

ELECTROMAGNET DEMONSTRATION*

*Adapted from Tesla for Teachers Lesson Plan, Developed by Jim and Judy Hardesty
PBS LearningMedia <http://www.pbs.org/tesla/tt/tt05.html>

CONCEPT AND BACKGROUND

According to the Law of Conservation of Energy, we cannot create or destroy energy, but we can change its form. That means we can transmit energy great distances in its electrical form and, when it arrives at its destination, change it into its mechanical form to do work.

The most common device for changing electrical energy into mechanical energy is the motor. Most motors use electromagnets to cause mechanical rotation. Before Nikola Tesla invented the AC (alternating current) induction motor, no motors could change AC into mechanical energy. The most fundamental element of the AC motor is the electromagnet, a magnet made from electric current. In this experiment, you can make and demonstrate an electromagnet to show students the most basic method of turning electric energy into mechanical energy.

Materials

- 1-inch iron nail
- 100' spool small-gauge insulated copper magnet wire (#25)
- knife switch
- 4-inch iron nail
- 6-volt battery
- small iron staples
- paper clips or tracks

Procedure (can check against illustration/
http://www.pbs.org/tesla/tt/change_energy.htm)

- 1 Wrap the 4-inch nail with a coil of 25 to 50 turns of the wire.
- 2 Connect one end of the coil to one terminal of the knife switch.
- 3 Connect the other terminal of the knife switch to the battery.
- 4 Connect the end of the coil to the other terminal of the battery.
- 5 Hold the tip of the 1-inch nail near the flat end of the 4-inch nail.
- 6 Close the knife switch quickly and open it (do not leave it closed).

Expected Outcome

The 1-inch nail will be pulled toward the 4-inch nail. This is mechanical energy in action. The mechanical energy is caused by the electromagnet.