

## PROTECTING MACHINE SHOPS FROM TRANSIENT SURGE DAMAGE

*The risk of transient surge damage to machine shops is significantly higher than a typical office due to the high cost and complexity of microprocessor-based equipment used in this type of facility. This white paper is intended to provide the reader with information that can be used to mitigate damage and lost revenue resulting from transient surge events.*



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Electrical service voltage to machine shops is typically 3-phase with most common service voltages being 277/480Y, 120/208Y or 120/240 high leg delta. Quite often, internal transformers are installed to match the supply voltage to the

needs of a particular machine (or machines) contained within the building.

Most machine shops have multiple lathes, mills, drills and CNC (Computer Numeric

Control) machines that are used to create products for various industries. CNC equipment can be quite sensitive both to transient surge events and to momentary power interruptions.

## PROTECTION FROM TRANSIENT SURGE EVENTS

*We offer the following recommendations to mitigate the risk of transient surge damage to a machine shop. .*

- ✦ Seek the services of an experienced licensed electrician or engineer to review your facility to make sure that the facility is properly grounded. Quite often the author of this article has found additional ground rods driven next to each machine which is against National Electric Code (NEC) standards which require a single point ground at the electrical service entrance.
- ✦ Please also inspect the ground and soil at the electrical service feed to make sure that it is dry. A damp or wet ground can attract transient surge event as a thunder storm approaches since most other grounds in the area are “dry” until the storm arrives and saturates the soil.
- ✦ Check each three-phase device to make sure that their control circuits include “loss of phase” protection. This protection module will interrupt power to three phase equipment if one of the phases (A, B, and/ or C) loses power, thus avoiding damage to compressors and motors.
- ✦ Install a quality hard-wire surge protector on the load side of the main electrical disconnect (or first panel upstream from the electric meter serving the facility).
- ✦ Install an additional hard-wire surge protector on all panels within the facility. This layered approach will significantly reduce or eliminate opportunities for a transient surge to ricochet through the building searching for the easiest path to earth ground.
- ✦ Locate the panel that provides power to outdoor signs and install a small surge protector on each circuit breaker providing power to these lights or devices located outside of the main building structure.
- ✦ All computer equipment should be plugged into a quality (\$50 to \$75) surge protector.

## PROTECTION FROM “BLINKS”:

Electric utility power distribution systems make use of automatic resetting circuit breakers a.k.a. “reclosers” to reduce the length of power outages due to a wide range of system events (lightning strike to line, car vs. pole, tree limbs).

Similar to a circuit breaker in your home, a recloser monitors current flow and should it sense an over current condition (fault), it will open and then “reclose” restoring power in seconds rather than blow a fuse and cause a lengthy power outage. A recloser will typically

“cycle” three times and if it still senses an over-current (fault) condition, it will open and “lock out” until a utility service person can check the line for the cause of the fault.

While recloses are quite beneficial in reducing lengthy power outages, a recloser event can create havoc if power is interrupted during critical CNC operations. An unexpected power interruption can snap milling bits and can damage or destroy expensive products that were being created through the CNC process.

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### ***We offer the following suggestions to help mitigate broken bits or product damage resulting from momentary power interruptions (blinks):***

- ✦ Maintain a log of recloser operations noting date/time and the number of blinks. If more than one every few weeks, share this log with your utility to see if they can find and correct the source of the blink.
- ✦ Reach out to the manufacturer(s) of your CNC machines to find out if they have “ride through” kits to help minimize risk of damage to bits or product during “blinks”. Many variable frequency drives have optional ride through kits (inductive chokes) that install at the power feed to the drive to help the device ride through a momentary power interruption.
- ✦ Consider purchasing true “on-line” (double conversion) battery back-ups to support critical microprocessor based loads. Please check with the manufacturer to make sure that maintaining power using a battery back-up won’t cause additional operational problems
- ✦ Review programming options for your CNC machine to determine whether a “lift and park” programming option is available. This would help reduce opportunities for the milling bit to snap or damage/destroy the product.
- ✦ Any part of the CNC machine that plugs into a 120-volt receptacle should be plugged into a high-quality surge protector. (\$75 to \$100)
- ✦ Verify that each compressor (HVAC/ refrigeration/ coolers) has “time delay upon restart” protection modules installed and operational. These protection devices will keep the compressor from starting at high refrigerant pressure after a momentary power interruption (blink). Typical delay times are 3 to 5 minutes after power is restored.
- ✦ Visually inspect the area below the utility electric meter to make sure that the soil is normally “dry”. A damp area caused by an AC drain or leaky water valve near the ground rod can actually attract transient surge energy as storms approach and start hitting the distribution lines.

Careful review of critical equipment contained in a machine shop and installation of protective devices noted above can go far in mitigating opportunities for transient surge events and momentary power interruptions to cause damage.

## **ABOUT KENICK, INC.**

KENICK, Inc. has been providing surge protection products and solutions to the electric utility industry for over 32 years. Their facility includes a state-of-the-art research laboratory, allowing them to test surge protection products to see how they respond to small, medium, large and “oh my gosh... what was that?!” transient surge events.

## **ABOUT THE AUTHOR**

Peter Jackson has been responding to the needs of electric utility clients and their customers for over 25 years. His knowledge and expertise in mitigating transient surge damage events has been gained through hundreds of field reviews and their successful outcomes.

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# Questions?

Please contact us if you have questions about this article or a particular issue that you need help with.  
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