**5 . Applications:**

Single phase induction motors are in very wide use in industry especially in fractional horse-power field. They are extensively used for electrical drive for low power constant speed apparatus such as machine tools, domestic apparatus and agricultural machinery in circumstances where a three-phase supply is not readily available.

Single phase induction motors sizes vary from 1/400 kw to 1/25 kw are used in toys, hair dryers, vending machines etc.

Universal motor is widely used in portable tools, vacuum cleaners& kitchen equipment.

**Disadvantages:**

Though these machines are useful for small outputs, they are not used for large powers as they suffer from many disadvantages and are never used in cases where three-phase machines can be adopted. The main disadvantages of single-phase induction motors are:

1. Their output is only 50% of the three-phase motor, for a given frame size and temperature rise.
2. They have lower power factor.
3. Lower efficiency
4. These motors do not have inherent starting torque
5. More expensive than three-phase motors of the same output.
6. Low overload capacity

**6 Principle of Work**

A single-phase induction motor is not self starting but requires some starting means. The single-phase stator winding produces a magnetic field that pulsates in strength in a sinusoidal manner. The field polarity reverses after each half cycle but the field does not rotate. Consequently, the alternating flux cannot produce rotation in a stationary squirrel-cage rotor. However, if the rotor of a single-phase motor is rotated in one direction by some mechanical means, it will continue to run in the direction of rotation. As a matter of fact, the rotor quickly accelerates until it reaches a speed slightly below the synchronous speed. Once the motor is running at this speed, it will continue to rotate even though single-phase current is flowing through the stator winding. This method of starting is generally not convenient for large motors. Figure 5 shows single-phase induction motor having a squirrel cage rotor and a single phase distributed stator winding. Such a motor inherently docs not develop any starting torque and, therefore, will not start to rotate if the stator winding is connected to single-phase A.C. supply. However, if the rotor is started by auxiliary means, the motor will quickly attain final speed. This strange behavior of single-phase induction motor can be explained on the basis of double-field revolving theory.

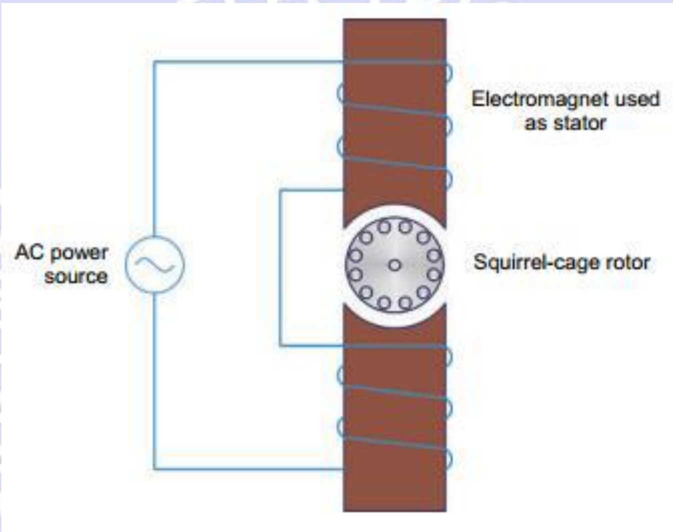


Figure 5 single-phase induction motor.

### 6.1 Operation of Single phase induction motor

(i) When stator winding is energized from a.c. supply, a rotating magnetic field (RMF) is set up which rotates round the stator at synchronous speed Ns (= 60 f/P), when f = frequency and P No. of poles pairs.

(ii) The rotating field passes through the air gap and cuts the rotor conductors, which as yet, are stationary. Due to the relative speed between the rotating flux and the stationary rotor, electrical motive forces (EMF) are induced in the rotor conductors. Since the rotor circuit is short-circuited, currents start flowing in the rotor conductors (Figure 6). The flux from the stator will cut the coil in the rotor and since the rotor coils are short circuited, according to Faraday's law of electromagnetic induction, current will start flowing in the coil of the rotor.

(iii) The current-carrying rotor conductors are placed in the magnetic field produced by the stator. Consequently, mechanical force acts on the rotor conductors. The sum of the mechanical forces on all the rotor conductors produces a torque which tends to move the rotor in the same direction as the rotating field with speed N =Ns (1-S) when S= slip and N = rotor speed (Figure 6).

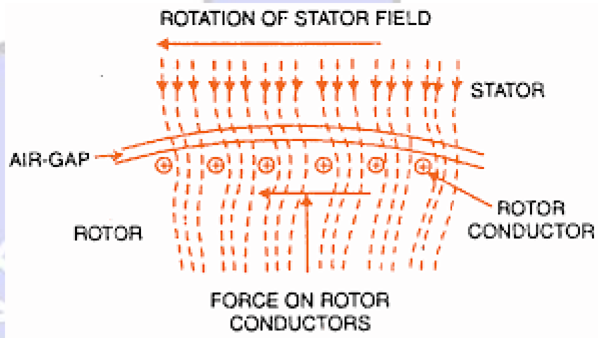


Figure 6 Transmission of Rotate magnetic field