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ELECTRIC MOTORS IN LIVES OF PEOPLE

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An electric motor is a device used to convert electrical energy to mechanical energy

The basic principle on which motors operate is Ampere's law. This law states that a wire carrying an electric current produces a magnetic field around itself. Imagine that current is flowing through the wire loop shown in the figure below. The presence of that current creates a magnetic field around the wire. Since the loop itself has become a magnet, one side of it will be attracted to the north (N) pole of the surrounding magnet and the other side will be attracted to the south (S) pole of the magnet. The loop will begin to rotate, as shown by the arrow marked F.

DC motors. When electric motors were first invented, AC current had not yet been discovered. So the earliest motors all operated on DC current, such as the current provided by a battery.

AC motors. What happens next depends on the kind of electric current used to run the motor, direct (DC) or alternating (AC) current. With AC current, the direction in which the current flows changes back and forth rapidly and at a regular rate. In the United States, the rate of change is 60 times per second, or 60 hertz (the unit of frequency).

In an AC motor, then, the current flows first in one direction through the wire loop and then reverses itself about 1/60 second later. This change of direction means that the magnetic field produced around the loop also changes once every 1/60 second. At one instant, one part of the loop is attracted by the north pole of the magnet, and at the next instant, it is attracted by the south pole of the magnet.

But this shifting of the magnetic field is necessary to keep the motor operating. When the current is flowing in one direction, the right hand side of the coil might become the south pole of the loop magnet. It would be repelled by the south pole of the outside magnet and attracted by the north pole of the outside magnet. The wire loop would be twisted around until the right side of the loop had completed half a revolution and was next to the north pole of the outside magnet.

If nothing further happened, the loop would come to a stop, since two opposite magnetic poles—one from the outside magnet and one from the wire loop—would be adjacent to (located next to) each other. And unlike magnetic poles attract each other. But something further does happen. The current changes direction and so does the magnetic field around the wire loop. The side of the loop that was previously attracted to the north pole is now attracted to the south pole, and vice versa. Therefore, the loop receives another "kick," twisting it around on its axis in response to the new forces of magnetic attraction and repulsion.Thus, as long as the current continues to change direction, the wire loop is forced to spin around on its axis. This spinning motion can be used to operate any one of the electrical appliances mentioned above.

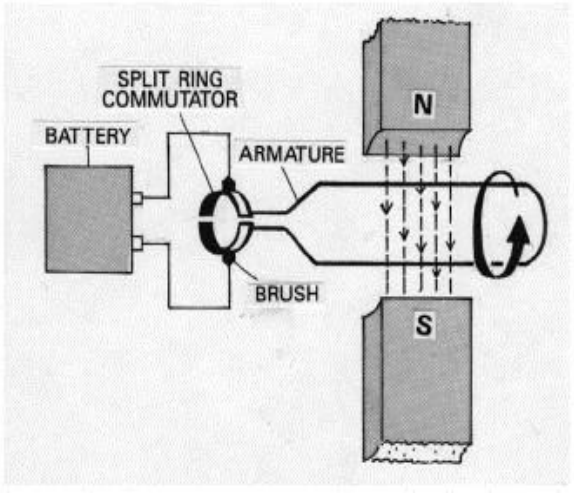

Fig. 1 - Simplified scheme of dc electric motor

A ¼ Horsepower Motor performs the work of two men continuously, more-efficiently, and less-expensively. (And with much less complaining!)

Motors have a number of advantages when compared to engines:

Advantages

- Low Initial Cost - The initial cost of an electric motor is considerably lower than a fossil-fuel engine with the same Output Horsepower Rating (in nearly every case).
- Long Life - Because electric motors contain relatively few moving parts, they have extensive operational life spans. For instance, an appropriately selected and maintained electric motor offers up to 30,000 hours of operating life without major repairs. (This is the approximate equivalent of 3½ years of perpetual usage.)
- Low Maintenance Requirements - Electric motors are durable and have extensive operating life and minimal service requirements.
- High Efficiency - Electric motors are highly-efficient with ratings that range from 50% to 95% (depending on the motor's size and operating conditions).
- Automated Control - Automated controls are easily installed to operate electric motors, providing the versatility of automatic and remote Start/Stop functions.
- No Fossil Fuels - They require NO fuel, engine oil maintenance, battery service, and do NOT freeze in sub-zero temperatures.
- Labor Cost Savings - Electric motors reduce requirements for labor due to lower maintenance and easier control which ultimately makes production more profitable by reducing costs).
- Occupational Safety - Motors contribute to the safety of the work environment, emitting little noise, NO exhaust, and without flammable fuels.

There are some disadvantages that accompany the use of electric motors.

Disadvantages

- Portability - Many larger electric motors are NOT easily portable, and even if a motor is small enough to be portable, consideration must be made for the correct electrical supply and voltage at the new site.
- Demand Charges - Using high-horsepower motors in applications where they are run infrequently (Low Load Factor) can result in costly electrical demand charges which results in a high cost per hour of operation.
- Remote Locations - Expensive line extensions are sometimes needed for installation in remote locales where existing electrical power is NOT available.

Speed Control - Speed-controlled motors are rather costly and require intricate special equipment that often complicates installation.

So, how electric motors influence our life?

To tell a long story short I would like to say that in every aspect of our modern life we come across different types of electric motors such as in our houses, outside for example:

1. Water

We simply turn the tap on and water appears – but how many of us consider that electric motors are needed to power pumps which filter and move clean water to our homes?

2. Irrigation

Much of the food we eat is grown via modern irrigation methods – made possible by our friend the motor, of course.

3. Cars

The average car contains around 30 electric motors, controlling the windows, starter, windscreen wipers, air conditioning and wing mirrors to name just a few.

4.Oil rigs &processing plants

Modern oil drilling would be impossible without electric motors and neither would the operation of processing facilities to provide fuel for our cars and heat for our homes.

5. Mining

The extraction of coal, a vital fuel for electricity production, requires equipment such as cutting machinery, conveyor belts and shuttle cars.

6. Power stations

Power stations enable us to illuminate our homes at the flick of a switch – they need motors to power feed-water pumps, fuelling steam turbine generators that produce electricity.

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7. Trains

That daily rail commute simply wouldn’t happen if it weren’t for the train’s traction motor.

8. Ships

Thruster motors help propel ships through the water, enabling the global transportation of essential goods including cars, cement and food.

10. Theatre

Even a visit to the theatre is influenced by motors, such as the curtain raising and scenery movement.

To sum up I would say that the motor despite its disadvantages are a good substitute for the internal combustion engine and if the humanity will choose

them as the main types of engines we would have a great future!

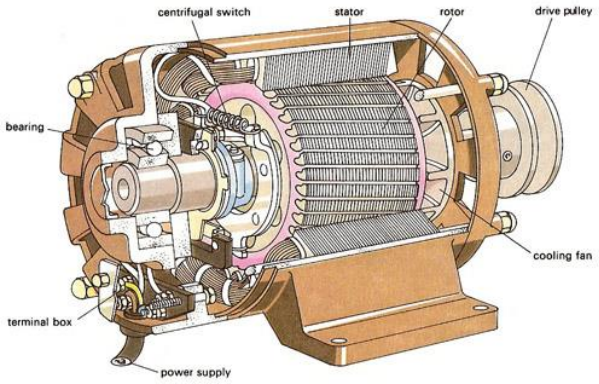

Fig. 2 - Sectional drawing of modern electric motor