## Reasons MTE Matrix Filter Contactor Options Make Sense:

- ***The contactor option can be used to prevent capacitor leading KVAR from getting to the utility when the drive is off.***
  - Any passive harmonic filter will exhibit leading power factor but because the reactive current leads the utility voltage the watt meter does not record any real power in the form of watts. KVAR current can be read with a clamp on amp meter. Seeing this current with the drive off is alarming to some people. Capacitor removal by contactor prevents any filter current draw. With the cap in circuit the KVAR energy can be used to correct lagging power factor just like the PF cap banks or switched out with a contactor.
- ***A contactor added on each filter can prevent the utility voltage from increasing in the presence of many filters that are off and don't have contactor cap removal.***
  - Adding leading reactive energy to the utility will affect the grid voltage regulation causing it to rise above the normal settings.
- ***Removing the filter capacitors from the harsh effects of utility surges and transients during drive / filter down time can add years to capacitor life.***
  - The harmonic filter inductors will not always protect the capacitors from many of the fast events on the utility as the magnetics of the reactor becomes more of an air core during such high-speed events and does little to limit ringing pulse oscillations at the capacitors. The transients take the path of least resistance to ground which usually is a single capacitor. Switch out the caps and prevent cap damage while the filter is idle.
- ***A harmonic filter equipped with a contactor that is available to switch out the filter capacitors facilitates additional filter protection technology and prolongs filter life and ensures uninterrupted drive power.***
  - The magnetic NC temperature switch in the filter's shunt could be used to disengage capacitors if the filter magnetics is overheating from an outside event or due to cap failures.
  - A 3 phase (Phase-Sequence, Phase loss relay) control module monitoring capacitor voltage provides a simple way of protecting filter components and can be used to open the capacitors' contactor if an imbalance is detected in time to prevent hardware damage while maintaining power to the drive. New utility warnings indicate that 3 phase power may be single phased for longer periods of time by the new re-closure response to separate phase events and customers need to provide protection to 3 phase powered devices.

- A field retrofit is possible using a voltage monitor relay to trip on a specified voltage drop across the 5% impedance drive side reactor coil which adds self-capacitor switching via the contactor so that the filter will automatically select when the caps are added or removed. A 5% coil drops 5% of the applied voltage at 100% current. If you want to switch in the caps at 30% of full load the voltage drop across the coil of 480vrms power is 7.2vrms so the voltage monitor should be set for a 7.2 volts trip point.

- ***For "high line voltage" plus filter voltage boost a drive may fault on over voltage. A contactor option prevents this.***

  - A harmonic filter with a contactor can manage the inherent 4.5% filter voltage boost to prevent a sensitive drive from tripping on over voltage. To accomplish this a contactor in the cap circuit should be added with a control signal to switch the caps. MTE offers various contactor options to provide flexible control solutions. All contactor options are basically the same and function to connect the capacitors and take advantage of the increase in reactor impedance (voltage drop) during loading.
  - MTE recommends switching in the caps at about 30% of the filter load to ensure the high voltage is reduced by the loading the reactor. Dropout should be less 10-20% to prevent contactor chatter
  - A drive's programmable output relay or run relay can be used to control the contactor and provides the flexible means of control. Speed, current, torque or time can provide the necessary control for adding the caps to achieve the 30% filter load point.
  - MTE offers four contactor option from a loose contactor "002" to a fully automatic "009"