CAPACITALK™

Capacitor At Load

MYRON ZUCKER INC.
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No. 107

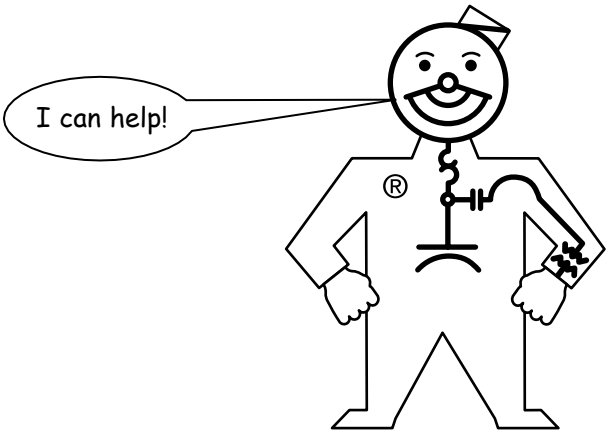
A Letter to CAL
(Maintaining Voltage with Capacitors)

Dear CAL,

We have a large number of motors in our manufacturing process. Some of these motors are quite large—up to 300 HP—and they cause voltage dips in the plant when we start them.

Since I know that capacitors store a charge, can I use a Myron Zucker, Inc. power factor correction capacitor to replace the voltage I lose when starting my motors?

Signed,
"Dipping in Death Valley"



Dear "Dipping,"

You are right about capacitors storing a charge, but we must look at what occurs in the electrical system over a period of time. It is the time factor and the amount of stored energy that really come into play when considering capacitors for voltage control.

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Let's consider a motor's current requirements during startup. For most motors that are used in industrial and commercial 3-phase applications, the starting, or inrush, current can be 6 to 10 times the normal running current. It can even be higher at startup for high-efficiency motors. Also, this startup current requirement can last for several seconds. That need for large currents from a limited power source causes the dip in voltage. For example, a 1000-KVA transformer, as a power source, supplies 1200 amps at 480 volts. If there are several loads, including a 300-HP motor, which could draw 1000 amps at startup, the total ampere requirement could exceed the 1200-amp rating, thus the voltage suffers.

Now let's consider a capacitor's current requirements. A capacitor is fully charged very quickly, much quicker than a motor's current requirements settle out. Likewise, it discharges quickly, relative to a motor's inrush requirement.

An energized capacitor is a source for supplying voltage during a dip. However, it would typically dump the bulk charge quickly when connected to a system which is requiring current as in our example.

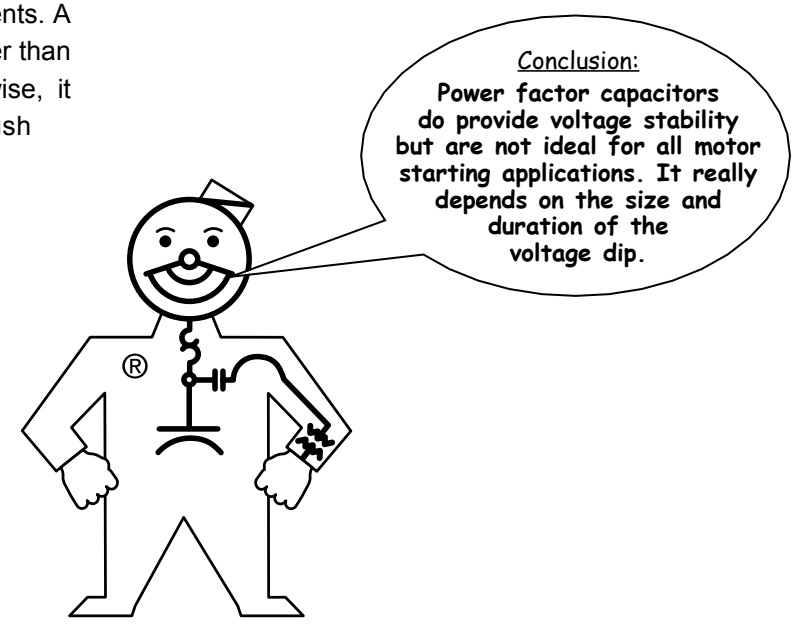
The 300-HP motor inrush causes a voltage dip longer than the capacitor can replace.

Normal Voltage Rise

Capacitors connected to a circuit will cause the nominal voltage to rise somewhat in the steady-state mode (non-startup). This voltage rise can be estimated with the following formula:

$$\% \text{ Voltage Rise} = (\% \text{ System Reactance}) \left(\frac{\text{Capacitor KVAR}}{\text{System KVA}}\right)$$

(For an approximation of "System" values, you can use the percent impedance and KVA of the transformer.)



Yours in capacitance,

CAL

If you have any questions for **CAL** about your power factor capacitors, simply write to **Myron Zucker, Inc.,** or e-mail us at **info@myronzucker.com**.

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