Electronic Concepts, Inc.

Film Capacitor Innovation Without Limits

526 Industrial Way West
Eatontown, NJ 07724
732.542.7880
sales@ecicaps.com
www.ecicaps.com

Mechanical Considerations for Capacitor Mounting

Over the last 30 years in the plastic-dielectric capacitor business, I've seen many electrical failures resulting from mechanical issues. Stressing electrical connections can lead to ESR increases over time, arcing at contact planes, and hot terminations from improper contact. Plastic-dielectric capacitors, especially polypropylene dielectrics preferred in the power applications, expand much more than metals. Transportation and installation of large systems can result in large mechanical stresses transmitted to the terminations. Over time, temperature excursions along with mechanical shock and vibration, affect the connections leading to potential thermal runaway.

As time goes on, and new engineers enter the field, it can be beneficial to restate some of the lessons learned. Sometimes what's old becomes new again. Here's just a few basic notes to consider when planning the mounting and installation of power capacitors.

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- When mounting a capacitor never use the electrical contacts as the sole mechanical mountings or supports.
- Always provide some form of stress relief to absorb expansion and contraction coefficients. Service loops or other means such as flexible cables or braids allow the capacitors to move without transmitting stress to the terminations.
- If connecting axial devices between bus bars, it is best to connect only one end to a rigid bar, and use cable or other means of stress relief to connect the other end.
- When connecting radial devices using rigid bus bars or laminate structures across a parallel or series capacitor array, contact arcing can occur due to tolerances on terminal heights.
- The body of the capacitor should be independently supported by mountings integrated to the package, or other means independent of the electrical terminals.
- Observe the torque limits, and always support the terminal when applying the torque to prevent transmitting the stress to the internal capacitor connections.
- Line hash your bolt connections to make it easy to inspect if terminations are loosening over time.
- Observe clearances when safety mechanisms require mechanical freedom. Some capacitors, particularly oil filled units employing series disconnects, often depend on the unit's ability to disfigure (expansion of cans or lid distortion) to create the disconnect. Rigidly mounting the devices with heavy bus bars can impede the distortion and negate the safety disconnect.

Although these may seem obvious upon first glance, I still see systems where these basic precautions are overlooked, and come back with a vengeance. The capacitor life is shortened, and the potential for catastrophic failure (most often fires in AC applications) increases with time as the capacitor losses increase to thermal runaway. Taking a little extra time to insure proper stress relief will provide safer operation and higher reliability in your power applications.

J. Bond – June 2015