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- Defect-Free Wire Cutting and Stripping
- HellermannTyton - A History of Innovation
- New Solutions Automate Wire Harness Production
- Electrical Characteristics and Terms for High Speed Data Systems

20 Years of Excellence for EWPTE!



Consolidated Electronic Wire & Cable

By Joe Tito
Wiring Harness News

It's not often we get to profile a company that is over 100 years old. Wiring Harness News was privileged to learn more about Consolidated Electronic Wire & Cable in a conversation with Jason Kline, Director of Marketing. Jason provided some detailed history prior to our chat.

Originally founded as Mann Electric, the company incorporated in 1919 as Consolidated Wire & Associated Corporations in Chicago, Illinois. In fact, a listing for the original company can still be found in the US Government Printing Office's Congressional Serial Set. Under the new

corporation, Consolidated Wire manufactured and provided bulk wire and cable along with radio accessories to electronic distributors throughout the 1920s and '30s. With the world at war in the 1940s, Consolidated was enlisted by original equipment manufacturers (OEMs) for their core expertise, supplying the US military with wire and cable for communication purposes.

The company continued to flourish under that structure, but in the 1980s, a second generation of leadership broadened the business philosophy, bringing with it a new name for the organization, Consolidated Electronic Wire & Cable Corporation. During this period, the enhanced Consolidated Wire moved further



Strategy meeting at Consolidated. From left, Marco Lara, Sales, Jason Kline, Director of Marketing, and Peter Liavas, Sales.

into the OEM marketplace and began forging strategic partnerships internationally. Versatility and a service orientation were solidified as the backbone with which the company would continue to build upon.

During our interview, Jason's passion for his company's pride in quality and customer service seemed to permeate into every statement. I was curious and dug a bit deeper to understand that Consolidated Elec-

tronic has been an ESOP (Employee Stock Ownership Plan) company for over twenty years. As an ESOP committee member, Jason was able to share a bit about what makes this employee owned business model so valuable to its employees and in turn, its customers. "When I joined the Consolidated team, my previous experience was with a large corpora-

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EWPTE Celebrating 20th Anniversary

The Electrical Wire Processing Technology Expo [EWPTTE] will be celebrating its 20th Anniversary with this year's show being held Wednesday, May 13 and Thursday, May 14 at the Wisconsin Center in downtown Milwaukee, WI. Billed as the "Nation's Largest Dedicated Wire Processing Event", the show projects to have 200 exhibitors and 3000+ attendees.

Since 2001, EWPTTE has grown into the most comprehensive resource for wire processing industries, encompassing electrical wire harness, wire/cable processing, consumables, cable assemblies, cord sets and more.

New technologies are a key focus and machines on site are up and run-

ning so that attendees can get hands-on experience and compare performance.

Education has always been a cornerstone of this event and this year there is more than ever. All seminars are FREE.

Here is the schedule:

WEDNESDAY, MAY 13

8:30am - 9:30am **Misconceptions in Testing: Limits of Fault Detection**

Presenter: Christopher E. Strangio, CAMI Research

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New Solutions Automate Wire Harness Production Line Balancing

Since its invention in the late eighteenth century, the automobile has become an integral feature of modern society and culture. Early vehicles, even those with electric propulsion systems, were primarily achievements in mechanical design and engineering. However, as vehicle technology has advanced, electric and electronic (E/E) components and features have multiplied in vehicles. While early E/E features were limited to radios, cruise control, and power windows, today automotive electronics are

among the most crucial components equipped on modern vehicles. A growing number of vehicle systems are enabled entirely or in part by the E/E system within the vehicle. This includes everything from comfort and quality-of-life features like heated seats, air conditioning, and in-vehicle infotainment systems (IVI), to limited automation, advanced driver assistance systems (ADAS), and essential vehicle functions (Figure 1).

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Figure 1. Vehicle E/E systems enable a growing number of vehicle functions including critical systems and passenger-focused features.



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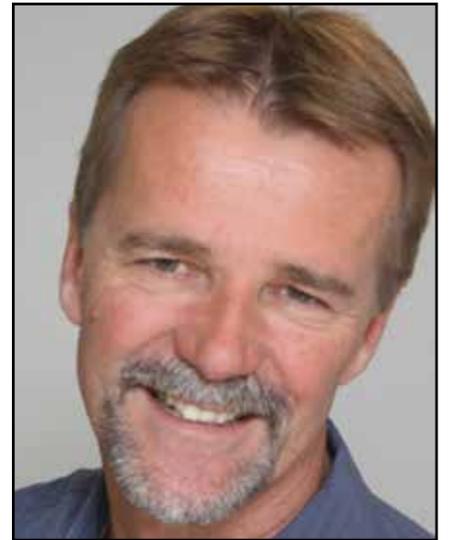
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LEADERSHIP

PUTTING INSIGHTS INTO ACTION

Gamification: Why it Matters to Manufacturing

By Paul Hogendoorn



Paul Hogendoorn

Think about the importance of people in your manufacturing business for a moment. Yes, they are your employees, and yes, they are most likely your biggest input cost and your biggest monthly expense. Yes, they may be your most valuable resource, and yes, your biggest headache at the same time. People are important to your operation's sustainability and viability. But they are more than that. They are representative of your most important audience - your customers.

In North America, the middle class was made by manufacturing companies and continues to be sustained by the manufacturing industry. The healthier our manufacturing industry is, the healthier our economy, and likely, the healthier our society in general. It's all connected. But things are changing, and our manufacturing companies need to change too. And the biggest change is because our people are changing.

A whole generation is approaching retirement and manufacturing

companies are struggling to replace them. The incoming generation is very different from the exiting generation. Marketers have already identified the differences and have helped companies tailor their product and sales methods to reach the new generation. But the same transformation process hasn't happened when it comes to trying to attract the generation to the workplace, and that's a mistake. We

Continued on page 6


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Gamification: Why it Matters to Manufacturing

Continued from page 4

compete for the young generations' attention to sell them our products and services, and we need to do the same thing to attract them to our industry. The way we think of them as potential employees should be the same way we think of them as customers - they are critical to our long-term success. We need them just as excited about the jobs we offer as the products we hope to sell them.

My generation - the boomers - wanted white picket fences, two

cars in the driveway, and the ability to put our kids through college and university. On average, we worked for three companies over our entire career. Generation X followed, changing jobs a bit more often, with more focus on personal career status. Generation Y is very focused on more work-life balance, social engagement, and they tend to change jobs even more often. And following them, we have Generation Z, the most tech-savvy and tech addicted generation of them all. Plus, Generation Z is as passionate about effecting societal

change (climate issues) as the boomers were in the late 60's (ending a war).

As the oldest group moves out of our workplaces, we need to aggressively change our workplaces and careers to attract and accommodate the newest generation. At first glance, the new generation appears to be vastly different from the boomers, but in two critical ways, they are very much the same: they have a strong need for purpose, and a desire to be part of a physical (non-virtual) community. Where they differ is in their need for feedback - they need constant feedback to remain engaged, and when they are not engaged, they do not remain.

To attract the best of this generation, and to keep them, we need to offer them a workplace that offers them all three: purpose, community, and lots of feedback to keep them engaged. Think of bowling alleys and movie theatres in the 1980's. It was good enough to meet the needs of the boomer generation, but they both went into rapid decline and many thought they were obsolete. But, check out a bowling and entertainment facility today, or a multi-screen theatre, and you see the exact opposite. The parking lots are overflowing and the facilities are full every night of the week. Their product is fundamentally the same, but they adapted to their target audience, and they are thriving. Our manufacturing plants need that type

of transformation, and gamification can be a part of that.

Gamification is simply a matter of making meaningful things more visible, and more interesting, in real time. Your bulletin board by the punch clock, for instance, is likely filled with posters and information that is weeks or months old. The metrics you provide as performance feedback are likely disconnected from the actual work they do in their departments or on their machines, and is probably days or weeks old.

Think of how this generation has grown up, with instantaneous feedback, visually presented in very interesting ways. Every action in a game yields a result, and that drives continued engagement. The other thing noteworthy about video games today is that many are collaborative, with players not playing against each other but playing with each other to build a city or achieve a victory.

The manufacturing companies that will succeed and thrive in the future will be the companies that attract the best people from the coming generation by adapting their workplaces, making them more attractive, the work more engaging, and the time spent more meaningful.

Paul Hogendoorn is cofounder of FreePoint Technologies. For more information on gamification or "reconnecting meaning with work", contact Paul at paul.hogendoorn@getfreepoint.com



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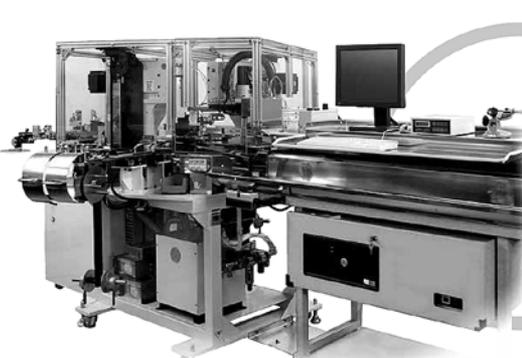
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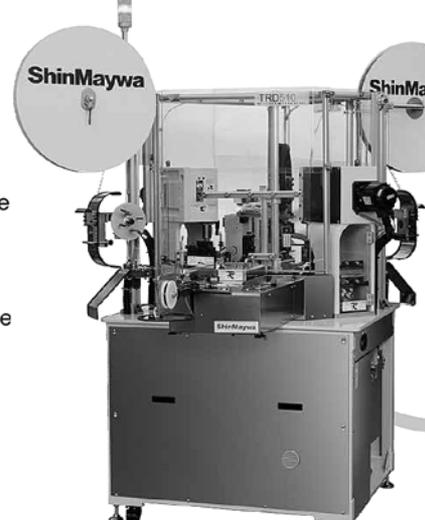
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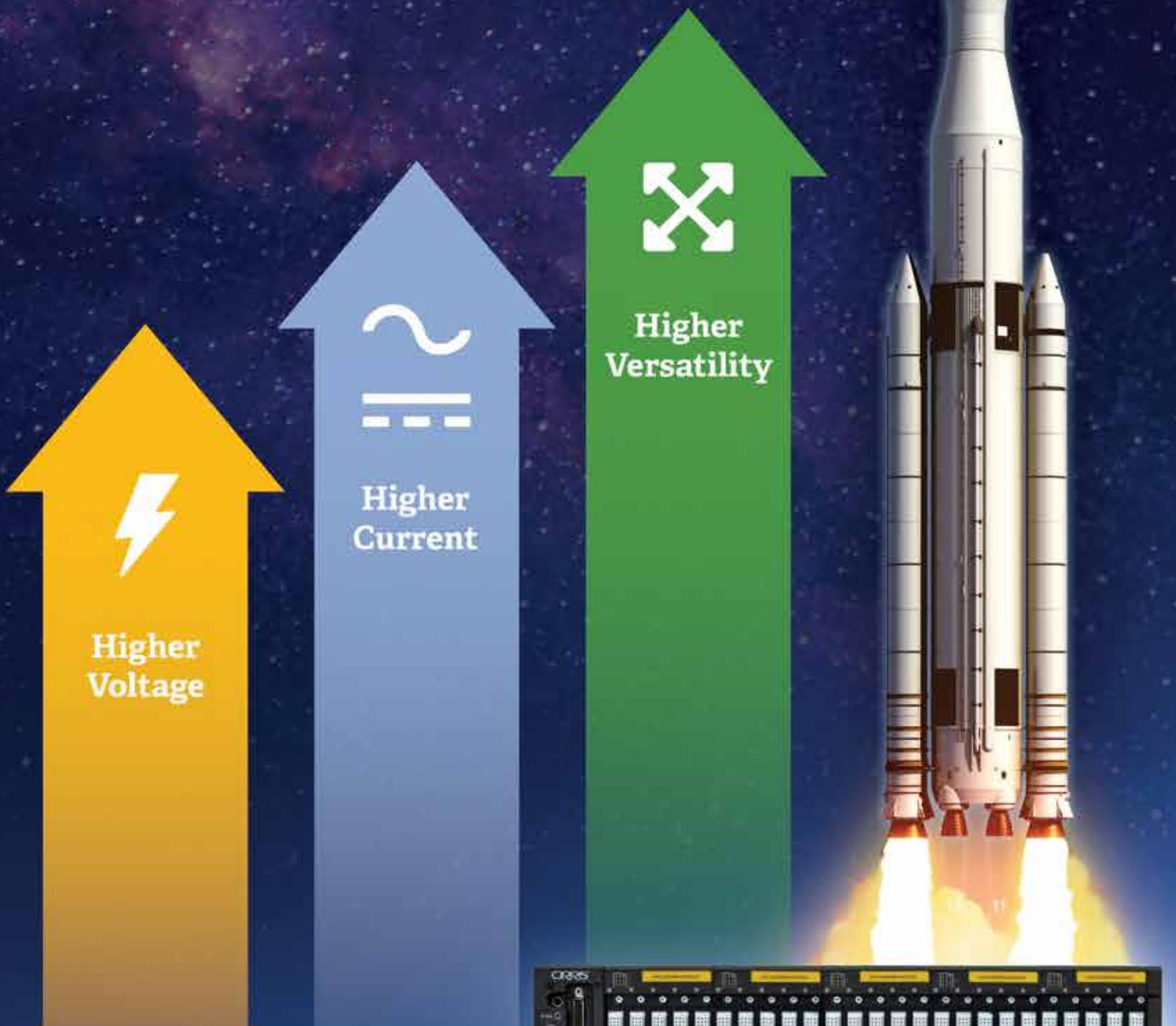
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WIRED IN WHMA UPDATE



Wiring Harness Manufacturer's Association

IPC Emerging Engineer Program Offered to WHMA Members

By Christine Siebert

IPC launched the Emerging Engineer program in 2016 to provide professionals early in their careers an opportunity to learn from the dedicated industry volunteers who participate in standards development. This program has now been extended to WHMA members. Through this sharing, our valued IPC/WHMA leaders will mentor IPC/WHMA Emerging Engineers and provide them with the tools they need to continue standards development for many years to come. As Mentors they will also have the opportunity to ensure their projects carry forward while they help build the future.

This program is an exciting way for WHMA members to become more involved in the IPC Standard development, i.e. IPC/WHMA-A-620 Acceptance for Cable and Wire Harness Assemblies, IPC-HDBK-620 Handbook and Guide to IPC-D-620 and IPC/WHMA-A-620, IPC-D-620

Design and Critical Process Requirements for Cable and Wire Harness, IPC-A-640 Acceptance Requirements for Optical Fiber, Optical Cable, and Hybrid Wiring Harness Assemblies. WHMA mentors will be able to mentor young, emerging Engineers and assist them with navigating the IPC committee and standards. The mentor/mentored do not have to work in the same company. This is a great way for both parties to network and learn more about IPC standard committees.

To be eligible to participate as an Emerging Engineer, professionals must have worked in the industry for less than 5 years or be a university student. Mentors must have worked in the industry for a minimum of 7 years and on an IPC committee for at least five years.

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Continued on page 10

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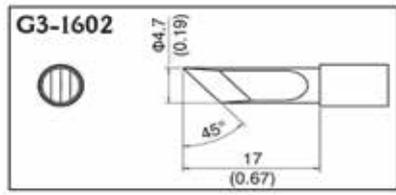


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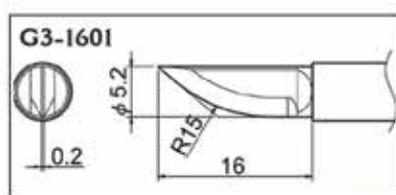
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Continued from page 8 _____ leadership skills and technical expertise

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- Recognition for program participant and his/her company - industry awareness
- Registration to recognition luncheons

“The IPC Emerging Engineer program gives new engineers a leg up early in their careers,” said John Mitchell, IPC president and CEO. “And it enables industry experts a chance to share their knowledge and expertise with the next generation of engineers. We’re all working together to make our industry stronger.”

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As always, if you have any questions, please email contact.us@whma.org or reach out to me directly at Christine.siebert@ipc.org.

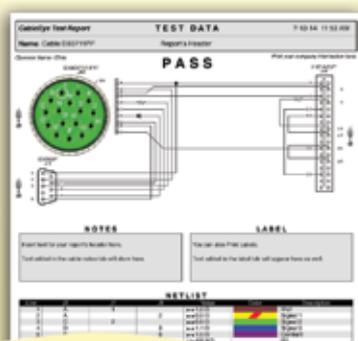
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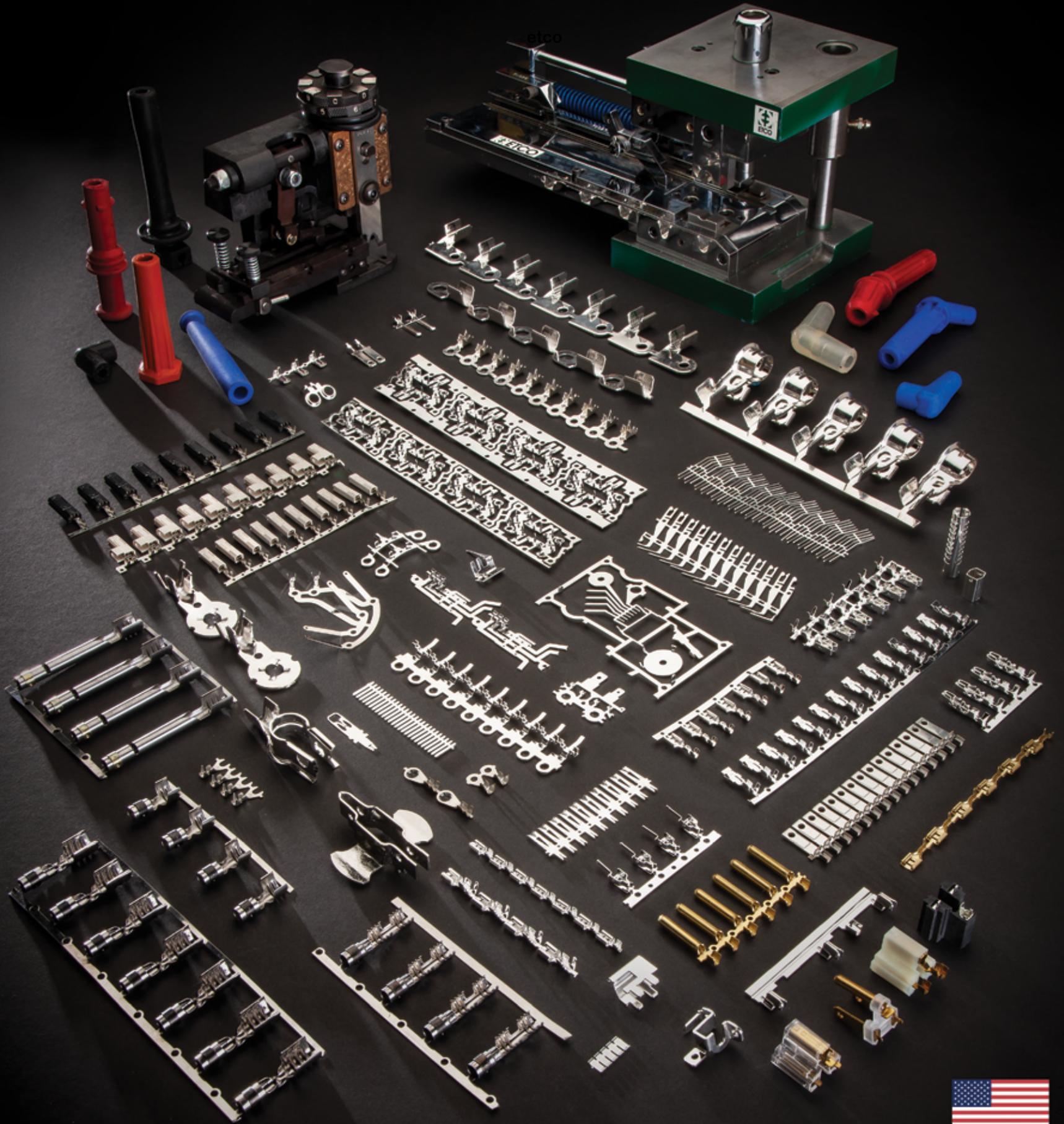
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M & A 101: Lessons learned from decades of deals

Perception vs. Reality: An Avoidable Obstacle in Consummating a Deal

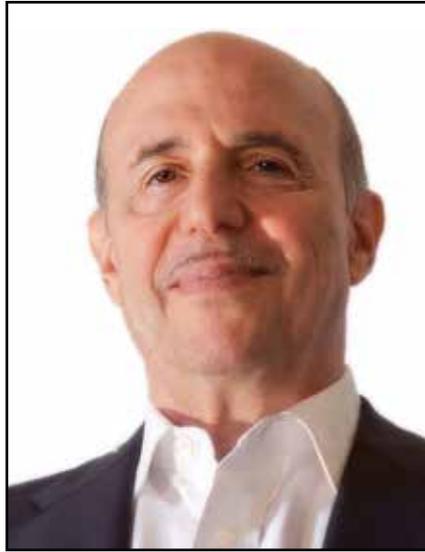
By Loren Smith

A gap between perception and reality--on the seller's side or the buyer's--is often the biggest barrier to getting a deal done. If the owner of a wire harness company or the prospective buyer has not been exposed to the basic steps in a transaction, misperceptions can loom large in undermining an otherwise straightforward process. Here are just two examples of potential stumbling blocks.

Snag #1: It is common practice at closing for a percent of the purchase price to be held back in an escrow account for a specified period. This is a form of insurance protecting the buyer in the unlikely event that something as important as an undisclosed liability or lawsuit is discovered post-closing. Even with discoveries such as these, the escrow agent has a fiduciary responsibility not to release the held funds until both the buyer and seller agree. (In my years of experience, the funds in escrow have always been released to the seller with interest after the holding period, but that does not minimize the importance of this practice.)

To a seller with no familiarity with this procedure, holding funds in escrow might be seen as a reduction of the purchase price, giving the buyer the right to request release of the funds. If this is the perception, it is easy to see how the seller would push back hard against this standard procedure and jeopardize the deal.

Snag #2: Another example is the common practice for a buyer to visit one or more of the selling company's largest customers when a deal is close to being completed. Not only is this important fact-finding for the buyer, but the visit also benefits the customer. Customers appreciate knowing in advance



Loren Smith CEO
Blue Valley Capital

their harness supplier is being sold, and quite often the acquiring company brings something to the

acquired company that has value for the customer. For example, the acquiring company could bring added financial strength or more technological capability, and when this is explained, along with the fact that the seller's key management team will remain in place, visits tend to be quite positive.

But if an uninitiated seller frets that the buyer might learn something during the visit that dampens enthusiasm about the acquisition--or that the visit might spook the customer and cause the customer

to start casting about for a new supplier--it is easy to see how the seller might resist the visit.

Wire harness owners, highly invested in effectively running their business, are not necessarily conversant with many of the elements of getting a deal done. That is precisely why I take the time on the front end of a deal process to explain matters such as those above.

Loren Smith can be reached at lms@blvcapital.com or www.bluevalleycapital.com



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Optronics Acquires USA Harness

With its acquisition of USA Harness, Optronics will disrupt the status quo, taking its place as one of only a handful of industry suppliers offering a comprehensive line of integrated modular power delivery and lighting solutions for commercial vehicles.

Optronics International, a manufacturer and supplier of heavy-duty LED vehicle lighting, announced that it has completed its acquisition of Texas-based USA Harness, Inc. A leader in trailer harnesses and electronic control systems, USA Harness serves the global transportation industry with its USA-PLUS Sealed Modular Wiring Harness System and its patented USA-PLUS Modular Connection System. With its unique O-ring-style seal and secondary lock pin design, the USA-PLUS Modular Connection System has been tested and proven to perform at three times the industry standard.

The acquisition makes Optronics the newest of only a few manufacturers capable of fully serving the light-, medium- and heavy-duty commercial vehicle industry with both lighting and harness technologies. The industry will benefit from increased competition and a broader array of advanced, integrated, modular power delivery and lighting solutions.

"In less than a decade, Optronics has dramatically changed the competitive landscape in commercial vehicle lighting with its focus on technological innovation, broader options and greater value, and we're about to do the same with harnesses," Brett Johnson, president and CEO of Optronics International, said. "OEMs have become ever more adamant in encouraging us to enter the harness side of the business, because the competition in that segment has remained so limited."

Optronics is already a respected harness manufacturer on three continents and is the undisputed leader in Australia. Coupled with its diverse international background and experience, the newly acquired engineering and manufacturing capabilities of USA Harness will position Optronics to hit the ground running in North America, while fully leveraging its synergies as a global lighting and harness supplier.

"We have watched Optronics' exponential growth over the years and have engineered more and more harness systems for use exclusively with their lighting," said Debby Thompson, interim president of USA Harness. "Though we'll continue to produce harness systems that interface with all major lighting manufacturers, we're excited to now be able to offer a fully integrated modular power delivery and lighting solution."

Optronics is committed to its global manufacturing culture, and according to company officials, the acquisition of a U.S.-based harness manufacturing capability gives the company even greater supply chain latitude. "Just like the OEMs we serve, we're going to manufacture harness and lighting systems wherever it makes the most sense," Johnson said.

"Miller Industries is a publicly traded global manufacturer with facilities in the United States, England and France," Will Miller, president and Co-CEO of Miller Industries, said. "Optronics already has lighting and harness systems on some of the world's

most respected commercial vehicle brands, and we see this move as a natural progression for a global tier-one supplier."

With their blended experience, both companies will begin selling integrated modular lighting and harness systems from day one. Targeted manufacturers include those making heavy-duty dry van, reefer, tank, car haul and flatbed trailers, as well as those making light- to medium-duty trailers. Heavy-duty truck and body manufacturers will also be a focus, as will heavy-duty off-highway vehicles, armored couriers and other specialized vocational equipment manufacturers.

"We're excited to see more competition come to the commercial vehicle lighting and harness business," Andy Tanner, president of Talbert Manufacturing, said. "Knowing Optronics, I expect this move to benefit my company, my customers and the industry as a whole."

About USA Harness

Founded in 1991 in Winnsboro, Texas, USA Harness manufactures premium, custom electrical wiring harnesses for commercial vehicle applications, including, heavy-duty dry vans, tank trailers, car haulers, refrigerated trailers, truck body/bed, heavy-duty off-highway vehicles, armored couriers, light- to medium-duty trailers, and specialized vocational equipment. Learn more at usaharness.com.

About Optronics

Founded in 1972, Optronics International is a premier worldwide manufacturer and supplier of branded industrial and commercial vehicular safety lighting products. The company specializes in LED and incandescent lighting for the HD, trailer, transit vehicle, RV and marine markets. Optronics is headquartered in Tulsa, Oklahoma and has facilities in Annan District, Tainan, Taiwan. The company also has ISO 9001:2015 certified manufacturing facilities in Muskogee, Oklahoma and Goshen, Indiana. Learn more at optronicsinc.com.

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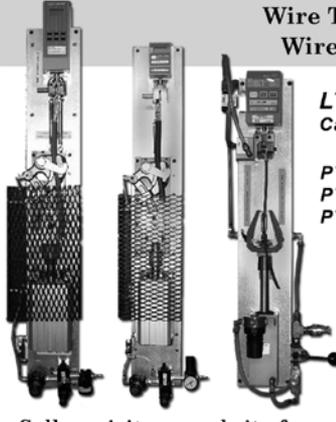
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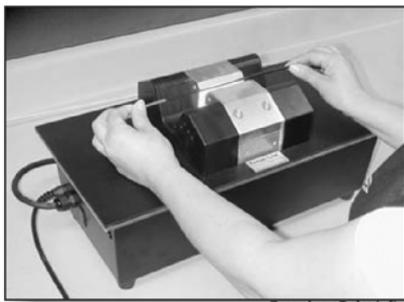
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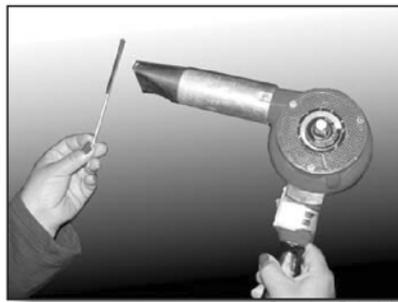
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Upcoming Zuken Innovation World

In order to stay abreast of industry developments and ever changing customer needs, Zuken has created a series of user group meetings called Zuken Innovation World. The gathering that covers the Americas will be held on April 27 - 30 on Coronado Island in San Diego, and WHN spoke with Paul Harvell and Bob Potock to discuss the event in detail.

"This is our user conference that we frame around technology and innovation," Bob mentioned, "and it revolves around the pillars of innovation, education and networking." The innovation pillar, as he described, will reveal ways Zuken's software portfolios, along with partner integrations, can optimize the engineering and design process, while overcoming manufacturing challenges. You'll see, for example, the Harness Builder for E3.series transfer information from the quoting process all the way through to manufacturing and testing.

Zuken partners in manufacturing and test equipment will be on hand to demonstrate the ways their products interface with Zuken software to maximize time and cost savings. "It's quite a big mix from the design and PCB side, all the way through the harness side," said Paul, "so we like to bring as many things into them room as we can."

On the education pillar, Bob noted they will have about 40 technical breakout sessions that cover printed circuit boards, wire harnesses, and digital engineering. "We call it Zuken University," Bob detailed, "and it has very much of a classroom feel with learning on design best practices, but with the tools right there."

In addition to the classes, Zuken will also have an Expert Bar set up. "It's a very popular activity where we have our product experts set up at a bar area with a 50-inch monitor," Paul described. "It allows our customers to go up and have one-on-one time with our technical team."

As Bob pointed out, Zuken Innovation World events provide an outstanding opportunity for networking. "This is a great opportunity for our customers and prospective customers to network with one another, with our valued partners, and with the Zuken

technology team."

Paul emphasized that the event is different from a typical trade show or conference because you're closer to the technology. Zuken and their partners are there in a more informal setting to answer questions and solve problems. "So, in that respect, it's much less of a sales event, and more of a learning and doing event."

Equipment Manufacturers Welcome!

As much as prospective customers are encouraged to gather for the event, so too are harness manufacturing test equipment suppliers. "We'd like to people from the wire harness side because we're always looking to expand our partnership ecosystem," Bob mentioned, "so, from that perspective there's a lot to be gained by third party attendees." Zuken hopes that industry equipment suppliers can meet with them to talk about integration solutions, and also meet with Harness Builder for E3.series customers to see how they are using the software.

For more information on Zuken Innovation World, visit

More about Harness Builder for E3.series

Harness Builder for E3.series is a wire harness design software that supports the custom wire and cable harness market. This E3.series integrated module is designed to be used by harness manufacturers for the accurate quotation/estimate and full creation of nailboard/pegboard documentation. OEM's and contract manufacturers can easily create their harness documentation from drawings and/or a wirelist, in a short amount of time. Data sheets can be easily added to documentation. Pricing information, lead time and assembly time can also be calculated automatically.

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NEWS PLUGS



USA Harness Granted New Patent on Its Ultra-High-Performance USA-PLUS Modular Connection System

USA Harness, Inc., a leader in trailer harnesses and electronic control systems for the global transportation industry, announced that it has recently been granted a patent for its new USA-PLUS Modular Connection System. The new patent supersedes a previous patent the company held for an earlier iteration of the system, and



USA-PLUS Modular Connection System

improves on its O-ring-style seal and secondary lock pin design. The new USA-PLUS Modular Connection System features a design variation that increases the engagement integrity between the system's integral O-ring and the corresponding groove of its mated connection. A unique lock pin of contrasting color helps inspectors identify

complete connection mating. The lock pin assures precision alignment of all components and a firm, complete, watertight union that employs dielectric grease as a sealing agent and a barrier to moisture, dirt and corrosion.

The company's USA-PLUS Sealed Modular Wiring Harness Systems are simple for OEMs to assemble, and use the same USA-PLUS Modular Connection System throughout. All of the connectors are constructed using a durable virgin vinyl molding compound. Even novice assembly workers can make flawless connections quickly and repeatedly, because the system's keyed pin orientation guides a precision interface every time. Harness ends can be constructed to mate with any incandescent or LED lamp from any major manufacturer.

"Since its 1996 introduction, the USA-PLUS Sealed Modular Wiring Harness System has been considered the gold standard for its engineered durability, sealing efficacy and operational robustness," said Brett Miller, vice president of engineering for USA Harness. "Laboratory testing of the USA-PLUS Modular Connection System demonstrates that it can stand up to at least three times the cyclical testing standards recommended by the Society of Automotive Engineers (SAE)."

Salt spray exposure tests following American Section of the International Association for Testing and Materials (ASTM) B117 standards, showed that the USA-PLUS Modular Connection System was able to remain fully operational and unimpeded after three times the testing exposure period recommended by SAE. The testing was performed by an independent lab and was terminated prior to any indication of system failure.

Continued on page 20



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NEWS PLUGS continued



Continued from page 18

The USA-PLUS Modular Connection System is offered in a variety of styles that will accommodate virtually any modular plug-together application. The USA family of connectors includes 2-way, 4-way, 6-way and 7-way configurations. A 10-way system has also been developed for use in

demanding military applications and for electrical systems with auxiliary circuitry. All harness systems with the USA-PLUS Modular Connection System come with an industry-leading five-year warranty.

"People say we have the lowest warranty claims rate in the industry," Miller said. "And with the introduction of our new patented USA-PLUS Modular Connection System, those claim rates are about to drop even further."

Founded in 1991 in Winnsboro, Texas, USA Harness manufactures premium, custom electrical wiring harnesses for commercial vehicle applications including: heavy duty dry vans, tank trailers, car haulers, refrigerated trailers, truck body/bed, heavy duty off-highway vehicles, armored couriers, light- to medium-duty trailers and specialized vocational equipment. All USA Harness wiring systems are custom designed to fit specific applications, and meet or exceed all applicable industry standards. The company's patented USA-PLUS system provides the most advanced molded harness connections available in the market, accommodating up to ten separate circuits in one system (US Patents 6,319,039 and 10,014,631). Learn more at www.usaharness.com.

The Wiring Harness Manufacturer's Association Launches Spanish-language Website

The Wiring Harness Manufacturer's Association (WHMA) is now providing Spanish speakers quick and convenient language access through a new Spanish-language website at www.whma.org. With the launch of this new site, WHMA is now able to provide important industry information directly to Spanish-speaking professionals.

WHMA is the ONLY global trade association exclusively representing the cable and wire harness manufacturing industry including manufacturers, their suppliers and customers. WHMA, with IPC, has created the only industry-consensus standard for Requirements and Acceptance of Cable and Wire Harness Assemblies, IPC/WHMA-A-620. This standard is used worldwide and is provided in many different languages including Spanish.

"WHMA/IPC is committed to providing our Spanish visitors with in-language content, and we are passionate on our commitment to be a global organization. Having a Spanish-language website is making this a reality," said David Bergman, WHMA executive director.

The new Spanish website contains the exact same educational content as the English-language website and includes links to WHMA's manufacturer and supplier members, pertinent information and events.

The Wiring Harness Manufacturer's Association® (WHMA) was established in 1993 to serve and dedicate their resources to the global cable and wire harness industry. WHMA is the ONLY trade association exclusively representing the cable and wire harness manufacturing industry including manufacturers, their suppliers and customers. (www.whma.org)

IPC (www.IPC.org) is a global industry association based in Bannockburn, Ill., dedicated to the competitive excellence and financial success of its 5,700 member-company sites which represent all facets of the electronics industry, including design, printed board manufacturing, electronics assembly and test.



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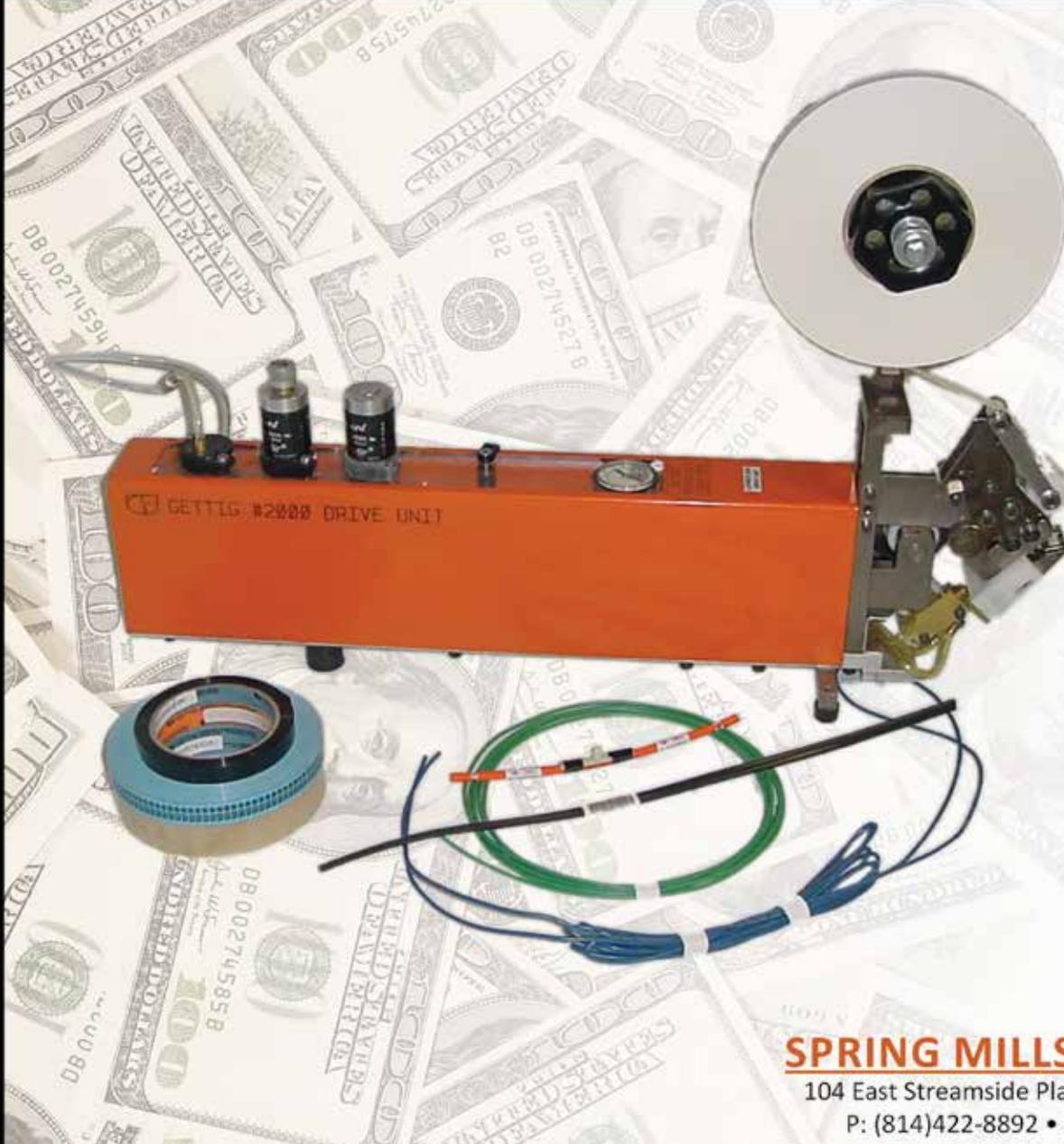
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HellermannTyton – A History of Innovation



Paul Hellermann

Electrical wiring in the early 1930s was encased with rubber and bound by cotton thread. Stripping the wire for termination produced very frayed and untidy results. Inspired by the tiny rubber tubes in bicycle valves, German inventor and entrepreneur Paul Hellermann devised a system to address this problem. His ingenious three-pronged tool easily stretched rubber sleeves, encapsulating the ends and preventing them from fraying (Figure 1). Paul Hellermann GmbH was established in 1935 in Hamburg, Germany to produce and market the tools, along with the

chloroprene rubber sleeves and grommets in various sizes.

Coming to America

Intrigued by a myriad of opportunities, company leadership was determined to have a North American presence. They established operations in Milwaukee in 1969. Tyton Corporation of America was operated as a sales distributor of the natural and black colored cable ties being produced by Insuloid Manufacturing Company, wholly owned by Hellermann GmbH, in

Continued on page 23



Figure 1. Hellermann's tool solves the fraying issue.

CETEC ERP

Production Scheduling Gantt Chart

Base Capabilities Capacity Calendar Work Start Hour: 8 Work End Hour: 16

Order (order) Line Item (line item) Work Location (all)

Date 2019-09-01 2019-09-31 Zoom to Fit View By Order View By Location

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HellermannTyton *Continued from page 21*

England. The U.S. operation was set up in the old Kaiser Tannery building on 30th Street and Hampton Avenue, occupying the third floor. Blank bags of cable ties would arrive from overseas, and small labels were then applied with a label gun.

Growth came quickly, and so did the need for space. Tyton relocated a year later, then again in 1972 to a newly developed industrial strip. By 1974, Tyton took over a 16,000-sq. ft. facility a few miles northeast of the current location.

Ralph Kendall became president, with Ray Lauffenburger as vice president. Lauffenburger and Ernie Klauder were the company's two salespeople. At that time, Tyton was still just a distributor of Insuloid Manufacturing's cable ties.

Recognizing an opportunity to improve the quality and timely availability of products, Kendall, still president of the U.S. operation, convinced corporate to allow manufacturing in Milwaukee. Thus began the shift from importer to manufacturer. Manufacturing got under way in 1975 with the purchase of three Arburg injection molding machines. Supervision and tooling were supplied by Paul Hellermann GmbH, the sister company in Germany.

Two Paul Hellermann employees traveled to Milwaukee to train the factory operators in handling the molds. Heinrich Kabel, director of

engineering at the German location, and his secretary, Elke Tews, visited Milwaukee on multiple occasions to assist in process improvement. Tews turns out to have had more than an administrative role and was trained on how the presses operate. At one point, she highlighted a crucial maintenance step that solved a problem when running the cable ties.

By 1976, there were three injection molding machines and 27 employees in manufacturing, quality assurance and administration. The company produced three different cable ties, which were featured in a three-page catalog containing other Insuloid cable ties still produced overseas. There were no computers at that time to check stock or keep records. Each day, the office staff would handwrite the dollar amounts of orders. Every time the company reached \$100,000 in sales, the team would go out to lunch and celebrate.

In July 1976, Dennis Plesha replaced Ralph Kendall as president, bringing prior experience in the cable tie business. He hired a number of salespeople, and revamped pricing to be more competitive. Under his direction, the business really began to flourish.

By 1978, there were six molding machines and 55 employees in manufacturing, warehousing and QA. They added three more ties, as well as

Continued on page 25

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Date: 2019 11:08 10:00AM

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Part #	DEM Part #	Country of Origin	Date Code	Lot Code	Parent	PO #	Receipt
RAW1514821			02014	#GPRODUCT2			
RAW1802711			013M124	#GPRODUCT2	21.1	00 2019-10-10	
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HellermannTyton *Continued from page 23*



Figure 2. Snapper Hose Clamp

Snapper hose clamps to the in-house manufactured products (Figure 2).

Recognizing the need for more space, a new building was erected on an empty site at the corner of Bradley and Faulkner Roads. Tyton moved to the new, 40,000 sq. ft. facility in August 1978. At the start of production, there were 12 molding machines, six from the previous location and six brand new ones.

The onboarding of Ed Dyer in 1983 signaled the beginning of a product engineering department. Plesha and Lauffenberger continued to lead the company. Dyer and Al Pharris, technical manager, collaborated to develop new products with nothing more than pencil and paper drawings. Dyer worked on a new hand tool, while Pharris designed other products.

Business at the Faulkner location had really accelerated by 1984, prompting the need for additional space, so the company invested in a 40,000-sq. ft. addition to the facility. Dyer the engineer began to assume another role: Dyer the architect. He

designed a massive second story in addition to an expanded main level because of the growth he saw coming.

In 1986, Tyton launched the first hand tool to tighten and cut cable ties, the MK7 (Figure 3). The product portfolio really began to take shape, transforming Tyton into an industry solutions provider. At this point, the company found themselves collaborating directly with OEM engineers to provide better solutions. The truck and heavy equipment markets represented the initial OEM opportunity.



Figure 3. Original MK7 Hand Tool

The advent of Computer Aided Design (CAD) reached the company in 1987. Their first CAD system computer featured a 40 Mb hard

Continued on page 27

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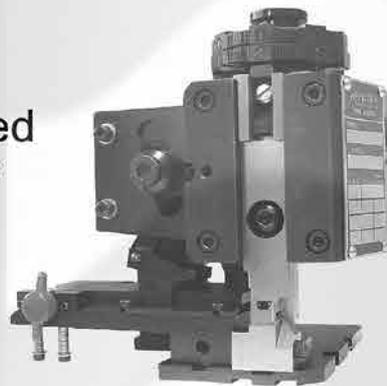


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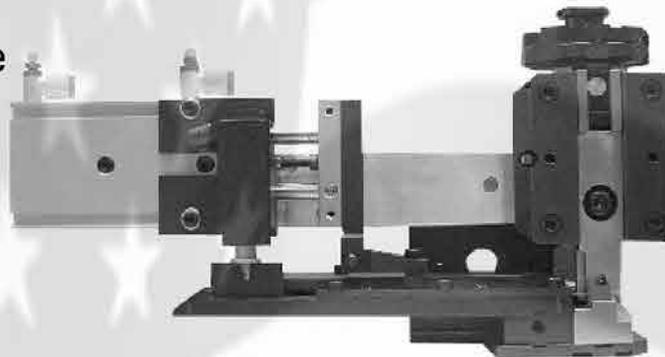


Model 1700

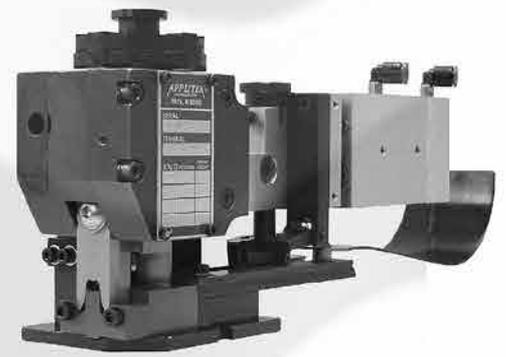


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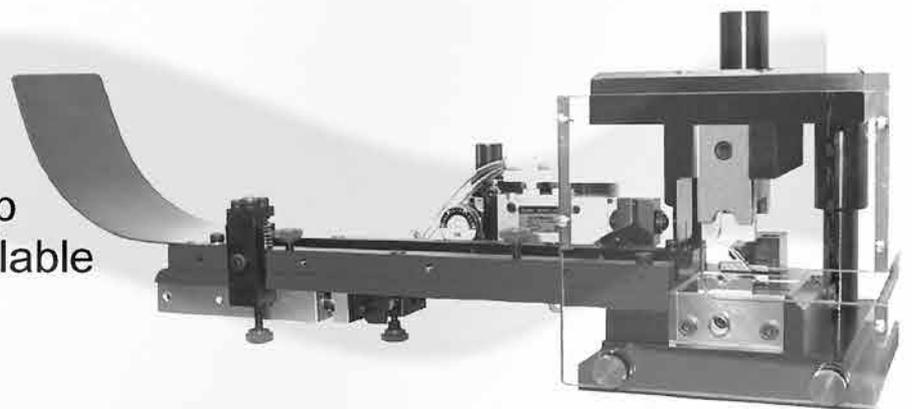


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HellermannTyton Continued from page 25

drive; state-of-the-art by standards at the time. Dyer would later recall laughing at the prospect of ever filling up that much space. Today, a single part file can be that large!

Soon, Tyton was serving other industries such as light vehicle, electrical wholesaling, telecommunications and appliances. In 1989, they introduced their first custom automotive part - the Corvette Canister Clamp (Figure 4). The following year, a molding facility was purchased in Naples, Florida to quickly respond to customer demand.



Figure 4. Corvette Canister Clamp

By 1995, the Faulkner facility added another 33,000-sq. ft. addition for the automated manufacturing of cable ties. In 1997, the company changed the name from Tyton Corp. to Tyton Hellermann. A year later, a larger, 115,000-sq. ft. facility was constructed to accommodate the growing Naples operation. That same year, a warehouse was added in Mexico to address growing wiring assembly production in the region.

On the heels of the increased market penetration, along with all the facility enhancements and additions, the next decade brought explosive revenue growth. Uniquely engineered cable ties such as the Wide Strap and Dual Clamp joined the ranks, as did TagPrint® Pro label creation software.

Perhaps the company name didn't roll off the tongue as well as it should have. As a result, in 1999, all locations across the globe (27 at that time) united under the name HellermannTyton.

In 2000, the acquisition of UK-based RW Data resulted in HellermannTyton Data.

The data division introduced the game-changing CAT6 copper connectivity solution, RapidNet®, in 2003, demonstrating an increased focus on the datacom industry. This laid the groundwork for many industry-wide solutions in place today.

A new president took the helm in 2005. Jim Campion had started with the company 16 years earlier as executive vice president in charge of sales. In 2006, a nearby Milwaukee facility became the dedicated location for extruded and pre-terminated products.

It eventually became evident that the North American operations needed more manufacturing space to keep pace with growing demand. In July 2012, the company purchased a 92,000-sq-ft building three miles from HQ. This facility enabled HellermannTyton to supply every major harness maker in North America, as well as GM, Ford, Chrysler, BMW and Mercedes with existing and custom parts.

The already brisk momentum got a boost from identification products, which dominated the solar market almost immediately. Having code-compliant solar labels; along with a supporting mobile app and a number of fastening options, like the metal edge clip and fir tree ties; positioned HellermannTyton as the solar identification and wire management experts.

In 2013, HellermannTyton engineers guided the launch of the EVO® 7 manual cable tie application tool (Figure 5), which dominated the field in terms of comfort and performance.

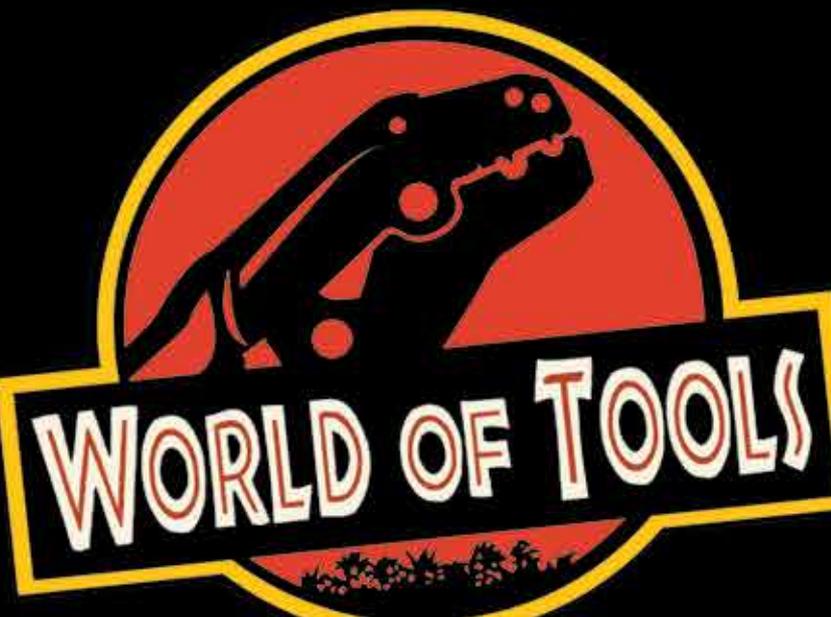
A year later, in 2014, HellermannTyton launched the AT2000 CPK automatic cable tie application tool. This wasn't the

Continued on page 29



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HellermannTyton Continued from page 27



Figure 5. EVO® 7 Manual Cable Tie Application Tool

company's first automatic tool, but it did represent a huge leap in technology, repeatability and flexibility.

The company's Good Hope factory was working at capacity and beyond. All signs pointed to the need to expand yet again. In 2015, HellermannTyton more than doubled the size of its main North American manufacturing facility to 200,000 sq. ft.

In 2016, the U.S. team developed another industry first with the

Ratchet P-Clamp family. The following year, a major remodeling began at the headquarters on Faulkner, beginning with a bright, modern customer care department and extending throughout the rest of the facility. A production facility opened in Monterrey, Mexico to address a growing need for product assembly.

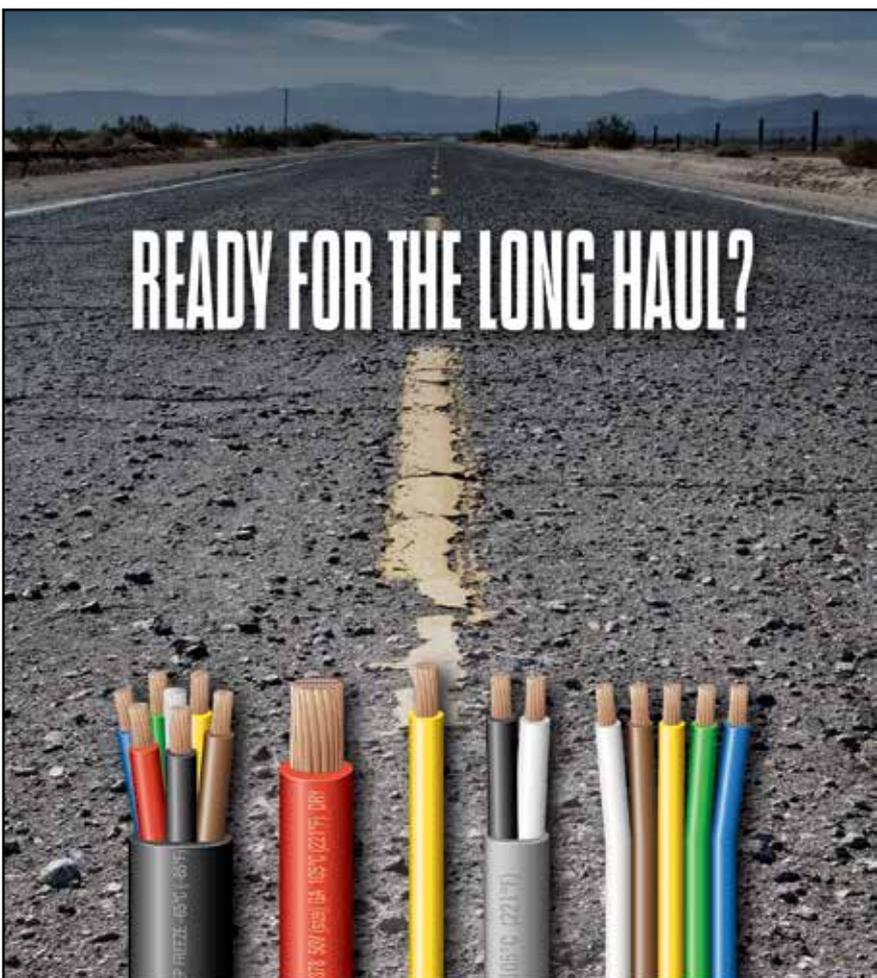
President Jim Campion retired in the spring of 2017. He didn't hesitate to name his replacement - the talented and energetic vice president of marketing, Terry Tuttle, a 29-year veteran with the manufacturer. Terry's leadership and guidance have taken the company forward while maintaining its unique culture.

HellermannTyton celebrated 50 years in North America - occupying 10 sites - in 2019. Today, the interior of the Faulkner HQ would be unrecognizable to anyone who retired two years earlier. Successive years of double-digit growth are the result of extremely talented people, strong customer relationships and a unique understanding of the technical markets the company serves with equally technical solutions.



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New Solutions Automate Wire Harness Production Line Balancing

Continued from page 1

The rise of automotive E/E content casts additional emphasis on the wire harness that connects these various systems, providing and distributing electrical power and signals. Today's wire harnesses are vastly more complex as a result of technological innovation and consumer demands for new features. Some modern mid-size vehicles contain up to 40 harnesses, amounting to hundreds of connectors, thousands of terminals and up to 1500 wires. If taken apart and put into a continuous line, these wires would exceed a length of 2 miles (3.2km) and weigh approximately 132lbs (60kg). In addition, there can be more than 70 specialty cables, such as coax, high-speed data, and USB cables. In older cars, this number was closer to 10.

Harness complexity will only continue to escalate as companies continue to advance vehicle technologies, particularly in the automated and assisted driving space. Advanced driver assistance systems (ADAS) and eventually automated vehicles vastly increase the number of sensors and actuators that will be equipped on a vehicle. Even as manufacturers consolidate ECUs to create more centralized vehicle architectures, the significant increase in sensors and actuators will cause harnesses to grow in size and sophistication.

These trends in the automotive industry towards electric and electronic vehicle features and components are expected to drive growth in the wire harness manufacturing industry. According to a report from Future Market Insights, the global automotive wire harness

market is expected to reach a value of \$91.53 billion in 2025. The report identifies rising automobile sales and increasing demand for electronic safety features, high-end electronics, and electric powertrains as driving forces behind the projected growth in the wire harness industry.

With growth comes fresh challenges and new pressures on the industry. To support the greater number of electrical and electronic systems, some of which are very sophisticated, wire harnesses are becoming intensely complex. Manufacturers must also accommodate all of the possible configurations of a vehicle, a number that frequently rockets into the tens of millions. While manufacturing these complex systems, companies have to meet very tight timelines, exacting quality requirements and minimize production costs to maintain a competitive position in the market.

In such an environment, wire harness manufacturers that can increase the efficiency of their production processes will be better equipped to seize new opportunities and respond to dynamic conditions. Harness manufacturing line balancing, a lean manufacturing concept, is a promising strategy that allows harness manufacturers to improve their manufacturing efficiency and ensure on-time delivery to customers.

Line balancing: What is it?

Line balancing is a process of balancing the workload of each operator at each workstation on a production line such that no operator or station is either over-burdened or left idle (Fig-

Continued on page 42

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	WEDNESDAY, MAY 13	THURSDAY, MAY 14
8:30am – 9:30am	Misconceptions in Testing: Limits of Fault Detection Christopher E. Strangio, CAMI Research	Making Connections: Soldering and Cables Frank Honyotski, STI Electronics, Inc.
10:30am – 11:30am	Training – The Key to Profitability Rob Boyd, Schleuniger	The Evolution of EMI Shielding Cory Peltzer & Madison Lenschow, Zippertubing
12:30pm – 1:30pm	Digital Transformation Trends in Wire Processing Patrick Moroney, Komax	Crimp Systems – Maximizing Performance and Durability Shelley Green, Pico Tools
2:30pm – 3:30pm	Islands of Automation Paul Harvel, Zuken	SEMINAR ROOM SPONSORED BY  Schedule subject to change

On Tuesday:

IPC/WHMA will hold a one of a kind **workshop and roundtable** from 2:00 - 5:00pm. Entitled "IPC-WHMA-A-620 Emerging Needs for Criteria – Repair/Rework, Design for Manufacturing (DFM) Issues, High Voltage Electric Mobility", it will cover many aspects of repair and rework required for the cable and harness industry. Instructor will be the Chairman of the IPC Acceptability Standards Committee, Constantino González - Management/Process Improvement Global Consultant for ACME, Corporation.
Visit: <http://www.ipc.org/TechEd-620A>

CAMI Research Inc. will be conducting a **complimentary seminar** entitled "Beyond Continuity and HiPot Measurements".

Cami Research Inc. will also be holding an **advanced training workshop** entitled "Improving Reliability of Continuity & HiPot Testing". Sign up before March 31 and receive a special Early Bird Registration 50% Discount.
Visit: <https://www.camiresearch.com/Campaigns/wpt-expo.html#Training>

On Wednesday and Thursday:

There will be special, **Free Classes** on Crimping & Advanced Levels of Wire Processing Technologies – 2-Hour Sessions being offered by Schleuniger & Komax.
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- Educational Knowledge Bar – 20 minute relaxed seminars on business practices from your peers.
- **FREE LUNCH** – Yes, there is such a thing! [Thursday only]

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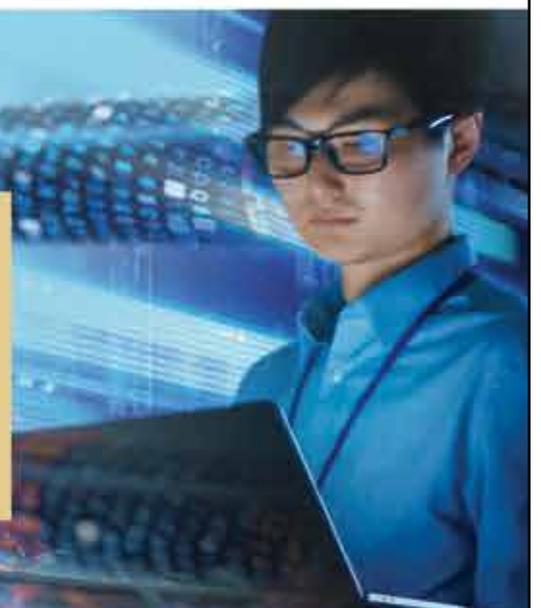
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Register by April 22, 2020 – Admission Fee [\$20] Will Be Waived.

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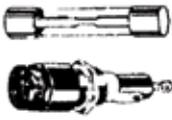
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In every issue of Wiring Harness News, Anixter will bring you informative articles about wire and cable technology.

Electrical Characteristics and Terms for High-speed Data Systems

High-speed data (greater than 1Mb/sec) in digital systems requires precise cable electrical performance. By having the correct balance of properties, the conductor size, dielectric material and wall thickness, the cable design engineer can produce electronic cables that are tailor-made to transmit high-frequency digital data pulses over the greatest distances. The signal output from these cables preserves the required wave form definition and will eliminate, or at least minimize, data errors. Below details some of the factors and characteristics to consider when planning a high-speed data system.

Dissipation factor (DF), otherwise referred to as the power factor. The dissipation factor is defined as the reciprocal of the ratio between the insulating material's capacitive reactance to its resistance at a

specified frequency. It measures the inefficiency of an insulating material. This is a measure of the dielectric losses in an electrical insulation when used in an alternating electric field and of the energy dissipated as heat. In electrical wire and cable products, a low dissipation factor is important because it indicates low AC dielectric losses.

Dielectric constant is used to determine the ability of an insulation to store electrical energy. The dielectric constant is the ratio of the capacitance induced by two metallic conductors with an insulator between them.

Capacitance describes the ability of two electrical conductors, which are separated by a distance or dielectric material, to store an electric charge between them. An example of this is when a cable or harness with two or more wires can store a charge and this stored charge can affect the way the cable performs. A high-capacitance cable slows down the voltage rise time and decay time for

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each pulse, effectively distorting the data. A pair of conductors separated by a dielectric is a capacitor. Capacitance is measured in picofarads (pF/ft.). Low-capacitance cables maintain the required wave shape and minimize possible data errors. A lower capacitance cable performs better than higher capacitance cable. The low-capacitance cable is required with high-speed data, thus providing less distortion.

Resistance and reactance combine to form impedance, which is defined in terms of two-dimensional quantities known as complex numbers. When alternating current passes through a wire that contains reactance, energy is alternately stored in the insulation and released from a magnetic field or an electric field.

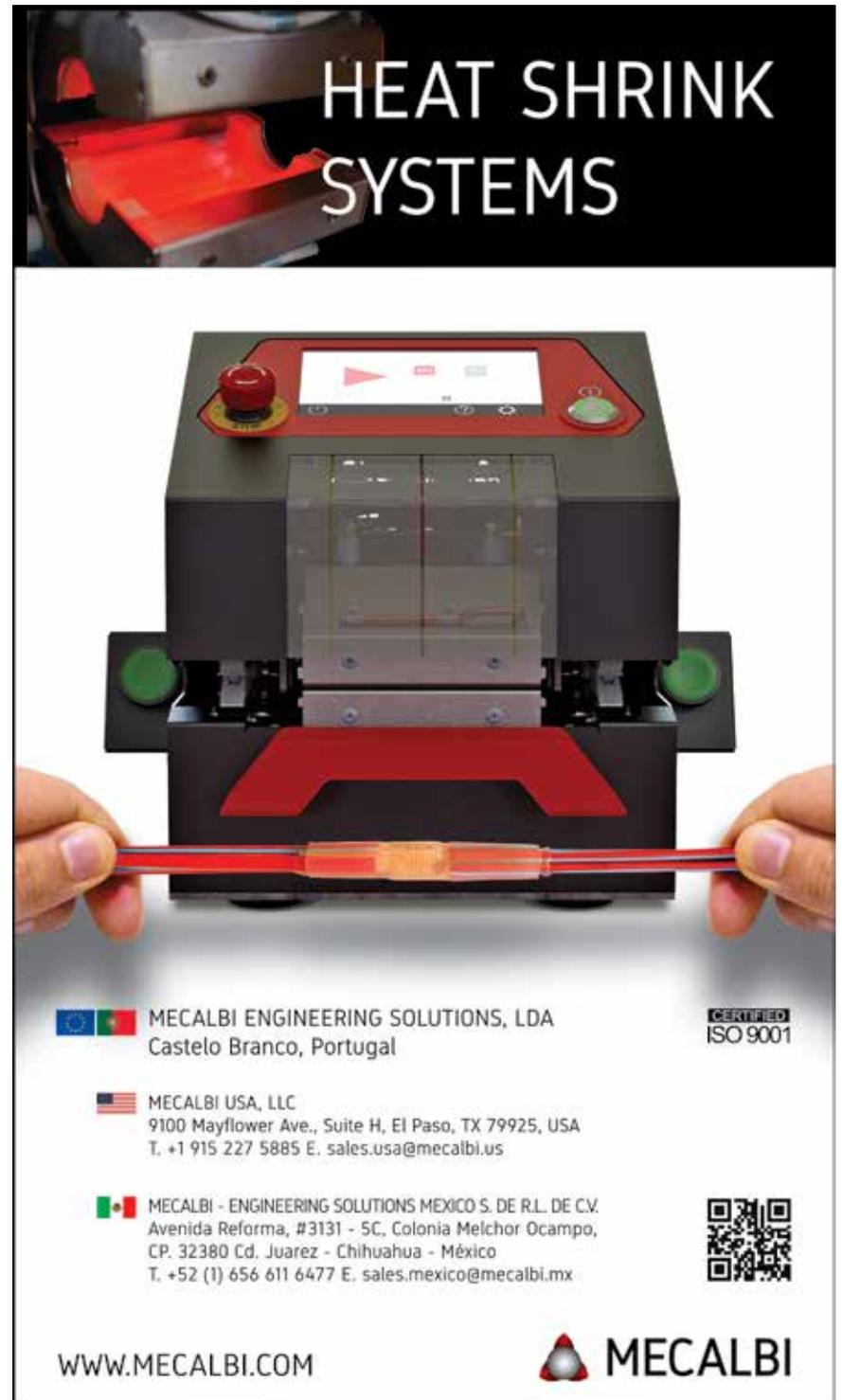
Impedance is a term expressing the ratio of voltage to current in a cable of infinite length.

Velocity of propagation, commonly called velocity, is the ratio of the speed of the flow of an electric current in an insulated cable to the speed of light.

50 Ohm and 75 Ohm values refer to the impedance customarily used in coaxial cable designs. Impedance is a measure of resistance in the cable to the flow of electrical energy. 50 Ohm cables are typically for data applications, whereas 75 Ohm cables are routinely used for video applications.

Our experts have a deep understanding of the electrical terms and how they are all interrelated in determining the correct insulation systems and cable designs to meet the specific needs of your application.

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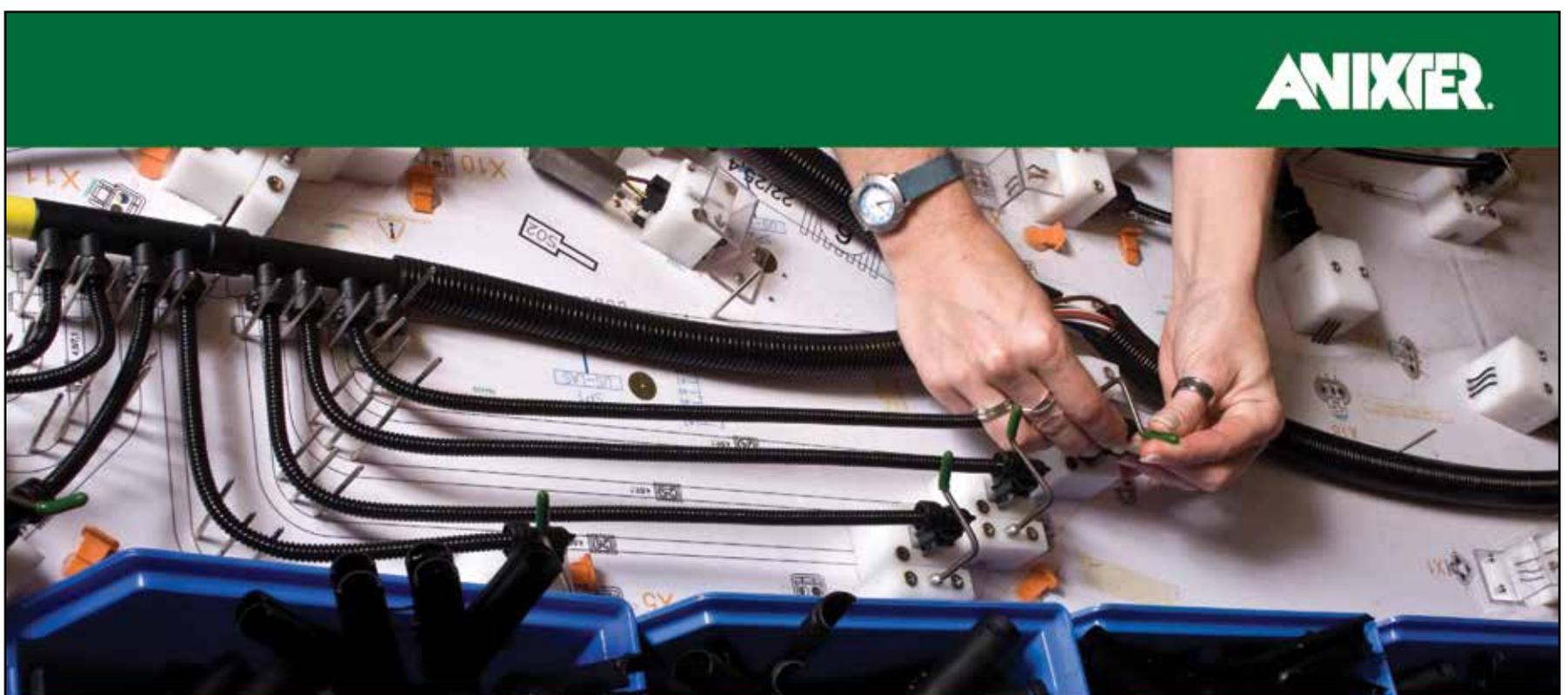
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Continued from page 1

10:30am - 11:30am **Training – The Key to Profitability**
 Presenter: Rob Boyd, Schleuniger

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 Presenter: Frank Honyotski, STI Electronics, Inc.

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 Presenters: Cory Peltzer & Madison Lenschow, Zippertubing

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 Presenter: Shelley Green, Pico Tools



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 There will be special, Free Classes on **Crimping & Advanced Levels of Wire Processing Technologies** – 2-Hour Sessions being offered by Schleuniger and Komax.

Registration is now open for the event at ElectricalWireShow.com Anyone registering on-line before April 22 will have their Admission Fee [\$20] waived.

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New Solutions Automate Wire Harness Production Line Balancing



Figure 2. Line balancing attempts to match the production rate to customer demand by balancing the workload of operators and workstations across a production line.

Continued from page 31

ure 2). The balancing of these workloads is based on Takt time, which indicates the rate of production required to meet customer demand. Producing faster than the Takt time can lead to excess inventory while lagging behind it can cause late deliveries to customers. Either case can lead to elevated production costs and unhappy customers. In contrast, a manufacturer that consistently meets or comes close to its pre-determined Takt time will

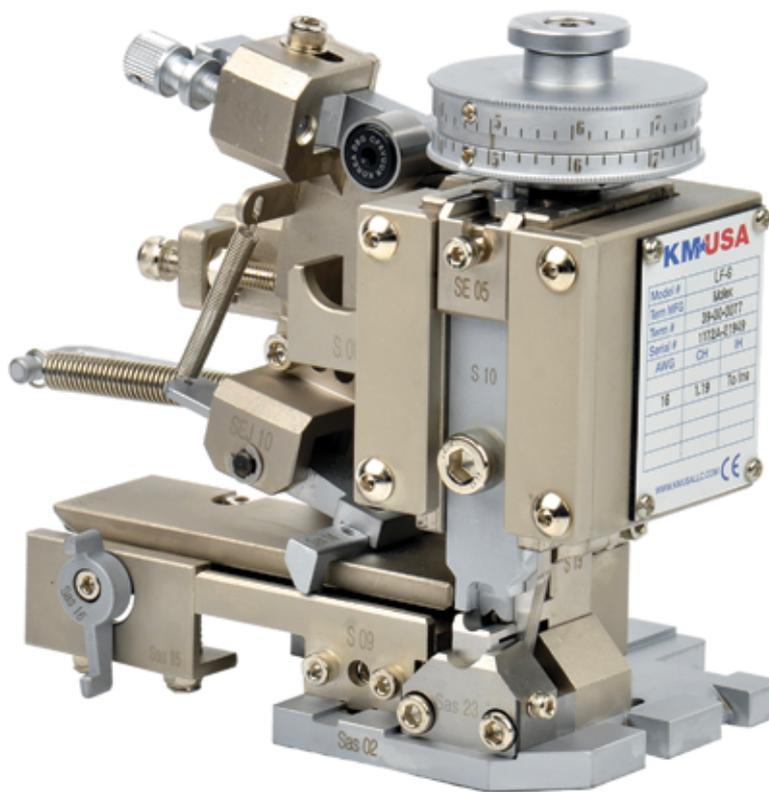
eliminate production bottlenecks, excess capacity, and other forms of waste to ensure on-time delivery of products at the lowest cost.

While line balancing is an important tactic for harness manufacturers, it can also be challenging and costly to implement. Line balancing, like other aspects of harness manufacturing preparation, requires extensive manual labor to complete. Time-study engineers (REFA in Germany) first need to conduct detailed timing studies of their current production processes that are then used by manufacturing engineers to calculate assembly and Takt times for each product being manufactured. Next, they must evenly distribute all the assembly tasks, considering the previously defined time for each operation. Here, the logical sequence of assembly needs to be respected to avoid task violations. For instance, assigning a task to a workstation before a prerequisite task has been performed. Finally, the manufacturing engineers will have to repeat this process for each production line to ensure maximum efficiency.

Attempting to perform line balancing manually, using spreadsheets and formulas, is difficult, error-prone and time-consuming. In addition, any changes to a product bill-of-process (BoP), harness design, order volume,

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New Solutions Automate Wire Harness Production Line Balancing

Continued from page 42

and more may require updates to the allocation of tasks across the production line. Further manual work is required to make these changes and to rebalance the production line. In addition, slow and labor-intensive manual processes make investigating multiple balancing scenarios, comparing them, and performing “what if” analyses almost impossible to achieve. This results in suboptimal production line efficiency.

Now, new solutions are available that digitalize and automate the line balancing process. By removing manual and labor-intensive processes, these solutions can help wire harness manufacturers fully leverage line balancing strategies to maximize production efficiency and minimize cost.

A New Approach to Line Balancing

These new line balancing solutions, such as Capital Harness Line Balancer from Siemens Digital Industries Software, part of the Capital software suite, provide guided and intuitive balancing of tasks across a harness production line (Figure 3). Manufacturing engineers can quickly and accurately distribute manufacturing tasks across workstations on a production line, allowing time for multiple “what if” scenarios to be compared and analyzed. The manufacturing engineers will be able to identify

optimal balancing scenarios, ensuring that production lines operate at maximum efficiency.

These line balancing solutions automate previously manual tasks, vastly reducing the time and effort required to achieve optimal production scenarios. Furthermore, these solutions can integrate with the rest of the vehicle E/E systems and harness engineering flow to create a digital thread from vehicle definition through manufacturing planning and execution. These integrations ensure that manufacturing engineers have complete and up-to-date information as they allocate resources and plan production processes.

For example, Capital Line Balancer can pull required assembly tasks directly from the product bills of process (BoP), allowing the manufacturing engineer to begin allocating tasks to workstations right away. The engineer can develop one or multiple line balancing scenarios for the same product, assigning tasks with intuitive drag-and-drop functionality. The solution also automatically consolidates tasks from multiple harness variants, giving the engineer a complete picture of tasks across harness designs and variants.

As the engineer works, Line Balancer can provide constant guidance on the earliest workstation in which a task can be performed based on task and material dependencies. The solution can also identify errors and conflicts based on these defined dependencies, such as

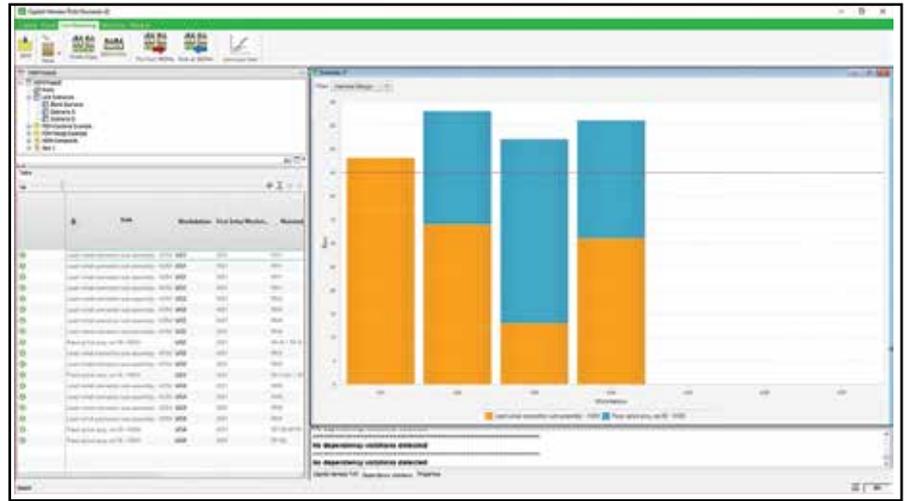


Figure 3. New line balancing software solutions feature intuitive interfaces and guidance for manufacturing engineers to accelerate the balancing of workloads across production lines.

out-of-sequence operations within a given workstation, or across multiple workstations. All the while, dynamic charts display the time variance for tasks at each workstation for all, one, or a selection of the harness variants. Hyperlinks and cross-highlighting make navigation between these various views easy.

Once the manufacturing engineer is satisfied with a balancing scenario, they can push it back to the product BoPs, automatically updating the tasks in the BoP with the correct workstation assignments. Then, the engineer can use these BoPs to generate workstation specific work instructions for the manufacturing floor, ensuring a continuous digital thread from the harness design data to the factory floor.

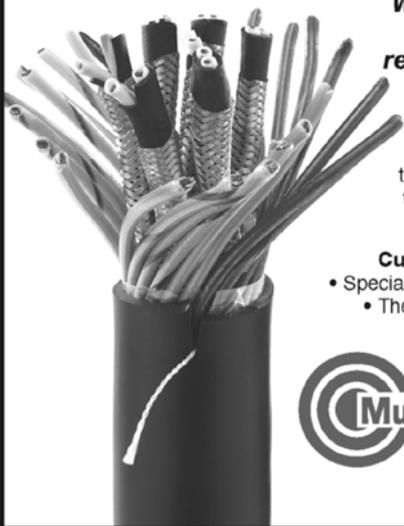
As part of the Xcelerator portfolio, the data from Capital Line Balancer can also be leveraged in downstream manufacturing engineering. For instance, the line balancing data can be fed into plant simulation software to validate production lines within a virtual model of the production plant. Accurate line balancing data allows manufacturing engineers to plan material delivery and logistics within the facility, helping them to identify potential issues early in the engineering process.

Digitalized Solutions Prepare Suppliers for Tomorrow

The growing importance of automotive electronics and software is further emphasizing the criticality of the E/E architecture and wire harness. In a dynamic market, harness suppliers that can maximize production efficiency while maintaining the agility to respond to customer needs will put themselves in a strong competitive position.

New line balancing software solutions can help harness manufacturers achieve this flexibility and efficiency by helping engineers to optimize harness production lines. By automating and digitalizing the line balancing process, harness manufacturers will save valuable time and money while improving their ability to meet customer demands on time. Furthermore, integrations with the rest of the harness and E/E systems engineering and manufacturing flow ensures manufacturing engineers always have up-to-date information at their disposal, and streamlines the communication of needed changes back upstream. These capabilities will help harness manufacturers refine their current processes, while robust integrations will help them remain flexible to the demands of tomorrow.

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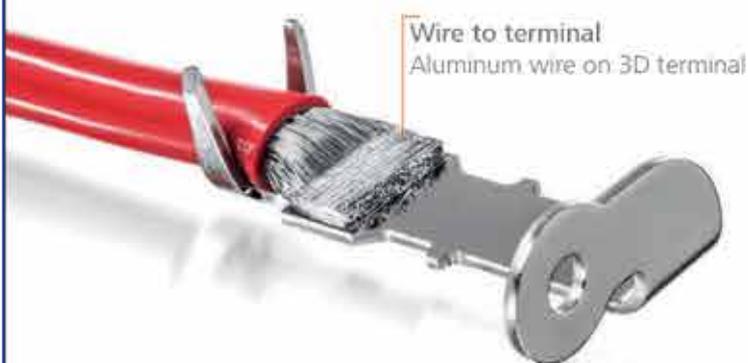


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Consolidated Electronic Wire & Cable

Continued from page 40 _____

tion,” he recalled. “One of the first things I noticed when I got here was an employee removing items from the trash to place them in the recycle bin instead. That may seem insignificant, but that level of care was something new for me. I knew in that moment that this was something I wanted to be part of for a long time.”

Jason explained how the company is developing educational opportunities for employees to better understand how the business works. The Consolidated Electronic ESOP



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committee has developed a dynamic curriculum of adult learning comprised of various multi-media tools, as well as games and activities to bring information to employees in a way that is easily digestible while championing each team member with their rights as a stake owner of the company.

The whole notion of empowering through education and learning has transcended to the way they engage customers as well. The connection to customers became apparent immediately when I asked for an example of how this culture impacted customer service. “When you call Consolidated, a person will answer the phone, not a phone prompt maze. When you submit a ‘Contact Us’ form, someone with your specific account information responds, and you’ll never be routed from one silo of an organization to another.” Jason stressed that a qualified expert is picking up the phone to customize the experience to the inquiry or request. “Every single individual here is exceptionally qualified and an expert in the industry,” he explained. “It is fun being able to support our business partners in such a profound way, and I think that is why there has been such low turnover in our business. You’re an owner here, you’re empowered to serve, so why would you want to leave?”

In fact, following our interview, Jason was off to join his ESOP committee peers in organizing an activity for team members. "We're breaking the organization into teams of five, at individual tables with milk cartons that are 18 inches apart, supplying each team with straws, packing tape, twine and scissors. The goal is to build a bridge together, capable of supporting one of our 4-ounce spools. The winner will be whoever's bridge can support the most weight!"

I noticed the theme of 'education' as a metaphor beginning to repeat in our discussion and asked if that theme impacted his decisions as a Marketer. "You've got it! One of the underlying themes, as well as obligations, to market in our B2B ecosystem is to share our expertise." Jason stressed the marketing strategy isn't just about branding at Consolidated, but rather engaging with customers and potential customers with a myriad of useful approaches to solutions. He is happy to have a powerful ally in that endeavor. "Our partners at ThomasNet help us to develop meaningful content that can aid folks through the buying process in our industry. Whether you're a first-year procurement manager or a twenty-five-year engineer, we've got direction to help you make educated decisions." He is specifically proud of a 'Wire & Cable Industry 101' eBook the company has published. You can check that out at con-wire.com and its available for download.

Jason also mentioned the company actually going to be featured on an upcoming Thomas.net podcast. Our Director of sales, Tim Duncan is going to be speaking with Tony Uphoff, the CEO of Thomas, and discussing trends in the cable industry. "It's extremely low-cost for the type of exposure they get and, as Jason emphasized, the person listening is likely close to the point of transacting business, and can easily pick up the phone or reach out via email for a quote."

Recent years have shown phenomenal growth at Consolidated Electronic Wire & Cable, expanding over 25% year-over-year out of their humble main base in Franklin Park, Illinois. It's rare to find a company with this

much history that is still so motivated by innovation and growing at that pace. I asked Jason what else this success could be attributed to. "That's easy," he said, "We keep it simple and do the fundamentals better than anyone else, period. The customer is always the focal point; therefore, we listen." He likes to say the company has a big company reputation, with small company values. "We can deliver on what is most important, fair pricing, expert guidance, relentless service, and quality products."

Custom wire harnesses, overmolded cable assemblies and power cords are Consolidated Electronic's bread and butter. I asked what else makes Consolidated unmistakable to their customers. "You should check out one of our blogs!" He speci-

Continued on page 49



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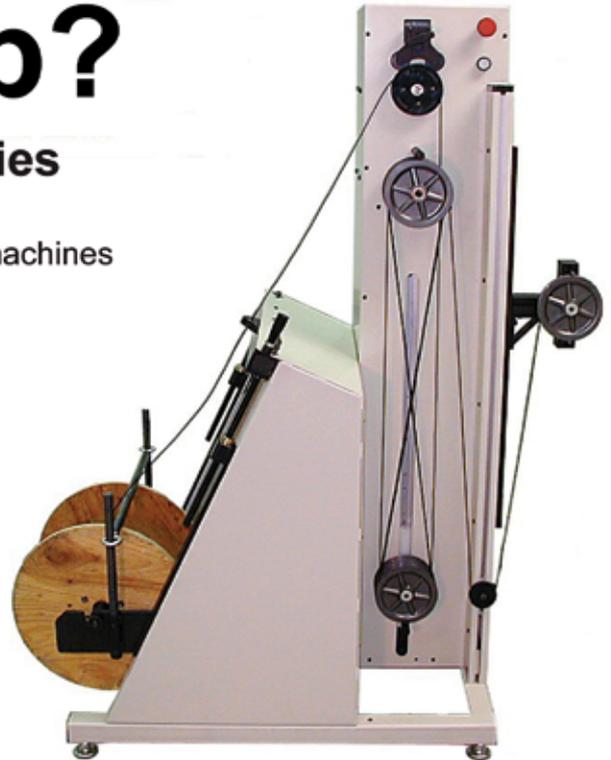




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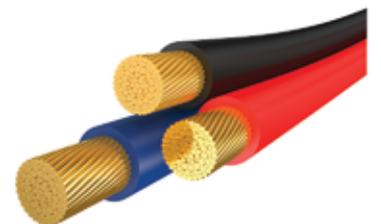
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Consolidated Electronic Wire & Cable

Continued from page 47 _____

cally directed me to Conwire.com/standing-out-from-the-rest, where I learned more about how the company has established rock solid customer relationships spanning several decades. By utilizing their warehousing and distribution services, they are able to save their customers money while delivering product where and when its needed. What really impressed me, though, was the extent to which this group is willing to customize the perfect solution for each case and application.

Another key to success for the company, as Jason sees it, is the fact that they've worked with such a variety of customers over the years. "You likely haven't heard the name Consolidated Electronic Wire & Cable," Jason explained, "but you have likely depended upon many products that have put their trust in us." They have been partnered in every major industry, in every industry segment including automotive, lighting, telecommunications and agriculture. After getting to know these guys first hand, it seems likely they will be around for another 100 years!



Bridge building experiment at Consolidated Wire and Cable.

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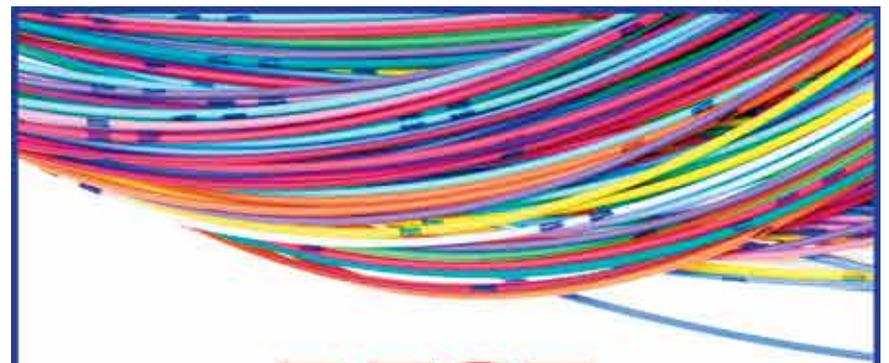
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Is it just me . . . or is it really hot in here?

Dealing with heat in enclosures

Imagine you find yourself locked in a small metal closet with little or no ventilation . . . it wouldn't take long before you were perspiring profusely and gasping for breath. Well, now imagine that you're a 19-inch rack stacked with computers and other electronics in that same closet. It wouldn't take long

before excessive heat forced you to shut down completely.

An electronics enclosure is designed to protect electronic components and devices by providing a physical barrier to aggressive media like humidity, water, oil-contaminated air, corrosive vapors, and airborne dust. As threatening as these factors are, the number one enemy of today's high-performance electronic and microelectronic components

housed in enclosures is actually excessive heat. As the packing density inside enclosures has increased, so have the importance of heat dissipation and energy efficiency in modern climate control enclosure systems. If exposed to a 10K increase in temperature relative to the maximum permitted operating temperature, an electronic component's service life can be cut in half and its failure rate doubles. (See Figure 1 Arrhenius equation in Figure 1 page 52)

Continued on page 52

We have you covered



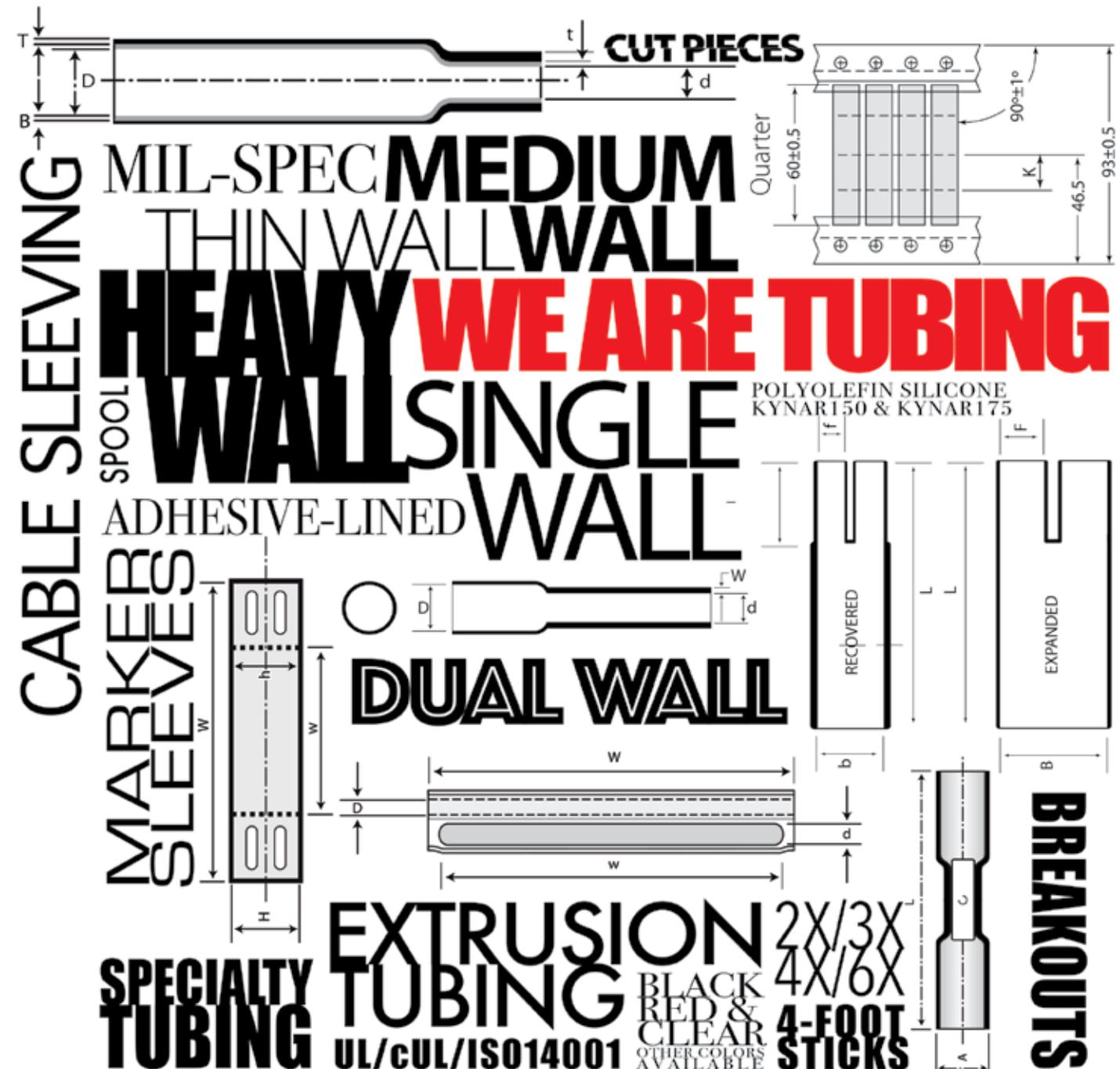
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Is it just me . . . or is it really hot in here?

Continued from page 50

Thermal conduction and convection are the most significant forms of heat dissipation commonly used to cool enclosures and electronic housings. Whether we are dealing with heat conduction or convection depends on whether the enclosure is open (air permeable) or closed (air-tight). With an open (i.e., air permeable) enclosure, the heat can be dissipated from the enclosure via air circulation from inside to outside (thermal conduction). If the enclosure must remain closed (air-tight), the heat can only be dissipated through the enclosure walls (through convection).

Whether natural convection is sufficient to dissipate the heat loss Q from the closed enclosure through the walls to the outside depends on the ambient temperature (T_u) and the maximum permitted internal temperature (T_i) inside the enclosure.

sure. The maximum temperature increase relative to the environment inside the cabinet can be determined from this equation:

$$(T_i - T_u) = \frac{Q_v}{k \cdot A}$$

where k is the heat transfer coefficient (for sheet steel $k = 5.5 \text{ W/m}^2 \text{ K}$) and A (m^2) is the enclosure surface area, determined according to DIN 57 660 part 500.

Here's an example of how to calculate heat loss in the enclosure: = 400 watts

Enclosure surface area ($W \times H \times D$
 $600 \times 2000 \times 600 \text{ mm}$)
 $A = 5.16 \text{ m}^2$; $T_u = 22^\circ\text{C}$
 $(T_i - T_u) = 400 / (5.5 \cdot 5.16) > 22 - 14 = 8 \text{ K}$

Result: The enclosure internal temperature (T_i) with heat loss of 400 W and surface area of 5.16 m^2 at an am-

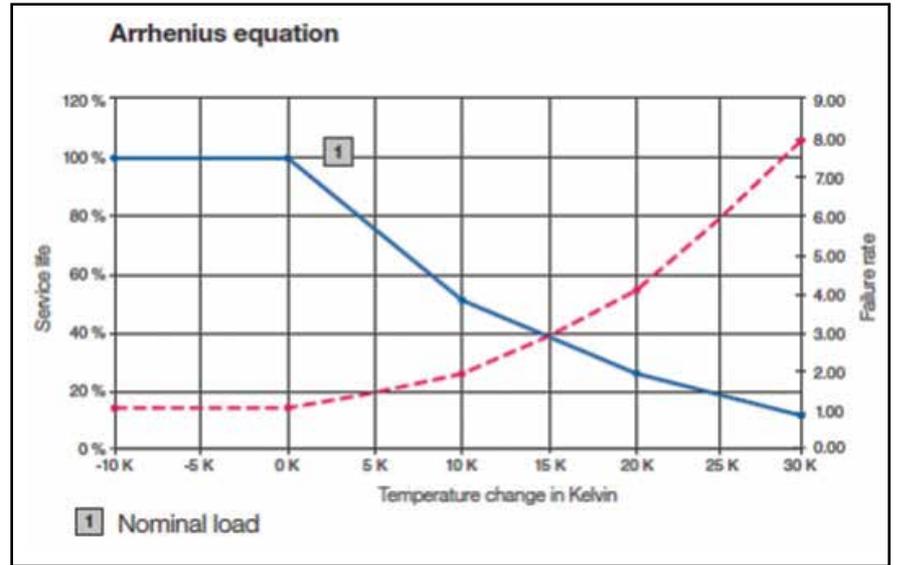


Figure 1. Arrhenius Equation

bient temperature of $+22^\circ\text{C}$ will rise to approx. $+30^\circ\text{C}$.

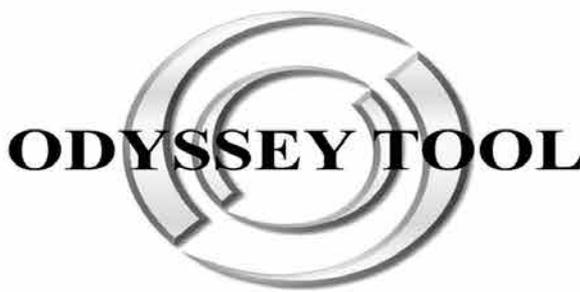
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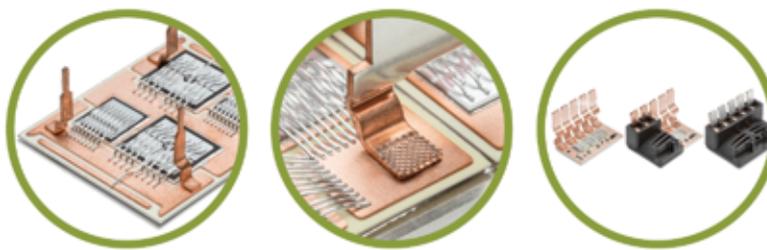
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Back to Basics

Soldered Wire Termination Series

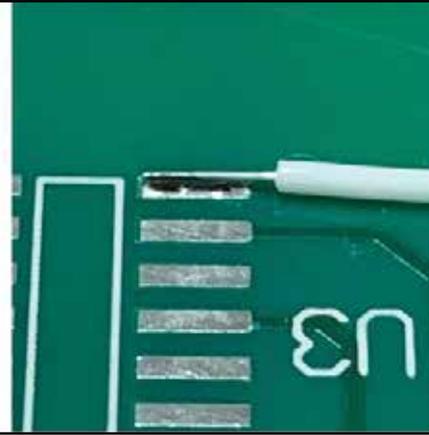


Figure 2. Mechanical Stripper

By Ray Cirimele
STI Electronics Inc.

This is the first of a series that will review soldered wire terminations from beginning to end in detail. Wire preparation is the first step in the process

and wire insulation removal (stripping) is the first step in wire preparation.

There are many methods of insulation removal. We will focus on manual insulation stripping using one of the two most common tools for manual stripping.

Mechanical Stripper (Figure 2, to be covered in the next issue)



Figure 1. Thermal Stripper

Thermal strippers usually come in a hot tweezer configuration with various styles of opposing elements (Figure 3). Thermal strippers have one major advantage over other types of handheld wire stripping devices. When the heated blades of the stripper come into contact with the wire insulation, it will slowly melt through the insulation, and with normal pressure applied, it will leave a very thin film of insulation between the blades and the wire strands. With no physical contact between the blades and

the wire strands, strand damage from the stripping operation is avoided. This can be important because in the past, specification requirements specified that wire 22 AWG and smaller could not use mechanical strippers due to the slight risk that the cutting edges could scrape the strands exposing the underlying copper.

Step 1: Set the wire stop

Many of the handheld thermal strippers have adjustable wire stops to multiple wires have the same strip length (Figure 4). A setup wire may be used to ensure that the wire stop is set correctly before proceeding.

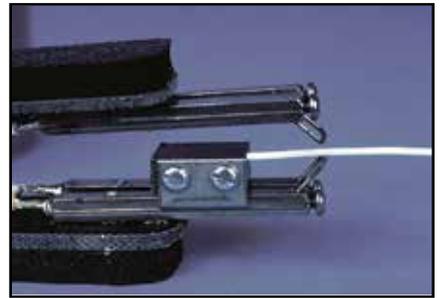


Figure 4. Set wire stop.

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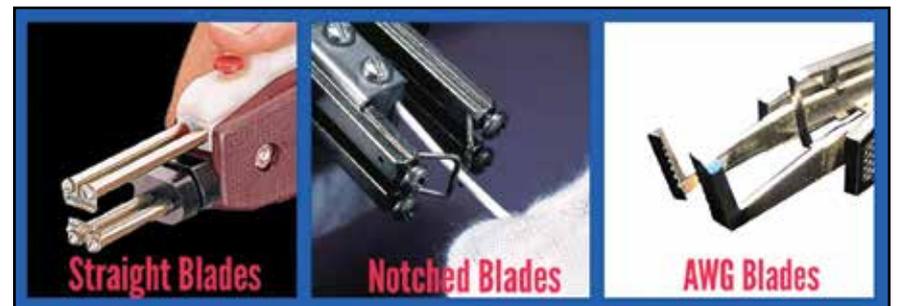


Figure 3. Hot tweezer configurations.

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Step 2: Place the wire

Place the wire in the correct position between the blades (Figure 5).



Figure 5. Position wire.

Step 3: Squeeze the handles

Use firm pressure to bring the opposing blades into contact with both sides of the wire insulation.



Figure 6. Firm insulation contact.

Step 4: Melt through the insulation

Allow the heated blades to melt through the insulation until resistance is felt from the wire strands (Figure 7). Give the blades a quarter turn before releasing the pressure and removing the wire. The quarter turn will ensure that there is no area of the insulation that did not make contact with the heated blades.



Figure 7. Melt through insulation.

Step 5: Removing the insulation slug

Give a gentle pull on both sides of the insulation to break the thin film of insulation still connecting the insulation slug from the insulation (Figure 8). When removing the insulation slug it is important to keep the pattern of the wire strands in the same condition as it was when covered with insulation.



Figure 8. Gently pull insulation.

Importance of Wire Lay

Changes to the wire strand pattern can actually affect the electrical characteristics of the wire. The best way to maintain the natural lay of the strands is to slowly twist in the direction of the strand twist as you are pulling the insulation slug from the wire.

When the strands have been straightened out during the insulation removal, birdcaging of the wire strands is likely to occur (Figure 9) resulting in diminished long term reliability.



Figure 9. Birdcaging of straightened wire.

When the strands are overtightened (Figure 10) it may result in diminished long term reliability and may also affect the electrical characteristics of the wire.



Figure 10. Overtwisted wire.



Figure 11. Perfect wire lay.

Obviously, leaving the strands in the same spiral lay they were in under the insulation is the desired condition because this will make it a lot easier for the electrons to navigate through the strands to his destination.

Look for Part 2 of this series in the May/June issue of Wiring Harness News. STI Electronics, Inc. will outline the basic practices of mechanical wire stripping.

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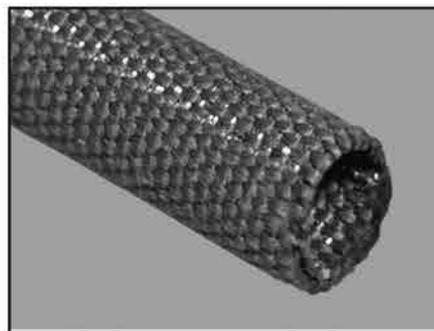
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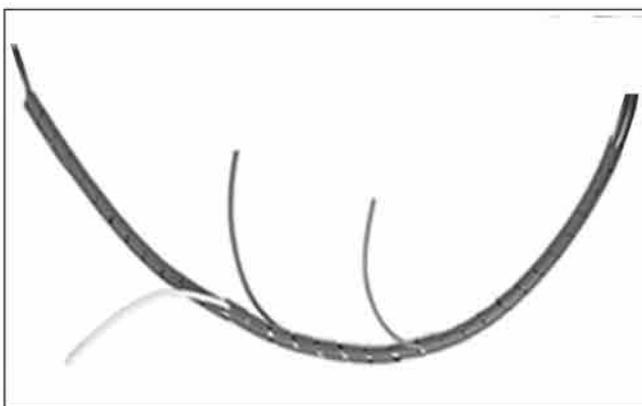
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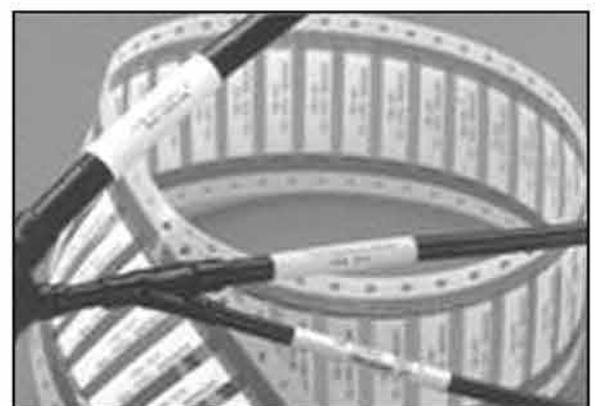
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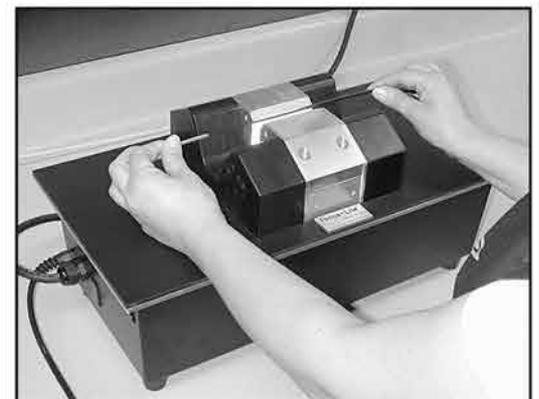
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Defect-Free Wire Cutting and Stripping

By Peter Doyon
Vice President Product
Management, Schleuniger, Inc.

Wire Cutting and Stripping (C&S) machines have been around for over 100 years. Until recently, C&S machines did not have the ability to detect whether the insulation stripping blades have touched and have possibly damaged the underlying conductor. Stripping quality control has been left to the judgement of the machine operator who typically does a first article inspection. Assuming the first piece looks good, the production batch is run and the assumption is that all of the wires in the batch are produced in the same quality as the first piece. Unfortunately, that is not always the case. Wire quality can vary and a machine program that worked perfectly in the past is no guarantee that it will work perfectly every time.

Wires have been getting smaller and insulations have been getting thinner in many different industries including automotive, military and aerospace. With less insulation to work with, wire stripping has become more critical. In order to achieve a clean, perpendicular cut of the insulation, the stripping blades must be positioned closer to the conductor. This increases the risk of blade to conductor contact, and possible damage to the conductor.

Use of aluminum wire has been on the increase, usually due to cost and weight savings vs. copper. Aluminum has a much lower fatigue resistance than copper. A small nick on an aluminum wire can result in a complete fracture after very little bending. For this reason, it is imperative that aluminum wires not be nicked or scraped during the stripping process.

The IPC/WHMA-A-620C standard specifies whether a given wire can be nicked or cut, depending on the Class (I, II or III), the quantity of strands in the wire and whether or not it will be tinned. Some Class I applications allow one or more strands to be cut completely, whereas some Class III applications (typically mil/aero and medical) do not allow any damage whatever.

Modern C&S machines can produce several thousand measured, cut and stripped wire or cables per hour. How can you be sure that all of them meet the applicable stripping quality standard? Other than 100% post inspection, another way is to use the new SmartDetect option from Schleuniger for their MultiStrip 9480 C&S machine.

The SmartDetect system electrically isolates the stripping blades from the rest of the C&S machine. A very sensitive control system senses even the slightest contact between the stripping blades and the conductor. With the SmartDetect system,

Continued on page 59

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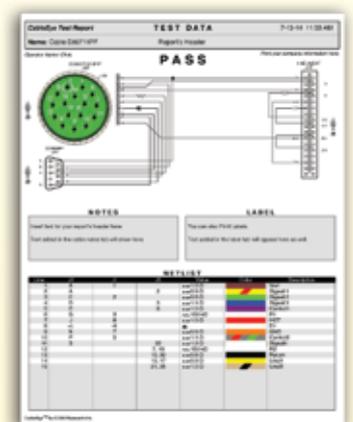
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3	4	5	+/- 100Ω	+11.7 50	Control
4	3	5	+/- 100Ω	+11.7 50	Control
5	3	4			Alarm
6	3	3			LED
7	4	2			UV Usage



Diagnostic Netlist/Schematic



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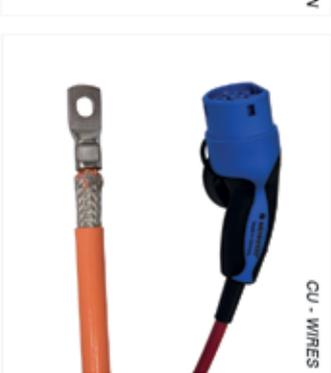
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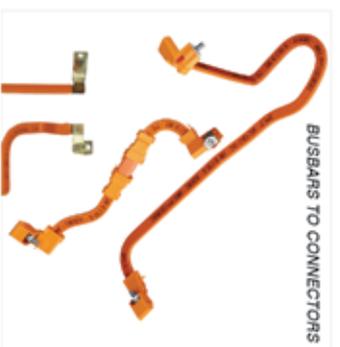
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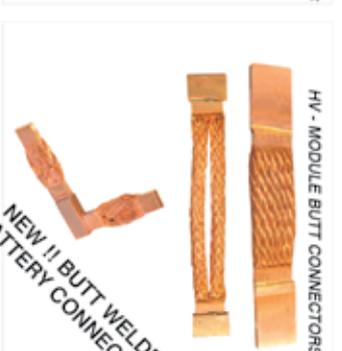
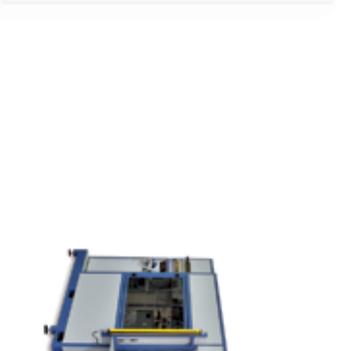
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Defect-Free Wire Cutting and Stripping

Continued from page 57

two sensing zones have been defined. The first sensing zone is monitored during the incision of the stripping blades into the insulation. The second sensing zone is monitored during the stripping (pull-off) of the insulation. Users can define tolerances for each sensing zone.

Some wires with particularly thin insulations cannot be stripped without having the stripping blades contact the conductor. The type of stripping blades used will determine how deep of an incision into the insulation is required for a successful strip. Universal V-type blades form a square shaped cut into the insulation, leaving the most uncut insulation compared to other stripping blade types. Properly sized Radius-type blades form a circular cut into the insulation and don't require as deep of an incision into the insulation in order to achieve a clean cut. Radius blades can still damage the conductor since there is no centering system to prevent the blades from cutting into one side or the other. Finally, Die-type blades are custom made for each wire size / insulation thickness combination and

utilize a counterbore that centers the wire during the incision and stripping process. Unfortunately, die-type blades do not offer the versatility of universal V-type blades that most customers prefer.

Stripping blade to conductor contact in itself does not mean that the conductor will be damaged. The tolerance of the SmartDetect incision sensing zone tolerance can be set to allow a given amount of blade contact that is acceptable based on empirical testing. Referring to figure 1 below, the graph line represents the stripping blade diameter position vs. time. In this example, a tolerance of 0.1mm has been programmed into the MultiStrip 9480 SmartDetect system for the Incision zone. This means that the SmartDetect system will allow stripping blade to conductor contact as long as it occurs within the last 0.1 mm (.004") from the programmed stripping position (SP). The example shows that there was blade to conductor contact at 0.11 mm from the SP position, therefore the SmartDetect system would display an error message for this example.

Continued on page 59

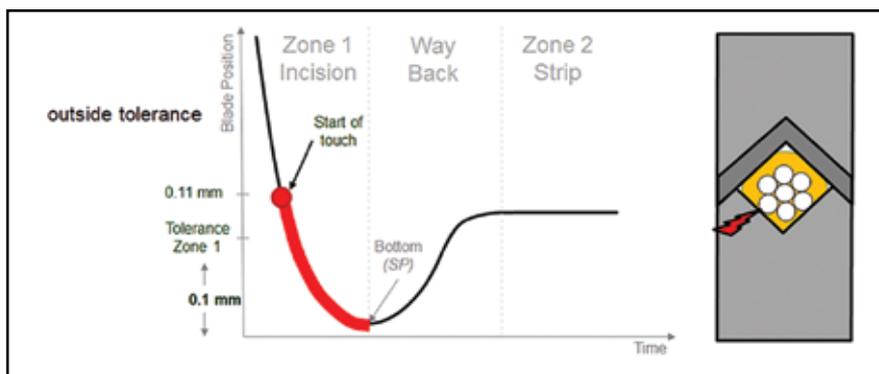


Figure 1. Stripping blade diameter position vs. time.

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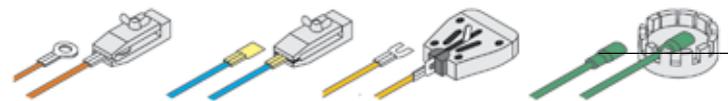
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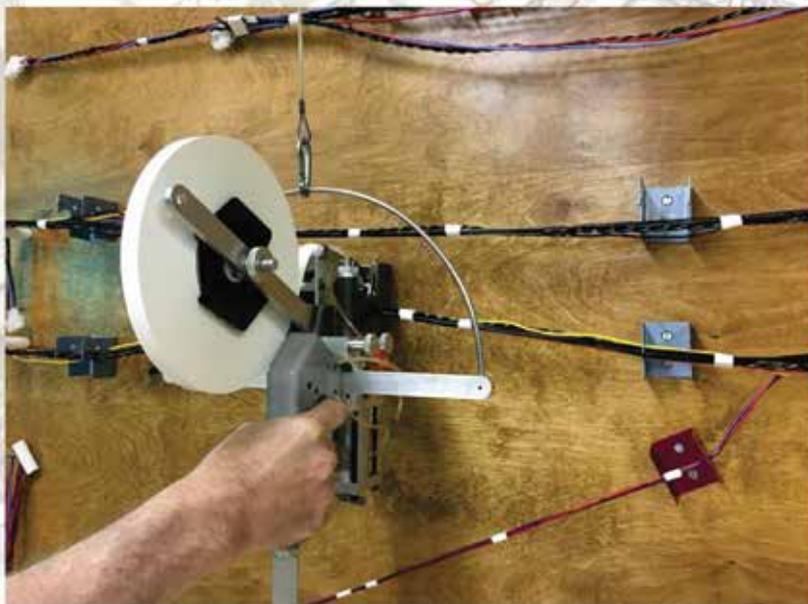
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Defect-Free Wire Cutting and Stripping

Continued from page 59

Stripping blade to conductor contact can also be acceptable during the stripping (insulation

pull-off) phase of the stripping process. Referring to the example in Figure 2, a tolerance of 20% has been programmed for SmartDetect sensing zone

2. This means the SmartDetect system will allow the stripping blades to touch the conductor for 20% of the Pull-Off length, which in this case is 2.0 mm. The SmartDetect system monitors the accumulated length of all of the stripping blade to conductor touches and compares the sum to the programmed tolerance value. If the sum of the touches is less than the programmed value, then the SmartDetect system will not display an error message. In the example below, the total accumulated length of the touches is 1.5 mm, therefore the SmartDetect system will not display an error in this example.

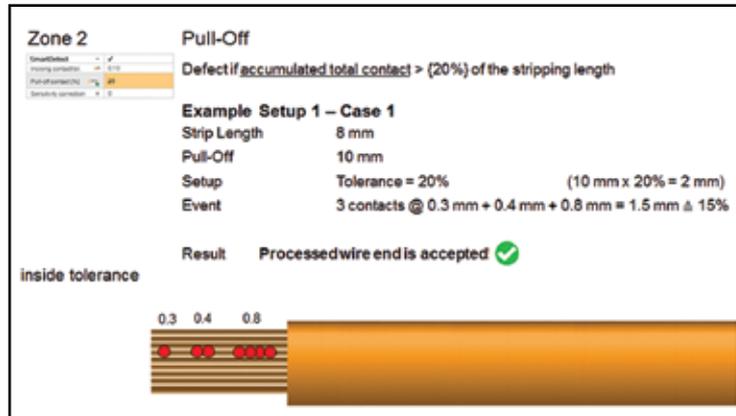


Figure 2. Stripping blade to conductor contact.

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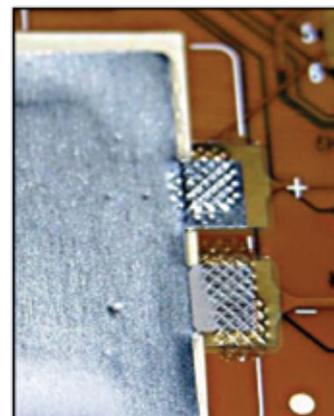
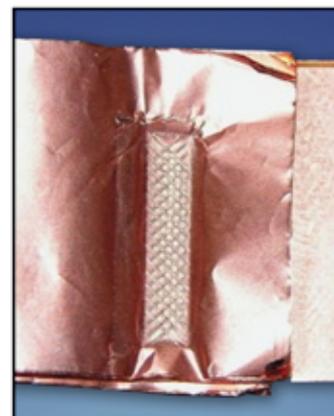
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The Schleuniger SmartDetect system is very flexible and provides in-process monitoring of wire stripping quality during a production run. Settings are saved with each job and can be recalled as required. The SmartDetect system also works with other cable types such as multiconductor, flat, coaxial and twisted pair. Each layer of a multi-layer cable can be monitored. For example, on a coaxial cable, the SmartDetect system can be programmed to monitor any blade to conductor contact during the outer jacket strip and inner conductor strip. It can be programmed to ignore any blade to conductor contact when making a cut into the braided shield.

With the ever increasing demand to produce the highest quality wire and cable assemblies, the SmartDetect option for the Multi-Strip 9480 offers an easy to use in-process solution that is guaranteed to catch wire stripping quality issues on each and every wire or cable as it is being produced, rather than finding a problem after the production run has been completed.

**CLASSIFIED ADS
 PAGES 63-64**

NEWS PLUGS *continued*
**Indium Corporation
Announces New
Jetting Solder Paste**

Indium Corporation continues to develop innovative solder paste solutions to fit customers' needs. PicoShot™ NC-5M is designed for customers needing a no-clean halogen-free SAC305 solder paste for their Mycronic jetting systems or add-on and repair modules.

PicoShot™ NC-5M jetting solder paste is the first material to come out of Indium Corporation's new partnership with Mycronic, a global leader in dispensing and jet printing equipment.

PicoShot™ NC-5M is a no-clean halogen-free solder paste approved after joint Indium/Mycronic technical development with Mycronic's MY 600/700 jetting systems. PicoShot™ can be used in standalone applications, such as system-in-package (SiP), jetting into cavities, stencil-replacement, shield attach, and microBGA. It also complements the stencil printing of Indium8.9HF. Designed as a no-clean solder paste, PicoShot™ can be cleaned easily with industry standard cleaning solutions.

PicoShot™ NC-5M's formulation meets or exceeds:

- ANSI/IPC J-STD-004B ROL0 requirements
- Halogen-free requirements per IPC and IEC61249-2-21 standards
- IPC standards for SIR and ECM

Additionally, PicoShot™:

- Provides exceptional jetting performance for a halogen-free Pb-free solder paste
- Reflows in air or nitrogen (ppm O₂ level from 50-1,000)
- Has a clear residue with minimal flow-out
- Significantly reduces head-in-pillow (HIP)
- Eliminates or significantly reduces graping
- Minimizes reflow spatter

Indium Corporation also offers a PicoShot™ NC-5M conditioner (purging gel) designed to allow the rapid purging, cleaning, and long-term storage of jetting, dispense, and micro-

dispense systems without the use of liquid solvents. PicoShot™ Conditioner C-1 is a chemically benign, bright blue-colored translucent, viscous gel that aids in visual endpoint detection and prevents inconsistent dispense volumes and clogging caused by solder paste dry-out.

To learn more about Indium Corporation's new jetting paste, visit www.indium.com.

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Continued on page 62

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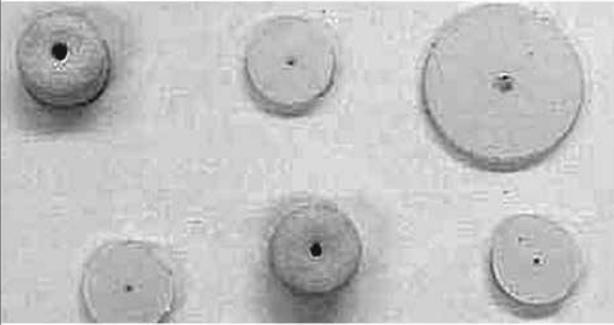
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NEWS PLUGS continued



Continued from page 61 _____

of PFC200 Generation 2 controllers with the release of the new 750-8215. The 750-8215 is IIoT-ready, comes with two Ethernet ports, two PROFINET ports, and is programmable with WAGO's e!COCKPIT software (CODESYS 3.5).

The PROFINET ports are switched for use as a line configuration enabling the controller to function as an I/O device connected to a PROFIBUS master. The two Ethernet ports can be used in a switched configura-



tion or separated, and support other protocols such as EtherCat and Sparkplug (with additional licenses).

Other features of the 705-

8215 controller include:

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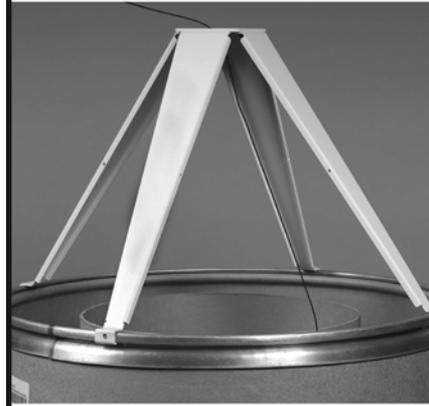
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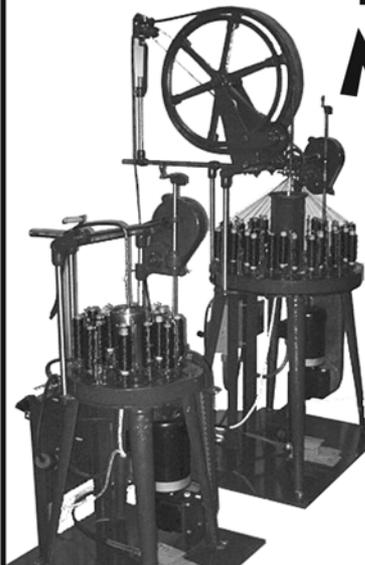


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NEWS PLUGS continued**Heilind Electronics to Exhibit at CONEXPO-CON/AGG in March**

Heilind Electronics, a leading global distributor of electronic components, will be showcasing its portfolio of interconnects this March at CONEXPO-CON/AGG. Held in Las Vegas, March 10 – 14, the event is North America's largest construction trade show representing safety and traffic, engines, components and electronics, business solutions, applications and more.

At the show, Heilind will feature

connectors, relays, fans, labeling, cabling and harness products from leading manufacturers like 3M, Amphenol Sine, Brady, Bulgin, Conec, HARTING, Hubbell, Molex and TE Connectivity.

"Heilind will be exhibiting a variety of interconnect solutions used extensively in construction equipment, trucking, agricultural machinery, earth moving equipment, engines and components, aerial lifts and cranes. All are designed to meet and exceed the harshest working environments," said Mark Ferris, Supplier Business Manager, Heilind Electronics.

Heilind Electronics, which serves customers ranging from start-ups to multinational OEMs, will have representatives at booth #B90923 for the

duration of the show. CONEXPO-CON/AGG takes place March 10 through March 14 at the Las Vegas Convention Center in Las Vegas, Nevada.

About Heilind Electronics

Heilind Electronics, Inc. (www.heilind.com) is one of the world's lead-

ing distributors of connectors, relays, sensors, switches, thermal management and circuit protection products, terminal blocks, wire and cable, wiring accessories and insulation and identification products. Heilind has locations throughout the world.



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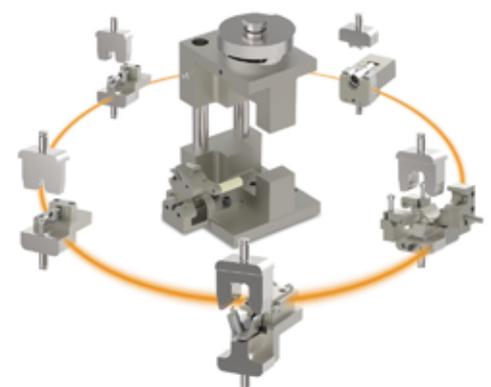


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