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TECH WATCH

Why Whole Building Surge Protectors Don't Work

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Whole building surge protectors (SPDs: Surge Protection Devices) often claim to be a "first line of defense" against surges. A review of their performance ratings, however, shows this claim is inaccurate. It is acknowledged that supplemental lower clamping level point-of-use products (SPDs) are still required to protect sensitive electronics.

EPRI (Electric Power Research Institute) is a research institute which services the power utility industry. They research components and systems for power utilities. They researched systems consisting of a "whole house" surge protector with typically high clamping levels supplemented with lower clamping level point-of-use protectors as recommended by the whole house surge protector suppliers.

EPRI, in a "System Compatibility Research Project" concluded ". . . with the 'lower bidder' (lower clamping level) downstream SPD (point-of-use protector) absorbing most of the energy. This means the upstream SPD (whole building surge protector) remains passive: not only a waste of resources, but also a possible problem of inviting the large surge currents to flow deep into the power distribution system, where they can cause interactions with adjacent circuits, defeating one of the benefits of whole-house surge protection.

Their reasoning was simple. The "whole house" and branch circuit protectors typically had a very high let-through voltage or VPR (Voltage Protection Rating) of 700 to 1,000V. A 700V VPR is too high to protect sensitive electronic equipment, requiring a lower 330 to 400V VPR point-of-use protection for optimum protection of these sensitive systems.

Lower VPR Needed

The lower VPR product turns on first, limiting the surge to 400 volts, well below the 700 volt panel protector clamping rating — making the higher VPR "whole building" main panel and branch circuit protectors useless, and the point-of-use protector the actual "first line of defense".

"Whole building" and panel protectors with VPRs of 700 volts or more, are ineffective when the required lower clamping level plug-in protectors are on the same circuit, because the lower clamping level product will clamp first and do all the work! The claim that the "whole building" protector is the first line of defense is incorrect.

Compounding the issue, plug-in protectors have a history of failure and fires due principally to an extremely low overvoltage rating (called MCOV), often as low as 127V.

MCOV (Maximum Continuous Operating Voltage) is a critical voltage, above which MOV (metal oxide varistor) overheating and failure are likely. The safety agency, Underwriters Laboratories (UL®) requires this critical safety rating to be prominently displayed on all new surge protectors.

A 127V MCOV is only a few volts above the normal supply voltage, and small supply voltage changes exceeding the MCOV rating can lead to surge suppressor failure, affecting the reliability and safety of these products and the connected system. Unfortunately, in order to achieve a VPR low enough to protect sensitive equipment, MOV based surge protectors must have a low MCOV, making them vulnerable to the minor powerline voltage variations.

Safety First

According to the *Sky Valley Chronicle* (Seattle Washington), Oct. 1, 2012, "Every year, thousands of fires result from surge protectors, power strips and electrical cords".

As previously mentioned, MCOV is so important for safe-

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ty that UL **requires** that the MCOV rating be visible on each surge suppressor. Unfortunately, manufacturers typically avoid placing the important MCOV safety rating on the packaging, so you may not be able to see it until the package is opened and you inspect the product for the ratings. A low MCOV rating is what likely contributed to so many surge suppressor failures and fires. A safer MCOV rating would be 150VAC or greater.

While studying MOV use within electronic products, EPRI also discovered "the Metal Oxide Varistor, designed to be the first line of defense against transients, is often the weakest link during surge events." EPRI tests showed that removing the MOV from products actually enhances the survivability of the products when encountering surges, since the MOVs are basically sacrificial, and often fail due to surges and temporary overvoltages, disabling the equipment. The EPRI tests indicate that MOVs, the heart of many surge suppressors, are actually doing more harm than good. Today's power supplies can work effectively over a very wide voltage range, but MOVs are fixed voltage clamping components. To be effective, they must clamp close to the power wave peak, but if the power wave increases slightly above the MOV clamp level, the MOV can overheat and fail.

Series Filter Protection

The EPRI report suggests the use of "a semiconductor that is turned on in response to a fast-rising surge but is not turned on by a slow-rising TOV" (temporary overvoltage). That is precisely the approach the patented series filter technology uses — it adjusts the filter based on the surge energy.

As previously mentioned, MOV-based suppression can degrade product reliability, and even cause fires, while wide voltage range OEM series filters can operate over the full voltage range of today's power supplies, dramatically improving product reliability and safety.

A whole building surge protector that really works does not exist, but series filter technology can protect entire branch circuits given proper MCOV and VPR. Series filter technology is available in branch circuit, point-of-use and OEM configurations. They have a safe MCOV rating of 175VAC — with 265VAC available as an option — a let-through voltage of 330 volts or less, and an endurance rating of 1,000 worst-case surges, making them effective, reliable and safe.

Since series mode technology was first introduced in 1989, there have been no reports of series mode surge failures, fires, or product recalls, in spite of this product's use in critical applications. WVR (Wide Voltage Range) technology can operate over the full 85 to 265VAC range with full effectiveness, while WVR-TSC technology effectively cancels out surges completely, where the ultimate in protection is needed. The WVR-TSC technology received *Electronic Products Magazine*'s "Product of the Year" award for 2006 for the outstanding performance achieved.

Whole building surge protection must be reviewed as a complete system. What is to be protected? What level of protection is required? What are the results of surge related failure? What are the down-time costs? Alternative options with superior performance and endurance are readily available.

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