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**DEPARTMENT: ELECTRICAL ELECTRONICS ENGINEERING**

**COURSE CODE: EEE 326**

**COURSE TITLE: ELECTRICAL MACHINES**

**ASSIGNMENT ON POWER FACTOR CORRECTIONS AND SYNCHRONOUS MOTORS.**

1. [**How is Power factor correction done by using a synchronous motor?**](https://www.quora.com/Electrical-Engineering-How-is-Power-factor-correction-done-by-using-a-synchronous-motor)

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.A solid State voltage and frequency regulator regulates the field winding. Increasing the field winding excitation of the unit results in its furnishing reactive power (VARs) to the system and reducing the field winding excitation allows the system (VARs) to consume reactive power. Consequently, it serves as a condenser in over-mode and an inductor in under-mode.

1. [**What is meant by power factor when it come to synchronous motor?**](https://www.quora.com/What-is-meant-by-power-factor-when-it-come-to-synchronous-motor)

Synchronous motors are designed for unit (1.0) power factor, or 0.8 leading power factor, operation. The power factor of the motor can be greatly varied by varying the engine's DC excitation. Over-excited synchronous motors work at the leading power factor and have kVAR-like reactive condensers. It results in an increased power-supply balance for the machine.

1. [**How do synchronous motors improve power factors?**](https://www.quora.com/How-do-synchronous-motors-improve-power-factors)

A synchronous motor is over-excited and has a leading power factor. This makes it useful for the correction of industrial loads by the power factor. Both transformers and induction engines draw lagging currents (magnetizing) from the line. ... This increases the factor of plant power and decreases the necessary reactive current from the grid.

1. [**Why there is better power factor in synchronous motor as compared to that of an equivalent induction motor?**](https://www.quora.com/Why-there-is-better-power-factor-in-synchronous-motor-as-compared-to-that-of-an-equivalent-induction-motor)

Higher PF implies low energy transfer requirement of MMF, thus low demand for magnetizing current. The synchronous machine has separate DC excitation which reduces the arousal dependency of the system on the main supply and hence better PF.

1. [**How can a power factor be controlled in synchronous motors?**](https://www.quora.com/How-can-a-power-factor-be-controlled-in-synchronous-motors)

With a change in the excitation the power factor of a synchronous motor is increased. The power factor changes from lagging to unity, and then to a leading power factor, when the motor excitation increases. This motor property is used to improve the leads 'power factor, having a factor for low lagging power. Usually the synchronous motor is operated without any mechanical load when the motor is used to boost the factor in this way. The excitation is balanced in such a way as to function at a leading factor of strength. A synchronous condenser is then connected to the synchronous motor.

1. [**What happens when synchronous motor operates on no load?**](https://www.quora.com/What-happens-when-synchronous-motor-operates-on-no-load)

A synchronous motor with leading power factor that operates on no-load can act as a synchronous condenser. Since the motor this is not really a no-load operation, though acting as a condenser actually feeds a part of the reactive load of the device it is attached to. Depending on the system voltage, the same motor will draw a reactive current from the battery when operating with lagging power factor at no-load.

1. [**Why is a synchronous motor not used for developing power factors?**](https://www.quora.com/Why-is-a-synchronous-motor-not-used-for-developing-power-factors)

A synchronous motor is used to develop power factor by varying the excitation. When it is under excited the power factor lags, when it is normally excited the power factor is unity (i.e its equal to 1), when it is over excited the power factor leads.

1. [**Why is the efficiency of the synchronous motor greater than the induction motor?**](https://www.quora.com/Why-is-the-efficiency-of-the-synchronous-motor-greater-than-the-induction-motor)

Output is higher than an induction motor with the same output and voltage level, since there are no slip-related losses or additional magnetizing current losses. There's no difference in speed for synchronous motors between air gap spinning magnetic field and rotor.

1. [**Why is a fixed power factor used in a motor?**](https://www.quora.com/Why-is-a-fixed-power-factor-used-in-a-motor)

Power factor of motor induction depends on load and velocityPower factor can be set by synchronous motors. These engines normally are enormous and therefore their reactive capacity cause huge losses. It's probably a matter of productivity, and economic reasons.

1. **If a synchronous motor has a leading power factor, does this motor consume or supply reactive power? Does this motor consume or supply real power**

Whenever a synchronous machine(motor or generator) is operated at the leading power factor(PF), it will often shed its leading Reactive VARs(voltaampere reactives) for such machine that is deficient with leading VARs(operating at lagging PF) and hence the VARs defficient machine will absorb the leading VARs supplied and continue to increase its lagging PF to unit. Now, when this machine is finished with improving its PF from lagging to unity and still being fed excessively with Leading VARs, it will finally begin to act as a Leading VARs source for some other Leading VARs defficient machines linked in the power network.

1. [**We use multiple MV synchronous AC motors from 350hp to 2000hp. What is a ballpark efficiency of these motors? I'm trying to estimate operation...**](https://www.quora.com/We-use-multiple-MV-synchronous-AC-motors-from-350hp-to-2000hp-What-is-a-ballpark-efficiency-of-these-motors-Im-trying-to-estimate-operation-costs)

You can't really handle anything when you don't calculate it. Every motor must have voltage and current (transformer-based) instrument if you have MV motors. You can measure the power Used by each motor using the instruments. The Energy Tarriff then extractthe Energy Used and Many.You have then the running costs without going through the guess of performance...

1. [**Why is the efficiency of a synchronous motor greater?**](https://www.quora.com/Why-is-the-efficiency-of-a-synchronous-motor-greater)

Efficiency is better than an induction motor with the same output and voltage level, since there are no slip-related losses or excessive magnetizing current losses. There's no difference in speed between air gap spinning magnetic field and rotor with synchronous motors.

1. [**Which motor can operate at a high power factor?**](https://www.quora.com/Which-motor-can-operate-at-a-high-power-factor)

Capacitor run motor

1. [**How is the power factor considered in an induction motor?**](https://www.quora.com/unanswered/How-is-the-power-factor-considered-in-an-induction-motor)

Power factor is a number that informs us about the performance of an AC system such as induction motor in very short lengths. As we know, the voltage lags at a given angle in an inductive load current. The higher the lag, the power factor would be less. In the case of DC current, voltage and current is inphase but in the case of AC the current lags the voltage at a given moment.

1. [**How does a synchronous motor work as a power factor corrector?**](https://www.quora.com/How-does-a-synchronous-motor-work-as-a-power-factor-corrector)

As a consequence, the machine's real or active power is the sum of the current voltage and cosine part. The angle cosine between Voltage and Current is referred to as power factor. If this factor is small, the current in the line will need to increase to pass the power needed. This current increase would lead to a drop in voltage and excessive heat loss resulting in reduced performance.