The Myth of Whole-House Surge Protection

Surge protection at individual components or circuits is the only way to protect against internal surges.

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Wouldn't it be wonderful if we could put an air filter in Chicago and filter all the air in America?

A good idea, but it can't possibly work effectively.

That's why a service entrance powerline surge protector -- often called a whole-house surge protector -- does not live up to the billing.

Just like the Chicago air filter, a service entrance surge protector can provide some protection from the 20 percent of surges originating outside a house, but not the 80 percent of surges which originate within a house.

Where Do Surges Come From?

For a better understanding, you need to know that:

20 percent of surges originate outside a house from nearby lightning strikes, which couple surges into nearby power wires
Normal utility operations can cause electrical disturbances
Perhaps the most common external surge source is when power is interrupted for any reason – a tree falling on wires, a car hitting a pole, wind damage, utility repairs, etc.
Wires conducting electricity create a magnetic field. When power is interrupted, the

magnetic field collapses, inducing large voltages in the wires. A 12-volt spark coil relies on this principle to generate many thousands of volts to fire spark plugs.
80% of surges come from within a building are generated every time equipment cycles on and off.

Internal surge levels are related to the magnitude of current being interrupted and the length of wire from the service entrance to the load.

The longer the wire and the higher the current, the bigger the surge generated when the power is interrupted.

A classic example is a coffee pot located far from the service entrance. Every time the heater kicks on and off to maintain the coffee temperature, significant surges are generated.

It should be obvious that a coffee pot cycling on and off several times an hour is a much more frequent event than a tree falling on the power wires, or a lightning storm.

2 Technology Choices

Two basic surge protection technologies are available today with radically different performance and endurance.

The dominant technology is **sacrificial shunt mode technology**. Typically, this technology uses MOVs (metal oxide varistors.)

The second is **series filter technology**.

The shunt mode (MOV) technology relies on a three-stage, or zoned approach to whole-house protection:

1. Service entrance protection
2. Branch circuit protection
3. Point of use protection

Service entrance and branch circuit protection must be installed by licensed electricians. The point-of-use plug-in protection should be used with each piece of sensitive equipment.

These products generally incorporate "protection working" lights or alarms since they use sacrificial components (MOVs) that should be periodically replaced to maintain protection as the protection degrades with exposure.

In many instances, it is impractical to have service entrance and branch circuit protection. Either an electrician would need to install and periodically inspect the service entrance and branch circuit protectors or the homeowner would have to rely only on the point-of-use plug-in products.

In these cases, the shunt mode plug-in point of use protectors have much greater exposure, and may not even be rated for the level of exposure they will see.

With **series filter technology**, plug-in point-of-use filters are available that can repeatedly eliminate damaging surge energy and noise.

This eliminates the electrician-installed service entrance and branch circuit protectors needed by the

shunt MOV technology. Since there are no sacrificial elements in the filters, routine maintenance and concern about protection level is eliminated.

"Protection working" lights are not required since filters do not "wear out" with use. Advanced Power Quality filters are now available that cancel out the worst-case powerline surges and noise and have at least a 10-year life with the worst surge.

How Do Filters Work?

Powerline surges consist of a brief burst of high-frequency energy. The power frequency is 60 Hz. Surge frequencies are 20,000 Hz and higher.

A filter that removes the surge frequencies will eliminate not only the surge but also the associated noise. Removing powerline noise has the added benefit of improving the quality of the A/V signals.

Filters work continuously. Unlike shunt mode clamping circuits that do not begin to suppress a surge until the clamping level is exceeded, the continuous operation of a filter can be much more effective.

In fact, modern Power Quality Filters have been shown to filter and cancel out surge voltage to such an extent that protected equipment will be unaware a worst-case surge event has even occurred.

Couple this with a 10-year life for point of use applications, and you have a worry-free, noise free, maintenance-free electrical environment.

Safety Certifications

Underwriters Laboratories has a UL 1449 Safety category for "Surge Protective Devices" (SPDs). This covers the older shunt mode technology.

Filter technology is covered under UL 1283 "Electromagnetic Interference Filters."

Meanwhile, Modern Power Quality Filters under UL 1283 can be effective and reliable at surge suppression. They operate over a wider voltage range than products called Surge Protective Devices (SPDs), which are under UL 1449.

Rudy Harford is chief engineer at Zero Surge Inc. He holds over 40 U.S. patents in the field.

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