

GENERATORS



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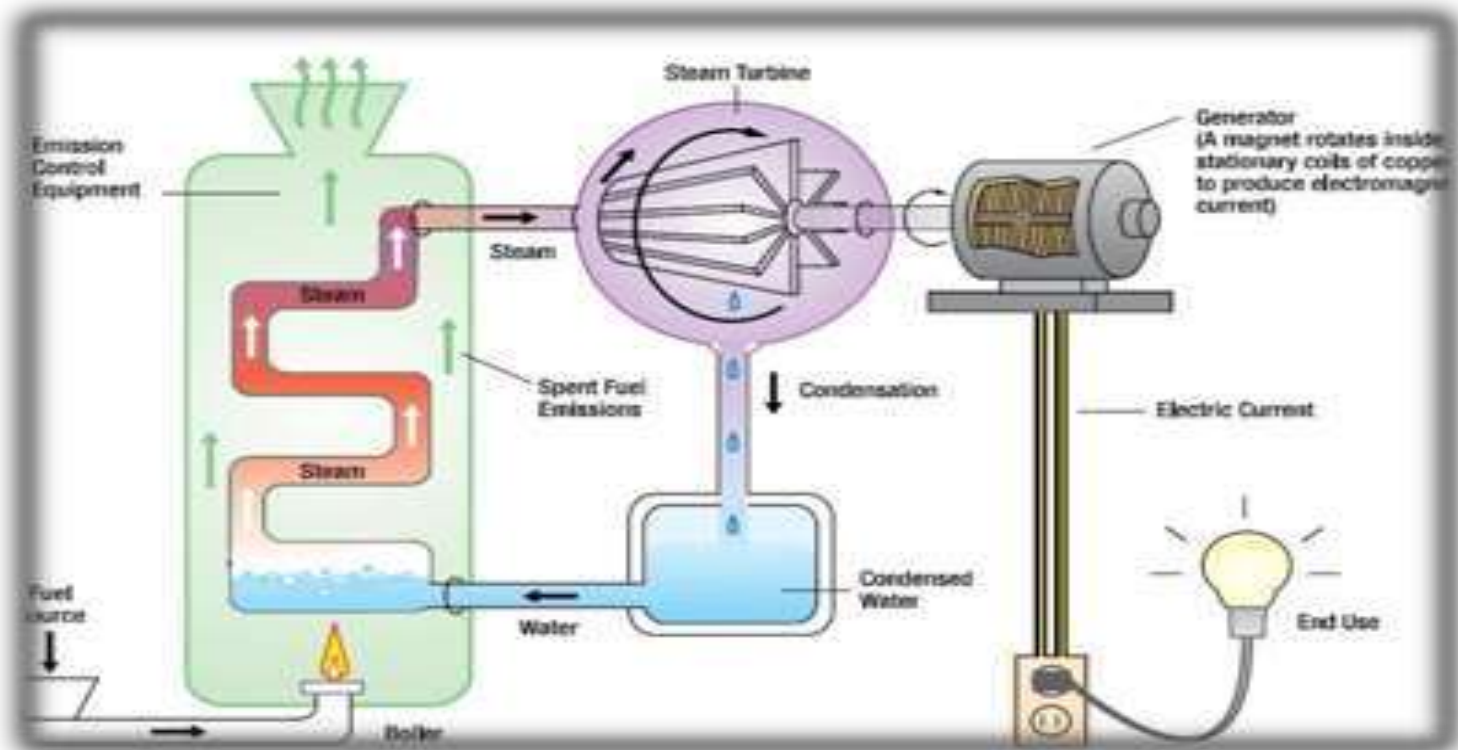
Electric Generator

- Introduction
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- Uses of electric Generator



What is Electric Generator ??

- The electrical generator was first invented by the Hungarian inventor and engineer Anyos Jedlik sometime between 1827 and 1830. Jedlik invented the generator



What is Electric Generator ??

- An electric generator is a device which converts Mechanical energy to Electrical energy.



Electric generator is also called Dynamo.

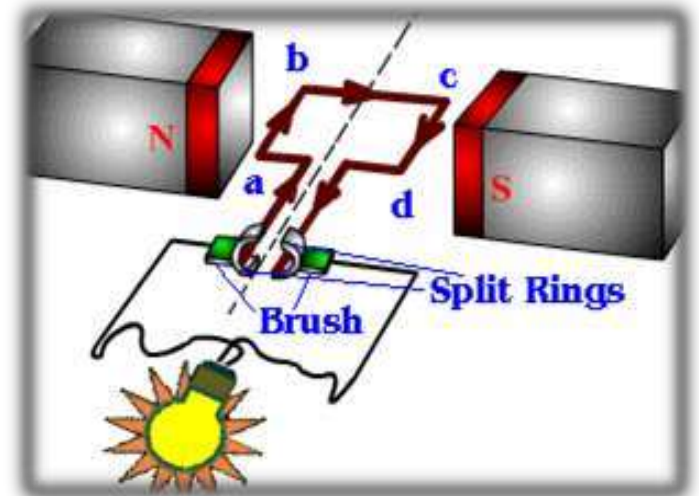
Principle of an electric generator

- In generators mechanical energy is transformed into electrical energy.

- The principle of all of the generators is same, although the detail of construction may be differ somewhat.

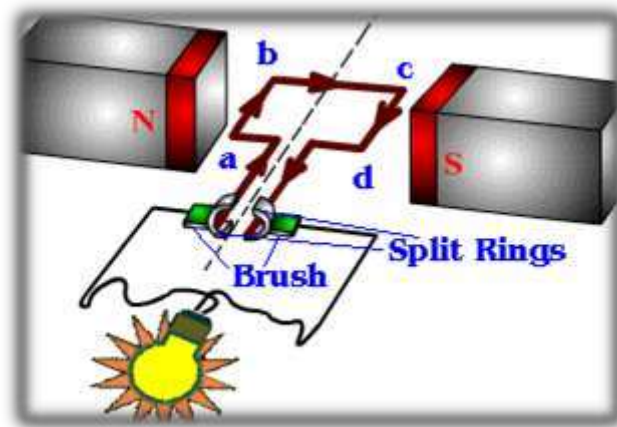
- A generator has two main parts:

1. Coil
2. Magnet



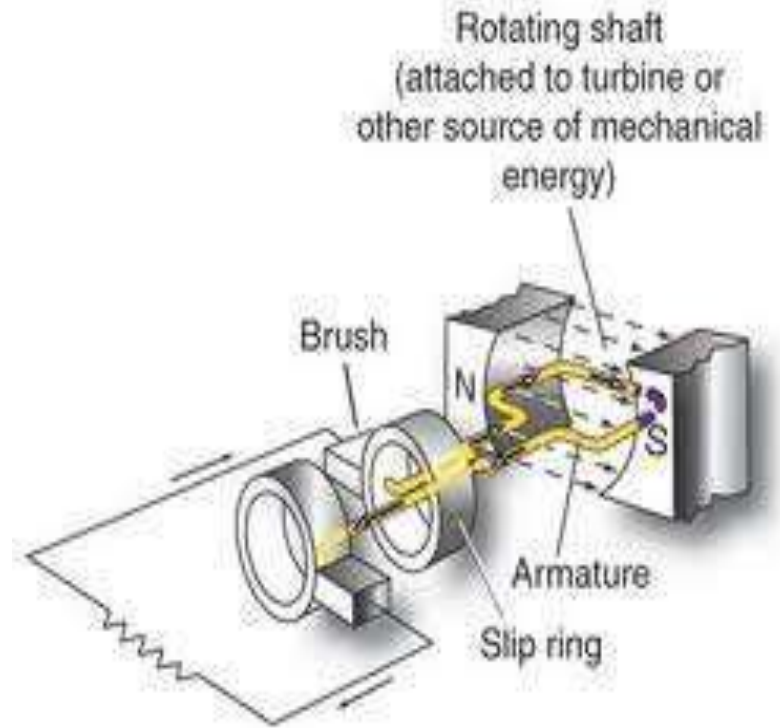
Principle of an electric generator

- Generator works on the principle of electromagnetic induction discovered by Michael Faraday in 1831-32..
- *Faraday's Law* : An Electro Magnetic Field (E.M.F.) is induced in a conductor (i.e. a coil) when the magnetic field around it changes. The magnitude of the E.M.F. is proportional to the rate of change of the field, or rate of cutting flux, while its direction depends on the direction of the rate of change.



Principle of an electric generator

When coil is rotated in a magnetic field by some mechanical means magnetic flux is changed through the coil and consequently EMF is induced in the coil.



Construction of a Generator

Simple loop generator is having a single-turn rectangular copper coil rotating about its own axis in a magnetic field provided by either permanent magnet or electro magnets.

In case of without commutator the two ends of the coil are joined to slip rings which are insulated from each other and from the central shaft. Two collecting brushes (of carbon or copper) press against the slip rings. Their function is to collect the current induced in the coil. In this case the current waveform we obtain is alternating current. In case of with commutator the slip rings are replaced by split rings. In this case the current is unidirectional

Working of Electrical Generator

Most metals have electrons that can move around freely. These electrons allow electricity to move through the metal, transmitting electrical energy from one place to another. These metals are called electrical conductors. A generator is a device that is used to move electrons through a conductor to give electric power. It does this by using a magnet that forces electrons to move along a wire at a steady rate while putting pressure on them. With the help of a generator, the electrons can transmit electric energy from one point to another. The difference in the number of electrons and the pressure that the generator applies is what creates the different electric currents. The generator spins at a certain number of rotations per minute. The number of electrons that move is measured in amps. The pressure is measured in volts

History and evolution of Generators

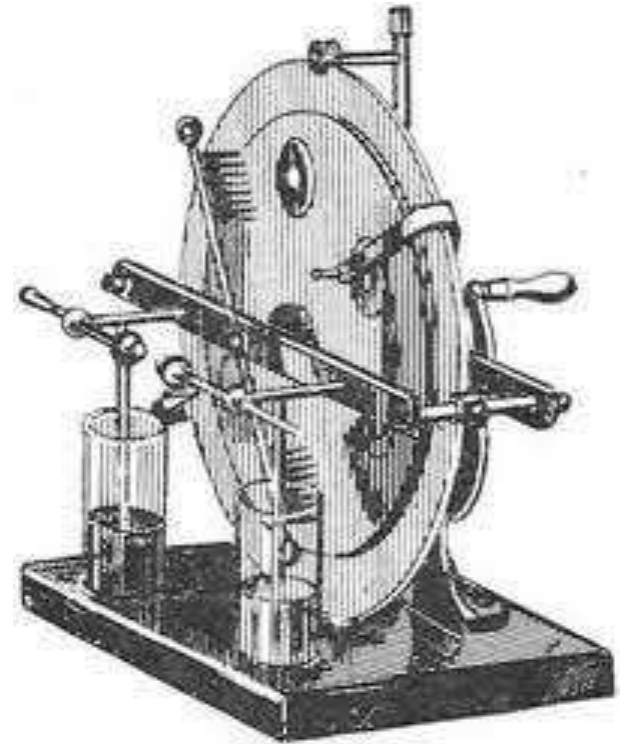
Michel Faraday and Hippolyte Pixii were pioneers who invented early machines like generator. There are following **stages of evolution of Generators.**

- Electrostatic generators.
- Principle of electromagnetic induction.
- Invention of Dynamos.
- Alternators and their evolution.

Electrostatic Generators

Before the connection between electricity and magnetism was discovered Electrostatic generators were invented.

They were never used for commercial power generation and were left due to inefficiency and difficulty.



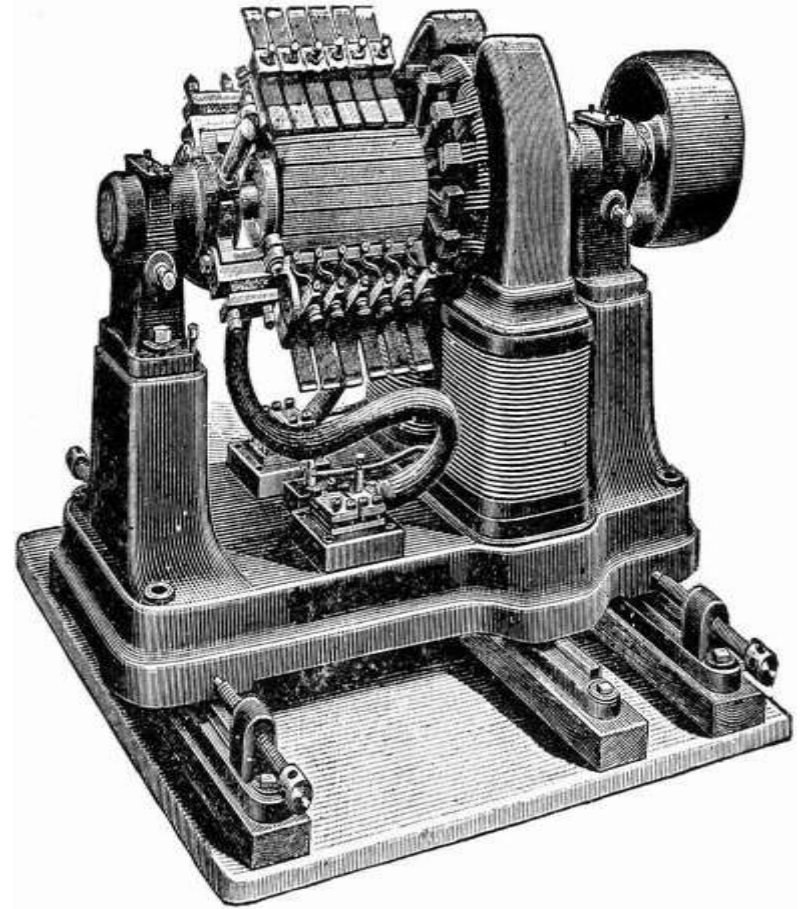
Principle of electromagnetic induction

The scientific principle on which modern generators work was discovered by Michel Faraday, he gave first electrical demonstration of electromagnetic induction in August 1831.

Then he created world's first electrical generator called "Faraday's disk"

Dynamos

- Dynamos use electromagnetic principles to convert mechanical rotation into a pulsating direct electric current through use of a commutator.
- 1st dynamo was built by Hippolyte Pixii in 1832.



Alternators

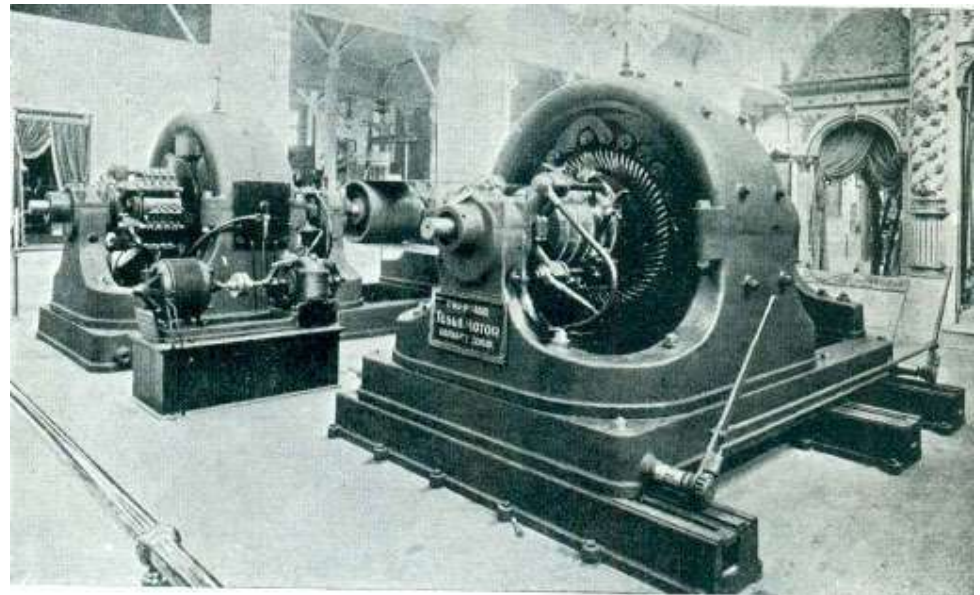
After that alternating current generators were invented.

- 1st TWO PHASE AC GENERATOR was built by J.E.H.Gordon in 1882.

- In 1886 1st Public demonstration of ALTERNATOR SYSTEM was given.

- Nikola Tesla done very useful work in evolution of alternators.

- Lord Kelvin and Sebastian Ferranti also done some work.

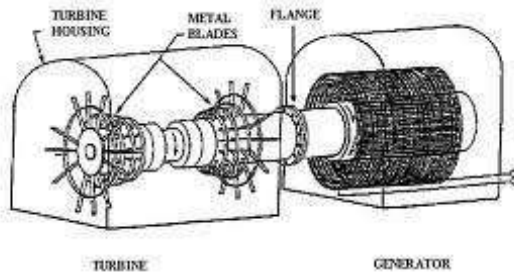
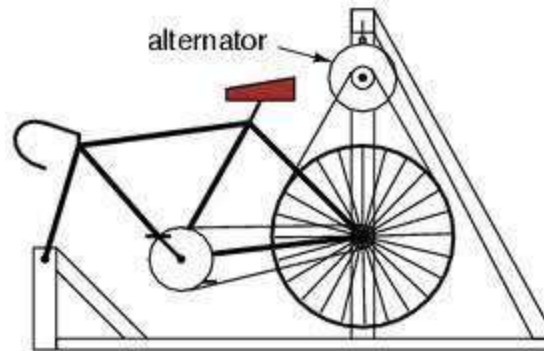


Types of Electric Generators

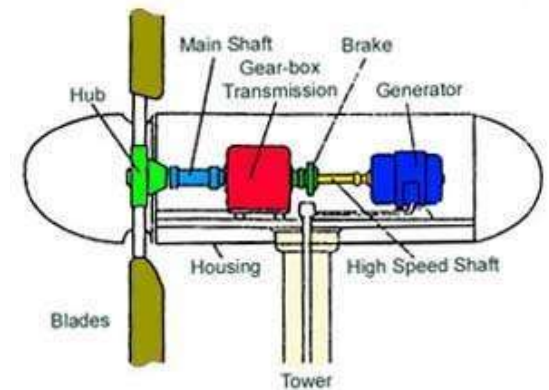
Electric generators types depend on the type of generating Equipment employed, the electrical energy produced is either direct current (DC) or alternating current (AC).

- **AC generators** are classified as single-phase or polyphase. A single-phase generator is usually limited to 25 kW or less and generates AC power at a specific utilization voltage. Polyphase generators produce two or more alternating voltages (usually two, three, or six phases)
- **DC generators** are classified as either shunt, series, or compound-wound. Most DC are the compound-wound type. Shunt generators are usually used as battery chargers and as exciters for AC generators. Series generators are sometimes used for street lights. The emf induced in a DC generator coil is alternating. Rectification is needed to direct the flow of current in one direction. The generator rotating commutator provides the rectifying action.

According to mechanical work input generators can also be classified. As engine generators , human powered generators , turbine generators and wind mill generators.



When a turbine is attached to the electrical generator, the kinetic energy (i.e., motion) of steam pushes against the fan-type blades of the turbine, causing the turbine, and therefore the attached rotor of the electrical generator, to spin and produce electricity.



Mainly used generators are engine generators. They are also known as Gensets. They use engine, which provides mechanical energy by use of chemical energy provided by different chemicals as Gasoline, Propane, Diesel fuel and Natural gas.

They can further be classified into 3 main types.

1. Standby Generators
2. Portable Generators
3. Commercial Generators

Standby Generators:

- These are large, often permanent units often stationed outside a building and like to provide backup power in case the in electricity switches off.
- They can sense when a power interruption has occurred and automatically start to provide emergency power



Portable Generators

- These generators are designed to be transported whether on cart trailer or by hand where there is no utility of power.
 - They are capable of providing up to 1000 kilowatts of power.
- They use either diesel natural gas , gasoline or propane as fuel



Commercial Generators:

In areas where power supply is intermittent or lacking as in THIRD WORLD provincial areas, generators can also be set up to provide additional power.



Uses of Electrical Generator

- Hybrid electric vehicle (HEV) drive systems, automotive starter generators, aircraft auxiliary power generation, wind generators, high speed gas turbine generators.
- An A.C. generator, or 'alternator', is used to produce A.C. voltages for transmission via the grid system or, locally, as portable generators.

