SHEPHERD TRANSFORMERS INDUSTRIES ®

What is Power Factor?

Power Factor is a measure of how efficiently electrical power is consumed. In the ideal world Power Factor would be unity (or 1). Unfortunately in the real world Power Factor is reduced by highly inductive loads to 0.7 or less. Th is induction is caused by equipment such as lightly loaded electric motors, luminaries transformers and fluorescent lighting ballasts and welding sets, etc.

What does it do to electricity bill?

In a 3 phase supply, kW consumed is (VOLTS x AMPS x 1.73 x P ower Factor) / 1000. The Electricity Company supply you VOLTS x AMPS and they have to supply extra to make up for the loss caused by poor Power Factor. When the power factor falls below a set figure, the electricity supply companies charge a premium on the kW being consumed, or, charge for the whole supply as kVA.

What causes Power Factor to change?

Inductive loads cause the AMPS to lag behind the VOLTS. The wave forms of VOLTS and AMPS are then "out of phase" with each other. The more out of phase they b ecome then the lower the Power Factor. Power Factor is usually expressed as Cos Phi. (Ø)

In 3 phase power supplies the "power" can be measured as a triangle. ACTIVE Power is the base line and is the real usable power measured in kW. REACTIVE power is th e vertical or that part of the supply which causes the inductive load. The reactive power in is measured in kVA r (kilo volt-amperes reactive). APPARENT Power is the hypotenuse. This is the resultant of the other two components and is measured in kVA.

Equipment Causing Poor Power Factor

A great deal of equipment causes poor power factor. One of the worst offenders is lightly loaded induction equipment. Examples of this type of equipment, and their approximate power factors follow:

• 80% power factor or be tter: Air conditioners (correctly sized), pumps, centerless grinders, cold headers, up setters, fans or blowers.

• 60% to 80% power factor: Induction furnaces, standard stamping machines, and weaving machines.

• 60% power factor and below:
Single-stroke presses, automated machine tools, finish grinders, welders. When the above equipment functions within a facility, savings can be achieved by utilizing industrial capacitors.

Function of Capacitors

Electric power has two components: Active power, which p roduces work.
Reactive power, which is needed to generate magnetic fields required for operation of inductive electrical equipment, but performs no useful work.

Active power is measured in KW (1000 Watts)

Reactive power is measured in KVAR (1000 Volt -Amperes Reactive)

Total power is measured in KVA (1000 Volts -Amperes)

The ratio of working power to total power is called Power Factor. The function of Power Factor Correction Capacitors is to increase the power factor by supplying the reactive power when i nstalled at or near inductive electrical equipment.

How Capacitors Save Money

Capacitors lower electrical costs in two ways: In many areas, the electrical rate includes a penalty charge for low power factor. Installation of power capacitors on the electrical distribution system within a facility makes it unnecessary for the utility to supply the reactive power required by inductive electrical equipment. The savings the utility realizes in reduced generation, transmission, and distribution costs are passed on to the customer in the form of lower electrical bills.

The second source of savings derived through the use of power factor correction capacitors is in the form of increased KVA capacity in the electrical distribution system. Installation of capacitors to furnish the non-productive current requirements of the facility makes it possible to increase the connected load by as much as 20 percent without a corresponding increase in the size of the transformers, conductors, and protective devices making up the distribution system which services the load.

Benefits of Power Factor Improvement

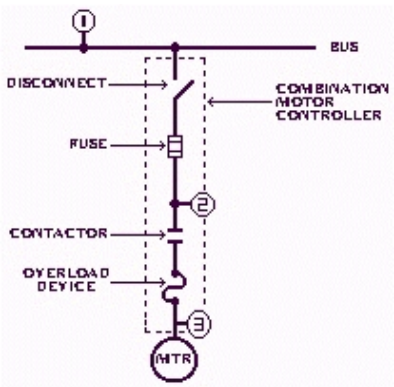
Power factor (PF) is the ratio of useful current to total current. It is also the ratio of useful power expressed in kilowatts (KW) to total power expressed in kilowatt-amperes (KVA). Power factor is usually expressed as a decimal or as a percentage.

Example: 60 KWk
PF = 0.60 = 60%
=100 KVA
Kilowatts = 60 KW, KVA = 100 KVA
The significant effect of improving the power factor of a circuit is to reduce the current flowing through that circuit which in turn results in the following benefits:

HOW TO IMPROVE POWER FACTOR ?

Power factor correction is achieved by installing capacitors. Under fixed load & fixed voltage conditions it is possible to install fixed capacitors in the system. But this will not be an exact compensation for loads which are varying quite frequently. In most of units load varies frequently. Power factor can either be controlled manually or by automatic control system. In manual control the operator has to go on making adjustment all the time which is very tricky and human error can not be ruled out. suppose unit is on no load & all the capacitors remains connected throughout night this may cause 5 to 10% higher electricity bill.

In automatic control, power factor control relay keeps on sensing the power factor all the time and gives suitable signals to contactors connected to the different value capacitors. By fine tuning of relay parameters & load balancing, unity power factor can be achieved easily.



Technical particulars of SHEPEHRD APFC PANEL

1.Reference standard	:ISS 13340: 1993
2. Manufacturer's Name	: Madhav/Subodhan/Epcos
	:
3. Reference Ambient temperature	:50o C
5. Temperature Rise over Ambient (With 5% 5th Harmonic)	:50 C Maximum
6. Rated Voltage	:440 / 415 Volts.
7. Max Continuous Over - Voltage	:10% Continuous. (As per ISS)
8. Over Current	:30% of rated current. (1.3 In)
9. Insulation Level	:3 KV
10. Insulation Resistance	:50 M W
11. Rated Frequency	:50 (+ / - 3%) Hz.
12. No. Of phases.	:3
13. Connection Symbol	:Delta.
14. Type of dielectric	:Metallized PP
15. Discharge Device / Res. Volt. Resistance value	:Resistive. Residual Voltage 50 V.
16. Type of Impregnant	:PXE (NPCB) / dry
17. Losses (per KVAr)	:0.5 Watts / kVar (Max.)