Electrical Power Networks Require Virtual Real-time Power Conditioning

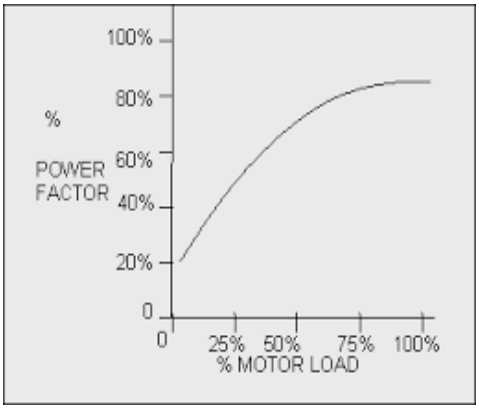
by Alex Wenger

COOL, CLEAN CONDITIONED POWER™

The efficient operation of electric power networks requires virtual real-time power conditioning. At last, we can meet those requirements.

The electric power demand from factories, offices, large retail facilities, health, government and military facilities, etc., change from moment to moment. The changes are caused by electrical loads that are frequently turned on and off and loads that continuously change. The operation of elevators or air compressors are good examples.

Elevators: In the case of an elevator designed to carry 10 people, imagine an elevator sitting idle at the ground floor. A person on the 2nd floor wants to go to the 5th floor, and 9 people on the 3rd floor want to go to the 8th floor. At the start of its run from the 1st floor, the motor driving the elevator has almost no load. At the 2nd floor, when a person enters the elevator, the load increases to approximately 10%. When the 9 people waiting on the 3rd floor enter the elevator, the load reaches 100%. Then, as people get on and off the elevator at various floors, the load will increase or decrease depending on the number passengers that enter and exit. As a result, the power factor presented to the power mains will continuously change, second by second.



The power factor for an induction motor can vary from 0.20 – 0.85, as the motor load varies from no-load to full-load.

Compressors: Load variability for compressors acts in similar ways to elevators. When an air compressor first starts, the pressure in the compressed air storage tank is low. As a result, the load on the motor that drives the compressor is at its minimum and the power factor presented to the power mains is very low. As the pressure in the tank increases, the power required to store an additional unit of air increases, and the power factor increases.

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To control peak demand charges from the power company, the rapid changes in power factor are controlled by the MPTS virtually, in real-time. The MPTS monitors and controls each of the phases of a 3-phase power line independently. With a sampling rate of 20,000 samples per second, the MPTS can begin to detect changes in power requirements in 50 microseconds.

The MPTS takes multiple samples to determine what adjustments need to be made to the power transmission line and then makes the necessary changes in as little as 10 milliseconds, less than the time it takes for one full cycle of AC power at 60HZ.

Using the MPTS, demand charges, which can amount to 50% of the electric bill, can be reduced by 20% to 40%.