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Reducing High-End Printer's Vulnerability to Power Quality Issues



Abstract

The modern copier is a tremendously complex machine with many electronic and mechanical devices. The failure or even malfunction of a single component can cause defective printing, a system outage, or even machine failure. For end users, this is an unacceptable and costly loss of productivity from a major capital investment. For dealers, this means a service call using valuable personnel and potential component or product replacement. If the problems persist, reputation damage inevitably follows. While copiers have evolved into very reliable products, they are at risk from ill-understood power quality issues.

Modern multifunction copiers deliver major business productivity – when running

The modern multifunction copier is a technological marvel. Higher-end models are capable of printing production-quality color copy at over 70 pages per minute with advanced finishing features. These high-end machines deliver tremendous office automation productivity and may cost as much as an automobile.

Paralleling the impressive sophistication of the modern copier is a revolution in how copier suppliers conduct business. While dealers once focused primarily on selling product, today many of the most successful dealers have evolved into service providers, tailoring managed print services to their clients' needs with long-term billing and service agreements. For such advanced machinery and advanced business models, reliability is critical.

The perils of power quality problems in high-end printers

To most people, electricity is simply a utility just like the water mains. You flip a switch, the lights go on. Despite occasional blackouts, electricity supply is mostly reliable in developed markets. But just as water and sewage systems can hide serious deficiencies beneath the surface, electric power supply is not as problem-free as we'd like. Surge voltages, and voltage sags and swells routinely occur. Even if utility supply is good, power problems can arise from other sources including poor building wiring, load switching, distortion emanating from many non-linear loads (e.g. personal computers), or sudden shifts in demand for electricity.

For simple, resistive loads like the old-fashioned light bulb, these power quality problems are of little consequence. But for sophisticated machinery and electronics, they can pose substantial problems. Even worse, the issues are often non-obvious and follow no clear pattern, resulting in mysterious errors and wasted service calls.

Copiers are more vulnerable to power quality issues than most office electronics due to their mechanical complexity. A copier is a sophisticated electro-mechanical system that contains powerful computer electronics. With higher capacity than most desktop computers, a copier has numerous electric motors, electromechanical switches and gears. Power quality disturbances can upset the operation of these systems. The result can be paper jams, damage to expensive circuit board assemblies and mechanical subsystems.

Voltage sags and swells have a significant and negative effect on the electromechanical systems in a sophisticated copier. Voltage changes can cause electric motors to overheat or function at the incorrect rate. In more extreme cases, failure can result. In switch-mode power supplies, the effects are more complex. Undervoltage, especially if below 92 volts, will eventually cause the system to forcefully reboot. Overvoltage can damage or destroy the power supply.

The current state of copier power protection

The market has not responded well to these power quality challenges, especially at the higher end. Many end users and even dealers are unaware of how common these power quality issues are, resigning themselves to frustrating machine malfunctions, part failures and service calls.

Power conditioning products for the copier industry do exist, but many are undersized and aren't robust enough to protect this large, complex machine. Most make do with a very simple filter and surge protector within a small plastic enclosure. These products do provide some basic filtering and surge suppression, so they are better than nothing. They are also typically marketed with an equipment loss insurance policy, giving peace of mind.

Because these devices are virtually the same as surge protectors in general, they are affordable. This allows their manufacturers to offer insurance policies to cover equipment damage. While it is nice to be reimbursed for equipment damage, and insurance policy does not prevent downtime, nor does it replace lost productivity. The philosophical question is whether it is better to invest money upfront in a true power conditioner in order to ensure sustained long-term reliability and productivity in this busy world.

Simple protection devices do not regulate voltage at all and therefore aren't able to correct problems arising from voltage sags and swells. While they may provide filtering in addition to surge protection, it is inadequate for many power problems that impact high-end copiers. This limited filtering will not address issues in a seriously degraded environment, such as outdated, overburdened wiring commonly seen in older buildings. The surge protection of low-cost devices may be somewhat effective, but generally are not robust enough to survive major surge events.

One vendor has several customer testimonials on its website saying customers are delighted that their power filters exploded during a surge event, sparing the copier. While this is preferable to the copier exploding, a robust product would survive. In a managed print situation, the dealer would be on the hook for a service call even if the filter manufacturer replaced the device out of warranty obligations.

The solution

TSi Power Corporation's VRP series of precision line conditioners is engineered to extremely demanding performance requirements – and are ideally suited to protect high-end copiers from power disturbances and problems. These line conditioners quickly realize their return-on-investment through reduced service calls, increased uptime and of course, avoiding the need to replace this very expensive equipment.

The VRP offers robust surge protection and line noise filtering. With an oversized capacitor, inductor, and metal oxide varistor, it provides surge protection and slows down fast transients while being very reliable, even in the most demanding environments. Unlike basic power filters, the VRP automatically regulates voltage. It is able to regulate operating voltage from within plus or minus 20% of the nominal voltage to within 3% (95 - 145 V in, 120 V \pm 3% out). Because its regulation speed is 20,000 times per second, sudden voltage sags and swells are not an issue. In applications where enhanced filtering and isolation is required, an isolation transformer can be added (such as TSi Power's ILC line of Isolation Line Conditioners). In this case, output is fully isolated from input and the neutral-to-ground bond recreated.

In conclusion

Important and expensive office equipment needs to be online as much as possible. End-users with either demanding requirements or concerns about equipment failure should pay attention to power quality. Dealers engaging in managed print services, long-term repair agreements or simply good customer service can reduce their costs and service calls by highly trained personnel by selecting an appropriate power conditioner. Existing products are not satisfying this task well, especially at the high end, but solutions do exist – specifically precision line conditioners such as the ones engineered by TSi Power.

About the author

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TSi Power specializes in manufacturing indoor and outdoor UPS, line conditioners, precision automatic voltage regulators, automatic transfer switches and DC-AC inverter systems designed to meet the challenging international power conditions.



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