JACKSON SWITCHGEAR

POWER FACTOR CORRECTION

Power factor is a measure of how efficiently electrical power is consumed. A system with a poor power factor consumes more power than it needs, resulting in high energy bills. Power factor monitoring and the introduction of corrective equipment may result in significant savings.

WHAT IS POWER FACTOR CORRECTION?

When a system is 100% efficient, the power factor is unity. If the power factor is less than unity, extra power is needed to do the same work. Power Factor Correction (PFC) equipment returns the power factor to as close to unity as possible thus reducing the burden on the supply.

BENEFITS OF PFC

- Reduction in power consumption and therefore electricity bills
- Increase in energy efficiency
- Increased load capacity from existing supply
- Reduction in transformer and distribution equipment I^2R losses
- Reduction in voltage drop in long cables
- Extended equipment life due to the reduced burden on cables and components
- Reduction of voltage distortion

OUR SERVICES

Our service includes a comprehensive power factor survey to determine requirements. We will then design and manufacture a custom built solution to restore the power factor to near unity. PFC results in significant energy savings, and it is reasonable to expect a return on your investment within a short timeframe.

STANDARD AND DETUNED SOLUTIONS

We offer both standard and detuned PFC solutions.

Standard solutions are fully automatic, with microprocessor controlled staged regulation. The capacitors are manufactured from impregnated metallized polypropylene and have a self-healing capacity. A range of sizes from 5Kvar units upwards are available.

Detuned solutions have all of the features of the standard PFC but with the added feature that the capacitors can force the resonant frequency of the network below the frequency of the lowest harmonic present. This ensures that no resonant circuit and no amplification of harmonic currents exist. Such an installation also results in effective filtering based on inductor selection, reducing the level of voltage distortion on the supply.

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SIEMENS

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POWER FACTOR EXPLAINED

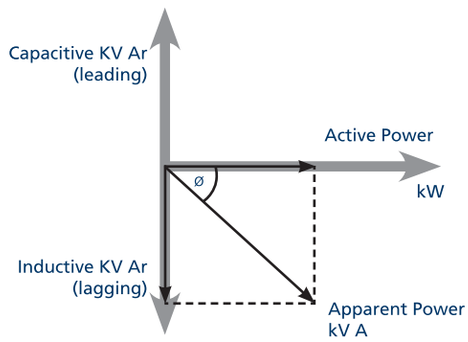
Most electrical equipment creates an inductive load on the supply. This inductive load requires a magnetic field to operate, and when this magnetic field is created, the current will lag the voltage, i.e. the current will not be in phase with the voltage. Power Factor Correction compensates for the **lagging** current by applying a **leading** current, reducing the power factor to close to unity.

WHAT IS POWER FACTOR CORRECTION?

The power factor of a supply can be expressed as the cosine of the angle between Apparent Power and Active Power (cos ø). The diagrams below show the relationship between active, reactive and apparent power before and after PFC.

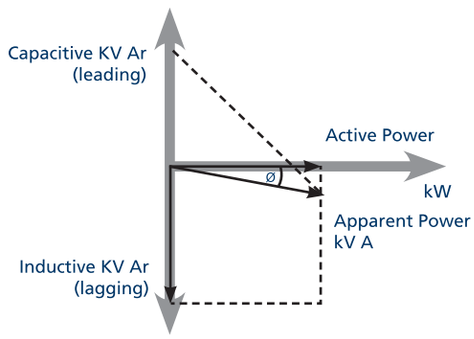
BEFORE:

- Inductive kVAr lags the Active Power by 90°
- Apparent Power is the vector sum of Active Power and lagging Inductive kVAr
- Power Factor is the cosine of angle ø



AFTER:

- Capacitive kVAr now leads the Active Power by 90°
- Apparent Power is the vector sum of Active Power + lagging Inductive kVAr + leading Capacitive kVAr



As the angle ø is reduced, cos ø tends to 1 (unity power factor). Both apparent power (kVA) and total reactive power (kVAr) are significantly reduced.

FLATTENING THE HILL

A good analogy is to envisage a person running along a surface. The gradient of the surface will influence the effort required. When the running surface is flat, then the angle ø between the horizontal and the slope is 0°. As cos 0° = 1, the runner achieves 100% efficiency, i.e. power factor = 1 and 100% of the energy burned is being used to run along the surface. However, if the running surface is steep, say at 25° to the horizontal, only 90% of the energy burned is being used to run as cos 25° = 0.9, i.e. power factor = 0.9. Therefore an extra 10% of energy is required. In layman's terms, PFC reduces the slope.

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