

IGBT Based Power Factor Correction SVG

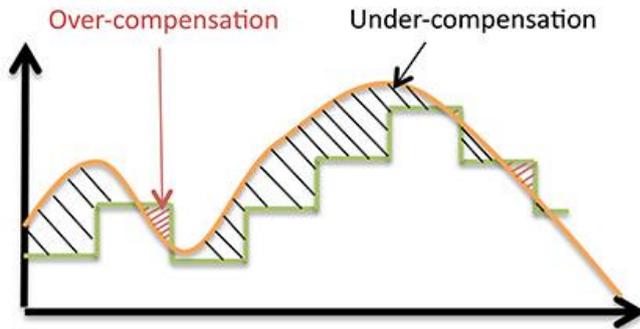


Why ? That's always the key question when considering new technologies.

Heres The Answer:

- Dynamic, Stepless Compensation
 - Adds exactly what is required to meet your Power Factor Targets. No More, No less.
- Results in better Power Factor, for less costs
 - Better results for your critical load
 - Less money spent on power bills
- Better Knowledge of your own network
 - Far more detailed reporting
 - Corrects Power factor changes within 15ms
 - Reacts to changes in less than 50 micro seconds
- Virtually Maintenance Free
 - No capacitors to replace
- Far Safer
 - No capacitors to ignite

The SVG represents the latest generation technology in the power factor correction field. By eliminating the need for switched capacitors and providing dynamic step-less compensation, the SVG offers high performance in a compact package (including wall mounting options)!



It operates by detecting the load current on a real-time basis through external CT's and determining the reactive content of the load current. The data is analysed and the SVG's controller drives the internal IGBT's by using pulse width modulation signals to make the inverter produce the exact reverse reactive current of the corresponding load reactive content.

This is injected to the grid to compensate the reactive content of the load current. By adjusting the output voltage amplitude and phase angle or by directly controlling the AC side current, the SVG can absorb or generate var according to the load reactive power or the grid voltage level.

- **Excellent power factor correction performance**
Can maintain a PF of 0.99 lagging or unity if required
- **Compensates both inductive and capacitive loads**
Corrects lagging and leading power factor (-1 to +1)

Eliminating the weakest link

This new method of PFC takes away the most vulnerable and weakest link in a traditional PFC system – the switched capacitors. Various environmental conditions (eg. excessive temperature, over-voltage, harmonic distortion) may cause capacitors to rupture and ignite.

The average life span of a switched capacitor is heavily dependent on the ambient temperature in which it is operated – requiring careful selection with respect to permissible operating temperature range. These temperature limits work well in colder climates but may not necessarily work well in Australia. The new generation technology in the SVG eliminates the operational limitations, safety concerns, space demands and life span issues of capacitor banks.

Operates in all 3 phases

A traditional switched capacitor type PFC system measures one phase and then provides stepped kVAR compensation to all phases based on the measurements taken from the one phase being measured. The other two phases all receive the same compensation, irrespective of what the other two phases actually need. The SVG measures all 3 phases and provides specific dynamic kVAR compensation each phase.



Greater longevity

With traditional capacitor type systems, the physical cabinet space required for the compensation steps is the same, whether the steps are 6.25kVAR or up to 50kVAR steps. This results in requiring large cabinet space even for small adjustments. The other disadvantage for having a small step for fine adjustment is that it gets over used (frequently switched). The PFC controller uses an algorithm that evenly distributes the work load amongst the available steps except when one or two of those steps are of a smaller capacity. This brings into play the actual useable lifetime of the components used, for example the life of the contactor!

Not affected by resonance

The system is not susceptible to existing harmonics and therefore does not need a blocking reactor and is unaffected by resonance whereas for the traditional PFC system this is very much a problem.

- **Corrects load imbalance**
- **Can operate at low voltages**
- **Dynamic step-less compensation**
- Profiles the load and operates with a response speed of <15ms
- Dynamic reaction time is less than 50µs
- No possibility of over-compensation or under-compensation
- Only injects the kVAR that is needed in that moment

The Genius of Simplicity

Virtually maintenance free

Can be used with existing PFC systems

High reliability and safety



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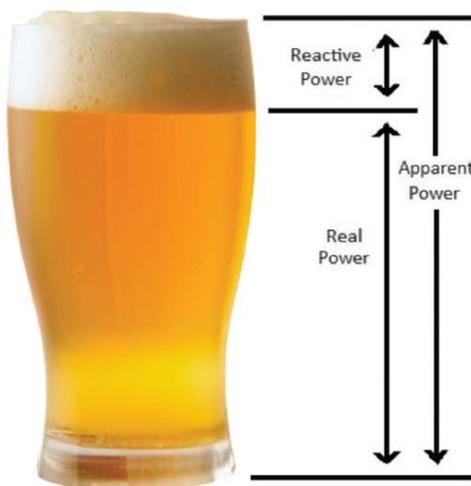
What is Power Factor ?

Power Factor is a measure of how effectively incoming power is used in your electrical system and is defined as the ratio of Real (working) power to Apparent (total) power.

Real Power (KW) is the power that actually powers the equipment and performs useful, productive work. It is also called Actual Power, Active Power or Working Power.

Reactive Power (KVAR) is the power required by some equipment (eg. transformers, motors and relays) to produce a magnetic field to enable real work to be done. It's necessary to operate certain equipment but you don't see any result for its use.

Apparent Power (KVA) is the vector sum of Real Power (KW) and Reactive Power (KVAR) and is the total power supplied through the power mains that is required to produce the relevant amount of real power for the load.



Let's look at a simple analogy in order to better understand these terms.

Let's say you've ordered a glass of your favourite beer. The thirst quenching portion of your beer is represented by Real Power (KW). Unfortunately, along with your ale comes a little bit of foam that doesn't quench your thirst, represented by Reactive Power (KVAR).

The total contents of your glass (KVA) are this summation of KW (the beer) and KVAR (the foam).

The power factor is the ratio between Real Power and Apparent Power. It's expressed as a value between -1 and 1 and can be either inductive (lagging) or capacitive (leading).

If the power factor is 1, then all of the power supplied is being used for productive work and this is called 'unity'.

$$\text{Power Factor} = \frac{\text{Real Power (KW)}}{\text{Apparent Power (KVA)}} = \frac{\text{Beer}}{\text{Beer + Foam}}$$

The more foam you have (the higher the percentage of KVAR), the lower your ratio of KW (beer) to KVA (beer plus foam). Thus, the poorer your power factor.

The less foam you have (the lower the percentage of KVAR), the higher your ratio of KW (beer) to KVA (beer plus foam) and the better your power factor. As your foam (or KVAR) approaches zero, your power factor approaches 1.0 (unity).

The NEED for Power factor Correction

A power factor of -0.7 for example, indicates that only 70% of power supplied to your business is being used effectively and 30% is being wasted. The wasted power is the Reactive power (the foam in the previous example). Most loads are inductive in nature, which means the power factor will typically be less than unity.



The further the power factor is from unity, the greater the apparent power drawn and therefore, the greater the current draw for the system. The increased current may require an increase in the size of your transformers and installation power wiring.

Increased current also results in increased heat which affects the longevity and lifespan of an electrical system. This can add a great deal of cost to the installation and may also limit the expansion of a plant.

Why is Power Factor important? It's important because you may be paying for reactive power (foam) that you cannot use to power equipment. If you can reduce the foam, you can get more 'beer for your buck'. Improving the power factor results in less current being drawn, therefore less electricity costs, less heat and greater longevity of the electrical system.

What is Power Factor Correction?

Poor Power Factor can be improved by installing Power Factor Correction (PFC) equipment. Traditional solutions incorporate banks of capacitors that work as silent reactive power 'generators', often housed in a metal cabinet similar to the one that houses your electrical switchboard.

Power On offers the latest generation of advanced performance PFC solutions that do not need a capacitor bank and offer many advantages due to their compact and modular configuration.

Many power suppliers charge for the base load (kW) and a maximum demand tariff. If this maximum demand tariff is measured in kVA, then improving the power factor reduces the kVA of the installation, thus reduces the maximum demand tariff and thereby reducing your power costs.

It is actually a network regulation that customers maintain a specific minimum power factor (values depend on your region). Utility companies may charge customers a penalty on top of consumption charges when customer power factor is less than a determined value.

How Can Power Factor Correction Help You?

An electrical load with a poor power factor draws more current than a load with an improved power factor for the same amount of useful power transferred and can put unnecessary strain on the electricity distribution network. By improving your power factor, you can reduce your electricity bills through lower monthly demand and capacity charges. Typically payback periods for power factor correction are between 1-3 years. Given the life expectancy of power factor correction equipment and the potential savings, it can be a very worthwhile investment.

Poor power factor may cause power losses and voltage drops, which can contribute to overheating and failure of motors and other equipment. If your electrical system is near capacity, installation of power factor correction equipment may help avoid costly infrastructure upgrades by lowering the existing electrical demand on your system and improving efficiency stability.

