

MILWAUKEE ELECTRONICS NEWS

Q4 2017

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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 PCB layout services through its San Diego PCB business unit and quick-turn prototyping through its Screaming Circuits business unit.

Standard SMT Platform Now Used in All Facilities

The Milwaukee facility's SMT line has been enhanced with Panasonic placement equipment to improve throughput and efficiency. The placement equipment utilizes a feeder cart system, PanaCIM software and DGS Data Creation System. The Panasonic NPM-W2 chip shooter and Panasonic NMP-W2 multifunctional pick-and-place machine re-



The Panasonic equipment platform is now utilized in all three Milwaukee Electronics facilities.

place a Fuji CP-6 IP-III machine. The line's Ekra screen printer and Vitronics XP 2 8-zone reflow oven stay in place.

The new equipment was installed in middle of Q4. It improves operational efficiency and quality in several ways. Glue dispense capability is now integrated in one of the Panasonic's placement heads, eliminating the need for standalone glue

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Message from Mike

As we end 2017, we look back on a year of continuing growth and change. We now have a common Panasonic equipment platform installed in all three of our



facilities, we are continuing to increase real-time visibility, responsiveness and throughput through enhanced systems, and we have fully integrated our San Diego PCB business unit into our service mix, providing customers with one of the most comprehensive product development support solutions in our segment of the industry. We

see continued growth opportunities in 2018 and plan continued infrastructure investment and internal improvements to support them.

Our 2017 customer satisfaction survey is complete. We continued to see a drop in survey participation and will be working on ways to enhance this in the future. In terms of individual facilities, our Milwaukee facility ranked the highest of all three of our facilities in customer satisfaction. Top customer challenges are shorter lead-times, pressure to reduce costs and unpredictable demand, so it isn't surprising that lead-time reduction was the number one area our customers would like to see us invest in.

On the engineering side, performance ratings improved relative to communications with

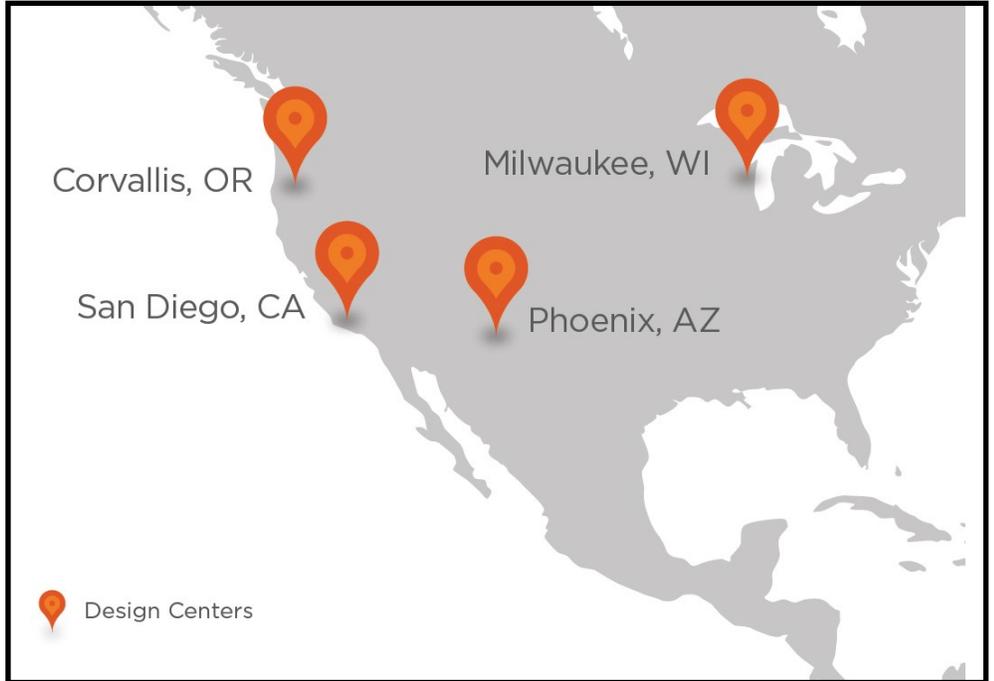
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Mike Creeden (right) accepts IPC's Distinguished Committee Service award.

Creeden Receives IPC Award

Mike Creeden received a Distinguished Committee Service award at IPC's Fall Standards Development Committee Meetings, held in conjunction with the Surface Mount Technology International (SMTAI) conference and exhibition. IPC gave the award in recognition and appreciation of Mike's contributions to the development of the IPC-2226A, Design Standard for High Density Interconnect (HDI) Printed Boards. It was presented at the IPC Committee Awards luncheon on Sept. 18 at the Donald E. Stephens Convention Center in Rosemont, IL.



Milwaukee Electronics' Engineering Team is distributed across four locations. The engineering reorganization is designed to make it easier for customers to conveniently access the right mix of resources for their projects.

Milwaukee Electronics Reorganizes Engineering Team

Milwaukee Electronics has grown significantly over the last year and its engineering capabilities have substantially evolved. To better ensure that customers have seamless access to the right mix of engineering resources, these resources have been consolidated into a single department managed by Clint Hanson, who reports to Rick McClain, Milwaukee Electronics' COO. The San Diego PCB operating group, led by David Carmony, is also now part of the engi-

neering organization.

"These changes are intended to make our Engineering group more responsive to both internal and external customers, with greater flexibility in assigning resources when needs change, as well as facilitate new customers into utilizing other related services that we provide," said Mike Stoehr, Milwaukee Electronics' President and CEO.

Message from Mike

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customers, issues management, and accurate and timely quotes. Our engineering customers now prioritize information systems as a place for us to invest.

While the surveys remain anonymous, we do look closely at the trends data they provide and use it as the basis for our equipment and systems investment. The

feedback we've received suggests we are focusing on the right issues. We face the same lead-time challenges that all companies are currently facing in the materials market, so that will continue to be a challenging environment in the coming year. However, the enhancements we've made in equipment and systems over the last several years are enabling our team to work smarter in virtually every aspect of

our business, so we do expect to see continued improvements in responsiveness and throughput over the coming year.

I'd like to wish you and yours a very Merry Christmas and a healthy and happy 2018.

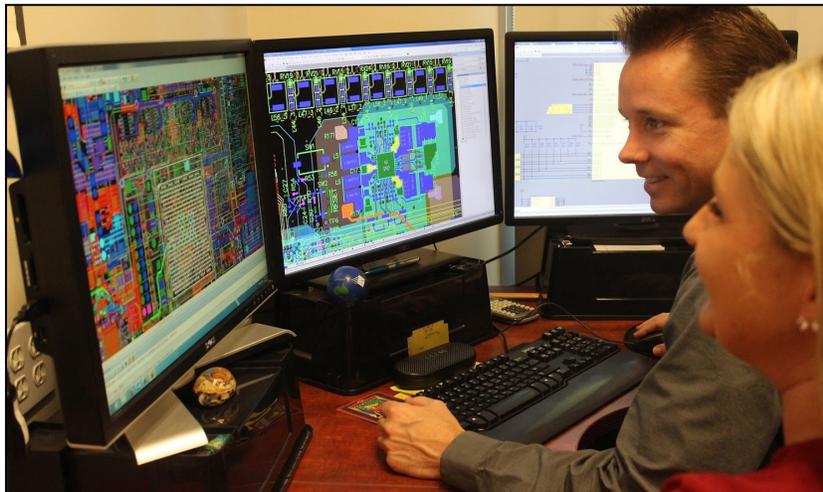
P. Michael Stoehr
President & CEO

Engineering in Action

Helping Customers Find the Balance Between Electrical Integrity and Cost

One of the benefits of using a full-service PCB layout organization is the ability to leverage the team's expertise to shorten product development learning curves. The team at San Diego PCB doesn't simply lay out printed circuit boards (PCBs). They also help their customers understand the tradeoffs associated with a given layout strategy. For example, a startup company focused on medical diagnostic imaging needed to develop a functioning, marketable prototype as quickly as possible. The development budget was limited and the customer wanted to limit the PCB layer count to save money on the PCB.

San Diego PCB's team worked with the customer to balance the competing needs of electrical integrity vs. cost. The team presented the customer with



The team at San Diego PCB helps its customers understand the impact of their choices.

a range of cost vs. yield vs. performance tradeoff scenarios to help them better understand the impact of their choices. A working compromise was presented that best balanced all three concerns.

The Result

San Diego PCB provided a layout that met their performance objectives in the

timeframe they needed. The team could have designed the PCB with four layers, but showed the customer that the circuit would perform better and be more robust if the PCB was designed with six layers. The customer was able to get to market faster because with the six-layer PCB, since they didn't have to debug performance issues. The end solution reduced cost and time in the development cycle, but did raise the raw PCB cost.

The team also added built-in test to ensure product integrity and better in-circuit test coverage. The designer placed

the components on one side of the PCB because it worked better mechanically and enhanced production throughput. The San Diego PCB team was able to further reduce cost by analyzing the bill of materials, lowering part count and finding better priced sources.

SMT Line

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dispensing capability. The work envelope in each machine has been expanded to 21 inches by 29 inches, enabling the facility to support customer requirements for larger board sizes. The PanaCIM software can show real-time information on production cycle time, machine performance, operation ratio, placement quantity and production quantity, or be customized to show any information desired. The machine verification (MV) feature in the PanaCIM software automatically checks the feeders in each cart to validate the right

parts are present. The DGS system can recommend optimum feeder loading sequences and the best nozzle sizes to minimize placement time and improves throughput.

"Operationally, we now have intelligent feeder capability in place across all our placement machines, since this is also a capability in Mydata lines. This combined with the feeder cart systems makes our goal of zero changeover time a reality, which is critical to effectively managing high mix production. We also can electronically support our customers' traceability and tracking requirements via bar

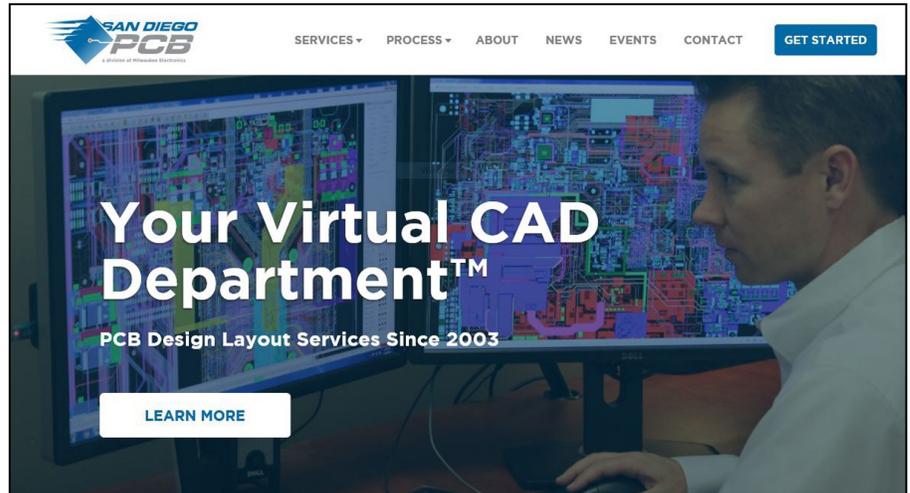
codes. The PanaCIM software also supports our continuous improvement efforts by providing daily and weekly machine efficiency reporting," said Terry Martin, the facility's Operations Manager.

Additionally, the new equipment shortens up the line footprint by 25 feet, freeing up adding production space capacity. This investment brings Milwaukee Electronic's total SMT capability up to 9.5 lines.

San Diego PCB's Redesigned Website Goes Live

San Diego PCB's new website went live in Q4. The redesigned website highlights the business unit's printed circuit board (PCB) layout core competencies and process. The *Get Started* section provides an easy way to initiate a request for quotation, while highlighting the documentation needed for a fast response. View the new website at www.sdpcb.com.

The new website also includes case study examples of some of San Diego PCB's most complex projects.



Tecate Facility Adds High End Needle Winding Machine

The Tecate facility has purchased an ATOP BNW-15A high end needle winding machine to improve throughput in its brushless motor manufacturing activities. Brushless stators are used to meet the growing demand for energy-efficient, compact and best performing motors. However, the production of these stators requires increasingly complex assembly processes, combined with a strong design capability.

"ATOP makes very accurate equipment. The machine has two heads instead of the single head used on our existing equipment. The new equipment is three-to-four times faster than the existing machines, completing two coils every three minutes. It also has a broader range of winding parameters and can increase output to meet demand, said Pirouz Pourhashemi, the Tecate facility's General Manager.



The new machine in operation in Tecate.

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