



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35



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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

**COURSE NAME: 23EET101/BASIC ELECTRICAL AND
ELECTRONICS ENGINEERING**

I YEAR / I SEMESTER

Unit II – ELECTRICAL MACHINES

Topic : Synchronous Generator



SYNCHRONOUS GENERATOR



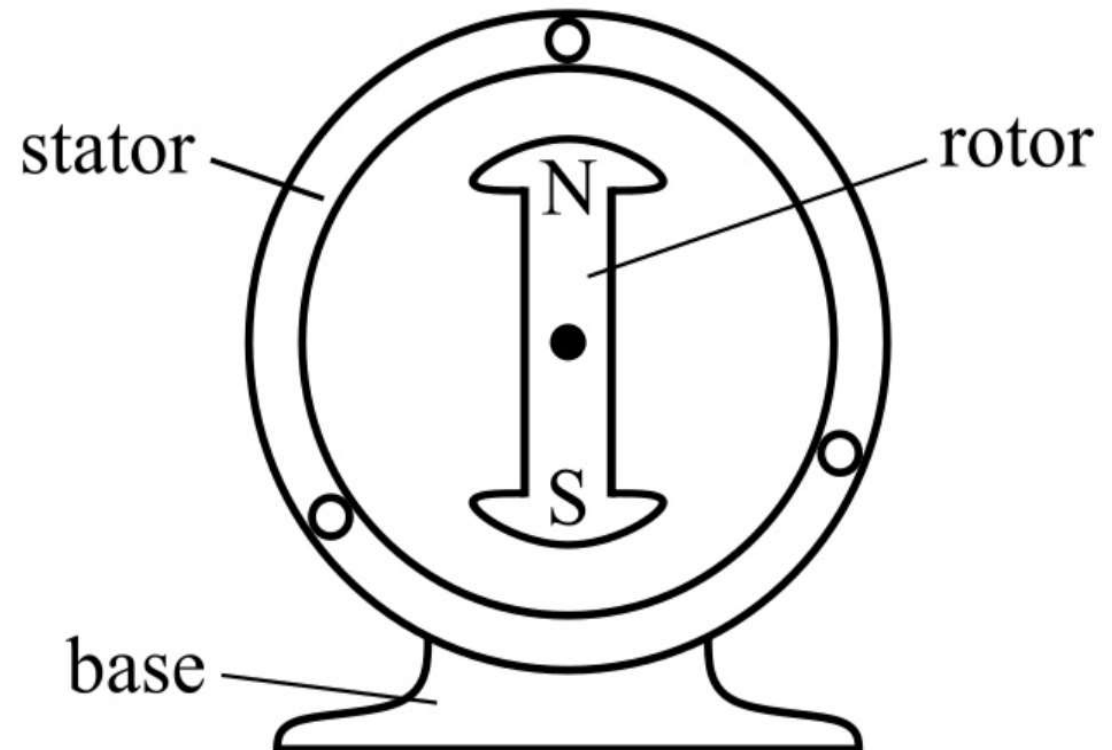
- A *synchronous generator* is a **synchronous machine** which converts mechanical power into AC electric power through the process of electromagnetic induction.
- Synchronous generators - **alternators** or **AC generators**. The term "alternator" is used since it produces AC power.
- It is called a synchronous generator because its rotor must be rotated at a constant speed called **synchronous speed (N_s)**.





CONSTRUCTION

- ▶ **Stator** - static or non-moving part of the alternator
- ▶ **Rotor** - rotating or moving part of the alternator





STATOR

- **outer cover - yoke**, is made up of cast iron - protects the internal parts of the alternator against external mechanical and environmental threats.
- **stator core** - has several slots cut on its inner periphery to hold stator windings and also provides a low reluctance path for the magnetic field.
- **stator winding** - also called **armature winding**, is made up of copper conductors and voltage is generated in this winding when the generator is operated.

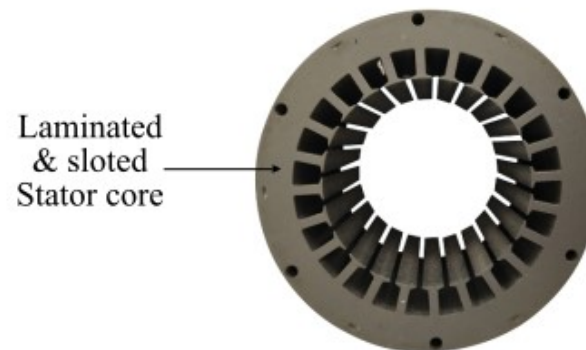


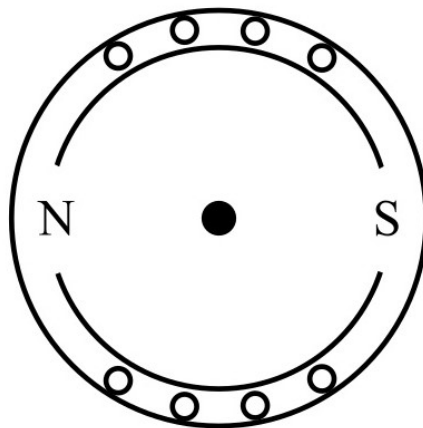
Fig. - Stator of Alternator



ROTOR

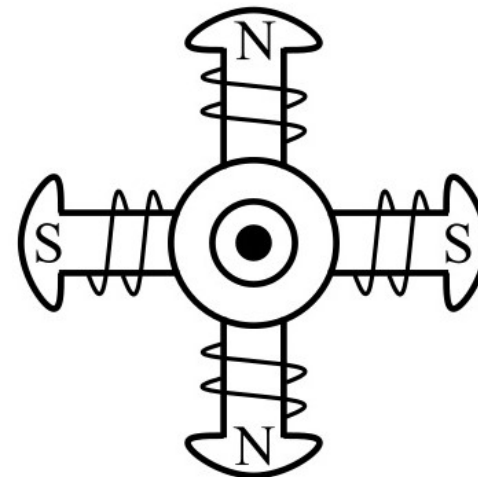
Cylindrical Rotor

- field winding or rotor winding is uniformly distributed in rotor slots.
- The rotor core is mounted on a rotor shaft .
- Also, the electrical connection between the exciter and rotor winding is provided through an assembly of slip rings.



Salient-Pole Rotor

- rotor core with project pole faces mounted on a rotor shaft.
- The field windings are placed on the salient-pole cores. These field windings are excited from an external exciter through an arrangement of slip-rings and carbon brushes.





WORKING PRINCIPLE AND OPERATION



- works on the **principle of electromagnetic induction**, i.e., when the flux linking a conductor changes, an EMF is induced in the conductor.
- When the armature winding of alternator subjected to the rotating magnetic field, the voltage will be generated in the armature winding.
- When the rotor field winding of the alternator is energised, the alternate N and S poles are developed on the rotor.
- When the rotor is rotated in the anticlockwise direction by a prime mover, the armature conductors placed on the stator are cut by the magnetic field of the rotor poles.



WORKING PRINCIPLE AND OPERATION



- As a result, the EMF is induced in the armature conductors due to electromagnetic induction. This induced EMF is alternating one because the N and S poles of the rotor pass the armature conductors alternatively.
- The direction of the generated EMF can be determined by the Fleming's right rule and the frequency of it is given by,

$$f = \frac{N_s P}{120}$$

- N_s is the synchronous speed in RP
- P is the number of rotor poles.



APPLICATION



- For electric power generators at power generating stations because of stable frequency..
- These are also used in automotive charge batteries.
- They are also used as portable generators.
- It is used in the systems wherever stable speed is necessary.
- It is used to preserve the power factor (PF) of the system.



VIDEOS



Working—

<https://www.youtube.com/watch?v=1tyBWqVSUfI>

Principle of Operation-

https://www.youtube.com/watch?v=bftlqMh1b_g