



**Outlines:**

* **Introduction**
* **Types of Electrical Machines**
* **Types of 3-Ph induction motor**
* **Basic Principle**
* **Working Principle**
* **Compnents of induction motor**
* **Application**
* **Comparision between 1-ph I.M. & 3-ph I.M.**





 Electrical Machines are Electromechanical energy converson devices.

 Electrical motor coverts electrical energy into mechanical energy and electrcal generators are vice versa.

 Most of the Industrial load are inductive, especially 3-ph induction motors are widely used in industrial applications for continious operation.





# 1.AC Machines 2.DC Machines

**AC Machines:-**

* 1-Ph Induction Motor
* 3-Ph Induction Motor
* Synchronous motor
* 1- Ph Transformer
* 3-ph Transformer
* Altrnator or AC Generator





**DC Machines:-**

**-DC Motor**

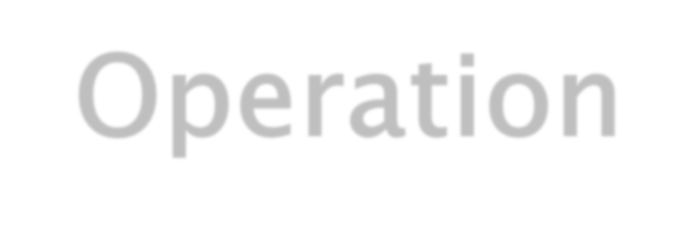
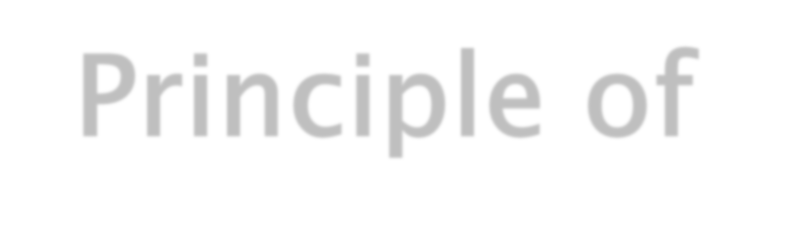
**-DC Generator**

**DC Motor:**

* **DC Shunt Motor**
* **DC Series Motor**
* **DC Compound Wound Motor**

**DC Generator**

* **DC Shunt Generator**
* **DC Series Generator**
* **DC Compound Wound Generator**



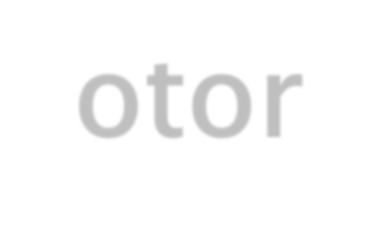
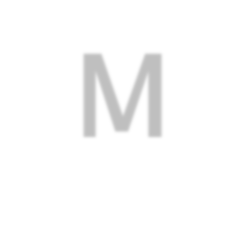
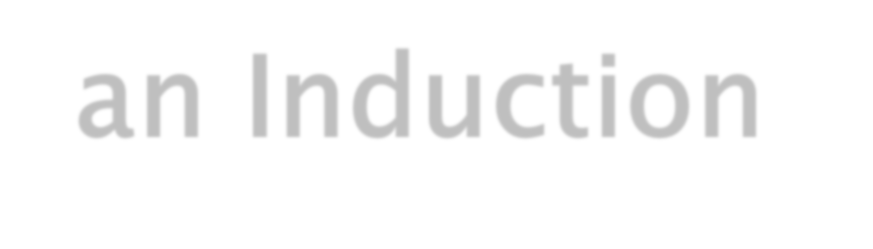
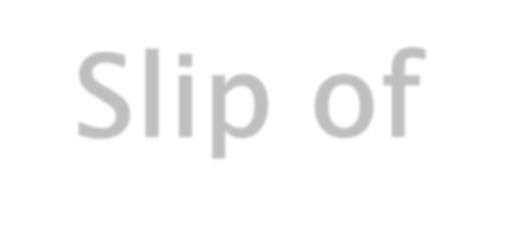
**Principle of Operation**

 A Rotating Magnetic field (RMF) is set up in the stator when a 3- Phase supply is given.

 The stationary rotor cut the revolving field and due to electromagnetic induction an e.m.f. is induced in the rotor conductor.

 As the rotor conductor is short circuited current flows through them.

 It becomes a current carrying conductor in magnetic field and start rotating.



**Slip of an Induction Motor**

* + Induction motor rotor always rotate at a speed less than

synchronous speed.

* + The difference between the flux (Ns) and the rotor speed (N) is called slip.
  + % Slip (s) = Ns – N

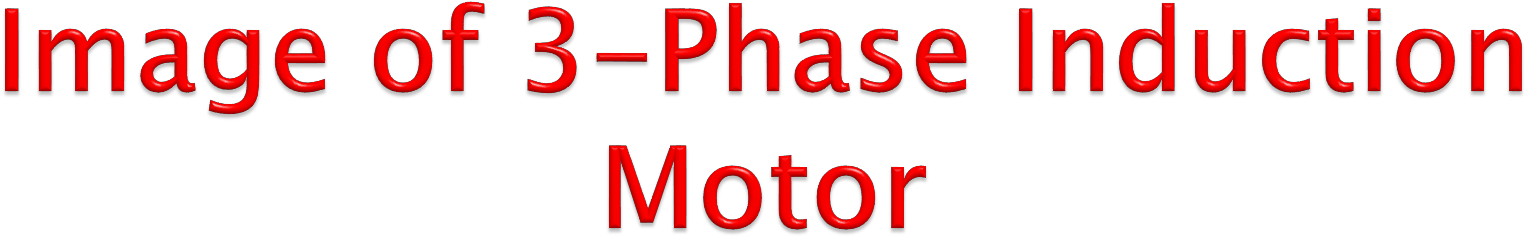
Ns

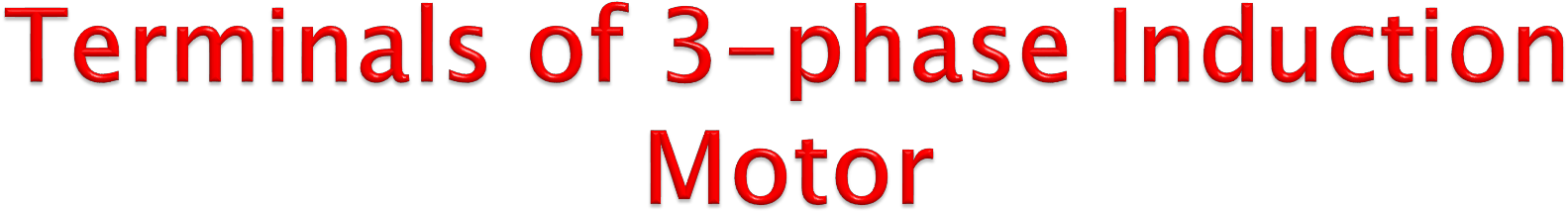
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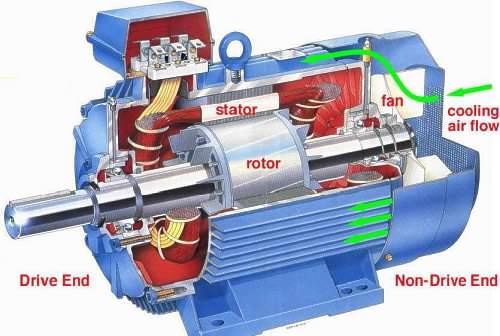
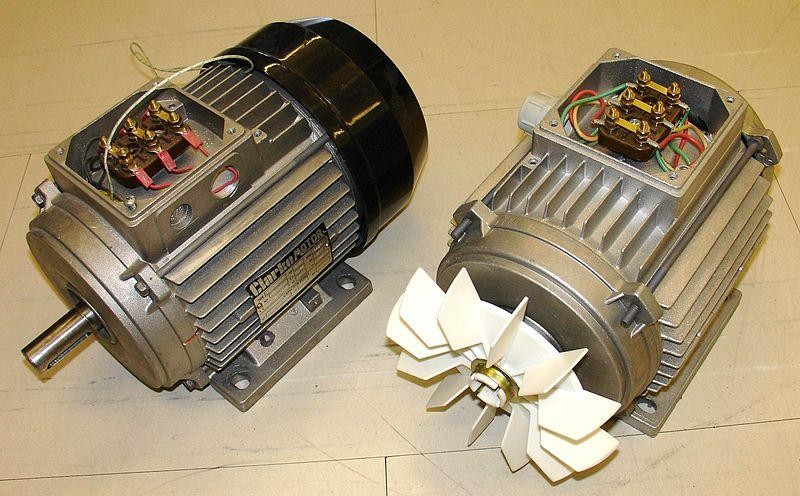
Where Ns=Synchronous Speed N= Actual Speed of rotor

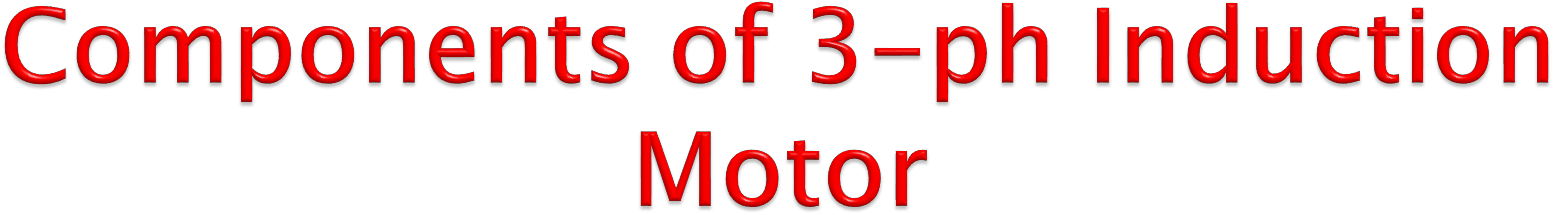


* + Slip speed = Ns – N











* **Frame**
* **Stator**
* **Stator Winding**
* **Rotor**
* **Rotor Winding**
* **Cooling Fan**
* **Bearings Frame:**

**Frame provides mechanical support to the stator and rotor. It is made from casting materials.**

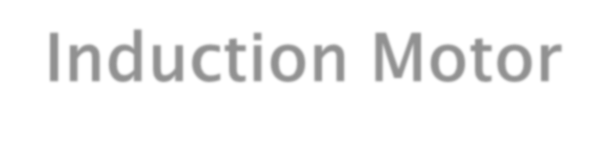
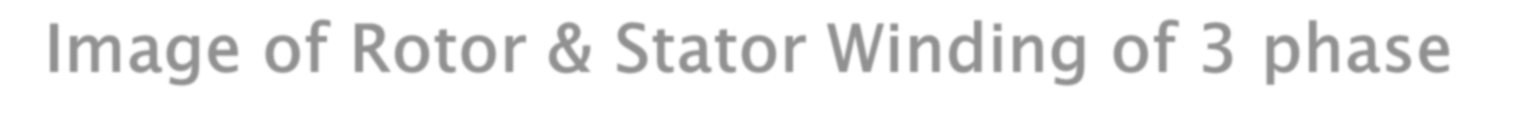
**Stator:**

**It is stationary part of induction motor. It consists stator winding**

**It is housed on the motor frame.**

**Arrangement of stator in 3-Ph induction motor are given below:-**

**Image of Rotor & Stator Winding of 3 phase Induction Motor**







Components of 3-ph Induction Motor

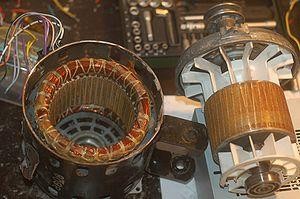


* **Rotor:-**
* **It is the rotating part of the induction motor.**
* **It is housed on the shaft of the induction motor.**
* **It has two ends, one is called Driving end and another is called non-**

**Driving end.**

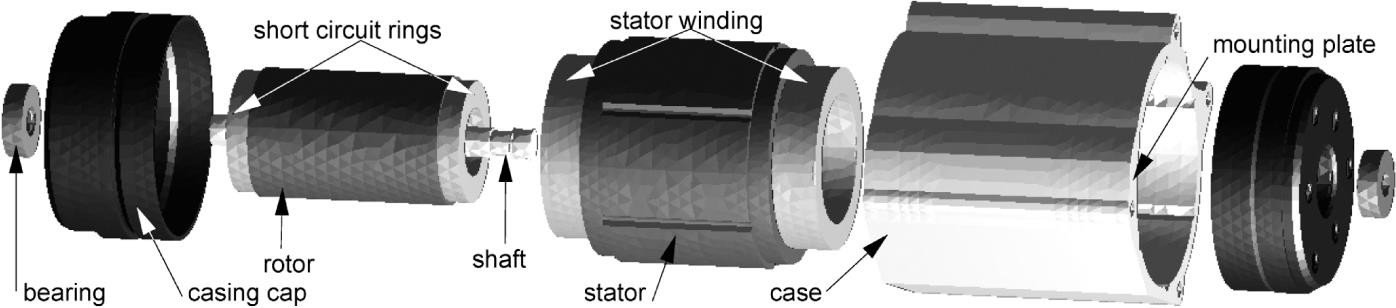
* **Mechanical load is connected on driving end while cooling fan is connected on non-driving end.**
* **Both the ends are connected with bearings for free rotation means of reduced friction losses.**
* **Arrangement of rotor of induction motor are given below:**

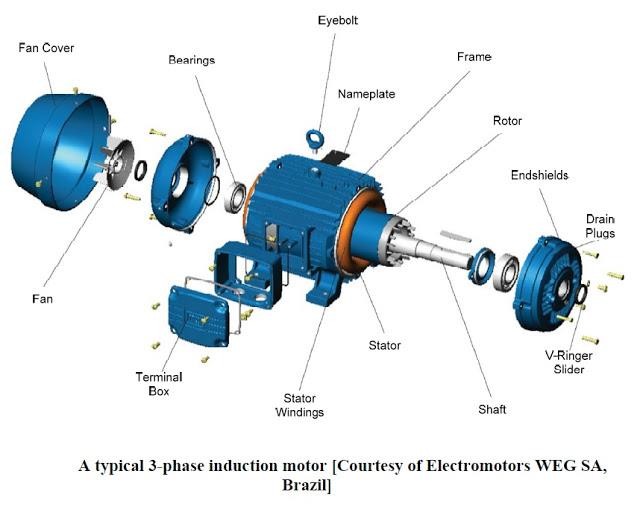




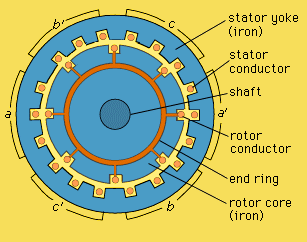




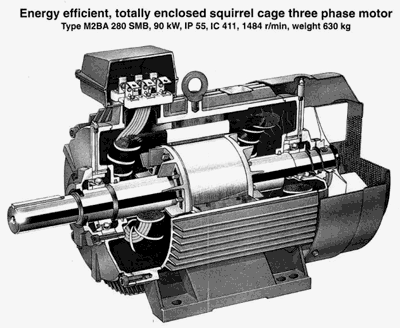
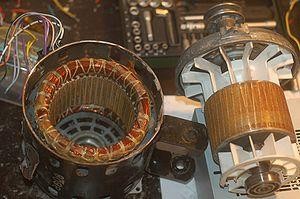
















Stator Windings:

 Star connected

 Delta connected

Rotor Windings:

 It is wound as rotor bars and short circuited at both the ends through end rings.





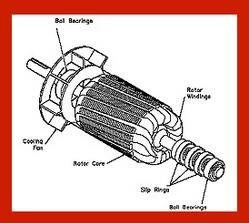
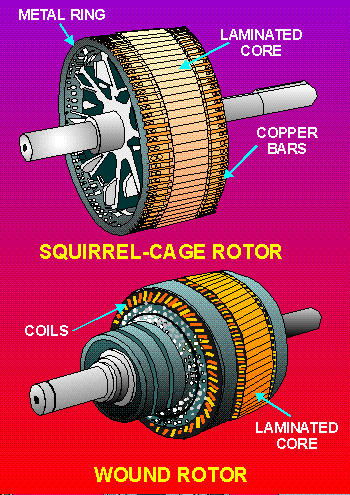




According to rotor construction it can be Classified in two category according to rotor Construction:-

1. Squirrel cage induction motor
2. Slip ring induction motor





















Squirrel cage Induction Motor:-

 Most of the application of industrial as well as domestic are this type of induction motor.

 Its construction is simple and rugged.

 Cheap copare to slipring IM

 Maintainance is easy

 Cost is less compare to slipring IM

 Can use at explosive area

 Starting torque is low compare to slip ring IM

 **Application:-**

 Leath machine, Compressors,centrifugal pump, in agriculture etc. where cost is most important factor





Slipring Induction Motor:-

* It has high starting torque compare to squirrel cage IM
* Construction is complicated
* Maintanance cost is high compare to squirrel cage IM
* Starter requires compulsory
* Can not use at explosive area
* Application:-
* Crane,hoist,lift and wherehigh starting torque is required

