IV - HOW TO IMPROVE THE POWER FACTOR

By installing capacitors or capacitor banks.

Improving the power factor of an electrical installation consists of giving it the means to produce a varying proportion of the reactive energy that it consumes itself.

Different systems are available to produce reactive energy, particularly phase advancers and shunt capacitors (or serial capacitors for major transport networks).

The capacitor is most frequently used given:

. its non-consumption of active energy,
. its purchasing cost,
. its easy use,
. its service life (approximately 10 years),
. its very low maintenance (static device).

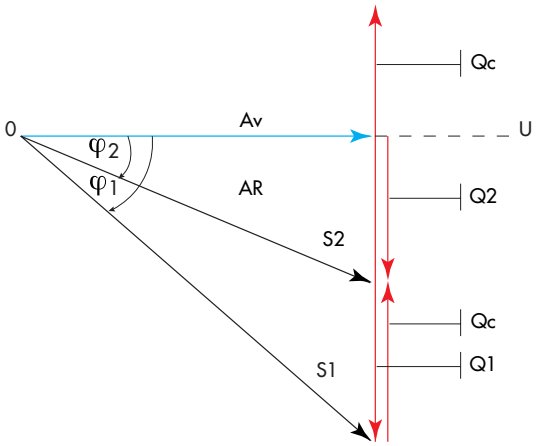
The capacitor is a receiver composed of two conducting parts (electrodes) separated by an insulator. When this receiver is subjected to a sinusoidal voltage, it shifts its current, and therefore its (capacitive reactive) power, by 90° forward the voltage.

Conversely, all other receivers (motors, transformers, etc.) shift their reactive component (inductive reactive power or current) by 90° backward the voltage.

The vectorial composition of these (inductive or capacitive) reactive powers or currents gives a resulting reactive power or current below the existing value before the installation of capacitors.

In simpler terms, it can be said that inductive receivers (motors, transformers, etc.) consume reactive energy, while capacitors (capacitive receivers) produce reactive energy.

Power diagram



P : active power
S1 and S2 : apparent powers (before and after compensation)
Qc : Reactive power of capacitor
Q1 : Reactive power without capacitor
Q2 : Reactive power with capacitor

Equations :

Q2 = Q1-Qc
Qc = Q1-Q2
Qc = P.tg φ 1-P.tg φ 2

$$Qc = P(tg\ \varphi\ 1 - tg\ \varphi\ 2)$$

* φ 1 phase shift without capacitor
* φ 2 phase shift with capacitor