

Introduction

Overview

The Powersaving Company is proud to present the latest technology to save electricity – the Electricity Saving Box and the Saving Saint. These products:

- will save energy sources efficiently
- is environment-friendly
- provide additional protection against lightning
- will stabilise voltage balance and current source
- will protect electrical appliances and prolong their life-span
- are CE certified
- is easy to use and maintenance free

Become part of the solution – save up 35% on your electricity bill and reduce the release of harmful CO₂ in the atmosphere!

In 2004, after an increased electricity shortage, the Chinese government, realized that they should not only focus on generating more electricity, but also on the effective use of it.

In order to promote the development of electricity saving products, a government supported meeting was held in the spring of 2005 to evaluate the different energy saving products. Our **Electricity Saving Box** was awarded the “Excellent Green Environment-friendly Product” of China.

Through this award the **Electricity Saving Box** was affirmed as a National Class product and also a leading product in the list of electricity savings products in the home.

Now, for the first time in South Africa, our company makes it possible for each and every household and small business to become part of the solution in combating global warming, while at the same time saving money.

The solution will pay for itself by reducing electricity usage by *up to* 35%.

Our Products

Power Saving Box

The Electricity Saving Box helps to stabilise voltages and reduce currents in your power supplies. It enhances the power efficiency of electrical appliances, avoiding wastage of the electricity supplies and helping to extend the life-span of your electrical appliances. This is accomplished by supplying electricity at the requisite load by the use of a specially designed capacitor. These advanced capacitors store the additional electricity needed for stabilising electric current within an inductive load. The Power Saving Box also reduces so-called "parasitic" losses. Parasitic losses are mainly heat losses incurred in any electrical connection or device which are not used to any benefit. By reducing the current, parasitic losses are reduced and therefore, the amount of electricity purchased from your utility company has been reduced resulting in power savings for your home or office.

...it enhances power efficiencies... and helping to extend the life-span of your electrical appliances.

Rated voltage: 90V — 240V
Rated frequency: 50Hz — 60Hz
Rated capacity: 15kW



Saving Saint

The Saving Saint is a new high technology product. It is more powerful than The Electricity Saving Box (28kW) and has more functions. It stabilises electric current and provides additional

...additional protection against the effects of lightning...

...oxidise carbon atoms which accumulates on electrical wire...

protection from the effects of a lightning strike. It inhibits high or low voltage; even inhibit big or small wave-like (non-linear) electricity. It oxidizes the carbon atoms which accumulates on electrical wire so as to drain electricity build-up and acquire equalization. The Saving Saint improves efficiency, reduces electrical-waste (including parasitic losses) and lengthens the lifespan of electrical appliances. The Saving Saint can be widely applied for use in the home, office, school, hotel, restaurant, storage, laundromat, small factory, etc.

Rated voltage: 90V — 240V
Rated frequency: 50Hz — 60Hz
Rated capacity: 28kW



For 3-phase applications, please contact us for for advice.

How it Works

(non-technical)

All electrical supply is subject to surges from time to time, which result in spikes or parasitic peaks that cannot be used by your appliances as working power. These spikes simply consume electricity to no benefit. Worse still, they result in overheating, which shortens the life your appliances and wiring, and in extreme cases can cause burns, blow outs and power cuts.

Our Power Saver uses a capacitor system to stabilize the flow of electricity. It reduces the spikes in the supply, protecting against surges. The system improves the power factor of your electricity and reduces your electricity bill by on average 15%.

One power saving unit will work on the whole circuit in your building. Our field testing for a typical home consistently show that the unit will save 3 to 4 kW per day, based on electrical consumption of 30 kW per day. The amount of savings depends on a few factors, such as the types of electrical appliances, the time they are in use and the location. Places near to shops, restaurants and light industries, where the voltage supply is unstable and fluctuating will see higher savings. Where voltage supply is particularly unstable, the unit can reduce consumption by 30% or more.

The unit reduces the reactive power generated by inductive loads (even non-linear loads). This improves safety by reducing the overheating of electrical wiring. It also extends the life-span of your electrical appliances.

...will save 3 to 4kW per day...

... shops, restaurants and light industries...the savings will be higher... by 30% or more.

In all electrical systems, the wattage heating losses (kWh's you are paying for) are an effect of current and resistance. If you increase either value, the wattage heating losses increase. Wire itself has a fairly low electrical resistance. So wattage losses from wire are typically quite small; however, when wire is cut and placed into a mechanical fastener, (slipped into a hole in a metal block and then clamped down with a bolt), significant resistance is added to the electrical circuit. Each such mechanical fastener can add from 5 to 50 times the resistance of the wire itself. Examples of such connections are: disconnect switches, bus bars, fuse blocks, circuit breakers, heat coils in protective systems, motor starters, distribution transformers, isolation transformers, line reactors, solid state switching systems and lighting ballasts.

It is estimated that up to 20% of a building's electrical costs are emitted as heat. The powersaving device will reduce the amount of current flowing through your electrical system – thereby reducing wattage heating losses, resulting in savings in your electricity bill.

The Power Saving Box is manufactured in China and is CE certified.

How it Works

(Technical)

Power Factor Correction (PFC)

Definition

Power factor correction (PFC) is a technique of counteracting the undesirable effects of electric loads that create a power factor (p.f.) that is less than 1. Power factor correction may be applied either by an electrical power transmission utility to improve the stability and efficiency of the transmission network; or, correction may be installed by individual electrical customers to reduce the costs charged to them by their electricity supplier.

Explanation

When an electric load has a p.f. lower than 1, the apparent power delivered to the load is greater than the real power that the load consumes. Only the real power is capable of doing work, but the apparent power determines the amount of current that flows into the load, for a given load voltage.

Energy losses in transmission lines increase with increasing current. Power companies therefore require that customers, especially those with large loads, maintain the power factors of their respective loads within specified limits or be subject to additional charges. Engineers are often interested in the power factor of a load as one of the factors that affect the efficiency of power transmission.

Power factor correction returns the power factor of an electric AC power transmission system to very near unity by switching in or out banks of capacitors or inductors which act to cancel the inductive or capacitive effects of the load. For example, the inductive effect of motor loads may be offset by locally connected capacitors. It is also possible to effect power factor correction with an unloaded synchronous motor connected across the supply. The power factor of the motor is varied by adjusting the field excitation and can be made to behave like a capacitor when over excited.

It is not possible to cancel out harmonic current using these techniques, so different techniques must be used to correct nonlinear loads.

How it Works

(Technical *continued...*)

Electricity Industry Aspects

PFC is desirable because the source of electrical energy must be capable of supplying real power as well as any reactive power demanded by the load. This can require larger, more expensive power plant equipment, transmission lines, transformers, switches, etc. than would be necessary for only real power delivered. Also, resistive losses in the transmission lines mean that some of the generated power is wasted because the extra current needed to supply reactive power only serves to heat up the power lines.

The electric utilities therefore put a limit on the power factor of the loads that they will supply. The ideal figure for load power factor is 1, (that is, a purely resistive load), because it requires the smallest current to transmit a given amount of real power. Real loads deviate from this ideal. Electric motor loads are phase lagging (inductive), therefore requiring capacitor banks to counter this inductance. Sometimes, when the power factor is leading due to capacitive loading, inductors (also known as reactors in this context) are used to correct the power factor. In the electricity industry, inductors are said to consume reactive power and capacitors are said to supply it, even though the reactive power is actually just moving back and forth between each AC cycle.

Electricity utilities measure reactive power used by high demand customers and charge higher rates accordingly. Some consumers install power factor correction schemes at their factories to cut down on these higher costs.

How it Works

(Technical *continued...*)

Application

Linear Loads

Power factor correction is achieved by complementing an inductive or a capacitive circuit with a (locally connected) reactance of opposite phase. For a typical phase lagging p.f. load, such as a large induction motor, this would consist of a capacitor bank in the form of several parallel capacitors at the power input to the device.

Instead of using a capacitor, it is possible to use an unloaded synchronous motor. This is referred to as a synchronous condenser. It is started and connected to the electrical network. It operates at full leading power factor and puts VARs onto the network as required to support a system's voltage or to maintain the system power factor at a specified level. The condenser's installation and operation are identical to large electric motors.

The reactive power drawn by the synchronous motor is a function of its field excitation. Its principal advantage is the ease with which the amount of correction can be adjusted; it behaves like an electrically variable capacitor

Non-Linear Loads

A typical switched-mode power supply first makes a DC bus, using a bridge rectifier or similar circuit. The output voltage is then derived from this DC bus. The problem with this is that the rectifier is a non-linear device, so the input current is highly non-linear. That means that the input current has energy at harmonics of the frequency of the voltage.

This presents a particular problem for the power companies, because they cannot compensate for the harmonic current by adding capacitors or inductors, as they could for the reactive power drawn by a linear load. Many jurisdictions are beginning to legally require PFC for all power supplies above a certain power level.

The simplest way to control the harmonic current is to use a filter: it is possible to design a filter that passes current only at line frequency (e.g. 50 or 60 Hz). This filter kills the harmonic current, which means that the non-linear device now looks like a linear load. At this point the power factor can be brought to near unity, using capacitors or inductors as required. This filter requires large-value high-current inductors, however, which are bulky and expensive.

How it Works

(Technical *continued...*)

It is also possible to perform active PFC. In this case, a boost converter is inserted between the bridge rectifier and the main input capacitors. The boost converter attempts to maintain a constant DC bus voltage on its output while drawing a current that is always in phase with and at the same frequency as the line voltage. Another switchmode converter inside the power supply produces the desired output voltage from the DC bus. This approach requires additional semiconductor switches and control electronics, but permits cheaper and smaller passive components. It is frequently used in practice. Due to their very wide input voltage range, many power supplies with active PFC can automatically adjust to operate on AC power from about 100 V (Japan) to 240 V (UK). That feature is particularly welcome in power supplies for laptops and cell phones.

How it Works

(Technical *continued...*)

Power Factor Explained

Definition

The **power factor** of an AC electric power system is defined as the ratio of the real power to the apparent power, and is a number between 0 and 1. Real power is the capacity of the circuit for performing work in a particular time. Apparent power is the product of the current and voltage of the circuit. Due to energy stored in the load and returned to the source, or due to a non-linear load that distorts the wave shape of the current drawn from the source, the apparent power is equal to or greater than the real power. Low-power-factor loads increase losses in a power distribution system and result in increased energy costs.

Explanation

In a purely resistive AC circuit, voltage and current waveforms are in step (or in phase), changing polarity at the same instant in each cycle. Where reactive loads are present, such as with capacitors or inductors, energy storage in the loads result in a time difference between the current and voltage waveforms. This stored energy returns to the source and is not available to do work at the load. A circuit with a low power factor will have thus higher currents to transfer at a given quantity of power than a circuit with a high power factor.

Circuits containing purely resistive heating elements (filament lamps, strip heaters, cooking stoves, etc.) have a power factor of 1.0. Circuits containing inductive or capacitive elements (lamp ballasts, motors, etc.) often have a power factor below 1.0. For example, in electric lighting circuits, normal power factor ballasts (NPF) typically have a value of (0.4) - (0.6). Ballasts with a power factor greater than (0.9) are considered high power factor ballasts (HPF).

The significance of power factor lies in the fact that utility companies supply customers with volt-amperes, but bill them for watts. Power factors below 1.0 require a utility to generate more than the minimum volt-amperes necessary to supply the real power (watts). This increases generation and transmission costs. Good power factor is considered to be greater than 0.85 or 85%. Utilities may charge additional costs to customers who have a power factor below some limit.

AC power flow has the three components: real power (P), measured in watts (W); apparent power (S), measured in volt-amperes (VA); and reactive power (Q), measured in reactive volt-amperes (VAR).

How it Works

(Technical *continued...*)

The power factor is defined as:

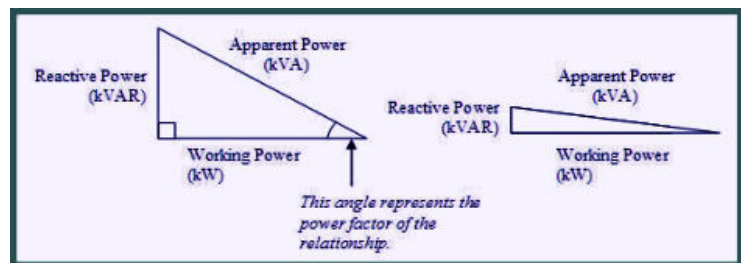
$$\frac{P}{S}$$

In the case of a perfectly sinusoidal waveform, P, Q and S can be expressed as vectors that form a vector triangle such that:

$$S^2 = P^2 + Q^2$$

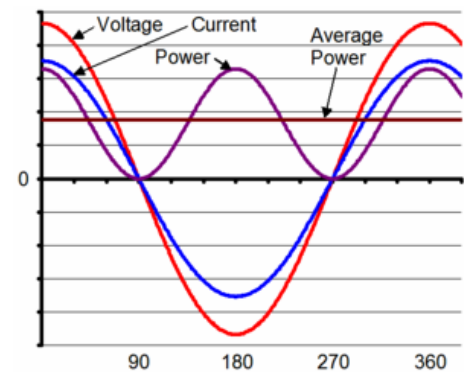
If ϕ is the phase angle between the current and voltage, then the power factor is equal to, and:

$$P = S |\cos \phi|$$

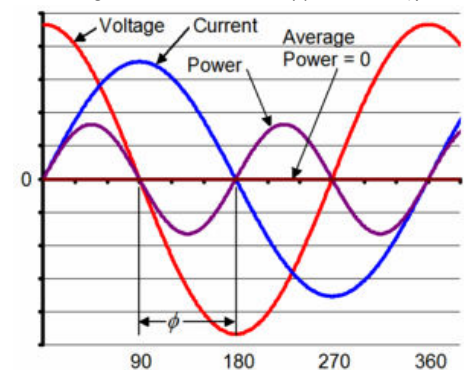


By definition, the power factor is a dimensionless number between 0 and 1. When power factor is equal to 0, the energy flow is entirely reactive, and stored energy in the load returns to the source on each cycle. When the power factor is 1, all the energy supplied by the source is consumed by the load. Power factors are usually stated as "leading" or "lagging" to show the sign of the phase angle.

If a purely resistive load is connected to a power supply, current and voltage will change polarity in step, the power factor will be unity (1), and the electrical energy flows in a single direction across the network in each cycle. Inductive loads such as transformers and motors (any type of wound coil) generate reactive power with current waveform lagging the voltage. Capacitive loads such as capacitor banks or buried cable generate reactive power with current phase leading the voltage. Both types of loads will absorb energy during part of the AC cycle, which is stored in the device's magnetic or electric field, only to return this energy back to the source during the rest of the cycle.



Instantaneous and average power calculated from AC voltage and current with a unity power factor ($\phi=0$).



Instantaneous and average power calculated from AC voltage and current with a zero power factor ($\phi=90$, $\cos\phi=0$).

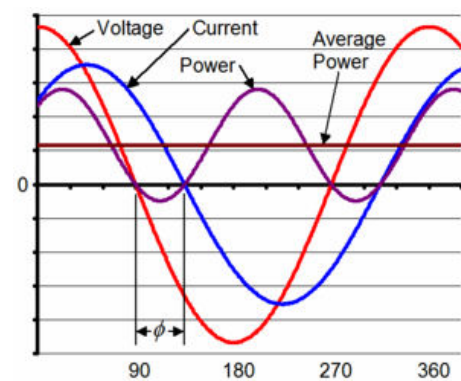
How it Works

(Technical *continued...*)

For example, to get 1 kW of real power if the power factor is unity, 1 kVA of apparent power needs to be transferred ($1 \text{ kW} \div 1 = 1 \text{ kVA}$). At low values of power factor, more apparent power needs to be transferred to get the same real power. To get 1 kW of real power at 0.2 power factor 5 kVA of apparent power needs to be transferred ($1 \text{ kW} \div 0.2 = 5 \text{ kVA}$).

It is often possible to adjust the power factor of a system to very near unity. This practice is known as power factor correction and is achieved by switching in or out banks of inductors or capacitors. For example the inductive effect of motor loads may be offset by locally connected capacitors.

Energy losses in transmission lines increase with increasing current. Where a load has a power factor lower than 1, more current is required to deliver the same amount of useful energy. Power companies therefore require that industrial and commercial customers maintain the power factors of their respective loads within specified limits or be subject to additional charges. Engineers are often interested in the power factor of a load as one of the factors that affect the efficiency of power transmission.



Instantaneous and average power calculated from AC voltage and current with a lagging power factor ($\phi=45^\circ$, $\cos\phi=0.71$)

Contact Us

For more information on these products, please visit:

www.plugintosavings.co.za