

## How to Protect Against Power Surges

By J. Rudy Harford, Zero Surge Inc.



Point-of-sale equipment, digital menu boards, signage, displays and other electronics at convenience stores represent ripe targets for degradation and damage from unexpected power surges. At the very least, untimely power interruptions can interfere with operations and customer service without warning, subsequently causing associated costs that can be significant.

According to a recent survey, more than 75 percent of respondents reported that at least 2 percent of their terminals were damaged or in need of repair during the past year as a result of power surges, and more than 62 percent incurred an annualized related maintenance cost of at least \$400 per terminal.

In most cases, "dirty power" is to blame. Dirty power is typically associated with lightning-prone areas because of their repeated brownouts and power outages. But dirty power emerges as a particular problem for c-stores, regardless of lightning strikes or locations, because of the entrenched reliance on sophisticated electronics and the constant cycling of electrical equipment within the building. This continuously places operations at risk, since cycling equipment generates surges, causing diminished power quality and serious damage to components and potential unavailability of equipment.

### Historical Performance Problems

Technically, a surge is a dramatic increase of voltage lasting up to 50 microseconds, and a spike represents an increase of voltage for two nanoseconds or less. If a surge is high enough and lasts long enough, components can overheat and burn. While surges are inherently worse than spikes, both can damage equipment or degrade components over time and consequently, shorten service life.

Surges can be classified as external or internal. While external surges (caused by storms and normal power company switching operations) generally are more severe, internal surges occur more frequently – representing about 80 percent of all surges – when equipment within a c-store is cycling on and off. Immediate equipment failure may not occur, but equipment life can be shortened from the cumulative effects of smaller, damaging surges. The immediate effects can be lost data, slow system response and other anomalies.

Historical performance problems associated with standard surge protectors can be traced to Metal Oxide Varistors or MOVs (fixed clamping level components). When voltage hits the protector, the two semiconductors are supposed to divert the excess power to the neutral and grounding wires, sending only the right amount to the hot wire and on to the equipment.

However, while the essential role of a MOV is to divert surge current, its lifespan shortens and failure becomes imminent as more surges (or spikes) are diverted. A MOV is also required to display a "failure indicator," which is an acknowledgment of its sacrificial history (planned obsolescence) because they will wear out after repeated use. Hence, one strong surge can spell disaster with no forewarning.

### Power Quality Filters to the Rescue

As a more practical alternative, non-sacrificial "series filter" surge suppression technology limits

surge current, surge voltage and surge duration, overcoming the many shortcomings of shunt suppressors plagued by excessive let-through voltage, limited service life, poor filtering and safety ground wire contamination. These advanced "power quality filters" rely on inductive filtering circuitry connected to a neutral power line conductor to store and safely discharge surges without contaminating the critical safety ground reference.

Employing established Wide Voltage Range (WVR) technology, the filters definitively can sense and suppress surges on 120-volt power lines, even when the power is low at 85 volts or high at 175 volts – and anywhere in between. Ideally suited for c-store operations, the technology "menu" includes plug-in products with multiple outlets for point-of-use equipment, panel-mounted branch circuit models, original equipment manufacturer modules for inclusion in a product manufacturer's designs, and custom configurations.

### **Tips for System Selection**

When considering "filter-based" solutions for surge protection, the following questions can help guide in system decision-making and successful outcomes:

- Should the system be installed immediately using plug-in protection?
- Is it desirable to protect multiple outlets/rooms with one installation at the main panel (handled by a professional)?
- Will the system sense and suppress surges generated by equipment cycling on and off inside the c-store?
- Will the system remove EMI/RFI electrical fluctuations that can further disrupt c-store electronics?
- Is the system sacrificial? Will it require a replacement schedule due to degradation over time?
- If installed at the main panel, will the system require supplemental protection?

One final note: When selecting the most appropriate surge suppression technology to protect sensitive electronics, a reliable rule of thumb is to determine whether product ratings have been based on actual endurance testing. Our recommendation is to ask the supplier for performance and endurance test results from a nationally recognized testing laboratory.

Otherwise, if a surge suppression product is not rated ideally both for performance and endurance, its use can become a dangerous gamble – prompting the startling realization down the road that an ordinary surge protector may prove to be worse than no protection at all.

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**Editor's note:** The opinions expressed in this column are the author's and do not necessarily reflect the views of *Convenience Store News*.