MPTS®

MAXIMUM POWER TRANSFER SOLUTION

AMICI ENTERPRISES, LLC
FOR MORE INFORMATION GO TO | WWW.AMICIENTERPRISE.COM

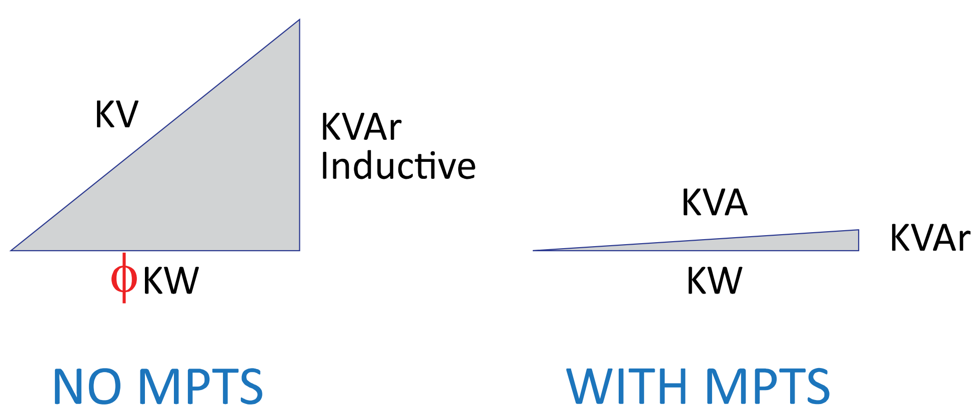
Power Factor Analogy

by Alex Wenger

Like input voltage and input current, Power Factor is an operating parameter of every device that consumes AC power. It is important in commercial and industrial applications of AC electricity but has a relatively minor role in residential applications. Low Power Factor in commercial and industrial applications can significantly increase the cost of electric power for an office building or manufacturing facility. The MPTS controls the Power Factor in facilities that consume large amounts of 3 phase AC power at either 208VAC or 480VAC.

Power Factor Improvement Using MPTS

Electronic and dynamic solution KVAr is significantly decreased, Harmonics THD is reduced. No increase in harmonics. No parasitical load on the system. Minimal maintenance, MPTS lasts more than 10 years.



The MPTS does not change the Power Factor directly. It continuously adjusts the impedance matching on the power line, thereby reducing reactive power consumption. MPTS also reduces Total Harmonic Distortion (THD) by reducing total current (Amps) consumption. MPTS thereby minimizes magnetic core material nonlinearities in motors and transformers, which are a major source of harmonic distortion.

The net effect of reducing reactive power and THD is to consistently improve the Power Factor. Typical Power Factors attained by the MPTS are 0.95.

To fully describe the effects of Power Factor in AC circuits, complex equations and number notation need to be used. However, since few people are comfortable with this form of mathematics, we present an analogy to explain Power Factor.

Imagine a rowboat with room for eight oarsmen. Furthermore, imagine that the rowboat is entered in a race with other identical rowboats. The course of the race is defined by a starting line, a finish line, and well-marked lanes for each boat. If the oarsmen apply the same amount of force on both sides of the rowboat, the boat will go straight ahead and not out of its lane. The race is started. Each of the boats, keeps within its lane as they head toward the finish line. All of the energy expended by the oarsmen is applied to making the rowboats race to the finish line. By analogy, this corresponds to a Power Factor value of 1.00. No energy is wasted getting the rowboats to the finish line. It is the ideal situation.

In the real world, things are often not ideal. In the case of supplying AC electrical power, we often come across cases where the Power Factor is 0.70 or even lower. Low Power Factors result in wasted energy, which is converted to heat that damages the electrical equipment and increases charges from the local power company.

Now imagine we have modified one of the row boats to have two additional oarsmen sitting side by side in the center of the rowboat. Suppose the race has begun and that the center oarsman on the left side (port) uses his oar in a strange way. He dips the oar into the water as far away from the boat as he can and he pulls the oar directly toward the side of the rowboat. Furthermore, the oarsman on the right (starboard) side does not even put his oar into the water. The effect would be two fold. None of the energy used by the center port side oarsman would go toward moving the rowboat toward the finish line. Worse, the energy input would move the rowboat into the next lane, resulting in certain disqualification! This corresponds, loosely, to a low Power Factor environment.

Clearly, we have a way to mitigate the problem caused by the port side oarsman, by using the available starboard side oarsman. The starboard side oarsman could use his oar to produce a thrust that exactly equal to and opposite to the force generated by the port side oarsman. If the port side oarsman makes a change in the direction that he moves his paddle, the starboard side oarsman, makes a compensating change to maintain the balance of forces on the rowboat, allowing it to go on a straight course to the finish line of the race. This corresponds, loosely, to what the electronics of the MPTS does in correcting the electrical Power Factor from say 0.70 to 0.95 or better. This seemingly small change in Power Factor can extend the useful life of electrical equipment and reduce current consumption (Amps) between 20% and 40%.