

ELECTROMAGNETICS

Unit 4
Session 2

Introduction to -

- Motors
- Working Principles of different Motors
- Difference types of Motor



Lesson Aims:



1. Working principle of Motors
2. Identify different Motors with their usage in real life
3. Classify types and functions of Motors

- What are Motors?
- What is the difference between AC & DC Motors?
- What are the different types of motors?





Motor



Starting in the center of the wire, wrap the wire tightly and neatly around the marker 30 times.

Slide the coil you made off of the marker.

Wrap each loose end of the wire around the coil a few times to hold it together, then point the wires away from the loop, as shown:

Electric Motor Armature

What is this? What is its purpose?

Ask an adult to use the hobby knife to help you remove the top half of the wire insulation on each free end of the coil. The exposed wire should be facing the same direction on both sides. Why do you think half of the wire needs to remain insulated?

Electric Motor Removing Insulation

Thread each loose end of the wire coil through the large eye of a needle. Try to keep the coil as straight as possible without bending the wire ends.

Electric Motor Needles

Lay the D battery sideways on a flat surface. Stick some modeling clay on either side of the battery so it does not roll away.

Take 2 small balls of modeling clay and cover the sharp ends of the needle.

Place the needles upright next to the terminals of each battery so that the side of each needle touches one terminal of the battery.

Electric Motor with Clay

Use electrical tape to secure the needles to the ends of the battery. Your coil should be hanging above the battery.

Tape the small magnet to the side of the battery so that it is centered underneath the coil.

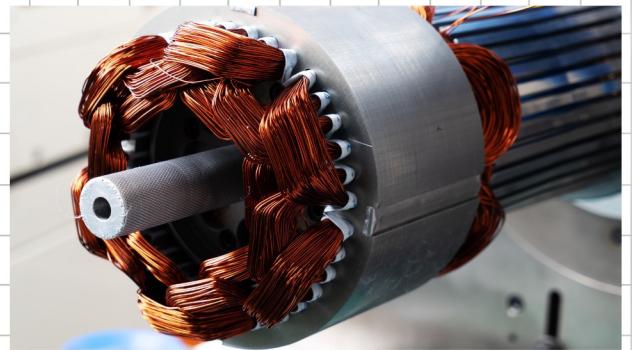
Completed Electric Motor

Give your coil a spin. What happens? What happens when you spin the coil in the other direction? What would happen with a bigger magnet? A bigger battery? Thicker wire?

Brainstorming



An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. An electric generator is mechanically identical to an electric motor but operates with a reversed power flow, converting mechanical energy into electrical energy.



Electric motors can be powered by direct current (DC) sources, such as from batteries or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters, or electrical generators.

Components:

The two mechanical parts of an electric motor are:

- the rotor, which moves
- the stator, which does not.

It also includes two electrical parts, a set of magnets and an armature, one attached to the rotor and the other to the stator, forming a magnetic circuit.

Field magnets - The magnets create a magnetic field that passes through the armature. These can be electromagnets or permanent magnets. The field magnet is usually on the stator and the armature on the rotor, but in some types of motor, these are reversed.

Bearings

Rotor

Stator

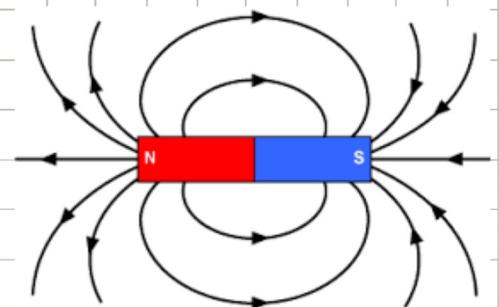
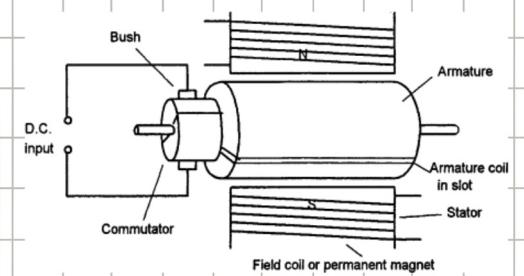
Armature

Commutator

- Motor supply and control

Motor supply

Motor control



Types of Motor:

- Self-commutated motor
- Brushed DC motor
- Electronic commutator (EC)
- Universal AC/DC motor

- Externally commutated AC machine: AC induction and synchronous motors are optimized for operation on single-phase or polyphase sinusoidal waveform power frequency such as those supplied for fixed-speed applications by the AC power grid or variable-speed application from variable-frequency drive (VFD) controllers.

- Induction motor

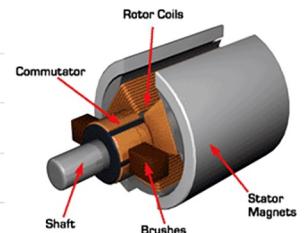
Synchronous motor

Doubly-fed electric machine

- Special magnetic motors

Rotary

Linear motor

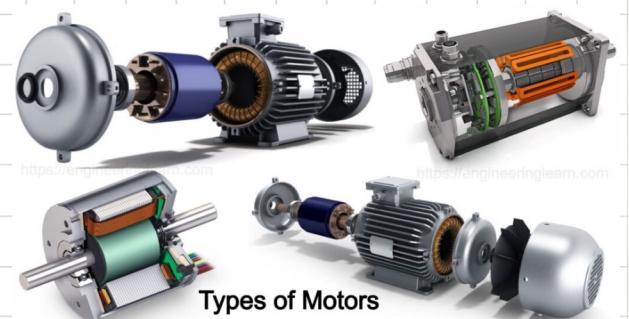




Activity

Demonstration through 3D animation video of all types of motors and their part on YouTube.

Share your observations



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Reflection

- 1) What does an electrical motor do?
- 2) What are the types of electrical motors?
- 3) What are the main parts of the motor?
- 4) What is the importance of studying electric motors?
- 5) What are the uses and applications of an electric motor?
- 6) How is an electric motor important in our daily life?
- 7) What is the main purpose of an electric motor?



For more information -

