SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EC309 ELECTRICAL MACHINES AND POWER SYSTEMS

II YEAR / 03 SEMESTER MECH & MCT

Unit 4 – SPECIAL MACHINES

Linear Induction Motor

LINEAR INDUCTION MOTOR

- ✓A Linear Induction Motor (or **LIM**) is a special type of induction motor.
- ✓It is used to achieve rectilinear motion rather than rotational motion as in the case of conventional motors.
- ✓Its are quite an engineering marvel, to convert a general motor for a special purpose with more or less similar working principle, thus enhancing its versatility of operation.

Linear Induction Motor Design

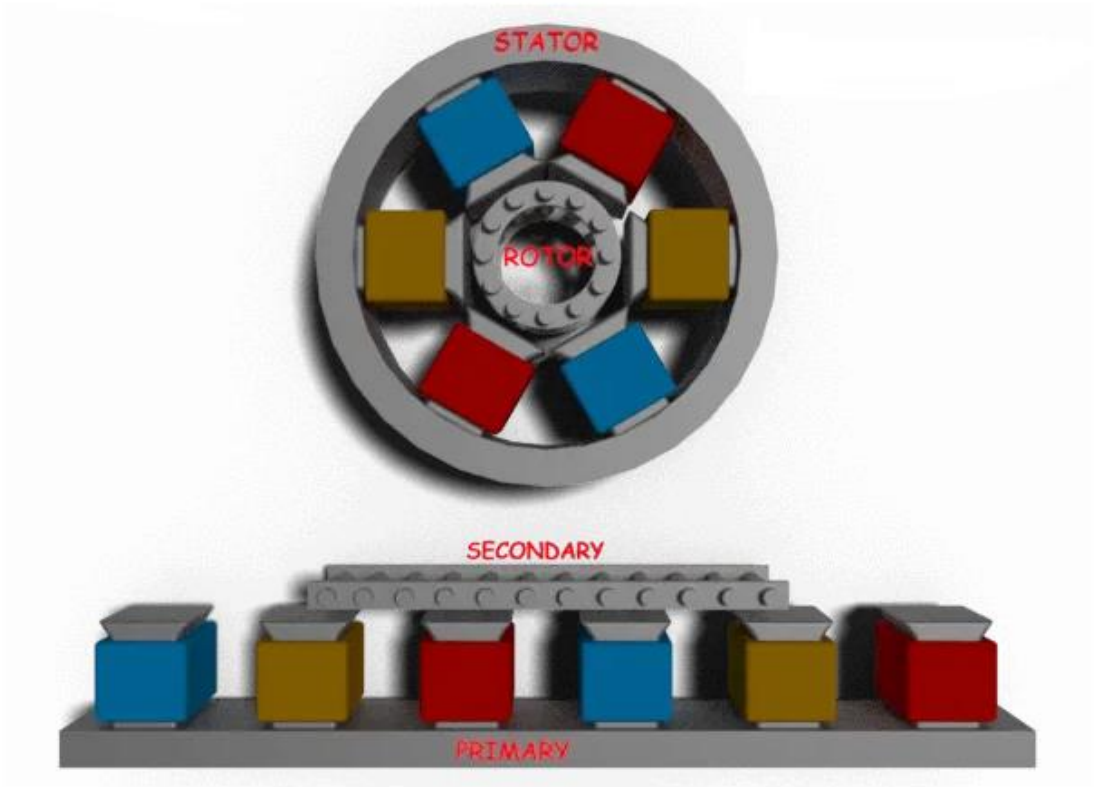
- ✓The basic design and construction is similar to a three phase induction motor, although it does not look like a conventional induction motor.

- ✓If we cut the stator of a polyphase induction motor and lay on a flat surface, it forms the primary of the linear induction motor system.

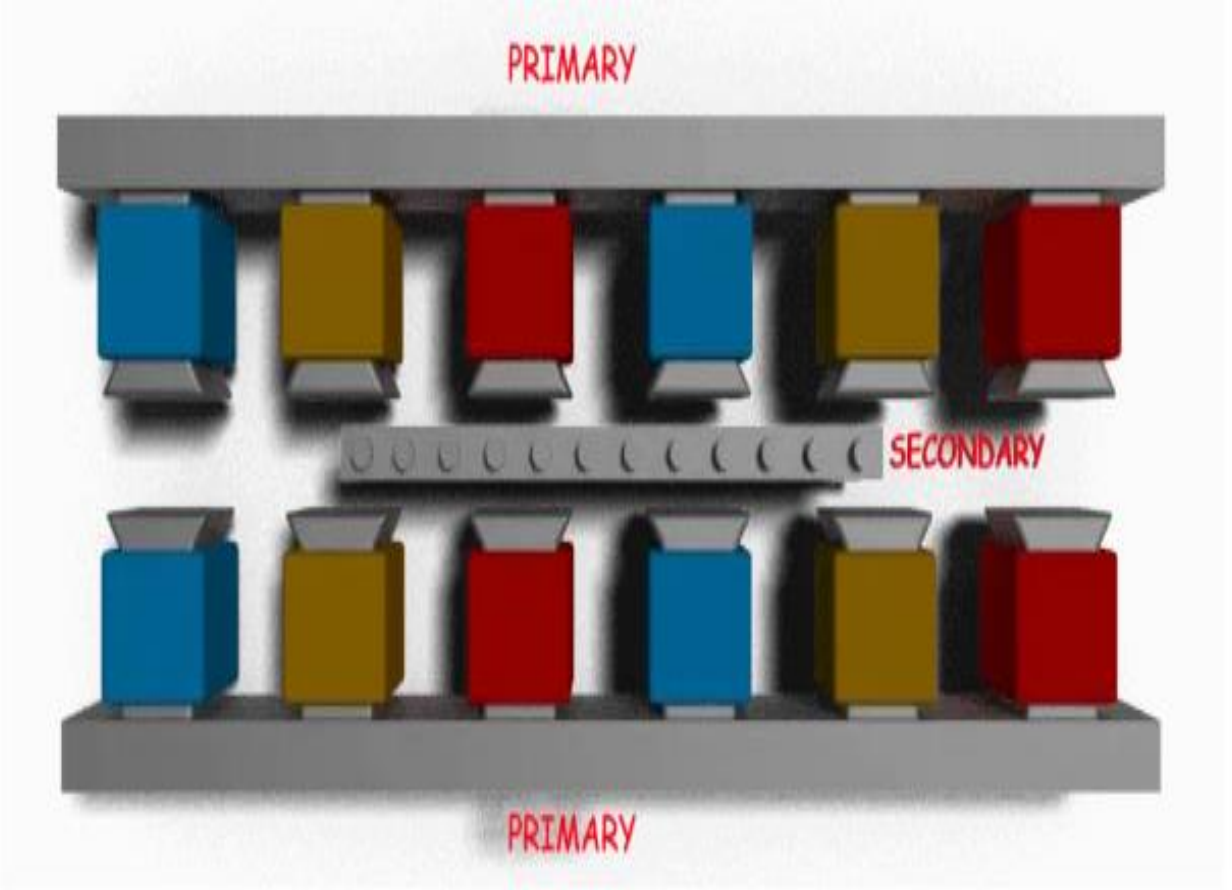
- ✓Similarly, after cutting the rotor of the induction motor and making it flat, we get the secondary of the system.

- ✓There is another variant of LIM also being used for increasing efficiency known as the **Double Sided Linear Induction Motor** or **DLIM.** It has primary on either side of the secondary, for more effective utilization of the flux from both sides.

Construction



Single Sided Linear Induction Motor



Double Sided Linear Induction Motor

Working Principle

- ✓When the primary of a LIM gets excited by a balanced three-phase power supply, a flux starts travelling along the entire length of the primary.
- ✓This linearly travelling magnetic field is equivalent to the rotating magnetic field in the stator of a three phase induction motor.
- ✓Electric current gets induced in the conductors of the secondary due to the relative motion between the travelling flux and the conductors.
- ✓Then the induced current interacts with the travelling flux wave to produce linear force or thrust.

- If the primary is fixed and the secondary is free to move, the force will pull the secondary in the direction of the force and will result in the required rectilinear motion.

$$V_s = 2tf_s \; m/sec$$

- Where f_s is the supply frequency in Hz,

  V_s is the velocity of the linear travelling field in m/sec

  t is the linear pole pitch i.e. pole to pole linear distance in m.

- For the same reason as in the case of an induction motor, the secondary or runner cannot catch the speed of the magnetic field.

$$V = (1 - s)V_s$$

- Hence there will be a slip. For a slip of s, the speed of the linear induction motor will be changeable.

Application

- ✓Automatic sliding doors in electric trains.
- ✓Mechanical handling equipment, such as propulsion of a train of tubs along a certain route.
- ✓Metallic conveyor belts.
- ✓Pumping of liquid metal, material handling in cranes, etc.

Drawbacks

- ✓Requires a larger air-gap as compared to a conventional rotary induction motor.
- ✓The magnetising current drawn is larger than rotary induction motor of same rating.
- ✓The efficiency and the power factor are lower than conventional induction motor of the same rating.