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- Wire Wisdom - Insulation Jacket Shrinkback
- Explaining the Approval Process for Wire & Cable Products
- 3 Steps to Success: Measure, Analyze, Share - Don't Forget to Share



Justice Electronic Training Services (JETS)

By Fred Noer

In the 16th century, the English philosopher, scientist and essayist Francis Bacon emphasized the importance of learning when he wrote that “knowledge is power.” Five centuries later, Lucy Justice personifies the essence of that famous Baconian phrase.

As the president and CEO of Justice Electronic Training Services (J.E.T.S.) in Orlando, Fla., Justice empowers people with information as well as hands-on instruction to improve the quality of products manufactured in the wiring harness industry. She is an IPC certified

master trainer, and her firm is an IPC certified training center.

Another dimension to J.E.T.S. is its manufacturing capabilities. They include harnesses, cable assemblies, box builds and printed circuit board assemblies built for the aerospace, aircraft, military, medical, defense and commercial markets.

At this point in the short history of J.E.T.S., which Justice, 60, founded in June 2006 and began operating in October 2007, the emphasis is on training staff members for companies. She urges them to make training one of their top priorities.



Lucy Justice (left) instructing a student on the proper way to assemble a wire to a terminal connection.

Explaining the Agency Approval Process for Wire and Cable Products

By Mike Levesque & Randy Elliott, C&M Corporation

Some engineers think it is science. Others contend it is some type of black magic.

Many have no idea of exactly how the process works.

Regardless of what is known –or unknown – about the submission and evaluation process, there are few that will disagree with the premise that agency certifications, such as those offered by organizations like Underwriters Laboratories (UL), Canadian Standards Association (CSA), or Intertek, formerly known as Edison Testing Laborato-

ries (ETL), to name only a few, are an important part of any product offering in the wire and cable industry. With today's focus on product safety, there has been an increased need for wire and cable products to carry either a listed or recognized mark signifying they have been independently evaluated and have met the appropriate safety guidelines that have been established based on their intended use.

In an attempt to help bring some clarity to the agency certification process for bulk cable, I have posed a series of related questions to Randy Elliott, C&M

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“You should never stop training or get too comfortable because things do change, and sometimes they are things we didn't anticipate,” she said. “When you make a long-term investment in training, your company will grow and be successful. People are excited about learning.

“You always have to move forward and grow,” Justice said. “When you increase the knowledge of your work-

force, you ultimately will benefit in the end.”

The primary benefit is higher quality. It becomes evident not only in products but in manufacturing processes and in the people on the production floor. In turn, the quality of the service to customers is higher, and so is their satisfaction.

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14th Annual Electrical Wire Processing Expo A Great Success

By Joe Tito, Wiring Harness News

Milwaukee comes alive in the spring, and it's not just the tulips. On May 14th and 15th, 2014, the city was once again host to the 14th annual Electrical Wire Processing Technology (EWPT) Expo. It's the biggest dedicated wire processing event in the world, and they blew the doors off of the Wisconsin Center with 2,800 attendees. That represents a 23% increase from 2013 attendance! With 168 exhibitors and over 45,000 square feet of exhibit space; the show highlighted assembly, inspection, and testing products geared for harness manufacturers.

As wide was the range of exhibits, so was the range of attendees. I personally ran into visitors from Germany, Spain, UK, Italy, China, Japan; plus a ton of folks from Canada. All agree there is nothing quite like the EWPT Expo, and that it really is the single best marketplace for goods and services to support the wire harness industry.

Four Shows In One

This is the third year the Expo has shared a location with 'The Electrical Manufacturing and Coil Winding Show'. Visitors viewed exhibits covering assembly, coil winding, and testing for the

Continued on page 8

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Shrinkback is the tendency for the insulation of a wire to pull back from a splice or termination connector.

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Over 10,000 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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Wiring Harness News
P.O. Box 527,
Richmond, IL 60071 USA

http://www.wiringharnessnews.com

Office Hours:

7:00 a.m. - 3:30 p.m. CST - (Monday-Thursday)
Printed in the USA.

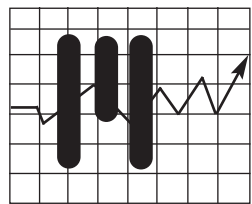
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3 Steps to Success: Measure, Analyze, Share – Don't Forget to Share!

By Paul Hogendoorn



Paul Hogendoorn

Readers of this column have seen me write on the topic of productivity measurement quite a bit lately, but it's a message worth repeating, and a message worth building on. It's true that "you can't improve what you don't measure", but measurement all by itself does not guarantee success. Measurement is only the first step. Analyzing the information properly is the second step, and this sometimes is where things get snagged. Sharing the information is the third step, and it's often the step that is forgotten completely. In the next few paragraphs, I'll review the 3 critical steps to success, and I'll give you three cliché expressions to help you remember them.

Step 1: Measure. Measurements need to be granular, automatic, and in real time. In other words, they have to be empirical; facts. Anecdotal measurement leads only to anecdotal improvement.

When starting a new productivity improvement initiative, it's a good idea to simply measure and record the relevant inputs for a week or so in order to establish a baseline against which to

measure success. (Suggestions on what to measure are discussed a bit further on). Remember, "you can't improve what you don't measure."

Step 2: Analyze. Analyze your data to determine the process's KPIs - it's "key performance indicators". From experience gained the last few years working with wire harness manufacturers, the following are the most common KPIs

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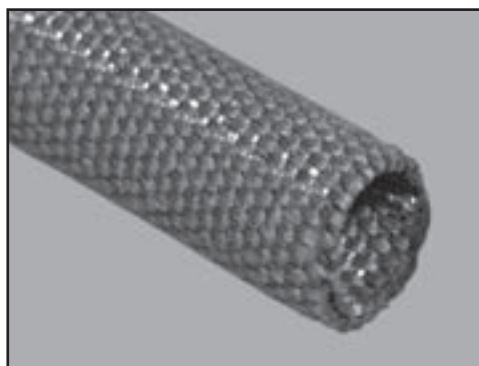
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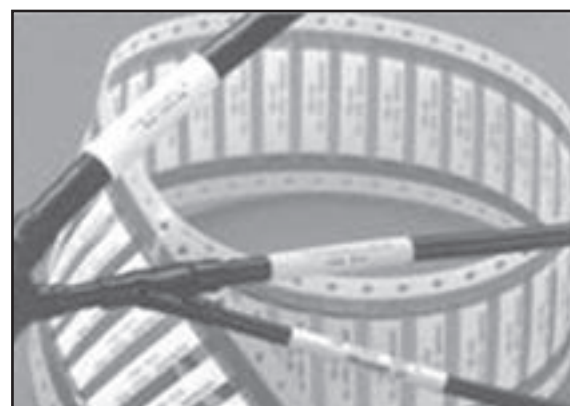
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3 Steps to Success: Measure, Analyze, Share – Don't Forget to Share!

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that we encourage our customers to look for:

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- The actual time of the last part produced in a shift
- The total elapsed time in between the first and last part
- The total time the machine was capable of producing a part
- The total time the machine was incapable of producing a part
- The total parts produced

This is the low hanging fruit. These things are all easy to measure, and improving on any of these things will make a direct positive impact on productivity immediately. Remember, "it's about time" – productivity improvement is about measuring time.

Step 3: Share. Information needs to be shared effectively with the production and supervising team involved in the process being measured. It needs to be presented as a tool, and not as a weapon. Here are some tips:

- Let it be their information. Not management's information that's filtering down to them. This information is gathered on their process and reveals their results. Information should be available to

the production team as if they own it.

- People prefer to measure themselves, rather than feel like others are measuring them.

- Present the reports as 'empirical' information. The numbers are what they are. There's no interpretation or manipulation – it is what it is.

- Set and share reasonable productivity improvement goals.

Remember, "sharing is caring". The information needs to be shared in an effective manner – it's a tool not a weapon. Your people need to know what the score is, and what the expectation is, in order to improve. Simply measuring them, without sharing the relevant information in an effective way, is not equipping them for success. Sharing is critical to their success, as well as yours.

How to Measure:

There are many different ways to measure, but the following example is based on the use of FreePoint's cost effective "black box" productivity measurement tools. (There's ads elsewhere in this publication).

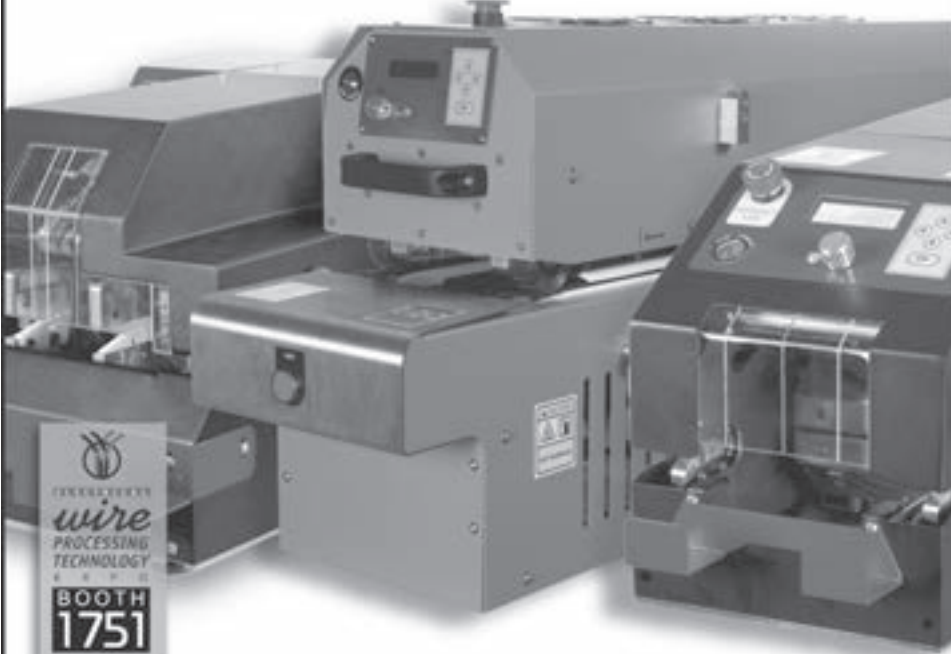
What to Measure:


Measure what you want to improve. Don't measure too many things in a process. Measuring too many things cre-


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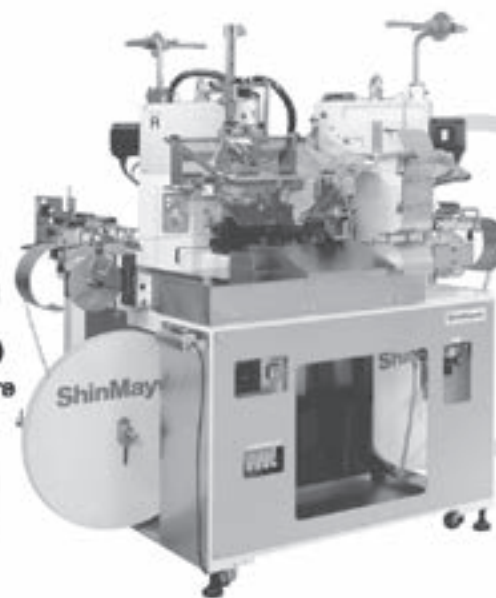
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manufacture of electrical products. New this year, however, these shows were joined by 'The Internet of Things North America Show,' and the 'Motion Control Conference and Expo'. Internet of Things is a new trade fair focused on cloud-based devices and equipment for the manufacturing environment. The Motion Control Expo is dedicated to the design and operation of motion control systems for manufacturing and industrial applications. One badge gets you access to all four shows, and the combined effort brought in an additional 460 visitors. When coupled with the 991 booth staff occasionally milling

about, it made for a very dynamic environment.

The Seminars

Each year, I praise the Exhibitor Advisory Committee for the wonderful seminars they provide. This year was no exception. The seminars are always held in the morning hours, so even if you attend all of them, you have plenty of time to peruse the exhibits. Many thanks to *Wire & Cable Technology* for sponsoring the seminar room.

I'm not going to go into great detail on each seminar. But I would like to let you know who was

there, what they spoke about, and what I thought was the main take-away:

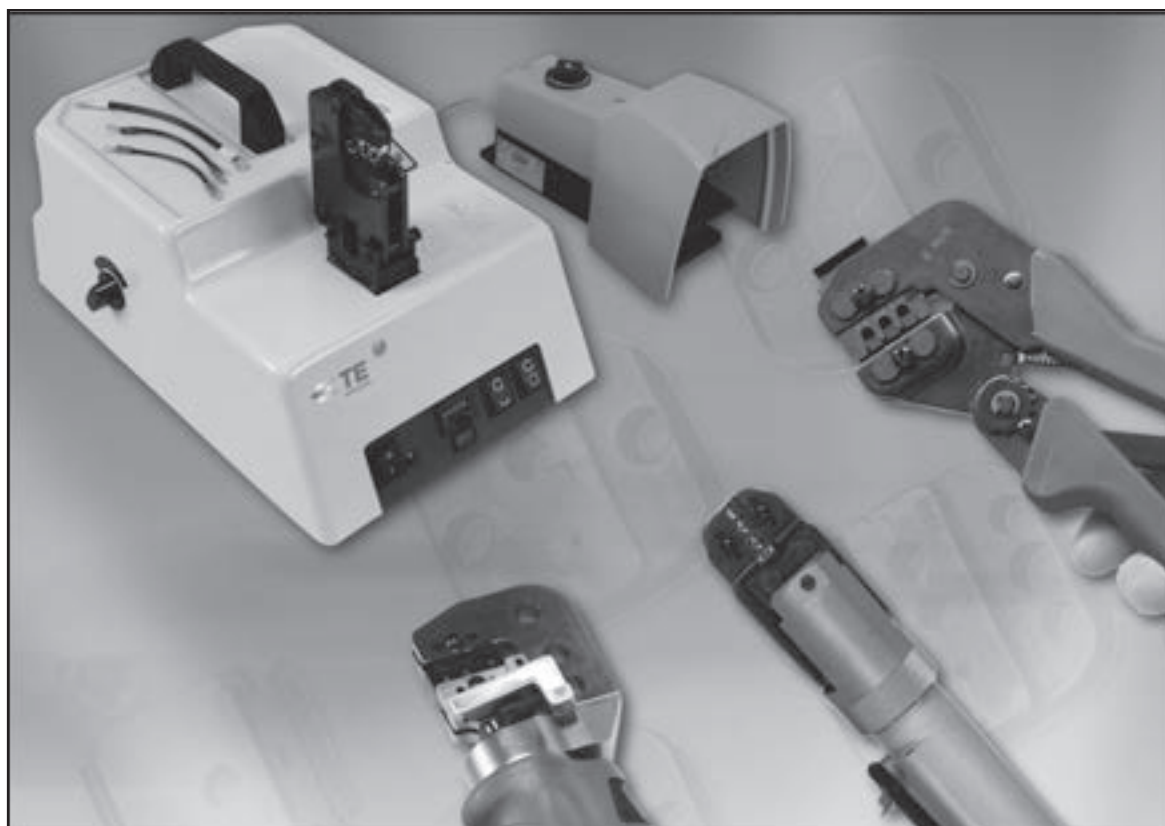
IPC/WHMA A-620 Update - Presented by: Donnie Hill, President and COO of Precision Manufacturing Co & Rick Bromm, VP Business Development of Altex Inc. I think the best point these gentlemen put forward was how the standard changes the conversation from 'price only', to a deeper dialog about the quality and knowledge you bring to the table as a certified A-620 harness supplier.

Selection of Wire & Cable for Aerospace

- Presented by: Albert Emery, Materials Engineer, Lockheed Martin Corp. Albert described the harsh environments their harnesses must survive. Their years of research has led them to a well codified wire and cable selection criteria. Drop me an email at joetito@rocketmail.com, and I'll be happy to share those with you.

Use of Aluminum Wire for Automotive - Presented by: Dave Fleak, Global Product Manager & NA Business Leader for LITEALUM & Waldemar Stabroth, Marketing Director Technology/Innovation - Terminals/Connectors for TE Connectivity. Well, the USCAR guys have been here year after year telling us it's coming. And now TE's new "Litealum" is here. As promised, the technology is all in the crimp. Existing equipment can be used and no new connectors will be needed.

Wire Printing and Marking - Presented by: Todd Fries, Marketing Manager Identification Systems, HellermannTyton & Barbara Susmilch, General Manager, Partex Marking Systems USA. It's wise to develop a comprehensive wire marking strategy. Know the benefits and limitations of the various printer types and label materials, and see how those fit your individual needs.



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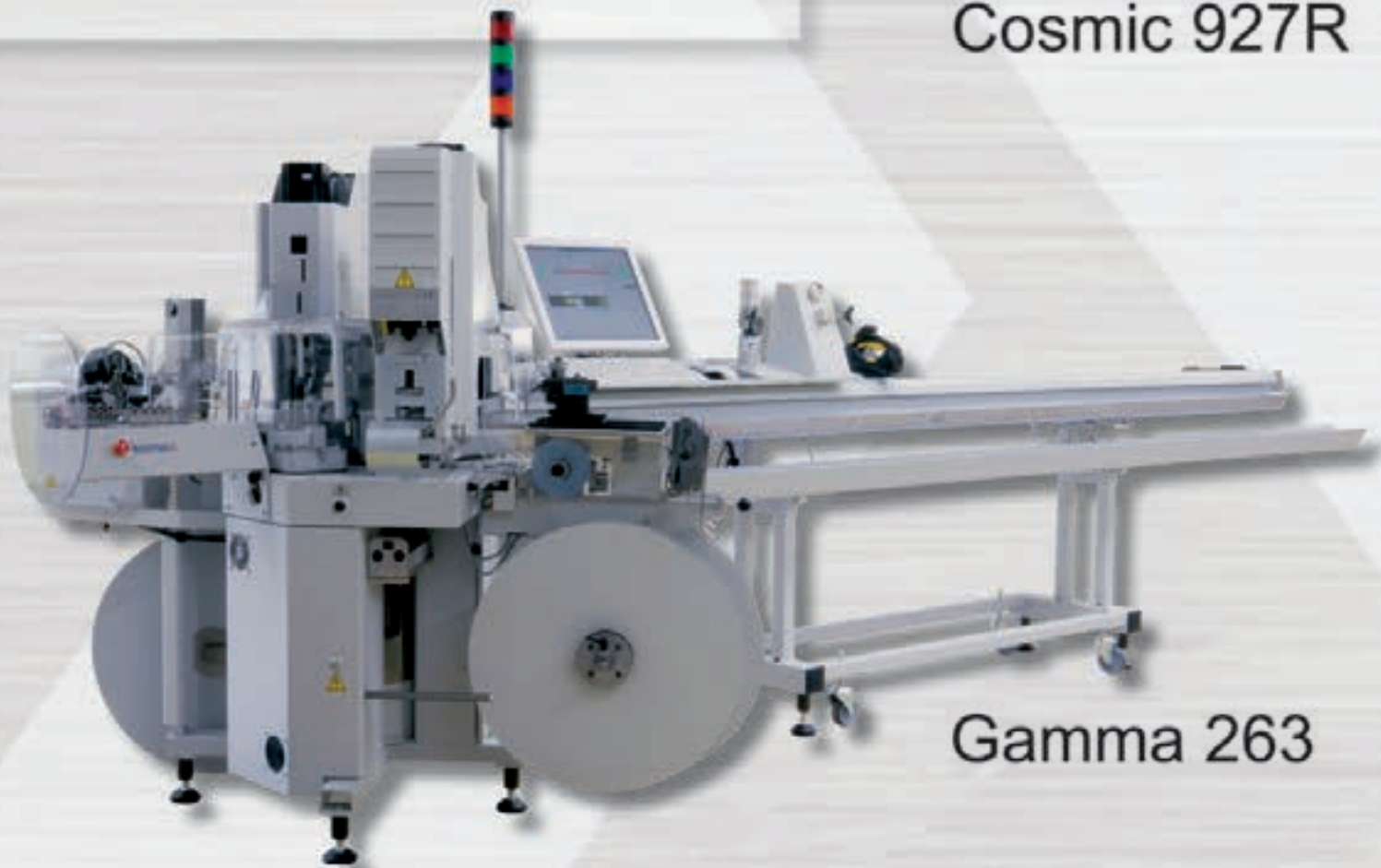
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Brent Stringham Joins the Komax Wire Team as the New Business Development Manager

Komax Wire is proud to announce Brent Stringham as our new Business Development Manager. Brent Stringham has been working in the wire processing industry for over 30 years and has a vast knowledge of the wire industry. He will bring great value to the Komax Wire Team with his extensive knowledge and network within the industry.

Brent Stringham is eager to become a team member to a company that strives for total customer satisfaction. Brent stated, "One of the reasons I decided to join the Komax Wire Team is the family-orientated culture and atmosphere that Komax Wire has established." Brent's favorite aspect of his job is being able to evaluate his customer's needs and provide

knowledgeable recommendations and solutions. Brent stated, "With my extensive background knowledge in the industry, it has allowed me to establish credibility and be viewed as a valued consultant." Brent strives to ensure that his focus is always placed on the customer.

As the new Business Development Manager, Brent hopes to expand Komax Wire's current market potential and uncover needs in those markets for future products. Brent is looking forward to helping us continue to be the leaders in the wire processing industry. We are thrilled that Brent Stringham has joined the Komax Wire Team and are excited to see the positive influence he will have on the future of our company.



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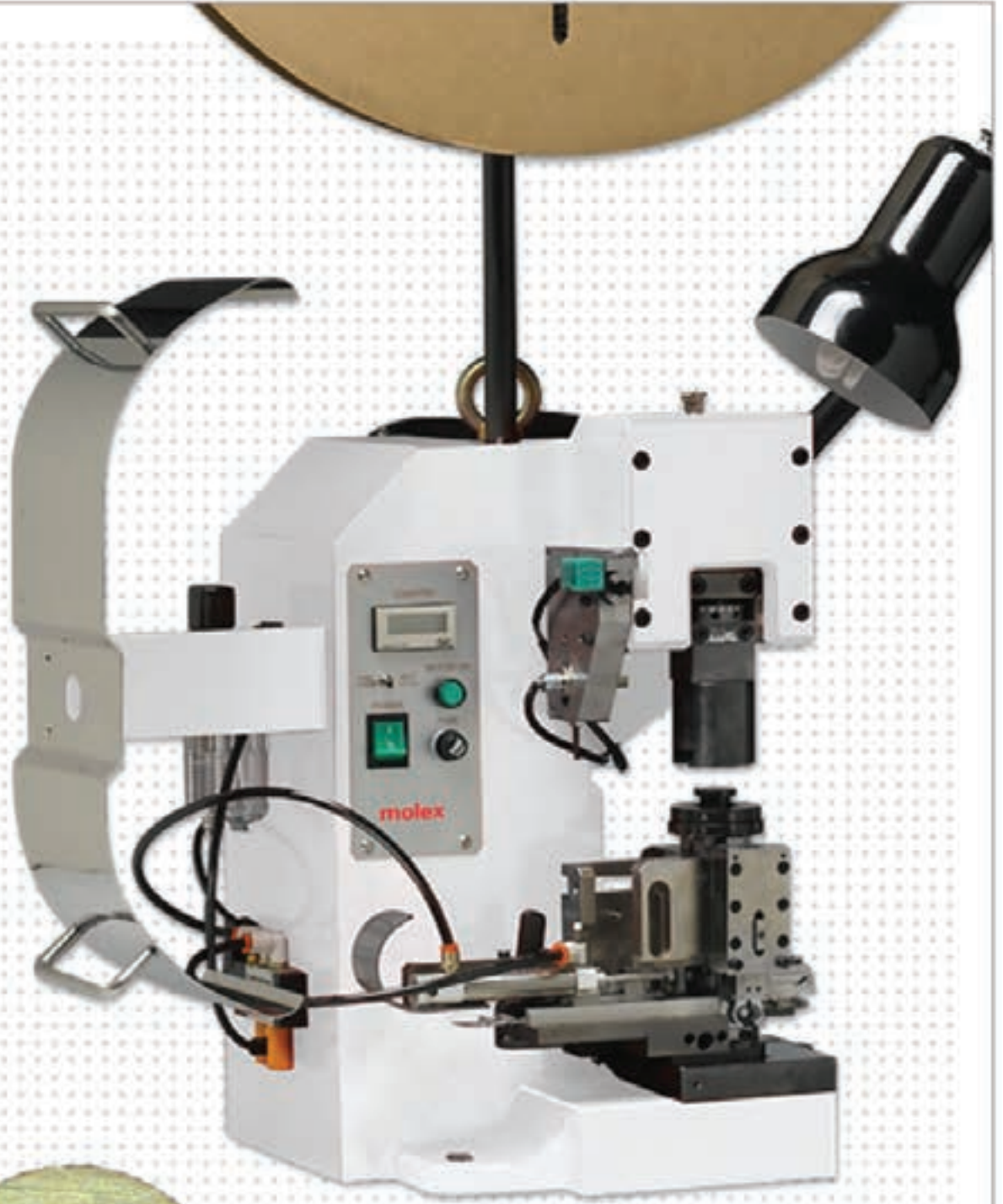
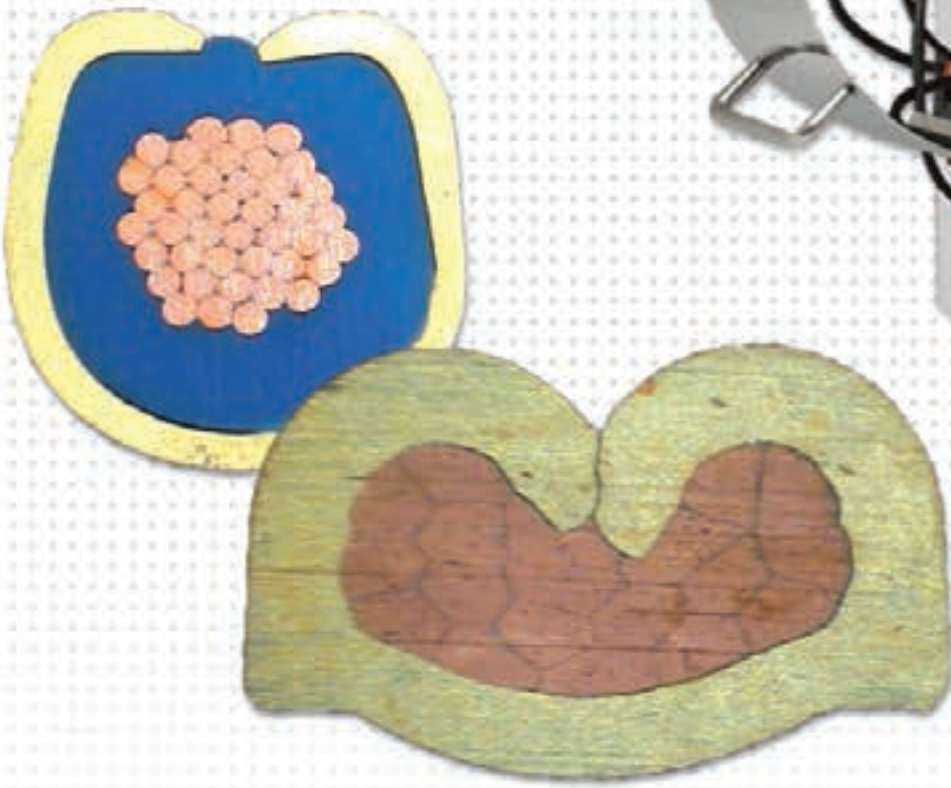
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3 Steps to Success: Measure, Analyze, Share – Don't Forget to Share!

Continued from page 7

ates the possibility that meaningful information will be lost in the noise. Remember that you are measuring with a purpose, and the purpose is to improve productivity.

From a pure productivity (or OEE) perspective, the 4 conditions that we believe are most useful to measure are:

- The total time the machine is capable of producing a part
- The parts made
- The time the machine is in maintenance or set up mode
- The time the process is waiting for parts

For example, in a wire cutting machine:

- The “conveyor running” signal can tell you when the machine is capable of making a part.
- The “cutter” signal or “cycle counter” signal can determine when a cycle has been completed (a part has been made)
- The “safety cover up” signal can determine when the machine is in maintenance, set-up, or being adjusted
- The “material call” (Andon) button or lamp can determine if the machine is stalled waiting for material. (Not all facilities use material call buttons, so this may not be possible in all cases.)

It's important to find the “information” from the “data”. The “information” you are looking for are the key performance indicators for that machine or process. With a FreePoint box, every condition transition is written into a .csv file that can easily be imported into excel. From that file, it will be fairly easy to identify the key performance indicators critical to that process, including machine utilization, production throughput etc.

Once you establish your “key performance indicators”, it is easy to create a simple summary that lets you see or report on the health of the process in just a quick glance. Remember, what it is you report (what you share with the people involved) is what ends up getting improved.

Some suggestions for the measurements that can drive improvement are given above in Step 2. After that, it's just a matter of sharing information effectively.

Here are the 3 cliché expressions to help remember the 3 steps to productivity success: “you can't improve what you don't measure”, “it's about 'time'”, and, “sharing is caring”.

Measure. Analyze. Share.

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How NOT to Sell a Business

Loren M. Smith, CEO
Blue Valley Capital



Loren M. Smith, CEO
Blue Valley Capital

This past summer my wife and I went to my college reunion at Miami University in Oxford, Ohio. It had been many years since I'd seen former classmates, and over the weekend several discussions transcended small talk to "What have you done with your life?"

A number of classmates had become entrepreneurs, and two of my closer friends had founded businesses shortly after graduating. Both had done quite well, but with none of their kids having an interest in their businesses, both decided to sell so they could retire.

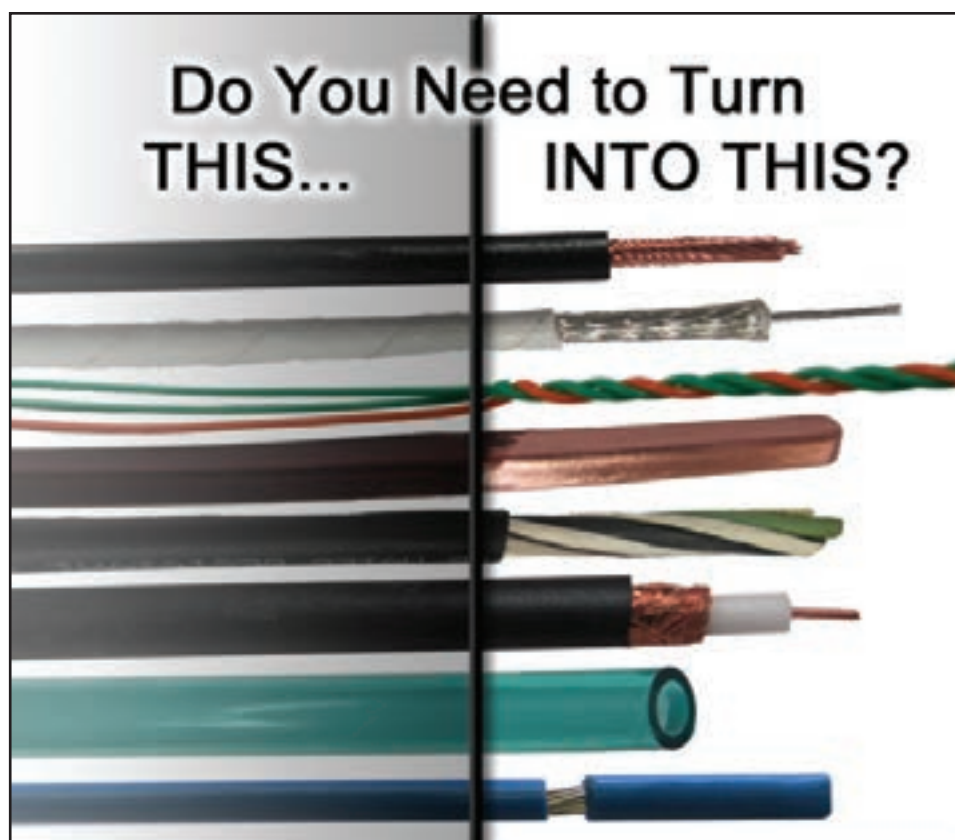
Unfortunately, the stories they told me were not pretty and not new. In each instance the attempt to sell was unpleasant and unsuccessful. Although neither friend was in our industry, they were both in somewhat similar US-based manufacturing businesses, so I am sharing a glimpse of their experiences as cautionary tales. We'll call my old friends Al and Bob.

Al had built a \$10M-revenue business and was approached by a prospective buyer in a similar industry who proposed putting together the deal himself. Not only was the buyer coming forward with a fair price and terms, but he was also committing to retaining Al's man-

agement team. This was a key concern of Al's, and he signed a letter of intent and began involving his attorney and accountant in sale preparations. The expectation was that within 60 to 90 days, after due diligence, there would be a closing.

Even though the due diligence did not turn up any nasty surprises, the buyer used some due diligence findings as justification for modifications in price and terms. One adjustment would have been bad enough, but when renegotiations kept recurring, Al eventually halted further discussion. With no potential buyer waiting in the wings, Al had to put his sale and retirement plans on hold,

Continued on page 14



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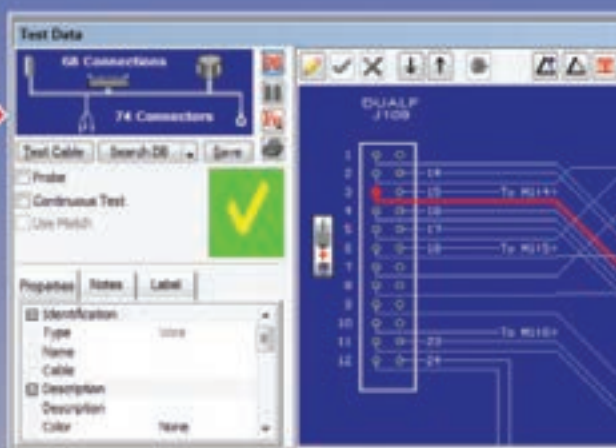


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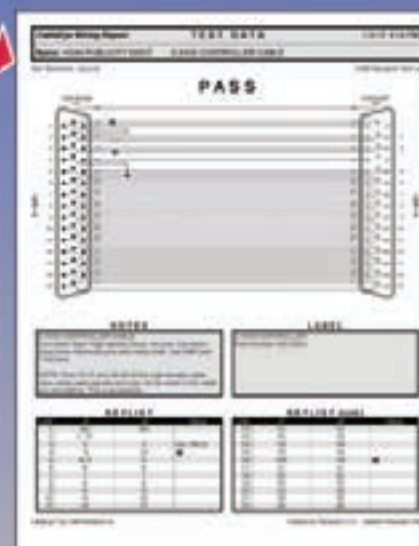


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How NOT to Sell a Business

Continued from page 13

and he was still in limbo at the time of the reunion.

When Al asked for my input, I had to level with him. In the absence of a competitive sale process (more than one interested buyer), what he had experienced was not unusual.

Bob's experience trying to sell his \$25M-revenue business was different but equally frustrating. He had been approached by a "buy side" broker who told him he had relationships with private equity firms that paid him to bring them deals. This sounded mighty attractive: no fees or other expenses and no preparation he or his team would have to contribute to the process.

Because the broker was going only to trusted private equity firms, it appeared that confidentiality was not an issue, and because there would be more than one potential buyer, the process would be competitive. No wonder Bob concluded that this was an excellent way for him to sell his business.

As the broker continued to schedule conference calls with private equity firms, however, Bob realized none of them really knew anything about his business or the market he served. Consequently, he had to spend an inordinate amount of time educating prospective buyers about the basics of his business

and the industry. And because all prospective buyers had been provided with his financials, Bob routinely had to field questions he was totally unprepared to answer, often finding himself on the defensive.

Over time, Bob recognized that the broker's criterion for selecting buyers was not industry knowledge; it was readiness to pay his fee. Moreover, none of the firms had in their portfolios any companies that might create synergy with his company. With nothing going the way he had anticipated, and no offers on the table, Bob's decision to terminate the process was an easy one. But what was not easy was resigning himself, like Al, to keeping the company and delaying retirement.

Does either of the approaches my friends tried ever work out? Sure, but not often. Without a competitive process and without the involvement of someone who has a track record in your industry, a seller can waste valuable time without achieving a positive result.

The reunion was great fun, with lots of laughs. And next time I connect with my friends, I expect them to be in even better humor, having wised up about a few critical steps in selling your business.

Loren Smith can be reached at lms@blvcapital.com or www.bluevalley-capital.com

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NEWS PLUGS

Amphenol Offers Explosion Proof Heavy Duty Connector Series

Amphenol Industrial Products Group, a global leader in interconnect systems, offers a heavy duty connector series that is explosion proof and certified for use in IECEx Group 1 mining hazardous locations.

Based on Amphenol's Star-Line series, the Amphe-Mine EX product line is made up of environmentally sealed plugs and receptacles and provides outstanding performance in harsh environments.

Ideal for use in underground mining explosive environments and applications, petrochemical refineries, land and offshore drilling systems, this rugged connector series is certified to the latest IECEx standards including Group 1 mining applications in Australia and ATEX certificate Zone 1 standards.

These compact environmental connectors offer exceptional mating properties and come in high grade 316 stainless steel. Their design provides outstanding performance in explosive-proof automatic and process control systems as well as in instrumentation systems.

Used in power distribution for underground mining machinery, data transmission and acquisition for underground communication systems and in motors, Amphenol's Amphe-Mine EX is threaded, flame-proof and fabricated to prevent the mixture of explosive gases and the electrical circuits by means of tighter tolerances in mated junctions.

The Amphe-Mine EX series offers the industry's broadest range of backshell arrangements and contact inserts for power (up to 1,135 amps at 1,000 V/AC or DC), signal (up to 143 contacts) and mixed power control applications.

All contact inserts are interchangeable and reversible to suit specific needs. Solder, crimp and pressure terminals are available.

These rugged connectors offer a full range of hardware styles including the use of flameproof rated cable glands.

They feature high quality copper contacts with silver plating (gold plating available as an option) as well as a hard anodic coating. Composite inserts for power, control and instrumentation services available.

Amphenol's Amphe-Mine EX series features RADSOK technology that offers higher current ratings (up to 25% higher than standard contacts) with lower mating forces as well as high reliability, low contact resistance, high mating cycles and a self-cleaning design.

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The Model 16B processor has two stamped foil heating elements that are manufactured to a strict wattage specification. Consistent temperatures (ambient to 650° C) are controlled by a thermocouple embedded into the upper heating element connected to a closedloop temperature controller. An alarm light illuminates whenever the actual heating element temperature varies from the set point temperature.

Speed Control

The belt speed is selected using a 3-digit thumbwheel via a closed-loop motor controller and DC gear motor.

Minimal Skill Requirements

There are clearly marked guides for aligning the assembly as well as the tubing or device. The operator only has to center the assembly then the tubing and slide it into the belts. The belts carry the assembly through the heating and cooling zone, depositing them into the bin.

Labor costs are reduced significantly because once an operator loads an assembly, that operator can begin preparing another assembly. The throughput rate is usually limited by the rate at which the operator can load assemblies into the process.

Versatility

The processor is designed to process a broad range of heat-shrinkable products up to 19 mm [0.75"] in diameter and 90 mm [3.5"] in length. Heat output can be controlled to accommodate a wide variety of products and substrates.



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MasterMover First Cadonix UK Customer for Arcadia

Cadonix Ltd, the Cloud-based automotive harness CAD specialist, named MasterMover, a world leader in electric tugs, as its second customer and its first in the UK. MasterMover has purchased Cadonix Arcadia for use in its Derbyshire, England site, where it designs pedestrian operated electric tugs for the movement of goods in factories and warehouses worldwide.

Commenting, Dan Evans, Electrical Design Engineer at MasterMover, said, "MasterMover electric tugs are becoming increasingly sophisticated, and we are introducing CANbus to support the introduction of new features such as wireless control and more advanced

steering systems. We need to bring more complex wiring harnesses to market more quickly and Arcadia is exactly the design environment that we need to achieve this."

He continued, "MasterMover's ability to customise tugs to suit individual customers is an important differentiator. The Arcadia environment makes it quick and easy to adapt the wiring harness to accommodate design changes. The real time simulation feature allows us to see very quickly what impact changes will have before a prototype is built. It is a flexible tool that allows us to offer a flexible service to our customers. The cloud based model allows us to work live from customer sites if we need to.

Cadonix stood out as being responsive, flexible and easy to deal with, making adaptations to Arcadia to address our design needs."

Jon Collins, Business Development Director, Cadonix, responded saying, "MasterMover is a skilled and creative manufacturer that employs innovative design features not seen elsewhere in their sector. To achieve its vision it required an electrical design environment that is flexible, gives clear visibility of design performance before a prototype is built, and handles complexity well. Arcadia was created from the ground up as the vehicle wiring harness design environment for the 21st century, and we are delighted

with their endorsement."

Arcadia CAD is an easy to use, ground-breaking software tool offering schematic design, animated circuit simulation and analysis, electrical networking, harness design and full design rule checking for wire harness layout and manufacture. Using the integrated simulation capabilities, engineers can be assured that their design intent is carried through into the physical implementation. Arcadia interfaces with the most popular 3D MCAD and enterprise wide PLM and ERP tools, allowing projects to transition easily and smoothly into manufacture. Customers can quickly import databases and designs from many legacy systems.

MasterMover is a UK based world leader in the design and manufacture of pedestrian-operated and battery-powered electric tugs to move wheeled loads up to 120,000 kg in an easy, safe and controlled way. MasterMover is a growing business with strong export activity, supplying many of the world's largest industrial companies. The company has a large in-house design team which designs all the products it manufactures. MasterMover electric tugs carry the CE mark.

Based just outside Oxford, England, Cadonix is a specialist in electrical design and project management software for the automotive industry. Its dedicated engineering and technology led team have all worked in the industries we support, our solutions are designed to work with the industry practices and not dictate particular workflows. This enables our solutions to be rapidly deployed and adopted. Cadonix aims to become a market leader by consistently exceeding its customer's expectations; providing them with best of breed technology solutions for electrical design and project management.

Cadonix is backed by Caresoft Global, a subsidiary of the \$1.2 billion ABT Group; an Illinois based Engineering and IT/ITeS Service Provider, with offices in the UK, Europe and Asia.

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Explaining the Agency Approval Process for Wire and Cable Products

Continued from page 1

Corporation's Regulatory Compliance Engineer. Randy has been a practicing engineer in the wire and cable industry for over 20 years. His background in R&D and design engineering has brought him into contact with regulatory agencies and their requirements on a regular basis throughout his career. For the past three years, his focus has been completely on regulatory issues for C&M.

Who is responsible for testing and what do their results mean?

Interesting first question! For test results to be accepted as valid, they must be performed by a Nationally Recognized Test Lab, also known as an NRTL. These organizations are part of OSHA's NRTL Program, which is a part of their Directorate of Technical Support and Emergency Management. These labs test a given product to an appropriate standard and render a decision on whether or not that product met the requirements of that standard. In the case of wire and cable, the National Electric Code (NFPA 70) would be an example of installation guidelines against which standards and test parameters would be

developed by the appropriate governing regulatory bodies. These parameters would then be used by the NRTL to determine whether a submitted product is compliant. Contrary to what many believe, these NRTL organizations do not grant "approvals". They only certify compliance of a product sample to a set of performance criteria.

Why is an agency mark necessary and what does it mean?

An agency mark serves as verification for a cable consumer that the item they are purchasing has been tested, certified, authorized, recognized and/or listed by a certified testing facility. Further, it ensures the product can be sold and used for the function it was intended without harm to human beings, animals, or the environment. In a word, it assures the buyer that the cable has been independently tested and based on the results the product will meet or exceeded all safety requirements for the application in which it will be used. In many instances related to wire and cable, the markings required by the product's certification provide evidence to the AHJ -

Continued on page 18



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Explaining the Agency Approval Process for Wire and Cable Products

Continued from page 17

Authority Having Jurisdiction - that the product has been properly tested and is appropriate for the use intended.

How is the correct agency mark determined for a given product?

This is based in large part on the application and use of the product. Considerations such as where the cable will be used and how it is to be installed are part of the evaluation. In addition, safety codes as designated by the government of a particular country and any state or local building and installation codes must also be part of the process when the appropriate mark for a cable is determined. Again, the NEC would be very representative of such a governing code.

What is the difference between a listed, recognized, or certified product?

This is a common question that we hear often in the regulatory group and I am glad you asked. Each designation is a different way of saying the cable has been tested

and found to comply with the standard it was tested against. Often, depending on the type of marking required, the testing parameters will be different. Generally, a 'listed' product will carry more stringent testing than a 'recognized' product. Further, 'listed' products can stand on their own while 'recognized' products usually serve as components in larger systems. The differences can be traced back directly to the standard each product type will be tested against. Those standards are driven by the end use.

How does a NRTL determine which tests they will need to run?

When a request for a new approval is made to a test facility, an engineer from the lab is assigned to work with the manufacturer. The work plan is captured under what is often called a 'project'. As part of the project, the engineer assigned reviews the construction and requested approvals and determines what tests and safety standards will have to be met based on the applicable standards in order for the lab to be able to approve the construction as either a listed, recognized, or certified product.

How are the sample constructions a lab will evaluate determined?

As part of the scope of the project, the responsible NRTL engineer assigned will determine, based on the certifications sought, what constructions will be required for evaluation. Often it is not a single construction, but a range of constructions that are driven by the manufacturer's desired approvals. For example, most manufacturers will not seek approval for a "six conductor, 28 AWG, PVC insulated, unshielded" cable construction. They will seek something more along the lines of "2 to 50 conductors, 28 AWG 18 AWG, PVC insulated with optional shielding". Generally, a wider range of approvals will require a larger range of samples. The detail provided by the NRTL engineer to the manufacturer will include parameters such as conductor counts, gauge sizes, and wall thicknesses for both the primary insulation and jacket that will be required in the various samples submitted.

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What are some of the typical tests that are performed when evaluating cables?

The number and types of tests are driven by the approval sought by the manufacturer. At a high level, and at a minimum, all physical parameters are tested. This would include parameters such as tensile and elongation, as well as material thicknesses. In addition heat aging, cold bend, cold impact, and flame testing, among others, may also be added to the overall test plan.

Why are some submittals completed quickly while others require significant time?

It all comes down to the approval sought. Some approvals require very basic testing and are completed quickly. Some listings, however, may require, for example, a long term aging test that could take several months to complete. Some other types of testing, such as sunlight resistance test, may take 720 hours, or just over a month of around the clock testing, while a Weatherometer test may take 1000 hours, or just short of six weeks of non stop testing. Often times, at the end of the day, the approval time is a function of simple physics - you cannot do a 1000 hour test in 20 hours.

What happens if you fail the testing?

In addition to being disappointed from an approval perspective, the manufacturer is also somewhat disappointed financially as well. If your samples fail the evaluation, you are provided with options that are consistent with your testing organization's guidelines. As an example, should you fail your testing, you might be allowed to close the project and be billed for 50% of the quoted testing price, or, if you feel you can quickly address any of the failure modes indicated, you may be allowed to opt for leaving the project open and re-submitting new samples, at which time an additional charge of up to 50% of the cost of the originally quoted price would be added to your invoice. Cable users can take solace in the fact that no product is granted an approval unless it has met the required testing. 'Very close' is never good enough relative to NRTL testing.

Do the samples submitted for testing match the actual product?

The form of the samples submitted are determined by a number of factors. In some instances, an exact product match may be requested, while other times constructions that differ from the exact product parameters may be requested. Regardless of the construction submitted, the decision on what samples will be provided is driven by the testing requirements.

How do the NRTLs determine from their test results the range of the approval they will grant?

Generally, specific tests require samples that may include particular cable constructions, wall thicknesses, materials, etc. Based on the original intent of the project combined with the lab's years of experience in testing and evalu-

ating test data - and they have a lot of experience! the responsible engineer will correlate the testing results and from that determine what range of cable constructions best meet the actual application requirements of each listing requested. What this can mean to a manufacturer is while a certification has been granted, it may not carry the range of construction options that was originally requested. Based on the need or intent that drove the manufacturer's original request that may or may not turn out to be a problem.

How are compliant cables identified and why is the identification important?

Each of the organizations that evaluate cable products has a methodology for identifying cables that have passed their testing regimens. For example, UL

uses an "E" number while CSA identifies cable via a "LL" identification number. ETL uses yet a different identification system. Regardless of the method, the process of identifying compliant products allows an inspector who is out in the field evaluating a cable construction the ability to quickly determine the manufacturer of the cable or product. If a cable user needs to know the manufacturer, perhaps to secure replacement parts or ask technical questions, in the case of a UL certification, for example, they can reference the E number on UL's website where they will be provided with the name of the manufacturer.

Continued on page 21



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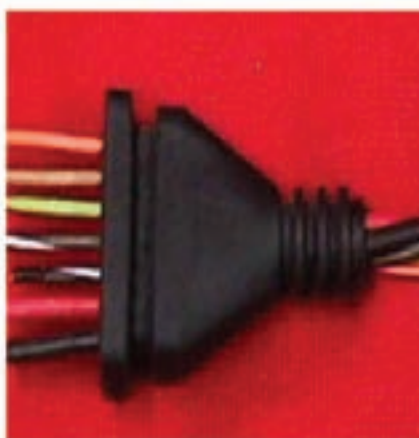
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Explaining the Agency Approval Process for Wire and Cable Products

Continued from page 19

How does the NRTL ensure the parameters they have approved are met once actual manufacturing begins?

That is a good question. Using UL as an example, they provide a FUS (Follow Up Service) whereby the UL Inspector is at the manufacturing facility periodically. During the visits, the inspector is free to move about the manufacturing floor or warehouse and pick random samples of products that carry any type of UL marking. The samples and frequency of collection are determined by the applicable sample plan. Those samples are then tagged and submitted to the UL test lab for follow up testing to ensure products are being manufactured according to listing requirements. Other labs may use similar type of follow up service.

How does the manufacturer ensure compliance around parameters that cannot be easily tested lot to lot, such as those associated with long term aging?

Manufacturers have internal quality control programs that randomly test products for compliance. That is a 'given' for

any company that has a viable quality system. Generally, when specific materials are certified or listed by a test lab, the manufacturer's engineering team will design new cables using the materials that are known to have passed testing for the key parameters they are considering in their design work. Based on the cost and time involved around approvals, it serves no purpose to supply products for testing that are unknown relative to their ability to meet certain performance criteria if reliable and proven materials or manufacturing techniques are available.

What latitude does the manufacturer have around changing materials – as an example, for cost savings – without the risk of losing their approval?

All changes to materials listed by a NRTL as part of their approval documentation have to be resubmitted for approval. Even if the new material is superior in every way based on test results from the vendor or the manufacturer, if it was not part of the original submit-

Continued on page 23

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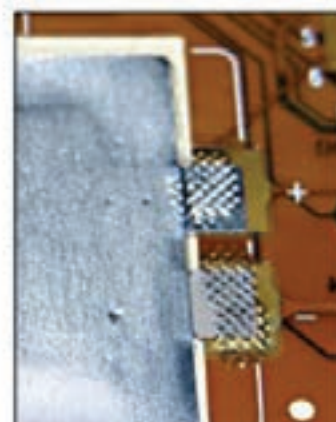
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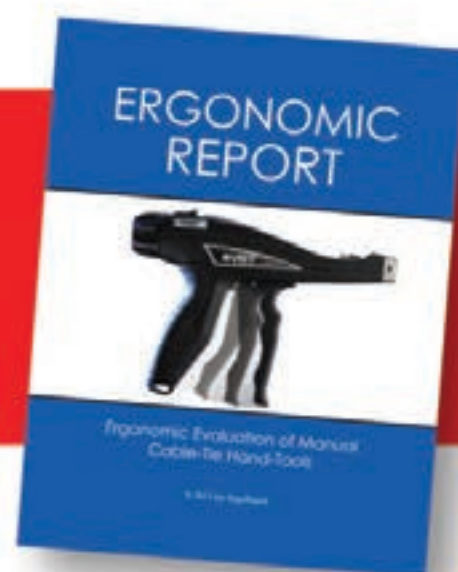
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Explaining the Agency Approval Process for Wire and Cable Products

Continued from page 21

tal it cannot be substituted. It is that simple and straightforward. The only way new materials can be added to the existing listing before use is through a submittal, retesting, and a subsequent certification by the test lab after their evaluation. This provides another assurance to users that they are purchasing the same product each time they buy.

What is harmonization?

Despite being competitors, NRTL's often test to the same standards. As a result, and in the interest of fairness, they often cooperate around product certifications and toward that end have developed standards that mirror each other. As an example, let's consider a cable that is made by a US manufacturer who is seeking a particular certification for both the US and Canadian marketplaces. In the example, let's assume the test lab used is located in New York. If the testing done in that lab would be identical to the testing done in a Canadian based lab, the certification received from the New York lab would carry what is called a "harmonized" mark. This mark would indicate the product is certified for use in both the US and Canada. The same could be true if the test location was Toronto, for example.

Certifications for products used in Europe, or tested in Europe for use in the US or Canada can also be part of this cooperative, or harmonized, certification program.

In today's world of compressed product introduction cycles and a 'faster to market' focus for many companies, the importance of the agency approval process to the introduction strategy cannot be underestimated. In many instances the time required to secure the approvals can outpace the time required to design, prototype, evaluate, and submit the samples to a regulatory agency for their evaluation.

When choosing a wire and cable vendor it is important that the manufacturer possesses not only an in depth under-

standing of product design but the certification process for those products as well. This technical expertise on the part of your vendor is critical to avoiding compliance issues that could potentially derail a new product introduction or delay the implementation of a product improvement.

With this being said, one of the soundest strategies for cable users who may require specific agency approvals that are based on unique constructions required to support their product, or will be counting

on their cable vendor to secure specified approvals as part of their service offering, is to engage the manufacturer as early in the design cycle as possible, understand the approval process that will apply to the product under development, and include the required evaluation time as part of their overall development plan.

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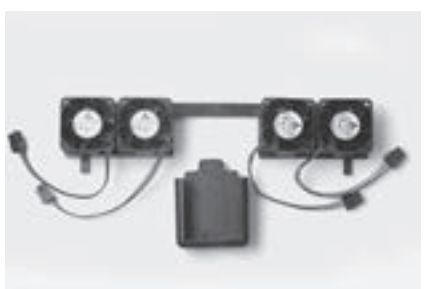
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Komax Wire New Director of Sales Tim Crider

Komax Wire is proud to announce Tim Crider as the North and Central America Director of Sales. Tim Crider has been working in sales for over 15 years and has experience in all aspects of sales.

Tim will bring great value to the Komax Wire team with his ambitious drive to improve and educate the sales force. When asked about one goal he would like to accomplish in his first year, Tim stated, "Ensuring that our sales team is finding the right product solutions that fits our customers' expectations with the highest level of quality

and customer support."

Tim's favorite aspect of working in sales is being able to interact with people and finding solutions for any type of problem. When asked to describe the Komax Wire culture, Tim stated, "Komax Wire is a team based company that is dedicated in ensuring total customer satisfaction is achieved beyond the sale of a product."

We are excited to have Tim join the Komax Wire team and we are eager to see the positive influence he will have on our sales force.



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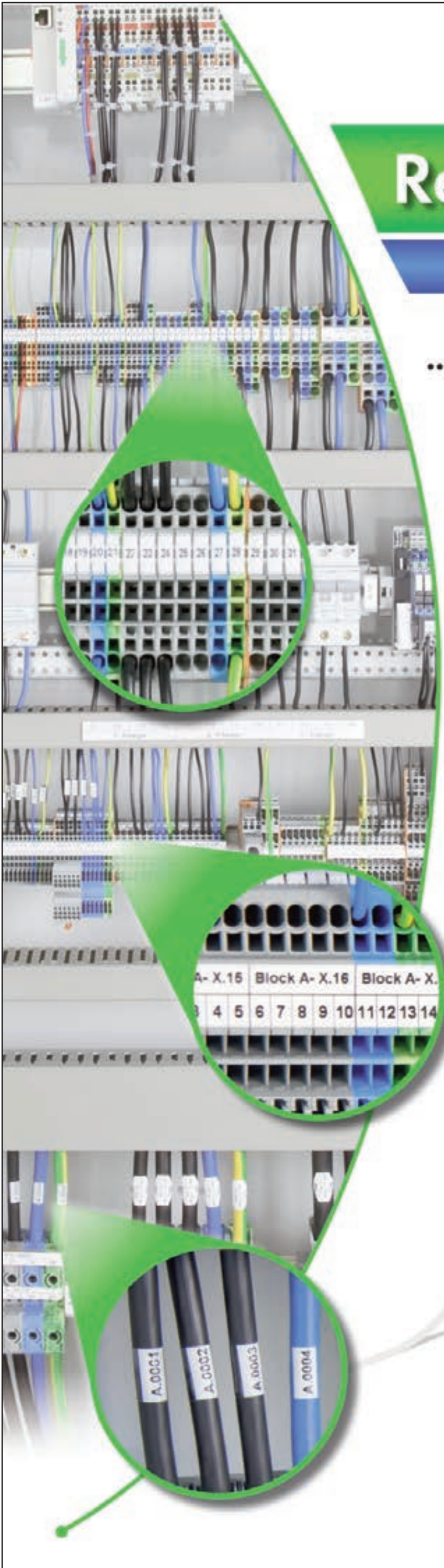
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NEWS PLUGS continued**New Production Manager at TLC Electronics Announced**

TLC Electronics, Inc. is pleased to announce that Peter (Fong) Xiong has been promoted to Production Manager at TLC Electronics, Inc.

Xiong was previously the production supervisor for TLC Electronics' value added production operations. Xiong has over 17 years of experience in the manufacturing industry with 14 years at TLC Electronics. Prior to TLC, Xiong's experience included manufacturing positions at ADC Telecommunications and Medtronic.

"Peter's previous leadership experience

in TLC's cable assembly manufacturing environment along with his record of achievements at TLC makes him an asset to TLC's customers, suppliers and fellow employees. This promotion is another testament to TLC's commitment to place highly qualified individuals in key roles within TLC to strengthen the company's position in the marketplace and continue our aggressive growth pattern", said Jon Crofford, President of TLC Electronics.

Reporting to TLC's president, Xiong's new responsibilities will include managing and training TLC's manufacturing personnel, job trafficking and overall manufacturing floor supervision.

TLC Electronics, Inc., based in St. Paul, MN is one of the Midwest's largest regional distributors of electromechanical components and value-added manufacturers of wire assemblies, cable harnesses and

electro-mechanical sub-assemblies for the electronics industry. See www.tlcelectronics.com for additional details on the company.

KOA Speer Again Receives Top Supplier Awards from TTI

KOA Speer Electronics, a leading supplier of passive electronic components, announced they have received TTI's 2013 Platinum, Diamond and Best Quality Awards for Supplier Excellence. The TTI Supplier Excellence Award Program represents the highest recognition possible of a supplier's performance within TTI. The program is centered on quality measurements that include: on-time delivery, receiving quality, customer-reported quality, administrative quality, operations and business systems.

2013 marks the fourth consecutive year KOA Speer has received the Diamond and

Best Quality awards, which are awarded to the supplier with the overall highest point achievement, and to the supplier who scores the highest in each of the possible Quality categories. KOA Speer has been a Supplier Excellence Award recipient in 18 of 19 years that TTI has presented the awards. The Platinum Level Excellence Award is an honor that can only be achieved after superior performance for a minimum of 5 consecutive years.

Melanie Pizzey, TTI Vice President Global Product Operations, stated "We are pleased to announce this year's Diamond Award and the Best Quality Award will be presented to KOA Speer Electronics for the fourth year in a row, acknowledging their distinguished performance in the Americas for 2013. KOA Speer has continued to demonstrate their dedication and commitment to excellence."

Jeff Rice, President of KOA Speer Elec-

tronics, commented "Being named Top Supplier by TTI is very rewarding for our entire organization. Our team works extremely hard to carryout the principles of our Quality 1st program and deliver outstanding service on a daily basis."

TTI, Inc., a Berkshire Hathaway company, is a specialty distributor of passive, interconnect, electro-mechanical and discrete components. TTI is the distributor of choice for electronic manufacturers worldwide. TTI's extensive product line includes: resistors, capacitors, connectors, potentiometers, trimmers, magnetic circuit protection, filters, relays, switches, sensors and discrete semiconductor devices. TTI is recognized as the industry's leader in service and quality and provides a broad array of supply chain services to its customer base. TTI along with its subsidiary Mouser Electronics employs more than 3,500 with over 100 locations throughout North America, Europe and Asia.

For more information about TTI visit www.ttiinc.com.

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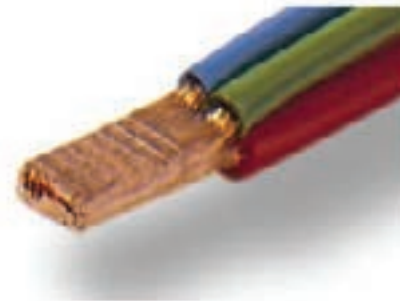
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Continued from page 8

Optimizing Your Wire Processing Operation - Presented by: Gustavo Garcia-Cota, NA Key Account & Crimping Manager, Schleuniger Inc. This was a wide ranging presentation, but I zeroed in on the importance of calculating Overall Equipment Effectiveness as a means to gaging productivity.

Crimping Quality & Maximizing Productivity - Presented by: Erich Moeri, Engineer Application Director, Komax USA. It's best to detect problems throughout the production process instead of waiting until an assembly is completed. Monitor in-process to maximize quality and productivity.

Hospitality

If you've visited the show the last couple of years, you have noticed that the name of the venue in downtown Milwaukee has changed a couple of times. But what hasn't changed is the cheerful service from the staff at the Wisconsin Center. Special thanks to the following hospitality sponsors:

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And as always, we at *Wiring Harness News* were pleased to present the After Hours VIP Party, Thursday Exhibitor Breakfast, Attendee Bags, Business Center & Lounge, Cyber Cafe, Directory, Landmarks, and Massage Area.

The EWPT Expo is an unparalleled event. As for the general show management, I think the folks at the national exhibition management companies could learn a lot from the way Jay Partington, Cheryl Luck, and the rest of the crew at EPI Shows, run the EWPT Expo.

If your a small harness shop, or a huge tier two supplier, you really should be attending this show on a yearly basis. Should you even be considering exhibiting in 2015, please act fast. This show has sold out the past few years, and next year will undoubtedly be the same. Contact Cheryl Luck at EPI shows at cheryl@epishows.com.

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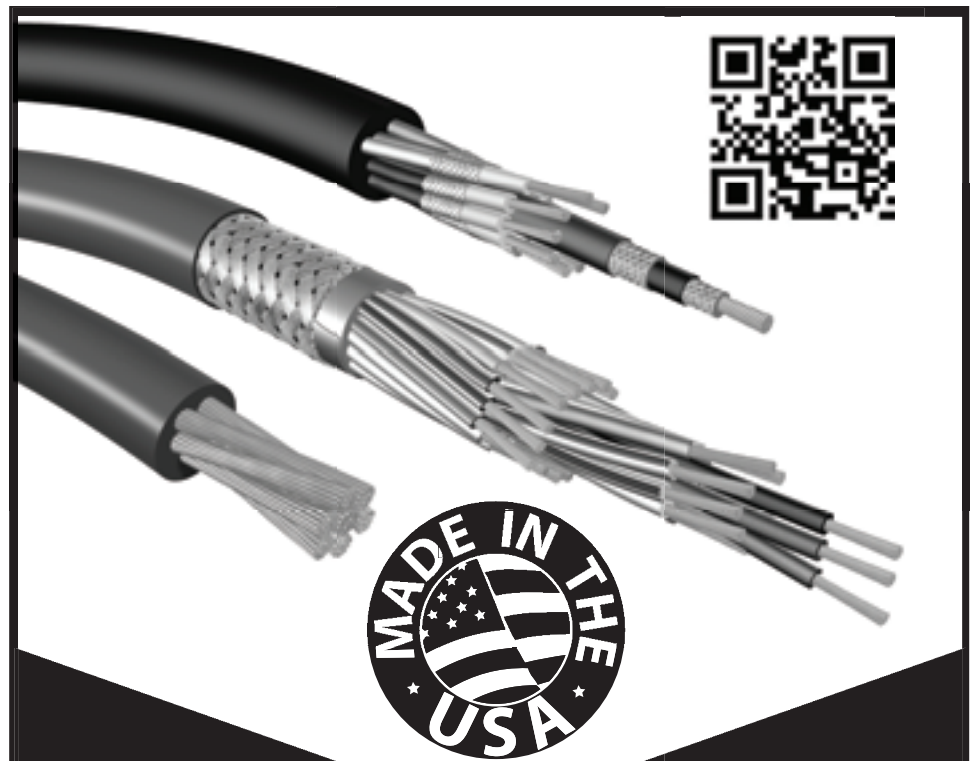
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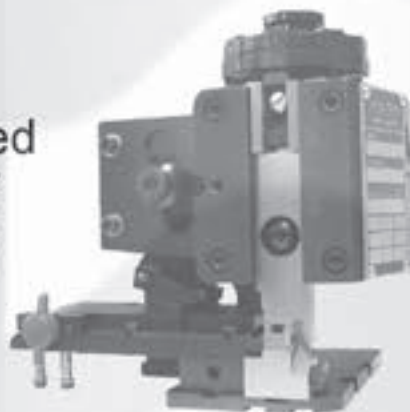


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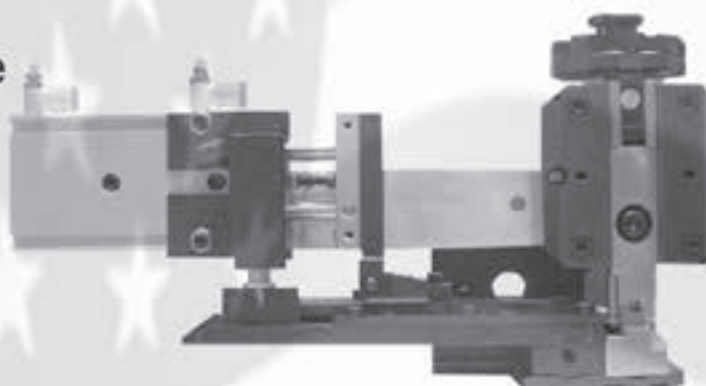


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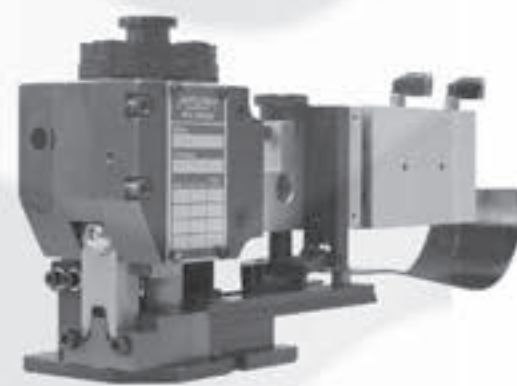


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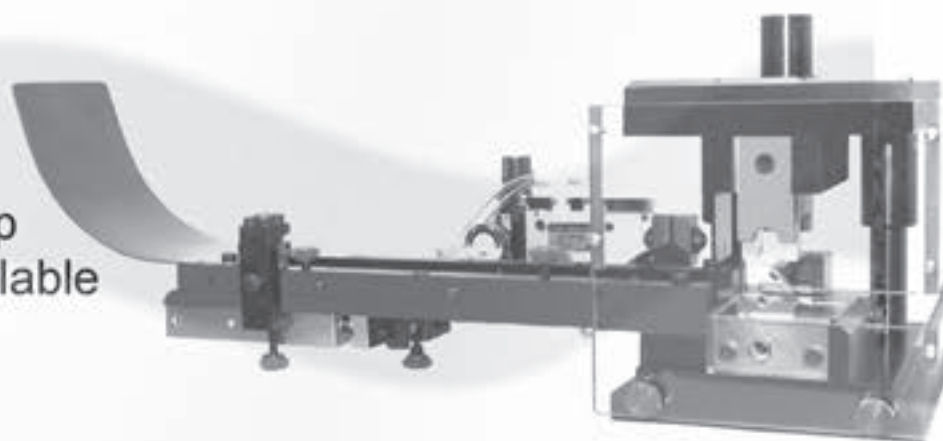


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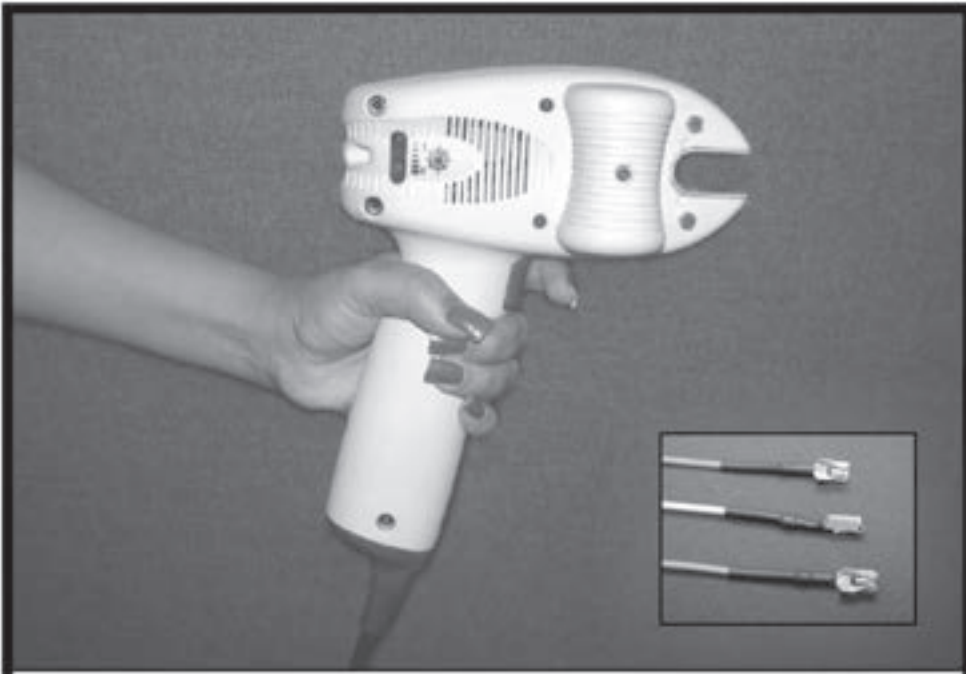
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In every issue of Wiring Harness News Anixter will bring you informative articles about wire and cable technology.

INSULATION AND JACKET SHRINKBACK

Shrinkback is the tendency for the insulation of a wire to pull back from a splice or termination connector. If shrinkback occurs, an excessive amount of copper (or aluminum) conductor can be exposed and increase the risk of a short circuit. Shrinkback can also occur on the jacket of a multiconductor cable. If the jacket pulls back from a splice or termination, it exposes the cable to dirt and/or moisture. Common causes of shrinkback and industry methods used to measure and control it are discussed below.

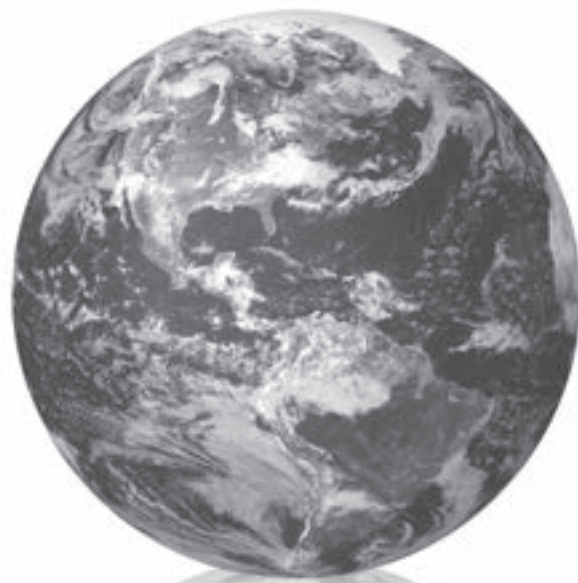
the insulation may pull back if friction with the copper conductor is too low to hold it in position. High temperatures and wide temperature excursions tend to accelerate the process. Polymers vary in their susceptibility to shrinkback as a result of their basic chemical structure. For example, the thermal coefficient of expansion of a polymer can affect shrinkback. A higher thermal expansion coefficient means a larger volumetric change during temperature changes. This could lead to larger shrinkbacks. Table 1 contains coefficients of linear thermal expansion for common wire and cable polymer resins.¹

WHAT CAUSES SHRINKBACK?

Shrinkback can occur when built-in mechanical stresses are present in the insulation or jacket material as the result of the manufacturing process. For example, if a copper conductor moves through an insulation extruder head at a speed slightly faster than the molten insulation compound coming out of the extruder head, the molten insulation becomes stretched. When the insulation compound is cooled, the insulation can become "frozen" in this stretched condition. If the wire is later cut into short lengths,

Polymer	Thermal Expansion Coefficient (10-6°C)
Polypropylene	68-95
Polyethylene (low density)	100-200
Polyethylene (high density)	110-130
Fluorinated ethylene propylene	83-105
Polyvinylidene fluoride	85
Ethylene tetrafluoroethylene	59
Polytetrafluoroethylene	100
Polyurethane	100-200
Polyvinyl chloride (rigid)	50-100
Polyvinyl chloride (flexible)	70-250

Table 1: Coefficients of linear thermal expansion



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INDUSTRY TEST METHODS

To minimize shrinkback, the wire and cable industry has developed test methods and standards to measure and control it. One test method frequently used to evaluate the shrinkback of communication cable insulation is contained in ANSI/ICEA Standard S-56-434.² Section 5.4.1.3 *Shrinkback* of the document details the test method. The test is performed on a six-inch sample from the insulation. The sample is placed in a circulating air oven for four hours at a temperature of 115° C for PE (polyethylene) and 130° C for PP (polypropylene) insulation. Shrinkback is defined as the total shrinkage of the insulation from both ends of the sample. The pass/fail criterion for this test is 0.38 inches (10 mm).

In addition to the ANSI/ICEA *Standard*, UL 2556 *Standard for Safety Wire and Cable Test Methods* also has test procedures for determining insulation shrinkback. UL 2556 Section 7.4 *Shrinkback* contains a test method for determining shrinkback on insulation in water by immersing a sample in water at 90° C. UL 2556 Section 7.5 *Shrinkback in Air* determines shrinkback in air by heating the sample to be tested and then allowing it to cool. Once the sample is at room temperature, shrinkback, if any, is measured.³

Although it is important to determine insulation shrinkback, it is necessary to also test cable jackets in order to decrease the chance of water and dirt migration into the cable. Section 5.4.3.3 *Shrinkback* of the ANSI/ICEA document contains the test method for a shrinkback test on cable jackets. It requires the removal of a 0.5 inch (13 mm) wide by 2 inch (50 mm) long strip

of material from the jacket. This specimen is then measured in length before and after oven conditioning at 100° C (115° C for some materials) for four hours. The percent shrinkage is then calculated from these measurements. The maximum jacket shrinkage permitted is 5 percent.²

INSULATION CLEARANCE

The distance between a termination device and the end of a wire's insulation is called "insulation clearance." This distance is shown as measurement "A" in Figure 1. Shrinkback can contribute to excessive insulation clearance and the risk of a short circuit. Maximum recommended insulation clearance is defined in Section 4.4.1 *Insulation Clearance* of IPC/WHMA-A-620.⁴

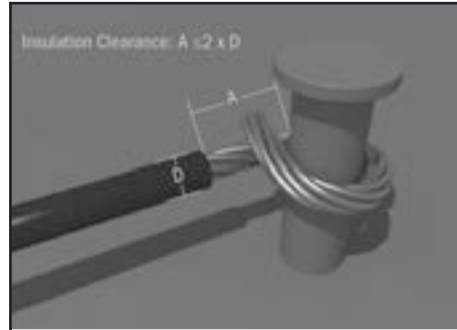
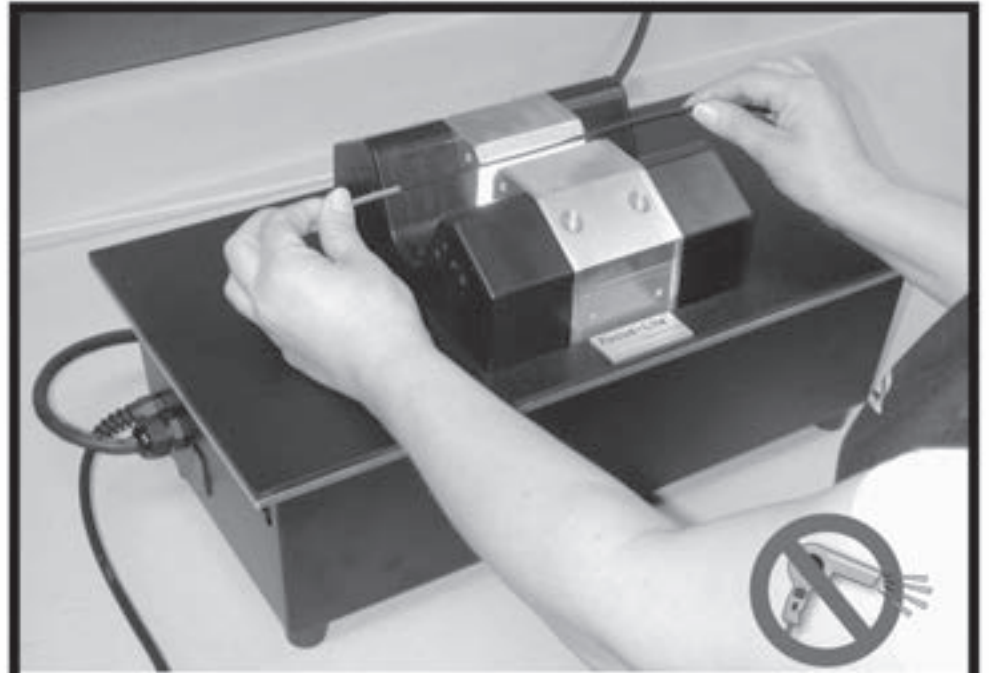


Figure 1: Insulation Clearance⁴

This document requires the insulation clearance to be less than two wire diameters (shown as "D" in Figure 1) or 0.06 inches (1.5 mm), whichever is greater. One way to minimize the effect of shrinkback on insulation clearance is to use terminations that employ insulation support crimps as discussed in Section 5.1.1 *Insulation Support Crimp* of IPC/WHMA-A-6204.

Continued on page 58



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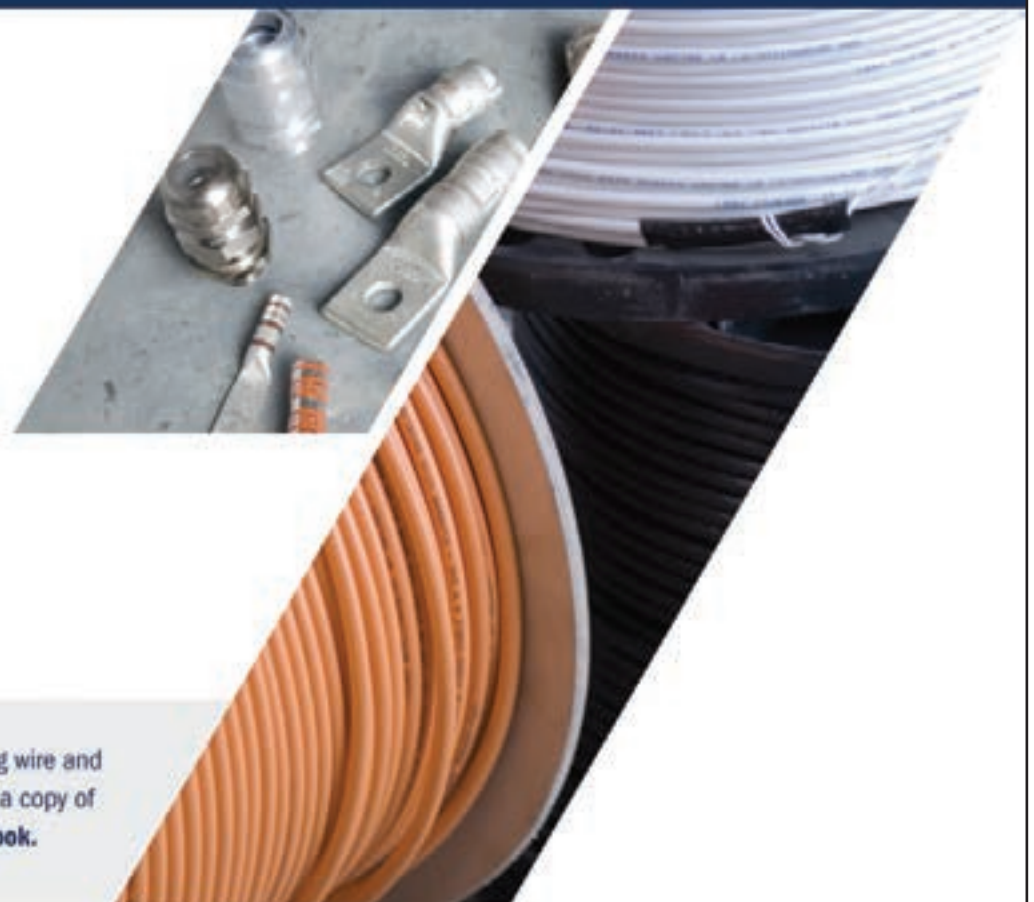
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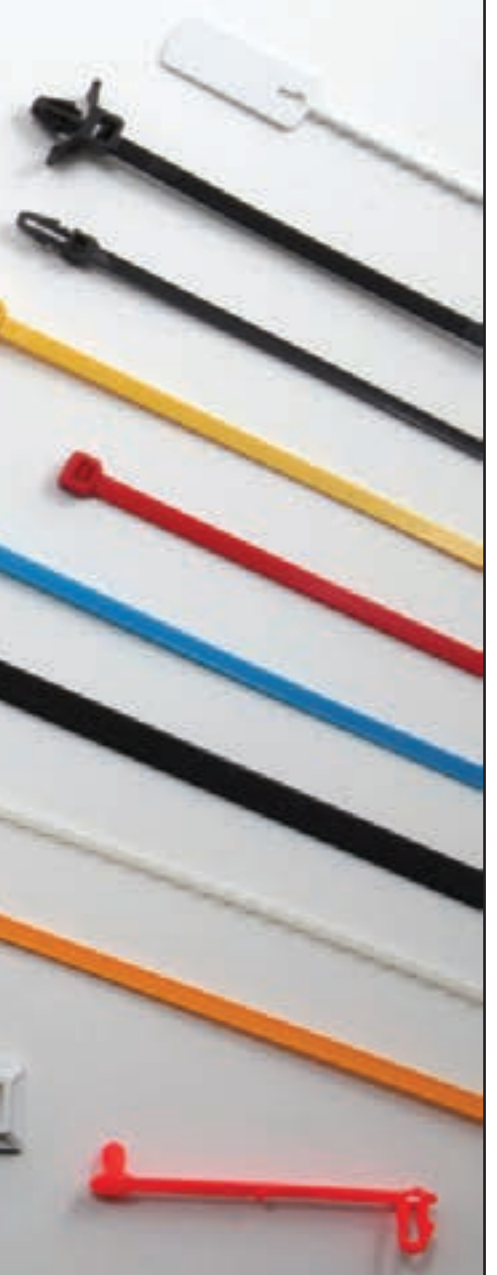
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Justice Electronic Training Services (JETS)

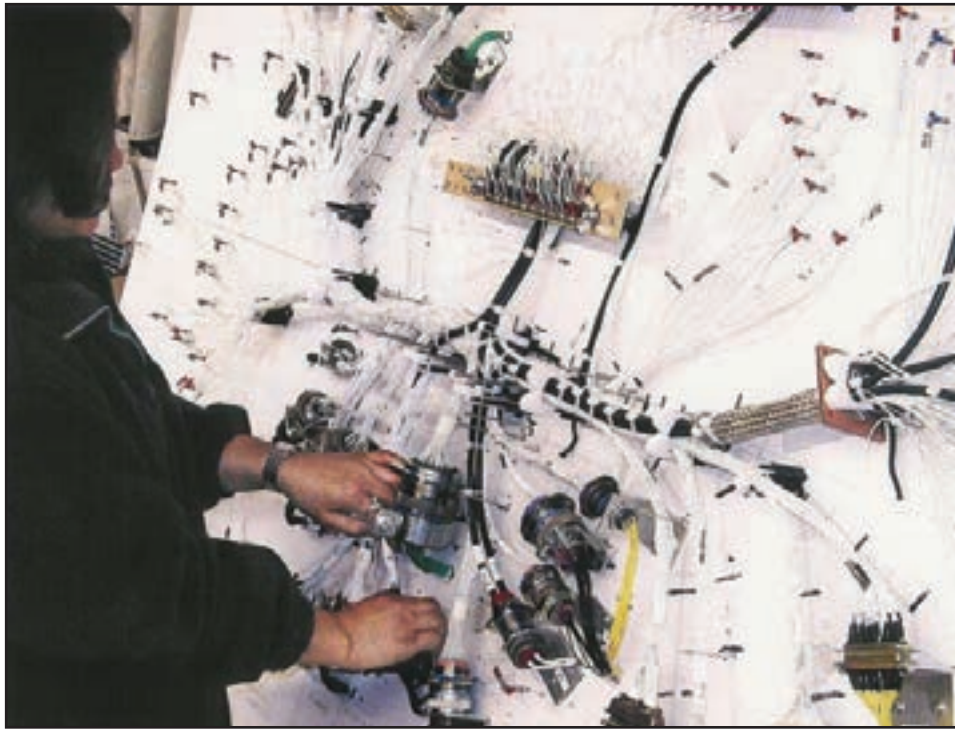
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Justice takes the matter of quality one step further. It is a big step, one to which she is wholeheartedly committed. She wants to increase reshoring production of harnesses, cables, printed circuit boards and related components in the United States so more Americans have jobs. "We have lost so much of our indus-

try. I want it to regain a stronghold here," she said.

Achieving such a goal rests largely with quality, Justice stated. "If companies seriously dedicated themselves to quality, we could grow electronics manufacturing here," she said. "If we do that, peo-

Continued on page 36



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2	2	66	↔ 0.3 Ω	✓	< 1 µA	1200V	> 1 GΩ	0.067 mA	818V	12 MΩ
3	3	67	↔ 0.1 Ω	✓	< 1 µA	1200V	> 1 GΩ	0.071 mA	820V	12 MΩ

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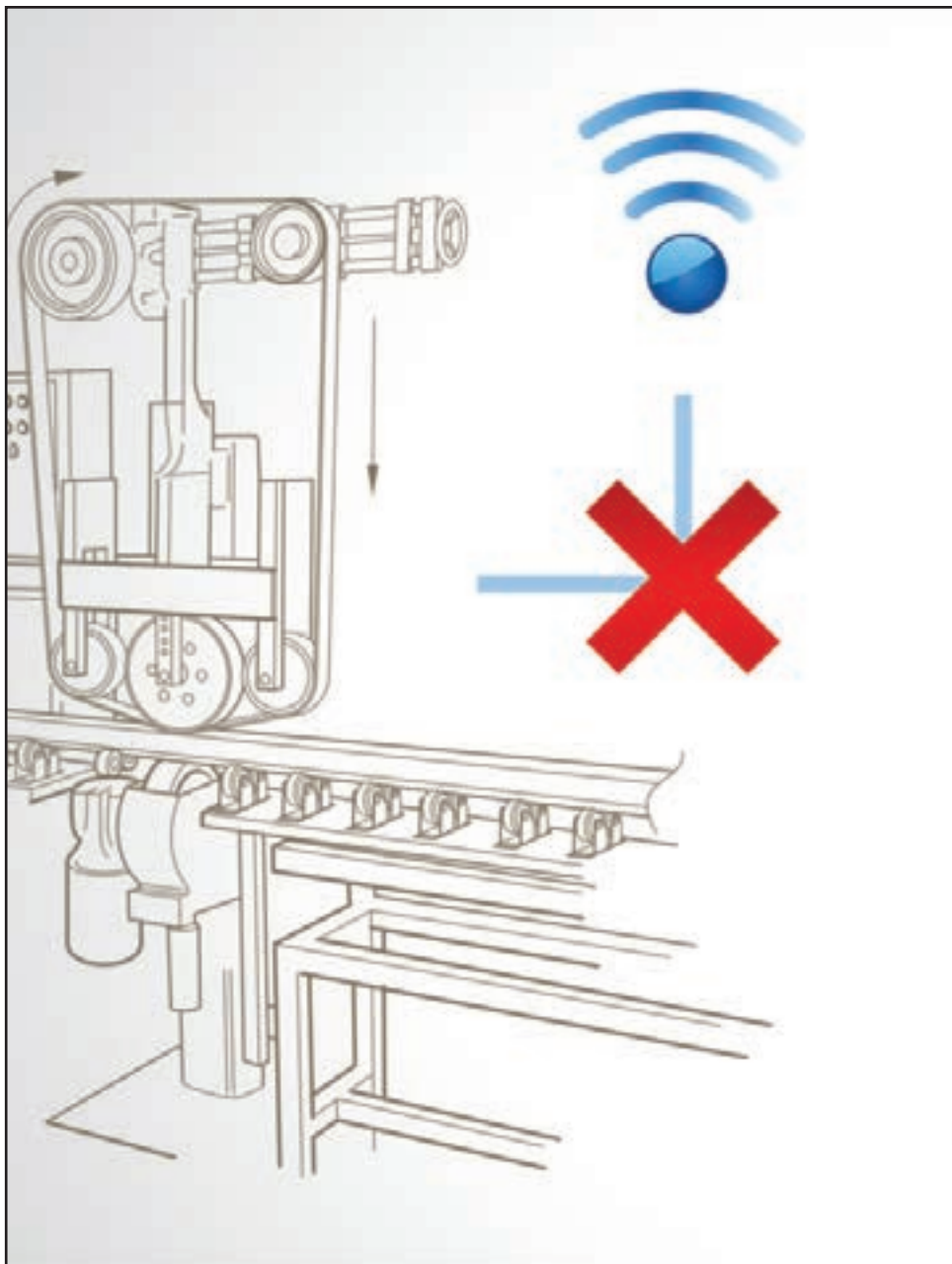
Justice Electronic

Continued from page 33



Sherry Bloom (right) and a student learning a solder technique.

Continued on page 38



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Justice Electronic Training Services (JETS)

Continued from page 36

ple will be knocking our doors down. Products may be more expensive, but they're going to last. Building a quality image in the United States will put us back on top of the electronics industry again."

More manufacturing in the United States also enhances national security, according to Justice. She has serious concerns about how items made overseas and used in components for U.S. military equipment could cause harm to

it and the people using it.

J.E.T.S offers training for certification and recertification for five IPC standards. They are

IPC A-610, IPC/WHMA A-620, IPC J-STD-001, IPC J-STD-001ES and IPC 7711/7721.

A-610 is for quality assurance and visual acceptance of an electronics assembly. The three-day J.E.T.S. session for this standard consists of lectures and exams about accept/reject criteria. Passing the course results in a certificate valid for two years.

The three-day A-620 class focuses on the requirements and acceptances for harnesses and cable assemblies, and successful completion earns a two-year certification. Such topics as dimension tolerances, crimped and soldered terminations, splices and insulation displacement are covered.

The J-STD-001 standard for soldering requires five days of lectures and hands-on work by attendees. They learn hand and machine soldering processes, reflow, material requirements, quality criteria, testing methods and statistical

process controls. A certificate is valid for two years.

J-STD-001ES (Space Addendum) covers the acceptance criteria specifically for people working on hardware for aerospace applications, but the one-day course is taken after gaining J-STD-001 certification.

The IPC-7711/7721 course is for reworking, modifying, repairing, or restoring electronic products. Mostly through hands-on work over five days, participants learn about the procedures, tools and materials needed. Completing the course means a two-year certification.

Assembly by people with IPC certification often is mandated by customer contracts, Justice stated, adding that products not meeting that stipulation would be rejected. Should one company subcontract part of the assembly to another firm, it also must meet the requirements of the contract and whichever IPC standard is stated therein.

Recertification is necessary because "technology changes so rapidly," Justice said. "You have to stay current in the navigation of the standard and be comfortable with it. You need to have the information and be able to refer to it without waiting for someone to tell you to go forward. You don't want to stop production to have to do it."

Requiring recertification after two years is logical, according to Justice. "Three or five years would be way too long," she said. "If you don't use the document, you lose what you learned. Then you are not that quick in doing the work. Time is money."

J.E.T.S. tracks its students and notifies them about recertification two months in advance. A 90-day extension is possible. However, lack of recertification may lead to product rejection and contract loss.

Justice said J-STD-001 and A-610 are the most popular courses at J.E.T.S., with A-620 gaining in popularity. By the end of this year more than 500 people, including 267 recertifications, will have been trained by J.E.T.S. either at its Orlando facility, where 90 percent of the training occurs, or on-site at companies for the balance of 10 percent.

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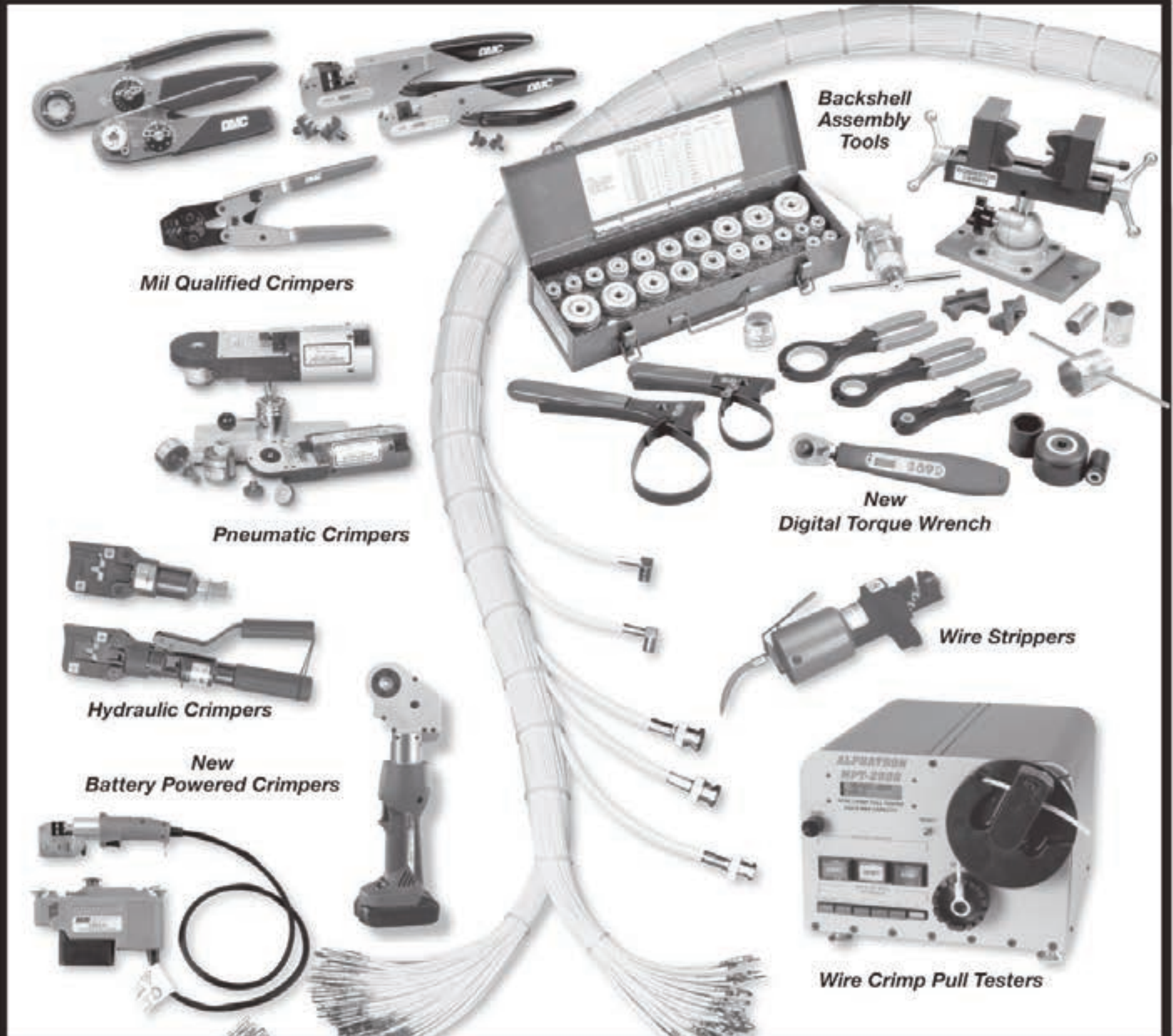
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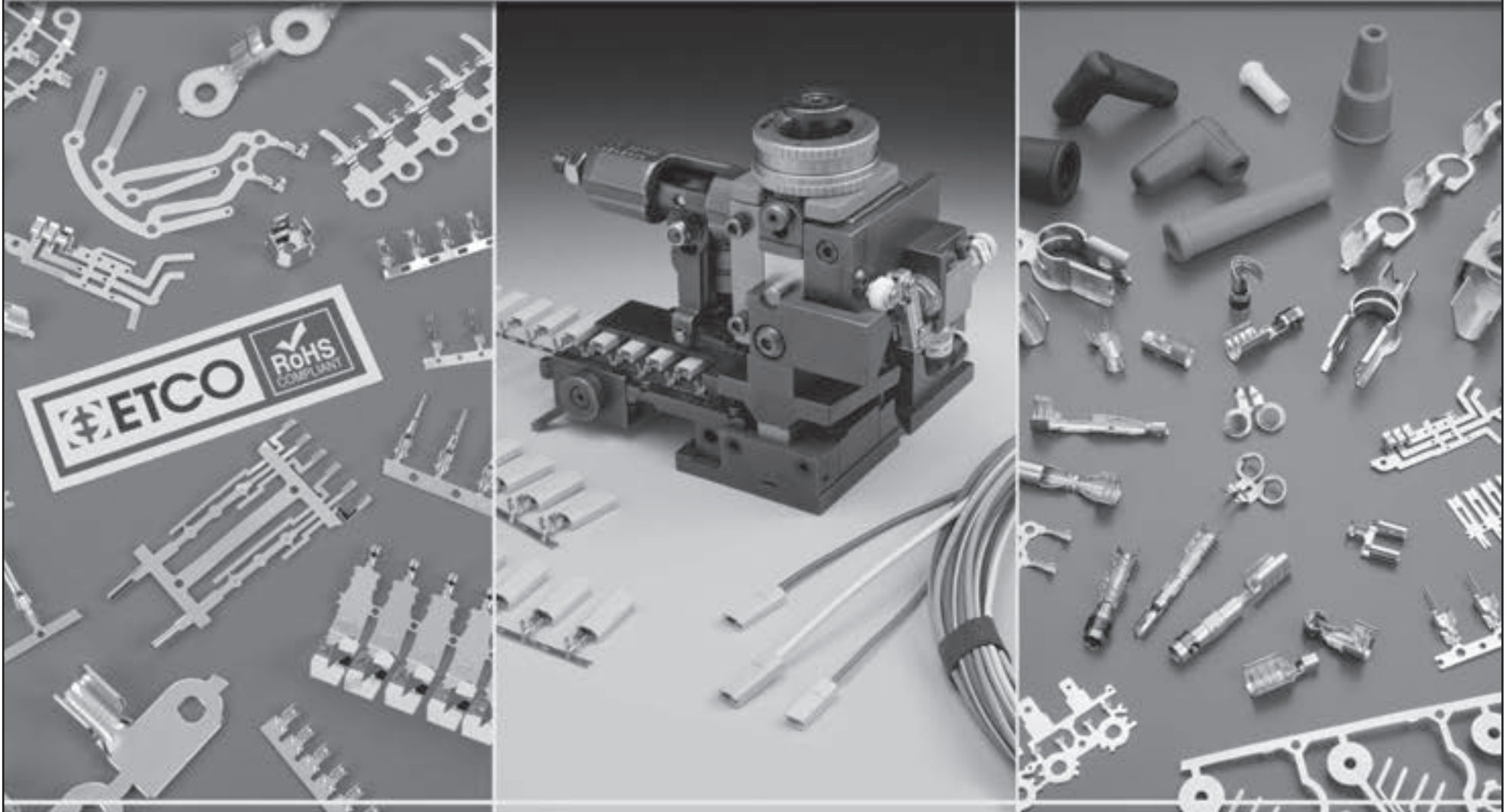
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Justice Electronic Training Services (JETS)

Continued from page 38

accommodated in one session with one trainer or 20 people with two trainers. Justice likes an average class size of eight. "Smaller is better," she said. "I dedicate myself to one-on-one time with each student to observe soldering and other processes. Then I find out why they are making mistakes and how to correct them."

Justice reported one student held solder in her mouth while working, and other trainees' mishandled equipment, often leading to oxidized tips on soldering guns, rendering them ineffective. "I love teaching people who have not soldered before because they have no bad habits," she said. "I tell people when they do make a mistake that it is a good thing because they can then learn a lesson."

"I want companies to reap the rewards of training and instill quality in their people," said Justice. "I want companies to be successful and grow and create more opportunities for people. I really do care."

J.E.T.S. is one of four IPC authorized training centers in Florida and the only one in Orlando, which has Research Park and numerous companies and government agencies that provide products and services for the U.S. military and the aerospace program. The exclusivity is one reason why Justice started her company, which is one mile from the Orlan-

do International Airport.

Justice's company has done training for such corporations and organizations as Lockheed-Martin, Northrop Grumman, L-3 Communications, Raytheon, Harris Corp., NASA, General Electric, SAIC, Argon ST and General Dynamics. An additional 57 plus subcontractors have been served by J.E.T.S.

Although Justice began operating her business in 2007, she has been involved in the harness and cable industry almost her entire life. She discovered an aptitude for mechanics by helping her stepfather Robert overhaul the engine in his 1962 Mercury Comet in 1966.

About that time Justice's mother Anne took electronics courses and was hired by a company that produced telecommunications equipment for the military. She was a solderer, and often Justice watched her mother work, all the while learning about tooling, equipment and quality. Eventually she picked up a soldering iron and began working.

After Justice graduated from high school in 1971 she wanted to work with her mother at General Dynamics, but Justice was not hired there. Instead, she operated a machine at Stromberg-Carlson in Lake Mary, Fla. The firm produced coils and switches for telecommunications companies.

Continued on page 42

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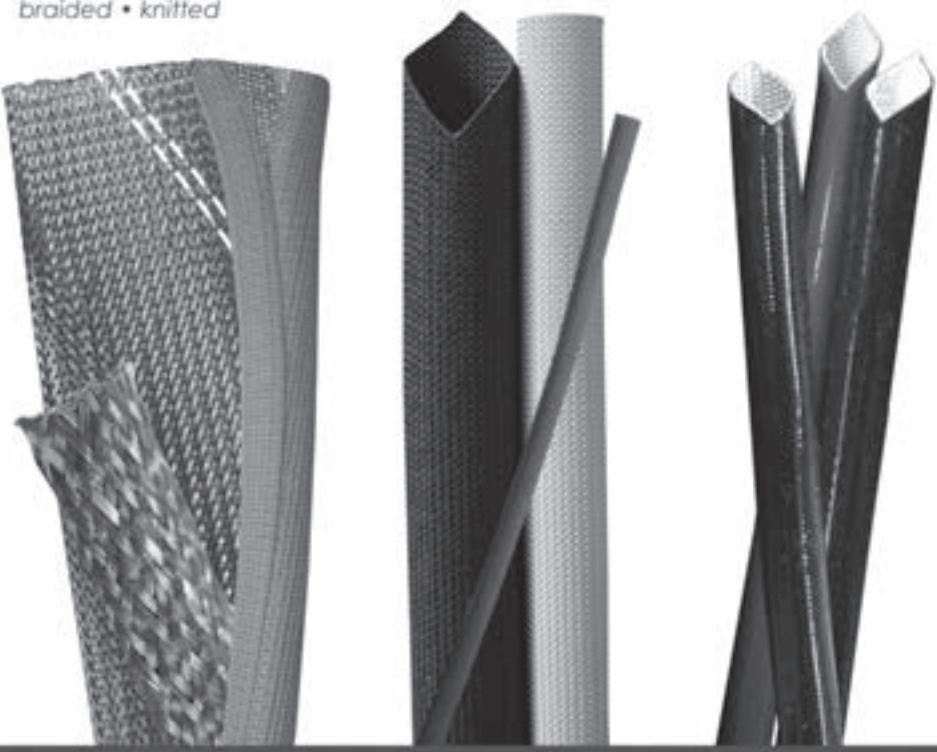
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Justice Electronic Training Services (JETS)

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During Justice's five years there, she advanced into quality and testing and invented fixtures that enabled production workers to assemble items in multiples instead of singles. "I have been an innovator all my life," Justice said. "I'm always looking for a way to make something better."

In the mid-1970s Justice worked at Exxon Office Systems in a subsidiary that produced the first fax machines. She first was on the assembly line building PCBs and mechanical assemblies and then in customer service and repair.

Employment over the next 30 years was in the assembly departments at Florida companies Educational Computer Corp., Valentec Dayron, Tri-Tech Electronics, Intelitec, Precision Electronic Circuits, Data Metrics and Indra Systems. Parts and components made by the companies were for F-16 and F-18 jet aircraft, simulators, Abrams tanks, Javelin and Patriot missiles, smart bombs, torpedoes, chemical weapons, ticket machines, ruggedized printers and computers, heartlung machines and satellites.

Justice acquired experience and expertise about such products as harnesses, cables, PCBs, electromechanical assemblies and box builds. She learned engineering, assembly, inspection, quality assurance and documentation as well as logistics, kitting, drilling, plating and soldering.

"I have vast knowledge from the last 40 years," Justice said. "Engineers at companies where I do training often call me to consult if they are having problems with their production lines and prod-

ucts. Engineers are not taught real-world experiences, so when they are fresh out of college they have no hands-on knowledge."

The idea for J.E.T.S. arose in 2001 when Justice accompanied a friend who did not want to go alone to an IPC class in New Hampshire about J standards. The trip prompted Justice to consider becoming an IPC trainer.

Orlando, the Silicon Valley of Florida with Central Florida Research Park, the fourth largest in the United States, had no author-



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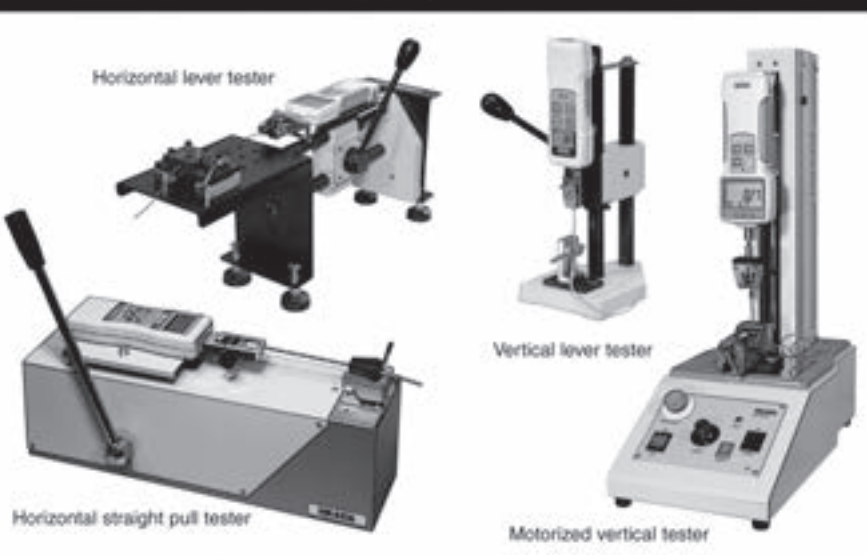


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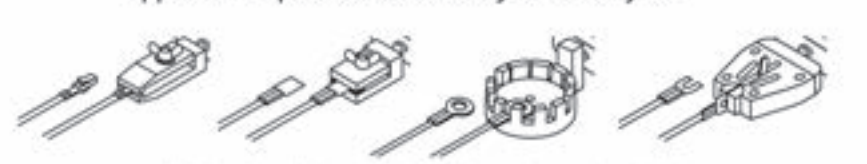
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ized training centers at the time. And, the U.S. Department of Defense (DOD) had just adopted IPC standards for its hardware products.

"Foremost with IPC is product reliability, not aesthetics," Justice said. "DOD was all about beauty, not reliability. You're just adding more cost by making it look pretty. With IPC, it's about reliability of the product, not aesthetics.

Besides assembling cables at Indra Systems in Winter Park, Fla., in the mid-2000s, Justice worked at developing J.E.T.S. and waited for the right time to launch her company. That occurred when Indra announced a layoff.

Due to her high productivity Justice was not included in the layoff. However, a woman at the company named Ruthie was. Justice was concerned about the consequences on Ruthie because she was a single mother of three, similar to Justice's mother decades earlier.

A person of faith, Justice prayed about the situation and then resigned from Indra, allowing Ruthie to keep her much-needed job and its benefits. "I told my supervisor about my business and said it was time for me to step out of there to do what the good Lord wants me to do," Justice said.

Teaching comes naturally to Justice, and she has assisted people on production lines since she started at Stromberg-Carlson. "I'm a person who tries to help everybody," she said. "I pass on my knowledge. I don't hold back. It's not all about the money. It's what you give back to the industry. If you treat people right, the money will come.

"I've been in the field long enough that I can translate everything from the IPC training information," said Justice, who once belonged to the Association for Training and Development. "People's involvement in the training is critical. The key element is for the trainer to take a personal stake in what they're doing. I tell stories, and people love them. I know how to connect with people so they retain the information."

As a value-added service, Justice makes herself available via telephone and e-mail for consultations with trainees after they return to work and have questions about production. "When the training is done, that's only the beginning of my relationship

with people," she said. "I always keep an open line to what is happening on the floor."

Although training is most of her business, Justice is working on building its manufacturing side. "My ultimate goal is to have a well-oiled machine working together on both sides of J.E.T.S. with training and large-scale manufacturing," she said. "J.E.T.S. could grow exponentially with a blend of the two."

Production was strong over 12 months in 2009-10 when she had a contract with an R&D company working through the U.S. Army Program Executive Office for Simulation, Training and Instrumentation. The job required nine cables of varying lengths and complexity in 400-800 quantities. Ten people worked full time and five part time on the contract at the 2,000-square-

foot J.E.T.S. facility, which is in a corporate business park building.

"I am open to doing harnesses, cables, printed circuit boards and box builds," Justice said. "I can put anything in place to get the job done. I can pick from the cream of the crop of employees who have been displaced by employment at other companies due to government cutbacks."

She noted 8,000 people have lost their jobs at NASA. Many of them had to be retrained to IPC standards because NASA specs were not recognized outside the space agency.

Products made at J.E.T.S. are according to Class 3 standards. The highest class coincides with Jus-

Continued on page 44

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Justice Electronic Training Services (JETS)

Continued from page 43

Justice's target market of prime contractors for military applications. "Quality and customer service are everything to me," she said. "The customer always comes first."

To make high-quality products, Justice uses parts from 15 suppliers such as Digi-Key Electronics in Thief River Falls, Minn.; Mouser Electronics, Mansfield, Texas; Daniels Manufacturing Corp., Orlando; Wire Masters, Franklin, Tenn.; Alpha Wire, Elizabeth, N.J.; and PEI-Genesis, Philadelphia, Pa. "I have good relationships with all my vendors," she said. "If there's ever a problem, it's always resolved."

J.E.T.S. belongs to the Wiring Harness Manufacturers Association and is registered with the System for Award Management. It is a federal government program for businesses supplying products and services through the General Services Administration.

The company is working on registration with the Small Business Administration 8(a) Business Development Program that assists with procuring contracts, training, counseling and marketing. ISO certification through Business Solutions of Florida and registration as

an International Traffic in Arms Regulations vendor are being pursued, too.

Justice owns 80 percent of J.E.T.S., with the balance split among 24 shareholders. None of them have more than five percent of the shares.

"There is a legacy to this business because I'm following in the footsteps of my mother," Justice said. "As a trainer and a manufacturer, I have had an effect on countless lives that have been changed so people could support a family and have a good quality of life. The last six years have been an incredible journey."

"I've found I have to be resourceful to hang in there through the rough bumps due to the economy and sequestration," Justice said. She has seen improvement in the economy and contract manufacturing this year, a trend that is supposed to continue through 2017, due in part to Space X.

"It's all about climbing the mountain and not stopping," Justice said. "You have to have an open mind about what will work. If you believe strongly enough, you ultimately will win."

For more information, call 407-850-0205, e-mail info@justets.com, fax 407-850-0294, visit www.justets.com or write 5850 T.G. Lee Blvd., Suite 240, Orlando, FL 32822.



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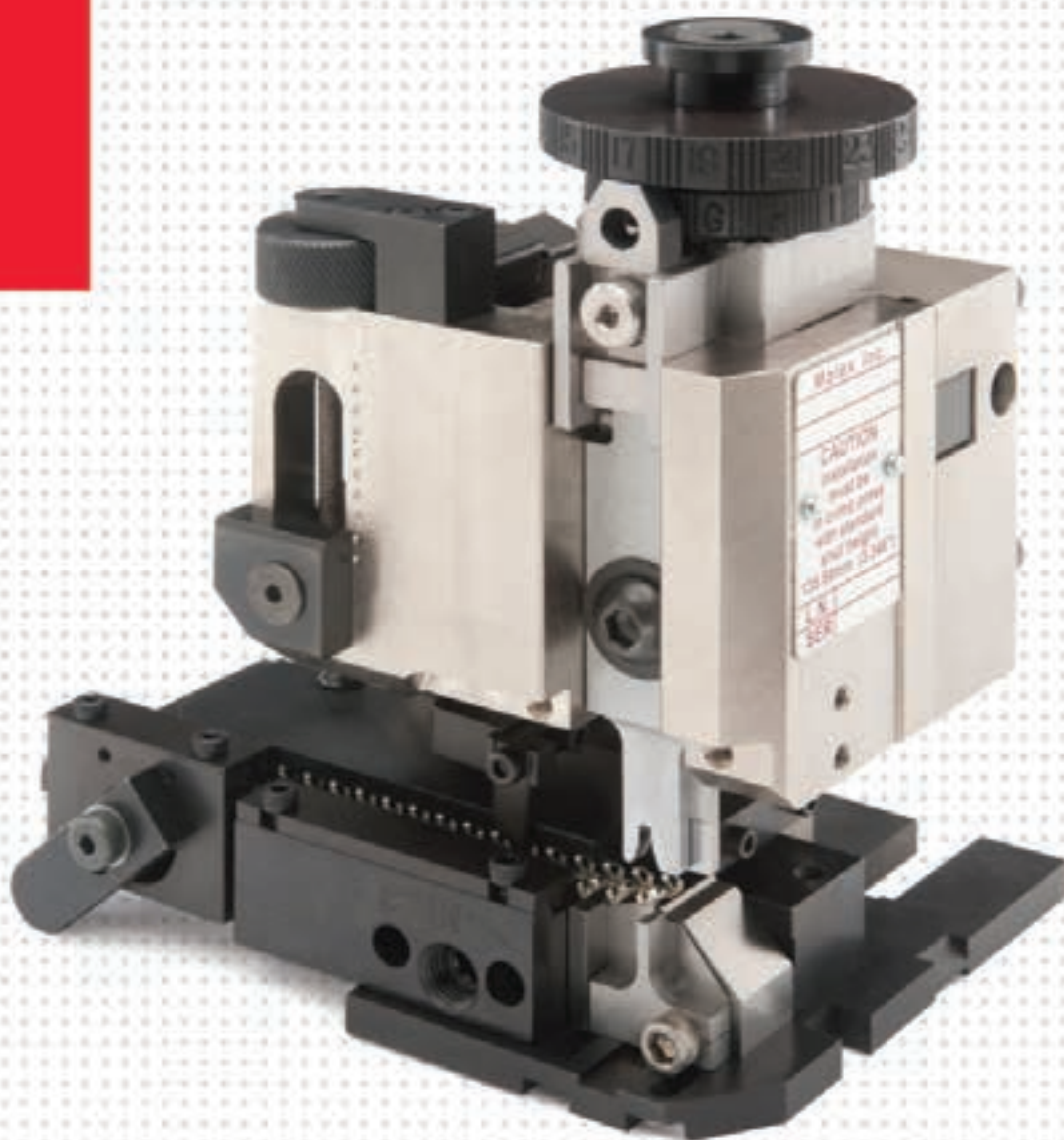
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NEWS PLUGS continued

Sharon Martin Joins Teknor Apex as Corporate Marketing Communications Manager

Teknor Apex Company has announced the appointment of Sharon Martin as corporate marketing communications manager.

Ms. Martin is in charge of advertising, public relations, trade show coordination, marketing collateral, and digital marketing for all Teknor Apex business units worldwide. These include vinyl, thermoplastic elastomers, nylon, custom compounding, color concentrate, and chemicals divisions and a garden hose business that is a nationwide brand in the U.S.

"Sharon is an experienced professional with background in all aspects of marketing communications," said Bertram M. Lederer,



Sharon Martin, Teknor Apex

executive vice president. "Her communications skills will play an important role in advancing Teknor Apex's long-range strategy for international growth, diversification, and synergy across our many product lines."

Ms. Martin brings over eight years of marketing experience in the medical industry. As marketing manager for Predictive Biosciences she was in charge of corporate branding, digital communications, public relations, and supporting new product launches. Previously she held marketing communications positions with Helicos BioSciences Corporation.

Sharon Martin holds a BA degree with a concentration in corporate communications from James Madison University, Harrisonburg, Virginia.

TEKNOR APEX COMPANY, a privately held firm founded in 1924, is an international polymer technology company headquartered in Pawtucket, RI, U.S.A. Teknor Apex operates twelve facilities in the U.S., Europe, Singapore, and China. Visit www.teknorapex.com.

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CERTI-CRIMP hand tools are designed to meet all feature requirements listed on applicable TE Application Specifications.

(Check appropriate product catalogs for qualification to military specifications, UL recognition and CSA certification.)

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Fairview Microwave Adds Over 20 New Break-Over Torque Wrenches for Use on RF Interconnect Components

Fairview Microwave, Inc. a supplier of on-demand microwave and RF products, announces the release of a new portfolio of break-over type torque wrenches used to precisely fasten connections between components and systems.

Fairview Microwave has added a broad range of these break-over type torque wrenches suitable for multiple RF connector types including 1.0mm, 2.4mm, 2.92mm, 3.5mm, 7mm, SC, SMA, SMC, SSMA, SSMC, Type N and TNC designs. These RF torque wrenches are offered with hex sizes (also called bit size) of 5/16", 5/8", 15/64", 5/32", 1/4", 9/16", 13/16", 3/4" and 25/32". The maximum torque values of these break-over wrenches are preset and range from 2 in-lbs to 14 in-lbs depending on the chosen configuration.

Fairview's break-over style torque wrenches feature a unique pivoting joint that "breaks" when the preset torque force has been reached. This prevents the connector coupling nut from being over tightened and damaged. The new break-over torque wrenches from Fairview are made with a nickel-plated steel wrench head that is connected to a light weight, ultra-durable anodized aluminum handle. Each torque wrench comes calibrated in compliance with ANSI/NCSLZ540-3 and ISO 10011 standards. These RF torque wrenches are secured inside a properly labeled wooden box for convenient storage.

"Our new series of preset break-over torque wrenches provide an accurate and consistent means of applying the proper mating force for a wide variety of RF connector types", explains Greg Arnold, Technical Sales Manager at Fairview Microwave, Inc. "The break-over action prevents over-torqueing for optimal RF performance while minimizing wear-and-tear on the connectors."

For additional details on the new RF torque wrenches and the company, please visit www.fairviewmicrowave.com/rf-products/break-over-torque-wrenches.html.



Break-Over Torque Wrenches

Dynalab Test Systems Introduces Major Release 18

Dynalab Test Systems has been committed to continuously updating its products and capabilities. With over 25 years of experience and over 30,000 testers sold, Dynalab offers products that reflect the highest level of industry knowledge and experience. The company's systems,

software, and services are designed to help customers develop solutions for their testing needs quickly, reliably, and economically.

Dynalab's release 18 includes several new features that increase accuracy and efficiency in programming. Specifically, the "Compare Connections" feature provides change control function when making program changes, therefore reducing the possibility of human error of accidentally deleting important data. Engineers



Dynalab's Major Release 18

may feel comfortable that they may audit their changes and undo a programming change if a mistake were made.

The NX Editor's importing and exporting data functions have been enhanced to make programming even easier. The new "Export Connections Data" function will export only the connections data to a spreadsheet. For multiple part numbers, a new tab is created for each part number for easier auditing and quality control.

Other functions include more control with programming functions, better reporting capability, enhanced relay testing and more.

For further information contact Dynalab Test Systems, Inc., 555 Lancaster Ave. Reynoldsburg, OH 43068. Visit www.dynalab-inc.com.



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MIL-SPEC	COMP P/N	BAND STYLE
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M85049/128-2	S3175-2C	Standard, Welded, Coiled
M85049/128-3	600-052	Standard, Stamped, Flat
M85049/128-4	600-052-1	Standard, Stamped, Coiled
M85049/128-5	S3175-3	Mini, Welded, Flat
M85049/128-6	S3175-3C	Mini, Welded, Coiled
M85049/128-7	600-057	Mini, Stamped, Flat
M85049/128-8	600-057-1	Mini, Stamped, Coiled



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NEWS PLUGS continued


Flexible PVC Elastomer Exhibits Outstanding Resistance to Cold for Wind-Turbine and Rugged Out-door and Industrial Cables

Teknor Apex Company has announced a new PVC elastomer for cable jacketing that withstands frigid outdoor and rugged industrial conditions while providing excellent flexibility and flame performance.

Flexalloy® 9614-73 elastomer is a 73 Shore A compound that is UV-stabilized and exhibits a brittle point of -65 °C or below. The elastomer provides flexibility, tensile strength, and oil resistance and is designed to pass the CSA's FT4 vertical flame test. Selected property data appear in the accompanying table. A complete data sheet is available at this link: http://www2.teknorapex.com/extreme_cold_temperature_outdoor_pvc_elastomer.

Potential applications include cables for wind turbines, industrial automation, Ethernet networks, robots, controls, sensors, and other demanding uses requiring high flexibility.

"Flexalloy 9614-73 elastomer has a property profile that compares well with those of other soft, high-flexibility thermoplastic elastomers (TPEs) used in cables for low-temperature and industrial applications, yet it is more cost-effective," said Michael Roberts, Industry Manager for the Vinyl Division of Teknor Apex. "It provides cold temperature endurance similar to that of thermoplastic polyurethane (TPU)."

For further information contact Teknor Apex, 505 Central Ave, Pawtucket, RI 02861. Phone (401) 725-8000 or Fax (401) 729-0166. E-mail: vinyl@teknorapex.com.

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Properties of Flexalloy® 9614-73 PVC Elastomer

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Specific gravity	D-792	1.29
Tensile strength, psi (MPa)	D-638	2,070 (14.27)
Elongation, %	D-638	425
Brittle point, °C	D-746	< -65
Max. continuous operating temperature, °C	UL-1581	105
Oil rating	UL-1277	4 days @ 100 °C

Source: Teknor Apex Company

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- 1 - SCHLEUNIGER EC3200 EcoCut, #34-2007
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- 1 - SCHLEUNIGER US2100 Stripper
- 1 - SCHLEUNIGER US2015 Stripper, for wire sizes 32-14ga; strip length .04" - .78"
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- 1 - SCHLEUNIGER PF1100 PreFeeder
- 1 - SCHLEUNIGER PF1000 PreFeeder (repairs required)
- 2 - SCHLEUNIGER CP1500 Heavy Duty Coilers
- 2 - SCHLEUNIGER Uni-A Applicators
- 2 - SCHLEUNIGER CT32, CT42 Crimp Presses
- 1 - SCHLEUNIGER HS4500 Hot Stamper
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- 1 - EUBANKS Wire Processor, Model 9800-01
- 1 - EUBANKS Wire Processor, Model 4900-01
- 2 - EUBANKS Model 2600 Cut & Strip Machines
- 1 - EUBANKS Model 02700 Cut & Strip Machine w/6215 Prefeed
- 1 - EUBANKS Model 67200-02 Wire & Tube Marking Machine
- 1 - ARTOS CS326 Cut/Strip Machine (2010) with a PF-6 Prefeed (2011)
- 1 - ARTOS Model AM.STRIP.50 Pneumatic Cable Stripper, 2008

PLUS: IDEAL Model STP Stripper, Part #45-930; RENNSTEIG Model CM-25-1 Pneumatic Crimper, 2006; CARPENTER Model 70B Strippers (3); MEGOMAT Model ASM3001-U Cut, Strip, Crimp Machine w/Crimp Force Monitor, 1996; METRONIC Alpha Jet C Inkjet Printer, 2006/07; MULTITECH 55T Injection Molding Machines, used 1 year; ARBURG 35T Injection Molding Machine, new



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Komax Cosmic 42R Rotary Stripping Machine

decision to select Komax's Cosmic 42R was based on the fact that various manufacturers in the North American market are now requiring smaller gauge cables. When Nortech gave Komax the opportunity to quote the Cosmic 42R; the Cosmic 42R outperformed its competitor. "While our current supplier offered a product similar to the Cosmic 42R, the

justification process was simple as the price-performance for the Cosmic 42R was considerably better", said Brett.

For further information on the Komax Cosmic Rotary Stripping Machines contact Komax Wire, 1100 E. Corporate Grove Dr. Buffalo Grove, IL 60089

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KOA Corporation Receives Pinnacle Award from Delphi

KOA Corporation received Delphi's 2013 Pinnacle Award for Supplier Excellence.

"We are extremely pleased to receive this award," Mr. Tadao Hanagata, President and CEO of KOA Corporation, said. "Additionally, achieving this award represents the dedication of all KOA employees to our customers and their commitment to excellence."

Currently celebrating ten years, this award recognizes a select group of Delphi's premier suppliers for their contribution to Delphi's Excellence culture and commitment to quality, value and cost performance.

"Delphi's supply base is critical to its efforts as a premier global automotive supplier," said Sidney Johnson, senior vice president, Global Supply Management. "Supply partners who exceed expectations, commit to quality and cultivate innovation help Delphi continue to offer game-changing solutions to our customers. Delphi's global team appreciates KOA Corporation for their continued excellence in 2013."

Delphi recognized 22 suppliers from 14 countries with its 2013 Pinnacle Award for Supplier Excellence. Delphi Automotive PLC (NYSE: DLPH) is a leading global supplier of technologies for the automotive and commercial vehicle markets.

Headquartered in Gillingham, U.K., Delphi operates major technical centers, manufacturing sites and customer support services in 32 countries, with regional headquarters in Bascharage, Luxembourg; Sao Paulo; Shanghai and Troy, Mich. Delphi delivers innovation for the real world with technologies that make cars and trucks smarter and safer as well as more powerful and efficient. Visit www.delphi.com.

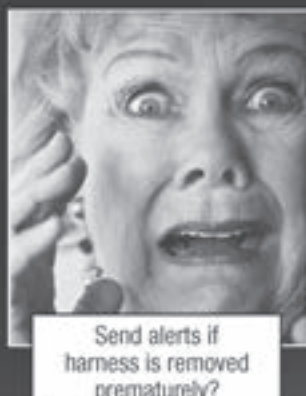
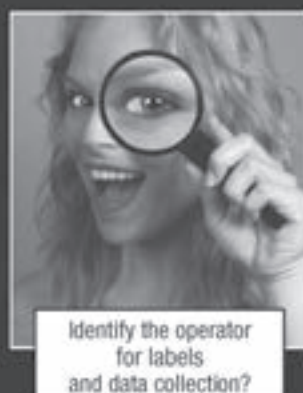
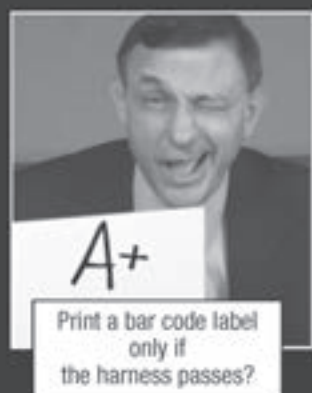
KOA Corporation, whose global presence includes corporate headquarters in Japan, and sales locations in the USA, Germany, China and Singapore, offers a wide range of products which include thick and thin film resistors, current sensing resistors and resistor arrays; thermal sensors, fuses and varistors; wire wound, multilayer, power and thin film inductors; LTCC's and modules.

Visit www.koanet.co.jp.

KOA Corporation, whose global presence includes corporate headquarters in Japan, and sales locations in the USA, Germany, China and Singapore, offers a wide range of products which include thick and thin film resistors, current sensing resistors and resistor arrays; thermal sensors, fuses and varistors; wire wound, multilayer, power and thin film inductors; LTCC's and modules. KOA Speer Electronics, an affiliate of KOA Corporation, has served the electronics industry since 1980.



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Capital Software Implemented the Electrical Wiring System Development Process on the Learjet 85 Aircraft

Capital Software implemented the Electrical Wiring System Development Process on the Learjet 85 Aircraft

Mentor Graphics Corp. announced that Bombardier Aerospace, a leading manufacturer of business jet aircraft, has implemented a complete digital development process for the Learjet 85* air-

craft's electrical distribution system. Adherence to the Federal Aviation Regulations (FAR) Part 25 Electrical Wiring Interconnection System (EWIS) mandate is now necessary for certification of new civil aircraft. With the FAA's and Canadian Transportation Agency's (CTA) EWIS mandate as a goal, Bombardier

achieved very significant process and quality improvement objectives. Bombardier Aerospace accomplished these by adopting innovative technology delivered by the Mentor Graphics® Capital® product family.

The Capital product is an advanced software suite for the electrical systems and wire harness domain. Used by leading aerospace OEMs, the Capital product is built to support the complex demands of integrated processes from initial aircraft definition through electrical system and design, harness manufacture and aircraft maintenance.

The Capital software used at Bombardier includes applications to address electrical systems definition and integration, integration with mechanical CAD systems, culminating with products that address the harness planning and manufacturing tasks. Along the entire process, data verification constantly occurs which ensures that the manufactured wire harnesses meet design intent. For example, EWIS wire routing constraints are maintained throughout the flow and

ensure that the as-built wire routing meets the EWIS mandate objectives.

Bombardier Aerospace used the Mentor® Capital Logic™, Capital HarnessXC™ and Capital FormboardXC™ software, supplemented by Capital's CATIA V5 MCAD integration applications. Since all the applications are data-centric, design data defined in one application is shared between all tools ensuring digital continuity throughout the development process.

"Bombardier Aerospace is a great example of an innovative company leveraging Capital's Platform Level Engineering Capabilities to achieve quantifiable business benefits. These tools help customers to realize their quality goals and position themselves strongly for the future," said Martin O'Brien, general manager of the Integrated Electrical Systems Division of Mentor Graphics.

For further information contact Mentor Graphics Corp., 8005 S.W. Boeckman Rd, Wilsonville, Oregon 97070-7777. Visit www.mentor.com

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Bombardier Aerospace is a great example of an innovative company leveraging Mentor Graphics' Capital product to achieve quantifiable business benefits

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“Another time, while driving to a customer’s site, our rep’s car caught fire. We eventually arrived there that night and finished the job in time for the morning shift,” Mando reports.

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.

Mando exemplifies the Eubanks business experience—highest-quality, U.S.A.-built wire strippers and markers backed by dedicated people itching to solve your wire problems.

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Cadonix Unveils World's First Cloud Based Wiring Harness Development Environment

Cadonix Ltd. has announced the world's first cloud based CAD tool for automotive electrical wiring design, analysis and report documentation. Arcadia was developed from scratch with ease of use at its

heart; using and enhancing the latest cloud software development technologies and practices. The company is also announcing its first sale of Arcadia, to one of the leading global manufacturers of cabling systems for the automotive

industry AQ Wiring Systems.

CEO of Cadonix, Andrew Armstrong said, "The harness is the second most expensive assembly of a modern vehicle after the drive train. Arcadia has been designed from the ground up with the single objective in mind, which is to help the electrical designer achieve the optimal design as quickly as possible and to give them complete confidence that the system will work exactly as intended. Arcadia is an end-end solution, taking a project from design and analysis through to full manufacturing engineering documentation."

He continued, "Using our patent pending cloud based technology, we are offering customers a solution that is economic, scalable and future proof. It is easy and quick to switch to Arcadia, and globally distributed design teams can access their projects at any time through an HTML 5 compliant web browser. Customers can import databases and designs from other leading wiring harness design environments into Arcadia."

AQ Wiring Systems is the first publicly announced customer of Cadonix Arcadia. Mikael Alvarsson, Managing Director of AQ Design said, "We have an aggressive plan to grow from our strong base into Central and Western Europe. We need to partner with suppliers and adopt design environments that are future proof and offer us the flexibility to compete effectively. Arcadia is an

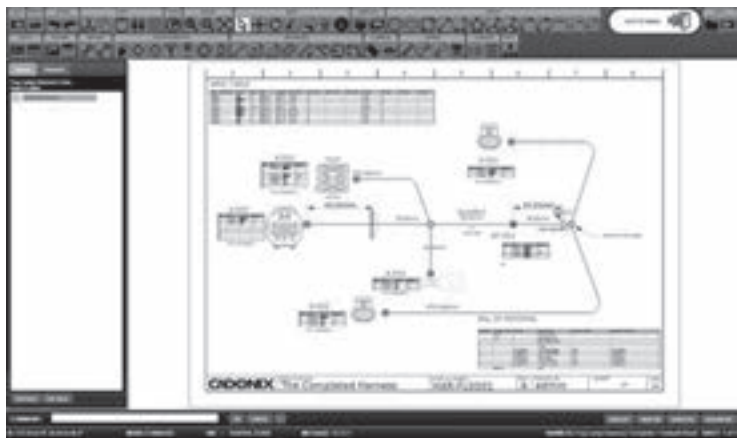
adaptable and intuitive environment that gives our design teams new scope for their creativity. Throughout the adoption process, we have found the Cadonix team exceptionally responsive and easy to work with. Their great willingness to introduce new features and adapt their tool to our needs was a major factor in our decision."

Arcadia CAD is an easy to use, groundbreaking software tool offering schematic design, animated circuit simulation and analysis, electrical networking, harness design and full design rule checking for wire harness layout and manufacture. Using the integrated simulation capabilities, engineers can be assured that their design intent is carried through into the physical implementation. Arcadia interfaces with the most popular 3D MCAD and enterprise wide PLM and ERP tools, allowing projects to transition easily and smoothly into manufacture. A particular strength of Arcadia is real-time animated simulation which paints a clear virtual picture of the electrical system and how it will behave in deployment. Using Arcadia's simulation capabilities, engineers can be confident that the design will work as intended - eliminating the need for a physical prototype. Any errors are trapped early in the design process, reducing the design cycle and improving design quality.

Arcadia includes a comprehensive

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WIRE PROCESSING



symbols and parts database. It provides for wires, motors, lamps, connectors, in-line connectors, splices, terminals, switches, relays, fuses diodes, LEDs, resistors, batteries, ECU's ground points, page / wire breaks, and more. Customised reports can be created to suit individual requirements. These include a full bill-of-materials, connectivity lists, wire usage, simulation and analysis reports, and many more. Reports can detail materials, terminal and wire lists including lengths, colours tags and BOM information.

Customers can quickly import databases and designs from many legacy systems. Using Cadonix patented cloud based technology customers can access Arcadia from any HTML5 compliant web browser once the license has been activated on the server. Customers have the option of hosting the tool on their own internal server, or accessing it securely from a Cadonix geographically collocated server. New releases and features are normally offered immediately and free of charge to existing customers. Cadonix offers a free 20-day evaluation license giving access to the full functionality of Arcadia using the customer's own data. Full support is provided during the evaluation period. Arcadia is available on a rental basis for short term projects or can be purchased outright.

Cadonix was formed in 2011 specifically to bring to market a completely new concept in automotive harness design. Its development team has spent the last 4 years creating and optimising Arcadia. The company is led by Dr Andrew Armstrong, CEO, Fergus Kendal, Technical Director and Jon Collins, Business Development Director. Andrew's background of strong, bleeding edge research and development into cloud and graphics software techniques allows Arcadia to be a best-in-class cloud application and his broad engineering knowledge filters down

into a tool built by engineers for engineers. Fergus' manufacturing and design experience in the automotive engineering industry has given him a breadth of experience of existing electrical engineering tools, practices and harness manufacture, and has over 20 years of industry experience.

For further information please visit www.cadonix.com.

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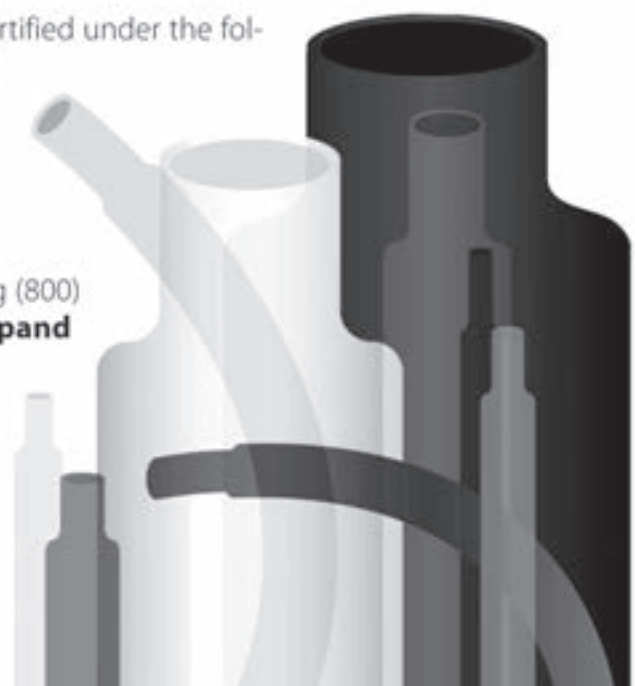
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NEWS PLUGS continued



DG Interconnect introduces new miniature auto-coupling connector

DG Interconnect is introducing the all new QL-5 series connector to meet the growing demand for a miniature, high density connector capable of ultra-high mating cycles in a cost effective package.

"The QL-5 is the perfect complement to our QL-7 Series product line. The medical industry has demanded all of the same magic in a smaller package!" says DGI's General Manager, Dave Galambos.

The QL-5 auto coupling mechanism latches with a fluid, rotational action that provides positive confirmation that the connector pair is fully engaged. The QL-5 is ideal for instrument applications requir-

ing up to 14 sealed contacts in a quick-lock package and meets medical industry standard for contact density and performance in a 0.5" diameter package.

What sets the QL-5 apart is an elegant design that blends well with contemporary electronic consoles. Like the larger



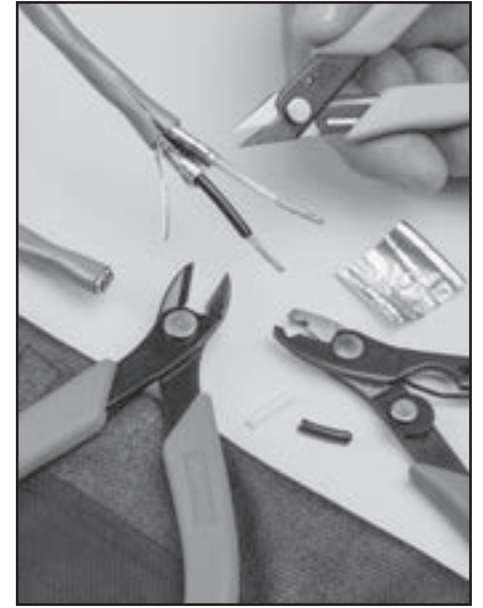
QL-5 series miniature auto-coupling connector

QL-7, the QL-5 shatters the interconnect service paradigm with a configurable design that facilitates the quick, low cost delivery of samples, prototypes, and pilot production cable assemblies.

The average volume price is approximately \$20 depending on lead length and contact arrangement. The QL-5 also eclipses most competitors with versions equipped to endure 100K mating cycles!

DG Interconnect is a provider of advanced interconnect solutions. It differentiates itself from the competition through product innovation and service.

For additional information on how an Eclipse interconnect might adapt to your application, contact a DGI sales engineer today @ 781.422.3002 / info@dginterconnect.com / http://dginterconnect.com.



Portable Wiring Tool Kit Cuts Cable Jacket, Insulation and Strips Wire

An upgraded tool kit with three essential hand tools that store in a handy trifold canvas pouch for all types of wire and cable preparation and repairs is being introduced by Xuron Corp. of Saco, Maine.

The Xuron® TK2300 Wire Harness Tool Kit features the three tools used most for assembly and field service wiring applications all packed into a handy trifold canvas pouch that fits into a tool kit or pocket. Included is the Model 440 precision scissor for slitting coaxial cable jacketing and cutting foil insulation, Model 2175 Maxi-Shear™ flush cutter for wire up to 12 AWG, and the Model 501 thumb adjustable wire stripper-cutter for 10 to 26 AWG.

Suited for professionals who need to assemble, install, or repair wire and cable in a facility or in the field, each tool in the Xuron® TK2300 Wire Harness Tool Kit is ergonomically designed with soft rubber hand grips, no finger loops, a Light Touch™ return spring, and a non-glare black finish. The canvas pouch has pockets for each tool and a hook & loop closure.

The Xuron® TK2300 Wire Harness Tool Kit is priced at \$56.95 (list).

For more information contact Xuron Corporation, 62 Industrial Park Rd., Saco, ME 04072-1840

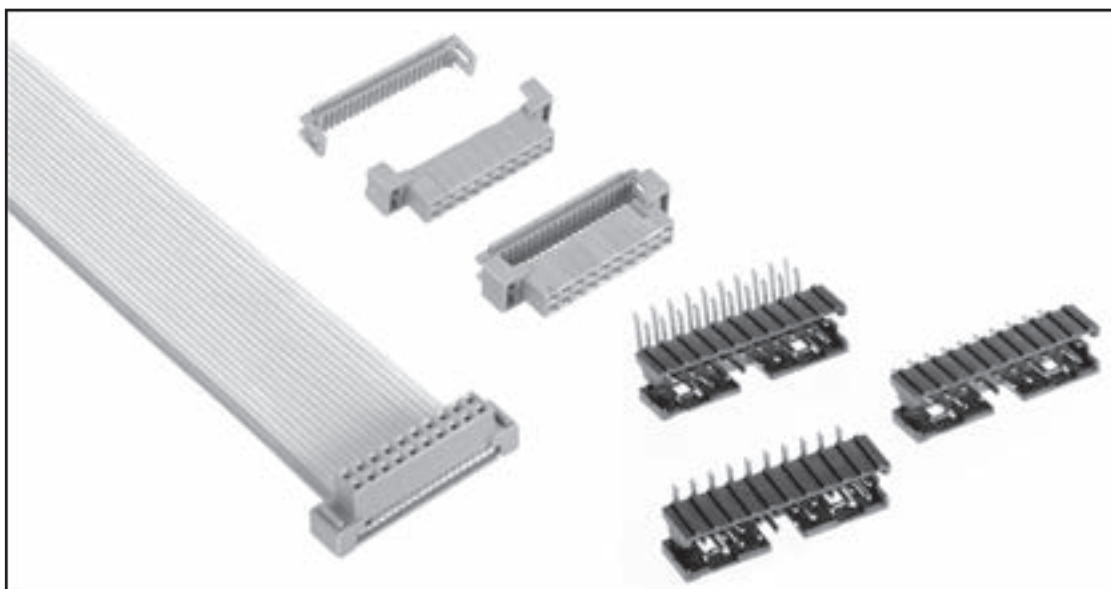
Phone (207) 283-1401 or Fax (207) 283-0594. Visit www.xuron.com.

Thermosleeve Offers CB-HFT 300 Thin-Wall Polyolefin Heat Shrink

CB-HFT(300) is a thin-wall, flame-retardant polyolefin heat-shrinkable tubing that is typically used where rapid shrinking and reduced space requirements are important.

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- Commonly used for insulating wire terminals and splices, mini switch etc.



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The 3M Ribbon Cable Socket, 158 Series and its mate, the 3M Shrouded Header, 159 Series, deliver an extensive set of features that provide manufacturers and cable harness builders numerous options in designing a variety of electronic systems. The 158 series socket and the 159 series header products are the first in a series of solutions to reinvigorate IDC technology, and provide the industry with a solid, comprehensive line of robust, sub .100" pitch cable-to-board solutions not offered in the market today.

The Ribbon Cable Socket, 158 Series provides a reliable cable-to-board interface in multiple product configurations to make it applicable to many general-purpose electronics applications:

- Available unique adhesive cover for discrete wire capability and secure termination
- Optional friction latch system for increased retention force when used with the Shrouded Boardmount Headers, 159 Series
- Available in 3M's unique "sword package," which helps to streamline the termination process, can reduce unnecessary process steps and can also improve termination cycle time
- 30µ" and 15µ" gold contact interface versions

The Shrouded Boardmount Header, 159 Series provides a reliable cable-to-board interface in multiple configurations for design flexibility and offers several different product options:

- Very small PCB footprint helps conserve valuable board real estate
- Friction latching system for increased socket holding force when used with the 3M Ribbon Cable Socket 158 Series
- Available in straight and right angle thru-hole, and straight surface-mount configurations
- 30µ" and 15µ" gold contact interface versions



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For further information, contact Thermosleeve USA, 12753 Moore St, Cerritos, CA 90703. Phone 800-421-3536. Visit www.thermosleeve-usa.com.

Digicom Electronics Awarded ITAR Certification

Digicom Electronics, Inc., a technology and quality driven electronics manufacturing services company, announces that it has received International Traffic in Arms Regulations (ITAR) certification. ITAR is a set of United States government regulations that control the export and import of defense-related articles and services on the United States munitions list. This certification enables Digicom to manufacture products and take on projects that are marked to be under ITAR control.



"Our attention to quality and detail and our ability to handle low volume, high end products has enabled us to prototype and manufacture many military, aerospace, and government-related projects," explained Mo Ohady, general manager, Digicom Electronics. "Receiving ITAR certification expands the base of projects we can accept and gives more flexibility to our customers whose products we are already producing and who now have projects that require ITAR certification."

Digicom is also certified for ISO 9001:2008, ISO 13485:2003 medical devices quality, and quality system regulation 21 CFR 820. Products are manufactured in Digicom's new state-of-the-art facility in Oakland, California. Digicom will be exhibiting at the Design-2-Part Show in Santa Clara, CA on May 21-22 in booth #407. For more information or to schedule an appointment, contact Digicom at +1 510-639-7003, email info@digicom.org, or visit our website at www.digicom.org.

Digicom Electronics offers advanced electronics manufacturing with "Made in the USA Quality" that fits the needs of larger enterprises while at the same time providing the benefits and individual attention needed to serve start-up companies. Digicom collaborates in all aspects of the process from the design to the final, fully compliant product. Material procurement and management services include planning, purchasing, expediting and warehousing of components and materials. Digicom is certified for ISO 9001:2008, ISO 13485:2003 medical devices quality, quality system regulation 21 CFR 820, and ITAR certification.

BURNDY Promotes Mike Smetana to Central Regional Sales Manager

BURNDY®, a leading manufacturer and provider of connector solutions to the industrial, energy, construction, telecommunication, petrochemical, data center, and transportation industries, is pleased to announce the promotion of Mike Smetana



**Mike Smetana, BURNDY
Central Regional Sales Manager**

to Central Regional Sales Manager. Mike assumed his role on April 1, 2014 and reports to Warren Jenkins, Vice-Presi-

dent, Sales and Marketing.

Mike joined BURNDY in July 2011 as a Field Sales Representative on the Chicago Sales Team. He has helped deliver excellent results in the market where BURNDY has seen very strong growth since 2011. Mike has been very active in selling new and focused products including thermOweld®. He has worked hard to improve our Distribution Channel and has enjoyed good success in some key vertical markets.

Previously, Mike was a District, then Regional, Sales Manager with Klein Tools. He led the Mid-West Region and managed both factory-direct and manufacturers' representatives. Mike also handled both Crescent Electric and Border States as National Accounts for Klein.

Mike holds a BBA from the University of Iowa. He and his family live in Darien, IL (Chicago Area).

For further information visit www.BURNDY.com

APPLICATORS / CRIMPING PRESSES / TOOLING



Mini
Left to Right



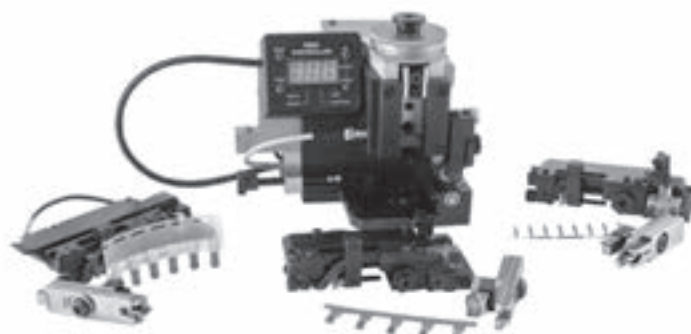
Mini (2 Post) Air
Left to Right



Heavy Duty Slide
Quick Change Tool Pack



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Quick Change Tool Packs
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Mini
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NEW ODYSSEY CRIMPING PRESSES



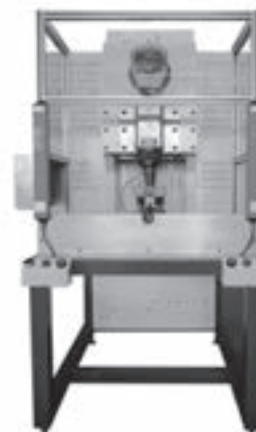
2 Ton



4 Ton



8 Ton



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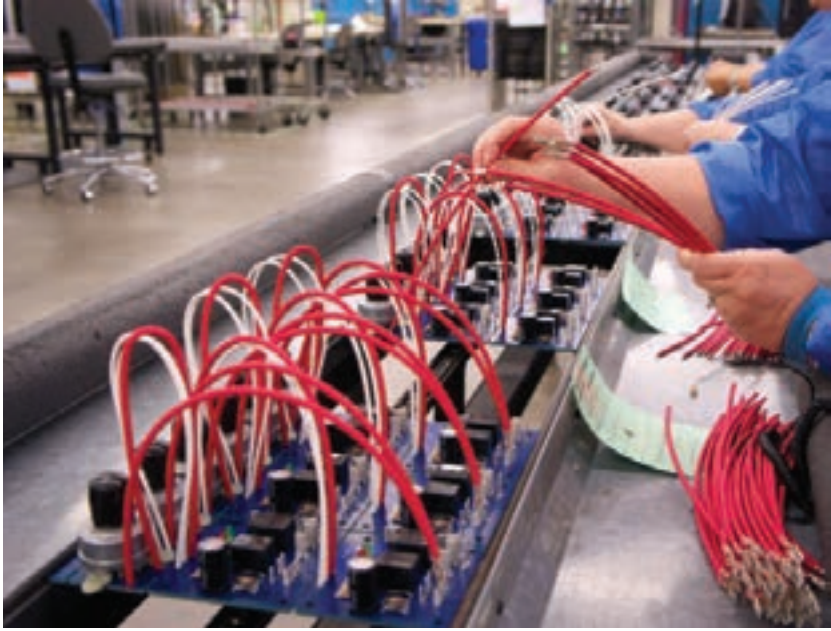
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WIREwisdom™ ANIXTER

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

Continued from page 31

SUMMARY

One or more of the following methods can be used to minimize the potentially negative effects of insulation and jacket shrinkback:

- Choose an insulation (or jacket) material that is inherently less prone to shrinkback.
- Increase the amount of friction between insulation and conductor, i.e., increase the wire's insulation strip force requirement.
- Employ splice and termination devices that are equipped with insulation support crimps.

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NEWS PLUGS continued



Delta Group Electronics and Mesa Secure Sign Marketing Agreement

Delta Group Electronics, Inc. and Mesa Secure Acquisitions, LLC announced today that they have signed a Joint Marketing Agreement whereby they will combine their collective knowledge and expertise to provide product design, engineering support and EMS services to

U.S. government and industrial customers with communication systems products. Mesa Secure has established a strong reputation of providing design and engineering solutions for the United States Department of Defense and other prime government contractors. Delta Group provides a full complement of EMS services in California, New Mexico, Texas, Arkansas and Florida.

"We are honored and excited to work with Mesa Secure in this joint endeavor. Its team of engineers has created a strong relationship with the U.S. military by com-

Amphenol

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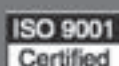
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pleting a series of design solutions for military communications systems," said Harry Mueller, President of Delta Group Electronics. David Grooms, Chairman of Mesa Secure commented that "Delta Group has the financial strength, quality systems and assembly capacity that are needed for our success. Wherever these opportunities come about, they have the geographic coverage that is needed in working closely with our customers."

Bill West, currently General Manager of Delta Group's California operations, will manage the relationship between Delta Group Electronics and Mesa Secure. David Grooms (currently Chairman of Mesa Secure) will lead the marketing effort for both Delta Group and Mesa. Grooms brings along significant industry experience having previously been President of Kyocera America, Inc. and Chief Operating Officer of Datron World Communications, Inc.

Founded in 1987, Delta Group Electronics, Inc. is a full-service Electronic Manufacturing Services (EMS) company offering low and mid-volume turnkey services for its customers in the aerospace, defense, medical and commercial industries. Based in Albuquerque, New Mexico, the Company also has assembly operations in San Diego, Dallas, Fayetteville, Arkansas and Rockledge, Florida with administrative offices in St. Louis. The Company's quality management certificates include ISO13485, AS9100C and ISO 9001:2008. For more information about Delta Group, visit its website at www.deltagroupinc.com.

Mesa Secure Acquisitions, LLC is located in Carlsbad, California and is currently celebrating 10 years of delivering best-in-class communication systems for the U.S. military and prime government contractors. For more information on Mesa, visit its website at www.mesasecure.com or contact David Grooms at dgrooms@mesasecure.com

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Amphenol Industrial Products Group, a global leader in interconnect systems, now offers a connector family with 1.5 mm socket contacts featuring Amphenol's RADSOK technology. Tru-Loc's rugged, compact, thermoplastic construction makes it ideal for use in harsh environments where high vibration and caustic fluids are present.

Offered in a 2-way, 4-way or 6-way plug and receptacle in-line system, Tru-Loc is rated to 13 Amps continuous (with 16 gauge cable). It is designed to perform in demanding environments such as under valve covers on diesel engines to mate to fuel injectors. It can withstand vibrations up to 32 Grms, and the interfacial seal is molded out of a fluoroelastomer material to withstand exposure to many chemicals.

This cost-efficient Tru-Loc series has an operating temperature range of -40°C to +125°C, with higher temperatures rated to 150°C available upon request. Tru-Loc has an IP67 rating when mated. The connector's stamped and formed terminals are RoHS compliant and can crimp to wire gauges ranging from 0.8-1.3 mm².

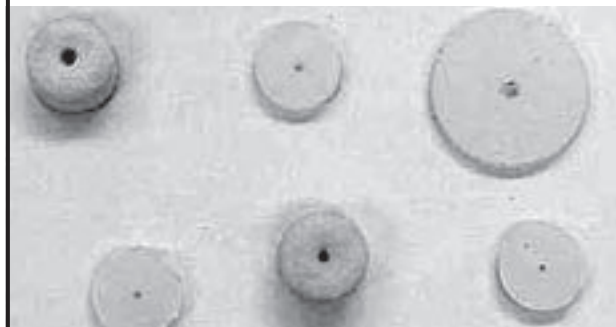
Tru-Loc can be designed by Amphenol's engineering team to mate to a device, splitter, sensor, as well as become a pass through connector, or be tailored to customer specifications upon request.

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Shalls and Shall Nots of Hand Tool Calibration

By Kellie Coble
Pressmaster Inc

The IPC/WHMA-A-620 is an industry consensus document that describes materials, methods, tests, and acceptance criteria for producing crimped, mechanically secured, or soldered interconnections and the related assembly activities associated with cable and harness assemblies. Compliance to this specification

requires each manufacturer to maintain control of tools and equipment used for crimping, cabling, wiring, measuring, soldering, and inspecting cable assemblies:

- Select tools appropriate for intended function
- Tools shall be cleaned and properly maintained
- Tools shall not be physically damaged
- Uncalibrated tools are prohibited in work area

- Documented maintenance schedules are required
- Maintain calibration and tool maintenance records

tion intervals are based on the type of tool and records of the tool's calibration. Records shall be maintained that document the calibration; and tools should be labeled, as a minimum, with the date of calibration, the calibration due date, any limitation of use, and the tool identification. Regardless of the manufacturer's documented control process for validating crimped connections, crimp tools shall not be used longer than 30 days between verification testing and still meet the requirements of IPC/WHMA-A-620 Class 1/2/3.

Visit Pressmaster AB online www.pressmaster.com

Kellie Coble is a mechanical engineer with more than 25 years manufacturing experience in various industries, including aerospace, commercial, industrial, and automotive. She is a Certified IPC Specialist and has worked with many applications involving crimping, and electro-mechanical interconnections. As manager of applications engineering with Pressmaster AB, a leading Swedish supplier of customized hand tools, Kellie serves as liaison between sales teams, engineering development, and quality departments to deliver new development tooling solutions for the professional end-user in various industries and markets. She may be reached at k.coble@pressmaster.se

Measurement standards used for calibrating tools are traceable to National Institute of Standards and Technology (NIST) or other National or International standards. Calibration of the tools shall be performed in an environment compatible with the environmental requirements of the tools. The cable harness manufacturer shall have a documented calibration system in accordance with ANSI/NCSS Z540-1 or ANSI/ISO/IEC 17025; in which the goal of the record system identified is to retain sufficient information to repeat a calibration under identical conditions. The identity of the personnel responsible for the calibration should be part of the records and all records should be safely stored for a designated period of time. Laboratories should maintain records of original observations with sufficient information to establish an audit trail.

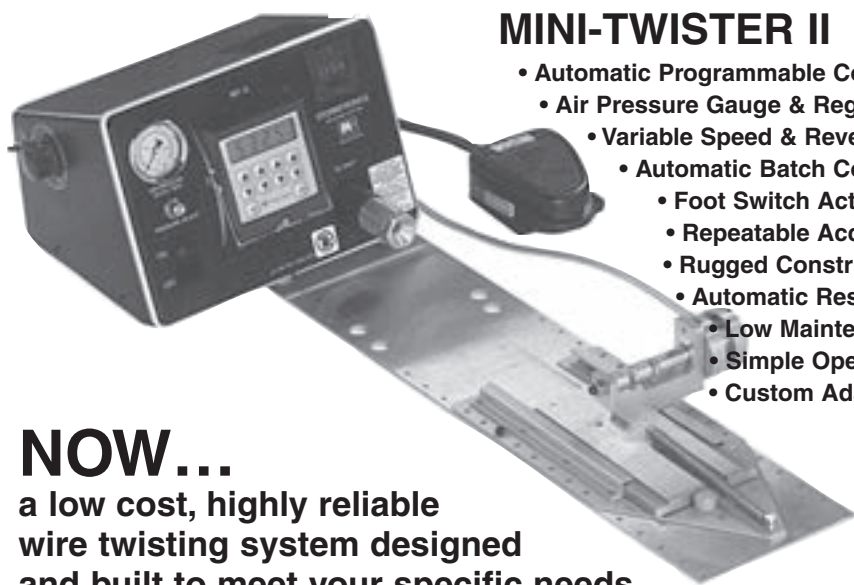
Torque tools, measuring equipment, mechanical and electrical test equipment (including contact retention testers) shall be calibrated. Crimping tools shall be calibrated and validated using a documented process. Calibra-

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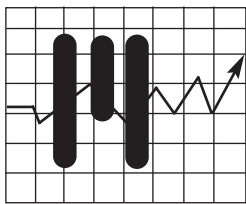
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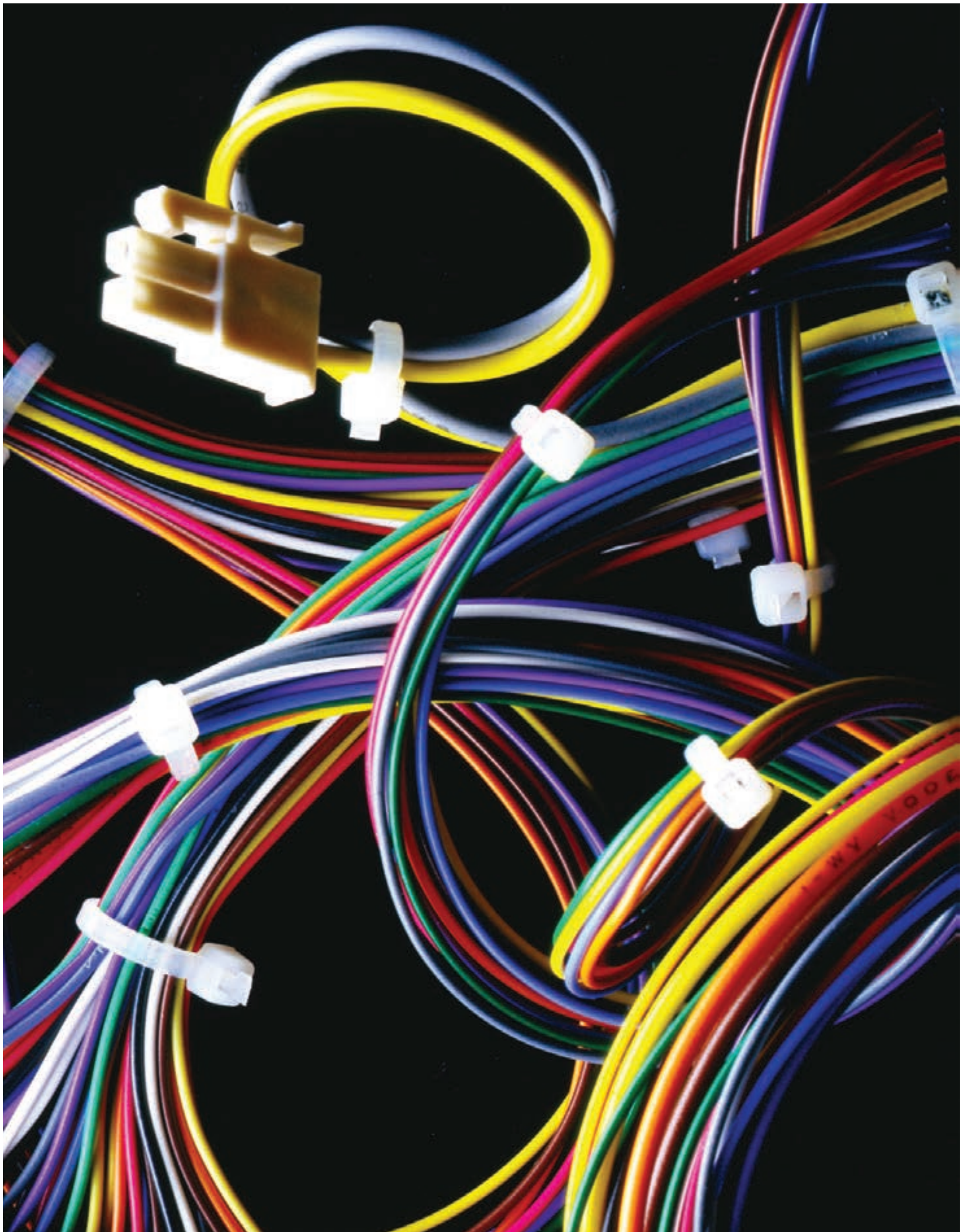
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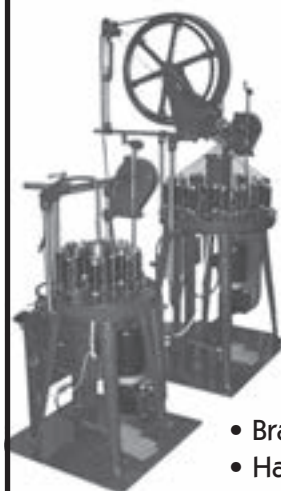
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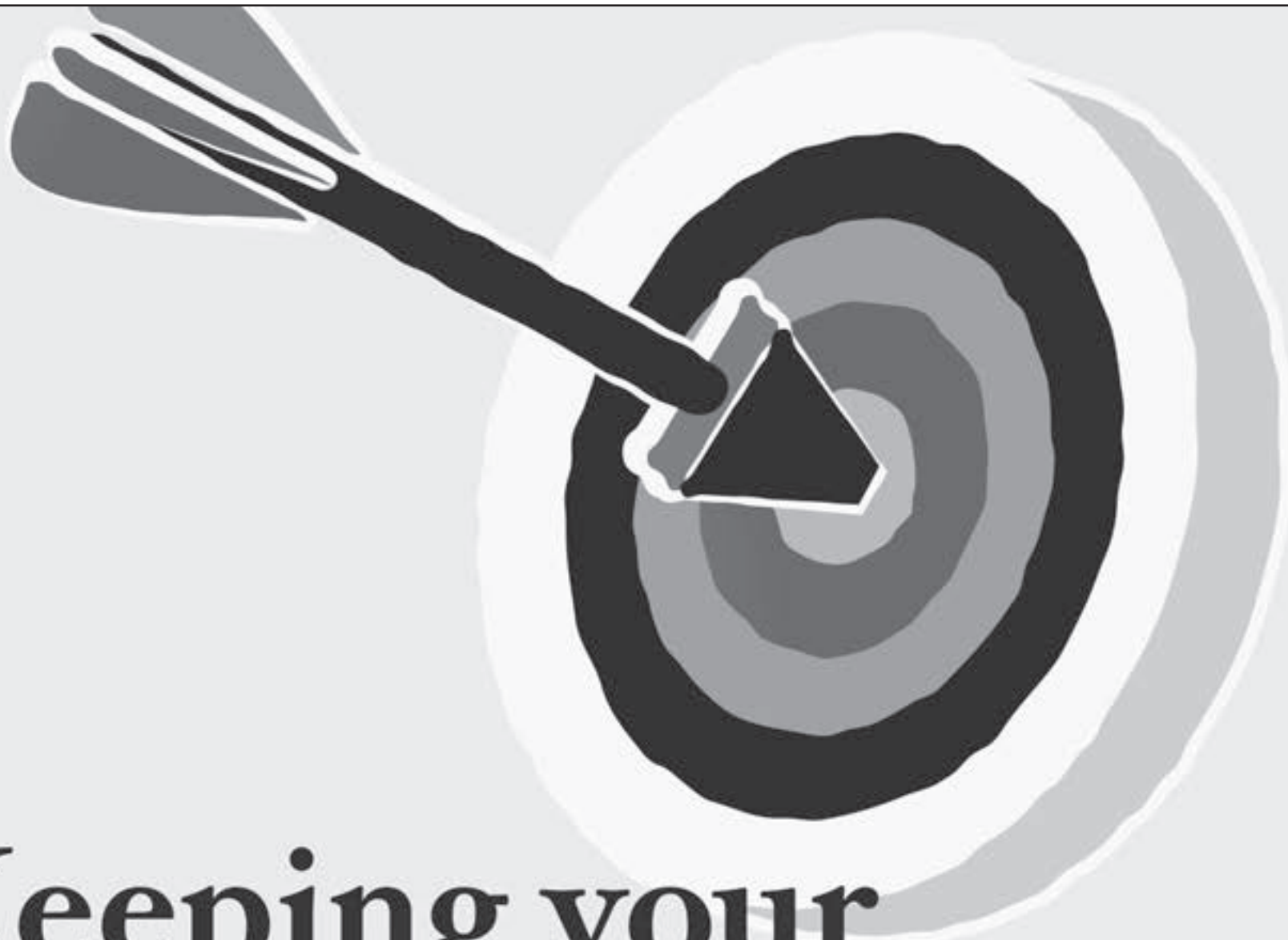
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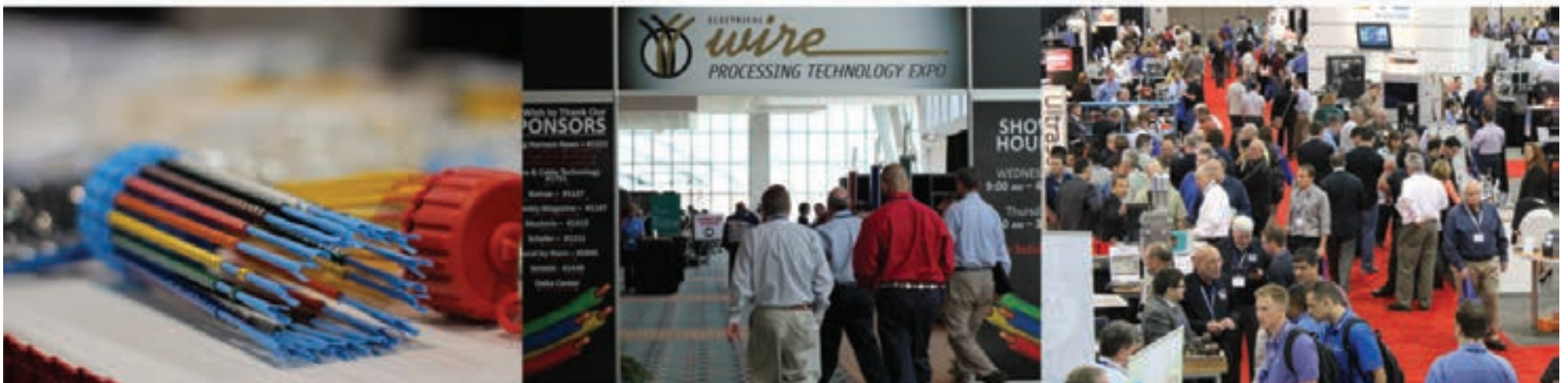


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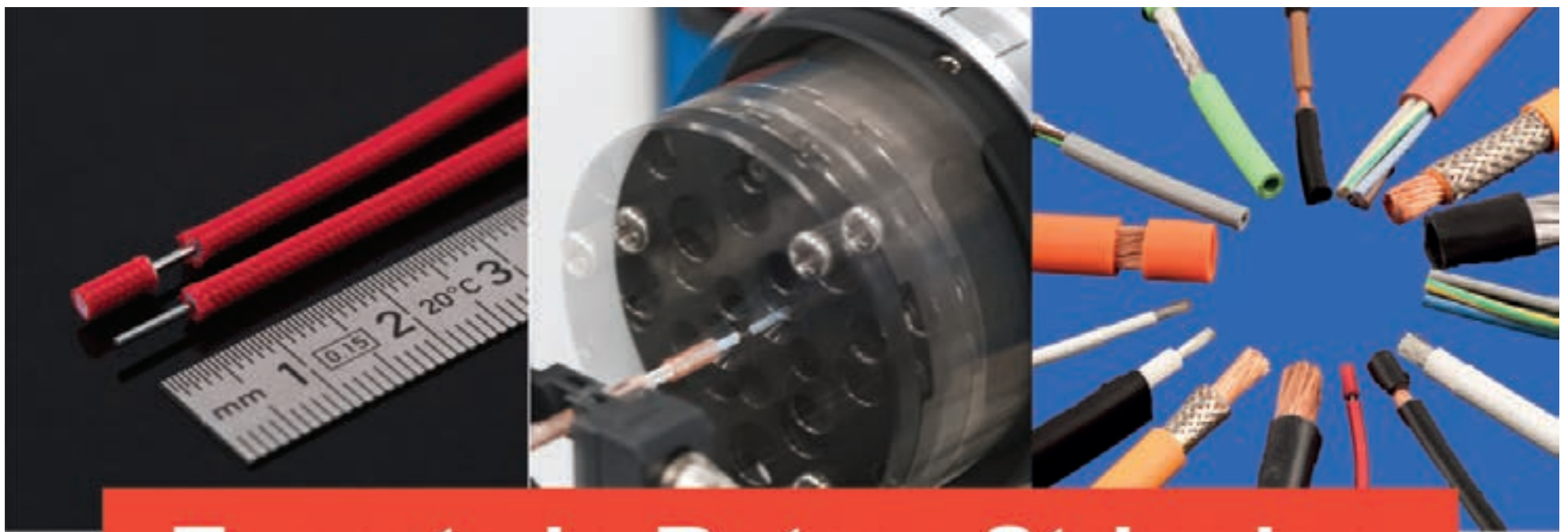
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