboard fins				
Plastic fins				

RPMs of turbine designs at different fan speeds and using the faucet

	Water Speed			Faucet
	Slowest	Medium	Fastest	
Cardboard fins				
Plastic fins				