



Teaching resource 13

Lenz's Law

An induced electromotive force always gives rise to a current whose magnetic field opposes the original change in magnetic flux.

Named after Heinrich Lenz, Lenz's Law is a common way of understanding how electromagnetic circuits obey Newton's third law and the conservation of energy.

A simple experiment can be used to introduce the concept of eddy currents and the conservation of energy in Lenz's Law.

Hold a copper tube over a protected surface and drop a metal slug down it. Now drop a magnet of an identical size down the tube - it will take about 8 times longer to pass through.

What's happening?

The movement of the magnet creates an electrical current in the copper tube. The current in the tube is commonly called an eddy current. This was discovered by Michael Faraday.

The eddy current in the tube generate their own magnetic field which opposes the magnetic field of the magnet causing it to travel more slowly through the tube. In 1834, Russian physicist Heinrich Lenz discovered this directional relationship between the induced magnetic fields and current, which is known as Lenz's Law. This is also the law of conservation of energy applied to electromagnetic induction.

Where does the energy go?

In this example the energy of the falling magnet is converted into electrical current, which is then dissipated as low-grade heat in the copper tube. If the copper tube has thinner walls, less current flows and hence less energy is converted and the magnet loses less speed.

Products which can be used for this demonstration:

1271 Orbit Magnetic Induction and Lenz's Law Kit