UNIT 6 PROJECT

Building a Better Motor

Background

Electric energy powers most of the gadgets used by our mechanized society. An electric motor is the result of the interaction between electric current and magnetic fields. In this activity, you will design and build an electric motor. Then you will create a marketing brochure to sell your product.

Challenge

Part 1: A Motor That Works

In this first part, you must simply *construct a motor that works*.

Part 2: Design a Better Motor

In the second part, you will redesign your motor. Select new materials and a design structure to construct a motor specifically designed to comply with, and compete in, one or more of the following categories.

- Fastest/slowest continually spinning motor
- Most reliable motor
- Smallest/largest functioning motor
- Motor requiring the least amount of current or voltage to operate
- Most creative overall design

Materials

- strips of Plexiglas™ (20 cm x 3 cm)
- 1/4 inch dowelling (10 cm in length)
- 2 sewing pins
- 1.0 m thin-gauge enamelled wire (36 gauge or smaller)
- empty bathroom-tissue roll
- heat gun
- drill and 1/4 inch drill bit
- sandpaper
- 24-gauge insulated electrical wire

Safety Precautions

- Observe caution whenever working with electric energy.
- Wear appropriate protective gloves when heating the Plexiglas™.

  Note: Hot Plexiglas™ looks just like cold Plexiglas™.

Design Criteria

As a class, establish guidelines and requirements for the marketing brochure. Include

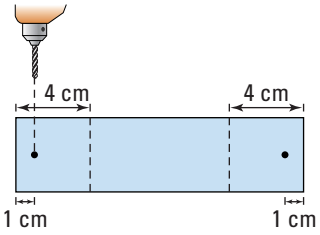
- a design blueprint of your finished product
- the category for which you are designing your motor
- a list of design improvements

Design a rubric to organize these guidelines to be used for assessment.

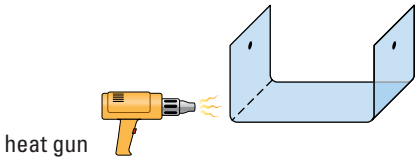
Action Plan

Part I

1. To build the base, drill a hole in each end of the Plexiglas™ strip.

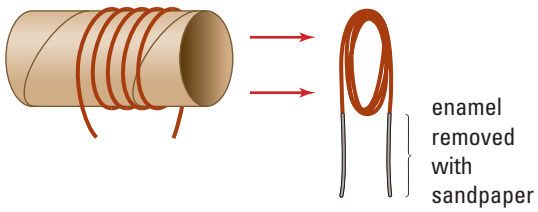


2. Carefully heat the Plexiglas™ along the dotted line drawn 4 cm from each end. Heat one end at a time, bending the Plexiglas™ to 90°.



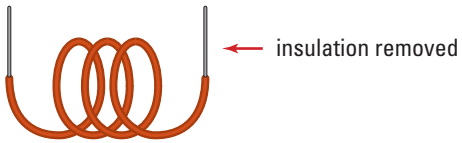
3. To build the coil, measure 1.0 m of the thin-gauge wire. Use sandpaper to sand the last 4.0 cm from both ends of the coil wire to remove the enamel.

4. Wrap the wire tightly around the tissue-paper roll. Remove the wire coil from the roll.



5. To build the commutators, cut two 15 cm lengths of the 24-gauge insulated wire. Carefully strip 2.0 cm of insulation off each end.

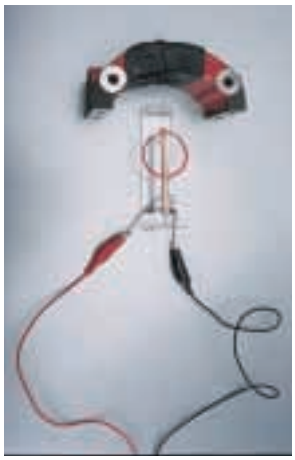
6. Individually wrap each wire strip around a pencil, leaving 4 cm unwound at each end.



7. Assembly: carefully glue the coil onto the wooden dowelling, ensuring that each sanded portion of wire runs down the length of the dowelling. Ensure that the wires are directly across from one another. Avoid getting glue on the sanded lengths of wire.

8. Carefully insert a pin into each end of the dowelling.

9. Place the pins and dowelling into the Plexiglas™ support as shown below.



10. Carefully glue the commutators into position, ensuring that they each make simultaneous contact, each with a different side of the sanded ends of the coil wire.

11. To make it go, place the coil in a large magnetic field.

12. Connect a direct current power supply to the free commutator ends. Turn on the power supply and watch your motor spin.

Part 2

Choose a category to compete in. Improve the original design, and tailor your motor to meet the specific criteria. You are encouraged to use different materials and structural layouts. Keep a log of design ideas. Include an explanation of how you solved any problems that you encountered.

Evaluate

1. Assess the success of your original motor. Does it operate continuously when activated?

2. Assess your technical effectiveness during the designing phase of this investigation. What skills and knowledge allowed you and your partner to accomplish the task? What aspects hindered your accomplishments?