

Waterwheels, Windmills, and Turbines Activity Sheet

Introduction

Have you ever seen a windmill whirling in a breeze? Or a waterwheel slowly turning in a stream? Our ancestors joined the shafts of these bladed wheels to gears, levers, and different types of machines. They used these simple machines to mill grain, lift heavy materials, and pump water. In the early nineteenth century, many factories used waterwheels to run machines that spun cotton and sawed lumber.

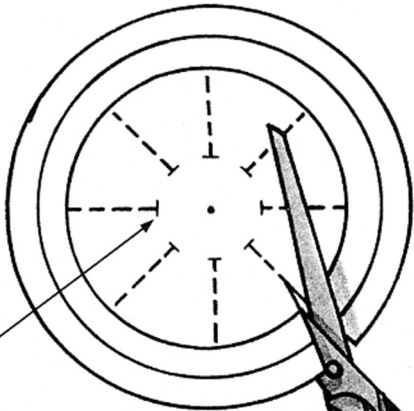
Today, modern turbine engines are used instead of waterwheels and windmills. Modern turbines are also bladed wheels with shafts that are joined to other machines. Modern turbines spin much faster and deliver more power than waterwheels or windmills. These turbines are mainly used to produce electricity.

Making a Turbine

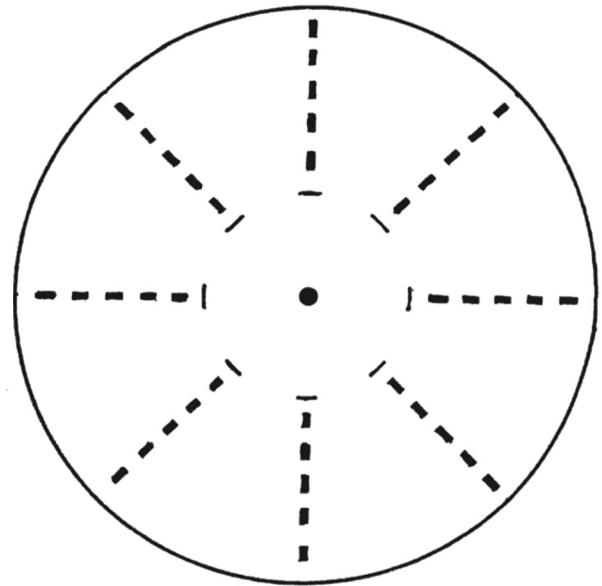
Each group will need:

- 1 pair of scissors
- 1 aluminum pie plate (at least 4 inches [10 cm] in diameter)
- 1 large paper clip (not the non-skid type)
- 1 metal nail
- 1 pencil
- 1 foam cup
- 1 plastic drinking straw
- Tray or pan to catch water
- Water
- Masking tape
- Glue

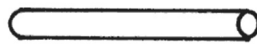
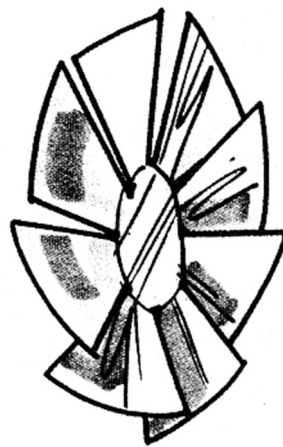
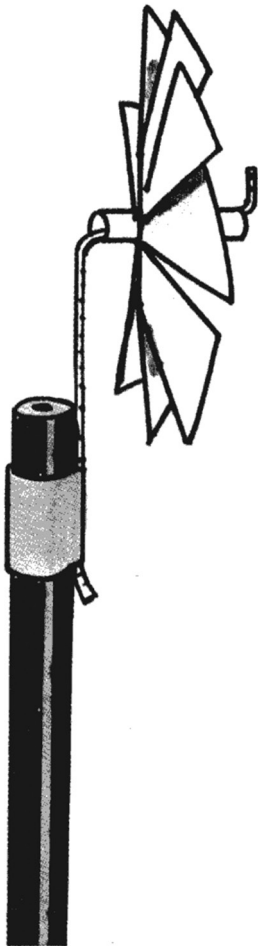
1. Cut out the turbine pattern. Use four pieces of tape to secure the paper to the pie plate.
2. Remove the edge of the pie plate by cutting a circle on the pie plate. You may want to leave some space around the turbine pattern for now and cut more carefully around the edge later. Make sure that the turbine pattern stays taped to the pie plate.
3. Cut along each of the dotted lines. Cut from the edge toward the center of the circle.
4. Cut along the small solid lines (the dashes) on the turbine pattern.
5. Use the nail to make a hole in the center of the turbine.
6. Trim the pie plate by cutting along the outer edge of the turbine pattern. Remove the turbine pattern from the pie plate.
7. Twist each blade of the turbine slightly in the same direction.
8. To make the shaft, cut a piece of drinking straw so that it is the same length as the one shown.
9. Carefully widen the hole in the turbine with a pencil point. Be sure you do not make the hole bigger than the straw. Put the piece of drinking straw through the hole. Make sure that the straw (shaft) fits snugly in the hole. Use glue if necessary. (Allow the glue to dry.)
10. Shape a paper clip into a long “L.” Fit the shaft on the long end.
11. Bend the long end of the paper clip down as shown in the picture. Tape the pencil to the long end of the paper clip. Your turbine should now look like the drawing.



Stop cutting
dotted lines here



turbine pattern



Straw length

Using the Turbine

Part A: The Windmill

1. Blow lightly on the turbine from the side.

Question: What happens?

Our Answer:

2. Blow harder on the turbine.

Question: What happens? Why?

Our Answer:

Part B: The Waterwheel

1. Make a hole in the bottom of your foam cup with a nail. Widen the hole with your pencil. Then cover the hole with your finger and fill the cup with water. Hold the cup about six inches (15 cm) above the aluminum tray.

Question: What kind of energy does the water in the cup have?

Our Answer:

2. Let one group member hold the turbine just below the cup. Remove your finger from the cup.

Question: What happens to the turbine?

Our Answer:

Part C: The Steam Turbine

1. Hold your turbine over the hole in the spout of a boiling kettle of water. Caution: Make sure your fingers are not close to the spout; steam can burn!

Question: Does Your turbine spin?

Our Answer:

Question: How was the steam made?

Our Answer: