

# The Advantages Of Designing With Thermally Protected Varistors Versus Standard MOVs

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Standard MOVs (metal oxide varistors) have been providing transient voltage surge protection from surges for many years. These surges can originate from lightning, electronic switching, electromagnetically induced surges and a myriad of other sources. MOVs are specifically designed to protect electronic equipment from over voltage transient surges however they are not designed to protect equipment from a temporary abnormal overvoltage. This temporary overvoltage can be much longer in duration than the typical 8x20  $\mu$ sec surge and can happen when a loss of neutral occurs in a three-phase system with imbalanced lines, or if an increase in the AC line voltage occurs from an unstable electrical utility company. A temporary overvoltage can trigger the standard MOV into a continuous clamping condition and result in fire, explosion or other hazardous condition. Figures 1 through 3 illustrates the sequence of events of what can happen to an MOV that experiences a 20% increase in line voltage.

The illustrated MOV is rated at 90VAC maximum continuous line voltage and the temporary abnormal overvoltage applied was 108VAC. It is not difficult to see that given thermal runaway, this could cause a catastrophic event, especially if the MOV were housed in a plastic enclosure which could catch fire.

Recently published Underwriter's Labs 1449 3rd edition has increased the levels of limited current during the temporary abnormal overvoltage testing that Surge Protective Device manufacturers are required to pass.

Thermally Protected Varistors from World Products Inc. addresses these concerns by integrating a thermo-fuse in series with a metal oxide varistor. When a temporary overvoltage limited current event occurs, the varistor will fail to a low resistance, and the thermo-link will open. This will effectively disconnect the damaged varistor from the circuit and prevent sustained follow current through the MOV portion. Proper design would be to incorporate an indicator circuit (LED) to alert the operator that the Thermally Protected MOV has failed and needs to be replaced. Also the AC line should be properly fused for the higher currents, and an enclosure must be used.



Figure 1.



Figure 2.



Figure 3.

