

# MILWAUKEE ELECTRONICS NEWS



**Q2 2015**

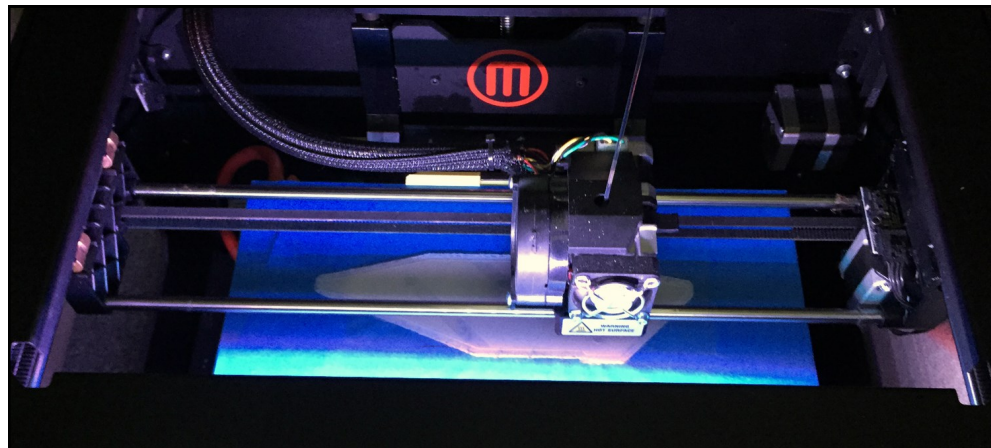
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## About Milwaukee Electronics

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.



*The 3D printer provides quick-turn solutions for obsolescent parts issues and tooling.*

## 3D Printing Eliminates Part Obsolescence Issues

Milwaukee Electronics is using 3D printing technology to provide quick-turn solutions to common issues. Recently a customer at the Milwaukee facility needed a creative solution to an end-of-life LED lamp holder with an extremely long lead-time. Using a 3D printer, Milwaukee Electronics was able

to create replacement parts to avoid the long lead-time, while keeping development costs to a minimum.

Its Corvallis Technology Center has been experimenting with the technology for over

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## Letter from Mike

We've added a new section to our newsletter titled, "Engineering in Action." One of the trends we see at Milwaukee Electronics is that customers increasingly want to work with a single supplier for a



wide range of needs. One-stop shopping isn't new to the electronics manufacturing services (EMS) industry. However, the most typical business model in the EMS industry concentrates engineering resources on manufacturing-centered, rather than design-centered activities, particularly at the regional contract manufacturing level.

Milwaukee Electronics was originally founded as an engineering-driven company. More than five decades later, we find that that our

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## Engineering in Action

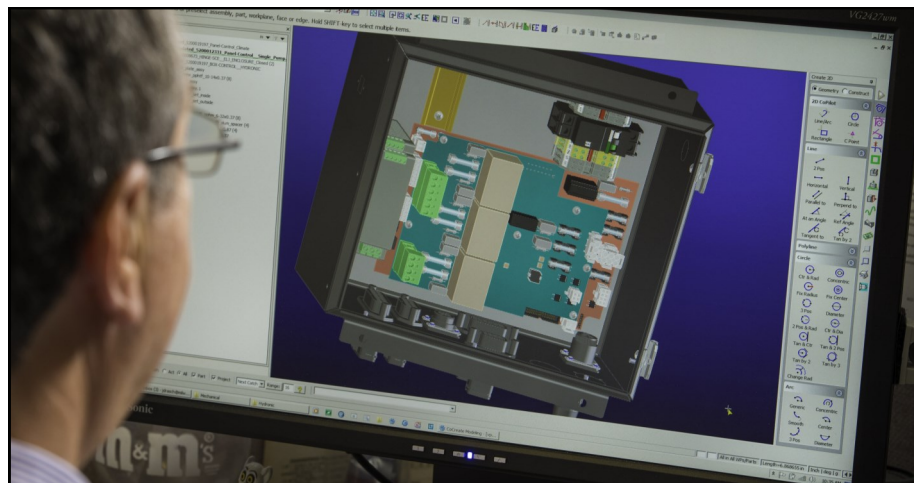
# Enhancing Safety Features and Intelligence

One of the key points of difference in Milwaukee Electronics' capabilities is the breadth and depth of its engineering capabilities. Its engineering team routinely helps customers solve challenges that are far beyond the engineering competencies of most of its similarly sized competitors. Our *Engineering in Action* series is designed to illustrate ways that Milwaukee Electronics helps fill the gaps in our customers' product design teams. This quarter's feature focuses on a solution developed to support a construction equipment manufacturer.

### The Challenge

The product was a manually operated concrete finishing trowel, which included a large trowel blade powered by a gasoline engine. While the manufacturer had designed a safety interlock system into the product which required the operator to keep both hands on the machine handles, operators were defeating the sensors in order to operate the machine with one hand. This created a safety hazard.

The customer had a strong mechanical



*One of the key points of difference in Milwaukee Electronics' capabilities is the breadth and depth of its engineering capabilities.*

engineering team, but looked to Milwaukee Electronics for an electromechanical solution.

### The Process

Milwaukee Electronics provided the customer with a preliminary development quote to research and evaluate multiple potential design concepts. This quote also included selection of an off-the-shelf plastic

enclosure to reduce tooling investment costs.

As part of the project launch process, the engineering team visited the customer to observe the product in use with a compromised safety interlock. They also analyzed the customer's

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## Engineering Talent, Tecate Facility Drive Growth

Milwaukee Electronics has seen an increase in new customers during the first half of 2015.

"Customers are more carefully evaluating the total cost of their outsourcing effort. Mexico is at cost parity with China and we are seeing some customers reshore. We've also seen strong interest from companies committed to keeping product development in the U.S. who want a contractor capable of providing localized support to their product development engineering team, plus a U.S. or Mexico manufacturing option," said Scott Pohlmann, Senior Director of Business Development.

One new project is coming from a Euro-

pean manufacturer of low voltage battery management systems. The products are used for scooters and bikes. The Milwaukee facility will provide engineering support for feature enhancements and the Tecate facility will do the production.

A manufacturer of residential boilers has also selected the Tecate facility for a labor intensive through-hole printed circuit board assembly (PCBA). They originally contacted Milwaukee Electronics for PCB layout assistance, did prototyping through Screaming Circuits and then had Milwaukee Electronics' team complete their hardware and software design after developing a technical specification.

Another new project in Tecate involves a

locking mechanism for recreational vehicles. The product is labor intensive and the Tecate facility's breadth of mechanical assembly capabilities is attractive.

The Milwaukee facility has been selected to produce an HVAC-related product which increases the efficiency of air conditioning by creating a mist prior to air conditioner. The project originally started on Kickstarter and Milwaukee Electronics did the design.

A manufacturer of warning signals has selected the Milwaukee facility for a project that involves significant

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## Letter from Mike

(Continued from page 1)

ability to provide engineering as well as manufacturing solutions is appealing to customers who want a single source for the entire product realization process combined with the responsiveness associated with a regional EMS provider. However, one of the challenges to our sales team has been that when OEMs aren't expecting an EMS provider to offer a particular service, they tend not to shop for it. We suspect even more of our customers and prospective customers have unaddressed engineering challenges, simply because internally they assume there isn't a viable third-party solution available. Our *Engineering in Action* feature is designed to better illustrate some of the ways our

Design Engineering Group is helping fill gaps in our customers' engineering teams and solve these critical challenges.

We are also starting to apply 3D printing technology in ways that support customers who have time-sensitive requirements for short-run production or quick-turn tooling. We see this as a capability that enhances our responsiveness in situations where standard lead-times aren't workable.

While engineering and a continuing focus on applying new technologies in innovative ways is a strong value proposition, we also see strong customer interest in our North American manufacturing solutions. Our West coast and Midwest manufacturing facilities are providing

regional solutions to companies who value proximity to their EMS provider. Our Tecate, Mexico facility provides costs at parity with its Chinese competitors, for companies looking to minimize logistics costs with a North American "offshore" solution. In short, we combine the variety of choices found at much larger EMS providers with the nimbleness achievable in a smaller footprint. We look forward to continuing to lead our segment of the industry with unique solutions optimized to our customers' requirements.

**P. Michael Stoehr**  
CEO & President

## New Customers

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engineering, prototyping and production work. As part of this the Milwaukee engineering team will be doing a conversion of the PCBA from through-hole to RoHS-compliant SMT.

Finally, the Milwaukee facility has also been awarded a project for a flow control system that will involve engineering, prototyping and mass production. The company is strong in mechanical engineering but looked to an electronics manufacturing services (EMS) provider for the electronics design. Under the arrangement with their previous EMS provider, they didn't own their electronics design. Milwaukee Electronics is doing

a redesign of the electronics for the customer, which the customer will own.

"Customers like the fact that we provide



*The Tecate, Mexico facility is located in a secure campus minutes from the border.*

a scalable North American solution that covers engineering, prototyping and man-

ufacturing, and that we are very clear about timing and deliverables. Our U.S. facilities are located in regions that have strong product development clusters and OEMs appreciate our ability to provide local support to these teams. Our Tecate facility is adjacent to a lower traffic border crossing which makes crossing goods and visitors faster. Plus, it is a brand new state-of-the-art facility located on a secure campus. The combination of these advantages aligns well with the requirements of our growing customer base," added Scott.

## 3D Printing

two years and recently upgraded its 3D printer to support a wider range of capabilities. "This customer needed a solution to an obsolete part. We were able to make several iterations until we created a part that met their requirements. In this case, 3D printing allowed us to come up with a solution that was both fast and

inexpensive for the customer," said Brandon Loo, Director of Engineering for the Design Engineering Group.

Recently, the printer was used to assist a Milwaukee customer who needed 250 pieces while a part was being retooled. It has also been used to develop quick-turn pogo pin and functional test fixtures.

"This is just one of the ways we are providing responsive support to customers with critical timeline constraints. As time goes on, 3D printing will continue to evolve and add more value to our customers," Brandon added.



## Engineering in Action

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initial electro-mechanical design for any potential takeaways that could be applied to the new design.

The design team then held a joint brainstorming session that included both engineering departments as well as customer's product management team personnel. Following that discussion, the team researched both a potential accelerometer solution and a gyroscope solution. A sample of each was obtained and both devices were bench tested for comparison results. Based on the requirement to halt a spinning trowel handle within 270° of travel, the gyroscope device was selected because it offered the fastest response time.

Once the product specification was approved, the team developed a full hardware, software and mechanical design. The team also supervised prototype unit tooling and build, and product verification testing.

### **The Solution**

Milwaukee Electronics integrated a single plane gyroscope with a small microcontroller that is mounted onto the unit's horizontal frame. This control monitors the horizontal rotation of the machine while ignoring the back and forth swinging action during normal operation. If the handle is suddenly released by the operator, the control monitors the acceleration in rotation and then snubs the engine spark causing the RPM sensitive braking system to activate within a single

revolution of the entire machine.

During initial prototype testing of the control, the unit was unable to meet the



*The unit is potted to protect the electronics.*

stopping requirement due to the gyroscope response time. The team resolved this issue by implementing a pre-emptive snubbing software algorithm. The microcontroller monitors the gyroscope movement data and begins to snub every other engine spark should acceleration start to increase. This does not cause any issues with engine run performance but does allow the control to "look ahead" in preparation for the need to fully snub the spark.

Due to the severe environmental conditions and the difficulties with mounting an off-the-shelf enclosure, the circuit board assembly is now assembled into a custom potting cup enclosure that was designed by Milwaukee Electronics and then sealed with an epoxy resin for protection from the physical elements and the extreme temperature conditions that

are generated by the gas engine.

### **Results**

The new control eliminated the ability for deactivation of a critical safety circuit by the operator.

In 2012, the customer approached Milwaukee Electronics with another project to develop a control for a ride-on version of the product. The operator used two joy sticks that interface to a steering computer to maneuver this equipment similar to driving a tank. When this tool is used near a straight surface edge, it is often difficult for the operator to hold a straight line during forward travel.

Milwaukee Electronics' engineering team was able to heavily leverage the previous design to develop a solution using the gyroscope control as the design basis. An upgraded gyroscope control is mounted to the ride-on trowel frame in a horizontal position and provides data to the steering computer to assist in tracking to a straight line until the operator moves a joy stick to change direction. This not only addressed the customer's challenge, but also significantly reduced engineering development costs.

Today, both controls are manufactured by Milwaukee Electronics. The engineering team successfully addressed a safety issue and added functionality that helped improve the equipment's overall performance.

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