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EIECT/ELECT ENGINEERING

EEE326

ELECTRICAL MACHINES II

1) A Synchronous Machine when used for power factor correction has two circuits, A Stator Circuit which is connected to the grid and a rotor circuit which is called Field winding/Excitation Winding. The field winding is controlled by a solid state voltage and frequency regulator.

2) This means that the three phase current entering the stator winding has an angle difference (theta) with the voltage

3) Stability point view 0.8 lag is the best power factor.With varying power factor load one can control it by using synchronous motor along with induction motors loads.Witch can used in controlling leading power factor when over excited and lagging when under excited.

4) Higher PF means low requirement of MMF for energy transfer , hence low magnetizing current requirement.synchronous machine have separate DC excitation which reduces machine's excitation dependency on main supply, hence better PF.where as IM have no such provisions, hence low PF .

5) The power factor of a synchronous motor is changed with a change in the excitation. When the excitation of the motor is increased, the power factor changes from lagging to unity and then to a leading power factor. This property of the motor is utilized to improve the power factor of the leads, having a low lagging power factor. Normally, when the motor is utilized in this way to improve the factor, the synchronous motor is run without any mechanical load. The excitation is adjusted in such a manner that it works at a leading power factor. The synchronous motor is then referred to a synchronous condenser

6) It will only draw a small current (active power) to mainly compensate friction and windage losses and it can be used to supply reactive power and control the power factor of an external system, by controlling the field current.

7) Synchronous motor can be run on unity, lagging or leading power factor. it is controlled with the field excitation.

8) Synchronous motor always rotates with synchronous speed, irrespective of the loading conditions. So, the effective output is not reduced, compared to induction motor. So, more efficiency is observed in this case. Also, the operating power factor is constant in synchronous motors. It is also a doubly excited machine, unlike induction motor.

9) Power factor of induction motor depend on load and speed.

Power factor of synchronous motors might be fixed. Usually such motors r huge and therefore their reactive power causes huge losses. It's a question of efficiency and economic reasons probably.

10) The real power is nothing to do with it. The real power will be proportional to the mechanical load. If the motor is uncoupled it will be (close to) zero, regardless of the reactive situation. If the load is consuming power, the motor will take it from the supply to pass on. If the load is supplying power the converse will apply.

11) Large synchronous motors have adjustable power factor. They can even have leading power factor. They are often set this way compensate for all the other induction motors. This can effect the efficiency of the motor depending on load. With the system tuned to near unity the entire distribution system benefits. It is a good way to go. There is not just one type of synchronous motor but they most often do better than standard induction motors.

12) In an induction motor, some part of the power is spent to generate the magnetic field in the motor. The synchronous motors have a fixed magnetic field due to the presence of permanent magnets. So their efficiency is higher.

13) Split phase motor

14) In a three-phase induction motor, there is a large component of magnetising current. It is required to make the motor operate, but it is large because the magnetic circuit for each stator phase looks like an inductor with rather a large air gap in it. Typically the magnitude of this magnetising current is around 50% of the full load current of the motor. This current is inductive, that is, the phase current lags behind the phase voltage by 90 degrees.

15) A synchronous motor has an adjustable field winding on the rotor. When the excitation current is increased, the magnetic field is strengthened; when it is decreased, the field is weakened. This changes both the power factor as well as the amount of reactive power absorbed by the motor.