



THOR SYSTEMS, INC.

SURGE APPS SA-019: ID/REALIZE PROFIT OPPORTUNITIES

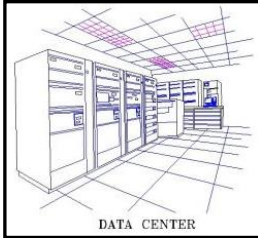
(Guidelines and application tools to promote improved Power Quality)

3621 Saunders Avenue
Richmond, VA 23227-4354

Identify & Realize Profit Opportunities

UNDERSTANDING THE PROBLEM

You may ask, "What common problems and related expenses are found in industrial facilities, airports, wastewater treatment plants, office buildings, hotels, hospitals, military installations, Federal and State Government buildings?" *All are subjected to the effects of poor electrical Power Quality (PQ).*



Nothing affects profitability as instantly and dramatically as unscheduled **downtime** (intermittent or longer-term), **system failures**, and loss of equipment or process **availability**. Electric power quality problems cost United States industry over \$100 billion annually.

Ref. Standards:
 UL 1449 4th Ed.
 UL 1283 5th Ed.
 C62.41.1: 2002 IEEE
 C62.41.2: 2002 IEEE
 C62.45: 2002 IEEE
 C62.62: 2010 IEEE
 C62.72: 2007 IEEE
 NEC 2014
 NFPA 70
 MIL-STD 220A

- Cost by sector:
 - 73% commercial (14.9 million small and large businesses)
 - 25% industrial (1.6 million facilities)
- Inexpensive components (circuit cards, chip sets, etc.) cause large financial losses.



- Factors which increase susceptibility of equipment/systems:
 - Large capital investments in commercial and industrial automation with embedded, sensitive electronic logic;
 - Magnitude/frequency of electrical transients (surges) worsen dramatically with increased use of electrical equipment;
 - Large scale integration and miniaturization of electronics in computers, communications and factory automation significantly increase sensitivity to poor PQ.

Results of Poor Power Quality:	Sources of Poor Power Quality:
<ul style="list-style-type: none"> • System upsets, lock-ups, or reboots for no apparent reasons • Premature equipment, hardware and logic card failures • Corrupted and lost data • Motor failures requiring rewinding or replacement • Interrupted production causing material and capacity losses 	<ul style="list-style-type: none"> • Internally generated transients: 80% of voltage surges and transients are caused by changes in electrical demand (starting and stopping of electrical motors, machine processes, computers, printers, elevators, pumping equipment, HVAC systems, etc.) • Externally generated transients: 20% of electrical problems are caused by external sources (lightning, utility grid switching, high winds causing power line arcing, electrical accidents, etc.)

HOW MUCH IS POOR POWER QUALITY COSTING YOUR COMPANY?

Expense Analysis ~ Identifying Investment Opportunities. More businesses are in highly competitive markets requiring them to identify opportunities to ensure competitiveness and increase profitability. Successful organizations relentlessly analyze data to understand what drives their expenses and profitability.

Classify expenses which can be converted to future profits. Surge protection is a trade-off between repair costs, equipment downtime and process interruptions.

How to start. Estimate the savings; add the costs from the categories below. Implementing site specific surge protection can yield a 30-70% reduction of these costs.

Maintenance Expense Categories:	Miscellaneous Expense Categories:
<ul style="list-style-type: none"> • Switchgear/distribution; emergency and mission critical power equipment; motor controls; motor rewinding or replacements • Building management/lighting controls systems • Telecommunications equipment • Office equipment (computers/servers/printers, copiers, etc.) • Elevators/escalators and HVAC systems • Security/fire detection and suppression 	<ul style="list-style-type: none"> • Lost operating efficiency • Poor equipment/system availability and longevity • Unnecessary equipment lock-ups/reboots/restarts • Increased inventory to bridge process interruptions • Late product deliveries

Business "strategy" addresses long-term guidelines for increased profitability. Improving PQ is a tactic to expand profits through reduced maintenance costs, increased equipment life, and enhanced operational efficiency. A recent study indicates *the average office building experiences 106 electrical PQ problems in a typical month.* In new construction or renovation, many power disturbances can be eliminated with surge protection.



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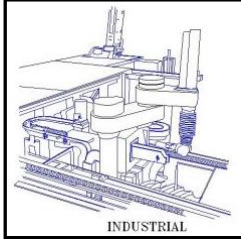
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IMPROVING BUSINESS CONTINUITY CONVERTS OPERATING EXPENSES TO PROFITS

The Solution: An Affordable Annuity. The application should match the Surge Protective Device (SPD) to the installation parameters and the electrical environment of the facility. Installation factors to consider: Criticality of equipment/process to the business; cost and time to repair critical equipment; and SPD locations and appropriate sizing.



A cascaded installation with SPD units at the Service Entrance and downstream at the protected equipment panelboards is required for effective surge protection. Cascading provides protection from **externally generated transients** and **internally generated transients**.

Susceptibility is often referred to when describing the ability of an installation to be affected by surge events. Susceptibility is defined by geographic location, electrical system size/location, and the electrical configuration.

Risk Assessment. THOR SYSTEMS has developed a “Site Risk Assessment Guide” (pictured at the right) to determine the appropriate surge protection for specific applications within a facility.

Improved Power Quality Cost. The cost to install surge protection is normally less than 0.25% of the cost of construction with a typical return on investment (ROI) of one year and often less than **six months**. After initial payback period, saved expense costs become **profit annuities** year on year.



The image shows a detailed 'SITE RISK ASSESSMENT' form. It includes sections for 'Assessment Criteria Selection', 'System Voltage', 'Distribution System Configuration', 'Short Circuit Current', and 'SPD Location'. There are also tables for 'Table 10' (Nominal Total Residual SPD kA/Mode) and 'Table 11' (Nominal Total Residual SPD kA/Mode). The form is filled out with specific data for a facility, including a 'Model Number' and 'Install Location'.

SURGE PROTECTION IS AN INVESTMENT OPPORTUNITY

Implementation. Schedule a THOR SYSTEMS Site Visit/Evaluation. During a site visit we will verify the electrical service/distribution and data/communications systems’ ground integrity, review historical maintenance/miscellaneous costs, and record a measurement of the electrical service ground resistance. Following a site visit, we will recommend solutions to improve your power quality and enhance your profitability, with a detailed equipment proposal and defined installation guide.

Results. THOR SYSTEMS’ power quality solutions will help you achieve your company’s objectives by detecting and eliminating power quality problems affecting your business and provide:

Improvements in Profitability:	Reductions in Expenses:
• Business continuity/operating efficiency	• Labor, overtime, and maintenance costs
• Equipment/system availability and longevity	• Equipment downtime
• Customer relations by improving on-time deliveries	• Equipment repair and replacement
• System and equipment connectivity	• Production material losses caused by unnecessary reboots/restarts

THOR SYSTEMS’ commitment goes beyond the manufacture of the product. We are dedicated to ensuring proper **site evaluation**, sizing and recommending surge protection for **electrical distribution** and **data communications** equipment, as well as implementing and commissioning these products.

PRODUCT OFFERINGS. THOR SYSTEMS’ products range from large facility service entrances to primary and secondary building distribution systems, including computer rooms and data processing centers as well as manufacturing, process control, small business systems and residential equipment.

Ref. Documents:

- SA-001 Introduction: Why Thor Systems?
- SA-004 Risk Assessment/Sizing SPD
- TSI 067 Site Risk Assessment Guide
- TSI 0119 Site Risk Assessment Spreadsheet
- TSI 068 Product Overview
- TSI 107 Design/Build Spec
- 3G TSr Product Spec Sheet
- 3G TSn Product Spec Sheet

Thank you for your interest in THOR SYSTEMS, INC. We would like to become an information resource for surge protection applications. THOR SYSTEMS offers products and services that provide protection from the more *obvious external* to the more *frequent internal* transient voltage sources. Our consistent focus on improved product performance and increased value to the customer is conveyed by our products’ transparent cover enclosures, showcasing the TILE Architecture, unique component configurations, and providing per mode status indication.

Should you have any questions, please feel free to contact us (804.355.1100) or visit our Web site, www.ThorSystems.us.