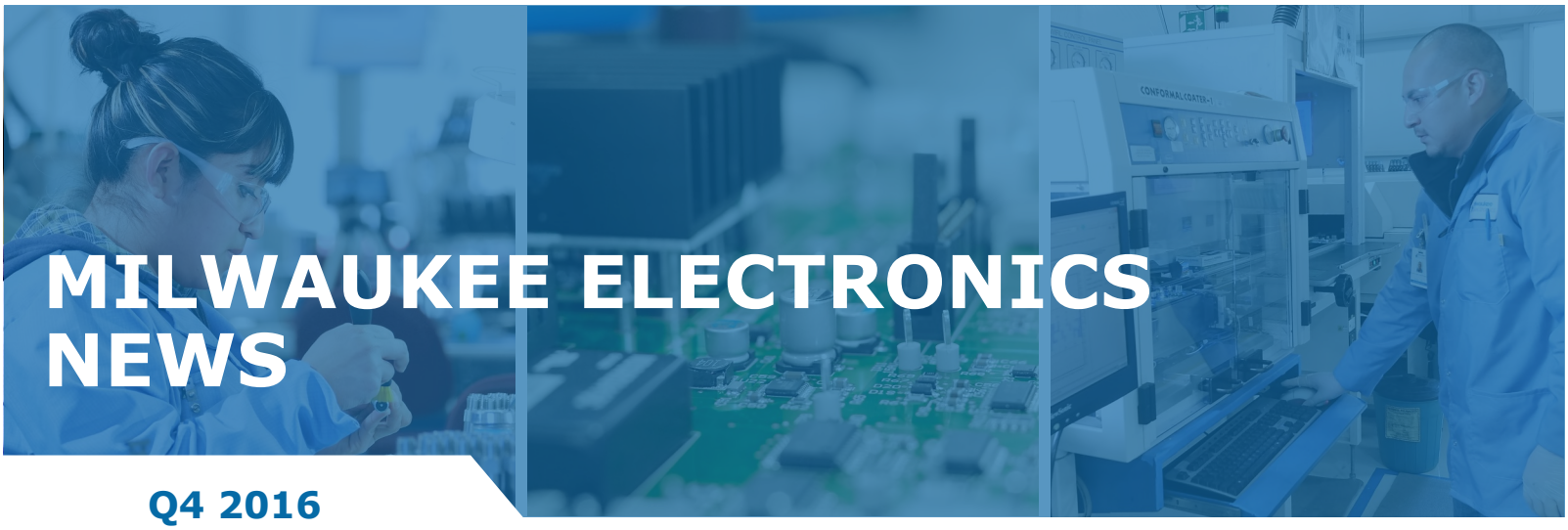

MILWAUKEE ELECTRONICS NEWS

Q4 2016

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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 quick-turn prototyping through its Screaming Circuits business unit.

Milwaukee™ Electronics
MANUFACTURING EXPERTS SINCE 1954

San Diego PCB Merger Announced

In November, Milwaukee Electronics merged with San Diego PCB, Inc. The merger adds a best-in-class engineering PCB layout design service to Milwaukee Electronics' portfolio of service offerings.

Above, San Diego PCB's headquarters.

"We see it as a great fit for our engineering-driven focus in the electronics manufacturing services (EMS) market. From an organizational perspective, we are completely aligned on the importance of maintaining the breadth of

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Message from Mike

Exciting things are happening at Milwaukee Electronics. Last month we announced a merger with San Diego PCB and we've also analyzed the results of our annual customer satisfaction survey.

The San Diego PCB merger is significant because it rounds out our complement of engineering and manufacturing service offerings. Mike Creeden, San Diego PCB's owner and now our VP of Layout Services will discuss the capability additions in detail in our Engineering in Action article. From my perspective, I see this as very beneficial to both our companies. We chose to call it a merger because we recognize that the bulk of the value in San Diego PCB is its expert, certified team. They employ some of the best designers in the world and match them with the best CAD tools. We see this team as a strong complement to our engineering resources and wanted to acknowledge the bench strength they represent appropriately.

Another key element that makes this merger extremely beneficial to all parties is our cultural alignment. Mike's focus is delivering a Rev 1 that has been executed well enough to eliminate the need for further spins. Our focus is delivering perfect product. Together we will both continue that "be the best of the best" culture. We also both believe in listening to the customer. Even when the customer is saying that he or she only wants

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Mydata Upgrades Increase Screaming Circuits' Efficiency

Over the last quarter, Screaming Circuits has upgraded the hardware and software on all its Mydata equipment.

"Since we created Screaming Circuits, MyData machines have been an important part of our formula for success. As we integrated a MY12 into one of our production lines, we saw the opportunity to make upgrades across all our MyData lines and standardize them," said Ashley Rochholz, Screaming Circuits' Manufacturing Manager.

The upgrades included new cameras providing improved optics on all machines, software revision level upgrades, new hard drives and a new server.

The optics are particularly important because as a quickturn prototype house, Screaming Circuits must deal with a wide variety of component styles and packaging types. Not all received material places well. The upgraded optics are identifying issues faster and providing more detailed error codes, which decreases the time needed to correct the issue. The new

Above, line upgrades have provided significant efficiency increases.

server has reduced programming and offline setup time.

The addition of the MY12 has also enabled the team to increase throughput.

"With the addition of this machine, we were able to take an older MyData machine offline. We are now using it to experiment with offline setup strategies, while the MY12 has provided some nice efficiency gains," added Ashley.

Ashley estimates that overall, the improvements have increased efficiency by 140 percent.

Screaming Circuits Provides Prototype Circuits to Badgerloop

Milwaukee Electronics' Operations Manager Terry Martin, Senior Director of Business Development Scott Pohlmann and Design Services Group Engineering Manager Larry Holten recently represented Screaming Circuits at the Badgerloop Pod Reveal Event in Madison, WI. Screaming Circuits is one of many sponsors of this innovative engineering project and has provided prototype circuits.

BadgerLoop is a student organization created to represent UW-Madison in the SpaceX Hyperloop Pod Competition. The competition seeks to innovate transportation with Hyperloop, an idea presented by SpaceX and Tesla Motors co-founder Elon Musk in 2013. Hyperloop transportation involves pod-like travel down a vacuum tube at high speeds. Badgerloop's ultimate goal is to win the competition, but more than that, to help lay the

Above, Milwaukee Electronics' Operations Manager Terry Martin sits in the Badgerloop vehicle.

groundwork for this innovative new transportation technology.

The Badgerloop team revealed their pod on Dec. 6, at the Wisconsin Institute for Discovery to eager transportation enthusiasts, including University of Wis-

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Engineering in Action

San Diego PCB Broadens Layout Expertise & Capabilities

This quarter's *Engineering in Action* article focuses on the capabilities added via Milwaukee Electronics recent merger with San Diego PCB. Milwaukee Electronics' VP of Layout Services, Mike Creeden, discusses how San Diego PCB fits into Milwaukee Electronics' engineering and product development support services.

What Key Capabilities Does San Diego PCB Add?

Creeden: San Diego PCB has a track record of serving industry leaders in industrial, electric vehicles, medical diagnostics, pharmaceuticals, automotive internet of things (IoT), defense, commercial and military aerospace, and communications segments. The Company's IPC CID+ certified designers specialize in high density interconnect (HDI), RF, and power integrity (PI) and advanced signal integrity constructs.

Our specialties include:

- Printed Circuit Board Design:
  - Extreme High Density Digital and Analog
  - High Frequency RF
  - Advanced DUT and Load Boards
  - Advanced Signal Integrity Constraints
- Schematic Capture
- Complex Mechanical and Electrical Constraints
- Design for Manufacturing (DFM) Analysis and Implementation
- Design for Assembly (DFA) Analysis and Implementation
- Design for Test (DFT) Analysis and Implementation
- Signal Integrity (SI), Power Integrity (PI) - Circuit Simulation and Analysis
- Development of High Density Interconnect (HDI) Technology
- Mission Critical Designs; where it must work right the first time.

Mike Creeden

How Does the Merger Change the San Diego PCB Business Model?

Creeden: Milwaukee Electronics was attracted to San Diego PCB because of the strength of its business model and there are no plans to change organizational structure or the way services are delivered. While we've distinguished ourselves as our customers' "virtual CAD department," the one difference in our business model going forward will be adding locations over time to provide customers more localized support. We are currently in San Diego, Phoenix and Milwaukee. We'll be adding an office in Portland, OR next.

What Differentiates San Diego PCB?

Creeden: The business model emphasizes providing highly trained designers in a CAD tool agnostic environment. Procedures drive a team process which makes it easier to ensure workload is evenly shared across the team. Designers are employees, not contractors or offshore service bureaus. Designers are all IPC CID+ certified to ensure they all work from a consistent industry-driven standard. The goal in every project is that revision 1 works and that layout supports superior quality in manufacturing. This focus on minimizing spins and delivering a manufacturable/testable design helps set San Diego PCB apart and aligns well with Milwaukee Electronics' values.

What Tools Do You Use?

Creeden: Our experienced designers are proficient in using a broad range of industry-standard tools that include:

- Mentor: Pads, Xpedition and DX Designer
- Altium

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Above, part of the San Diego PCB team.

Screaming Circuits Prototypes Help Support Product Launch

One of the benefits of Milwaukee Electronics' engineering-driven approach is its ability to match support capabilities to customer requirements. When Milwaukee Electronics' Senior Director of Business Development Scott Pohlmann called on Aries Industries, he thought their likely first need would be engineering services. He found the most immediate need was for prototype services for a tunnel inspection tool they are currently developing. The Waukesha, WI-headquartered company Aries Industries, Inc., is an innovative leader in the manufacture of robotic video inspection and rehabilitation equipment used in the sewer, water, oil & gas and mining industries worldwide.

Above, the Sentinel Tractor unit is shown on lower left with the reel to the right and Handheld All-in-One Controller on top of it.

The Screaming Circuits team was able to quickly build five prototypes and the product debuted at a trade show in Mexico, performing flawless demos. The prototype printed circuit board assemblies (PCBAS) are located in the tractor unit and the reel, which provides power to the tractor unit.

Message from Mike

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a specific service rather than all the services we sell. We built Screaming Circuits around the value proposition that you can buy as little or as much as you wanted from us. We will continue that mindset. We offer a full a lifecycle solution that includes layout services. We also sell just layout services.

Listening to the customer is also what drives our annual customer satisfaction survey. This year we saw customer participation rates drop slightly. However, we saw generally improved performance ratings across all locations. There are still specific issues we will be addressing. Cost and changing technology are the most significant concerns among our customers. We plan investments over the coming year that will continue to drive improvements in our responsiveness, ability to support advanced technology and efficiency.

One particularly interesting datapoint in our Screaming Circuits survey was that over 44 percent of our customers in that business unit are now Millennials. We are continuing to evaluate our customer experience and ordering tools with that metric in mind.

I'd like to wish you and yours a very Merry Christmas and a Happy and Healthy New Year. Thank you for your support and business.

P. Michael Stoehr

President & CEO

Engineering in Action Q&A

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- Cadence: Allegro and OrCAD

Our goal is to listen to our customer and then match the best design team with the best tool for the job.

What Benefits Do You See for Customers?

Creeden: I think the biggest benefit for customers will be access to a more integrated team. As San Diego PCB, we provided complete product development services by contracting with appropriately experienced design engineering teams. Now we are part of a company that offers those services in-house plus has both prototype and manufacturing capabilities. Similarly, Milwaukee Electronics had limited internal CAD capability pre-merger. Together, we offer a solution that can be as standalone or as bundled as a customer wants. And this breadth of capability ensures that the handoff process can be optimized for efficiency over time and customized to exactly what each customer wants. Most importantly, both teams understand that the end goal is to build a perfect product that meets quality requirements and cost targets.

San Diego PCB

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expertise and superior training standards found in the organization. Mike has joined our team as Vice President of Layout Services, with a portfolio of responsibility that includes both leading our layout services organization, expanding it geographically and increasing the manufacturing services offering to all existing layout customers," said P. Michael Stoehr, Milwaukee Electronics' President and CEO.

"I'm excited about the potential of this merger. My goal in choosing to sell the company was to align with a partner that would enable more rapid, controlled growth than was possible as a standalone entity. Milwaukee Electronics has the same commitment to doing it right the first time that we do. They also understand the value of customer-driven services and the need to allow customers to buy the services they require. Their business model already provides customers the choice of transaction-based or bundled services from engineering through volume manufacturing and our team adds to those offerings. Our customers now have a much broader menu of services to choose from, as well," said Mike Creeden, Vice President of Layout Services.

San Diego PCB has offices in San Diego, CA; Phoenix, AZ; and Milwaukee, WI.

Badgerloop

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consin-Madison students, industry sponsors and community members, in preparation for the SpaceX Hyperloop competition this coming January.

The free event featured multiple aspects of the transportation pod, including displays of its motor, software components and magnet arrays. Representatives from many of Badgerloop's 19 teams displayed and explained their work on the prototype, demonstrating that Hyperloop is more than a transportation dream.

Last January, Badgerloop placed third at Design Weekend, the initial phase of the Hyperloop pod competition sponsored by SpaceX. Badgerloop was the only team comprised primarily of undergraduate students.

Above, the Badgerloop vehicle stayed under cover until the big "reveal".

In January of 2017, Badgerloop will attend competition weekend at SpaceX headquarters in Hawthorne, California and test their pod on SpaceX's mile long test track.

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