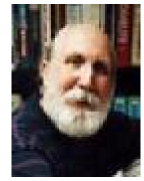


Shop “Tech Talk” October 2008

Q.	What is meant by the term Power Factor?

Easy Stuff First

**The power (PF) factor of an ac system is a number between 0 and 1.
This number is often expressed as a percentage i.e. A number between 0 and 100%
Power factor is only used when discussing ac systems. Never in pure dc systems
From a practical point of view we always want to see a power factor close to 1 (or 100%). This is as good as it gets!
Circuits that contain only resistive components have a power factor of 1.
Circuits that contain inductive or capacitive components have a power factor less than 1.
A low PF is caused by an electrical system having more of an inductive load than a capacitive load. Inductive loads lead to a lower PF and capacitive loads will improve, or lift, the PF in an inductive system closer to 1**

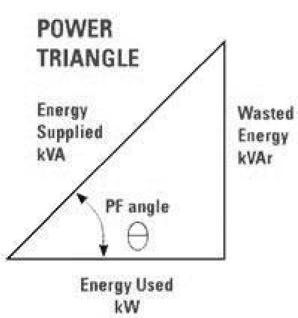
For Example:

1. In electric lighting circuits, normal power factor ballasts typically have a PF of 0.4 to 0.6
2. In electric lighting circuits, high power factor ballasts can have a PF greater than 0.9
3. An incandescent bulb would have a PF close to 1
4. Older motors and inexpensive new motors can have a PF of approx. 0.75
5. Premium high efficiency motors have a PF approx 0.86

Not So Easy Stuff

**The power factor of an ac sine wave electric power system is defined as the ratio of the real power to the apparent power.
So:**

Power factor = $\frac{\text{Real Power (watts)}}{\text{Apparent Power(VA)}}$ **.....Real power is measured in watts and apparent power is measured in volt-amps.**



**Apparent power is the numerical product of volts and amps.
Power factor written on a nameplate is often abbreviated as ‘ cos φ’
If we look at the power triangle to the left and apply trigonometry to it, then we can see that.......**

The cosine of the PF Angle, which = cos φ = Adjacent /Hypotenuse = Energy Used in kW / Energy Supplied in kVA. From this triangle we should be able to see that if the PF angle increases i.e. the power factor gets worse, and if we still have the same Energy Used, then the Wasted Energy has to increase in order to complete the power triangle. We can call it Wasted Energy because it does not perform any useful work.

Follow the Money

**The power company supplies power from their generators, transformers and power lines. We can see from the drawing above that if the PF angle is steeper (worse) and we have the same Energy Used then the Energy Supplied and the Wasted Energy will have to be larger. If the PF angle were reduced (improved) and the Energy Used the same , the Wasted Energy would be reduced and the Energy Supplied would be reduced so the Power Company would have to supply less kVA to satisfy their customer load. So more economical.
From the diagram we can also see that for a certain ‘Energy Used’ the Energy Supplied would be at its minimm if the PF angle is zero (the cosine of zero degrees = 1)
It is in the best interest of the Power Company and their customers that the PF of the connected load be as close to unity as practically possible. It saves $$$$$$$ all around.**

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