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## WHMA and IPC Sign Affiliation Agreement

WHMA members to receive all IPC-member benefits

After two years of discussion, WHMA recently announced entering into an affiliation agreement with IPC. IPC is a global industry association whose aim is to standardize the assembly and production requirements of electronic equipment and assemblies. IPC was instrumental in helping bring the WHMA/IPC A-620 to life. They curate the standard and subsequent changes and revisions. They also manage training and certification.

WHN recently spoke with Rick Bromm, President of Altex, Inc., and Chairman of WHMA, about the affiliation, and what it means for WHMA members. “A couple of years ago we were approached by IPC about the possibility of the two organizations working more closely,” Rick began. “They were starting to get a lot of re-

quests for support on the A-620 standard from different parts of the world, and we were surprised to learn it had actually become their second fastest growing standard. What IPC realized at the time is that, although there are similarities on the PCB and PCBA side, they really weren’t harness people.” A deepening of the bond between the two organizations began to make sense.

With an already established and successful relationship on A-620, both organizations bring value to the equation. “As a small association with limited resources, we didn’t necessarily have the ability to visit many shows to really get the word out about the A-620 and enhance the visibility of WHMA. We began to think it

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## Extrema Cables

By Joe Tito  
Wiring Harness News

We highlight businesses large and small in our profiles. Most have been in business for many years, but some, like Extrema Cables in Charlottesville Virginia, are in their early years. I spoke recently with Frank Churillo, Founder and President of Extrema Cables about how things are going for this young but growing business.

March of 2019 will mark Frank’s 4th anniversary in the business. He began our discussion telling how his background and experience led him to venture out on his own. “For the first half of my 20-year career I worked in design and development, and for the second half I worked for an engineering design company that did leading edge printed circuit boards,” he detailed. The boards were all outsourced and Frank managed the efforts of the contract manufacturers. “Along the way, I got tired of seeing how inefficiently things were being done, and I thought I would start my own company to try to correct some of the things I thought were wrong.”

Since he didn’t have a product, Frank began to scour government and military bids for something that was within his skill set. “I saw there was an opportunity to make electrical cable assemblies, and I thought that would be a decent way to get a little business started,” he explained.



Assembly for military application.

Eager to pull the boat close to the dock before the jump, Frank put out some bids while still at his old job. “I won a few, and the rest is history.”

As expected, it wasn’t easy in the beginning. “I had managed manufacturing from a higher level in my previous jobs, but there is a big difference between managing it and actually doing it. There are a lot of steps to go through, especially for the military as the specs are just overwhelming, so I spent the first couple of years getting that under my belt.” So far this year, things are working out well and the company just won a contract to sub for a prime contractor. That order alone should more than double Extrema’s output from last year.

Frank would like to continue to forge ahead with cable manufacturing as he has learned so much about it. He is in the process of quoting other applications, and he would like to bring some commercial harness builds on board. “I’d also like to get a little higher on the value chain and do some box builds as well as design work,” he mentioned.

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March/April 2019

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EDITORIAL CONTENT MANAGER

Joe Tito  
joe@wiringharnessnews.com  
Phone (407) 739-9811

ACCOUNT MANAGER

Jim Brown  
jim@wiringharnessnews.com  
Phone (708) 594-7764

ACCOUNTING

Marion Gray  
marion@wiringharnessnews.com  
Phone (708) 594-7762

Internet

http://www.wiringharnessnews.com

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Copies of *Wiring Harness News* (ISSN 1097-0789) are distributed bi-monthly to wiring harness & cable assembly shops, cord set manufacturers, companies that process electric wire & cable (including fiber optic) for use in their own products, their suppliers and other interested parties.

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International Harness Resources Inc., (IHR Inc.)

Wiring Harness News  
PO Box 669  
Schererville, IN 46375 USA

Office Hours:  
8:00 a.m. - 4:00 p.m. CST -  
(Monday-Thursday)

Printed in the USA

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# Extrema Cables

Continued from page 1

I asked Frank about any surprising challenges he has encountered since getting his business off the ground. “I would say the thing that has been the hardest for us, as far as cable assembly, is doing cables that have to pass a hot and cold salt water test,” he explained. They have had a couple of military cable jobs that required them to pass the test with zero leakage requirements. Frank and his team have found it arduous to economically produce cables that pass that test.

Although not surprised by it, Frank spoke about some of the challenges of running a company efficiently. “It doesn’t matter that you can make a cable that meets the specification; you need to be able to do it for a really good price, especially in the competitive area I’m in,” he emphasized.

On-time delivery and good communications with the customer are two strengths Frank sees emerging within his company. He prides himself in turning out quality product, but realizes that quality alone is not going to set him apart. “Our customers have seen that when we say we are going to do something in a particular time, we are getting it done.” There have been occasions where a component is late arriving, and Frank and his team have been diligent in

keeping customers informed. “We are good at keeping them in the loop, so I would say we are very customer oriented,” he reiterated.

Extrema Cables major strength, as Frank sees it, is not necessarily something the customer sees. With their technical background, they have been able to design processes and build solutions to do things for less money. “Being engineers, we’ve figured out some tricks and work arounds so we don’t have to buy expensive equipment. I can’t buy a \$10,000 circuit tester right now, but we can make something that gets the job done.” He noted that some of the quality inspectors sent in accordance with the government contracts have been very impressed with their quality assessment tools.

Frank is optimistic about the future and knows he is poised to take the company to the next level. “I think this is going to be the year things really take off for us as we go from a startup to a well-established company,” he pledged. So be on the lookout for Frank and his small but mighty team at Extrema Cables.

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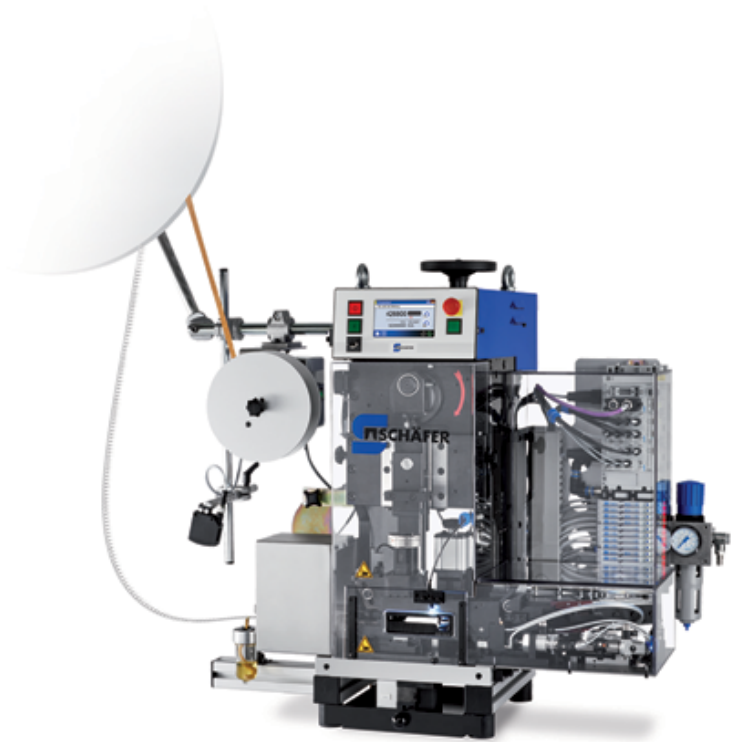
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# WHMA and IPC Sign Affiliation Agreement

Continued from page 1

might make sense for IPC to become our association management group,” Rick outlined.

As the WHMA board explored this possible marriage over a two-year period, they thought a good test would be a board member swap. Rick took a position on the IPC board, and John Mitchell, President and CEO of IPC, took a position on the WHMA board. “We did this to get to know each other,” Rick said, “and it gave me a lot of visibility into what could be done, especially from an international and government affairs perspective.” Rick has been able to attend the last two European Wire Conferences as an IPC and WHMA board member. “Some really high-quality companies like, Volvo and Dyson have been showing up at that event, and they are interested to learn there is an established global workmanship standard for wire harnesses.” He reiterated that without IPC’s horsepower, WHMA just wouldn’t have the resources to enhance the associations visibility abroad.

Under the new agreement, all current WHMA members become part of IPC’s membership and receive all IPC member benefits including educational, standards development, leadership, advocacy and solutions to industry challenges and opportunities.

Rick pointed out that starting in 2018, IPC committed to invest close to \$1.5M over the next 3 years to promote the A-620 specification in the transportation sector alone. “Now, all of a sudden, companies like Toyota and Lear are starting to know about the standard and about WHMA, so IPC really has a scale that allows us to get into some places we just haven’t been.” He is particularly excited about the new exposure because, as electric and autonomous vehicles gain notoriety, more emphasis is placed on the wiring. “Because of the redundancy aspect,” he explained, “autonomous vehicles have about four times the amount of wire harnesses.

Rick was also extremely complimentary of the efforts of Jim Manke and his group at Association Solutions, Inc. for their years of hard work managing WHMA. He mentioned that Jim and Kathi Schlieff will stay on throughout much of 2019 as the transition takes place, and will likely work on special projects for WHMA moving forward.

“As a global electronics industry association, IPC is honored to be able to bring the strength of its global brand and member services to WHMA,” said IPC’s John Mitchell. “WHMA’s mission is very similar to IPC’s - the two associations exist to help their membership innovate, compete and succeed within the marketplace. We

are knowledge providers and we connect our industries with a multitude of networking opportunities. We’re already hard at work to expand the involvement of the wire and cable industry globally in all IPC activities.”

“Change is always scary,” cautioned Rick, “and it took a lot of discussion to make everyone feel comfortable with the move. But if you don’t take any risks, then you’re not moving forward.” He concluded saying, “WHMA is thrilled to have signed the affiliation agreement with IPC. Our organizations have been working together for years and now with the agreement in place, WHMA will be able to access the resources of IPC to help meet our mission to ‘lead, educate and connect’ with companies in the cable and wire harness industry.”

### About IPC

IPC ([www.IPC.org](http://www.IPC.org)) is a global industry association based in Bannockburn, Ill., dedicated to the competitive excellence and financial success of its 4,900 member-company sites which represent all facets of the elec-

tronics industry, including design, printed board manufacturing, electronics assembly and test. As a member-driven organization and leading source for industry standards, training, market research and public policy advocacy, IPC supports programs to meet the needs of an estimated \$2 trillion global electronics industry. IPC maintains additional offices in Taos, N.M.; Washington, D.C.; Atlanta, Ga.; Brussels, Belgium; Stockholm, Sweden; Moscow, Russia; Bangalore and New Delhi, India; Bangkok, Thailand; and Qingdao, Shanghai, Shenzhen, Chengdu, Suzhou and Beijing, China.

### About WHMA

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.



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PUTTING INSIGHTS INTO ACTION

Measuring to Improve:

finding metrics that lead to success

By Paul Hogendoorn

M

Measuring the right things is just as important as measuring things right. Measuring the wrong things can get in your way and impair your ability to grow, distracting you by putting your focus on the wrong things. Success and growth come from doing more of the right things right, and less of doing the wrong things right.

I have worked with quite a few sales people over my career, but one in particular stands out head and shoulders above the rest. (I'll call him "Bob"). He knew his product and was passionate about the company; he had charisma and built trusted relationships easily. He was internally motivated by a desire to please his customers, and to win, and externally motivated by sales targets and commissions; the latter two also serving as the primary metrics used to measure his success. Many other sales people shared the same skills and passion and exerted similar energy, but they did not achieve the same measure of success. To me, that suggests that



Paul Hogendoorn

sales targets, and sales commission, were measurements of success, but were not the metrics that drove or created the success. The same is true in almost every plant I visit; the metrics used to measure effectiveness, or success, do not in and of themselves drive or create success, but yet, they are the only metrics used and shared. What Bob did different than the rest were a lot of little things. The time between a meeting and sending a follow up or a quotation was very

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# Measuring to Improve: *finding metrics that lead to success*

Continued from page 8

short, usually within 24 hours, often within 12 hours. The number of quotations he sent out was high, and they were usually very simple. They were easy to read, easy to understand, and were easy to say yes to. In short, he got more quotes out, got them out quicker, and they were less complicated than those put out by his peers. Those were the little things responsible for his success. The sales targets achieved were just the confirmation of it, and the commissions just the reward. If the efficiency of his quoting efforts was the primary metric (the ratio of quotes won vs lost), he would score poorly, and working to improve

that score would get in the way of his success.

Many plants today strive to achieve higher efficiency metrics, not really understanding what that really means, or how those goals can be achieved. Some plants I have visited have been gridlocked for two or more years, hoping to improve an overall efficiency metric, but not knowing how to even get started. In most of these cases, the problem lays with the metric itself – they are measuring their target improvement against the wrong metric, which has them trying to improve the wrong things.

What is right for one plant in one industry is not the right metric for other plants in other industries.

“OEE”, for instance, is a common metric used by many companies in the various spindle industries, but it is not the right metric for all. I have observed one company increase their value adding time on their spindle machines from 35% – 40% up to 50% to 55% in one year, then watch it slip back down to 45% to 50% in the second year, while overall productivity increased consistently in both years – up a total of 50% from 2 years earlier. In hindsight, it was clear that the OEE of their spindle machines was not the right metric to drive success, nor in this case is it even a good metric to define success. In another company I am familiar with, (in this case a forming company), overall production increased 45% over a 2 year period, without changes to equipment or staffing levels, and in this case too, individual machine performance metrics would have indicated that most of the machines were being operated less efficiently than before. This speaks to the difference between the words “effective” and “efficient”. Doing the wrong things more efficiently is not an effective strategy at all. At best, it stalls your efforts to improve. At worst, it accelerates your demise.

The process should start by asking the right questions, identifying the right goals, and then defining the meaningful metrics. The goal shouldn’t be to improve the efficiency of the equipment with the hope that will lead to the company’s suc-

cess. The goal should be the company’s success. Defining what that looks like will determine what things need to be improved to achieve it, and that in turn will determine the metrics that can drive daily attention and activity towards success.

“More product out the door, quicker, with less cost” would be the answer I would expect from most companies. That may mean running the equipment more efficiently, but it may mean exactly the opposite, as the 2 companies above experienced. Don’t let false metrics stand in the way of achieving the over all goal. If Bob (the sales guy above) was measured by the success rate of the proposals he sent out (his quoting efficiency), it would have gotten in the way of his success. Instead, he followed his internal metric, (how quickly he got the quote out), which was far more effective.

What are the metrics you are using, and, do they truly lead to your company’s success? What gets measured does get improved, but, does that improvement lead to your success? Are you measuring the things that matter?

Paul Hogendoorn is president of FreePoint Technologies. For more information on this topic, he can be reached at paul.hogendoorn@get-freepoint.com or www.getfreepoint.com “Measure. Analyze. Share. Don’t forget to share!”

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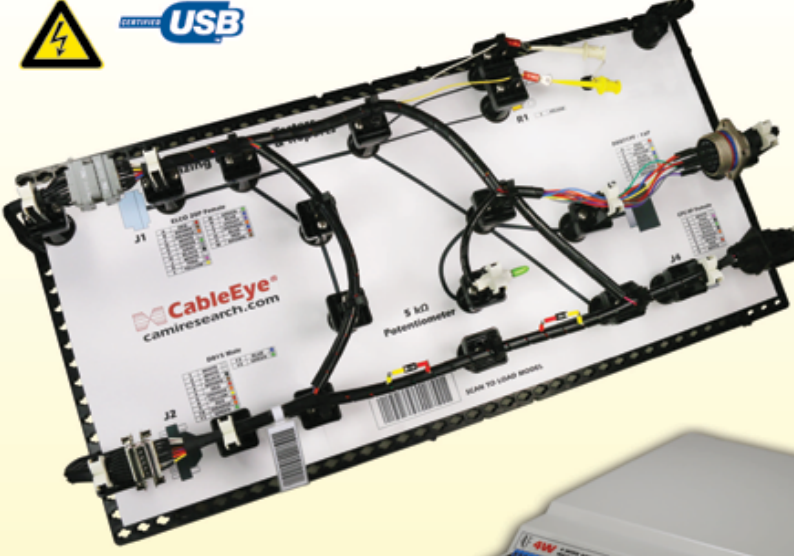
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1	28	28	16 mΩ	Pass	< 1 μA	1499 V	> 1 G	0.150 mA	996 V	7 M
2	30	30	32 mΩ	Pass	< 1 μA	1499 V	> 1 G	0.173 mA	996 V	6 M
3	32	32	63 mΩ	Pass	< 1 μA	1499 V	> 1 G	0.189 mA	996 V	5 M
4	34	34	125 mΩ	Pass	< 1 μA	1499 V	> 1 G	0.204 mA	996 V	5 M
5	36	36	249 mΩ	Pass	< 1 μA	1499 V	> 1 G	0.204 mA	996 V	5 M
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M & A 101:  
Lessons learned from decades of deals

Buyer Beware: Hidden Talent

By Loren Smith

I have heard more than one business owner or CEO give a seemingly surprising answer to the question “What keeps you up at night?” Sure, losing a key customer or getting embroiled in a lawsuit are mighty logical answers, but heads of companies fully understand why some execs answer, “Losing a key performer.” In virtually every business, one or more employees are so valuable that the company could face serious performance issues were those employees to leave.



Loren Smith CEO  
Blue Valley Capital

Wire harness businesses are hardly immune to that concern. In fact, many small or medium-sized harness companies enjoy the talents of people who have developed skills that would be close to impossible to replace quickly.

This circumstance is highly relevant for buyers because often these valuable performers are “hidden,” especially if they are not members of the management team. That means prospective buyers need to identify these vital employees at the begin-

ning of the acquisition process--and take steps to ensure their continued employment to minimize the risk of needing to replace them without adequate lead time.

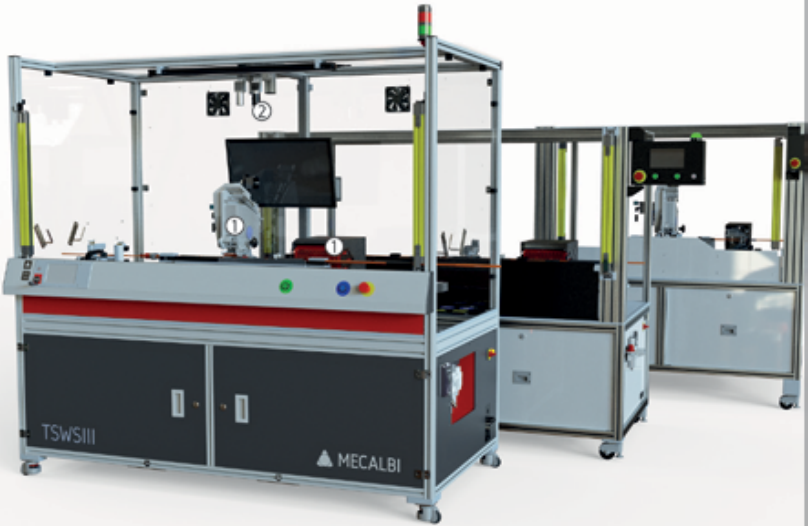
I became aware of this issue years ago when I acquired my own harness company, Monona Wire Corporation, and almost immediately recognized that one of my employees, Maggie, possessed a critical skill. Maggie was

Continued on page 15

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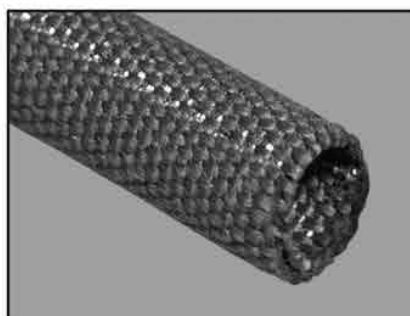
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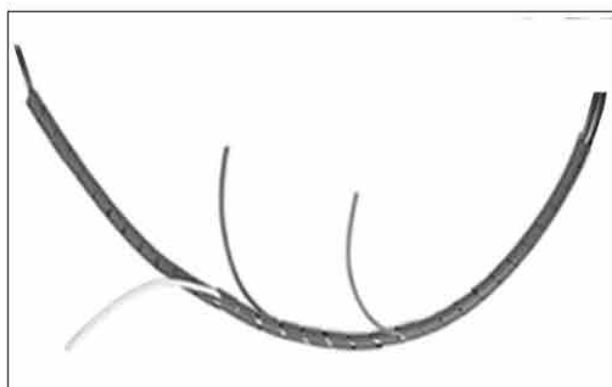
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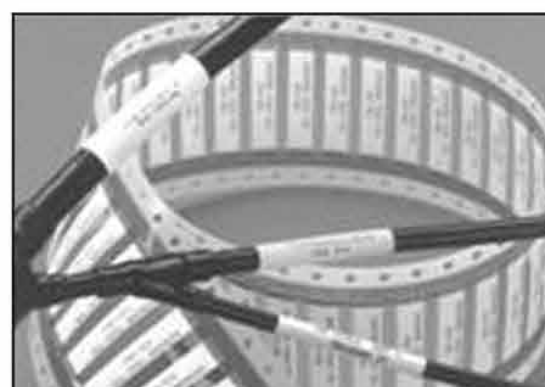
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# Buyer Beware: Hidden Talent

Continued from page 13

the lead person in our factory’s forming department, where circuits that have been cut and terminated are assembled on a form board to create the wire harness.

Our largest customer at the time provided us with blueprints that were very complex and difficult to interpret. But Maggie was able to examine these blueprints and configure form boards with amazing accuracy and speed. When I discovered how talented she was, I felt blessed. But I also felt vulnerable. If we were to lose her for any reason, I would have no clue how to replace her.

Knowing we had to develop backup people to help Maggie and eventually approach her skill level, we made that cultivation a priority. But that process took a long time because she was so exceptional.

Now, as someone who helps buyers and sellers make deals, I feel twice-blessed. First, because I inherited a hidden talent like Maggie

through dumb luck, and second, because my appreciation of her critical importance to our company always reminds me to be on the lookout for someone like her when I am helping put a deal together.

When we advise a harness company owner on the sale of his or her business, we make sure to scout out these folks and add them to the description of the management team, seeing as their contributions are so vital to the strength of the business.

Over the years, I have gotten to know quite a number of harness companies, and I am pleased that so many have one of more gems like Maggie. And whenever we do uncover one or more prized employees, we are able to benefit both the buyer and the seller. Our showcasing of a hidden talent provides a fuller picture of the company to the buyer, and, for the seller, it reflects positively on the company’s value.

*Loren Smith can be reached at [lms@blvcapital.com](mailto:lms@blvcapital.com) or [www.bluevalleycapital.com](http://www.bluevalleycapital.com)*

## ★★★ FOR SALE ★★★

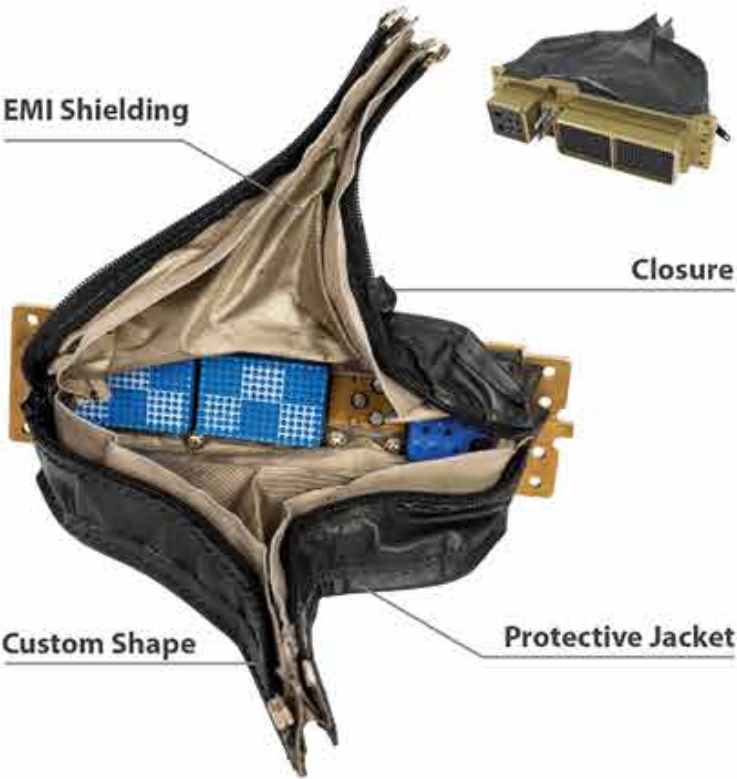
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- 1 - AUTOSPLICE Splicing/Crimping Machine, Model SAS/2-40
- 1 - CARPENTER “Compu-Strip” Cut & Strip Machine
- 1 - ERASER Model 1256 Wire Stripper, Part #RC-1071
- 1 - EUBANKS 2900 Cut & Strip Machine W/Model 6880-05 Prefeed
- 5 - EUBANKS 2700 Cut & Strip Machine W/Model 6815-05 Prefeeds
- 4 - EUBANKS Model 6480 Prefeeds
- 1 - GAST MFG Vacuum Chamber, Model 2065-V2
- 1 - HIPRECISE Model HPC-1820 Injection Molder, 2014
- 1 - JUNQUAN 2T Semi-Automatic Terminal Crimping Machine, Model SATC-20, 2007
- 1 - KINGSLEY Model MCM-650 Sleeve and Tube Marker
- 2 - KM USA 2T Crimp Presses, Model KM-802 N, 40mm stroke, 4/2016
- 5 - KENCO 3T Presses, 1.5”, 1.25”, 1.125” Strokes
- 1 - KOMAX Mira 230 Benchtop Stripper
- 1 - KOMAX DPS 272 Coiler, 2012
- 1 - KOMAX Gamma 311 Automatic Crimping Machine
- 1 - KOMAX 106 Prefeed
- 1 - LOCTITE Model 10-50 Posi-Link Volumetric Dual Cartridge Dispensing System
- 1 - LOEPFE Thermal Transfer Printer, Model TTP4000 (SCHLEUNIGER TTP4000)
- 1 - MOLEX TM2000 Universal Press, P/N 63800-8300
- 6 - NITRONIC Model ST730T Coax Cable Stripping Machines
- 1 - ONDAL Linear TaperS, 2016
- 2 - PANDUIT PATIM Cable Tie Machines w/Feed Hose, Hand Tools, Bench Mounts
- 2 - PERKINS 3T Presses, Models JR and 3-C, 1-1/8” Stroke
- 1 - RAMATECH Prefeed, Model ABW 800/300, 2005
- 1 - SCHAEFER EPS2001 Eccentric Press
- 1 - SCHLEUNIGER CC36 Automatic Crimping Machine, 2012 (Europe)
- 1 - SCHLEUNIGER CC2000 Cable Coiler, 2006
- 1 - SCHLEUNIGER CP1250 Coiler Pans, 2000
- 1 - SCHLEUNIGER CP1500 Heavy Duty Coiler
- 2 - SCHLEUNIGER CS9050, CS9100 Cut/Strip Machines w/PF2000 Prefeeds
- 1 - SCHLEUNIGER CS5300 Coax Cable Stripper
- 1 - SCHLEUNIGER ES9300 EcoStrip, 1998
- 3 - SCHLEUNIGER MP8015 Coax Wire Strippers
- 1 - SCHLEUNIGER MS9600 MegaStrip
- 1 - SCHLEUNIGER OC3950 Cutter, 2004
- 1 - SCHLEUNIGER OS9400 OmniStrip
- 1 - SCHLEUNIGER PF4200 Prefeed
- 1 - SCHLEUNIGER SC750 StripCrimp, 2005
- 3 - SCHLEUNIGER SC200 Stripper/Crimpers, 2014
- 1 - SCHLEUNIGER SC8100 Shield Cut, 2016
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The 19th Annual Electrical Wire Processing Technology Expo will be held Wednesday, May 8 and Thursday, May 9, 2019 at the Wisconsin Center in downtown Milwaukee, WI. Billed as the “Nation’s Largest Dedicated Wire Processing Event”, the show projects to have 175+ exhibitors and nearly 3,000 attendees.

Since 2001, the Electrical Wire Processing Technology Expo has grown into a com-

prehensive resource for wire processing industries, encompassing electrical wire harness, wire/cable processing, consumables, cable assemblies and cord sets.

New technologies are a key focus and machines are on site and under power so that attendees can get hands-on experience and compare performance.

Education has always been a cornerstone of the event

and seminars are free. To date, several topics scheduled to be covered include: Avoiding tariffs and customs taxes; Beyond the basics of crimping; Innovations in the large cable market; IPC A-620, and OEE [Overall Equipment Effectiveness].

Due to the success of the last show, the upcoming show has added on a fourth exhibition hall—increasing capacity to 186,000 sq. ft., up from 124,000 sq. ft.



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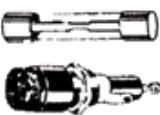


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## THE POWER WOMEN OF THE WIRE HARNESS INDUSTRY

In the March/April 2017 issue, The Power Women of the Wire Harness Industry debuted as an article series in WHN. The intent of the series is to highlight the careers of successful women who work/worked within the wire harness industry, and to share their experiences and insights on being a female during engineering school and in the field of power and signal distribution systems.

Because WHN is geared toward the manufacturers of wire harnesses, these articles will not reach the intended audience of your daughters, nieces, and other female family members and friends without YOUR help. I encourage all of you to share the articles—middle school and high school students represent the intended targets as well as collegiate freshmen and sophomores.

From first-hand experience, I can tell you I was initially intimidated by the thought of attending engineering school. I did not realize my own level of intelligence nor did I have any interest in helping my father fix vehicles, tractors, or light switches. As a result, I was unaware that I could be successful in a technical discipline. I fear that many other students may feel similarly—not realizing that there are many of us in wire harness engineering today who lacked mechanical interest or who did not graduate Valedictorian of our class.

The previous WHN Power Women articles featured a variety of engi-



Melissa Femia

neers including a non-traditional student. Thank you again to: Christina Koroll, Lisa Whatley, Kotomi Clegg, Araceli Tarango Martinez, Monica Urena, Marvane Johnson, Lisa Bellin, Marissa Feinman, and Rebecca Schenke. These women span 4 disciplines of engineering (Electrical/Electronic, Industrial, Mechatronic, and Mechanical), 4 birth countries (Columbia, Japan, Mexico & the USA), and a multitude of work areas and experiences. From scholastic programs to familial exposure, many had STEM influences though some did not. I encourage you to share their stories.

Spread the message I share with my daughters—there are so many

Continued on page 20

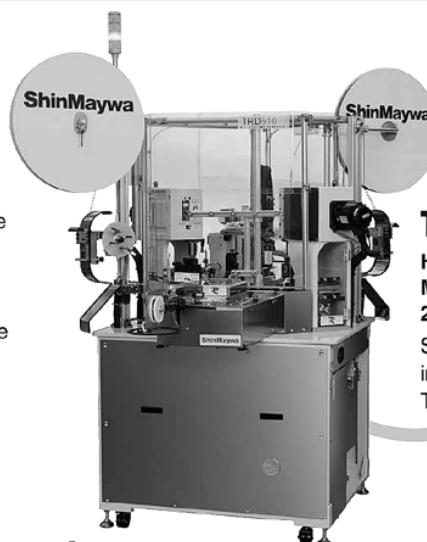
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# The Power Women of the Wire Harness Industry

Continued from page 18 \_\_\_\_\_

different areas in engineering. Just because one aspect of engineering is not interesting or preferable does not mean that the student would not excel in a totally different area within engineering. Furthermore,


engineers work in all different disciplines of a business. The skills learned in engineering school can be applied to many other areas of a business. Thus, an engineering graduate is not limited to working only in the field of engineering. Many engineers

become teachers or run businesses, as examples.

If you are interested in sharing the stories but missed the original WHN distribution, the articles are available on the Jana Diversity Solutions website at [www.janadiversity.com](http://www.janadiversity.com), or at

[wiringharnessnews.com](http://wiringharnessnews.com).

If you know a female engineer who would make a great candidate to feature in the Power Women series, please direct them to me at [melissa.femia@janadiversity.com](mailto:melissa.femia@janadiversity.com)



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WHMA UPDATE

WHMA

Wiring Harness Manufacturer's Association

By Christine Siebert

WHMA has been extremely busy these last six months with adding on many new Manufacturer/Supplier members, planning and executing WHMA's 26th Annual Wire Harness Conference in Dallas, TX and formalizing an already vital partnership with IPC.

As most companies know, great partnerships can be hard to find and when you find the right partner, you want to keep it and formalize it. WHMA and IPC have been working together for over 10 years through the development of the IPC/WHMA-A-620 standard. This standard remains the only industry-consensus standard for the Requirements and Acceptance of Cable and Wire Harness Assemblies. Revision C is the most current version of the standard with the committee working on the next revision scheduled for release in 2020.

WHMA and IPC have decided to take their partnership to the next level and form a Strategic Partnership. On January 1, 2019, WHMA and

IPC entered into an affiliation agreement that will allow WHMA and IPC to work closer together and grow the involvement of the cable assembly and wire harness industry globally. WHMA's Board of Directors and membership determined that WHMA's mission would more effectively be served by an affiliation with IPC which serves the global electronics industry supply chain, including the wire and cable industry vertical. The IPC Board of Directors also supported the alliance.

As an added benefit to all WHMA members, they will receive their current WHMA member benefits but also become IPC members receiving IPC member benefits including educational, standards development, leadership, advocacy and solutions to industry challenges opportunities.

WHMA will have one voting representative on IPC's Board of Directors with the WHMA Board of Directors structure remaining. In alignment with IPC's structures, this group will be known as the WHMA Board. David Bergman, IPC vice president of stan-

Continued on page 22

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WHMA UPDATE

WHMA

Wiring Harness Manufacturer's Association

Continued from page 21

dards and training, will support the WHMA Board as WHMA's executive director.

"WHMA is thrilled to have signed the affiliation agreement with IPC," adds Rick Bromm, president of Altex and chairman of the WHMA board. "Our organizations have been working together for years. With [this] agreement in place, WHMA will be able to access the resources of IPC to help WHMA meet our goals to lead, educate and connect with companies in the cable and wire harness industry."

"As a global industry-driven organization, IPC exists to help its member-companies innovate, compete and succeed and we are honored to extend our organization to the members of WHMA," says David Bergman, IPC vice president of standards and technology and newly appointed Executive Director, WHMA. "I am eager to support the WHMA Board as WHMA's Executive Director and use my background in international standardization to assist in the globalization of WHMA."

If you have any questions about this article, please email us at [contact.us@whma.org](mailto:contact.us@whma.org)

About IPC


IPC ([www.IPC.org](http://www.IPC.org)) is a global industry association based in Bannockburn, Ill., dedicated to the competitive excellence and financial success of its 4,900 member-company sites which represent all facets of the electronics industry, including design, printed board manufacturing, electronics assembly and test. As a member-driven organization and leading source for industry standards, training, market research and public policy advocacy, IPC supports programs to meet the needs of an estimated \$2 trillion global electronics industry. IPC maintains additional offices in Taos, N.M.; Washington, D.C.; Atlanta, Ga.; Brussels, Belgium; Stockholm, Sweden; Moscow, Russia; Bangalore and New Delhi, India; Bangkok, Thailand; and Qingdao, Shanghai, Shenzhen, Chengdu, Suzhou and Beijing, China.

About WHMA

The Wiring Harness Manufacturer's Association® (WHMA) ([www.whma.org](http://www.whma.org)) 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.

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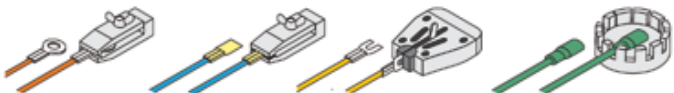
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# New WHMA Supplier Member Puts a Spin on Logistics

By Joe Tito  
Wiring Harness News

We attend a lot of trade shows, and I inevitably run into folks who are in the business of logistics. The term itself puts me off a little, but I suppose it's a lot shorter than saying 'movement of goods in and out of your facility'. Inevitably a conversation ensues where I hear phrases like, "We collaboratively initiate out-of-the-box benefits on the 3PL and 4PL agile infrastructures." Huh? Corporate doublespeak is a pet peeve of mine, and it seems pervasive in that industry. I think they do it just to mystify the whole process of inbound and outbound shipping.

That's why I was so enthralled to have a conversation, in understandable English, with Chris Nadeau, CEO and Co-Founder of Haversack. The company describes themselves as a first party consultant. They work with companies to set up systems to handle their own logistics. It's probably best to understand what Haversack is not. "We're not a third or fourth party logistics company (3PL, 4PL), so we're not a broker or freight manager. We're a true partner who teaches companies to do it themselves," Chris described.

Understanding how Chris and his business partner Wade Rogers came up with this truly unique concept in logistics will help you understand how it works. After a career in the Army, Chris met a VP from Conway Freight at a hiring conference. He decided to give it a try and was extremely successful for seven years. Then the company was sold, and Chris's position was eliminated. He



Chris Nadeau, CEO and Co-Founder of Haversack

was doing some consulting when he came up with the concept of Haversack. "I found this incredible void with industry knowledge, and discovered that shippers were pretty much at the mercy of carriers and logistics companies," he revealed.

Chris literally formed a company around the notion of giving companies the insider aspects of the logistics world so they can manage the task themselves. In addition to the knowledge, he brings along some dashboard tools for companies to use in their endeavors. "What we find is that if we take our knowledge, park it with them, and give them the right tools, they will be successful."

Chris and his experts do an audit at no charge, and come back with a benchmark for savings. "Because we are a gain-share model, we get paid on the savings, so I don't make any money unless you save money." That seems to be what differentiates Haversack. "When a 3PL company says they'll save you money, it's counter-

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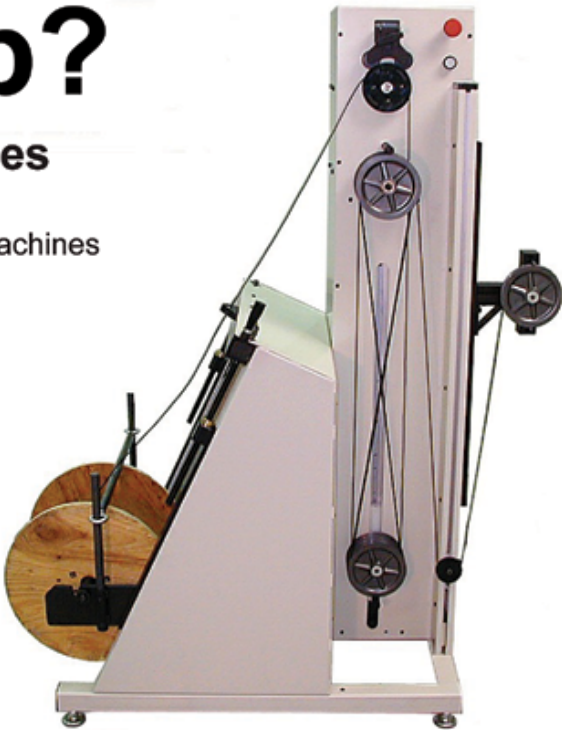




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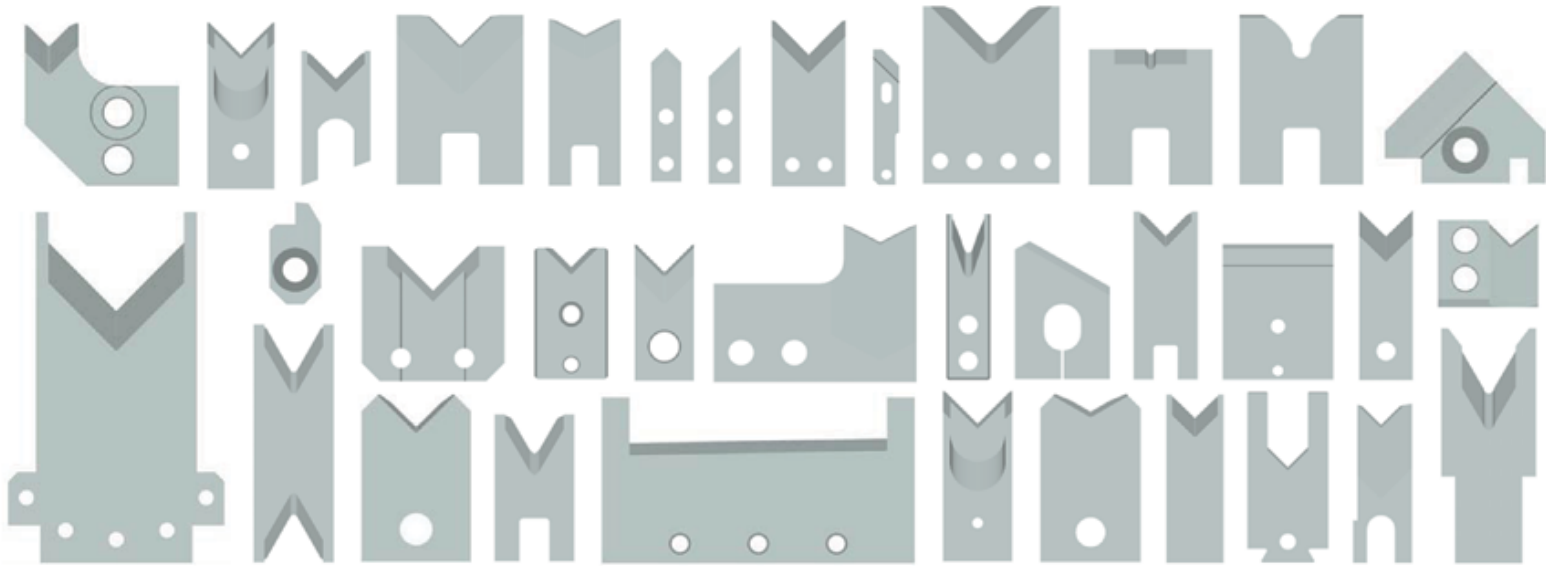
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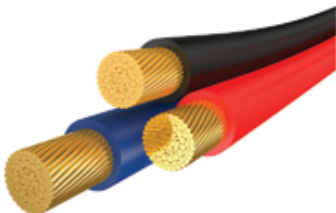
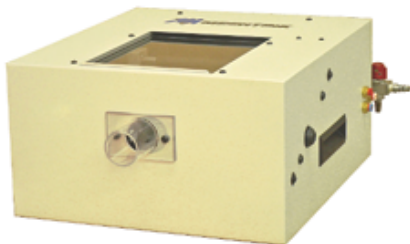
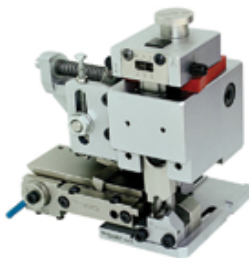
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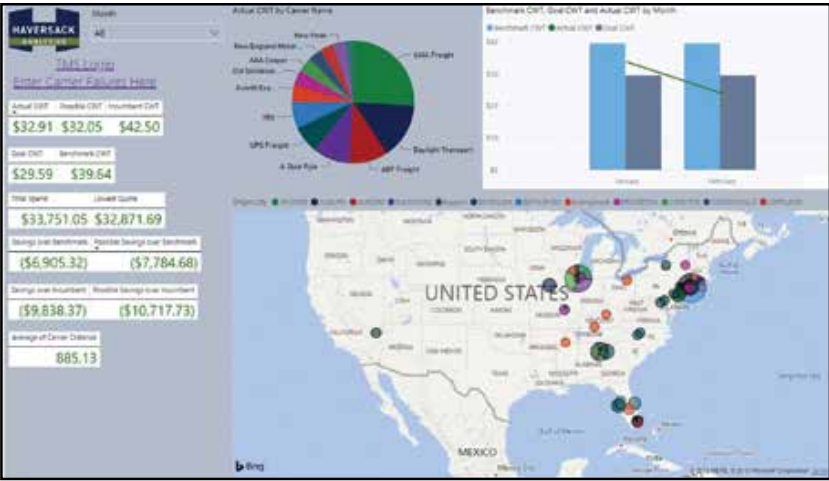
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# New WHMA Supplier Member Puts a Spin on Logistics



Haversack's software dashboard

Continued from page 23

intuitive because they get paid on how much you spend - the more you spend, the more they make,” Chris explained. “There’s really no incentive for them to reduce your spending.” Haversack has their own base tariff and fuel surcharge and they negotiate with all the major carriers.

That lack of transparency in the logistics world is a big part of what led Chris to create his unique approach. “We give you the same exact tools the logistics companies use and it’s all on your dashboard. We don’t manipulate the numbers - it’s all right there at your fingertips.” Haversack generally works on a 30 % gain share as their fee. Those charges adjust to any changes in savings. And they don’t require a contract. It’s all month-to-month. “A lot of people and thrown off by that, but I don’t need a contract - the system sells itself.” Chris seeks long-term relationships and he wants clients to see Haversack as part of their team.

Chris and his team help companies at all levels with truckload and LTL (less than truckload) shipments, but most of their work is with LTL. “Whatever the size of the company,

we can help and advise. We have some small companies that may only have 30 LTL shipments per year, and we just handle those on a per-transaction basis.” For companies this size, Chris maintains it’s more about helping people than making money.

“When you start a business, you hope your model works and to date, it’s been pretty successful. We’ve had some amazing wins for companies in a lot of areas of logistics.” Chris says they’ve been called disrupters but he sees Haversack as innovators. “We are looking to upset the industry because we think if companies can learn how to manage their own logistics, they can gain an incredible competitive advantage.

So, if you are looking to “aggregate your alliances to collaboratively functionalize deployments,” then maybe Chris and his group at Haversack aren’t for you. But if you are looking to demystify the art of shipping, and learn to do it like the pros, I suggest you give him a call. Haversack is a supplier member of WHMA and has worked with harness manufacturers. Chris can be reached at 704-743-7825, or by email at christopher@gohaversack.com. Visit their website at [www.gohaversack.com](http://www.gohaversack.com).

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# Why Don't OEMs Involve You in Their Design?

*(Explained from the perspective of an OEM product development engineer)*

By Ted Young,  
CABLE-I-E LLC

Well, it is a matter of timing.

As you probably know, an original equipment manufacturer's (OEM) development team is tasked with transforming a new product's requirements into a detailed product design with drawings that can be manufactured. It's done by using software specifically made for this purpose. Mechanical components and assemblies are designed in 3D computer aided design (CAD) modeling software. Printed circuit board (PCB) assemblies are detail designed in schematic and board layout software.

All the product's mechanical hardware components including motors, switches, sensors, and circuit board assembly outlines, are shown virtually in the 3D CAD software; quite accurately as a system. "What you see, is what you will get." This accuracy allows individual part designs to be completed, and drawings to be released from the virtual system design without first making physical parts.

Well guess what system is typically

missing from this virtual mechanical 3D design? It's the electrical cables and wires that connect all the circuit boards, motors, switches, sensors, etc. They are not there (Fig. 1 Page 28).

Cable and harness routing design and drawings are completed at the physical prototyping phase. This can be months later when the first prototype mechanical parts and circuit boards are ready to assemble.

Cable and wires are hand assembled into the prototype to create master assemblies. These master cable and harness assemblies are then removed from the first prototypes and laid flat to determine branch lengths, branch mounting and hardware positions. The overall cut lengths are added to finish drawings and B.O.M.

This puts the cable and wire harness design in a difficult situation for the OEM:

- It relegates electrical wiring development to being an afterthought to the primary product design. It's a difficult task as there is still the need to minimize development time (along with any surprises) and stay on the project's critical path timeline. Innovations in electrical wiring have been implemented at a rate less than 1/10th that of circuit board design over the last 30 years.

Continued on page 28

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# OEMs

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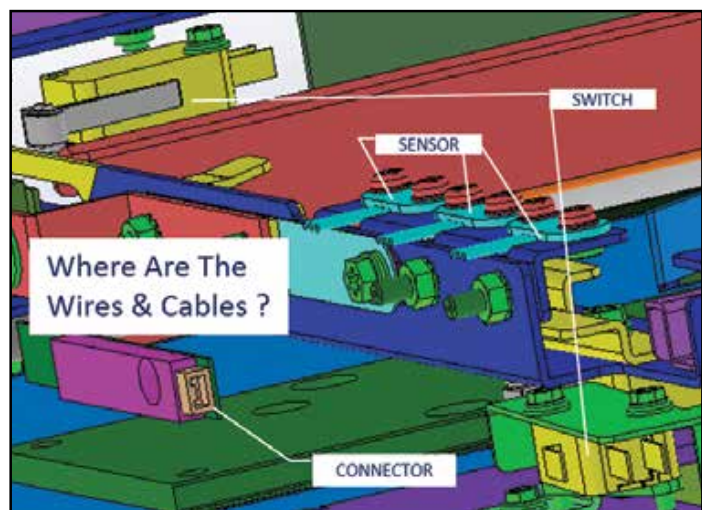


Figure 1. Electrical system in design software without wiring.

• There is no time to try or test anything new for the application or for assembly manufacturing improvement. This is because the development team is pushed to catch up with the rest of the design to stay on the product development schedule.

• Any wrong guesses made in the mechanical design as to where the wiring really needs to be, or what B.O.M. parts are needed, will force the electrical wiring to adapt to what space, routing, or connection components are available in the completed mechanical and circuit board design. Examples would be poor wire dress to PCBs (Fig. 2) or schedule delays from any

necessary scrap/rework/ make-new for mechanical components and/or PCBs.

• Final assembly labor of electrical cable and wiring into new medical equipment takes greater than 50% more than mechanical components of equivalent mounting complexity. There is little thought to modular assembly.

• On medical equipment, more than 30% of all reported service repair costs over the life of equipment are attributable to the electrical wiring system, but it is less than 8% of the equipment's original cost. An example would be poor routing of wires and connectors for motion protection and

component repair access. This causes significant service labor for removing and replacing proper wire routing.

This puts the cable and wire harness design in a very difficult situation for the harness manufacturers:

• Drawings given to the supplier are not open to design improvements or additional services; only essential changes. This is because the project schedule has already locked-in the design.

• The drawings tend to be rushed, are often incomplete, and may not be in a standard format.

• Cable and harness manufacturers must re-invent drawings before using. This adds significant time and effort to create first-time quotes and prototypes.

• No product design changes to support any cable and harness manufacturing improvements are acceptable.

• Communication with OEM is through buyers/planners (focused on price and schedule). The OEMs technical development team has moved on to debug and product introduction.

Component manufacturers are also affected:

• They are involved too late in the design process to provide the optimum solution, thus limited to short lead-time components.

• Technical detail guidance of what is required is scarce from the OEM.

Fortunately, virtual wiring design methods are improving. They are led by vehicle OEMs with new growth products in conjunction with their wiring design software partners and harness manufacturers.

So, the next question is, how can we compete and grow using these new trends coming to OEM product wiring design?

Let's look at some of the specific trends:

• Cable and harness manufacturers are gaining interest in software offerings. Their interests are for improving internal wire and cable documentation, quoting new designs, and for manufacturing preparation and assembly. This is, no doubt, why there will be at least four software exhibitors at the next



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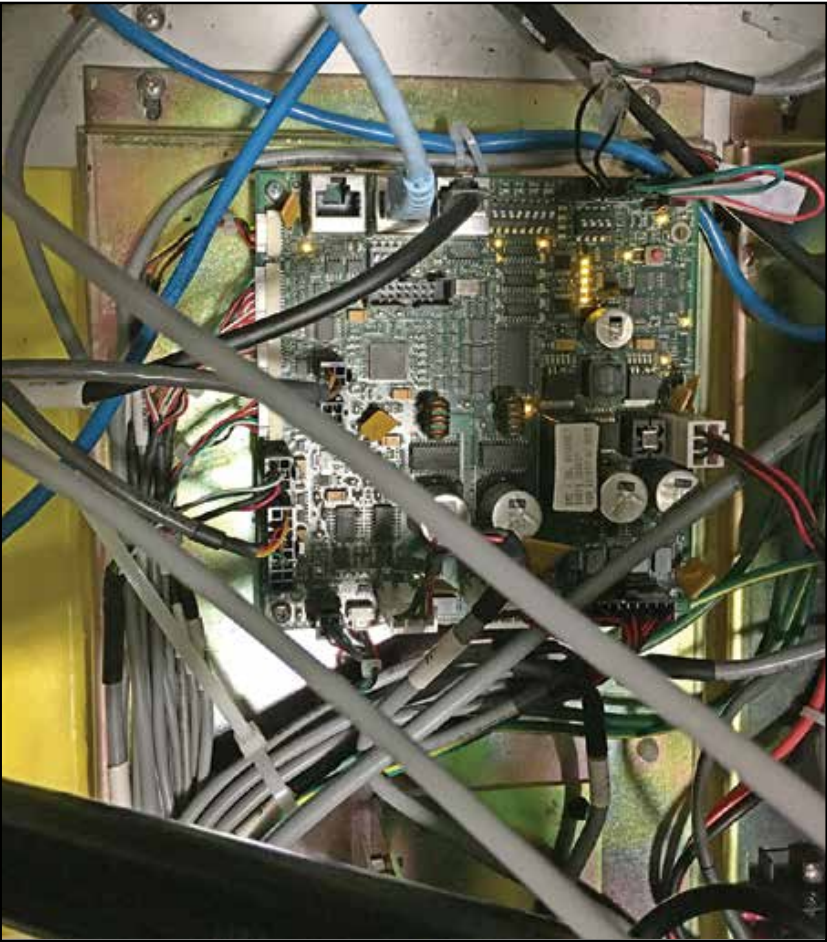


Figure 2. Poor wire dress to PCB.

Electrical Wire Processing Technology Expo in May.

- These software developers also offer schematic wiring diagram design modules. They are mostly for OEMs to use in wiring design, and are now primarily on the vehicle industry (Fig.3).The trend within these schematic software tools is that there is more interactive data exchange to mechanical 3D CAD software. They are easier to use and have less database and training overhead. This, along with reasonable pricing is key to main stream adoption.
- Mechanical 3D CAD, electrical/cable routing software is maturing. Connectivity and B.O.M. data exchange is typically provided from the wiring schematic software. The mechanical software can accurately route wires and cables through the virtual 3D equipment design. It gives overall cut lengths that are output along with 3D or 2D flattened drawings.

The new trend is that mechanical software is becoming “lighter,” meaning the routing of many wiring splines can be done within large part count assemblies without bogging down the computer (Fig. 4 Page 30). Features are being added to show peripheral components. Tubing, tape, and tie wraps, allowing branch lengths, branch mounting and hardware positions; can now be shown. Output to 3D and 2D drawings and B.O.M. are getting more complete

and more standardized. These improvements are key to getting mainstream adoption.

Vehicle OEMs with new growth products and higher electrical system content have become the leaders in changing wiring design methods. They are moving the design of equipment wiring up to the same completion schedule as the primary mechanical systems and printed circuit boards.

These OEMs are simulating the equipment wiring design well enough that different options can be tried. The result is more time to test, and more time for harness manufacturers and component suppliers to be involved. Harness manufacturers can now provide wiring for first physical prototypes, without having to wait for the prototypes to complete the wiring design. There is mounting confidence that the variation decided upon and seen in 3D CAD, is what will be documented, and what will show up as the physical prototype assemblies.

Tesla has publicly announced that they are focusing on improving wiring design in Tesla’s future “Model-Y” car. The Model-Y goal is to use a total wiring length of 100 meters, versus 1,500 meters now used in the Model-3. (WHN’s next issue will provide more details in the article titled “Vehicle OEMs Are Starting to Focus on Equipment Wiring, A Look into the Future”)

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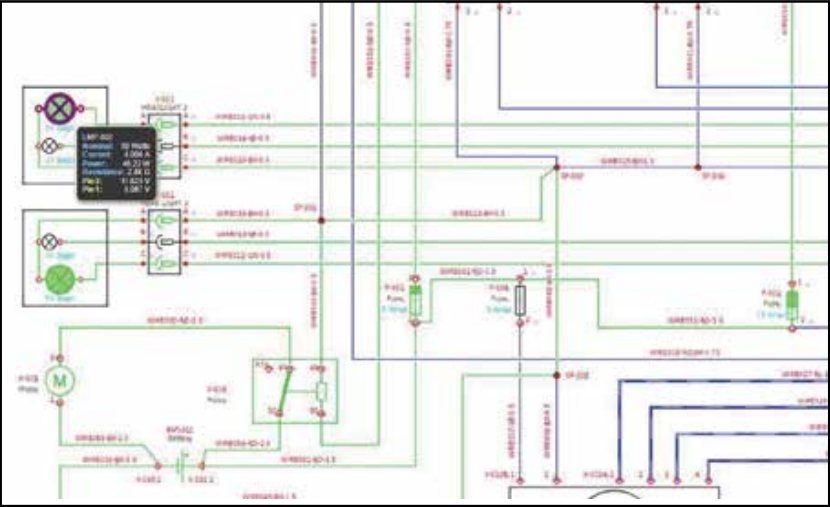


Figure 3. Wiring design schematic for automotive OEM.

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OEMs *Continued from page 29*

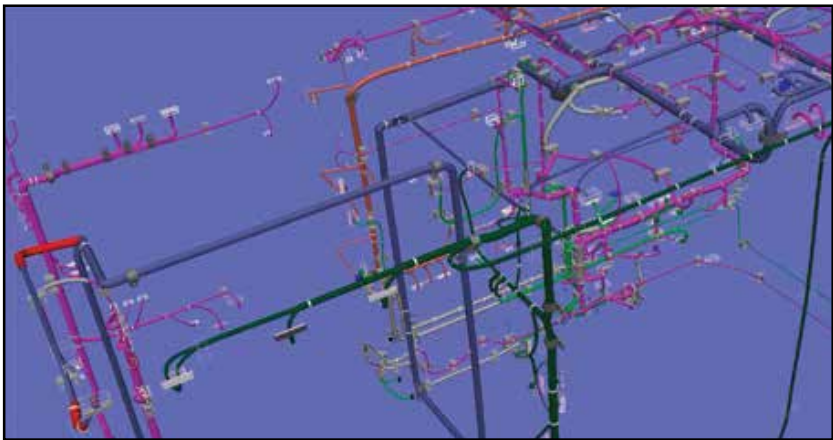


Figure 4. “Lighter” software designs allow for routing diagrams of multiple wiring splines.

How You Can Compete Globally, Using the Coming Design Trends

When an OEM is able to move their equipment wiring design development up to the same time as the rest of the product, there is no need to wait for physical prototypes. This begins a cycle of good opportunities and innovation for the OEM and their wiring/component suppliers:

- OEM Wiring development no longer impacts the primary product development schedule.
- The OEM electrical team can check connector mating and to-from connections, from circuit boards through to components, thus maintaining an accurate B.O.M.
- The OEM mechanical team can see exactly where connectors, cable and wire routing, and fastening will

be. The appropriate space and features can be provided and documented (Fig 5).

- OEM development team now has time to try and test alternate components, designs, and update the B.O.M. accordingly.
- There is now time to support design for moving cabling, orderly wire dress, modular fast assembly, and simple serviceability.
- The OEM has time to get harness prototypes from real cable and harness manufacturers, rather than having to cobble them together internally.
- The geometry and drawings given to harness manufacturers will have improved accuracy, be more complete, and have a much better chance at a standard format (Fig. 6).
- Harness manufacturers will be able to count on the drawing provided as an accurate base, rather than having to re-invent it. They can use it for rapid quoting, and as a means for two-way communication with the OEM technical team on further improvements. Harness producers can also use the data as an input to cut-

strip-terminate, continuity test, and for assembly and automation.

- Harness manufacturers get to learn from making the real physical prototypes with equipment technical team interaction, not just communications through buyer/planner.
- Harness manufacturers get to compete on additional service offerings, beyond basic product price. Examples would be moving cable testing, failure analysis (including X-Ray), material engineering and consulting.
- Connector and component manufacturers can be involved up front, when there is time for optimum solutions

But what about all those OEMs that aren’t cutting-edge thinkers with big money growth products? Unfortunately, there are still some stark realities:

- These OEM’s new product needs are below critical mass to support an internal improvement towards the new software capabilities. Improvement resources are still focused elsewhere.
- Cable and harness designs are

still valued less than other product equipment design functions by these OEMs. It is “just wires” that connect the “important stuff”.

- OEM Wire and cabling expertise is stagnate at best, with few internal experts. OEM electrical and mechanical development engineers do not get “excited” about wiring.

For these OEM’s that are below critical mass to prioritize wiring design, there is an alternate source of wiring design expertise that can be tapped. That would be you, their cable and harness manufacturer.

Why shouldn’t the people who care most about cable and harness assemblies design the wiring for new equipment products? Besides growing with your customers, or growing through consolidation, what other ways do you really have to globally compete? Providing the option to your customers to out-source their harness design to you, can give your company that competitive edge for the next level of growth.

Ask your existing customers if they would be interested in you designing their wiring for them when a future product is in development. Let

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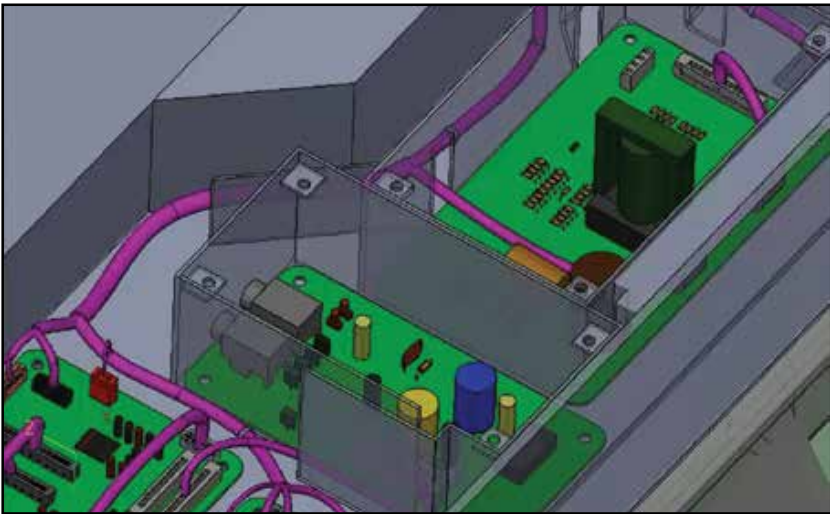


Figure 5. Electrical system in design software with wiring.

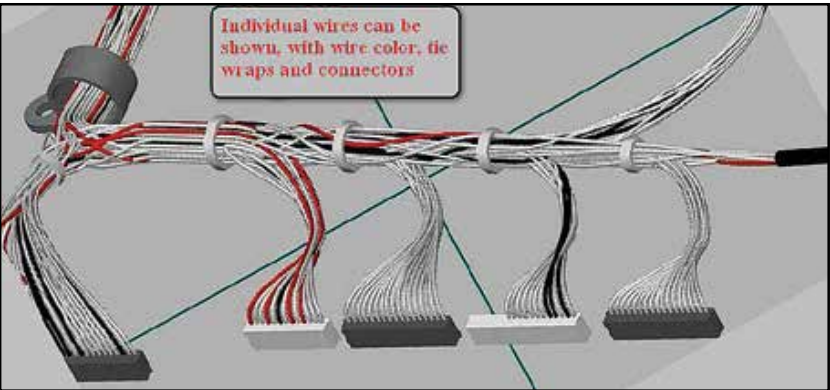


Figure 6. More accurate and meaningful design drawings.

them know they could actually see wiring in their 3D CAD and get physical assemblies in time for their first prototypes. This will necessitate upfront technical interaction with your OEM's new product electrical and mechanical designers.

You can globally compete, by first piloting upfront product design services to your OEM customers. It will take time and persistence and may require you to network and join with other like-minded manufacturers. The reward is huge, as you will open a source of early new product information, allowing a spiral of growth and innovation.

*Author:*  
*Ted Young, Partner at CABLE-IE, LLC*

- *CABLE-IE LLC -is a startup company, in the ownership and minimum viable product development phase. Focused on creating a cooperative of cable & wire harness manufacturers and of OEM new product design engineering service companies, that want to provide wiring design services to OEMs.*
- *Previously at Carestream Health, Rochester NY. Mechanical product development engineer, Technical project manager, Responsible for medical X-Ray In-room system, DRX Evolution Plus. Picture-8*
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In every issue of Wiring Harness News Anixter will bring you informative articles about wire and cable technology.

### Armored Cables: MC-HL, ITC-HL, MC and TECK90

Galvanized Interlocked Armor (GIA), Aluminum Interlocked Armor (AIA) and TECK90 cable systems offer engineers and specifiers a cable system with built-in environmental protection for all types of electrical circuits. They are used whenever mechanical protection is needed: instrumentation, control, communication or power distribution applications can all use armored cable.

Metal Clad (MC) Armored Cables are covered in UL 1569 and can include the following construction types:

- 600 V
- 2000 V
- 2.4 kV to 35 kV Medium Voltage (MV)

Composite cables that include optical-fiber members

In North America, armored cable products like AIA, GIA, TECK90 & CCW constructions each offer their own distinct advantages and deliver maximum performance and ease of installation for a broad range of commercial, industrial and utility applications. The unique characteristics of these all-in-one cable assemblies provide an alternative to the traditional labor-intensive cable-in-conduit installation methods. Continuously corrugated welded (CCW) aluminum sheath constructions have excellent crush, heat, moisture and chemical resistance to meet the requirements of harsh industrial conditions and are suitable for installation in Class I, Div. 1 hazardous locations.

MV armored cables are by convention manufactured in three color-coded jackets. 600-volt jackets are black and 5 kV cables have yellow jackets. In

the U.S., 15 kV cables are red. In Canada, 15 kV cables are orange.

**CCW Constructions (MC-HL)**  
CCW armor is made by forming an aluminum strip into a circle along its length and then welding it at the seam. This smooth tube is then rolled or crimped to form ridges in order to prevent kinking while bending. This MC type of armor provides an impervious seal against moisture and other chemicals. CCW is an excellent choice for VFD (variable-frequency drive) motor drive applications where the armor offers electromagnetic benefits.

MC-HL (Metal Clad Hazardous Locations) cable is recognized by the NEC as suitable for installation in Class I, Div. 1 hazardous locations in voltages ranges from 600 V to 35 kV. A similar type of construction is available in a 300V construction as type ITC-HL.

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**Aluminum Interlocked Armor (AIA) or Galvanized Steel Interlocked Armor (GIA) Constructions**

AIA and GIA constructions typically have a strip of metallic material spiraled around the cable core—each turn is interlocked with the preceding turn. AIA & GIA control and power cables typically feature a flame-retardant, sunlight and moisture resistant PVC, CPE, or LSZH jacket over the armor to ensure long-term cable performance. AIA is like TECK90 but typically does not have the inner jacket included under the armor. These cable assemblies can be installed exposed and concealed in wet or dry locations, indoors or outdoors. Applications include instrumentation, control, com-

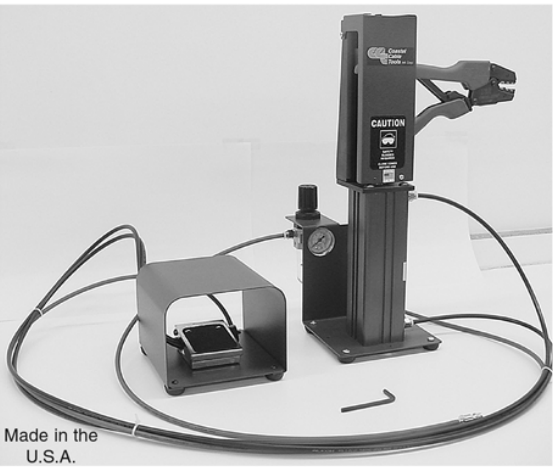
munication or power distribution applications from 300 V to 35 kV. AIA products are more flexible than CCW but provide less protection in moist or corrosive environments. AIA and GIA products meet the requirements of UL 1569 and are suitable for installation in Class I, Div. 2 hazardous locations, but they do not meet the more stringent requirements of UL 2225 and are therefore not suitable for Class I, Div. 1 hazardous locations.

**TECK90 Constructions**

In Canada, TECK90 armored power and control cable is factory constructed and tested for use as wiring in all hazardous locations when used with certified HL cable glands in accordance with the guidelines of

the Canadian Electrical Code. TECK90 constructions are not recognized by the NEC for MC-HL locations in the U.S. This product however is recognized as a cost-effective alternative to installation in conduit in both the U.S. and Canada and is used extensively in the pulp and paper industries all over North America. TECK90 products are designed for the demands of mining, chemical, petroleum and other harsh environments. They can be installed as exposed and concealed wiring in dry, damp or wet locations. TECK90 cable constructions include an inner PVC jacket, an aluminum interlock armor and an overall PVC jacket.

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To Be Precise.



# Capital Formboard Manager: Technology for Greater Wire Harness Manufacturing Efficiency

By Frank Hemmersbach  
Mentor Graphics

To optimize production lines, wire harness manufacturers sometimes build different but very similar harnesses on the same “merged” formboard, a method allowing for efficient use of both factory space and production line resources. This article first explains the existing challenges with this production line optimization method, then it describes and how the Mentor Graphics’ Capital tool suite supports engineering teams in overcoming these challenges to more quickly reach the zone of manufacturing profitability.



Frank Hemmersbach

### Introduction

The wire harness industry is very competitive. Increasing complexity is straining profitability of the manufacturing process, which is still highly manual and labor-intensive. This situation will almost certainly continue into the foreseeable future given megatrends such as electric vehicles and autonomous driving and their associated impacts on electrical distribution systems. In addition, harness makers still have to manage and implement lots of design changes even while the product is already in production, further impacting production lines. Resources like operators, equipment and even factory space are very valuable and must be managed with care.

The initial setup of a production line is itself a major endeavor requiring much manufacturing engineering experience. Preparation areas must be designed, harnesses must be arranged on formboards, holes for supporting fixtures must be drilled, supporting fixtures must be mounted to the formboard, workstations must be defined and content needs to be assigned to these workstations. Test equipment also must be designed and prepared. The whole production line must be balanced based on the given takt-time and forecasted take rates. Decisions must be made, based on the forecasted volumes, as to the required number of production lines and factory space. All of this happens with the goal of moving as soon as



Figure 1

possible to profitably producing the product.

These decisions must be reevaluated with each design change. Formboards may require an update, a well-balanced production line may need rebalancing or operators may need to be retrained. Productivity can decrease for a brief time after implementing a change in response to fluctuating take rates or volumes. A significant take rate change of one harness can drastically affect the capacity utilization of a production line. And even the usual variability of volumes and take rates over the project life cycle can force harness manufacturers to react and redesign the production lines. For example, during the ramp-up or ramp-down phase, volumes are typically lower, requiring a different manufacturing strategy.

### How Production Lines Are Designed

In an industry with high product volumes, like the automotive industry, rotary conveyor lines are often used in wire harness manufacturing. Figures 1 and 2 show such rotary lines and how they move. On these lines multiple wooden or aluminum boards are mounted on a rotating conveyor.

The whole rotary line is divided into different workstations as shown in Figure 3. Harness designs are often documented in a 2d non-scale product design drawing. Manufacturing engineers use this product design drawing (Figure 4) to create a full-scale manufacturing drawing, called a “formboard drawing” (Figure 5).

Continued on page 38

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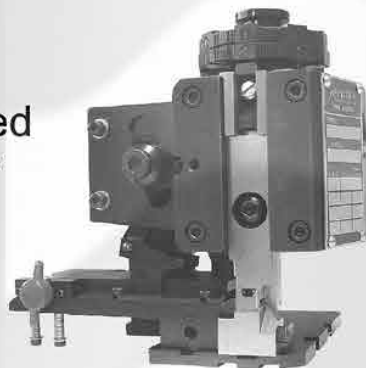


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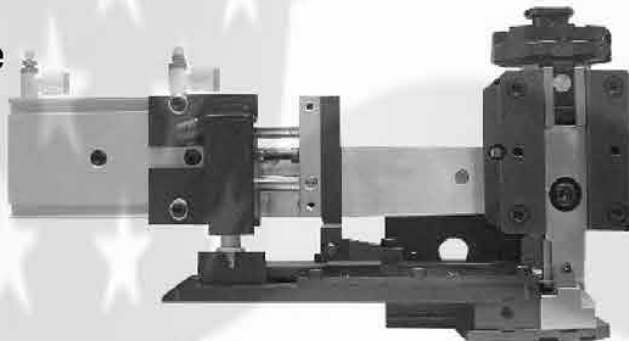


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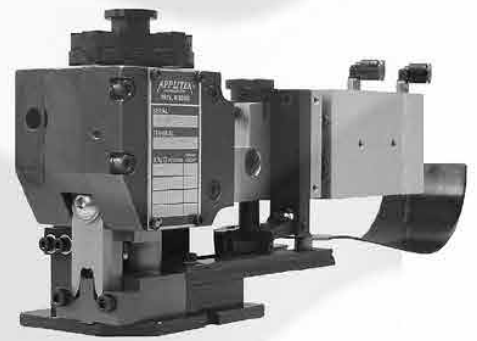


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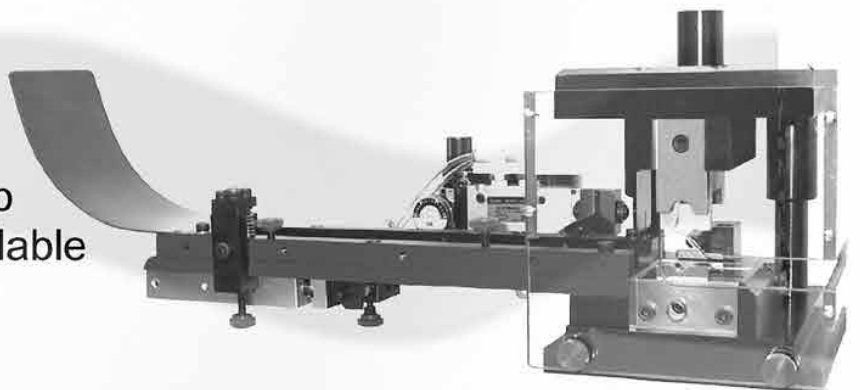


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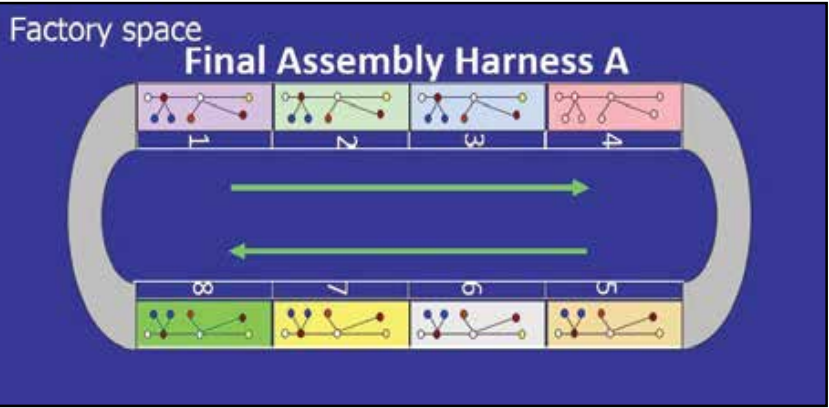
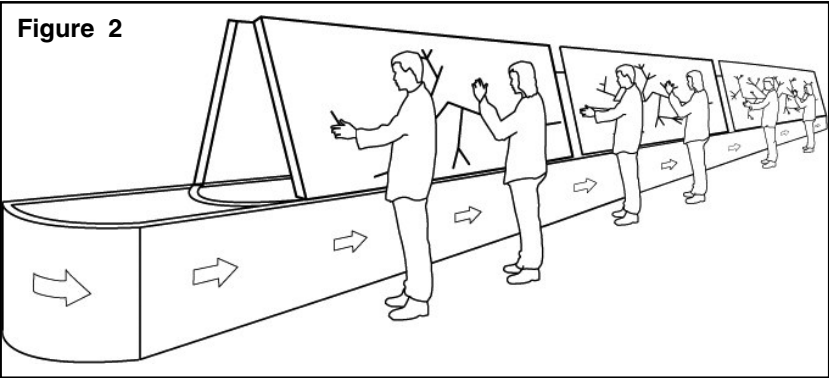
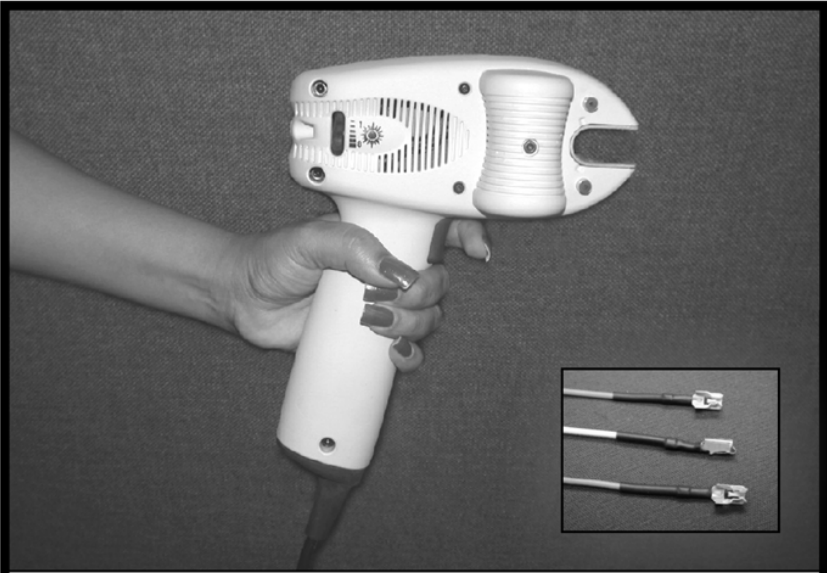


Figure 3 Multiple Workstations

Continued from page 36

Each of the mounted boards pictured in Figure 1 shows the same formboard drawing. These formboard drawings are one-to-one full-scale representations of the harness design data, enriched with additional manufacturing information. Along with the wire harness objects, all manufacturing-relevant objects like bundle forks, connector holders, clip holders or tape position indicators are graphically represented on these formboard drawings, providing visual

aids for the operators. These formboard drawings can be of single harnesses or composite-level harnesses. On a composite formboard, different derivatives of the same harness can be produced. Based on harness design complexity, forecasted volumes, take rates and other factory-specific factors, like available equipment and factory space, manufacturing engineers make decisions upon the design of the production lines, including the number of workstations. The goal of all these activities is always to de-

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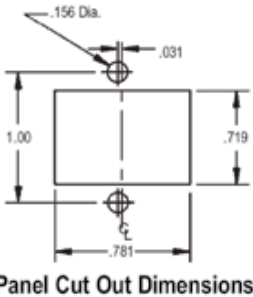
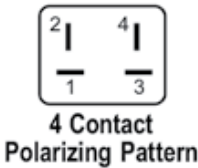
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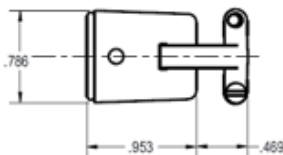
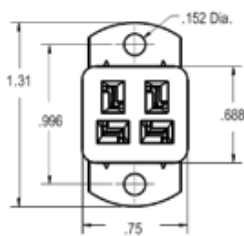
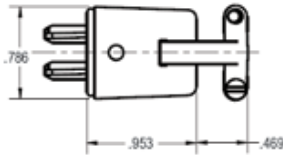
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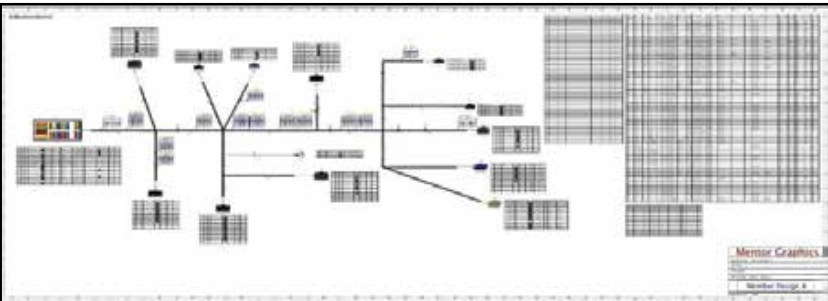


Figure 4 Full-Scale Manufacturing Drawing

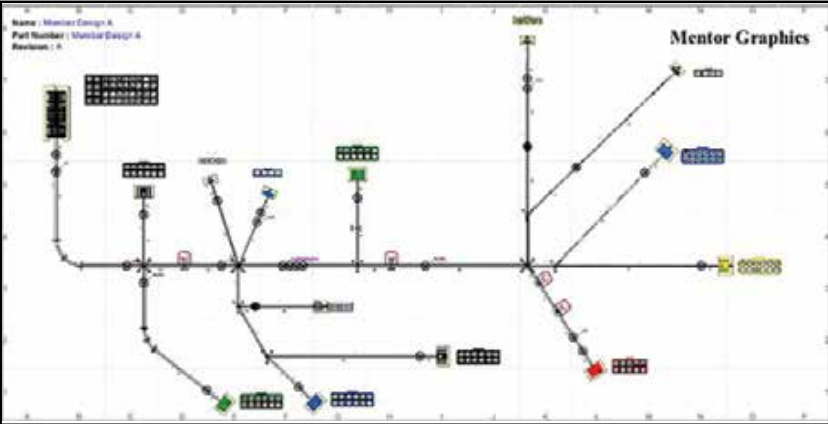


Figure 5 Formboard Drawing

sign a balanced production line design which allows them to produce the forecasted number of harnesses with the forecasted take-rates and to reach the profitability zone as soon as possible. Of course, it always takes a while to reach this zone, especially with complex products requiring a lot of human work. Operators invariably need some time to get used to the tasks they have to perform and to reach their best possible performance.

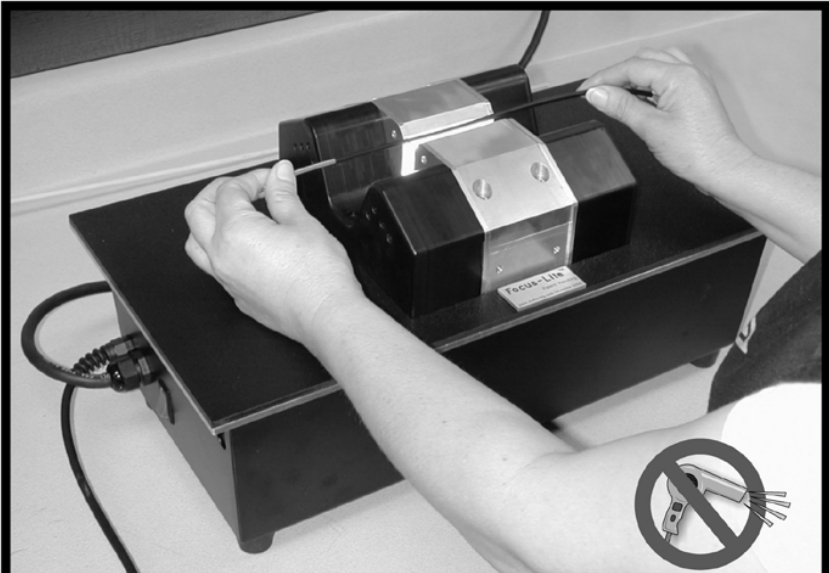
What Exactly Is A Merged Formboard?

Using merged formboards, manufacturing engineers can design production lines which allow them to

produce different (but very similar) harnesses on the same line. That is, multiple production lines can be replaced by a single merged line, freeing up available factory space and other resources. Under some conditions, the productivity and efficiency of individual production lines can be increased by using merged formboards. An example will be given later in this paper.

Since on a merged formboard drawing, two or more harnesses are shown, it is a common practice to use colors to highlight which elements belong to which harness. Note the three colors on the right side of Figure 6 (page 40):

Continued on page 40



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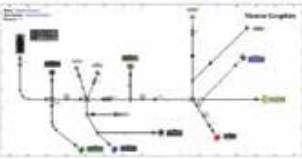
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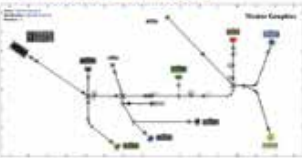
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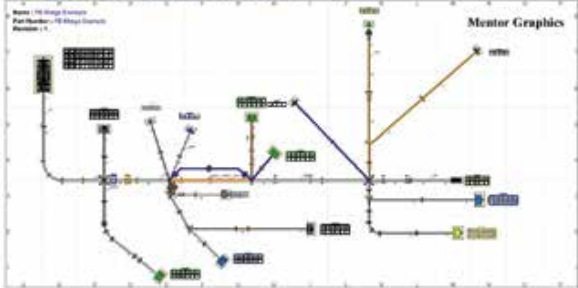


Figure 6

Continued from page 39

- Black: used for content which is common between all harnesses
- Blue: this content is just in one of the harnesses.

Blue color was assigned to this harness

- Orange: this content is just in one of the harnesses. Orange color was assigned to this harness

The shop-floor operator knows which harnesses need to be produced. With this knowledge and the color coding, he can identify the related section on the formboard.

Commonality between harnesses is the key parameter when deciding whether to begin the merge progress, which can be somewhat involved. Generally, 70 to 80% commonality is a rule of thumb target. If there is only little commonality, the resulting merged formboard will be very complex and complicate to read and understand. This will lead to low-production efficiency since operators won't get the required information fast enough from a complicated formboard drawing.

Example: How a Merged Formboard Can Positively Influence the Efficiency and Productivity of a Production Line?

Let's assume we currently produce diesel and petrol (gasoline) versions of a front-end harness for a passenger car. The commonality between both harnesses is maybe around 80%. The take rate for both is very similar, forecasted at 52% for diesel and 48% for petrol. The volume is quite high. Based on this information and some other parameters, we decide to produce the harnesses on separate production lines, one for the diesel and another for the petrol version.

We balance our production lines and finish all required preparation. The final setup provides us with spare capacity so that we are prepared to handle some volume increase, as well. We start production. Our experienced operators catch up quickly to the new design process and we soon enter the profitability zone.

Continued on page 42

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# Capital Formboard Manager:

Continued from page 40

After some months, a significant change in take rates is noticed. The diesel take rate is going down while the petrol take rate is increasing. Perhaps the reason is a very public and contentious discussion about the drawbacks of supposedly “green” diesel engines, thus influencing consumer sentiment. Demand for petrol engines will surge as long as the future for diesel remains unclear — a well-known situation in the German market. Regardless of the cause, the trend is clear and we have to decide how to react.

In the case of our example, the immediate effect is that our diesel production line is no longer efficient. The same factory space and equipment are being used to produce fewer harnesses. More alarmingly, the spare capacity on the petrol production line may not be sufficient to handle the increased take rate of this harness.

Here are our options:

- We could set up a second production line for the petrol front-end harness to cover the increased take rate. However, this will require more factory space, more equipment and more operators, and so may not be optimal (Figure 7).

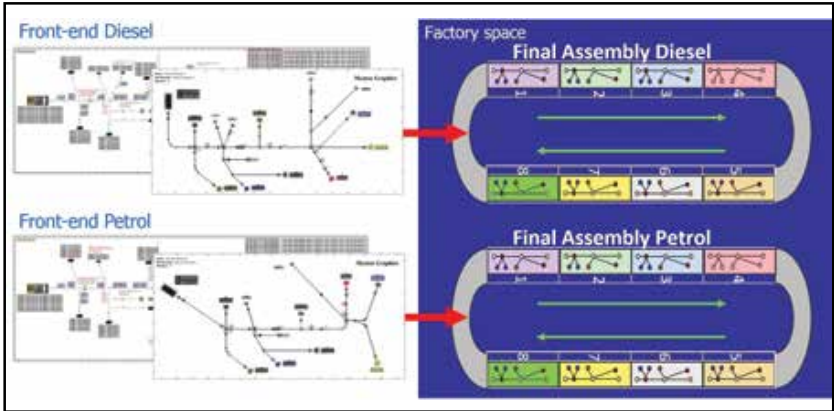


Figure 7 Second Assembly Line Setup

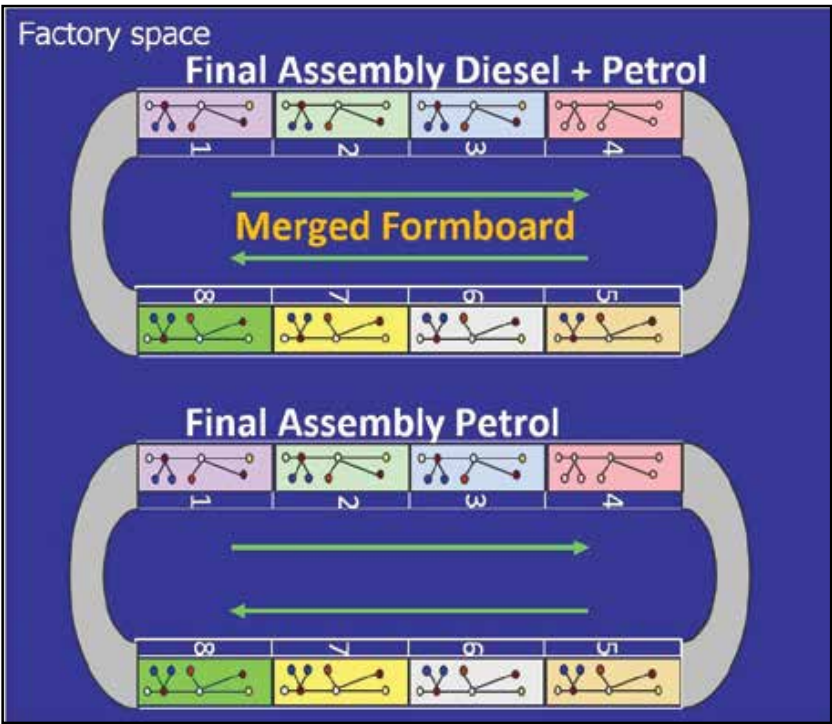


Figure 8 Single Assembly Line

- A better approach (Figure 8) might be to redesign the diesel production line in such a way that it's possible to produce both the diesel and petrol harnesses on the same line. In other words, we could create a merged production line using merged formboards.

Creating an efficient and cost-optimized merged line requires merging existing formboard designs into one

and ensuring reuse of most fixture and tool locations. That is, instead of again drilling all holes and placing all fixtures, engineers should only have to adjust the non-common parts of the harnesses.

Note in Figure 8 that we may well decide to leave the production line unchanged for the petrol front-end harness. With this adjusted setup, we are now able to handle the take rate

changes and produce the required number of front-end harnesses without further changes on the shop floor, such as setting up an additional production line. In fact, setting up a third line would lead to low efficiency and low productivity, because the diesel and the second petrol lines would be far under their capacities. So it's better to cover the changes with two production lines.

Despite the potential benefits illustrated by the example above, there is often resistance to even considering merged production lines because of a) the initial challenge of merging complex formboards, and b) the complexity of change management thereafter. Given current methods and capabilities, companies have to think very hard about investing the time and effort into the feasibility, implementation and maintenance of merged production lines to achieve those benefits. Sometimes they try and fail, often they don't even try because of the risk of failure.

Of course, our example draws a simplified picture of the solution. In reality, many parameters need to be considered during the decision process. But the main message is still the same: a merged

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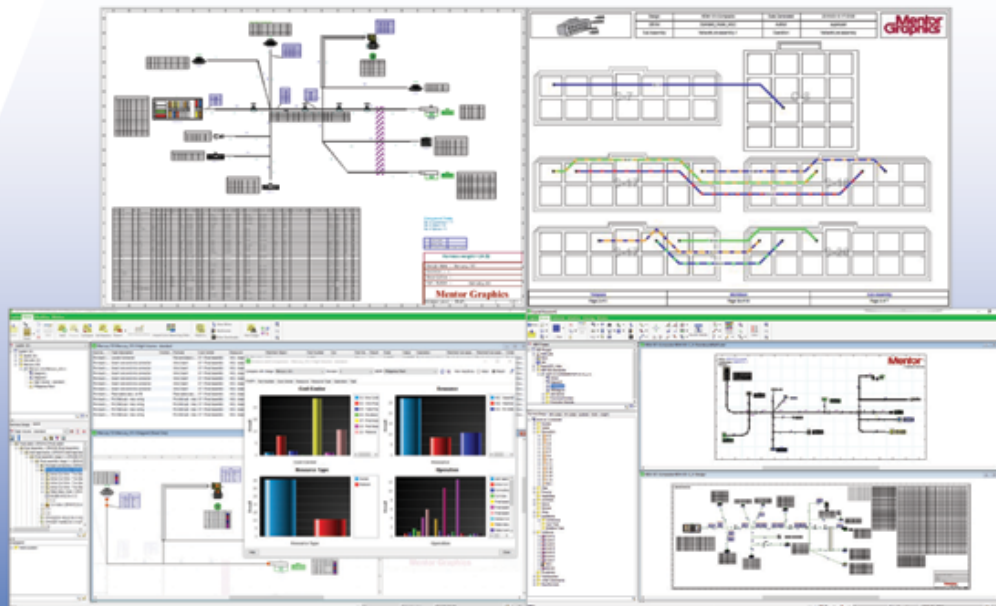
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# Capital Formboard Manager:

Continued from page 42

formboard can boost the efficiency and productivity of a wire harness production line, often significantly.

## How Are Merged Formboards Designed Today?

Traditionally, such merged formboards are created in a highly manual process using drawing tools which are not necessarily designed for reuse and sharing of data. Even the initial step — deciding if two harnesses are good candidates to be produced on a merged production line — is a

massive, labor-intensive task. Drawings need to be compared manually, with attention paid to a host of parameters such as dimensions, layout, components and their locations, required bundle fixtures and component holders.

The merge process itself is another laborious chore when done primarily using drawing tools. In fact, given limitations of most drawing tools, harness data is usually not considered at all at this step. That's why it can take days, or in case of big harnesses, even weeks, to finish the initial merged formboard design.

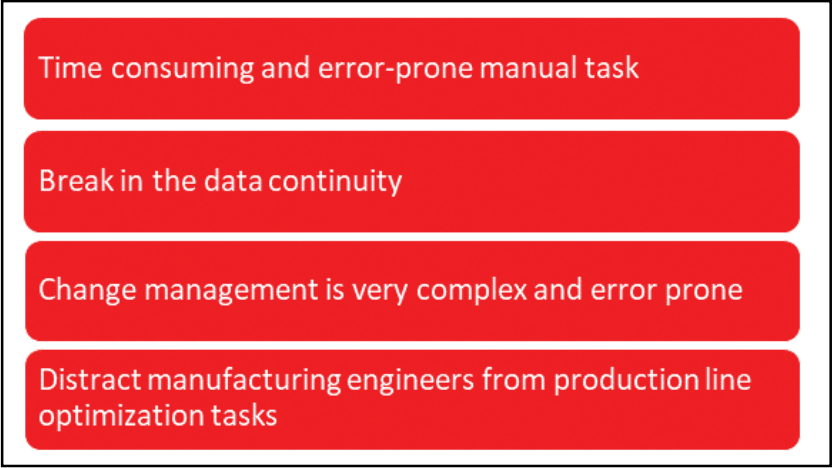


Figure 9 Disadvantages of Today's Drawing Tools



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Figure 10 Capital's Key Features

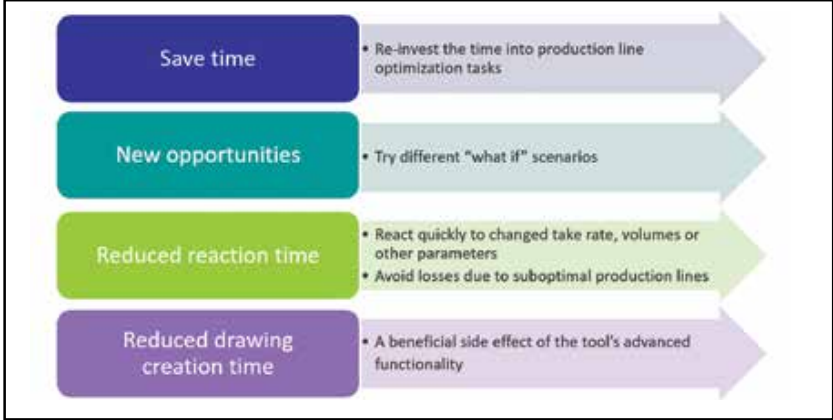


Figure 11 Capital's Key Benefits

Once the initial merged formboard is designed, it must be maintained. All changes made to the original harness designs must be implemented, which means updating the merged formboard. But again, since this merged formboard was likely designed using drawing tools disconnected from any data source, this is yet another time-consuming and error-prone manual task.

It is no surprise that many manufacturing engineers decide against production line optimization via merged formboards. For starters, it is often hard to find good candidates for a merged formboard. Even given significant commonality between two lines, the creation and maintenance of merged formboards is too onerous. And if engineers do go ahead, there is still room for improvement given the many disadvantages of today's drawing tools (Figure 9 Upper Left).

## Capital: How Merged Formboards Should Be Designed

The good news is that there are alternatives to exclusive reliance on drawing tools. The Capital suite from Mentor, a Siemens Business, provides data-centric technology supporting the entire design and manufacturing flow. The list below (Figure 10) pro-

vides an overview of some of Capital's key benefits.

A harness design in the Capital suite is, first of all, a dataset, which can also be represented by diagrams. Each diagram can be styled independently, allowing engineers to create the right graphical representation for each use case. Change management is easier and more reliable since data, once entered, can be reused almost indefinitely, and because data and the corresponding diagrams remain related to each other for the entire flow.

Capital provides a perfect environment for creating and maintaining merged formboards and production lines. Manufacturing engineers can select existing formboards and compare them to find good pairs of candidates. Given data continuity, Capital Formboard Manager provides a range of support in comparing merge candidates. Calculating the actual amount of common content can be done with a click of a button. Automated merge functionality can take over many lower level, "default" tasks.

The tool supports an engineering team's natural workflow. Knowledge about the harness, which is stored in the data, is readily available to be

Continued on page 46



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# Capital Formboard Manager:

Continued from page 40

applied throughout the entire merge process. The tool can provide information to the engineer on the spot,

a sharp contrast to traditional processes with no data continuity, where information retrieval requires a large amount of time. Capital also dramatically reduces

the time required to create a merged board. For example, the tool makes it easy to retain the position of existing fixtures on the physical formboard during the merge. Indeed, since relationships to the candidates (source designs) are maintained throughout the merge formboard process,

change management is generally very fast and easy to handle. Figure 11 describes several of the benefits of using the Capital Formboard Manager to create merged formboards as described thus far.

## Combined Formboard versus Merged Formboards

Combined formboards offer another means of using resources as efficiently as possible in wire harness factories. The difference is that in combined formboards, different harnesses are located at different positions. That is, spare space on existing formboards is used to produce a very different harness. This method is often used for small harnesses and harnesses with lower take rates. Combining formboards allows for many such harnesses to be produced using the same equipment and factory space. Capital Formboard Manager

can be used to create and maintain these type of formboards, as well. Figure 12 below depicts one such combined formboard.

## Conclusion

Capital Formboard Manager enables the creation and maintenance of merged formboards in an environment based on contiguous data flows. The tool makes it easy for manufacturing engineering department to maximize efficiency of their production lines. Transitioning from a purely manual approach relying exclusively on drawing tools to one centered on linked data vastly reduces the effort required to merge and combine boards and production lines. Capital allows manufacturing engineers to focus on what they do best, like quickly working through various line optimization scenarios, rather than operating ponderous drawing software. For harness manufacturers, this means making better shop-floor decisions and, ultimately, reaching the profitability zone that much faster as inevitable changes are made.

## About the author

Frank Hemmersbach (frank\_hemmersbach@mentor.com) is a product architect for harness design and manufacturing tools at Mentor, a Siemens business. He has 21 years of experience in the wire harness industry, including several with a major harness manufacturer within the design, development, manufacturing and IT departments. He is based in Cologne. For More Information go to [www.mentor.com/capital](http://www.mentor.com/capital)

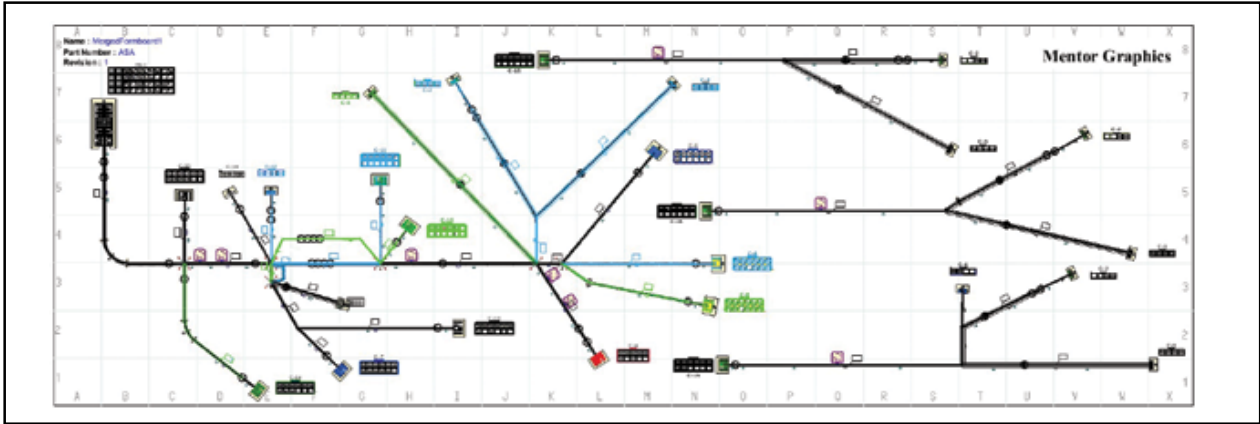




Figure 12 Combined Formboard

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# How Wire Harness Manufacturers Can Achieve Success Amid a Changing Nylon 6/6 Market

By Robert Rensa  
Panduit

Created as an alternative to silk in the 1930s, the practical applications for Nylon 6/6 weren't as vast then as they are now. In fact, prior to becoming

one of the most in-demand substances on the planet, the polyamide found itself most useful in 1940s wartime.

Primarily used when high mechanical strength, great rigidity, and good stability under heat are required, today Nylon 6/6 is one of the world's most critical components when it

comes to the creation of fiber applications, industrial applications, and engineering material. But beyond that and its use in industrial applications, power tools, and cable ties, the material is perhaps most crucial to the auto industry.

Much of the Nylon 6/6 that is globally produced eventually finds its way into auto applications like air intake manifolds, ball bearing cages, bushings, gears, electrical components, oil pans, and other various machined parts and under hood components. And while its resistance to heat, oil, and grease is especially useful in automobiles, perhaps its greatest offering to the industry is its ability to help improve fuel efficiency, increase design freedom, and reduce manufacturing costs. Not to mention, as safety regulations and standards become more stringent and widespread worldwide, the need for it will only increase because of how critical it is to the production of airbags.

Globally the demand for automobiles is steadily increasing. Forbes reports that international car sales have gained momentum and are projected to rise in 2018, up from an estimated 3.3 percent growth in 2017. 2016 was another record-breaking year with nearly 90 million cars and light

vehicles sold globally, up 4.8 percent from 2015<sup>1</sup>.

With no end for car demand in sight, demand for Nylon 6/6 has never been greater. Unfortunately, Chemical and Engineering News projects that the present 200,000-metric-ton shortfall of Nylon 6/6 output could grow to 800,000 metric tons by 2021<sup>2</sup>. The automotive industry relies on it, but the need for Nylon 6/6 is growing at the same time the world supply is decreasing.

Because of its popularity, OEM customers who are standardized on Nylon 6/6 may experience spot shortages. It is therefore essential that they understand the industry's most utilized logistics models.

## *Adaptability now can create future success for manufacturers*

There are two traditional methods for obtaining Nylon 6/6 – spot purchasing and large contract buying. When it comes to Nylon 6/6 buyers, spot purchasing tends to be used by those requiring smaller amounts of the material, making it a well-established and traditional buying method. When it comes to large contract buying, solutions providers will contract with companies to guarantee them a percentage of their business and



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in return get a guaranteed contract price and continuity of supply

An example of spot purchasing is when cable tie manufacturers reach out to their suppliers to conduct one-off purchases, which allows manufacturers to shop for the best Nylon 6/6 price at that time and to keep it stored to sell later. This can be advantageous in a long market because the plants have the supply but in a short market, spot purchasers will be at a disadvantage if the supply runs out. This method is especially popular in Asia.

In the U.S. and Europe, most large consumers – those buying six million pounds or more – are large contract buyers. Because companies have been guaranteed the material when utilizing large contract buyers, anything that would decrease the supply of Nylon 6/6 does not negatively affect them. Large contract buyers go to the front of the line for supply when there is an allocation, leaving spot purchasers to get theirs last or not at all. Additionally, being a large contract buyer allows the opportunity to actively seek out alternative sources to the supply.

Breaking down both strategies becomes a risk mitigation exercise. When times are tough, companies and large contract buyers get their Nylon 6/6, no questions asked, which leaves spot purchasers on the outside looking in. While spot purchasing allows various market prices to be sought, the market also dictates this price. The market doesn't dictate the price of large contract buyer supplies, meaning it's generally lower, more consistent, and based on what the market is now instead of when it was at the time of the spot purchase. Utilizing spot purchasers is a risk, while depending on large contract buyers provides consistent relief.

It's no secret that the supply chain of Nylon 6/6 is under extreme, potentially long-term pressure. In the end, utilizing spot purchasers is a risk, while depending on large contract buyers provides consistent relief. Utilizing large contract buyers al-

lows prices to not be made based on out-of-date market prices – whereas a large contract buyer's supply will have a consistent price, the price of a spot purchaser may reflect the price the materials cost three, six, even nine months ago, making it difficult to gauge what's a fair offer and what prices going into a potential transaction could be.

*Supply May Decrease, But Your Profitability and Productivity Don't Have To*

There are other ways for wire harness manufacturers to ensure their productivity and profitability remain regardless of the state of the Nylon 6/6 industry and supply. By taking these best practices on board, wire harness manufacturers can better manage the changing headwinds in the industry:

- **Reducing downtime:** Even with the most experienced workers, manual installations take time and produce less reliable electrical connections. An automated system ensures consistency over the manual alternative while reducing errors and downtime. They're also faster than manual, leading to an increased overall throughput. Given that impact, investing in an automation system makes good business sense.

- **Improving throughput:** By automating certain parts of the manufacturing process, more high-quality wire harnesses will be turned out in a shorter amount of time. This is especially true for the application of cable ties. While they are a relatively easy and cost-effective way of bundling wires in a harness, applying them manually is labor intensive. This is where better tools and automation can be a major improvement.

- **Being flexible:** Traditional harness board assembly has historically been a long and labor-intensive process, and the equipment used reflects the once-popular desire to carefully

Continued on page 50



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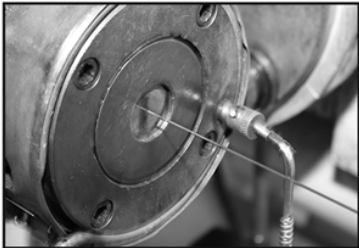
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# How Wire Harness Manufacturers Can Achieve Success Amid a Changing Nylon 6/6 Market

Continued from page 49

make something of quality by hand. But over time this has become impractical. Modular system offer an alternative that improves productivity, space utilization, and material quality. Like automated assembly solutions that increase speed and minimize errors, there are harness layout solutions that increase flexibility and minimize costs.

- Focusing on standards: Wire harness assembly being a traditionally manual process has historically left room for variances and quality errors in the final product. By holding your shop to a high level of quality and operational excellence, it signals to customers and others in the industry a commitment to excellence, and this – along with great products – helps attract new business.

Robert Rensa is the Business Development Manager of Wire Management Products for Panduit, a leading global provider of electrical and network infrastructure solutions. Robert has more than 40 years of work experience in sales, product and business management at industry leading companies including Panduit, Eaton, and Furnas Electric (now Siemens Automation). He is also active in industry standards bodies including as the Chairman for NEMA 5FB-2-Wire Management Products, a committee member for NEMA 5FB-2 Technical Committee, Chairman for CANENA-THSC 23A-62275 and technical expert for USNC-SC23A-TAG-WG17 to IEC.

<sup>1</sup>Winton, Neil. “Global Car Sales To Gather Momentum In 2018, While New Technology Disruption Lurks.” Forbes. <https://tinyurl.com/y8nqgous>.

<sup>2</sup>Tullo, Alexander. “The chemical industry is bracing for a Nylon 6/6 shortage.” Chemical and Engineering News. <https://tinyurl.com/y7u75nzy>

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Customers report something unusual too: Mando’s “can-do” attitude.

George Price, vice president of J&M Products, for example, writes how Mando takes time to answer questions, explain machine operation and even gave “tips on stripping some shielded cable that others said could not be done.”

“Can’t be done” is not in Mando’s vocabulary—either English or Spanish. On his own initiative, he solves problems, leads training classes, helps boost plant efficiencies, and makes lasting friendships while doing it.

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## NEWS PLUGS

### ICC Adds Glenair M83513 Connectors to Value-Added Assembly Offering

Interstate Connecting Components is now offering two-day value-added assembly on Glenair's MIL-DTL-83513 Micro-D shock- and vibration-resistant connectors.

Interstate Connecting Components, (ICC), a division of Heilind Mil-Aero and a leading distributor of military-aerospace connectors and accessories worldwide, is now offering

two-day value-added assembly on MIL-DTL-83513 (M83513) Micro-D connectors from Glenair -- a leading manufacturer of harsh environment connectors, backshells and cable assemblies.

ICC stocks Glenair's M83513 connectors in both QPL-approved MIL-SPEC and MWDM COTS (commercial off-the-shelf) versions, with one of the largest selections in the market. Through its T'DA® two-day assembly program, ICC can assemble hundreds of components in its inventory to create numerous connector combinations—thus expanding its selection even further. The value-added



assembly also translates into reduced cost and a faster turnaround time for customers.

All Glenair M83513 connectors have precision-machined shells and are designed to perform in high vibration, high shock environments. One of the key features of these robust D-subminiature connectors is their

advanced performance TwistPin contacts. The TwistPin technology utilizes a superior electrical and mechanical system that yields lower contact resistance and outperforms traditional machined or stamped electrical contacts. The contacts are available with insulated and un-insulated wire, PCB, solder cup or flex terminations.

This versatile product offers superior performance in high-vibration and high-shock environments and can be used in a wide range of military-aerospace and space-grade applications.

Visit ICC's website for more information about Glenair MIL-DTL-83513 Micro-D Connectors.

#### About Glenair

Glenair offers a variety of full spectrum product lines designed to meet every interconnect requirement. The company's portfolio includes military qualified and commercial connectors, as well as the industry's largest standing inventory of commercial and MIL-SPEC electrical connector accessories. Glenair manufactures the majority of its products in quality controlled plants in the United States.

### ICC Introduces TE Connectivity Corporation's INSTALITE Molded Boots with Rayaten Shielding

TE Connectivity's new Raychem INSTALITE boots offer next-generation Rayaten shielding and easy installation.

Interstate Connecting Components, (ICC), a division of Heilind Mil-Aero and a leading

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distributor of military-aerospace connectors and accessories worldwide, has added INSTALITE Rayaten-shielded molded boots from TE Connectivity (TE) -- a global leader in connectivity and sensors.

Like other Rayaten heat-shrinkable molded parts under TE's Raychem line, the new INSTALITE boots are designed to resist abrasion as well as common military fuels, oils and gases. In addition, they feature enhanced EMI performance with a lightweight screening capability of 70 dB of attenuation (up to 1 GHz). This level can be customized for individual requirements.

One of the most notable features of the boots is their simplified installation. Because the boots are manufactured with new flexible EMI shielding materials, they are less likely to crack and recover quickly from the heat shrinking process. The materials also allow for an expanded range of configurations, including several T-shape options and multi-way harness breakouts.

INSTALITE boots with Rayaten shielding fit most circular connectors and backshells, with options available for D-subminiature backshells. This versatile product can be used in a wide range of harsh environment applications, including military ground vehicles, missiles and missile launchers, naval shipboards, flight control instrumentation, radar systems and C4ISR systems.

Visit ICC's website for more information about TE Connectivity's INSTALITE Molded Boots with Rayaten Shielding.

About Interstate Connecting Components (ICC)

A division of Heilind Electronics, North America's largest interconnect distributor, Interstate Connecting Components ([www.connecticc.com](http://www.connecticc.com)) is an AS9100D-certified value-added distributor for the entire spectrum of electronic connectors, fiber optic connectors, backshells, tools, identification solutions and connector contacts. ICC specializes in the military-aerospace market and offers T'DA® 2-day assembly on D38999, M28840 and many other



MIL-SPEC connector lines. Follow ICC on Facebook at [facebook.com/connecticc](https://facebook.com/connecticc) and on Twitter at [twitter.com/connecticc](https://twitter.com/connecticc).

About TE Connectivity

TE Connectivity Ltd. is a \$14 billion global technology and manufacturing leader creating a

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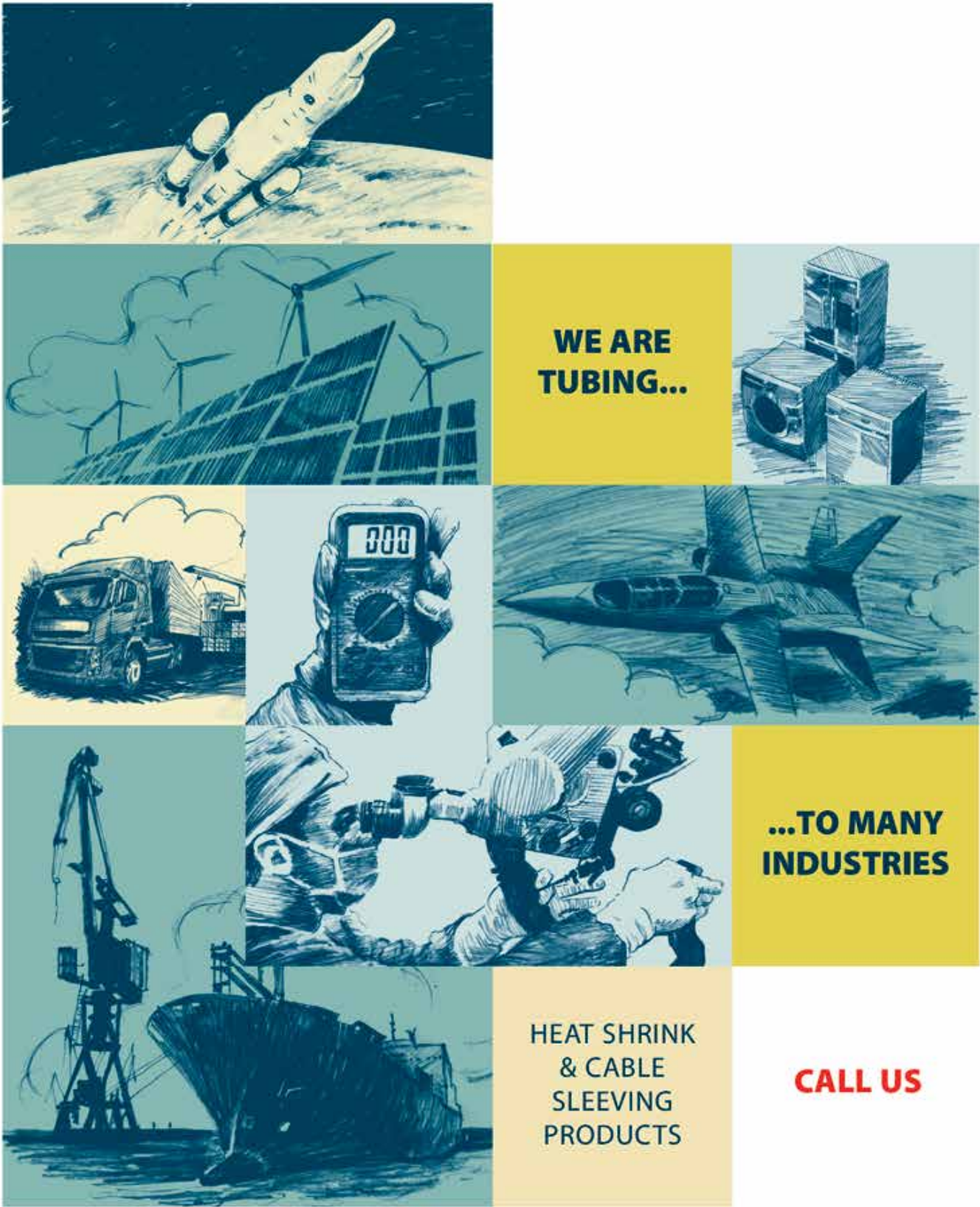
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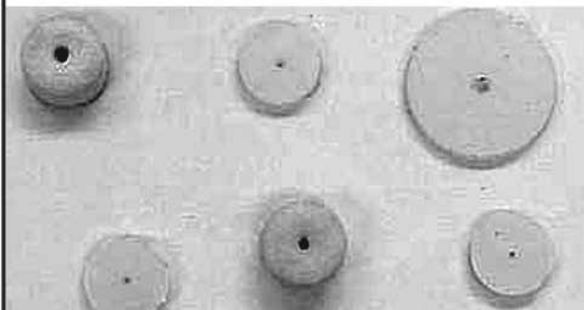
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## NEWS PLUGS continued



### CoaxStrip 6480 – The Perfect Solution for Nearly Every Need

The new CoaxStrip 6480 stripping machine increases production by an average of 15 percent, reduces your operating costs and guarantees high processing flexibility and quality. The ability to process coaxial cables with outer diameters of 1.2 to 12 millimeters makes it a perfect all-rounder for almost any production need. Schleuniger's CoaxStrip 6480 is equipped

with "cable end detection" and "cable diameter verification" for high-precision processing.

Schleuniger is proud to present another highlight for the end of the year: The CoaxStrip 6480, semi-automatic stripping machine, processes coaxial cables with an outer diameter of 1.2 to 12 millimeters, offers unique processing functions and helps you reduce your operating costs. With its simplified programming, high-performance control software, and high production performance, the CoaxStrip 6480 is the perfect solution for almost any production need.

### 15 Percent Increase in Productivity

With top quality features such as fast and easy machine setup as well as precise and powerful drives, the CoaxStrip 6480 qualifies itself as a great all-rounder, enabling you to produce even more wires in less time. While the newly developed, extremely powerful drives guarantee an average productivity increase of 15 percent, the reliable and quality-focused Schleuniger technology virtually eliminates unplanned downtime. Change-over times for changing mechanical parts are completely eliminated as both the cutting blades as well as the center-

ing and clamping jaws may be used for the entire range of wires. Schleuniger has also made maintenance of the machine quicker and easier by designing the protective cover to be removed without any tools.

The CoaxStrip 6480 further impresses with its innovative technology concept: Depending on the processing diameter, the contact point will vary on the blade edge for each of the three blades, increasing their service life and reducing operating costs. In addition, the three-blade stripping head offers a considerable advantage when removing highly adhesive insulations due to its large contact surface.

### Quality Control Made Easy

The new CoaxStrip 6480 furthermore provides three unique functions for quality monitoring: The "cable diameter verification" prevents the processing of incorrect wires because it ensures that the outer diameter of the inserted wire corresponds to the value entered in the wire program. If it does not, the machine stops and displays an error message. Schleuniger's newly developed cable retraction function automatically guides the wire into the correct stripping position, a great help in the work process, especially when processing flexible materials and long stripping lengths. And the "cable end detection" ensures that the



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lengths of the stripped wires are exact and precise, no matter how they are inserted into the machine. But it gets even better: The positioning of the stripping blades slightly behind the centering jaws, means that damage to the shielding, the dielectric and the inner conductor can be eliminated during the whole stripping process. A precise and clean cut is achieved thanks to the fact that the blade cuts are made linearly and at right angles to the cable axis. The three-jaw centering system, located directly in front of the blades, ensures that the wire is perfectly centered and stabilized during the stripping process. And: The centering jaw position can be programmed for each layer as well as for the twisting of the inner conductors, resulting in a reliable and high-quality result.

#### Intuitive Programming

The new CoaxStrip 6480 will not only win over long-time employees with its intuitive and powerful control software, but even occasional machine operators will be impressed: Never before has the programming of a semi-automatic stripping machine been so simple. The processing parameters are automatically calculated based on the raw material data, and the stored libraries even contain presettings for conductor cross-sections, which are displayed in both square millimeters and AWG. In addition, the raw material data of the most common coaxial cables are stored in the library from the very beginning. Like all Schleuniger automatic Cut & Strip machines, the new CoaxStrip 6480 is controlled by the S.ON software. This means that operators who are already familiar with Schleuniger products will find the same interface on all machines, reducing the amount of required training. In addition, the high-resolution color touchscreen offers an intuitive, modern and user-friendly interface.

More information about this new product can be found at [www.schleuniger.com](http://www.schleuniger.com). Should you have any questions, please e-mail [sales@schleuniger.com](mailto:sales@schleuniger.com) or call (603) 668-8117.



CoaxStrip 6480 semi-automatic stripping machine

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## NEWS PLUGS continued



### Shine Wire Inc. - Massachusetts Manufacturer of The Year

SHINE Wire Products Inc., an Electronic Contract Manufacturer specializing in cable assemblies, wire harnessing, and electro-mechanical assemblies, was recently named a Massachusetts Manufacturer of The Year by the Commonwealth's Manufacturing Caucus. Hosted by the Massachusetts Legislative Manufacturing Caucus, the nomination came from Representative John Barrett.

The Third Annual Manufacturing Awards Ceremony took place on Tuesday, October 30, at the Massachusetts State House in Boston. Speakers included House Speaker Robert DeLeo, Senate President Karen Spilka, and Secretary of Housing and Economic Development Jay Ash. Greg Shine accepted the award on behalf of all SHINE employees past and present. "Thirty-five years ago, SHINE set out with a mission to instill hope and offer opportunity to a community that was on the verge of losing many jobs. Today, the foundation of our business that was built on love and service to others remains strong," stated Greg Shine. "I dedicate this award to all of our employees, both past and present, who have embraced the values of our humble beginnings".



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Formed in August 2014, the Manufacturing Caucus includes more than sixty legislators from around the state. Lawmakers focus on training for manufacturing employees, encouraging innovation by helping start-ups access resources, and expanding education and apprenticeship opportunities in key manufacturing sectors. The goal of the caucus is to increase Massachusetts' competitiveness in manufacturing by providing legislative support. The caucus is focused on expanding opportunities in vocational high schools and community colleges to combat the skills gap.

Founded in 1984, SHINE is located in the Adams Corporate Park. Entering its thirty-fifth year in business, the company provides engineering support and finished products that are used in the test & instrumentation, medical, aerospace, military, industrial, and Homeland Security sectors. SHINE's quality system is certified to ISO9001:2015, UL and CSA, as well as ITAR registered by the US Department of State. You can contact Greg Shine 413-743-9933 x 101

### Heilind Electronics Now Stocking Molex OTS Squaba Discrete Cable Assemblies

Heilind Electronics, a leading global distributor of electronic components and the largest authorized distributor for Molex in the Ameri-



cas, has expanded its selection of interconnect solutions with the company's off-the-shelf (OTS) Squba discrete wire cable assemblies.

Squba wire-to-wire cable assemblies are designed to accommodate small spaces and provide protection against liquid, dust and dirt. In addition, their IP67 rating ensures a reliable connection even in wet conditions. Available in a variety of cable lengths to facilitate both prototyping and global production, the assemblies are utilized in commercial vehicle, consumer, industrial and medical markets.

Squba terminals can support up to 5.0 A of power with 22 AWG wire, challenging the traditional rule of increasing wire gauges with higher current ratings.

Visit Heilind's website for more information about Molex OTS Squba discrete wire cable assemblies.

Heilind Electronics, Inc. (<http://www.heilind.com>) is one of the world's leading distributors of connectors, relays, sensors, switches, thermal management and circuit protection products, terminal blocks, wire and cable, wiring accessories and insulation and identification products. Founded in 1974, Heilind has locations throughout the U.S., Canada, Mexico, Brazil, Germany, Singapore, Hong Kong and China. Follow Heilind on Facebook at [facebook.com/Heilind](https://www.facebook.com/Heilind) and on Twitter at [twitter.com/Heilind](https://twitter.com/Heilind).

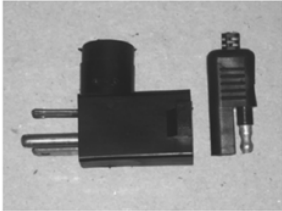
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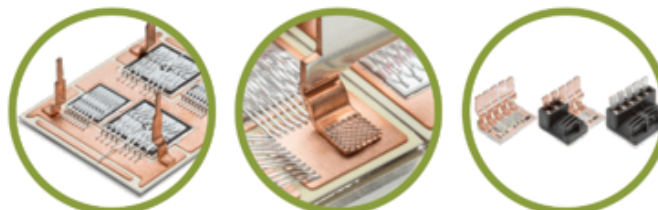
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# CableEye®4-Wire Precision Resistance Measurement Converter Board, CB53

CAMI Research Inc. (Acton,MA), manufacturer of the CableEye automation-ready cable and harness test system, announces release of the CB53 in the New Year. The CB53 is a special connector motherboard that will convert a top-mounted standard 64-pin connector board test fixture into a 4-wire test fixture. Conversion is valid when the UUT connects directly into the standard board rather than via a flying lead or adapter cable and eliminates the need to otherwise create custom 4-Wire test fixtures. The CB53 fits all CableEye models and is rated for HiPot testing at 800 Vdc, 500 Vac. 4-Wire resistance measurement is available for models M4 and HVX-series CableEye testers.

### Configuration

A leader in the development of PC-based cable and wire harness test systems, CAMI offers the CableEye suite of products complete with accessories – including auto-detected, plug-in connector boards for fast, convenient set-up and testing of standard cables. There is an extensive and growing stock library of these test fixture boards – most of which are populated with families of connectors, such as the audio market CB19. When pre-populated boards are used, the tester GUI automatically displays a graphic of the connectors and wiring under test. The tester can be readily programmed to do the same for custom boards and fixtures. These boards are designed to fit all CableEye testers.

Sold as a set of two boards, each CB53 accepts any other standard 64-pin configured board in a stacked configuration. The converter board plugs directly into the 64pin header of the tester and is sandwiched between the tester and the main connector board. 4Wire conversion is valid when the UUT connects directly into the main board, rather than via a flying lead or adapter cable. In addition to the latest CableEye software, the CB53 requires a tester with 4wire measurement capability, a mating connector board, and an expansion module. As with any 4wire mea-



CableEye 4-Wire Conversion Board

surement, twice the number of test points is required than for standard 2wire measurement, therefore an expansion module is necessary. Ribbon cables connect the CB53 to each bank of the expansion module.

### Warranty

All connector boards are included in CableEye's standard, renewable one-year warranty of the tester for which it was purchased.

### Availability & Domestic US Pricing

Available January 2019, a CB53 set is \$255(Item783) and requires the latest CableEye software as of Jan 2019, an expansion module, and a tester with 4-Wire measurement capability. The set includes two ribbon cables for connecting to the expansion module.

Contact [sales@camiresearch.com](mailto:sales@camiresearch.com) for a quote.

*Note: Prices are USA only and subject to exchange rates, freight and import costs. Contact your local authorized distributor for local pricing. CAMI Research produces expandable and upgradable diagnostic Cable & Harness Test Systems for assembly, prototyping, production, and QC of standard or custom cables. CableEye® Testers display, and document basic electrical properties such as continuity, resistance, capacitance, dielectric breakdown, insulation resistance, miswires, and intermittent defects*

# Why You Should Upgrade to a CableEye® Tester...

Setting the screen language is only one way in which the flexible, intuitive CableEye cable and harness test system adapts to meet your needs.

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- If you need reliable, fast diagnostic tools to find intermittent connections, locate shorts, opens, or miswires, our live graphic wiring display makes this a snap.
- If you want to automate a test procedure to ensure consistency, our built-in scripting with operator prompts does the job.
- If you need to protect your stored cable data from inadvertent erasure or tampering, set each operator's log-in privilege as needed.
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- If you prefer to readily share files and fixtures between different models, our common software platform makes that a cinch.
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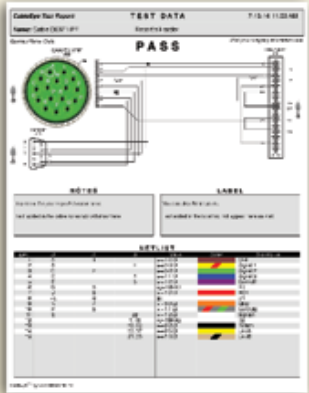
[camiresearch.com/testimonials](http://camiresearch.com/testimonials)



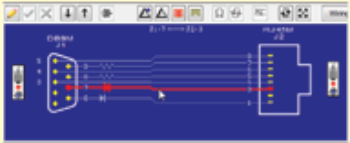
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Relay Control	Lock & Release Latches, Diverter Gates
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# FreePoint Doubles Down On Industrial IoT Growth In Manufacturing

Company announces acquisition of CoreSolutions to address demand from customers worldwide

FreePoint Technologies, an award-winning provider of software for the Industrial Internet of Things (IIoT) to manufacturers worldwide, today announced that it has acquired CoreSolutions, a software development company with offices in London, Ontario and Toronto. Through the acquisition, FreePoint will accelerate the development of its industry-leading Shift-Worx platform for machine monitoring in manufacturing while providing

enhanced flexibility for configuration and customization to meet enterprise customer needs.

Paul Hogendoorn, Founder and President of FreePoint Technologies, remarked, “We are excited to have the CoreSolutions team join us as we work with new and existing customers to double our global installed base in the next twelve months.” FreePoint products are currently deployed at over 100 manufacturing sites in the United States, Canada, Mexico, Australia, and other countries around the world. The company’s patent-pending industrial IoT technology, which measures value-adding activity by machine, delivers productivity improvements to customers of up to 30% and



Paul Hogendoorn (left) and Barney Lawn.

more. The results have been validated through research conducted by Fanshawe College in conjunction with the National Science and Engineering Research Council of Canada (NSERC).

“The team at CoreSolutions brings decades of experience in software development, project management, and product management and is a perfect complement to the highly skilled team at FreePoint Technologies. For the past year, we have been working closely together on several projects at some of our largest enterprise customers, with hundreds of manufacturing plants worldwide,” continued Hogendoorn.

“We are delighted to join the FreePoint family. CoreSolutions is very excited to have the opportunity to extend our work in the industrial IoT market and be a part of shaping technology that will greatly improve manufacturers’ visibility into machine activity and fully engage factory floor employees,” remarked Barney Lawn, Founder and CEO of CoreSolutions. Reflecting on customer demand, Lawn said “The potential in this emerging market is huge and

the skills we bring to the table will help FreePoint further accelerate its growth.”

The global market for industrial IoT solutions in manufacturing will exceed \$250-billion by 2019, according to estimates made public by BI Business Intelligence, primarily composed of software and related services.

The acquisition will be accretive to FreePoint’s 2019 revenue and EBITDA and will nearly double the number of employees. Barney Lawn will be COO of the combined entity and Paul Hogendoorn will continue as President and CEO.

### About FreePoint Technologies

FreePoint provides Industrial Internet of Things (IIoT) software to manufacturers worldwide, helping them easily, rapidly, and cost-effectively connect to their machines and with their people, delivering immediate improvements in situational awareness and operational efficiency on the manufacturing floor. More information is available at <https://www.getfreepoint.com/>

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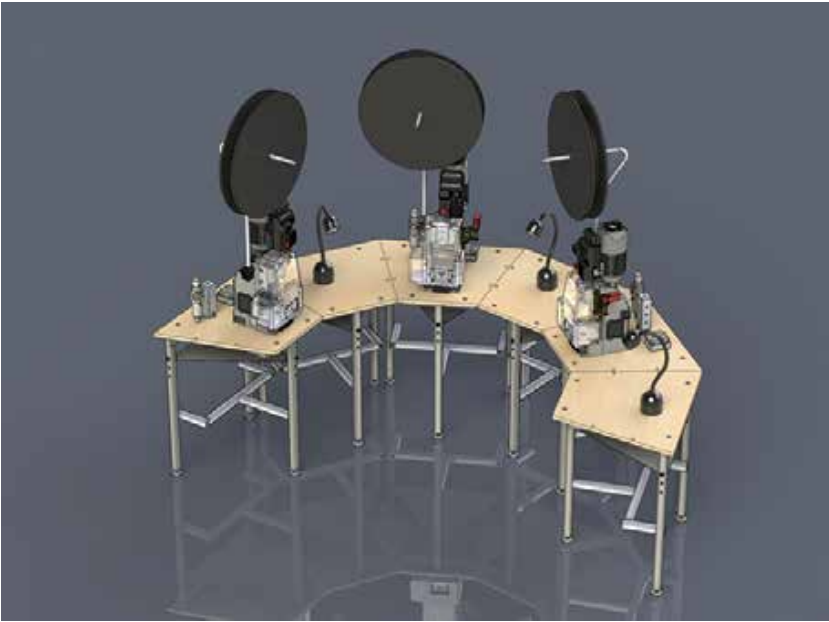
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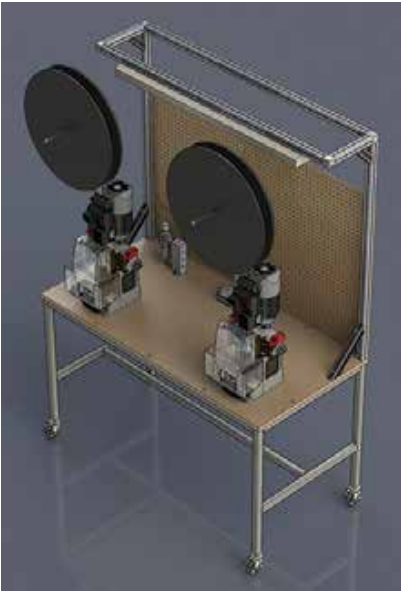


# Turnkey Work Stations



Mecal by Starn in conjunction with our sister companies Penn Weld Inc. and Starn Tool and Mfg., is excited to bring Turnkey Workstations to the Wire Harness Industry and the Custom Manufacturing world. We have recently increased our plant operations to include a 4th facility with our primary focus being the Turnkey Workstation and assembly/customer support operations.

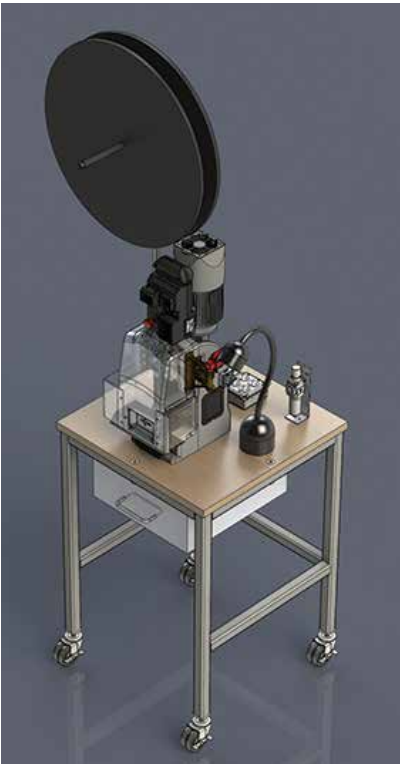
Our Ten Plus years in the wire harness equipment business with our partners Mecal Italy has taught us many things. The most notable is the effect and importance of delivery lead time. At the core of Mecal by Starn's business model is a 3-4-week lead time on Crimping Applicators and a 2-week lead time on standard spare tooling.



Over the last several years we have seen many of our customers expand their manufacturing operations with additional applicators and presses. We also came to realize they needed workstations similar to what Penn Weld produces for a large number of their customers in other industries. So began the concept of the Crimping Turnkey Workstations.

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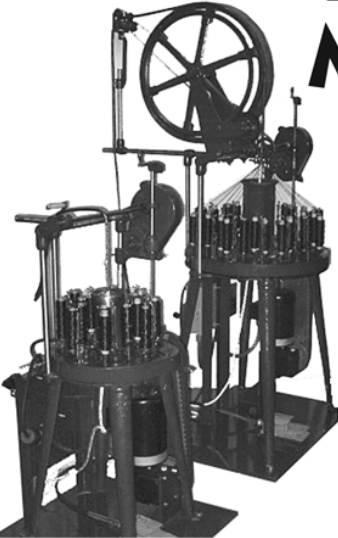
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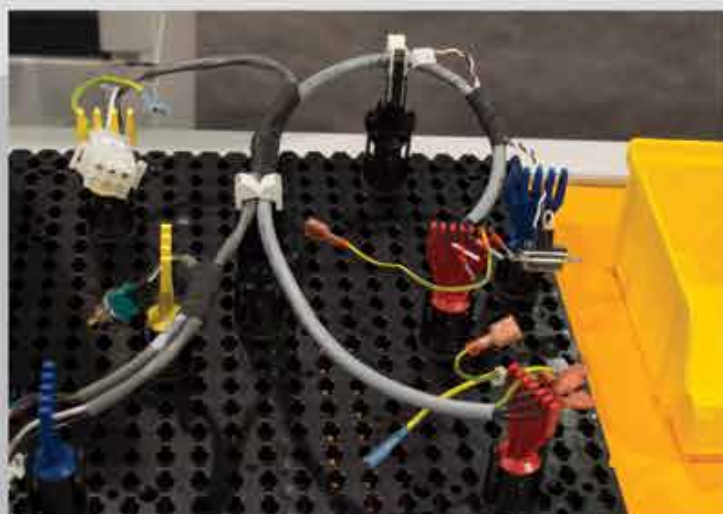
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## WHO NEEDS TO ATTEND THIS EVENT?

Decision makers who design, purchase, sell, install and maintain electrical manufacturing equipment for the wire and cable processing industry attend every year to continually strengthen partnerships and establish new alliances to grow their business.

- Discover what new technologies you should consider to increase your future productivity
- Learn how you can better use your existing resources to become more efficient and competitive
- Meet industry experts you can trust and learn from, gather valuable information and gain industry insight [Networking opportunities abound throughout the show, including sponsored food and beverage breaks and the VIP Party on Wednesday night]



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All seminars are FREE and led by industry experts to provide insights into the future and help you with your toughest challenges. Scheduled to date:

- “IPC/WHMA A-620”/Teresa Rowe, IPC.
- “Crimping: Beyond the Basics. Preparing for the New Reality”/ Terry Curtis, TJ Curtis Technologies.
- “Trends in Overmolding”/Steve Willing, ISC Engineering, LLC.
- “Large Cable, Large Problems: Considerations for Innovation in the Large Cable Market”/Todd Troutman, TE Connectivity.
- “Interesting and Unusual Applications of Cable and Wire Harness Testing”/Christopher E. Strangio, CAMI Research, Inc.
- “OEE (Overall Equipment Effectiveness) in the Context of Digitization as a Success Factor for Companies”/Rob Boyd, Schleuniger, Inc.
- “Fully Automatic Wire Harness Manufacturing”/ Günther Silberbauer, Komax

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