



Andhra Pradesh State Skill Development Corporation



Basics of induction Motors

**The principle of operation
and concept of slip**

An **induction motor** (also known as an **asynchronous motor**) is a commonly used AC electric motor. In an induction motor, the electric current in the rotor needed to produce torque is obtained via electromagnetic induction from the rotating magnetic field of the stator winding. The rotor of an induction motor can be a squirrel cage rotor or wound type rotor.

Induction motors are referred to as 'asynchronous motors' because they operate at a speed less than their synchronous speed. So, the first thing to understand is – what is synchronous speed?

Synchronous Speed:

The rotational speed of the rotating magnetic field is called as synchronous speed.

$$N_s = \frac{120 \times f}{P} \text{ (RPM)}$$

Where f = frequency of the supply.

P = number of poles.

Synchronous speed: The speed at which the magnetic field of the stator rotated is called synchronous speed.



Slip:

Rotor tries to catch up the synchronous speed of the stator field, and hence it rotates. But in practice, rotor never succeeds in catching up. If rotor catches up the stator speed, there won't be any relative speed between the stator flux and the rotor, hence no induced rotor current and no torque production to maintain the rotation. However, this won't stop the motor, the rotor will slow down due to loss of torque, the torque will again be exerted due to relative speed. That is why the rotor rotates at speed which is always less the synchronous speed.

The difference between the synchronous speed (N_s) and actual speed (N) of the rotor is called as slip.

$$\% \text{ slip } s = \frac{N_s - N}{N_s} \times 100$$