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Static Digest

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By Tim Jarrett

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Benchmarking Helps Medical Device Manufacturer Develop World Class Static Control Program



At Boston Scientific Corporation's Arden Hills, Minn., plant, an operator in the Cardiac Rhythm Management Group inspects a medical device assembly. The plant is equipped with 3M flooring and constant monitors as part of a benchmarking process based on the industry's highest standards for static control.

Electronic components in medical devices, like those in aerospace and military applications, are highly sensitive to electrostatic discharge (ESD) during manufacturing. Boston Scientific's Cardiac Rhythm Management (CRM) Group protects its cardiac devices from electrostatic energy through an ESD quality program that relies on benchmarking.

Boston Scientific: A World Leader

Boston Scientific Corporation, one of the largest medical technology companies in the world, develops and manufactures medical devices used in a broad range of specialties from cardiology and neurology to urology and gynecology. In 2006 the company expanded its global leadership in cardiac devices with the acquisition of Guidant, a company best known for the manufacture of defibrillators and pacemakers.

The CRM Group has design engineering and manufacturing sites at Arden Hills, Minn.; Redmond, Wash.; Clonmel, Ireland; and Dorado, Puerto Rico. The largest is the Minnesota campus with 3,000 employees in nine buildings on 100 acres.

Static control has been an important issue in the manufacture of cardiac devices for the past three or four decades. (Guidant originated in the Twin Cities area in 1972 as Cardiac Pacemakers Inc. and was purchased a few years later by Eli Lilly before being spun off in 1994.) At least as far back as the 1980s, manufacturing personnel wore wrist straps connected to ground to safely dissipate static energy on their bodies.

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As the technology changed and the sensitivity of components grew, static control became increasingly important. In the mid-1990s, as the business expanded, static-protective flooring was installed in new spaces and personnel in those areas wore special ESD footwear. In addition, continuous monitors were installed at workstations to ensure wrist straps were always connected to equipment ground.

ESD-protected Areas

CRM facilities designate all areas where customer (patient) products are handled as ESD-protected areas. Because personnel stand much of the time and operate multiple pieces of equipment from the back end to the front end of the manufacturing process, personnel in these areas have the option to use a flooring/footwear system as a first line of defense against ESD (primary ground). Roughly 45,000 square feet of the flooring in the Minnesota plant is covered with 3M™ Static Control Floor Tile 8400.

Either the flooring/footwear system or the continuously monitored wrist straps would meet ANSI/ESD S20.20, the industry's highest standard, but using both provides extra confidence in personnel ground integrity.

All personnel in manufacturing and design engineering wear ESD wrist straps that are continuously monitored. Although humidity is controlled year-round in ESD-protected areas, the skin can be extremely dry in Minnesota winters, when temperatures often dip below freezing. Personnel arriving in the morning and coming in again after lunch may have little instant moisture between the skin and the wrist strap, which can make grounding intermittent.

To prevent that problem, workers plug into 3M Continuous Monitors 724, which are installed at every workstation and other locations where personnel grounding may be needed. If wrist strap contact to the wearer is lost, the monitor alerts the wearer to check the wrist strap and restore the connection to the grounded system. 3M monitors use a resistance loop for reliable grounding of personnel. Essentially, there is no guessing about whether the wrist strap is making contact with the person's skin.

Either the flooring/footwear system or the continuously monitored wrist straps would meet ANSI/ESD S20.20, the industry's highest standard, but using both provides extra confidence in personnel ground integrity.

As part of the static control program, every work surface is static dissipative, specially marked for ESD use and properly bonded to equipment ground. A bench top ionizer is in use at every workstation to neutralize static charge that may build up on work-related or process essential insulators. Devices are stored and shipped in 3M moisture barrier bags or static shielding bags, based on the manufacturing or device transport process.

Testing, Verification and Training

The CRM Group conducts initial and periodic verification testing of ESD protective materials and equipment. Before purchase, these items are qualified against ESD Association standards. During use, their performance is verified periodically through an in-house Equipment Dispatch Monitor System. (This system uses a team of 15

trained technicians to install all new ESD equipment, move it when processes change and perform verification testing.)

Personnel test their ESD footwear multiple times each day and perform a functional test daily on their continuous monitors (connect, disconnect, reconnect looking for green light, red light and green light). Packaging is tested in the incoming inspection department, and ESD-safe garments used in all production areas are cleaned and then tested at the cleanroom laundry service.

In addition, personnel must understand how ESD can damage components and how their daily procedures can prevent it from occurring. CRM employees receive training when first hired, using a computer-based program developed in-house. They repeat the training once a year afterward as a refresher course. Employees also understand that they can ask questions and get individual assistance when necessary. A random internal assessment of manufacturing personnel and processes is also performed on a weekly basis to ensure the proper use and application of ESD protection equipment.

Benchmarking

Because cardiac devices are used in the human body, manufacture of these devices must meet the highest standards. CRM facilities received ISO certification in the early 1990s and undergo regular audits by the U.S. Food and Drug Administration.

For static control, the CRM Group uses a benchmarking process. Benchmarking is basically figuring out who's the best, who sets the standard, and how to meet or beat the standard. For CRM, the benchmarks are ANSI/ESD S20.20 and IEC 61340-5-1, set by the National ESD Association and the International Electrotechnical Commission.

Benchmarking requires comparing one's own program with the best in the business. The CRM Group continually measures its static control program against others through interaction with ESD Association Standards Committee professionals and EOS/ESD Symposium participants. In addition, local ESD Association chapter members representing other organizations in similar manufacturing environments visit CRM facilities (and vice versa) to observe and compare static control practices.

Through this process, the CRM Group has determined that its static control program is best in class compared to any part of the electronics manufacturing industry. Further, feedback from other electronics companies indicates that they use Boston Scientific's static control program as a world class benchmark for their own programs.



About the author:

Tim Jarrett has worked in the static control field for more than 20 years. He began with Control Data Corporation in its ESD Equipment and Materials Evaluation Lab. After several years, he joined Cardiac Pacemakers Inc., which eventually became part of Boston Scientific's CRM Group. A NARTE-certified engineer, he has been an active member of the ESD Association Standards Committee for more than 10 years and is currently chair, responsible for the development of all the committee's activities. He has served on the EOS/ESD Symposium steering committee, written and presented symposium papers, and is in his second term on the association's Board of Directors.

New 3M ESD Pro Offers Easy Way to Identify ESD Events

Despite the best traditional control programs, electrostatic discharges (ESD) may still occur – and those can be disastrous on sensitive components. The new 3M™ ESD Pro offers a quick and easy way to identify static events and verify effective control.



The new 3M™ ESD Pro provides a quick and easy way to diagnose ESD events and verify that your controls really work. Its portability allows you to detect ESD events almost anywhere – process steps, tools or materials.

When held near a suspected ESD source, such as an IC handler, for example, the ESD Pro will indicate ESD events (if any) with their relative strength and provide alarm and event count for the discharges above a set threshold. In doing so, the instrument is capable of weeding out most EMI (electromagnetic interference) events emitted from such equipment as step motors, solenoids and relays.

As a result, you can locate ESD problems and implement appropriate controls, often at a cost savings over a blanket-control approach. By reducing static discharges, you may ultimately improve yields and boost profits.

Increasing Sensitivity Calls for Measurement and Analysis

The increasing ESD sensitivity of electronic components and devices in recent years has led the industry to recommend greater attention to protective handling procedures. But unless you can spot and measure actual ESD events, you have no way of knowing whether the environment is safe. You may install expensive – and perhaps unnecessary – controls in all the wrong places and have no information about whether they really work.

The ESD Pro enables you to obtain evidence about ESD events, helping you better understand and equip the manufacturing environment. If the instrument indicates discharges in the tray-to-chip-to-board application, for example, you can begin to isolate whether the problem is the tray, tweezers, mat or something else. You can take steps to correct it and then verify the improvements.

ESD Pro separates and rejects EMI events using a patent-pending signal processing methodology. This capability minimizes the possibility of false positives from EMI events, thus improving the accuracy of detected ESD events and allowing the appropriate choice of controls.

If you need more precise information – specifically, the measured strength and timing of ESD events – you can opt for a complementary tool, the 3M™ EM Aware. If you need recorded values of discharges, the 3M EM Aware also offers the option of continuous data logging and monitoring. Another companion tool, the 3M™ Ground Pro, measures ground integrity, including EMI and voltage in ground lines.

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New Tool Offers Flexibility

The 3M™ ESD Pro is a hand-held, battery-operated ESD event indicator. Its portability allows you to use it every day and almost anywhere in the workplace to detect ESD events.

You can observe the relative strength of each ESD event and adjust the threshold setting to emit an alarm on only those static events occurring above a given level, depending on the sensitivity of the components or devices being handled or assembled. In addition, the counter of ESD events gives you a count of discharges exceeding the set level.

Why Use ESD Pro With Traditional Static Detectors?

The ESD Pro uses technology much different from traditional measurement instruments such as static field meters and voltmeters. First, the presence of static voltage does not mean that a discharge has occurred or will occur. Second, a discharge is really a rapid flow of energy, and traditional devices are too slow to notice such energy flows or measure their strength.

The ESD Pro gives you a way to quantify ESD events and link them to specific steps in the manufacturing process and to specific tools and materials used.

To order or obtain more information, contact a 3M manufacturer's representative or an authorized distributor and ask for ESD Pro, model number CTM082. Or call 3M Electronic Solutions at 1-866-722-3736. See www.3M.com/static or www.credencetech.com/products.

See New Product Catalog on 3M Static Web Site

3M Electronic Solutions Division has issued a new product catalog that contains all the 3M legacy static control products along with those of 3M Sanford (formerly SCC Products, Inc.) and 3M Santa Cruz (formerly Credence Technologies).

A key feature in the catalog is the selection guide for each product family.

You can download the electronic copy at www.3M.com/static. You can also contact your authorized 3M distributor or sales representative about a hard copy.

How sensitive are your products?

Knowing the ESD sensitivity of the components or devices you handle is an important step in detecting ESD events and analyzing the potential for damage.

Contact your 3M representative for help in determining sensitivity and suggesting possible locations of ESD events.



3M Overhead Air Ionizer – Fast and Effective



The 3M™ Overhead Air Ionizer 991 rapidly neutralizes static charge on objects within an area roughly 2 feet by 4 feet. Its ion generating system stays in perfect balance indefinitely, improving process time and yield.

What makes an ionizer effective? Two things: 1) its speed in neutralizing static charge and 2) its ability to maintain ion balance.

The 3M™ Overhead Air Ionizer 991 wins on both counts. First, the steady-state DC ion generator blows a constant stream of ionized air that neutralizes static charge within seconds, preventing ESD events.

Second, the ionizer maintains ion balance indefinitely, never needing calibration or adjustment. A proprietary ion generation system ensures the production of equal levels of positive and negative ions, despite variations in line voltage, fan speed and emitter point condition.

The 991 ionizer requires only periodic cleaning of emitter points. The points do not have to be replaced when cleaning, and adjustment is not necessary afterward.

Frees Up Work Space

The 991 ionizer, mounted above the work area, frees up valuable space on the workbench. It blankets an area roughly 2 feet by 4 feet, neutralizing charge on process-essential items made of plastic or other insulative material that cannot be grounded.

You can choose high or low fan speeds to control air flow and sound, providing a more comfortable work environment.

Other Models: Benchtop and Air Gun

3M offers three other ionizers. Two are benchtop models, the 963 and the smaller 960, which blow ionized air across a work surface. A third type, the 980 hand-held air gun, blows particulates off sensitive items.

For more information, contact your 3M manufacturer's representative or an authorized dealer. Call the 3M Electronic Solutions Division at 1-866-722-3736, or search under Products at www.3M.com/Static.

**3M Static Control
Customer Service**

1-866-722-3736

3M Mats and Runners Lessen Worker Fatigue

Alleviate worker fatigue caused by standing for long periods with the 3M™ Anti-Fatigue Mats and Runners 9900.



Bottoming-out occurs when the mat material is fully compressed.



A construction of small, hollow cylinders in the 3M™ Anti-Fatigue Mat 9900 allows cushioning support while standing and springs back after shifts in weight or sudden movements.

The mats and runners resist bottoming-out, or hardening, when compressed, yet are optimized for just the right cushioning and stability. That's because the mat interior consists of small, hollow cylinders that function like a spring when compressed. They spring back quickly when weight is shifted and absorb the shock of sudden movements.

The springy response helps facilitate blood flow to and from working muscles, improve posture, and maintain body balance.

Manufactured from durable rubber, the mats resist slippage on the floor, and their beveled edges reduce the risk of tripping.

The cushioning reduces stress on the spine and lower back muscles, issues that can affect the long-term health of employees. A feeling of physical well-being can help raise morale and improve productivity.

The mats and runners are conductive, providing excellent ESD protection. They are durable and easy to clean.

The mats come in a standard size, 3 feet wide by 5 feet long, as well as octagonal, with a 22-inch diameter. The runners are 3 feet wide and cut to custom lengths. Each mat has a 10 mm snap and comes supplied with a 15-foot 3M Ground Cord 3040.

For more information, contact your 3M manufacturer's representative or an authorized dealer. Call the 3M Electronic Solutions Division at 1-866-722-3736, or search under Products at www.3M.com/Static.

ESD Association Offers Training at 3M Austin

3M Electronics hosted three courses for the National ESD Association:

- April 22: ESD Standards Overview for the Program Manager
- April 22: Packaging Principles for the Program Manager
- April 23: EOS/ESD Failure Models and Mechanisms

For the association's complete 2008 training schedule and registration information, see <http://www.esda.org/documents/2008EducationSchedule.pdf>



Mary Beth Tempesco

Get Connected With 3M Staff

Mary Beth Tempesco, customer service supervisor for Static Control Products in Sanford, North Carolina, joined 3M in 2006 as part of the SCC acquisition. She is responsible for a six-member customer service team including four domestic and two international representatives. In this role, Mary Beth serves as a liaison between 3M customers and manufacturing.

Since her team is located at the plant, they have the advantage of being able to work directly with the scheduling and planning teams. What is Mary Beth’s favorite part of her job? “Knowing we offer a quality product with a short lead time.”

Contact her at mbtempesco@3M.com.

3M ESD Instrumentation Leader Gives Technical Papers at Two Asia Conferences



3M Electronics Instrumentation Director Vladimir Kraz describes ESD exposure to sensitive devices at the 2007 Taiwan ESD Conference Nov. 5.

Vladimir Kraz, instrumentation leader in 3M’s Electronics Solutions Division, gave technical papers at two recent conferences in Taiwan and Japan.

He gave a presentation, “ESD Exposure to Sensitive Devices During Device Packaging and Assembly,” at the 2007 Taiwan ESD Conference in Hsinchu, Taiwan, Nov. 5. The paper was one of a few chosen from the conference for publication in the Chinese-language *Electronic Monthly*.

He presented a summary of revision work on the SEMI E.33 EMC standard at the Dec. 5 workshop of SEMI Japan (Semiconductor Equipment and Materials International). The standard specifies electromagnetic compliance of semiconductor equipment and was last revised in 1994.

Kraz co-chairs the SEMI E.33 standard task force and was invited by SEMI Japan to speak at the workshop during SEMICON Japan, the world’s largest exhibition of semiconductor equipment and materials, in Mukahari Messe – Chiba, Japan.

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New Manager Aims to Improve Sales and Service

Mark Keesling has taken over as customer and sales operations manager for static protective products, with the goal of making it even easier for customers to do business with 3M.



Mark Keesling

“We’re using existing best practices as well as making changes to further streamline our support capabilities,” he says. “We believe our customers will enjoy some of the highest satisfaction and confidence levels in the industry.”

Keesling joined 3M from SCC, where he designed and implemented programs that made SCC an industry leader in customer service and loyalty. He is applying this customer-centered operation and service model in all areas of the 3M static business. Additionally, he is using successful strategies from SCC to help customers solve other problems they have by using 3M’s broad product portfolio: traditional 3M products, instruments from the former Credence Technologies, and packaging from the former SCC.

Prior to SCC and 3M, he held positions in marketing, sales and product management with multiple companies. His tenure included stops with several small businesses as well as Xerox and General Electric.

He holds a B.S. degree in industrial engineering from North Carolina State University and an MBA from the University of North Carolina at Chapel Hill.

Contact him at 866-722-3736 ext. 1194 or mekeesling@3M.com.



Vladimir Kraz (second from left) and Brent Beamer (second from right) accept the Industry Contribution Award from two National ESD Association officers - president Kay Adams (left) and senior vice president David Swenson (right).

ESD Association Honors 3M With Industry Contribution Award

3M received the National ESD Association’s Industry Contribution Award at the EOS/ESD Symposium Sept. 20 in Anaheim, Calif.

3M was the only company singled out for its “lasting impact on the Association or the industry.” Awards also went to five individuals for their efforts in education, volunteerism and leadership.

3M was honored for providing “continuous support for numerous personnel to the ESD Association since the first EOS/ESD Symposium in 1979,” according to the association’s November/December newsletter. “An original participant in the ESD Association and the Symposium, 3M has been an active and significant supporter of standards development and has presented tutorials and technical papers.”

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