CASE STUDY:

CAN YOUR MANUFACTURING FACILITY AFFORD NOT TO INSTALL SURGE PROTECTION EQUIPMENT?

To improve machine availability, operating efficiency and recurring maintenance expenses, Commercial Machine, Inc. turned to THOR SYSTEMS, INC. for a solution. Surge protection not only improved electrical power quality, but this investment has been paying dividends of $2,336/month for 34 months equaling $79,424 after an initial payback period of only six months.

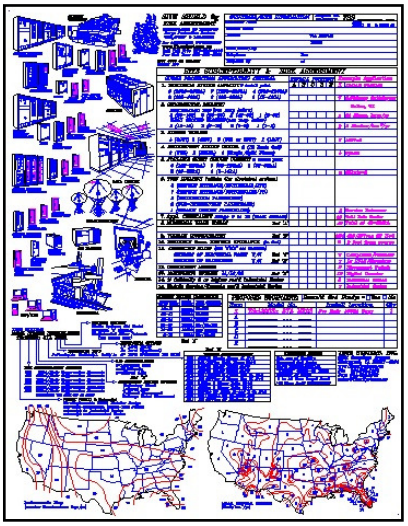
By Bob Van Sickle
President, THOR SYSTEMS, INC.

CHALLENGE

Commercial Machine, Inc. needed to identify the cause of recurring CNC machine service expenses and increasing lack of machine availability. THOR SYSTEMS was asked to investigate and make recommendations to improve operating efficiency and machine tool uptime. Reviewing 29 months of maintenance expenses and service issues revealed frequent logic card replacements were the major cause of machine downtime. Other issues included power supply failures, spindle/axis control failures, spindle drive motor rewinding after only 5 years of service and numerous machine lock-ups/reboots/ restarts for no apparent reasons.

SOLUTION

Data from the maintenance expenses, service reports, declining machine availability and interrupted production supported the conclusion that Poor Electrical Power Quality was the problem



Site Shield 3G Risk Assessment

While some power disturbances are obvious, the vast majority is unnoticed; collectively they cause problems that seriously disrupt productivity (from system reboots to hardware failures). Transient over-voltages are a major cause of malfunction or total failure of electronic circuitry and equipment. THOR SYSTEMS recommended the installation of Surge Protection to significantly reduce and/or eliminate harmful transients/surges and electrical line noise, thus preventing damage to sensitive electrical controls and electrical equipment.

1 - The Customer

Commercial Machine, Inc., founded in 1968 by Bob Jones, is an independent metalworking shop located in Richmond, Virginia, serving the Mid-Atlantic Region. (See www.commercialmachine.com)

Precision machining, industrial equipment and contract machinery are the key industries served. The primary machine processes performed are turning, milling, boring, grinding, tapping and threading. The product mix is 16% long run, 61% short run and 23% contract machine design/build. There are 20 full-time employees. Staff and shop floor employee turnover is very low (less than 1%). In early development, the company acquired CNC machines utilizing their metalworking benefits to leverage improvements in part run time, accuracy and overall cost efficiency. Software was also implemented to model and optimize manufacturing processes.

The business evolved, growing in manufacturing capability by expanding its original 2000 sq. ft. facility to its existing 22,000 sq. ft. facility through two building expansions. During these expansions the electrical distribution, manufacturing equipment complexity and overall business operations grew as well. Additional CNC equipment, multiple workpiece fixtures, bar feeders, prefixturing workpieces and chip-removal systems were also implemented to enhance the manufacturing processes.

Risk Assessment & Site Susceptibility

*The application should match the Surge Protective Device (SPD) to installation parameters and electrical environment of the facility. Installation factors to consider are criticality of equipment to the business, cost/time to repair critical equipment, SPD locations and appropriate sizing. A **cascaded** installation with SPD units at the electrical service entrance and downstream at the distribution panelboards feeding CNC manufacturing equipment is required for effective surge protection from transients/surges generated both **externally** and **internally.***

2 - The Problem

Nothing affects profitability as instantly and dramatically as unscheduled downtime (intermittent or longer-term), machine repairs, system failures and lack of machine availability. The events below often create interrupted production, frequently necessitating alternate machine set-up and programming to maintain scheduled delivery requirements:

- **Equipment Downtime**
  - *Recurring CNC logic card failures*, typically requiring a service visit *and electronic logic card replacement.* Hardware failures caused by voltage surges and transients are even more prevalent due to increased speed, sophistication and sensitivity of today's electrical and electronic controls; continuously until they fail causing

system failure for no apparent reason (normally this damage is not visible).

– *Premature motor failures* causing extended downtime, requiring motor rewinding or replacement. The life of motor windings can be dramatically shortened when the motor is exposed to surges/transient overvoltages, often the result of external sources (i.e., lightning, utility grid switching, power line arcing electrical accidents).

- **Disruptions And Material Losses**

  – *System upsets, lock-ups and reboots* caused by "crosstalk" (high frequency electrical EFI/RFI noise).

  – Parts being machined can be scrapped and tool breakage may occur due to machine malfunctions.

- **Susceptibility/Other Factors**

  – Advancements in electronic technology--miniaturization and increased integration of complex microprocessor controls--have made logic controls much more susceptible to poor power quality.

  – Magnitude and frequency of problems continue to worsen with increased utilization of sensitive electrical and electronic equipment in the metalworking industry.

  – Increased use of Broadband cable, DSL and T1 Lines for communication connections, require the computer to be "always connected," exposing machine controls to transient overvoltages.

- **Internally Generated Surge/ Transient Activity 80%.** Over 80% of all surge/transient activity is created inside your and/or neighboring facilities. Starting and stopping of electric motors as those used in automated systems and manufacturing (machine tools, cranes, HVAC, compressors, coolant pumping systems, etc.) can create a continuous stream of 250V to 6000V transients. DC drives, variable speed AC drives, welding equipment and DC power supply switching are other sources of surge/transients and electrical noise.

- **External Surge/Transient Activity 20%**. Lightning, utility grid switching, power line arcing (due to high wind) and electrical accidents represent a low percentage (less than 20%) of all transient activity, but generate high magnitude transients that can cause immediate hardware damage to electrical systems and destroy sensitive electronic equipment.

- Along with the AC power system, any data and communication entry points are also potential paths for destructive voltage transients.

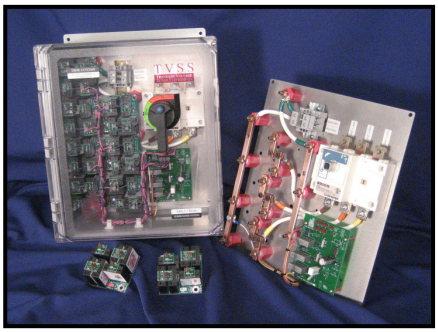
3 - How Did Customer Discover THOR SYSTEMS?

Commercial Machine is a supplier of machined components to THOR SYSTEMS. At Commercial Machine's request, THOR SYSTEMS conducted a detailed site survey of the electrical power distribution system throughout the facility.

4 - The Solution

THOR SYSTEMS recommended improving electrical power quality by installing surge protection at the electrical service entrance, downstream at the distribution panelboards feeding the CNC machines and data/telcom applications providing:

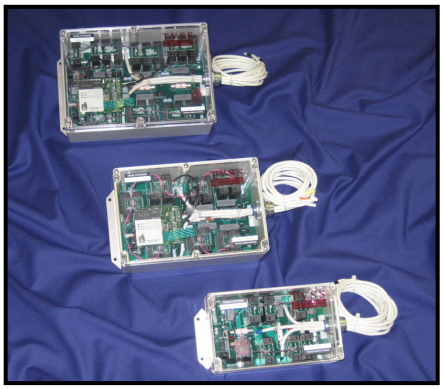
- Enhanced operating efficiency, equipment reliability, availability, and improved on-time deliveries.
- Increased performance and longevity for all electrically powered systems (i.e., machine tools/systems, computer networks, security, HVAC equipment).
- Reductions in labor, overtime and maintenance costs, downtime and material losses caused by hardware damage and reboots/restarts.



Modular Surge Protective Device (SPD)
With Field Replaceable Modules
Typically Located at Electrical Service Entry

5 - Implementation

During the investigative site survey conducted at Commercial Machine, the electrical distribution system was reviewed and a scope of work was developed defining the surge protection equipment, location/ installation. Additionally, a grounding system checklist was completed, requiring verification/proper bonding/measurement of ground impedance at service entry, each distribution panel and the data-telcom grounds. The locations of the SPDs were based on equipment susceptibility and criticality to the operation and, in one instance, was based on isolation of surge creating equipment. Surge protection was placed on the branch panel feeding the welding equipment, providing isolation of surges generated by the welding equipment from the rest of the operation.



Compact, Non-Field Replaceable Surge Device (SPD)
Located at Distribution & Branch Panelboards

6 - The Bottom Line: 6 Months ROI & Ongoing Dividends, Added Benefits of Improved Electrical Power Quality

Since Commercial Machine implemented surge protection, substantial improvements in machine reliability/ availability and required maintenance and service costs have been realized. The measurable increase in profitability, machine availability, and minimizing product disruption demonstrate dramatic improvements.

Expense history during the 29 months prior to surge protection installation (March 2003 through July 2005):

- Maintenance/service call expense (monthly average) $ 989
- Machine downtime/service issues (monthly average) $ 680
- Lock-ups/reboots/restarts (monthly average) $ 667

Totaled monthly costs *$2,336*

Surge protection was installed August 2005 and was monitored from September 2005 through January 2009 (installed for 40 months, 6 months payback time = 34 months of typical $2,336 savings/month = $79,424 of continuing profits through January 2009).

Total surge protection and installation costs were $13,840 (equipment $11,125 and installation $2,715). Return on investment (ROI) was 5.92 months ($13,840 ÷ $2,336).

Addressing power quality is a very viable alternative to just "fire-fighting" when inadequate machine performance begins to affect quality, delivery and possible customer relationships. The rewards of identifying and correcting root

causes of power quality problems are ongoing for machine tools of today and tomorrow.

Surge protection is a trade-off between the cost of maintenance/repair, equipment replacement, downtime/interruption and the investment in reliable surge protection.

To Improve Maintenance Expenses, Uptime and Availability send historical maintenance costs and electrical distribution panel schedule, connected equipment and relative locations within the facility to THOR SYSTEMS for evaluation. Immediately following a review of the facility/ maintenance information, a complete scope of work, equipment proposal and defined installation guide will be provided for consideration.

7 – Summation

Improving electrical power quality with the application of surge protection in the metalworking industry provides ongoing substantial cost savings and enhanced productivity. How these issues are identified, prioritized and corrected separate the companies in today's highly competitive world.

Bob Jones, founder and president of Commercial Machine, contacted THOR SYSTEMS again in November 2008, following a severe electrical storm. A replaceable component had failed in the service entry surge protection unit. The component was replaced by THOR SYSTEMS at no charge (40 months after initial installation). This was the *first* electrical problem experienced since the surge protection installation at his facility and there was no damage to any of his metal working equipment.

THOR SYSTEMS offers a wide range of surge protection and power quality site-specific solutions, requiring a capital investment with a typical one year or less Return on Investment (ROI). All of our products are designed to improve efficiency, eliminate downtime and protect mission-critical electronic equipment. Our solutions are installed in critical locations, i.e., protecting electrical service entrances, distribution systems, and data/telecommunications systems.

To improve Power Quality and Profitability, call us toll-free at 877/298-1100 or visit our Web site www.ThorSystems.us.

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