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Improving Power Factor

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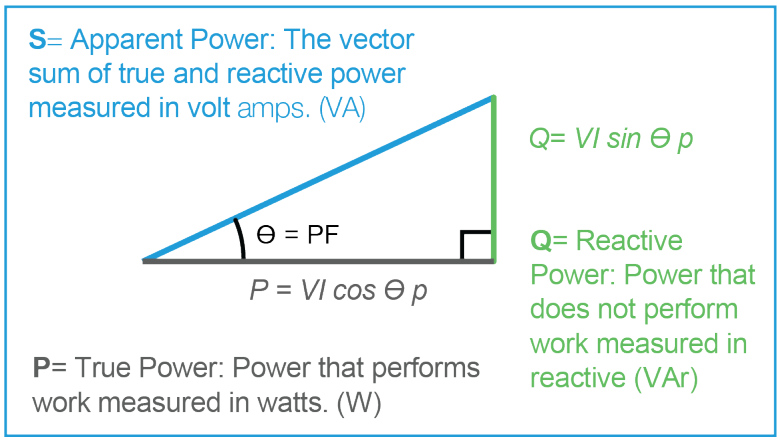
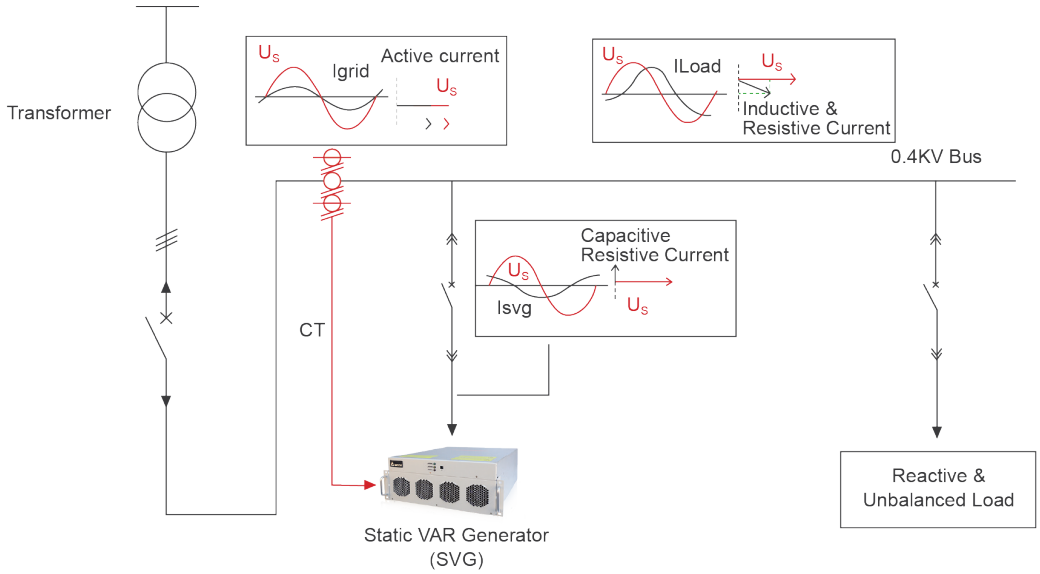
Introduction to Power Factor

Power Factor is the ratio of the real power that is used to do work and the apparent power that is supplied to the electrical circuit. It is the $\cos^{-1}(\theta)$ between the active power and apparent power as shown below:



Why is Improving Power Factor Important?

Power Factor is very critical and has a significant effect on power efficiency. Poor Power Factor causes additional current to be drawn from the supply than what is truly needed to run the load. This extra current will cause overloading of the electrical network, supply transformers, switchboards, motor switching devices and protection equipment, and cabling. As a result, energy suppliers are forced to charge a kVA demand on top of your energy bills across Australia. Therefore, controlling Power Factor can lead to reduced VA demand and thus helps save on utility company penalties and equipment costs. Installing a Delta SVG solution is an economical way to improve your Power Factor.



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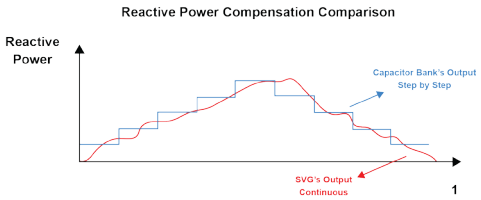
Benefits of the SVG over Capacitor Banks:

Capacitor Banks	SVG Technology
Under robust environmental conditions such as high temperatures, over-voltage, and harmonic distortion, permanent damage may be caused to the capacitors. Also, most of the capacitors switch off at 50° Celsius.	It can work well under various environmental conditions. Delta's SVG solution has the capability of working in up to 50° Celsius and then derates until 55° Celsius.
Capacitor Banks provide banks of fixed capacitance as seen in the Figure. This means the amount of correction is only available in multiples of fixed capacitances leading to over and under compensation. However, since the SVG uses inverter technology, it can deliver a dynamic step-less smooth compensation.	
It can only correct an inductive load.	It can correct both an inductive or capacitive load.
It does not mitigate 3-phase unbalanced loads	Since the SVG can compensate negative sequence current caused by non-linear loads, it ensures a balanced-3-phase grid current.
Capacitor banks are slow and take at least 20ms-40s to perform compensation.	Fast configuration capability provides fast analysis and response time. Provides cycle response <20ms and dynamic response $<100_{us}$.
Capacitor based systems might require a detuning reactor to lower the resonant frequency in order to avoid a potential resonance between capacitors, transformers and non-linear loads. If the detuning reactor is not installed, it could cause harmonic currents to be introduced and possibly sabotage the power systems stability.	No need to install the bulky, expensive detuning reactors. The SVG uses active compensation technology and therefore it has been designed to be unaffected by resonance.
Capacitor based systems keeps switching in steps constantly to achieve a target power factor. This constant switching is not reliable and hence has a reduced service life.	The SVG has low losses and is virtually maintenance free. It is highly reliable and the service life is expected to last greater than 10 years.
Standard Capacitor based systems require a larger footprint	It requires minimal footprint and saves more than 70% space compared to a capacitor bank. Up to 700kVAR may be fitted into one cabinet.
Limited user interface	Flexible control and monitoring (HMI, Ethernet, Modbus TCP, RS-485, CANopen, DeviceNet)

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Summary:

The Delta SVG Solution is far superior to a traditional capacitor bank based one in every single way. Contact Delta Energy Systems today to discuss the many options on offer with one of our experienced engineering consultants.

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