Is Low Power Factor Costing You Money?

Key Points

- Power factor problems can lead to higher energy bills and premature equipment failure.
- Capacitors can be added to the inductive load to correct power factor.
- Fixing voltage drops can increase motor starting torque, running torque, overload capacity, and lighting intensity.

Source: www.sxc.hu

Power factor may be one of those terms that you sometimes hear, but are not quite sure how it may affect you. Facilities with low power factor use more electricity to do the same amount of work. This requires additional generation capacity and results in higher energy bills. Moreover, low power factor may cause excessive voltage drops, which can lead to the overheating of equipment, reduced performance, and premature equipment failure. Low power factor is a serious issue that can negatively affect your bottom line.

What Causes Low Power Factor?

Caused by inductive equipment including motors, transformers, and high-intensity discharge (HID) lighting, low power factor is typically a concern for industrial facilities, but power factor problems can be a concern for any facility that uses these types of equipment.

In an alternating current (AC) power system, power factor is the ratio between real power and apparent power—expressed as a number between zero and one. *Real power (*the actual power used by the load to perform work at any given time) is measured in kilowatts (kW). *Apparent power (*the total power in an AC circuit) is expressed in kilovolts (kVA).

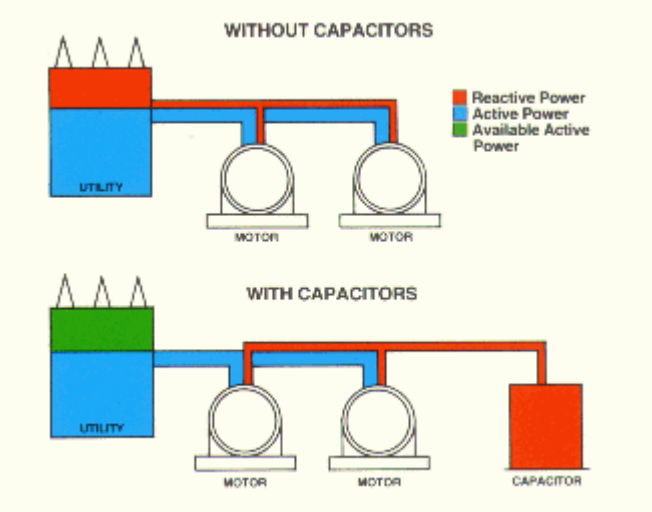
Inductive equipment requires the electric current to create a magnetic field; this magnetic field powers the device. Reactive power is non-working power created by the magnetizing current. The reactive power is stored in the load and then periodically returned to the power plant, moving back and forth across the power lines. The reactive power required of inductive equipment increases the apparent power. This increase in reactive and apparent power causes a decrease in power factor.

Correcting Power Factor

Correcting power factor by reducing reactive power helps facilities avoid the fees and extra charges associated with low power factor. Moreover, fixing voltage drops can increase motor starting torque, running torque, overload capacity, and lighting intensity—improving equipment performance.

The U.S. Department of Energy offers a number of solutions for correcting power factor including the following:

- Minimize the operation of idling or lightly loaded motors.
- Avoid operating equipment that is above its rated voltage.
- As standard motors burn out, replace them with energy-efficient motors. [1]
- Install capacitors in your AC circuit to decrease the magnitude of reactive power.



Source: Van Rijn Electric

Typically, a facility with many motors will have a lagging power factor (a power factor of less than one). Adding capacitors to this inductive load can correct the low power factor (see graphic at right). Too many capacitors, however, can create a situation of leading power factor, meaning that again there is inefficiency in the system. Adding capacitors does not significantly change real power; it merely shifts reactive power away from the utility load.

The addition of capacitors or capacitor banks to correct power factor should be carefully designed. Sometimes the motor load at a particular facility varies, meaning the amount of capacitance to correct the power factor will vary. In this case, the customer may want to consider a variable or automatic (rather than a fixed) capacitor bank. The optimum solution is to match inductance with the same amount of capacitance to keep the current and voltage in balance.

[1] Even with energy-efficient motors, however, the power factor is significantly affected by variations in load. A motor must be operated near its rated capacity to realize the benefits of a high power factor design.

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