MILWAUKEE ELECTRONICS NEWS

CELEBRATING 60 YEARS

Q4 2015

IN THIS ISSUE

About Milwaukee Electronics

Milwaukee Electronics designs and manufactures custom circuit board assemblies for the medical, transportation, military, HVAC and a variety of other industries. The Company operates over 135,000 square feet of manufacturing in Portland, Oregon; Milwaukee, Wisconsin; and Tecate, Mexico. In addition to EMS and product design and engineering services, it offers quick-turn prototyping through its Screaming Circuits business unit.

Milwaukee Electronics
MANUFACTURING EXPERTS SINCE 1954

The Tecate and Portland facilities will shortly see SMT equipment upgrades.

Milwaukee Electronics Adds Capacity and Throughput

Milwaukee Electronics is adding two new SMT lines. The lines are on order and expected to be installed in Q1. In addition to adding capacity, the lines reflect the next step in the Company's technology roadmap. A cross-functional team comprised of representatives from all facilities was responsible for evaluating requirements and agreeing on a standardized equipment platform. Panasonic has been chosen as the equipment supplier best suited to the needs the team identified.

"We feel that standardizing on a single platform across all facilities for our volume

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Letter from Mike

We've reached the end of another year filled with both challenges and accomplishments. As we close the year, I'd like to focus on what we've learned from our latest customer survey. Participation was lower in our EMS-related surveys. This is a change from prior years and I'd like to reiterate that while we don't see individual customer data, the aggregate data influences investment decisions and organizational improvement initiatives. In short, we not only listen to this feedback—we act upon it.

We saw overall improvement in our performance scores relative to our customers' pool of other suppliers. Our Tecate facility

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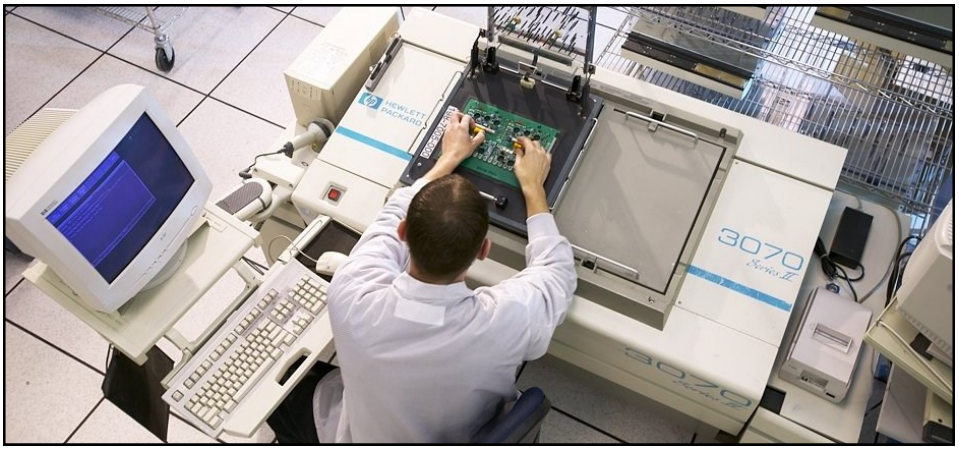
Engineering in Action

Best Practices in Design for Testability

As an engineering-driven company, the team at Milwaukee Electronics applies their expertise in many different ways to help customers improve their products. In this month's column we look at Design for Testability (DFT) best practices. DFT affects how components are selected, arranged, and integrates circuit-level testability for a printed circuit board (PCB). Its goal is to provide electronics manufacturers with a reliable, easy means by which to functionally test the workings of a fully assembled board – without requiring excessive amounts of time, cost or labor.



Design for Testability helps ensure optimum testability and lower the cost of test.

The physical design of a PCB has the biggest role to play in determining how easily, or how difficult it will be for a completed unit to undergo an in-circuit test. There are three stages in implementation of DFT during a PCB design and layout process:

- Establish what connections on the circuit board will be necessary for an in-circuit/MDA test system from an electrical standpoint.
- Determine the mechanical requirements of board alignment, and how to provide areas for test probes to make contact with the PCB.
- Generate the appropriate data for fixture fabricators and test programmers (in an efficient format) to equip testing machinery.

For full coverage of all components and connections, a test system needs electrical access to each node (or 'net') on the circuit board. A node is one electrical connection on a PCB, it consists of either a pin or a lead – and is connected, (via conductors) to at least two discrete components on the board.

Conventional in-circuit testing equipment uses a series of carefully placed spring probes sitting inside a 'bed of nails' style test fixture which is uniquely paired to a single corresponding PCB unit, or a multiple-unit panel.

This specially-made fixture makes physical contact with pre-selected probe targets on the PCB, which allows the test system to inspect for anomalies and defective components. DFT and the in-circuit testing processes it supports enable electronics manufacturers to

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Letter from Mike

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showed the highest improvement in performance rankings, followed by our Milwaukee facility. Our Portland facility saw a slight decline in performance scores for the first time in several years. As with last year's survey, short lead-times and a need for cost reduction were listed as major challenges for our customers. Not surprisingly, the top area in which respondents would like to see us invest was lead-time reduction, followed by equipment.

As I mentioned, we pay close attention to the survey data. As you will read elsewhere in the newsletter, we have two Panasonic SMT lines on order which will be installed in our Tecate and Portland facilities in Q1. A cross functional team from across the company selected the equipment as the best option for both increasing capacity and improving throughput. The purchase of this state-of-the-art equipment is in response to customer feedback about future needs.

Our goal has always been to produce perfect product. We've also felt maintaining a strong engineering capability was an important part of providing a differentiated solution to our customers and survey data continues to reinforce that. The overarching message we get quite clearly this year is that speed has become as important in EMS as it is in our Screaming Circuits' customer base. We set the standard in that area in prototyping and we are committed to raising the bar in that area in EMS over the coming year. The systems investments we've made over the prior two years and the equipment investments being made now provide an excellent foundation for achieving that goal.

As we enter the holiday season, I'd like to extend my best wishes for a Merry Christmas and a happy, healthy and prosperous 2016. I truly appreciate the support and good wishes our customers, suppliers and team members have provided over the past year.

P. Michael Stoehr

President & CEO

Milwaukee Electronics Sees Sales Growth in Two Areas

Business is increasing Milwaukee Electronics' Tecate facility in existing accounts. A manufacturer of traffic signaling devices co-located in the same industrial park has awarded a project expected to represent $5-$10 million in additional business at peak volumes. A board-level green energy power management project is expected to represent another $1-$5 million at peak volume. That customer has awarded an initial volume order representing approximately $1 million. Internal production in support of products Milwaukee Electronics private labels for customers is also expected to grow.

"Growth of existing projects was the main driver behind our decision to add another SMT line in Tecate. We are seeing solid business growth in Tecate," said Jered Stoehr, Vice President of Sales and Marketing.

Another area where Milwaukee Electronics' business continues to grow is in business that starts as engineering projects.

"We continue to see good progress in our design-to-EMS conversions. Trust is built during product development as our engineering team helps their teams solve challenges. Since we offer a full lifecycle solution, our prototype and EMS services are logical next step for many of these customers. The downside can be longer time to develop into volume production. However, we now have a growing pipeline of these projects beginning to translate to EMS business," said Scott Pohlmann, Senior Director of Business Development.

Much of the manufacturing growth in Tecate is driven by existing customers.

One project in this realm has recently been awarded. The product is a power over Ethernet LED lighting system. That project is a three-PCBA set. The purchase order for the engineering build of the first PCBA has been received and the rest are being quoted. Production is targeted for Q2.

Engineering in Action

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promptly catch defects after the stages of electronics assembly have been completed and achieve consistent results in their PCB assembly operations.

Key DFT best practices during the PCB design and layout process include:

- Appropriate placement, spacing, and sequencing of probe targets which provide a reliable electrical connection to each board 'network'
- Detailed examination of each component body size, spacing, height, and verification of visual/mechanical accessibility to all components
- Integration of tooling holes, also known as 'alignment holes' – which mate with test fixture guide pins, for accurate positioning within the system
- Adopting as compact a board size as possible because fewer test points result in less costly testing equipment and reduction of large-board related problems (such as board-flex during vacuum fixturing)
- Optimizing the shape of the PCB because board outline shapes that are rectangular in nature are more economical to fixture
- Restricting the number of necessary routed openings on the PCB so that minimal gasketing is required
- Eliminating open holes (such as unmasked or unsoldered vias).

As a comprehensive set of techniques to reliably, economically, and quickly test circuit boards, DFT provides an important way for the electronics manufacturing services (EMS) providers to balance the ever-increasing pace of consumer demand and product complexity.

Milwaukee Electronics' blog contains a number of best practices articles and can be accessed here.

New SMT Equipment

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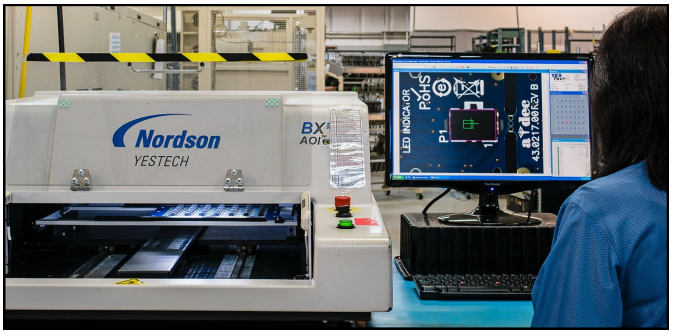
production requirements makes good sense. It facilitates smooth transfer of work for customers wishing to have product manufactured in multiple facilities, simplifies maintenance training and over time it will contribute to increased flexibility in capacity planning," said Rick McClain, Chief Operating Officer.

The team identified several areas where Panasonic's platform offered specific advantages to all facilities. First, setup can be done easily and rapidly offline using feeder carts. This allows the next job in line to be loaded while the earlier job is still running. The feeder cart system enables docking of a set of feeders vs. having to individually load and unload feeders into the machine. The 8 and 12 mm feeders have two lanes per feeder which doubles feeder capacity per cart. The cart system further cuts changeover time.

The equipment includes intelligent tape feeders, which supports automated material verification and traceability data collection utilizing the Panasim software suite. The software will also be able to monitor utilization data. This will support increased traceability requirements for medical and other mission critical products, plus help with real-time line balancing.

This line also has an integrated new product introduction (NPI) software toolset which will help to provide additional design for manufacturability (DFM) recommendations to supplement what is already provided after each NPI. There is also an automated support pin placement tool which allows the machine to place the support pins used to hold the PCBA in correct position. This will help reduce attrition related to missed part placements since the PCBA will be located to the exact machine coordinates determined by the machine's programming.



AOI capability will also be upgraded in Tecate.

In Tecate, the lines will utilize Panasonic NPM-W placement machines configured as a chip shooter and part placer. These machines are optimized for medium mix, high volume production. The current screen printer and reflow oven will be kept. However, a new Yestech automated optical inspection (AOI) system, new Checksum 12KN test platform and a new automated conformal coating line are also on order.

In Portland, the SMT line will use Panasonic AM-100 placement machines. These machines are optimized for high mix, medium-to-low volume. Longer term, the same configuration will be added to Milwaukee. The primary reason for setting up the two machines identically was to facilitate line balancing. With the Panasim suite of software tools, the machines can be programmed to build two less complex printed circuit assemblies (PCBAs) simultaneously or do two placement cycles on complex PCBAs with higher part count.

From a placement size perspective, the machines can accommodate parts as small as 0105 and as large as 1-inch high. Current customer requirements don't require placement of parts smaller than 0201. However, the goal was to standardize on equipment capable of supporting the continuing trend toward smaller parts. The machines can also accommodate a variety of component packaging configurations including enhanced feeder sizes, trays and tubes.

There is also a 3D scanner for leadless parts to check coplanarity, BGA ball suitability and identify visible defects. The Portland facility places a lot of 4-pin and 6-pin switches that have had coplanarity issues and the machines' ability to automatically identify that issue will help address the problem.

"In the last customer satisfaction survey, customers made it clear that they wanted to see investments in newer technology equipment. The platform we've chosen has the placement capabilities needed, plus integrated technology that reduces defect opportunities and changeover time, plus supports real-time line balancing. It aligns well with our commitment to perfect product. We also see this investment as our next step in becoming a more agile, leading edge EMS partner," Rick added.

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