SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EET204 -Electrical Machines II

II YEAR / IV SEMESTER

Unit 4 –STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR

Topic 7: Double cage induction motor

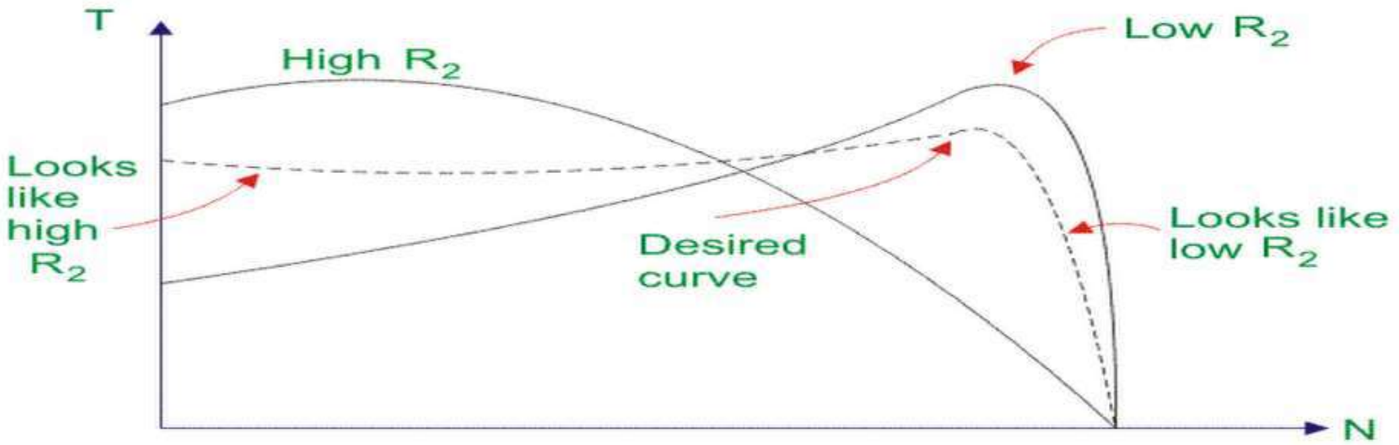
GUESS THE TOPIC NAME…

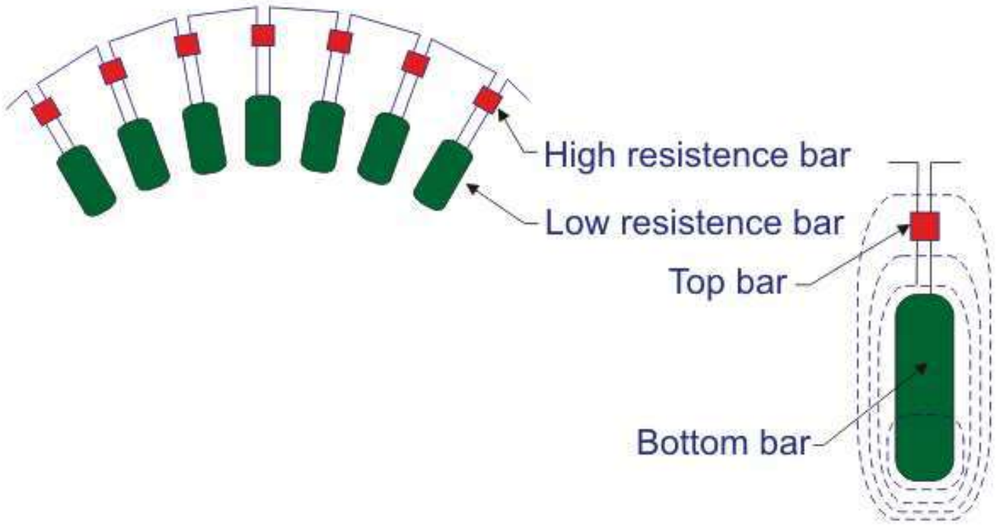
Dual cage rotor induction motors for large starting torque (source: ABB)

Double cage induction motor

- Conventional Squirrel Cage motors suffer from the disadvantages of low starting torque because of low rotor resistance.
- The starting torque can be increased by using the bar material of higher resistivity.
- However high rotor resistance reduces the full-load speed, increases rotor ohmic loss and lower efficiency.
- Therefore in order to achieve high starting torque without effecting the efficiency, the rotor resistance is made higher at the time of starting & low under normal operating conditions

Double cage induction motor

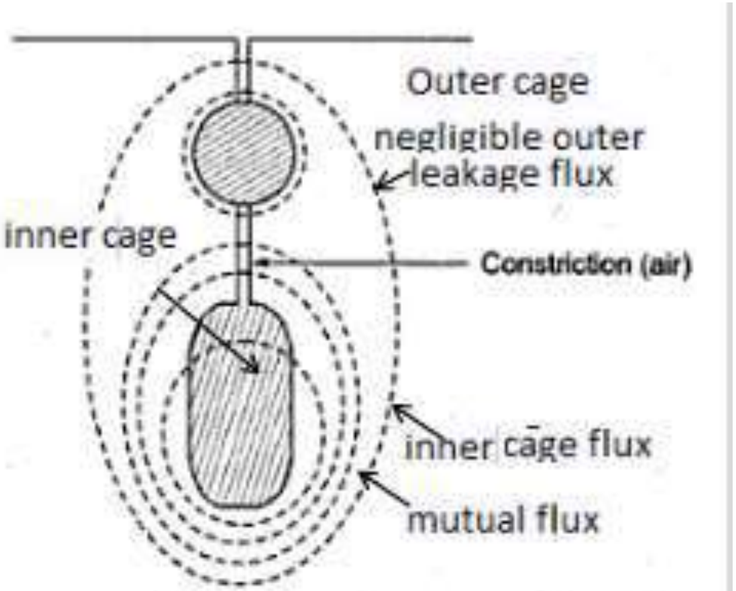




Double cage induction motor

An induction motor with two rotor windings or cages is used for obtaining high starting torque at low current.

The stator of a double cage induction motor is similar to that of ordinary induction motor. In double cage rotor there are two layers of bars as shown:



Slot-leakage flux pattern for double-cage rotor

The outer cage bars have a

- smaller cross-sectional area
- than the inner bars and are
- made of high resistivity
- materials like brass etc.

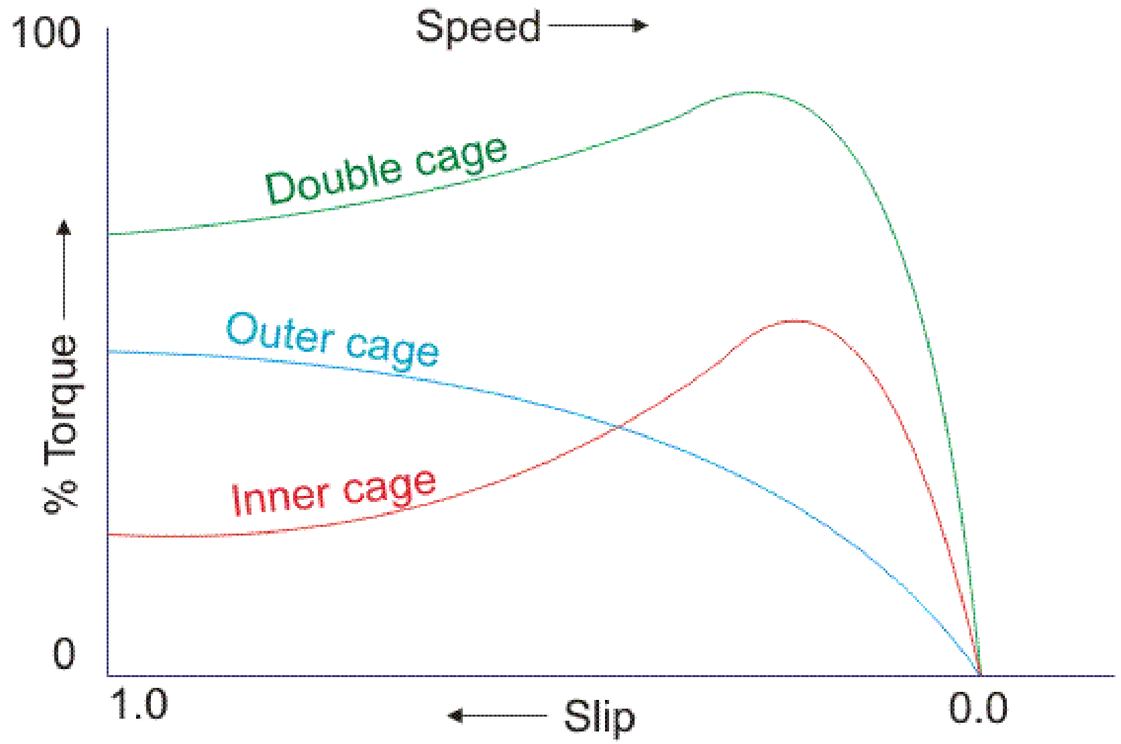
In order to attain the above desired conditions following types of rotors are used:-

- Deep bar rotor.
- Double cage rotor

Double cage induction motor

- The inner cage bars are made up of low resistance material like copper. Thus the resistance of outer cage is greater than that of inner cage.
- There is a slit between the top and bottom slot. This increases permeance for leakage flux around the inner cage bars.
- Thus the leakage flux linking the inner cage winding is much larger than that of outer cage. The inner cage winding, therefore has a greater self inductance.
- At normal speed, the leakage reactance of both the winding becomes negligibly small.
- The rotor current division between the two cages is governed mainly by their resistances.
- Since the resistance of the outer cage is about 5 to 6 times that of inner cage, most of the rotor current flows through the inner cage.
- Hence under normal operating speed, torque developed mainly by low resistance inner cage.

Torque-slip characteristic of double-cage rotor



It is evident by now that for low starting torque requirement, low-cost ordinary squirrel-cage construction is employed.

A deep-bar construction is adopted for higher starting torque applications and double-cage for still higher starting torque needs.

For large size motors with stringent starting torque needs, the most expensive slip-ring construction is used.

Applications

- Used in water pumps for various Irrigational and Industrial purposes.
- Used in Lathe machines and Drilling machines

SUMMARY

Double cage Induction motors

KEEP
LEARNING..

Thank u

SEE YOU IN NEXT CLASS