

SPEC-HARDENED SYSTEMS

Anthony A. DiBiase
EMC/Product Safety Consultant
119 Larkwood Drive
Rochester, New York 14626-4270

Tel: (585) 225-2857
Cell: 1-585 259-8556
E-mail: shsesc@aol.com
Fax: (585) 225-2857

Web sites: + members.aol.com/shsesc/myhomepage/index.html
+ www.irgnet.org

Bimonthly Newsletter EMC/Product Safety Notes Newsletter April 2006
Issue 47

Overview of the Fundamentals of Power Quality Management

A well-designed and executed power quality management program can significantly contribute to a company's long term bottom line. It will lower their electrical and electronic equipment's down time and malfunctions incidents. It will also decrease the company's energy costs and extend its equipment's functional life. Implementing a power quality management program in your facility is an important element that is vital to the effort directed towards meeting "Lean Manufacturing" objectives. Needless to say, facility-operating costs are reflected directly into the overhead costs that are included in the manufacturer's product costs.

Being technically competent in the area of power quality engineering is the Responsibility of the following personnel:

- Power utilities personnel
- Facility and facility maintenance managers within industry, medical, and educational institutions
- Local/regional governmental agencies
- Professional Engineers
- Electrical contractors and installer personnel
- Facility Engineers and Electricians
- End users of power management products

Power quality broadly encompasses the entire scope of interactions between the power supplier, the environment, and the user load systems/products. What this means is the delivery of clean power by the utility provider and the maintenance of this clean power from the source to the end use load. This involves the design, selection, and installation of all hardware and software in the power system directed at maintaining a high degree of power quality. Each element in the power system can effect the performance of the total system. There is a whole menu of disruptive factors that can degrade a power system's performance.

These include:

- Electromagnetic Interference both electric and magnetic fields
- Total Harmonic Distortion, primarily produced by no-linear loads
- Lightning both direct and indirect
- Electrostatic Discharge(ESD)
- Electrical Fast Transient/Burst(EFT)
- Voltage dips, interruptions, blackouts, and brownouts
- Voltage and current surges
- Neutral currents in wye systems loads
- Flicker that is produced by low frequency periodic high current demand loads
- Short duration transients superimposed on the mains waveform
- Power factor effects on power system loads
- Over voltage conditions

Individually or in combination of these power quality factors can cause degradation in the main's power system.

There are many mitigating methods and types of hardware that can be applied in correcting power quality problems.

These include:

- Uninterruptable Power Supplies(UPS), on-line and standby
- Transformer/inductor components this category includes line reactors, ferroresonant power conditioner, isolation transformers, and voltage regulators(tap changers)
- Backup motor/generator sets utilized mostly for critical loads
- Fuses, circuit breakers, and fault detectors
- Other factors that will improve power quality are, optimizing the system's grounding design and the conducting of a site survey to identify problems and taking the required corrective action

Managing a power quality program requires that the responsible personnel have a thorough understanding of the theory and practical engineering factors that effect a facility's power system. Power quality problems are on the rise; equipment and its application are increasingly becoming more sensitive and critical for a manufacturer's production requirements. There some essential elements that must be included in a power quality management program. These include an in-house total review of the present system, a study of the site survey data, and an identification of the power quality improvements that must be made to correct problems that are identified. The manufacturer should conduct a cost/benefit study before selecting the mitigation schemes required to optimize his power system

Factors to considered in the selection of the most cost effective approach in achieving the power quality management goals include:

* Energy costs

* Capital equipment replacement costs

- * Maintenance expenses
- * Staffing level reductions achievable
- * Productivity losses
- * Payback period

Implementing a robust power quality management program will produce immediate cost savings and significant long-term returns.

NEWS BRIEFS:

(1) Important Factors Associated with Military EMC Programs

Military EMC compliance is essentially based on a system's approach rather than a box-level approach typically used for commercial products. For obvious reasons EMC military standards requirements are closely tailored to their demanding end use environments and the need for them to maintain a high degree of reliability. The military equipment many times operate off a poor power quality source. Therefore, EMC issues become a more essential component in the system's design.

Military system's EMC requirements are discussed in document Mil-Std- 464A that covers EMC of the equipment with external environments within the system's platforms. Since EMC issues directly relate to safety factors, more so in the presents of ordnates, it is given the up most priority. Tests to be conducted for military equipment EMC are specified in document Mil-Std-461E and testing configurations and test conditions are specified in document Mil-Std-462. There is a one to one correspondence between the two documents. Tests specified in document Mil-Std-461E include conducted emissions, conducted susceptibility (immunity), radiated emission, and radiated susceptibility. In some cases special system's tests are required for certain types of equipment and environments.

Most military projects require that the contractor to prepare an EMC Program Plan as a condition of their contract. The EMC Program Plan delineates the project's organizational structure and specifies EMC related tasks that must be accomplished in order to meet the program's objectives. Also required is a Test Program Plan that specifies equipment to be EMC tested, testing setups, data reduction methods, and the test facility to be utilized in performing the testing, along with scheduling information.

EMC in military applications is a complex endeavor, far more so then that with commercial equipment. The contractor must pay due diligence to the EMC requirements early on and throughout the system's development effort. Following this philology will limit the military system's schedule delays and project costs.

(2) Update of the People's Republic of China(PRC) CCC Mark Requirements

The regulatory compliance system for EMC and Product Safety in the PRC in moving forward at a steady pace. Many people are not fully cognizant of the fact that there is a two-way path for products flowing to and from the PRC. American manufacturers must be knowledgeable on how to ship and sell to PRC. China's certification procedure requires the manufacturer to obtain the CCC Mark before exporting or selling his

products in the Chinese market. To demonstrate compliance to the CCC Mark Directive's requirements the BG (IEC/EN) standards must be utilized.

The following is a list of the more important elements contained in the CCC Mark system.

- (1) Certification testing must be conducted in one of the close to 100 PRC's testing laboratories
- (2) Documentation must be in the Chinese language(Mandarin)
- (3) There is currently 160 products divided into 33 categories that are subjected to the CCC Mark certification requirements.
- (4) The CCC Mark system has a very high Quality Assurance content, manufacturers facility inspections and periodic audits are required
- (5) A manufacture must as a first step determine whether his product is in the technical exemption category before spending more time on his certification effort
- (6) The CCC Mark system generally does not permit self certification or the use of a third party's testing results to demonstrate compliance to the CCC Mark requirements

Due to the expanding technological activities in PRC the IEEE board of directors are considering opening an office in the PRC. Other current events in the PRC include their increased emphasis on environmental issues. Recently the China's Ministry of Information for Industry released the deadline for compliance to the European Union's RoHS Directive. This directive restricts the use of certain hazardous chemicals in products sold in PRC. The deadline date for compliance to this directive is set for March 2007. The Chinese government is moving in the direction of more control over the domestic environmental pollution situation. Their efforts include establishing new domestic environmental regulatory requirements. Also, they are attempting to move their economy from high polluting prone industries such as steel making to an economy based on less polluting hi-tech industries such as computer manufacturing.

Complying to the requirements of the PRC's CCC Mark system's requirements can be costly, time consuming, and confusing, but entering the PRC market's huge potential may be well worth the effort and cost.

Spec-Hardened Systems is available to assist your company in meeting its EMC and Product Safety, design, training, and regulatory compliance requirements. It specializes in EMC design reviews of High Speed Digital Circuits.

Spec-Hardened Systems is a leader in providing cost effective EMC and Product Safety consulting services. Quotes will be provided upon request. Turnkey certification management and pre compliance product evaluation services are available.

Next Issue Topic will be:

“ The effects of EMC, Product Safety, and Environmental Regulatory Compliance Required Design Modifications impact on the Product's final Compliance Requirements”

ANNOUNCEMENT: Power Quality Management training is now available from Spec-Hardened Systems