

INDUCTION MOTOR

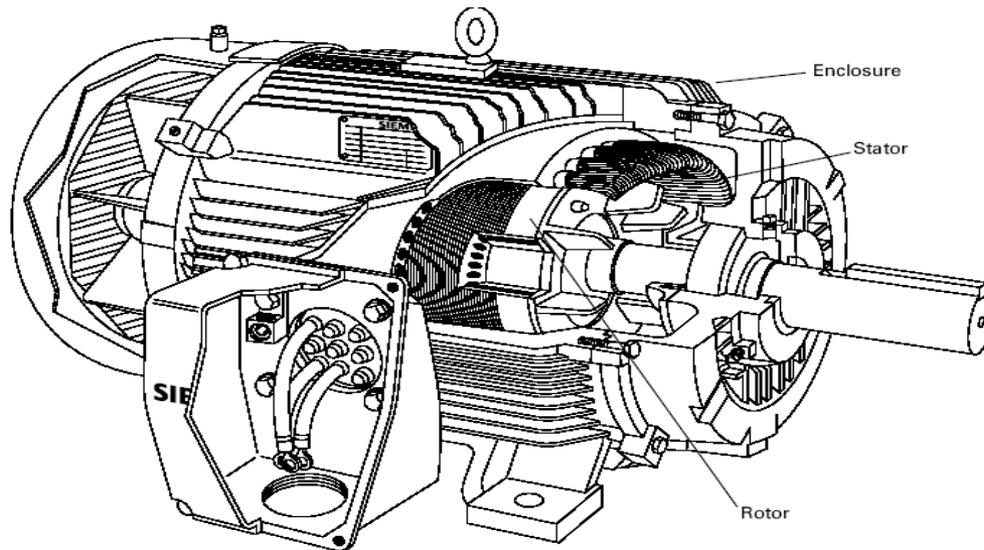


LECTURE 1



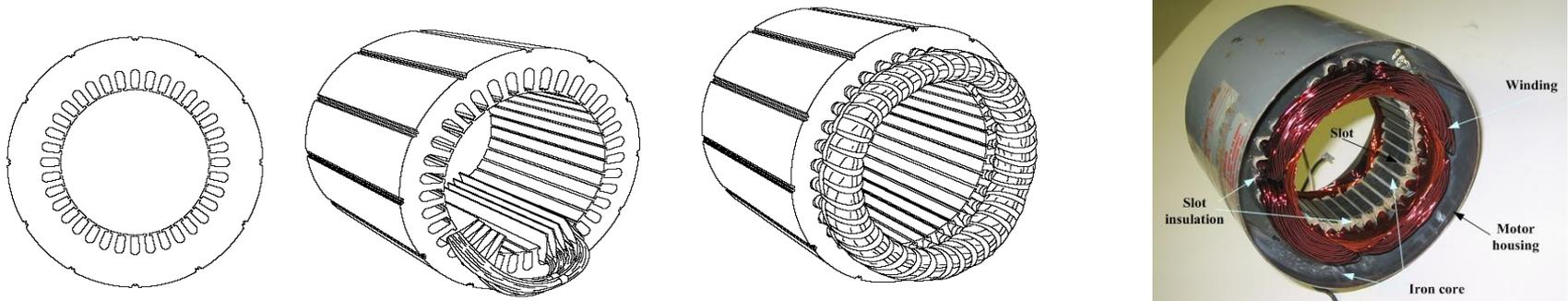
CONSTRUCTION

- Basic parts of an AC motor : rotor, stator, enclosure
- The stator and the rotor are electrical circuits that perform as electromagnets.



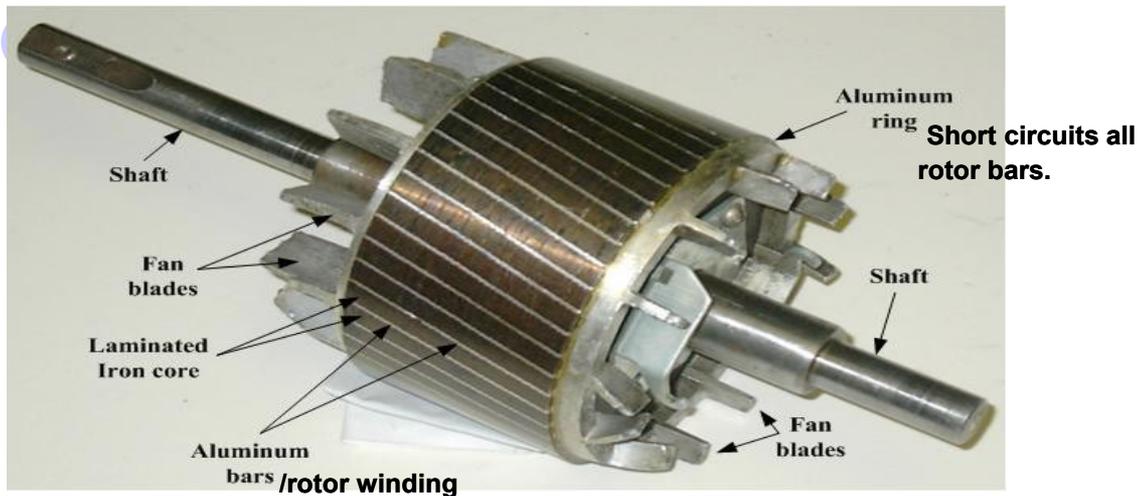
CONSTRUCTION (stator)

- The stator - **stationary** part of the motor.
- Stator laminations are **stacked together** forming a **hollow cylinder**.
- Coils of insulated wire are inserted into slots of the stator core.
- **Each grouping of coils**, together with the steel core it surrounds, **form an electromagnet**.



CONSTRUCTION (rotor)

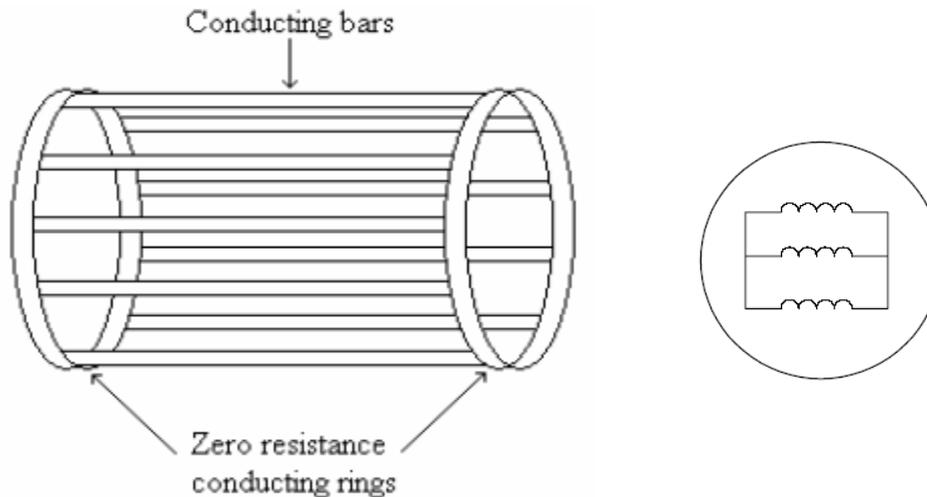
- The rotor is the **rotating part** of the motor
- It can be found in two types:
 - Squirrel cage (most common)



CONSTRUCTION (rotor)

❖ Squirrel cage type:

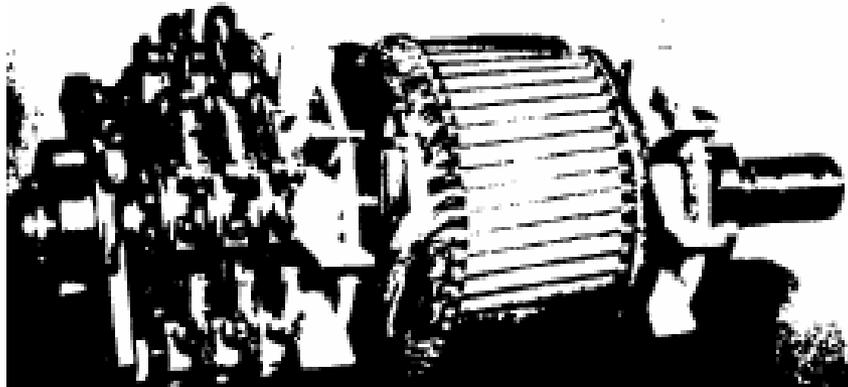
- Rotor winding is composed of copper bars embedded in the rotor slots and **shorted at both end by end rings**
- Simple, low cost, robust, low maintenance



CONSTRUCTION (rotor)

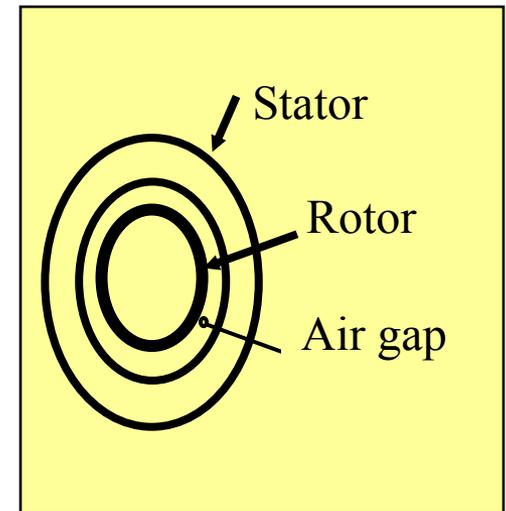
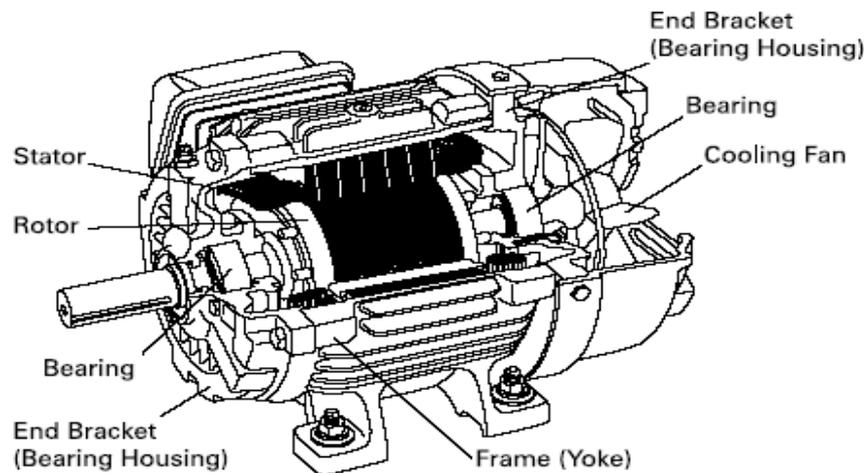
❖ Wound rotor type:

- Rotor winding is wound by wires. The winding terminals can be connected to external circuits through slip rings and brushes.
(similar with DC motor, with the coils connected together that make contact with brushes)
- Easy to control speed, more expensive.



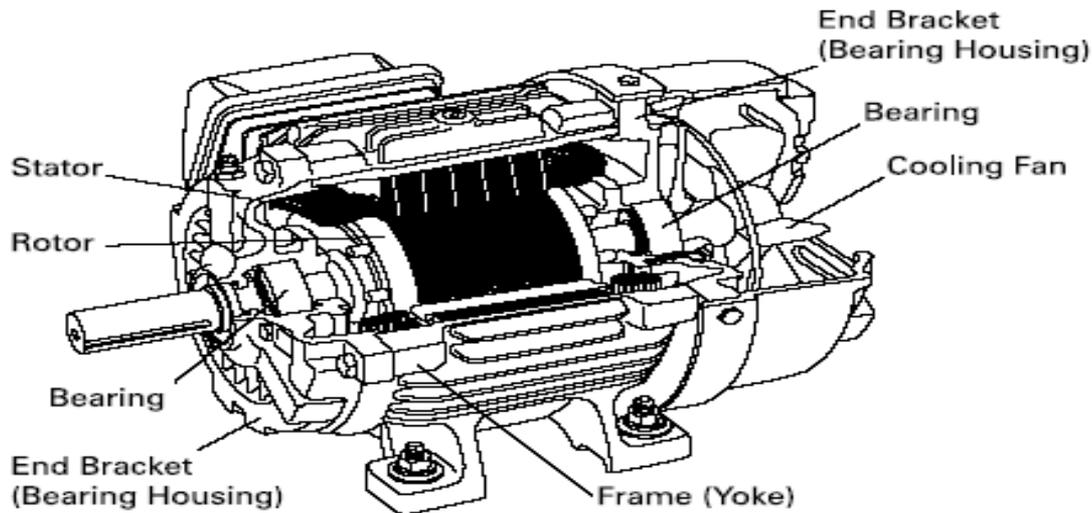
CONSTRUCTION (enclosure)

- The enclosure consists of a frame (or yoke) and two end brackets (or bearing housings). The stator is mounted inside the frame. The rotor fits inside the stator with a slight **air gap** separating it from the stator (**NO** direct physical connection)



CONSTRUCTION (enclosure)

- The enclosure **protects** the electrical and operating parts of the motor **from harmful effects of the environment** in which the motor operates.
- Bearings, mounted on the shaft, support the rotor and allow it to turn. A fan, also mounted on the shaft, is used on the motor shown below for cooling.



Rotating Magnetic Field

- When a 3 phase stator winding is connected to a 3 phase voltage supply, 3 phase current will flow in the windings, which also will induce 3 phase flux in the stator.
- These flux will rotate at a speed called a Synchronous Speed, n_s . The flux is called as Rotating magnetic Field
- Synchronous speed: speed of rotating flux

$$n_s = \frac{120f}{p}$$

- Where; p = is the number of poles, and
 f = the frequency of supply