



Power Factor

Are you getting the most from your power system? What if there was an easy way to improve your operation's efficiency, productivity and bottom line?

If you are responsible for your business' day-to-day operations, you face the difficult task of finding ways to increase your output of products or the delivery of services, while maintaining quality and lowering costs. And while there are countless scenarios and approaches to addressing this challenge; all must start with a basic understanding and audit of your facility's infrastructure and the impact of the equipment used within your operation

One easy place to start is with your electrical system's power factor. The benefits of doing this range from reduced charges from the utility company to increased load carrying capabilities in your power system losses. And the benefits of a "correct" power factor isn't limited to the balance sheet; there are also major environmental benefits associated with power factor correction. Meaning your company can reduce its carbon footprint while it improves its "bottom line".

What is a POWER FACTOR?

It's simply a measure of how effectively electrical power is consumed by the equipment it serves.

If your equipment uses every single kilowatt of power delivered to it for actual work, the power factor would equal 'one' or "unity" at 100%. Reality is, normal facility operations include equipment which do not optimally use the power it consumes.

For instance, transformers, electric motors, arc welders, fluorescent lighting, and other electronic equipment, are inductive loads and require a magnetic field to operate, meaning non-working power must be provided.

Electrical Power Used or Created by Your Facility Consists of 3 Components



WORKING POWER (Real or ACTIVE);

Power that's used for actual work. Active power converted into mechanical power, heat or light.

Measured in Watts (W) or (kW)



REACTIVE POWER: Non-working Power.

Used for 'magnetizing energy' needed to operate inductive equipment (such as motors, etc.) Measured in Volt-Amperes Reactive (VAR) or (kVAR)



TOTAL POWER (Apparent): Measured combination of both Working (kW) and Reactive (kVAR) power. Measured in volt-amps (VA) or (kVA).

$$kVA^2 = kW^2 + kVAR^2$$



Figure 1

While we clearly need reactive power to operate, the challenge is to maximize the working power provided by the utility while we minimize the amount of non-working power our equipment requires. This can be difficult, since loads have varying reactive power requirements. Low power factor is both a result of the equipment our business requires and how the equipment is used. Lightly loaded equipment such as transformers and induction motors operate at low power factor and require more reactive power.

Looking at figure 1; the relationship of these components becomes easy to visualize... If the working power requirements of the motor is constant, but let's say the equipment is improperly loaded, the motor's kVAR requirement increases, which means total power (kVA) increases. Since POWER FACTOR is a measure of your system's efficiency, we look at Real (working) Power to Total Power (kVA) or

$$\text{Power Factor} = \text{Working Power (kW)} / \text{Total Power (kVA)}$$

So, if working power remains constant and total power required increases, POWER FACTOR decreases.

Improving Your Electrical System's Power Factor

The clear way to improve power factor is to reduce the reactive component requirement. This is typically done by providing reactive power as close to the load as possible. The common method is to use power factor correction capacitors, however, these should be installed with a means to monitor the power and the individual requirement of the load. Improper coordination may result in system overcorrection, which will counter any correction benefits.

Complete power factor correction systems are available to automatically improve your system to your ideal power factor target. Southern Tier Technologies offers an intelligent power factor correction system that will dynamically maintain your system's efficiency, enabling your business to reduce utility costs, minimize system losses, and improve overall system capacity.