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Spotlight Electrical Systems

Downtime from electrical surges eliminated by voltage suppressor

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Problem

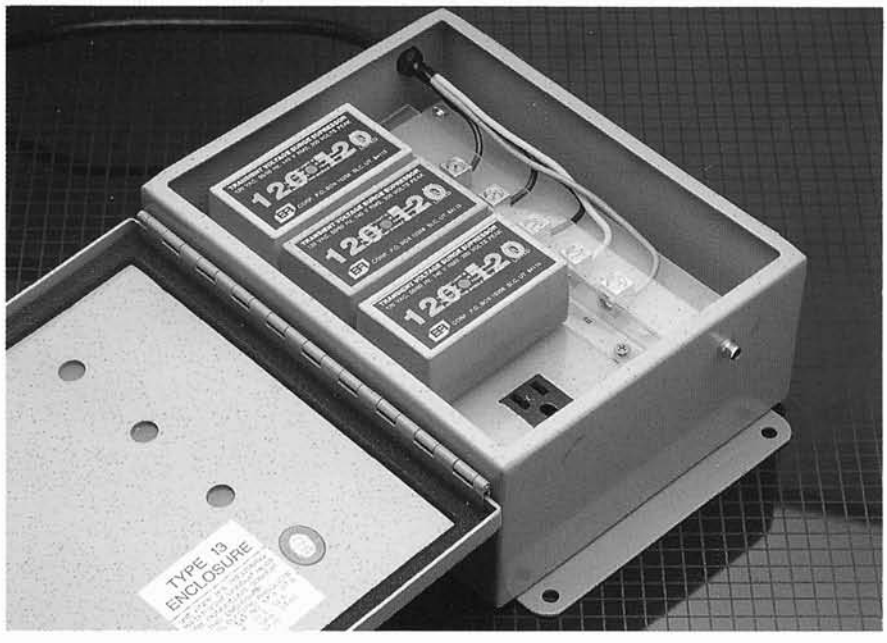
The 200-employee Eaton-Kenway Inc. facility in Salt Lake City, Utah, engages in the design and manufacture of automated, computer-controlled, storage and retrieval systems. The equipment built there is engineered to stack and store objects ranging from automobiles to small parts.

Commands, integrated with total plant computer systems, call for storage, location, removal, inventory control and reporting.

Precision in marketed equipment holds a high priority, which is reflected equally in the production facilities.

Although production uptime is high, a survey of plant downtime revealed that some 35% of lost hours could be attributed to transient variations in the electrical supply voltage. These disturbances arose from unexpected—or at least unavoidable—sources. Lightning activity near the utility supply line even miles away generated momentary effects. Random control of production machines, air-conditioning units and electrical tools caused power line fluctuations affecting entire circuits throughout the plant's electrical system.

This type of electrical activity is not uncommon. Studies have shown that transients generated in industrial environments can have nano second rise times, amplitudes in excess of 5000 volts and attendant high currents. As electronic equipment increases in complexity, this is ample to knock out memory, cause inappropriate functioning and shut down operations without leaving visible evidence of activity.



A transient voltage surge suppressor, of the type used at Eaton-Kenway Inc.

Because of the stresses they create, cumulative damage to semiconductor current pathways and junctions can occur from such incidents. Engineers at Eaton Kenway decided to protect their sensitive equipment from such hazards.

Solution

An experienced consultant was called in to assist in analysis and recommendations.

The first effort centered on four critical applications: two multi-purpose metalworking machines dependent on numerical control, a test system for electronic stacker control circuit boards, and a demonstration area where stackers are exhibited and tested in operation with robotic assist.

The decision was made to protect the main power supply to each of the numerical machines. Accordingly, a high-capacity, three phase transient voltage surge suppressor (TVSS) system with RC noise attentuation was installed at the service panel of each machine. The installed TVSS systems feature modular assemblies with each phase protected by a compact, 2 x 2 x 4″ molded plastic enclosure of plug-in design and featuring a normal/fault indicator light on the front. Response time for each unit is less than 1 nano-second.

The three modules per system are housed in a heavy-duty, weatherproof NEMA-12 case with hinged cover and security lock. Space is allowed for a spare plug-in module. Remote supervision of the normal/fault condition via an optic coupled logic system with sonic alarm is available.

In an interesting backup measure, account was taken of voltage perturbations induced by the functioning of the machine itself. Kenway engineers recognized that it is not enough to address only supply line voltage surges. Internally generated transients resulting from switch closure, contact bounce, etc., also must be controlled. Additional and separate modules were therefore wired in-line close to, or within the machine operating circuits, thereby establishing a viable "suppression network" addressing both external and internal transient activity.

A similar network was established for the circuit board test area, as well as the demonstration facility.

In each case, the modules were matched to the line voltage and current configuration of the specific application wiring, including delta or wye transformer feed; and single, split or multiphase current.

Eaton-Kenway insisted on suppression equipment that passed the IEEE-587 testing procedures and looked for an internal design that utilized both a metal oxide varistor and a cascading diode method of suppression. Noise attenuation capability was an unrequested, but added benefit.

Results

In the one-year period since the installation of the TVSS systems on the above-mentioned sets of electronic equipment, no downtime has been logged against voltage disturbances. Eaton-Kenway engineers feel they have satisfactorily met their critical problem.

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