

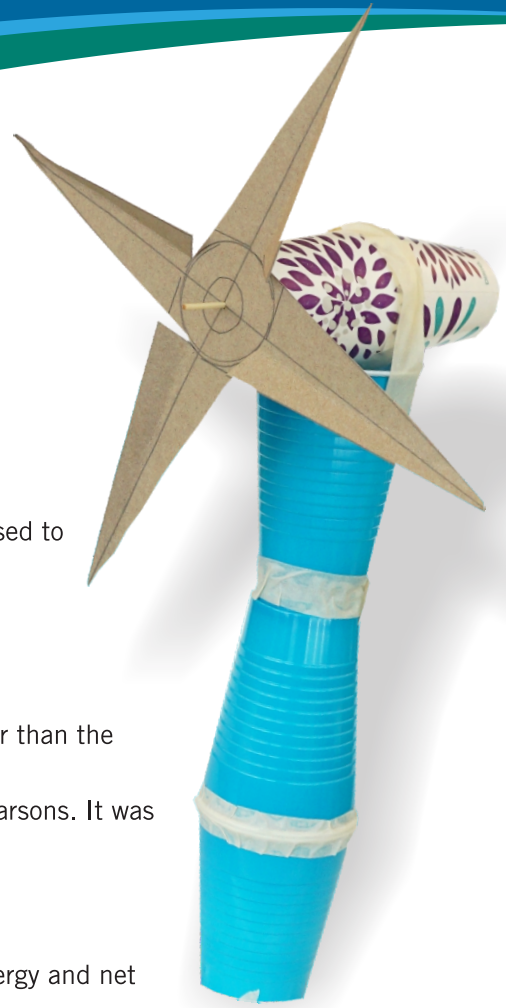


Turbine Technicians

Wind turbines, like windmills, use the power of wind to produce renewable energy. In this activity, children can make their own wind turbine out of household items to see how mechanical energy produced by wind can be used to complete a task.

Fun Facts/Information:

- A turbine is a mechanical device that turns fluid movement into energy.
- Wind turbines are big. A turbine tower averages over 320 feet tall - taller than the Statue of Liberty.
- The first turbine was the steam turbine, invented in 1884, by Charles Parsons. It was connected to a dynamo that generated 7.5 kilowatts of electricity.
- Wind turbines are a renewable energy source.
- Wind and solar energy accounts for about 10% of global energy usage.
- It is predicted that the world will be able to run on 100% renewable energy and net zero greenhouse gases by 2050.



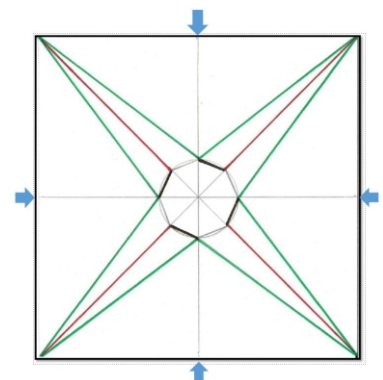
Materials

- Scissors
- 8" X 8" piece of heavy paper (cereal box, manila folder, card stock etc.)
- 10-12oz. Styrofoam cups (5) (paper or plastic cups will work as well)
- Dowel rod/straws/skewer (rod should be at least two inches longer than 2x the height of the cups you are using.)
- Tape (preferably duct tape)
- 4 beads (optional)
- Ruler
- Approx. a foot of string (thread, shoestring, yarn)
- Small fan
- Pencil

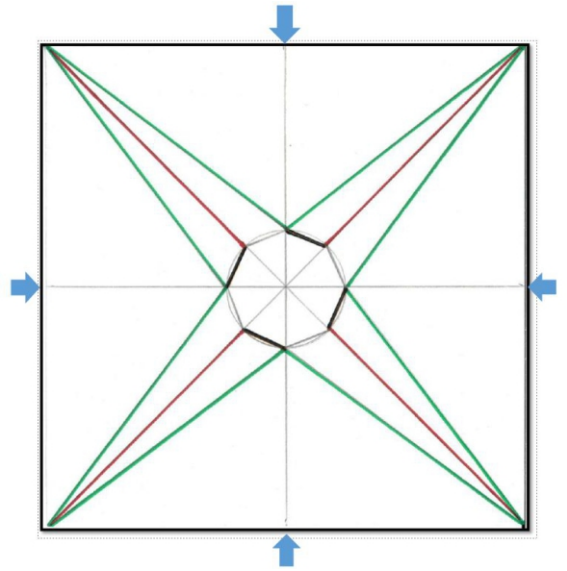
Directions:

Part 1 - Create your propeller

1. Use your ruler to trace an 8 inch square onto your heavy paper.
2. Cut out your square and place it in front of you. Use your ruler to make a mark in the middle of each side of your square (blue arrows). Use your ruler again to make a large X that goes from one corner of the cardboard to the other. The X should intersect at the very center of your cardboard.



3. Use the bottom of one of the plastic/paper/styrofoam cups to draw a circle in the center of the cardboard with the X being in the middle of your circle.
4. Use your ruler to draw a line from the middle marks (blue arrows) on the sides of your square through your circle to the opposite middle marks. Your circle should now be divided into 8 equal parts.
5. Use your ruler to draw a small line connecting each of the 8 points along the outside of your circle to the point next to it. These connecting lines should form an octagon shape just inside of your circle!
6. Use your ruler to connect two lines from each corner of your square to the nearest corner of your octagon (these lines are marked green). These are your blades!



Part 2 - Create your structure

1. Make a small hole in the middle of two cups. The hole should be just big enough to fit your rod through so it can rotate without a high amount of resistance. (Create the hole by pushing through from the bottom of your cup so that the rough part of the hole is on the inside of the cup.)
2. Tape the two cups together at the openings of either cup. This will be the top of your turbine.
3. Stick the rod through the cups. Spin the rod and observe the amount of resistance. If the rod does not spin freely you may have to widen the holes slightly. If you have beads you can place one or two beads on either side of the ends of the rod protruding from both ends.
4. Create a small hole in the center of your propeller. Slide the propeller onto your rod and secure it with tape to both sides. *Be careful to maintain a smooth surface with the tape so that it does not significantly reduce the rotation of the rod.
5. Fasten one end of your string to a cup by either taping it or tying it to a small hole in your cup. This will be your bucket! Tape the other end of the string to the back side of your rotating rod. *Loop the string so that when the rod spins it wraps the string around the rod.
6. Step 6: Tape two more cups together at their tops and place them standing up. This will be your base. Use tape to attach the top of your turbine to the base.

Congratulations! You have completed your turbine!

Part 2 - Operation:

To use, select a ledge to anchor your turbine and allow the string and bucket to hang down over the ledge. Place fan in front of your wind turbine and observe the air spinning the propeller and hoisting your bucket! If your propeller is having difficulty spinning, make sure that no parts are rubbing and causing the rod to get stuck. Challenge yourself to make improvements to your design and lift heavier objects in your bucket!