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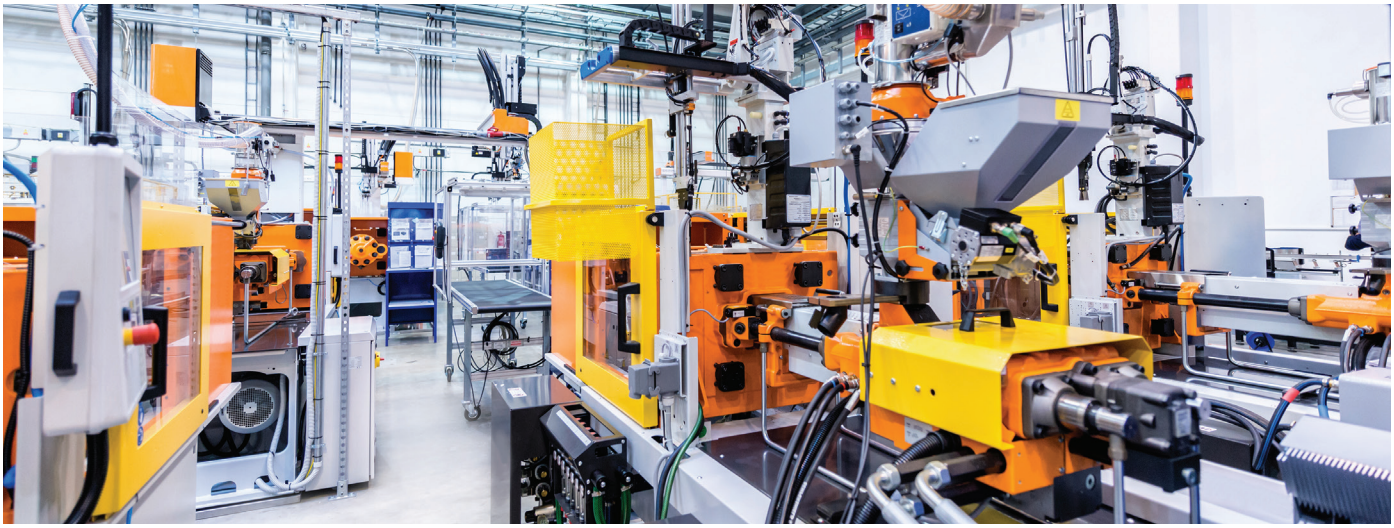
RAYCAP ARTICLE

Automated Systems in Industrial/Commercial Facilities Demand Better Surge Protection

by Paul Saa P.E.

In industrial/commercial settings, transients are more common than in residences, and the resulting interruptions in operations and the damage to equipment have quantifiable and often substantial costs. Fortunately, it is easy to install adequate levels of surge protection.



New Trends in Equipment Require Better Protection

Surge protection is a necessity in industrial/commercial applications, and trends such as the industrial internet of things (IIoT) and factory 4.0 make the need more profound. Consumers seem to regard the domestic problems that transients cause to be mere inconveniences and are often content with inadequate surge protection. Some calculate the odds of a serious failure to be so low they are willing to risk forgoing surge protection altogether. Industrial/commercial facilities cannot afford to be so cavalier.

The sources of the problem

People tend to think of surge protection as a guard against lightning strikes, which it is, of course. Lightning can cause enormous voltage surges that debilitate electronic systems, and sometimes even destroy them. Unprotected and under-protected wireless network nodes or wind turbines, for example, are notoriously susceptible to lightning strikes. But the problem can be handled. For example, products such as Raycap Strikesorb® are unexcelled in providing protection from overvoltages including even the largest surges.

Lightning is a perpetual problem, but transients are far more likely to be caused by other systems that are part of an electrical distribution network.

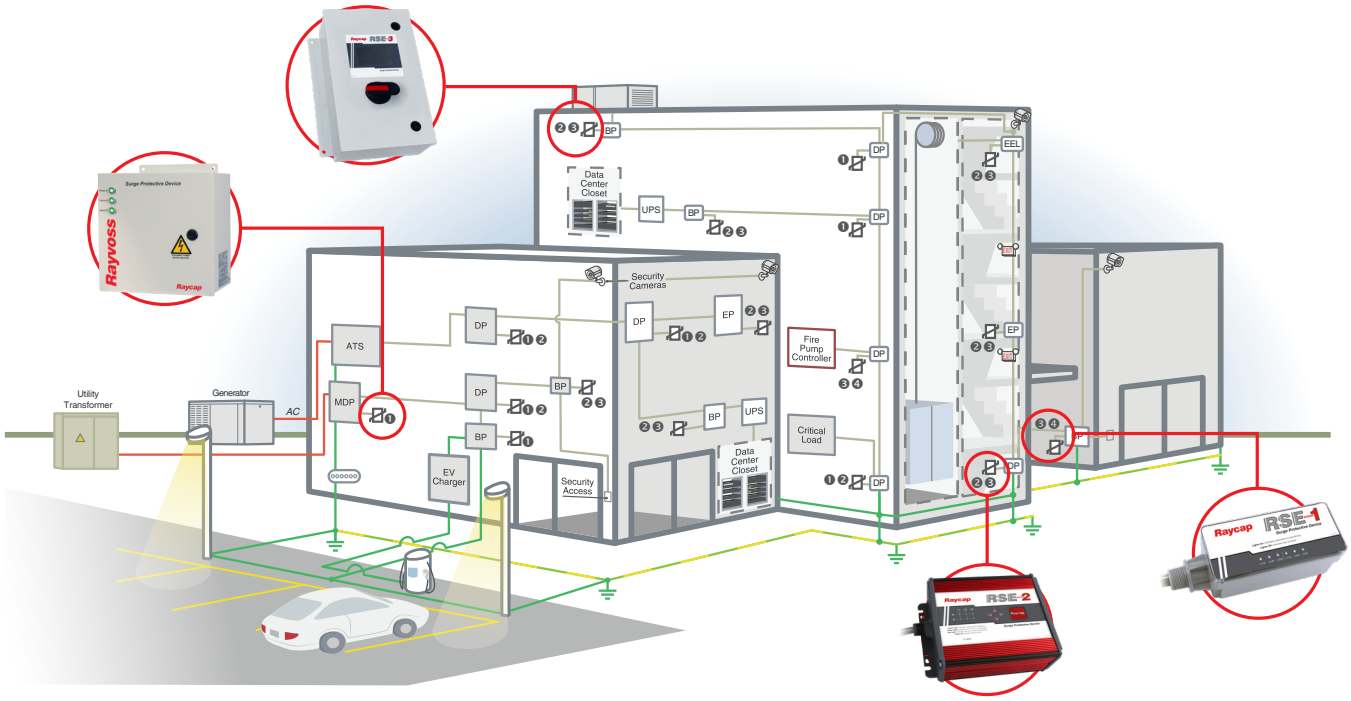
At home, those other systems tend to be items that get used intermittently, such as washing machines, copiers, or hair dryers. Industrial/Commercial facilities – factories, college campuses, office buildings, data centers, hospitals, etc. – are of course far larger than homes (or cell sites) and are equipped with a much wider range of heavy-duty electromechanical systems that constantly cycle on and off, such as HVAC systems, elevators, motors and medical diagnostic equipment.

Why do the IIoT and factory 4.0 exacerbate the problem? Both essentially further the ongoing process of automating, digitalizing, and connecting industrial facilities. Every additional step in this direction increases the potential of harm from voltage surges, however, and needs to be accounted for in facility surge protection plans.

Transients and the damage done

The IIoT and factory 4.0 are predicated on the expanding adoption of increasingly sophisticated yet delicate computing resources. Printed circuit boards (PCBs), integrated circuits (ICs), LED lighting and other semiconductor logic-based electronics are all susceptible to damage from even small transients. A large enough voltage spike could of course knock out any electronic system, but the chronic occurrence of milder transients can be just as destructive, especially for devices as sensitive as ICs; it's just that the damage is gradual and cumulative instead of immediately catastrophic.

The relentless degradation caused by unmitigated transients shortens the effective lifespan of electronic systems. It is common for electronics that are expected to last 10 years to be replaced in as little as two or three when installed in a facility lacking adequate surge protection.



A by-product of overvoltage can be the generation of excess heat, which is also damaging to advanced electronics and adds to the degradation. All of this is why surge protection should be factored into capital expenditure (capex) planning.

Another problem caused by voltage surges is less apparent, but no less serious. Transients can corrupt data as it's being transmitted. The effects of data corruption might be immediate, by causing an equipment malfunction, for example, or even a system shutdown. Bad data that doesn't make itself obvious by causing a service interruption might not even be detected until the data is accessed at some later date. Worse, it might never be recognized as corrupted data at all.

Suffering the damage that transients can cause is bad enough, but after it occurs it can be exceedingly difficult to diagnose the problem and fix it. Transients are frequent but intermittent and literally transient -- lasting microseconds. Tracking down past surge activity to identify the source of a transient is virtually impossible without being able to isolate the time when it happened.

These problems can be handled, however -- provided they're handled in advance.

Surge Protection Technologies and Techniques

Historically, U.S. standards that apply to electrical wiring neglected to address surge protective devices (SPDs). The electronics industry has been developing excellent surge protection technology all along, however, and keeps refining best practices with regard to where SPDs are needed, how much surge protection is required based on local circumstances, and how surge protection technology should be applied. All of this is gradually being codified in updated standards, rules and regulations, including the National Electrical Code (NEC).

Even with updated standards and recommendations, the surge protection requirements from one industrial/commercial site to the next are going to vary, so each facility should be subject to an individual analysis.

As indicated earlier, surge protection for industrial/commercial sites is largely about larger mechanical loads. It's a good idea to inventory on-site non-linear loads, in particular noting critical equipment (generators, refrigeration units, medical systems, etc.). Include the panels feeding known generators of transients, and don't forget all conductor entry points coming in and out of the building.

Other variables in a site analysis include grounding configurations, levels of electromagnetic interference and radio frequency interference, along with the susceptibility of site equipment to EMI and RFI.

Raycap recommends the maximum surge protection possible. Of course we do -- but it's because we've seen electronics fried by huge voltage spikes, and we've seen the accumulated damage of years' worth of unmitigated transients. Protecting against damage costs a lot less than fixing it, and protection is not that hard to install.

There are industry solutions, such as Raycap's Rayvoss industrial/commercial surge protection, that can be thought of as the first line of defense in surge protection. Rayvoss systems, for example, are designed for high-risk, critical power applications. Every system in this product line incorporates our Strikesorb Surge Protective Devices.

Strikesorb's unique design features a distribution grade metal oxide varistor (MOV) that can handle much larger surges without affecting performance. It is also rated for safe operation without the use of internal fuses, a unique feature that makes Strikesorb the most reliable surge protection device known. Strikesorb repetitively conducts excess energy from lightning surges and power surges while mitigating performance deterioration or aging to the SPD module.

Industry Solutions

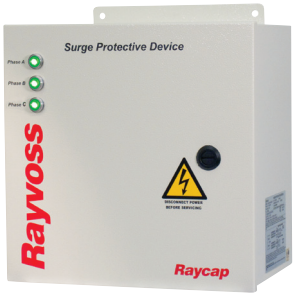
These solutions are engineered and tested for use in AC and DC power applications, and meet global safety standards. Rayvoss systems are available in a wide range of operating voltages, and can be customized to meet any electrical overvoltage protection needs.

Rayvoss systems are complemented by the RSE Series for AC surge protection. The “fine” surge protection of the RSE suppresses any surge that gets passed Rayvoss. RSE is comprised of three series, each designed and engineered to fit specific customer applications, and like Rayvoss, RSE products cover a wide range of voltages. Using Raycap’s unique stacked MOV design, the RSE line offers a more robust SPD, with lower let-through voltages and higher surge current capacities in a small footprint.

The supply of electricity has been so reliable for so long the average consumer might be excused for never realizing how dynamic the conditions in a wiring network can be. Engineers, however, know the flow of electricity is subject to all sorts of fluctuations. They have a constant awareness that semiconductor-based electronics are increasingly sensitive to those variations, that these systems need an exceedingly well-controlled supply of power, and that can only be accomplished by including the most technologically advanced surge protection available.

About Raycap

Raycap is an international manufacturer and technology leader with decades of experience providing innovative infrastructure solutions for customers in the telecom, energy, defense, transportation, and other industrial markets. Its solutions protect mission-critical applications and ensure the best possible system availability. The company's product portfolio includes lightning and surge protection technologies, structured cabling and connectivity solutions, power management systems, custom enclosures, cabinets, and wireless network concealments. Since its founding in 1987, the company has experienced continuous growth. Its engineering expertise, test laboratories, and multiple manufacturing facilities guarantee quality, reliability, and innovation. Product design, testing, and approval processes comply with all international safety standards. Raycap operates in the United States, Germany, Greece, Cyprus, Slovenia, and Romania.



❶ **Rayvoss 80mm**

❷ **RSE-3**

❸ **RSE-2**

❹ **RSE-1**

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