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- Choosing the Right Heat Shrink Product for the Job
- Leadership Requires More than 360 Degree Vision
- Wire Wisdom - Fire Testing



# 2011 Electrical Wire Processing Expo

The 10<sup>th</sup> Annual Electrical Wire Processing Technology Expo was held May 18th and 19th at its permanent home in the Frontier Airlines Center in beautiful downtown Milwaukee. The show was booming as more than 1700 attendees from around the world met over 100 exhibitors showcasing tools, processing equipment, test platforms, and other materials used in wire and cable harness assembly. The show has become the single biggest gathering of wire processing equipment manufacturers and harness fabricators in North America.

The show hosted five seminars highlighting new technologies and intensive

technical forums given by highly talented speakers from all facets of the industry. Minnesota Wire demonstrated some of their cutting-edge conductors and shields using their proprietary carbon nanotube structure, and discussed possible market applications. Representatives of USCAR from Ford Motor Company revealed the use of ISO metric wire on all new platforms, and discussed industry standardization. Schleuniger's presentation on crimping quality was likely the best illustrated and presented educational platform on crimp quality management ever presented to the industry. WCM Associates gave an excellent presentation on Value Stream Mapping and

## Non-Traditional Conductors & Shields – Minnesota Wire

Joe Tito  
Wiring Harness News

Representatives from Minnesota Wire were on hand at the recent Wire Processing Technology EXPO to host a seminar on the innovative non-traditional conductors and shields they are now producing. Chip Laingen, Director of Communications and R & D, and Brian Wagner, Director of new Market Development at Minnesota Wire, were on hand to describe their cutting-edge conductors and shields. They also discussed the market opportunities for these products, and invited feedback on the processing challenges of these new materials.

Minnesota Wire has been manufacturing wire, cable, and interconnect assemblies since 1968. Their story of innovation, however, started about eight years ago. Laingen stated, "As a company, we looked at our industry in terms of what was evolving in wire, and wire processing." After quickly concluding that "not

much has changed with wire for about 100 years," Minnesota Wire began to look at federally funded R & D programs that were available. They discovered the military was providing funds for development of new wire and components that were lightweight and invisible to radar. They then began the arduous process of applying for the funding. This, Laingen stressed, was the best way for Minnesota Wire to become innovative and globally competitive. He advised that "the Federal Government is the best venture capitalist - they let you keep your IP."

The first program they won, through an SBIR R & D program, was the Smart Connector Prognostic Health Management Wire program for an F16 upgrade. "With over 116 miles of wire in these legacy (older) aircraft," he explained, "there was a big problem diagnosing faults." Using Spread Spectrum Time Domain Reflectometry, their engineers

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Staff from Artos Engineering and Expo Productions celebrated Artos Engineering's 100th Anniversary at the Electrical Wire Processing Expo.

piqued the interest of the audience discussing ways to go "lean" with the administrative function. Rennsteig Tools rounded out the schedule presenting their new self-monitoring "Smart" indent crimp tool that boasts the ability to be calibrated quickly by the user. The seminar room was sponsored by *Wire & Cable Technology International*.

Visitors were also treated to great amenities that added to the comfortable atmosphere. *Wiring Harness News* sponsored a Business Center, Cyber Café, and a Massage Area for the weary. There were morning and afternoon snack and beverage breaks sponsored by Komax, Shafer, Mechtrix, and the traditional Thursday Bloody Mary Bar was sponsored by Mecal By Starn. Lobby coffee both days was compliments of the Wiring Harness Manufacturer's Association (WHMA).

Exhibitors to this show are able to show a great return to their trade show marketing expenditures, while enjoying

some royal treatment in the process. *Assembly Magazine* treated them to a Beer-N-Brats party on Tuesday, the day of set-up. The Frontier Airlines Center and *Wiring Harness News* had lavish breakfasts for exhibitors on the 17th and 18th respectively. *Wiring Harness News* and Artos Engineering held a wonderful VIP party on Wednesday with plenty of music, food, fellowship and fun.

*Wiring Harness News* caught up with exhibitor Phil Hulstedt of Mechtrix Corporation at the show. Hulstedt was most instrumental in getting the show started, and related his story. Some of the large shows that previously hosted wire processing equipment manufacturers were expensive, and began to gravitate away from the industry. As Hulstedt related, "I called Bucky Mueller, Pete Woboril, Jim Sopp, and John Olsen and said 'look, we have this wonderful new exhibition center here in Milwaukee -

Continued on page 3

## Choosing the Right Heat Shrink Product for the Job

Grayline Inc.

The following information will help you determine what type of heat shrink product is most appropriate for your application. It will serve as a step-by-step guide to assure you that you're buying the correct product, and it will help you to identify the most cost-effective solution while ensuring that what you buy is going to meet your needs. In this section, the basics of heat shrink tubing are discussed.

### How Does Heat Shrink Tubing Work?

Heat shrink tubing is manufactured using a two-step process. The first step involves standard extrusion procedures, after which a secondary process makes



the tubing heat-shrinkable. Although the details of this secondary process are proprietary, heat and force are used to

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OF WIRE  
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INSIDE

JULY/AUGUST  
2011

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The show has become the single biggest gathering of wire processing equipment manufacturers and harness fabricators in North America.

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Minnesota Wire presented a seminar at the Electrical Wire Processing Expo on the innovative non-traditional conductors and shields they are now producing.

1 **Choosing the Right Heat Shrink Product for the Job**

Grayline Inc., of Waukesha, Wisc. provides readers with a step-by-step guide to assure you that you're buying the correct product for your application.

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Wire Processing Expo

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we should try to get them interested in doing a show for just our industry,' and they were all interested." Hulstedt called the Frontier Airlines Center (previously the Midwest Airlines Center) and was able to raise their interest. The group sat down with Rick Freiberg from the Center and explained their idea of a smaller, well focused show. Freiberg was able to present the idea to management at the Center and, together with Jay Partington of Expo Productions, the show became a reality.

From Hulstedt's perspective, two things stand out about this show: "First, from the exhibitor point of view, not only is the cost relatively low, but the cooperation we get with the various tradesmen at the Frontier Airline Center is great. You have exhibitors falling all over themselves telling you what a great experience it is. It's one million percent better than what we experienced at the larger venues throughout the country. The second thing that's been a wonderful surprise is how much our customers have enjoyed coming to Milwaukee. It's safe. You can walk to a good restaurant, and hotel rooms are half the price of rooms of competing cities. The work rules and influences in the larger venues detract from the overall experience, and I'm glad we were able to build something without those distractions. Every-

body has done a good job and the exhibitors and attendees have both benefited."

His concluding remarks were equally complimentary: "This is a classic example of a show where quality is way more important than quantity. The vast majority of attendees are decision makers who have the ability to make purchasing decisions. There may only be about 1700 attendees, but every one of them is worth talking to. There aren't people there collecting brochures just to go back and show their boss they were busy that day."

The Electrical Wire Processing Expo show has grown steadily since its inception in 2001. The Milwaukee show has become the de-facto showcase in the industry for small manufacturers of prototype tools, to large manufacturers of high volume equipment. The conference is expected to be even bigger in 2012 with some coil winding vendors also scheduled to exhibit.

If you missed the show this year, it is imperative that you put it on your schedule for May 9th and 10th, 2012. For more information on exhibiting, or to be placed on the attendee mailing list, contact Cheryl Luck, Sales Manager, at [cheryl@epishows.com](mailto:cheryl@epishows.com).

(See photo coverage of the show on pages 30-31)

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**MANAGING EDITOR**  
Marilyn Magowan  
[marilynmagowan@yahoo.com](mailto:marilynmagowan@yahoo.com)  
**ADVERTISING/CIRCULATION MANAGER**

Kathy Freund  
[kfreund2000@yahoo.com](mailto:kfreund2000@yahoo.com)  
**INTERNET**  
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Wiring Harness Contact Information:

Marilyn Magowan - Managing Editor  
Phone 262-394-5558 • Fax 877-275-5916  
[marilynmagowan@yahoo.com](mailto:marilynmagowan@yahoo.com)

Kathy Freund - Advertising/Circulation Manager  
Phone 815-337-7885 • Fax 888-709-8179  
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## 7 Mile Solutions Inc. Acquires AMTI



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**B**ob Curran, a Cable Assembly and Wire Harness industry veteran of over 23 years and founder of 7 MILE Solutions Inc., recently acquired AMTI, a leading global manufacturer of precision tubing cutting and marking machines, shrink tubing, material curing ovens, and custom automated assembly machinery.

"As a former customer of AMTI, I was familiar with their high quality products, exceptional customer service and comprehensive technical support. AMTI (a former division of Maxant Technologies Inc.) has a well established track record and reputation as a market leader. Our tenured team is intimately familiar with the needs of our customers and is its greatest asset. We are poised for growth and will be working with our strategic customers/partners to further expand

on our world class product offering and our custom engineered automation solutions".

Curran founded Conectec RF/Conectec International a TS16949 registered in 1996. Conectec was located in Hoffman Estates and had provided RF/Coax interconnect and assemblies to the Aerospace, Automotive, Computer, Medical, Military, Test Instrumentation and Wireless Communications industries.

He started his career with NEP Electronics a regional value added distributor in Wood Dale Illinois where he was introduced to value-added assembly. He later moved to The Phoenix Company of Chicago, a RF connector manufacturer and assembler of RF/Coax cable assemblies.

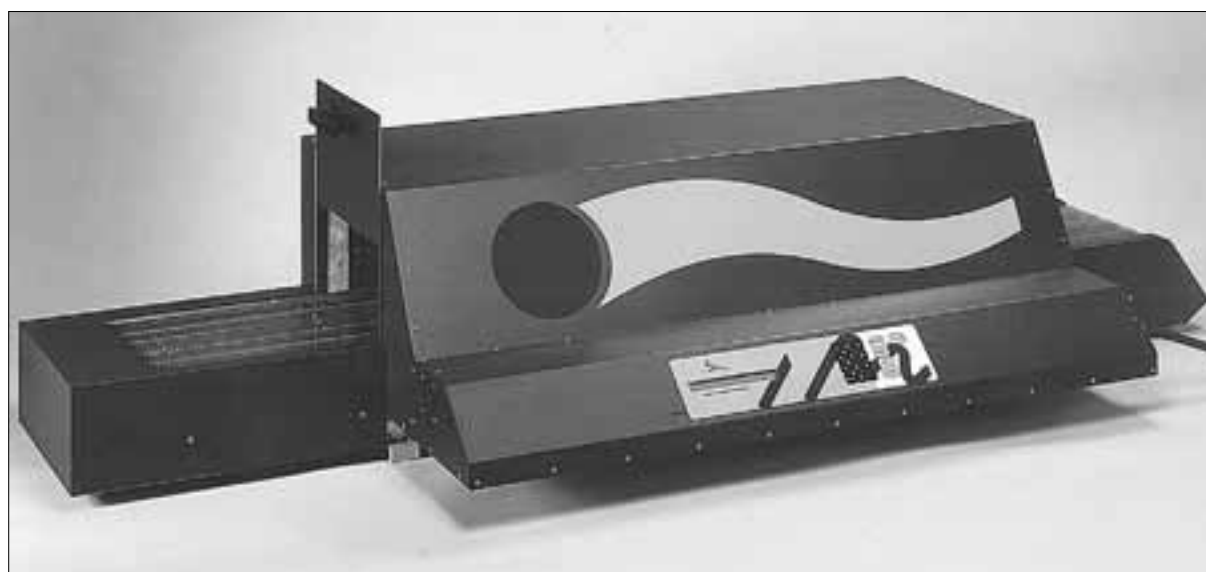
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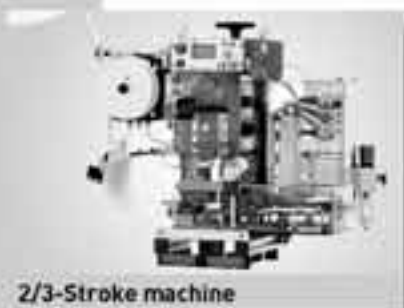
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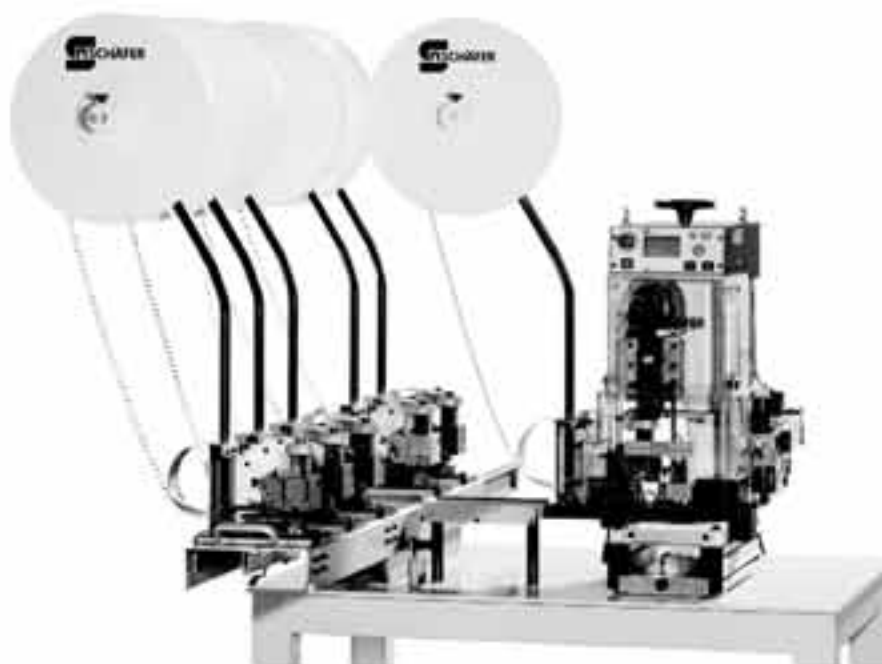
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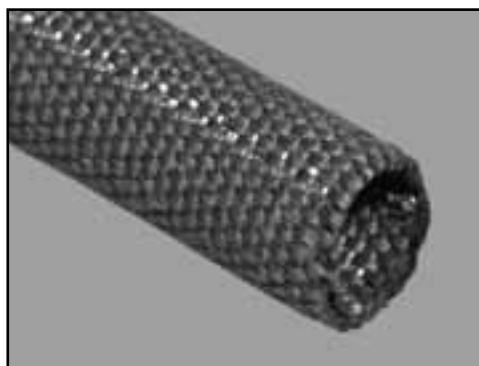
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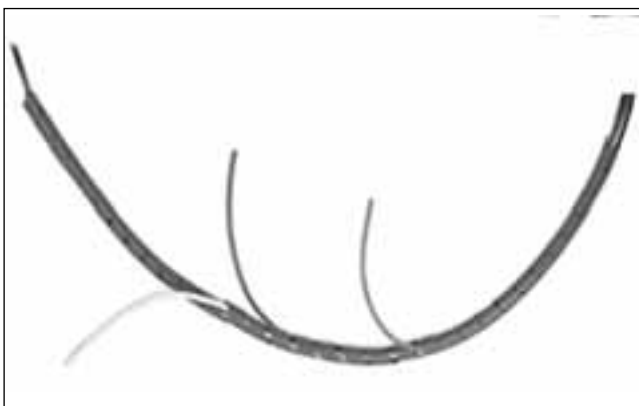
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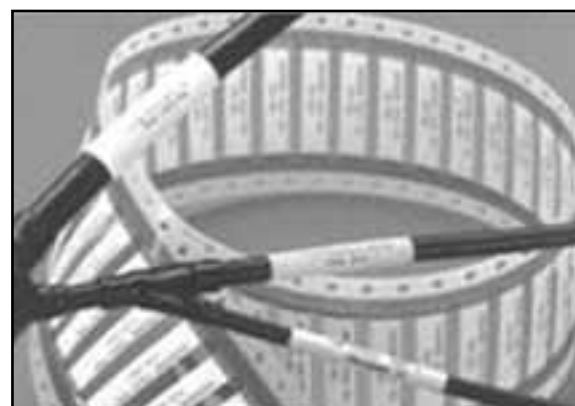
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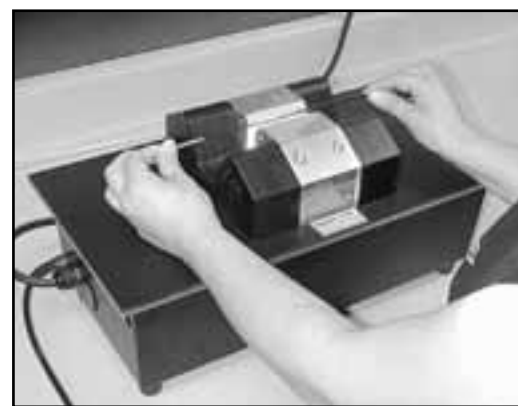
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# Leadership Requires More than 360 Degree Vision

By Paul Hogendoorn

Leaders need 360 degree vision, and then some. I'm two weeks into a six month sabbatical with the goal of setting the company's future course, but I find I can't properly look into the future without first reflecting on the past. A lesson I learned in a high school orienteering class many years ago is that you can't be sure of your direction unless you know for sure what point you came from and what point you are heading toward.

Looking forward is what most leaders do instinctively. It's the reason that many of them are leaders - they are looking ahead at where they want to be, not satisfied with where they currently are at. Often they look forward into what appears a fog to others, but they are fixated on a point on the horizon that they are aiming for. In their mind's eye, they have a picture of what their company looks like 2 years, 5 years and even 10 years off. Without a forward looking perspective, it's tough to really lead.

Leaders also have to look to their left and their right with regularity. Looking to one side, they see their competitors, alliance partners, customers and suppliers. It's important to know who your competitors are, not to copy them or follow them, but to make sure you always understand what differentiates them from you in the marketplace. And it's important to know where your alliance partners and suppliers are too. You need



Paul Hogendoorn, OES Inc.

to be on the same page with them.

Looking to the other side, many leaders find their primary resource network: other leaders. No one really knows the challenges and understands the true motivations of leadership more than other leaders. Over the 30 year course of my career, I have often sought the advice and counsel of other company leaders, and others have sought mine. Things are often not as black and white as others believe them to be. The motivation for most leaders is more than simply profit or the success of their companies - they want to make a difference, either in business, in other people's lives, or in the world. It's why their lives have always gravitated towards leadership. The challenges are often deeper than the symptoms that are evident on the surface, and

these are the things that keep them awake. Driven by unique motivations, and pondering the challenges at deeper levels, often leaves a leader needing the understanding company of other leaders.

The leader also needs to look behind as well. If no one is following, then you are not really leading. It's easy to go forward full speed ahead when you are fixated on a goal you believe in, but do those that are following believe it too? The leader has to be able to gage the level of buy-in by his or her team, and then perhaps adjust the scope of the vision in order to achieve the necessary buy-in. The leader's long term vision

doesn't have to change, but the scope of what is shared has to be adjusted according to the team's ability to embrace and digest it. Marketing and vision-casting are not just out-of-building and forward looking activities; they are just as important internally to keep your team in lock-step behind you.

That covers the four basic directions - forwards, backwards, and to each side. But there's more than that. Leaders also need to look upward, and also inward.

Paul Hogendoorn cofounded OES and OES-A. He is a founding member and past chair of the London Region Manufacturing Council and can be reached at [phogendoorn@oes-inc.com](mailto:phogendoorn@oes-inc.com)

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tivity of iStretch® is the same as regular wire, that gauging is the same, and that it is terminated using much the same process as regular wire. When asked whether resistance changes with stretch, Wagner said, “From what we have seen very little if any.”

He also stated that iStretch® is available in a variety of temperature ranges and is the same as traditional wire in terms of weight. Because the product is at the beginning of its life cycle, it is more expensive, “but with the variety of commercial opportunities so huge, the price will come down.”

Later, at the Minnesota Wire booth, Chip Laingen expressed the desire to work with other companies developing the market potential of iStretch®. When asked specifically about licensing the technology, Laingen stated “We are exploring all options but that type of partnership is certainly a possibility.”

*Authors Note on Federally Funded R & D - A significant portion of the presentation was spent outlining ways Min-*

nesota Wire used federally funded programs to fund R & D for their innovation. The federal programs presented were: Small Business Innovation Research (SBIR), Small Business Technology Transfer (STTR), and Broad Agency Announcements. Both gentlemen saw this as the company’s path for transformation over the past several years. Through the presentation, and discussions afterwards, it became evident that this journey is almost as intriguing as the innovations themselves. To that extent, I felt this part of the story is deserving of its own feature, which will be forthcoming in *Wiring Harness News*. Mr. Laingen has agreed to speak with me regarding their learning curve with these programs, and some of the intricacies of the application process.

In the mean time, he suggested a web site to view current funding opportunities: [www.zyn.com](http://www.zyn.com). This site is provided by Zyn Systems which is a technology and management consulting firm specializing in helping companies with federally funded R & D programs.

# WIRING HARNESS NEWS

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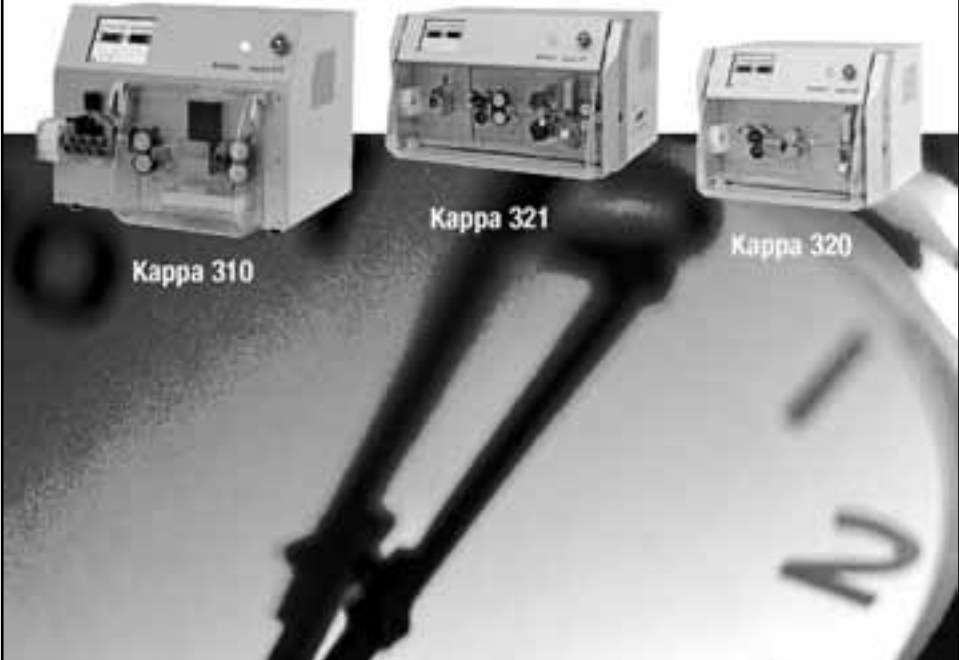
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# ANIXTER

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

## Wire Strippability

The ease with which a slug of insulation can be cleanly stripped from an insulated copper or aluminum wire is a characteristic that can impact the efficiency of the stripping process as well as the quality of the termination. Wire strippability is often taken for granted, but it quickly becomes a major concern if difficulties arise—especially with high-volume production. The characteristics of wire and automated stripping equipment sometime interact in subtle and complex ways. As a result, troubleshooting can be difficult and time consuming. Breaking an issue down into its component parts is usually helpful in understanding and correcting a problem. Below is an overview of some of the key characteristics that influence wire strippability.

### Strip Force

The strip force of an insulated wire is the axial force (in pounds or Newtons) required to remove a given length (for example 0.4 inch or 10 mm) of insulation from a conductor in preparation for termination. The amount of friction or adhesion between the insulation and the copper conductor must be low enough for the slug to be easily and cleanly removed, yet high enough so the remain-

ing insulation does not slide on the conductor during stripping or during subsequent processing. Industry standards provide test methods to measure this force.

A typical strip force measurement method consists of the preparation of a sample of wire with a certain length of insulation removed from one end of the wire while leaving a longer length of insulation undisturbed. The uninsulated end of the wire is then inserted through a hole in a metal plate that is slightly larger than the copper conductor. The remaining length of insulation is pulled from the conductor by pulling the conductor through the metal plate using a tensile testing machine pulling at a specified rate. The maximum force reached during stripping is measured and recorded.

The strip force of a wire varies with length of slug, wire size, insulation type, type of stranding, etc. but is typically in the range of 5 to 25 lb. (22 to 111 Newtons). Wire manufacturers can control strip force within reasonable limits by careful control of conditions during extrusion of the insulation including conductor surface cleanliness and texture, conductor preheat, extrusion temperature, extrusion pressure, "drawdown," cooling rate and so forth.

*Continued on page 12*

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# ANIXTER

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

Continued from page 10

**Cut-Through Resistance**

The cut-through resistance of a wire insulation (or jacket) polymer must be high enough to withstand the mechanical forces of installation and use and to comply with industry standards. At the same time, it must be low enough to permit the knives of a stripping machine to reliably cut the material. PE (polyethylene) and XLP (cross-linked polyethylene) are common materials with relatively high cut-through resistance, while EPR (ethylene propylene rubber), silicone and polyurethane have relatively low resistance. PVC (polyvinyl chloride) typically has a cut-through resistance somewhere between these two extremes. The knives of the stripping equipment must, of course, be sharp enough to cut cleanly through the insulation or jacket and must also be properly adjusted so the insulation is cut all the way through without nicking the copper or aluminum conductor.

**Crush Resistance**

As with cut-through resistance, the crush resistance of wire insulation must be high enough to withstand installation and in-service mechanical forces and to comply with industry standards. The crush resistance of a wire must also be high enough to withstand the force

applied by the grip of automated stripping equipment. This force is often adjustable and must be set high enough to prevent slippage as the insulation slug is pulled from the copper conductor, yet low enough so as to not damage the wire insulation. The crush resistance of a wire depends primarily on the type of insulation or jacket material, but also on the type of conductor stranding. Wires with finely stranded conductors typically have better crush resistance because the conductor is “mushier” than a coarsely stranded or solid copper conductor.

**Insulation Hardness**

Insulation (or jacket) hardness can also affect strippability. Soft, rubbery insulations such as EPR, silicone or CSPE can buckle and thus bind as they are being pulled from the conductor if adhesion to the conductor is too high, especially if the strip length is long. This phenomenon is seldom an issue with harder polymers such as PE, XLP and Teflon®. Polymer hardness is often measured and reported using a method called durometer hardness testing. Details of this test method are given in ASTM Standard D2240.

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# Balancing Cost and Complexity in Automotive and Aerospace Electrical Design

**John Wilson**  
Business Development Manager,  
Integrated Electrical Systems  
Division, Mentor Graphics Corp

In 1909, Henry Ford famously announced that his company would build only one type of vehicle (the Model T), and that customers could have their cars painted in any color... “so long as it is black.” So began a century-long saga of escalating options, choices, and complexity. By 2009, Mr. Ford’s company offered ten million configuration options (among them, black paint) for its popular F150 pickup truck—just one of many

models in the company’s product line.

Complexity is now the key challenge for vehicle design on every scale. Technology delivers ever more functionality, which means more features and capabilities that must be powered, monitored, controlled, and designed. A growing range of (mandated) active passenger restraints and emission controls must be interconnected. And amid all this, vehicle makers must offer aggressive pricing levels to stay competitive.

Customer options and variants can multiply the buildable configuration possibilities by a power of 2 for each addition. A car with 20

independent options, therefore, has 220 (1,048,576) potential configurations, though in practice this number is usually reduced by astute combining of individual options.

With hundreds of options and all the resulting variants, the task of delivering a finished, proven platform design becomes increasingly costly. The designs and their variants all need to be validated. Economies of scale for manufacturing become squeezed. Inventory, logistic and obsolescence cost rise, and the creation of service documentation becomes increasingly complex.

Of course, complexity comes at a cost and this must be weighed against the competitive value of variety, since more variety means more ways to attract and satisfy customers. Is there a balance to be found? Design tools need to move beyond the automation of electrical wiring design tasks and begin to treat electrical design as one element in an overarching challenge: the management of cost.

## Cost and Complexity Implications Drive Decisions

Much of the vehicle platform design team’s electrical engineering work depends upon making fundamental decisions about architecture. The decisions must consider both the electrical variance and the marketing-related variations from product planning. Otherwise a simple “inexpensive” change can prove costly when the vehicle is configured for real customers. Figure 1 (page 16) depicts a common situation: the need to achieve a desired functional result, which in this example can be achieved either by adding new bus messages or a new ECU. Which to choose?

Adding bus messages to the bus between Devices 1 and 2 would require additional programming on these two ECUs and possibly others, and will increase the bus latency. Integrating a new ECU (Device 3) and related wiring adds parts but may require no programming. While the latter choice looks more expensive, the full cost resides in the impact of either change across the millions of variant builds defined by Prod-

Continued on page 16

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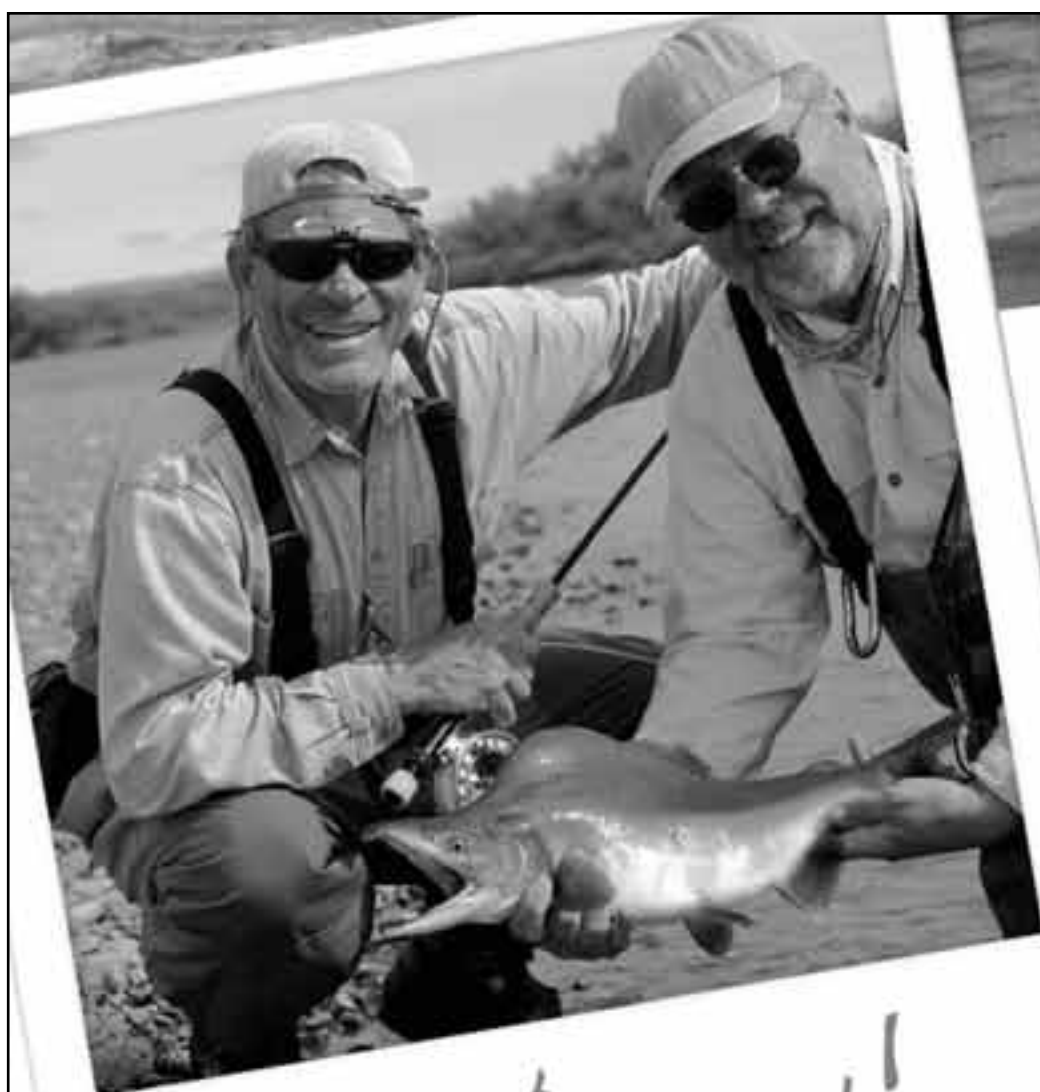
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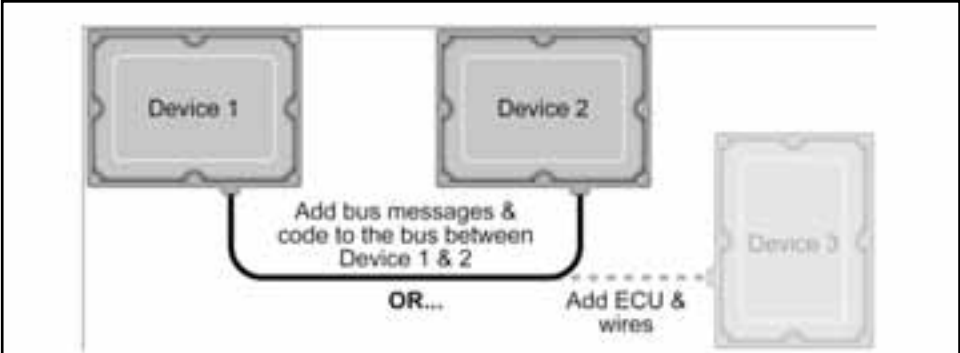
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# Balancing Cost and Complexity

Continued from page 14 \_\_\_\_\_



**Figure 1: Two approaches to implementing a function within a vehicle. The decision between these two must consider cost, weight, wiring, support, and more.**

uct Planning. Engineering decisions inevitably interact with marketing choices.

The only way to properly understand the interactions of marketing and engineering complexity is to fully model the relationships at every step in the process. Most brands offer many platforms, as implied in Figure 2. Each platform can be decomposed into several systems or domains such as electrical, interior, and body. These in turn decompose into subsystems and ultimately into individual components that may need to be engineered in one or more variants. The number of variants must be defined to ensure that a variant level is available to support every possible orderable vehicle, encompassing the 10 million configurations mentioned earlier.

Deciding the correct number of variant levels is not simply dependent on the constraints of the local system and a subsystem such as electrical wiring.

There is significant cross-dependency between systems and subsystems, signified by the arrows in Figure 2 (Page 18). For example, if a platform has three different roofline configurations, then this may require three differing electrical plans. This in turn might affect the interior details, and so on. Small feature-packaging decisions can have a big impact on the optimum number of variant levels. Finding the balance between cost and complexity is a huge task, but a study by A.T. Kearney concluded that companies can improve their profit by 3 to 5% by optimizing this balance.

### Tools and Processes in Transition

Product plans capture marketing choices: major mechanical variants, optional features, permitted feature combinations, and bundled features. Engineering architectures capture embedded software, electronics, networks, physical layout, functional imple-

mentations, and more. The two are reconciled by a process that follows a similar pattern in most companies:

- The design process begins with the platform definition and consideration of the feature content and option & variant definition.

- Then it proceeds with mechanical layout and electrical design steps that show how everything needs to be connected together from a purely electrical standpoint.

- Next, the physical wiring step maps the conceptual system connectivity onto the physical design.

The result of this effort contains all the correct wire routing, physical lengths, and more. These steps complete the wiring definition and set the stage for individual harnesses to be defined.

Unfortunately this time-consuming process makes it difficult to optimize

\_\_\_\_\_Continued on page 18

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## VALIDATION TESTING - EQUIPMENT WIRE HARNESS DESIGN

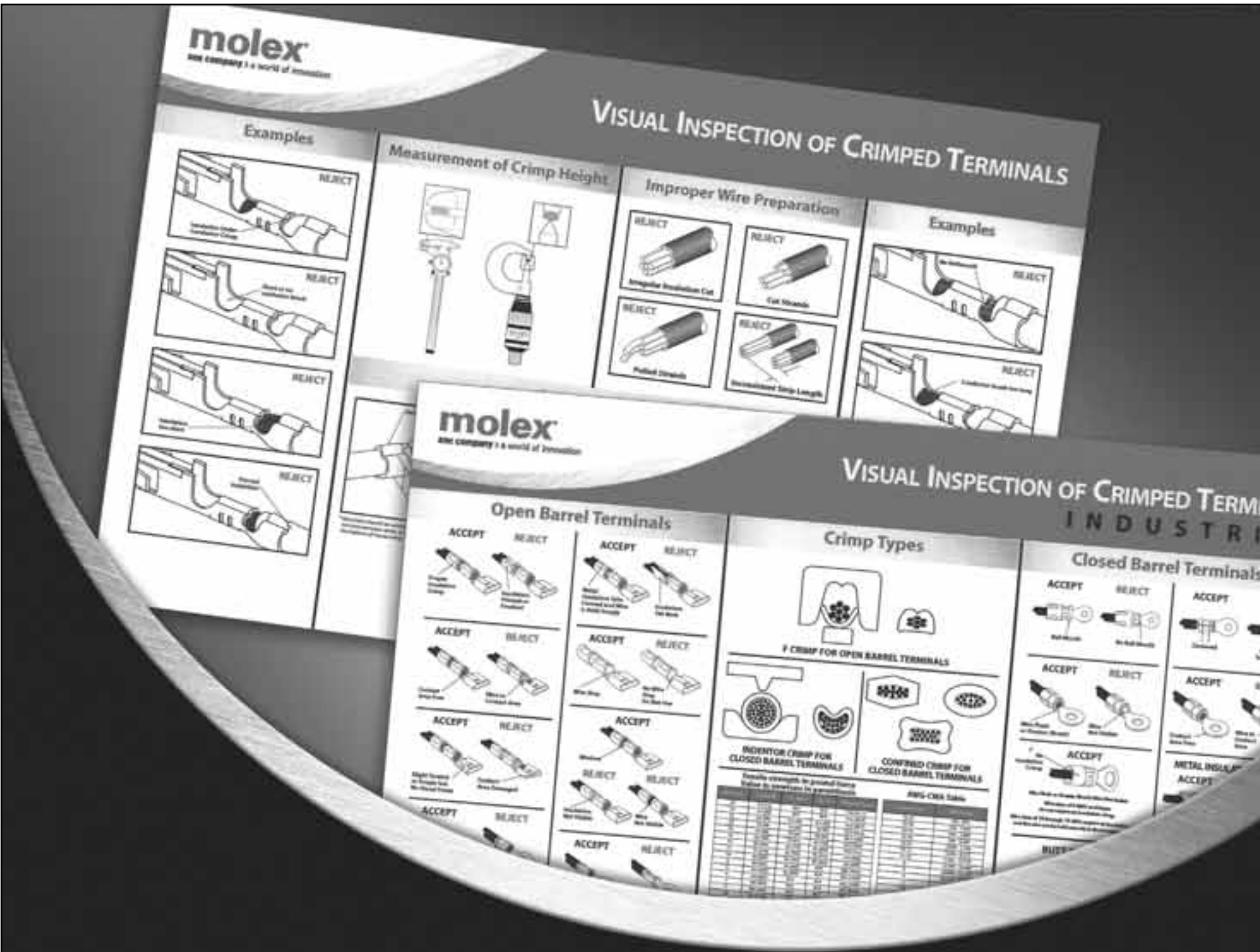
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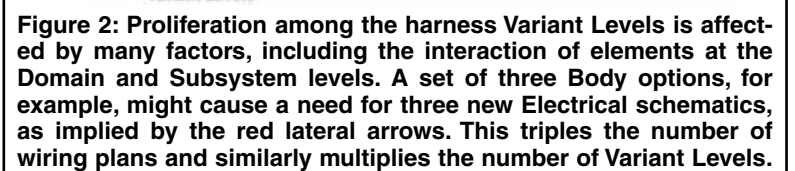
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## Balancing Cost and Complexity

Product planning tools are established in most enterprises today. Complementing the wiring design tools, product planning tools model the interactions of marketing choices such as major mechanical variants, optional features, permitted combinations, required combinations, and other factors. Planning tools capture all of the engineering detail involved in the design and use it to generate accurate cost metrics. This is the essence of balancing cost and complexity.

Continued on page 24



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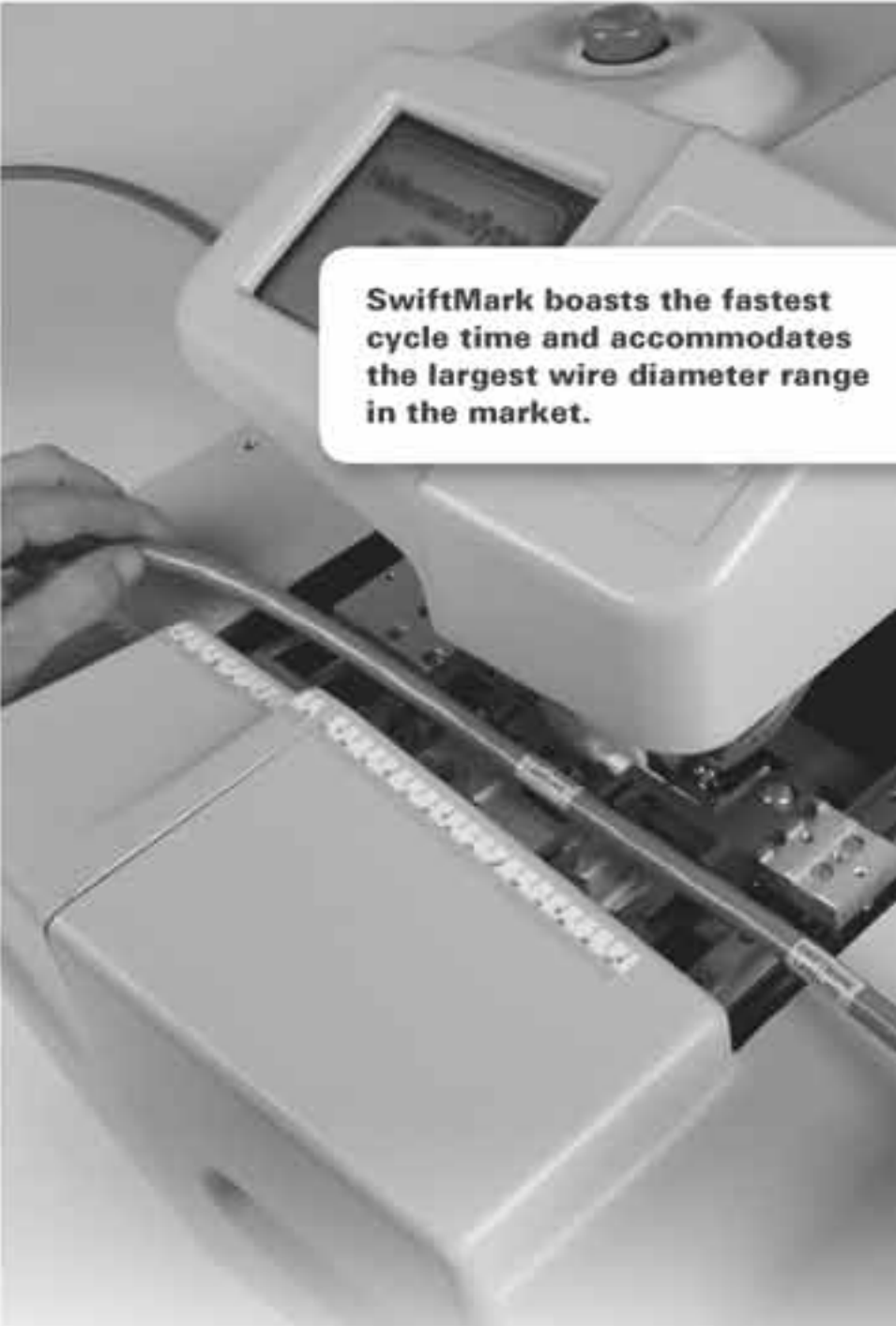
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NEWS PLUGS

Multi/Cable Corporation Announces Expansion of Manufacturing Facility

Multi/Cable Corporation, recognized as a leading manufacturer of custom made multi-conductor and multi-pair electrical wire and cable, is proud to announce a major increase in its manufacturing capabilities. A new 10,000 square foot addition will be added onto its existing facility during summer 2011.

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Multi/Cable's manufacturing process by providing space for several new manufacturing lines already purchased, awaiting installation. These improvements will allow our company to more than double our extrusion capacity. Additionally, Multi/Cable currently employs fifteen people and as many as seven new jobs may be created as a result of the expansion. Multi/Cable is thrilled that in these tough economic times it has the opportunity to expand to better meet the needs of its growing customer base.

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**Allied Wire & Cable Welcomes New Sales Reps To Locations Across the U.S.**

Allied Wire and Cable is proud to announce the addition of seven new sales representatives to its locations in New Hampshire, Pennsylvania, Wisconsin, and Nevada.

Despite economic struggles and widespread unemployment plaguing the U.S. in recent years, Allied has continued to grow its business and provide much-needed job opportunities. The past few

months have been no exception. Allied is pleased to announce the hire of seven new sales representatives to its locations across the country.

At Allied's headquarters in Pennsylvania, Jessica D'Andreamatteo, a recent graduate of the Indiana University of Pennsylvania, looks forward to the start of her career in the wire and cable industry.

Blair Dameron, another new PA representative, brings vast product knowledge to the team from his work at Fastenal. Dameron says, "Allied was one of my most reliable vendors while at Fastenal...their reliability and customer service as well as an amazing staff were things I truly believed in. I am excited to have the opportunity to join the Allied team."

Wisconsin welcomes Cory Kleebe and James Toshner, alumni of the University of Wisconsin – Milwaukee with experience in sales and marketing.

Toshner comes from a position as an Inside Account Manager with the Hunter Business Group, working with companies in the manufacturing and engineering industries.

Kleebe moves to Allied from a position as an Account Executive and Regional Marketing Manager for Skyline Displays and Marketing.

Allied's New England branch adds Stephanie Whitney, previously a Sales Manager Trainee at Bisco Industries, and a graduate of Palm Beach Atlantic University where she studied Business and Dance.


Chantay Williams and Michael Galena join Allied's newest location in Las Vegas, Nevada, opened in November 2010. Williams has a history with the wire and cable industry as a Sales and Product Manager at Arrow Electronics. More recently, she worked at Indium Corporation as a World-wide Customer Support Specialist.

Galena has over thirty years of experience in electrical wholesaling, ten of which were spent in the wire and cable industry. He comes to Allied from JCH Wire & Cable in Las Vegas. Galena says "I'm looking forward to continuing my career at Allied, and using my experience to give my customers the best service around."

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# Crimp Inspection System


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First the operator scans the circuit number, his worker number and the machine number. The target crimp specs and master image are recovered from the hard drive and displayed. Using current production samples the operator measures the conductor and insulation crimp heights and widths. The operator measures the pull force. The operator captures an image, either cross section or terminal image. When finished the data is stored in Excel.

Terminal #1	Terminal #2			
Dimension				
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Cond. CW	0.070	0.002	0.071	Measure
Ins. CH	0.080	0.005	0.080	Measure
Ins. CW	0.088	0.005	0.088	Measure
Pull	20.00	---	31.18	Measure

Master Image

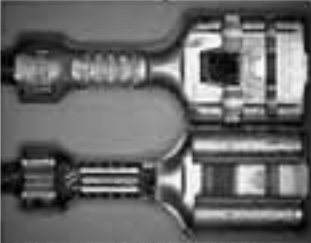


Sample Image




Shutter


cross section images or terminal images can be captured



Save into Excel




Scan the circuit number, operator number and machine number




Measure conductor and insulation crimp heights



Measure conductor and insulation crimp widths



Measure pull force



Capture cross section image or terminal image

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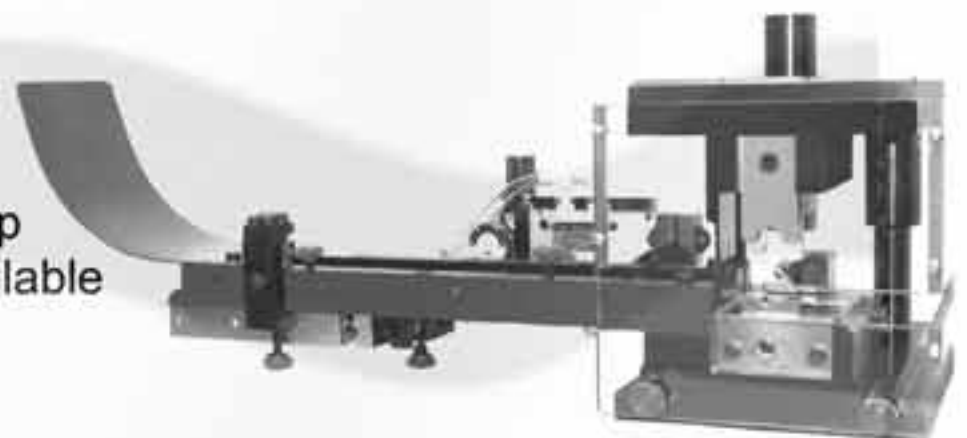


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NEWS PLUGS *continued*

**Hi-Tech® Trans-Guard® EXT Fuses**

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For more information about Thomas & Betts Hi-Tech Trans-Guard EXT Current-Limiting Backup Fuses, visit [www.tnb.com](http://www.tnb.com) or call (800) 816-7809.

**Gotelli Assumes Sales Manager Position at JIT Manufacturing Inc.**

JIT Manufacturing, Inc. has named Doug Botelli Sales Manager. Prior to accepting the Sales Manager position, Mr. Gotelli was the Western

Regional Sales Manager for Endicott Interconnect.

Mr. Gotelli has 25+ years of experience in sales and sales management in the Printed Circuit Board industry. Gotelli is based in San Jose, CA and will head up JIT Manufacturing's sales team, working extensively with account managers and customers in the field. The new position reports to Mark Whittaker, JIT General Manager.

"Doug has a tremendous manufacturing background and fully understands our products and services. Doug will be very effective working with our existing customers and customer support personnel while expanding JIT's customer base and sales channels," said Mark Whittaker, JIT General Manager.

For further information visit the JIT Website at [www.jitmfg.com](http://www.jitmfg.com).

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# Balancing Cost and Complexity

Continued from page 18

From this information the system generates an engineering feature list for a particular orderable vehicle or the complete platform. The report is used by the engineering architecture tool to specify the electrical content and calculate the costs for each feature.

Next, the electrical architect defines the topological layout for the vehicle and defines logical connectivity diagrams showing the conceptual connectivity among the car's various devices.

These diagrams are further refined to represent all of the variant possibilities with option codes attached to the various devices and connections.

Given this data, the system rapidly executes an automated wire synthesis process that generates a superset of all the possible wiring connections needed for the millions of buildable variants. This allows the cost of every element to be calculated. The "spider" chart in Step 6 summarizes and compares the costs of the diverse harness configurations. Now it is time to optimize the population of

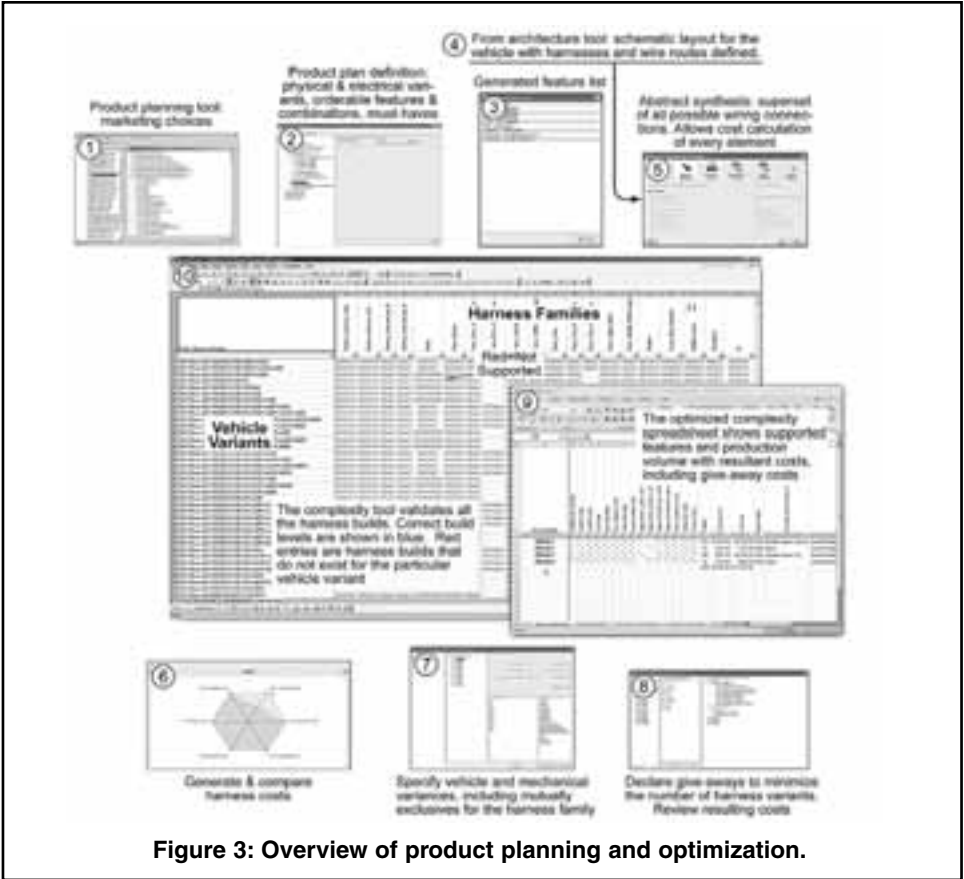


Figure 3: Overview of product planning and optimization.

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variants in order to balance complexity and cost.

Optimization begins by determining the number of harness levels required without any give-away, based on the entire product plan, including all mechanical variances and orderable customer options and their restrictions. In this case the analysis tool concludes that all customer builds in this simple example can be supported by 11 harness variants, assuming no give-away or redundant content in any harness.

Details in the report include the number of wires and connectors (individually listed) and the expected production volume. The cost model may be as simple or complex as desired; more sophisticated models might account for factors such as sequencing costs and obsolescence costs. And this step is the basis for choosing give-aways that, in the name of reducing complexity, will be fitted to all harnesses regardless of their feature specification.

This output is summarized on the optimized-complexity spreadsheet, Step 9, as is data about the level supported by each harness, the production volume of each build and the resultant costs including give-away costs. This roll-up of the optimization process is strategically important because it simplifies the search for alternate strategies and better solutions.

The process of developing this summary is straightforward: the engineer defines a series of give-away solutions and quickly gets feedback about the cost impact of each. By this means it is possible to iterate through alternatives rapidly, ultimately arriving at the best solution available under the circumstances. Modeling the complete cost impacts—such as piece cost as well as complexity management costs—ensures accurate, reliable results. With the give-aways specified by the product planner, the harness optimization in Step 8 reduces the number of harness builds in this simple example from eleven to only four.

Managing the Cost Tradeoff

Optimization is commonly used to determine the inflection point at which the contributions of rising management costs and declining piece costs yield the lowest total cost.

In this conceptual graph, the horizontal axis shows the number of buildable variant levels, and the vertical axis plots cost. The “Management Cost” line reveals that, as the number of variant levels increases, there is a linear increase in the amount of engineering and manufacturing work and associated costs.

The “Piece Cost” line is at its highest value when the number of levels is small, which implies that these units

contain a lot of functional content the customer doesn’t need, known as give-aways. And at the other end of the Piece Cost line, give-away costs are much lower because each variant is individually engineered. That sounds good, but look at the Management Cost at that point!

The “Total Cost” line sums the other two and reveals the point of optimized cost. Complexity optimization software looks at the interplay among many different cost contributors and speeds this type of evaluation, delivering reliable conclusions.

Validation Confirms Optimization

Are we done yet? No: the next step, validation, is crucial. It could be the one that saves the whole project from a costly oversight.

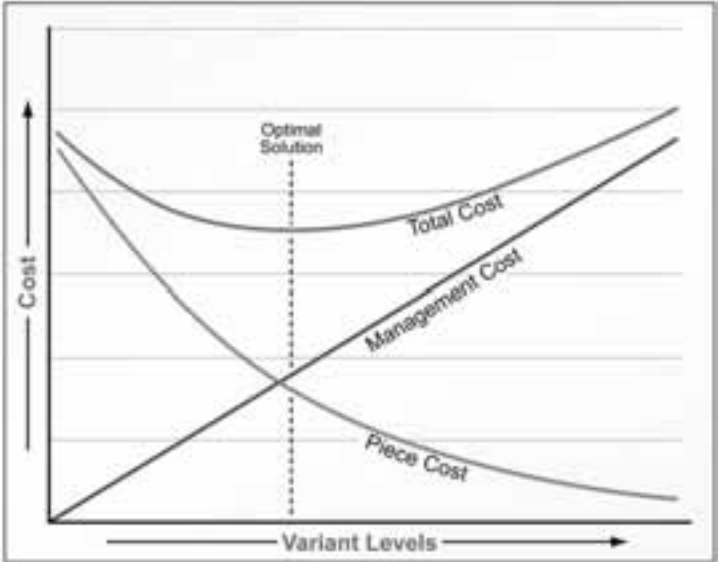
There must be a configuration to support every orderable vehicle package. A discrepancy might result in a completely-built vehicle with no connection to the dome light, or worse yet, the braking system ECU! While automated optimization is designed to ensure that orderable configurations are also buildable, validation is essential if:

- The product plan has changed
- It is necessary to validate a supplier’s final design, or
- The design was developed in a legacy design tool that relied on manual complexity analysis and optimization.

In the latter case it is prudent to confirm that the design meets all the current product plan requirements. The validation tool sorts through every orderable configuration and option mix the customer can choose from. Looking again at Figure 3, the matrix in Step 10 shows the results of a typical analysis. The left-most column list each vehicle variant and remaining columns show the applicable harness variants. Correct build levels are shown in blue, while red entries reveal levels that have no part number and cannot be built. As the matrix indicates, there are numerous problems in the main body harness. Of course, the documentation that led up to this analysis provides a traceable path back to the source of the configuration errors. In this illustrative example taken from actual customer data, the errors were the result of a change in the product plan.

Product planning and optimization tools for vehicular electrical system design are joining established architecture tools in a race against complexity. Software-based planning solutions can help engineers win this race, providing quantitative analyses to support informed choices about the cost of complexity versus the value of variety.

~WHN~



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

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

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

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## NEWS PLUGS continued

### Mouser Receives 20 Top Awards at 2011 EDS Conference

Mouser Electronics, Inc., a leading design engineering resource and global distributor for semiconductors and electronic components, received numerous accolades and awards from its supplier partners at the recent Electronic Distribution Show and Conference (EDS) in Las Vegas, NV. Suppliers cited many reasons for the honors, including double-digit sales growth, fastest introduction of new products, breadth of inventory, successful marketing campaigns and commitment to teamwork. Suppliers said it is easy to do business with Mouser.

"It is very gratifying to be recognized by so many suppliers," says Mouser President and CEO Glenn Smith. "We appreciate the partnerships and the recognition from these industry-leading suppliers. It's really great to work with such world-class manufacturers who share our philosophy of Service Excellence and recognize the importance of technology leadership."

For the third consecutive year, Mouser won the prestigious Catalog Distributor of the Year award from Littelfuse – the first distributor ever to win three times in a row. Top distributor awards also came from C&K Components, Neutrik, VCC, APEM, and CTS.

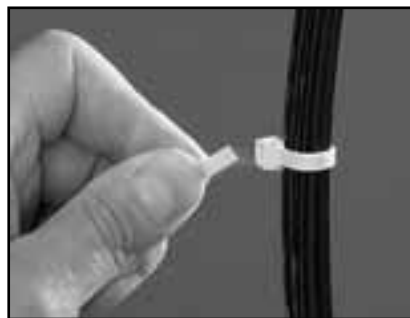
Mouser won the award for Fastest Channel to Market from Cooper Bussmann, recognizing Mouser for its focus on new product introduction. Mouser also won the prestigious eCommerce Distributor Excellence Award for Circuit Protection Products from Bourns.

Several suppliers honored their Mouser product manager as PM of the Year. These include: Alfredo Arteta for C&K, Eric Flodstrom for VCC, and Kelli Carvino for Omron. Mouser Product Specialist Joe Fox won the Outstanding Sales Performance Award for 2010 from Kingbright.

### Catamount® Twist Tail® Cable Tie Enables Trimming Excess Tail Without Tools

The new Catamount® Twist Tail® Cable Tie from Thomas & Betts enables the installer to remove the tail end of the tie without the

use of tools. The patented design allows the user to simply bend and twist off the tail after installation, leaving



**Catamount Twist Tail Cable Tie**

ing no sharp edges to scratch cables or hands.

"The Catamount Twist Tail Cable Tie enables installers to remove the

excess tail without tools," said Rachelle Weiss, product manager for Thomas & Betts. "This can save time since the installer needs only to grasp the excess tail between his thumb and forefinger, bend it in the other direction and twist. Plus, it doesn't leave sharp edges."

Available in white or ultraviolet-resistant black 6.6 nylon, the Catamount Twist Tail Cable Tie provides 30 pounds of minimum loop tensile strength, which is suitable for any light-duty cable tie application.

For more information about Catamount Twist Tail Cable Tie, visit [www.tnb.com/contractor/docs/catamount.pdf](http://www.tnb.com/contractor/docs/catamount.pdf) or call (800) 816-7809.

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# Choosing the Right Heat Shrink Product for the Job

Continued from page 1

expand the diameter of the tubing. The tubing is then cooled to room temperature while in the expanded state. If the tubing is later exposed to a sufficient

amount of heat, it will shrink down to its original size as long as it is not restrained from doing so.

## Where is Heat Shrink Tubing Used?

There are a number of useful applica-

tions for heat shrink tubing. Below is a list of its various uses:

- to provide electrical insulation (covering terminals, splices, wire repairs, or other connectors)
- to bundle loose items (most commonly wires in wire harnesses)
- as a protective covering, safeguarding from:
  - ♦ abrasion
  - ♦ cutting
  - ♦ chipping
  - ♦ peeling
  - ♦ scuffing
  - ♦ denting
  - ♦ low impact
- to provide an environmental seal, protecting sensitive components from contaminants such as moisture and chemicals which might cause oxidation and/or corrosion of the components
  - to provide strain relief
  - to provide thermal insulation
  - to color-code specific items
  - to change the surface finish of an object
  - to identify a component (with printing, a custom color, etc)

## Step 1: Understand Your Application

The most important aspect of choosing the appropriate heat shrink product for your needs is to understand and

define all that is necessary for your application. The only way to ensure that you're getting the most appropriate, cost-effective product is to fully understand your application and the requirements that need to be met.

## Sizing Requirements

Regardless of whether you're using heat shrink tubing in an electrical application, as a strain relief, as a protective covering, or for any other reason, determining the correct size is of the utmost importance. The two most important dimensions to measure for your application are the largest diameter that the expanded sleeve needs to slide over and the smallest diameter that the tubing needs to completely cover after shrinking. These two dimensions will be used later in Step 2 to help you determine the required size and shrink ratio for your tubing. If either of these locations has a non-circular profile, you will need to convert the non-circular perimeter to a diameter. To do this you must measure the total perimeter at this location and divide that number by pi (or 3.14). This will give you an "effective" diameter which you can use to help determine the tubing size you need.

For the component on the right side of the figure on the following page, the largest diameter is equal to  $(A+A+B+B)/\pi$  and the smallest diameter is simply d.

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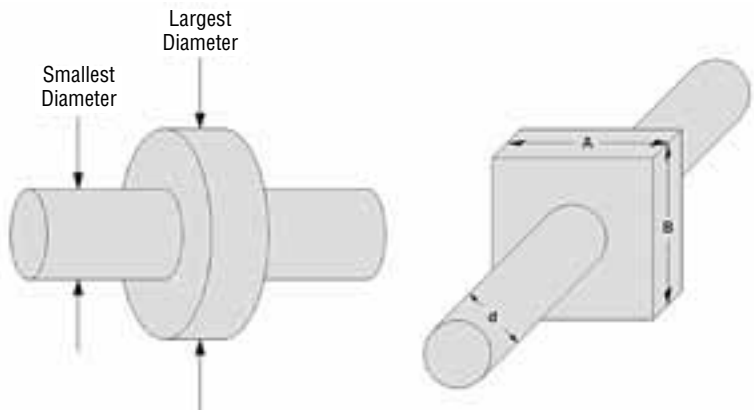
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Another important dimension to consider is minimum wall thickness. A certain minimum wall thickness might be required due to the electrical requirements of your application. Or, if the tubing is going to be subjected to excessive abrasion or wear, you may wish to have a heavier wall thickness than the standard size offers. In addition to defining your required minimum wall thickness, it is also necessary to determine the diameter at which this wall thickness will be required. This information is critical in choosing the required tubing size in Step 2.

**Electrical Property Requirements**  
If your heat shrink tubing is going to provide electrical insulation or bundle electrical wires, it is likely that it needs to meet certain regulatory guidelines. In order to choose the correct product for your application, you'll need to know if any UL/CSA (Underwriters Laboratories /Canadian Standards Association), ASTM (American Society for Testing and Materials), AMS (Aerospace Material Specification), EU (European Union), or other

automotive or military specifications need to be met. These guidelines usually cover common electrical requirements such as dielectric strength and flame resistance. Other possible electrical requirements could be that the tubing must be free of halogens or that it must be made out of a specific material. Make sure you understand all of the electrical requirements before you choose your heat shrink product.

**Operating Environment**  
Another critical step in defining the requirements of your heat shrink tubing application is to understand the environment in which the tubing will operate. For example, will the tubing be subjected to excessive abrasion or flexing? Will the tubing come into contact with any oils, greases, fuels, chemicals, or other fluids? It is also important to know if the tubing will be used indoors or outdoors. If it is going to be used outdoors it could be subjected to excessive UV exposure. If it is going to be lying on or buried

Continued on page 34

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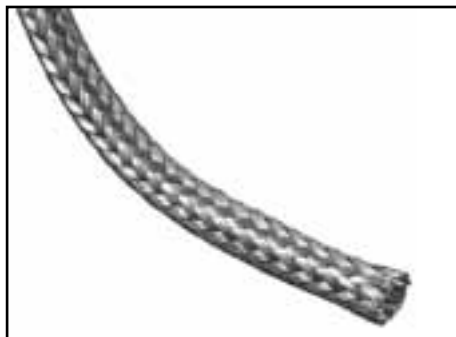


### New Metal Braided Sleeving Offers EMI Shielding

Waytek, Inc., announces new tinned copper braided sleeving as an aesthetic option for EMI shielding and grounding

harnesses, hoses and cables.

Automotive, heavy equipment and industrial applications have always used braided metal for secure and efficient grounding solutions. Waytek's new braided tinned copper sleeving is a perfect combination of economy and durability, and will provide many years of use even in exposed applications. It offers extreme blowout protection, and is resistant against abrasion and cutting. Metal braid-



Waytek's Braided Tinned Copper Sleeving

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One of the many benefits of the SSM is it will work with seal kits that you may already own. The seal size range for the standard track in the Schaefer unit is the widest in the industry. Its narrow construction saves space on your machine table, allowing for a wider variety of other modules. The SSM is designed to achieve maximum process speeds while minimizing space requirements.

**Wide range is standard**

The new SSM unit can handle seals in a wider range of sizes and shapes. It is user friendly and will process seals with diameters up to 10 mm and 9 mm in length in its standard configuration. This includes many hard shell seal applications. Optional settings are available for large seals with diameters up to 17 mm and 16 mm lengths. The SSM has many other cost savings options available as well.

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### Array Connector Appoints Rail and Transportation Sales Manager

Array Connector Corporation, a leading producer of high-reliability, environmentally sealed mil-spec connectors for rugged, critical applications, has appointed Ray Castry as North American Rail and Transportation Sales Manager. In this newly created post, Castry will be devoted exclusively to serving the connector, cable assembly and harness needs of customers in the rail, mass transit, locomotive and freight markets. He will also market Array Connector's zero halogen rail connector line that was recently approved by the New Jersey Transit Authority.

Prior to joining Array Connector, Castry spent the last several years heading up North American rail business development initiatives for a leading global connector and cable harness solutions manufacturer. He also spent many years in sales roles of increasing responsibility in the rail and transportation electronics field.

"Ray understands firsthand the design and environmental challenges currently facing the rail industry, including the need for smaller, faster connectors with higher bandwidths and the need to shrink connectors to accommodate high-speed electronics for Positive Train Control (PTC) systems," said Jeff Clarke, Director of Sales and Marketing for Array Connector. "His insight will be invaluable in designing connectors that continue to meet the evolving requirements of this market."

"I'm excited to join Array Connector because this is one of the most vertically integrated mil-spec connector manufacturers in the market," said Castry. "This fact translates into a custom-design lead time that's about half the industry average – a benefit that's particularly valuable to rail customers."

*Continued on page 40*





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# Choosing the Right Heat Shrink Product for the Job

Continued from page 29

below the ground, it may need to have superior resistance to fungus growth. Finally, an enhanced environmental seal (as obtained with adhesivelined heat shrink tubing) may be needed to protect any sensitive portion of the object the tubing is covering. All of these factors need to be considered prior to selecting your heat shrink product.

## Step 2: Determine the Required Tubing Size

The next step is to determine the most appropriate tubing size for your application. Using the measurements you obtained in Step 1, you'll need to define the following tubing dimensions that best suit your needs: minimum expanded ID, maximum recovered ID, and minimum recovered wall thickness. This section will explain each of these tubing dimensions and how they relate to your application measurements found in Step 1.

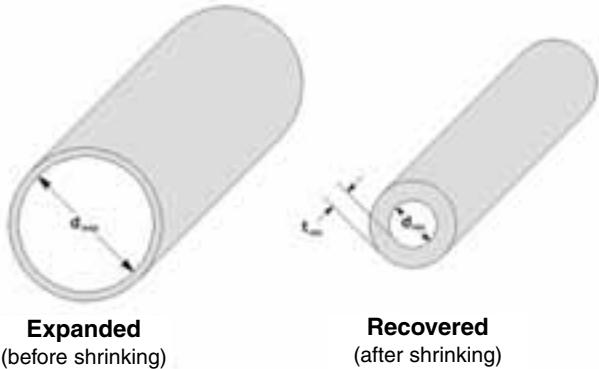
### Expanded & Recovered Inside Diameters

Heat shrink tubing is traditionally specified by the minimum original ("expanded") inside diameter and the

nominal shrink ratio. However, a good heat shrink product datasheet will not only list the minimum expanded ID and nominal shrink ratio of the tubing, but also its maximum recovered ID. First, check that the minimum expanded ID of the tubing is greater than the largest diameter that the sleeve needs to slide over (using the measurement you made in Step 1). Then, check that the maximum recovered ID of the tubing is less than the smallest diameter that needs to be completely covered (also measured in Step 1). Please see the figure below which illustrates these tubing dimensions:

### Shrink Ratio

If the product datasheet does not have maximum recovered ID listed, you can estimate it using the minimum expanded ID and the shrink ratio. If a heat shrink product has a 3:1 shrink





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ratio and the minimum expanded ID is 0.750", then the maximum recovered ID should be 0.750"/3 or 0.250".

Wall Thickness

Now that you have determined the required minimum expanded ID and maximum recovered ID (or shrink ratio), you will need to determine the minimum recovered wall thickness needed for your application. The wall thickness of a heat shrink product is traditionally specified as the minimum thickness at the fully recovered stage (see right side of the figure on page 34). Therefore, in order to determine the required wall thickness of your heat shrink product you must use another measurement from Step 1: your required minimum wall thickness and the diameter at which that wall thickness is required. If the diameter of what you are covering is greater than the maximum fully recovered diameter of the tubing, the final wall thickness will be less than what is specified on the datasheet. This is illustrated in the figure below:

The dimension  $t_{rec}$  is the wall thickness that would result if your heat shrink tubing were allowed to shrink fully without restraint. However, since your object is restraining the tubing from shrinking fully, you'll need to determine the required  $t_{act}$  before you can specify  $t_{rec}$  for the tubing. The approximate relationship between the

two thickness dimensions is as follows:

$$d_{rec} * t_{rec} + t_{rec}^2 = d_{obj} * t_{act} + t_{act}^2$$

A much simpler relationship can be used to solve for  $t_{rec}$  or  $t_{act}$ . This is a further approximation, but acceptable for this purpose\*:

$$t_{rec} = (d_{obj} * t_{act}) / d_{rec} \text{ OR } t_{act} = (d_{rec} * t_{rec}) / d_{obj}$$

\* This relationship can be off by 10-20% with heavier wall thicknesses. Contact your tubing supplier to ensure that you're getting the correct actual wall thickness with a given heavy-walled tubing size.

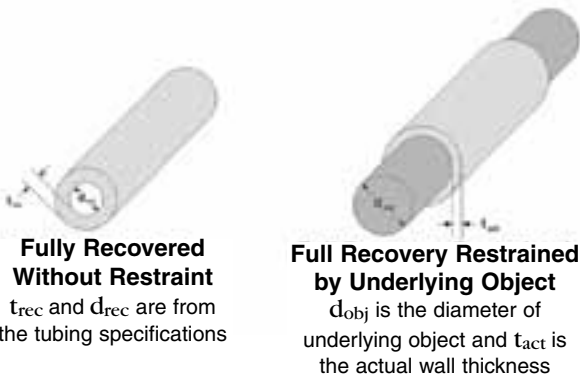
Variable Key

$t_{act}$  = actual wall thickness after shrinking onto the underlying object

$d_{obj}$  = diameter of the underlying object

$t_{rec}$  = specified recovered wall thickness of tubing

$d_{rec}$  = specified recovered diameter of tubing



Continued on page 36

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# Choosing the Right Heat Shrink Product for the Job

Continued from page 35

Available Heat Shrink Tubing Materials

## Length & Longitudinal Shrinkage

If tubing length is a critical dimension for your application, longitudinal shrinkage must be considered. In addition to shrinking in diameter upon the application of heat, heat shrink tubing may also shrink in length. The amount of length reduction depends upon the amount of diameter reduction as well as manufacturing processing variables, but it is generally about 15% of the original length or less. Because longitudinal shrinkage depends on various tubing characteristics, it is best to determine the expected longitudinal shrinkage of your heat shrink product from your supplier.

## Step 3: Choose the Appropriate Heat Shrink Material

Once you have defined all that is necessary for your application and have chosen the appropriate tubing size, you are ready to choose your heat shrink material. Often there are multiple products that will meet your needs, so it is important to also know the cost and availability of each option. This section will examine how to choose the right material by differentiating each by cost and capability.

A common misconception among heat shrink users is that there is only one heat shrink material. While polyolefin is the most widely used material, PVC heat shrink tubing can be a cost-effective alternative for many applications. In addition to the polyolefin and PVC material families, specialty heat shrink tubing is available in various fluoropolymers and elastomeric materials. Within each of these material families are many different compounds which are designed to excel in certain environments and/or meet particular specifications.

## PVC versus Polyolefin

Polyolefin is the most commonly used heat shrink material. Its advantages lie in the cross-linking of polymer chains, which allow it to withstand high temperatures in the 125°C-135°C (257°F-275°F) range. However, a common misconception is that "heat shrink is heat shrink"; that is, all heat shrink is the same and it doesn't matter what you choose. While PVC cannot withstand the highest temperatures that polyolefin can, there are many advantages to using PVC. The most important benefit to using PVC heat shrink tubing is lower cost. PVC generally costs anywhere from

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10% to 60% less than polyolefin. If your application involves an operating environment in which the continuous high temperature is 105°C (221°F) or less, you should strongly consider PVC heat shrink for the cost savings alone. In addition to the significant price difference, PVC also offers brighter, more vibrant colors than polyolefin as well as considerably better clarity in its clear version. Custom colors and transparent tints are also available with PVC heat shrink, but typically not with polyolefin heat shrink.

Two other advantages PVC holds over polyolefin are: 1) Clear PVC is flame retardant, while clear polyolefin is not, and 2) PVC is much tougher than polyolefin, with better tensile strength and abrasion resistance. If your operating temperature is 105°C (221°F) or less, it is strongly recommended that you consider PVC as a material option.

#### *Adhesive-Lined Heat Shrink Tubing*

Adhesive-lined (or "dual wall") polyolefin heat shrink tubing is a specialty product that has a wide variety of uses. This product is simply a standard polyolefin tube that has an inner-liner of adhesive that melts and flows at the same temperature at which the polyolefin tubing shrinks. As heat is applied and the tubing is shrinking, the flowing adhesive fills voids and conforms to the underlying shape. This forms an environmental seal, protecting the underlying component(s) from moisture or other contaminants.

#### *Other Heat Shrink Materials*

In addition to the products mentioned above, there are also other specialty heat shrink products available. These products all offer unique qualities such as extreme temperature resistance, exceptional chemical/fluid compatibility, and/or superior mechanical properties. Among these specialty products are fluoropolymers (PTFE/FEP/PFA), chlorinated polyolefin, elastomeric polyolefin, polyvinylidene fluoride (PVDF), and fluoroelastomers. Due to the enhanced qualities of these products, they are significantly more costly than the previously-mentioned products. In some cases, the price differences are extreme. The diagram

on page 38 gives you a simple, generic comparison of the price differences for a sampling of heat shrink materials.

#### **Step 4: How to Use Heat Shrink Tubing**

This section will discuss various heating methods commonly used to shrink heat shrink tubing. It will also provide some tips to keep in mind when using and storing the tubing.

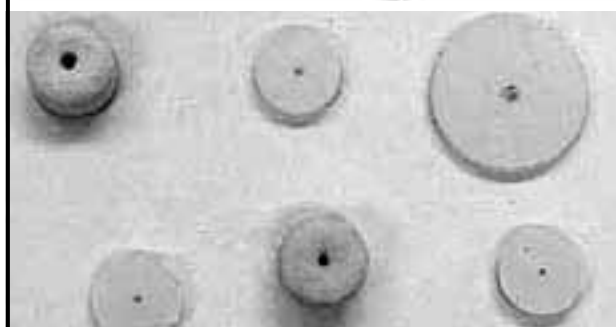
##### *Heating Methods*

The most common method of shrinking heat shrinkable tubing onto underlying components is through the use of a hand-held heat gun. However, for higher production volumes the preferred method of shrinking the tubing is to use a flow-through oven. This will ensure

a complete recovery of the tubing by evenly exposing it to sufficient heat for a satisfactory period of time. For PVC it is recommended that the tubing be exposed to 150°C (300°F) for three minutes. This will allow sufficient time at temperature to achieve a full recovery. At very high temperatures PVC will begin to soften, however, so increasing the temperature beyond 150°C in order to save time could produce negative results. Polyolefin, on the other hand, can withstand shrink temperatures much higher than 150°C. It is still recommended that the tubing be exposed to 150°C for three minutes in a flow-through oven, but in the interest of reducing processing time you can experiment with the use of

*Continued on page 38*

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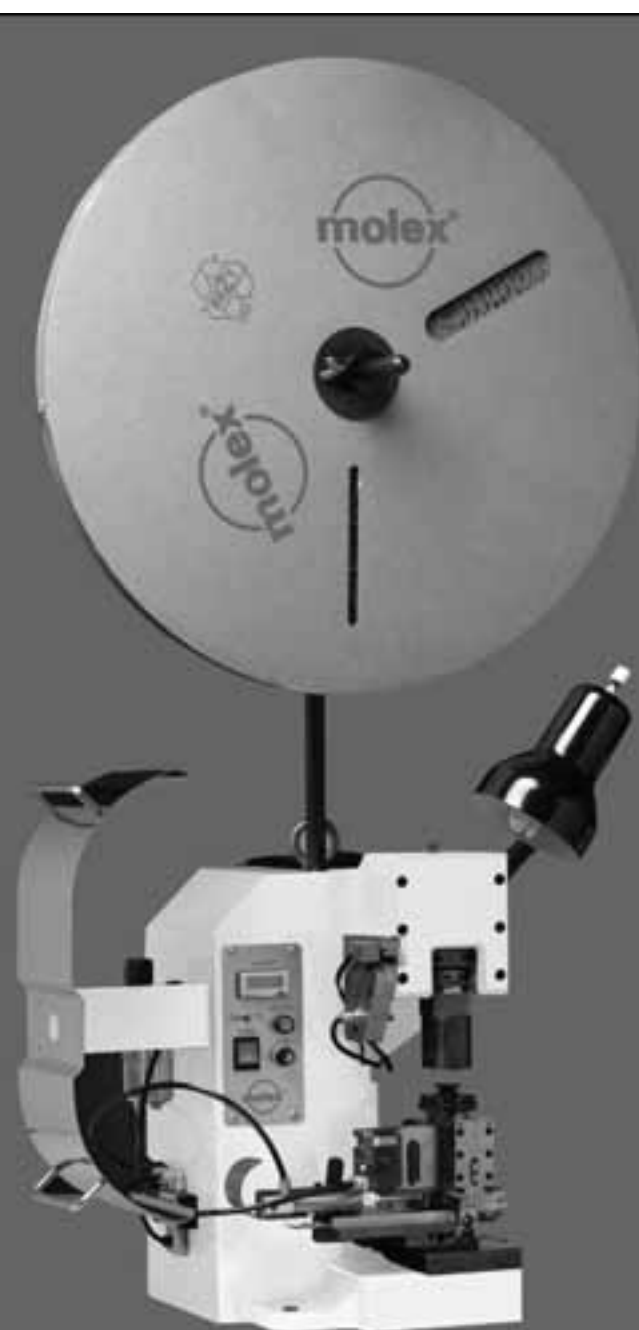
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# Choosing the Right Heat Shrink Product for the Job

Continued from page 35

### Storage Conditions


higher oven temperatures. Lastly, another method occasionally encountered is the use of focused light (as emitted by halogen bulbs) to shrink the tubing.

In order to avoid premature recovery, PVC heat shrink tubing must be stored at temperatures below 90°F (32°C) and out of direct sunlight. If these storage guidelines are adhered to, there should


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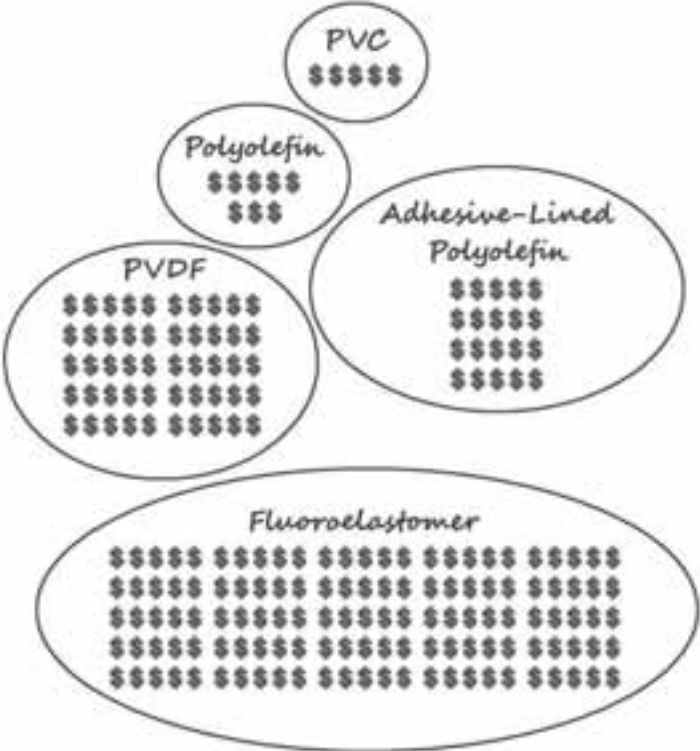
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## PVC Heat Shrink Tubing: Cost Advantages Over Other Heat Shrink Tubing Materials



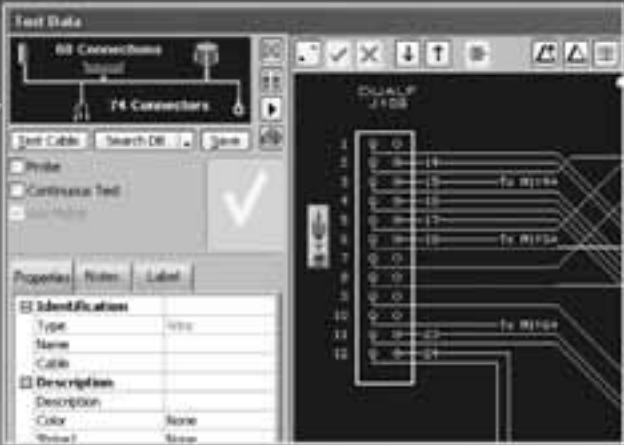
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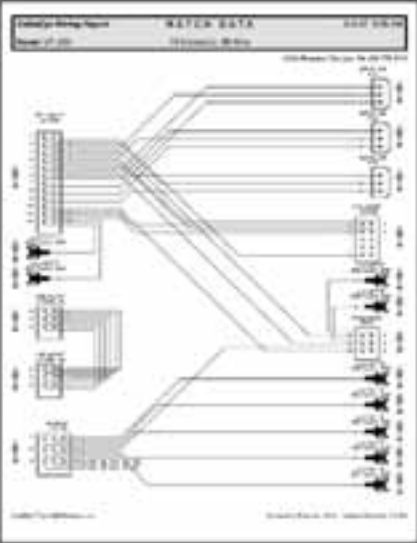
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be no concerns over shelf life of this product. Polyolefin, on the other hand, has a greater ability to withstand elevated storage temperatures and therefore there should be no shelf life concerns.

#### *Minimizing Longitudinal Shrinkage*

If your application calls for a long length of heat shrink tubing, there is a way to minimize and possibly eliminate longitudinal shrinkage. First, apply heat to each end of the tube with a heat gun, which will secure the tubing ends to the underlying component(s). Then complete the shrinking process along the remaining middle section of the tubing using a flow-through oven or heat gun.

#### **Step 5: Availability of Heat Shrink Products through Grayline Inc.**

This section will highlight the heat shrink products that are available through Grayline Inc., as well as the custom services that can be provided.

#### *Custom PVC*

##### *Heat Shrink Tubing*

Grayline HS105C, a UL-rated heat shrink PVC tubing product, is available in a vast array of custom sizes and colors. Within certain limitations, Grayline can manufacture HS105C in a custom ID and wall thickness to meet the requirements of your application. HS105C comes in many colors, including crystal clear, transparent tints, and a wide range of solid colors, even including glow-in-the-dark. Grayline also offers custom color matching for appearance-critical applications. HS105C is also available in custom shrink ratios.

#### *Chemically Cross-Linked Polyolefin*

Grayline is one of the very few manufacturers in the world to offer chemically cross-linked polyolefin heat shrink tubing. Although it does not have the flame-retardant properties of irradiated polyolefin, it can be manufactured in custom sizes and colors. Since this product does not need to be irradiated, small-quantity production runs are cost effective. If your polyolefin heat shrink application calls for a special size and/or a custom color, this is your only available option.

#### *Other Heat Shrink Materials*

In addition to the products mentioned above, Grayline offers various polyolefin, adhesive-lined, fluoropolymer, and fluoroc elastomer heat shrink tubing. A full listing of heat shrink products supplied by Grayline can be found at <http://www.graylineinc.com/wire-harness-electrical-tubing/heat-shrinkable-tubing.html>. For wire harness applications, these products are designed to meet the rigorous specifications of UL/CSA, ASTM, AMS, EU, and other various automotive and military specifications.

#### *Additional Services*

##### *Offered by Grayline*

Both PVC and polyolefin heat

shrink tubing can be printed on or hot stamped. This printing can be used to indicate part numbers, your company name, logo or contact information, safety warnings, instructions for use, or date of manufacture. Heat shrink tubing from Grayline can be supplied either on reels or cut-to-length.

*The preceding information is intended to serve as a basic guideline for new users of heat-shrinkable tubing. If you are interested in any of the products mentioned above or if you have any questions, please do not hesitate to contact Grayline at (800) 669-7986 or [sales@graylineinc.com](mailto:sales@graylineinc.com). You can also visit the Grayline website at [www.graylineinc.com](http://www.graylineinc.com).*

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## NEWS PLUGS *continued*

*Continued from page 32*

For more than 20 years, Array Connector Corporation has designed and manufactured high-reliability, environmentally sealed mil-spec connectors for instrumentation, communication and navigation applications. Its rugged, critical-application connectors are used primarily by the military, aerospace, rail, electronics and industrial sensors and controls industries. Recognized as a quick, efficient, cost-effective problem solver, Array also excels at creating custom connectors that fit specific applications at its manufacturing facility in Miami. The company's quality system

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### **BURNDY® Introduces the BSD Static Discharge Reels**

BURNDY®, a leading manufacturer and provider of connector solutions to the industrial, energy, construction, telecommunication, petrochemical, data center, and transportation industries, introduces the BSD series of Static Discharge Reels. Often used to dissipate static charge buildup developed while filling or dispensing fuel or other combustible liquids from fuel trucks or railcars, these reels are applicable in any area



**BSD Static Discharge Reels**

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For additional information, contact us at 47 E. Industrial Park Drive, Manchester, New Hampshire, 03109, call Customer Service at 1-800-346-4175, or visit our website at [www.BURNDY.com](http://www.BURNDY.com).

### **SPI Urges Prospective International Visitors to PE2012 to Start the Process of Obtaining a U.S. Visa**

With only nine months until the NPE2012 international plastics exposition, prospective attendees from countries whose citizens require a visa to enter the United States should start the process of obtaining one well in advance of the show, it was announced today by SPI: The Plastics Industry Trade Association. SPI produces the triennial NPE, which next takes place on April 1-5, 2012 in Orlando, Florida.

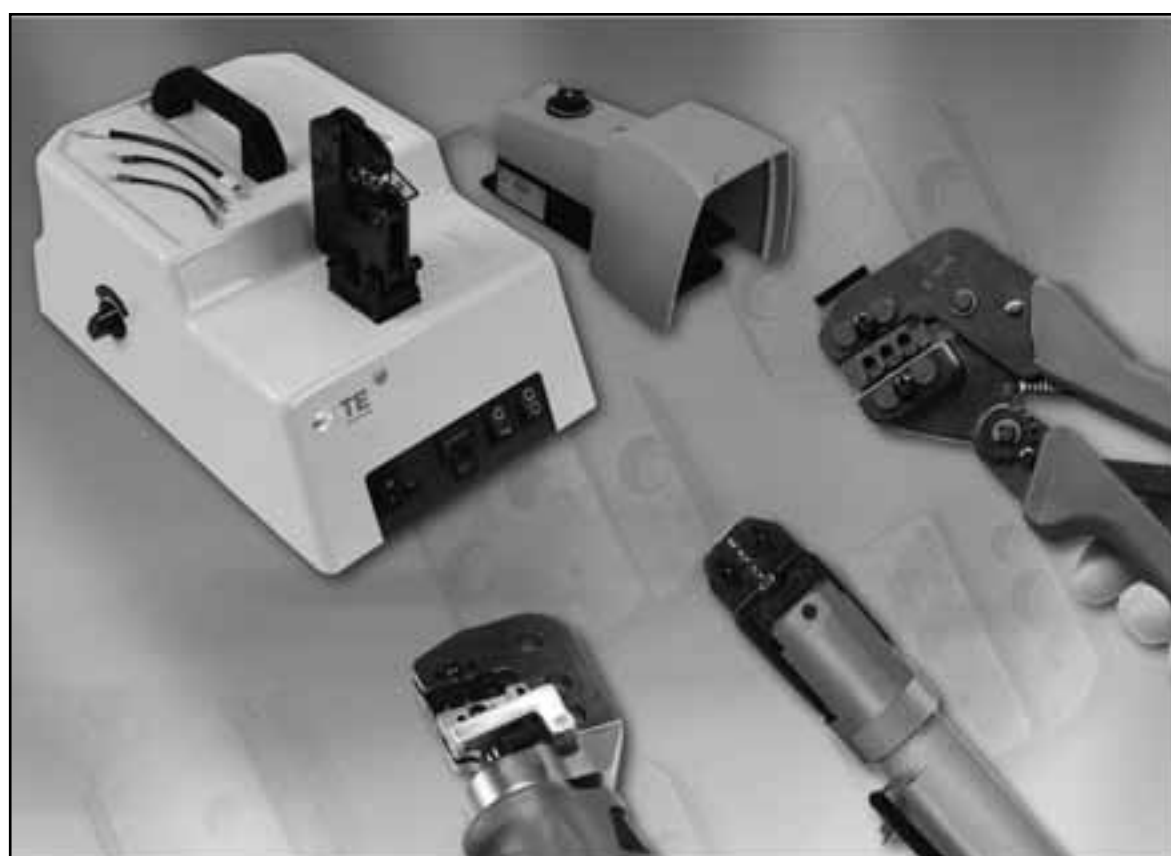
Most travelers to the U.S. must obtain a visa, in a process that can take anywhere from one to three months and sometimes longer. The process involves

1) making an appointment for an interview at the U.S. embassy or consulate in the individual's home country;

2) submitting an application, passport, and supporting documents at the interview; and

3) allowing for a period of time after the interview for the application to be reviewed and processed.

One of the required documents is an official letter of invitation to attend NPE2012 from SPI, which can be requested as part of registering in advance for



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the event. Advance online registration will become available at [www.npe.org](http://www.npe.org) starting in September.

“While the United States government has long worked with SPI to build international attendance at NPE, the U.S. Department of State strictly enforces visa requirements,” said Gene Sanders, SPI’s senior vice president of trade shows and conference. “The time it takes for processing an application varies with the location of the embassy and other factors, and there are always prospective attendees who fail to get visas in time for NPE. That is why we are urging international visitors to start the visa process early.”

Countries whose citizens are required to obtain a U.S. visa include all nations in Latin America, the Middle East, and Africa; nearly all nations in Asia, including China and India; and Russia, along with some of the nations of Eastern Europe. There are 36 countries whose citizens normally do not require a U.S. visa because they participate in a “Visa Waiver Program” (VWP) administered by the U.S. Department of State.

More information on travel and visas is available on the NPE2012 website at: [www.npe.org/Orlando/content.cfm?ItemNumber=4426&navItemNumber=6613](http://www.npe.org/Orlando/content.cfm?ItemNumber=4426&navItemNumber=6613).

Inquiries to SPI should be addressed to Carla Haus at 1-202-974-5276 or [chaus@plasticsindustry.org](mailto:chaus@plasticsindustry.org).

The U.S. Department of State has posted extensive information on the visa process at [http://travel.state.gov/visa/visa\\_1750.html](http://travel.state.gov/visa/visa_1750.html). The website includes a page with links to the sites of U.S. embassies and consulates throughout the world, typically providing local visa infor-

mation in the host-country language, as well as English. There is also a list of countries participating in the VWP.

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**New ATO/ATC Fuse Blocks**


Waytek Inc., a distributor of electrical supplies, has introduced the popular ATO/ATC Fuse Blocks that hold 4, 6, or 8 ATO/ATC bade fuses.

Their compact design offers you flexibility for mounting in limited space compartments. Clear durable dust covers are also available for additional protection from dust and debris, and they allow you to easily replace blown fuses. Rated for 32 volts DC, 20 amps per fuse station. Operating temperature is -30°C ~ +85°C.

Waytek’s Customer Service Representatives are available by phone at 800-328-2724 Monday through Friday from 7:30 am until 5:30pm central time. Orders can also be placed online by visiting [www.waytek-wire.com](http://www.waytek-wire.com).

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NEWS PLUGS continued

NEMA Participates in ANSI Electric Vehicle Standards Panel

Member company representatives and staff of the National Electrical Manufacturers Association (NEMA) participated recently in the first face-to-face meeting

for the newly-formed Electric Vehicle Standards Panel (EVSP) of the American National Standards Institute (ANSI). With an initial scope that focuses on the consumer-class of electric vehicles (EVs), the mission of the EVSP is to develop a roadmap for the U.S. standardization effort.

According to the opening remarks by ANSI President and CEO Joe Bhatia, the panel's efforts are designed to be complementary to other standardization activities in the U.S. and abroad, including as

those of the National Institute of Standards and Technology (NIST) Smart Grid Interoperability Panel (SGIP), the International Electrotechnical Commission (IEC), and the International Organization for Standardization (ISO).

"As you would expect, because of the impacts on the U.S. electrical infrastructure NEMA figures very prominently in the work of the EVSP," said Paul Molitor, NEMA's Assistant Vice President for Smart Grid. "Our staff and our members are actively involved at every level of the panel, and we are looking forward to improving our understanding of the issues and creating closer relationships with our counterparts in the electric vehicle world."

Other organizations and institutions involved with the panel include the U.S. Department of Energy, the Government Services Administration (GSA), the Institute of Electrical and Electronics Engineers (IEEE), the Society of Automotive Engineers (SAE), Underwriters Laboratories (UL), and several domestic and international automobile manufacturers.

NEMA is the association of electrical and medical imaging equipment manufacturers. Founded in 1926 and headquartered near Washington, D.C. For further information visit website [www.nema.org](http://www.nema.org)

compact fluorescent lamps result in lower temperature codes. With lower temperature codes, the fixtures can be safely used in a wider range of hazardous locations.

Internal components are encased in a rugged die-cast aluminum housing and lamps are fitted with a glass globe and polycarbonate guard for protection. Hazlux H3 Fluorescent Emergency Lighting Systems are designed for wet conditions and meet UL595 for inside, drip-proof marine locations. Their operating temperature range is from 32 to 104 degrees Fahrenheit (0 to 40 degrees Celsius).

The sealed, maintenance-free nickel-cadmium batteries will power the two 13-watt, PLC-type, compact fluorescent lamps for at least 90 minutes, and are rated for seven to 10 years of operation. The fluorescent lamps can be set for continuous operation (first on AC, then on DC) or for operation only during a power failure. The lamps are rated for 10,000 hours of life, reducing maintenance costs.

Hazlux H3 Fluorescent Emergency Lighting Systems are rated for UL844 Class I, Division 2 and Class II environments, including adverse industrial locations. They also meet Life Safety Code and Occupational Safety and Health Administration (OSHA) requirements, as well as the broadest range of UL924-listed hazardous fluorescent emergency lighting systems. The bright red epoxy finish enables Hazlux H3 Fluorescent Emergency Lighting Systems to be recognized quickly for maintenance and testing.

For more information about Hazlux HazBatt H3 Fluorescent Emergency Lighting Systems, visit [www.tnb.com](http://www.tnb.com) or call (800) 857-5711.

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## Cerro Wire Announces Stellar Safety Record



Cerro Wire LLC, a leading manufacturer of copper electrical wire and cable, announces that its Ogden, Utah manufacturing plant has achieved a rate of zero OSHA-recordable incidents over the last two years and has only had 4 over the last five years. The plant's innovation and attention to safety is one of the key reasons that the company's True Sequential Footage™ product was named one of the nine Top Products of 2010 by Wire and Cable Technology International.

The dramatic decrease in OSHA-recordable incidents, defined as any injury requiring more than first aid, came about due to a shift in mindset and corporate culture. Veteran employees worked cooperatively to help newer workers understand that most accidents

are preventable. According to Kathy Johnson, Human Resources Manager, veteran employees devised methods to reduce accidents, provided training, and made safety a reality on the production line.

"I am extremely proud of the entire team at our Ogden manufacturing facility," said Corey Schultz, Plant Manager. "A significant percentage of the workforce was new to the business, and the veterans looked out for their safety and helped them avoid dangerous or compromising situations where someone might be injured. Our employees have ownership and pride in what they do, which says a lot about the company and who works here."

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# Mexico's Manufacturing Continues to Grow

Manufacturing in Mexico continues to grow in 2011 with both new and existing companies expanding operations across various sectors, most notably record-breaking numbers in auto production and vehicle exports.

In May, more than 213,000 cars were manufactured in the country - 19.4 percent more than in the same period in 2010, representing the highest record, according to Eduardo Solis, president of the Mexican Association of the Automotive Industry (AMIA).

In the same month, exports rose 21.3 percent. May capped a five-month growth period for the first part of 2011, increasing 17.1 percent over 2010 figures and 16.4 percent over 2008 rates. In addition, Mexico, as the ninth-biggest vehicle producer in the world, produced a record 2.261 million vehicles in 2010, up 50 percent from 2009, according to AMIA.

Continuing the trend in increased vehicle production, Mazda announced on Friday that it will begin construction of a new plant in Guanajuato, Mexico this fall, with vehicle production to start in the second half of 2013.

The investment of \$500 million will allow Mazda to produce at least 50,000 cars a year at the plant. In addition, the Daimler Trucks North America plant in Saltillo, Mexico, is including a third shift, adding 479 more manufacturing workers and 32 additional staff workers. This will help meet demand for Daimler Trucks North America's its Freightliner and Western Star trucks.

Carlos Guzman, Pro-Mexico's CEO recently stated that "because of its manufacturing capacity, Mexico is a very competitive platform for several European and Asian economies that are looking to penetrate or increase their participation in the United States. Mexico is a remarkable manufacturing hub for the automotive industry, among others."

Automotive parts supplier Delphi is investing \$11 million and generating 2,000 jobs for a new auto parts manufacturing facility in the state of Durango. This will be the first Delphi plant in that state.

Additional manufactur-

ing growth is illustrated by Hawker Beechcraft's continued expansion in Chihuahua City. The company has opened two plants in the city in 2011, with plans to invest \$108 million more in opening another new plant, which will create 600 new jobs assembling structural parts for King Air turboprop airplanes.

In addition to auto and aircraft production, the steel industry also is growing in Mexico. President Felipe Calderon announced in June that the company Posco, a Korea-based company, is going to expand its steel plant in Altamira, Tamaulipas, with an investment of \$300 million. According to the President, this expansion will create 300

direct jobs and more than 600 indirect positions.

During the Posco expansion announcement event, Egidio Torre, Tamaulipas Governor, said that this investment shows that there is confidence to invest in the State.

With such expansion continuing throughout Mexico, and in light of Mazda's most recent announcement, President Calderon promises that Mexico will continue to work to promote more investment in the automotive, aerospace, electronic, and manufacturing sectors. This will continue to strengthen the country's worldwide reputation and position as an international manufacturing leader.

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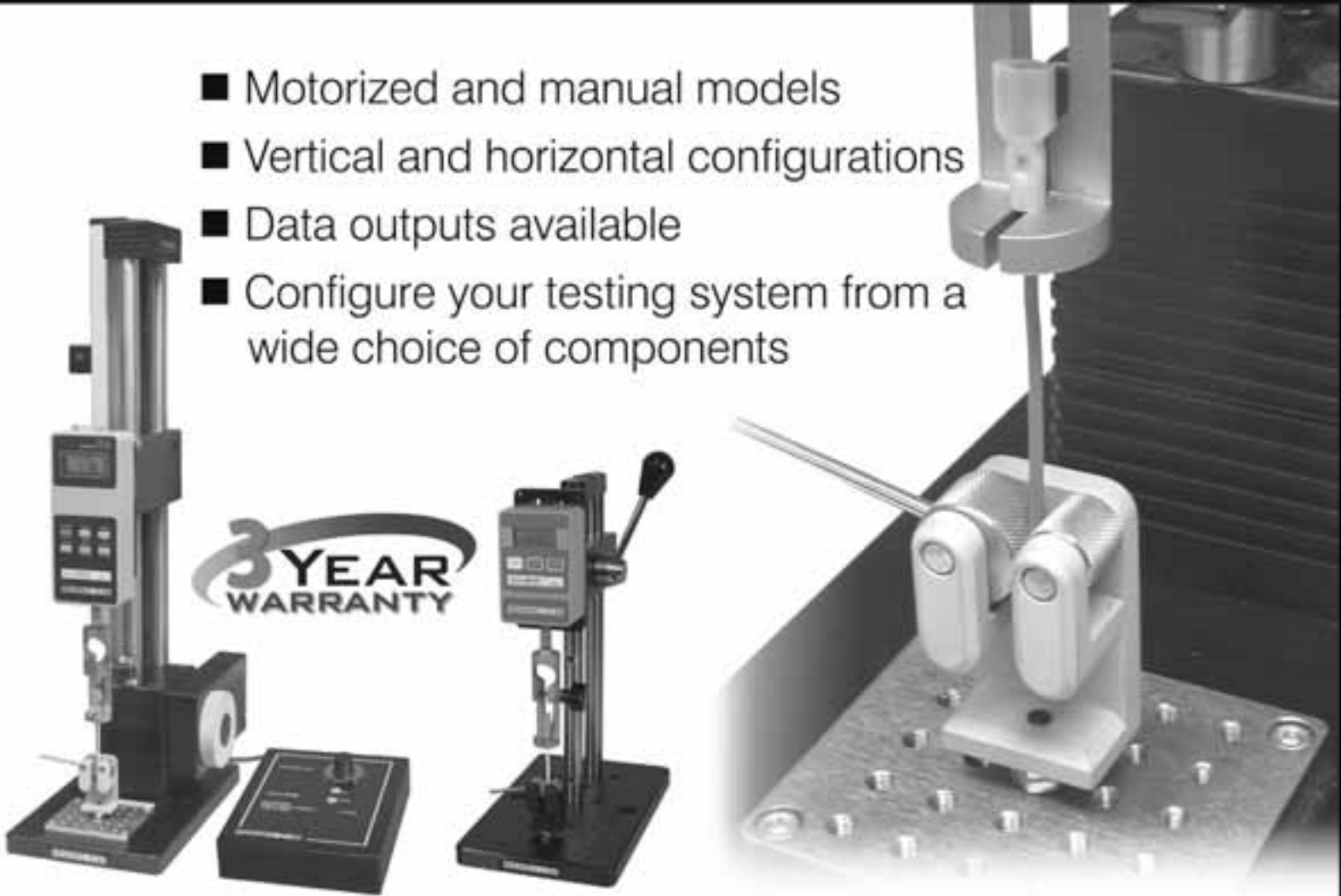
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NEWS PLUGS continued



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Standard "off the shelf" cables are available from stock for immediate delivery and custom designs, including cable assemblies with connectors of your choice, are also available with minimum lead times.

Cicoil's UL Recognized, RoHS Compliant & CE Conforming cables are manufactured in an automated, climate controlled environment and exceed the outgassing requirements of ASTM E-585. In addition, Cicoil offers anti-friction and static dissipative cable designs by request.

Cicoil has been a leader in designing and manufacturing high performance cable assemblies for over fifty years. The company's unique silicone coated flat cables provide high flexibility, extremely long life, and they can withstand temperature extremes from -65 degrees to +260 degrees Celsius. Cicoil's cables are used in thousands of demanding applications; including aircraft fuel control cells, semiconductor automation, and the Space Shuttle. Cicoil designs and manufactures its cable and cable assemblies in an auto-

mated facility in Valencia, California. Cicoil's quality assurance system is certified to the ISO 9001 (AS9100) standard. Visit [www.cicoil.com](http://www.cicoil.com) for more information, or call 661-295-1295 to speak to an application engineer.

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#### L-com's New IP66/67-Rated Duplex LC Fiber Cables Deliver Single Mode Connectivity in Harsh Environments

L-com, Inc., a global leader in the manufacture of wired and wireless connectivity products, now carries single mode duplex LC cable assemblies that are IP66/67-rated. This rating indicates that they can withstand moisture, chemicals, and corrosive gases and liquids.

"Fiber optic connectivity is important in all environments," said Dave Gallagher, Product Manager. "Harsh environments complicate connectivity, but these new cables provide a durable, reliable solution for that."

Trusted for more than 25 years, L-com, Inc. is headquartered in North Andover, Mass., and is ISO 9001: 2008-certified. For more information, please visit: <http://www.L-com.com/>.

#### Amphenol's Expanded Line of NEPTUNE Connectors Provide Better Environmental Protection

Amphenol Industrial, a global leader in interconnect systems, has expanded its

line of NEPTUNE connectors to include an inline receptacle that provides better protection from environmental elements. Designed to provide reliable connection in the most demanding power generation and distribution environments, NEPTUNE connectors are 50% smaller in size and weight than competitive models.

The new inline configuration seals the receptacle's backshell on the outer jacket cable, versus an open backshell on a panel mount receptacle, enabling the connector to withstand harsh conditions typically found in rugged power applications. These include land and offshore oil exploration and drilling platforms as well as power distribution in large scale facilities such as convention centers, manufacturing plants, production platforms and communication shelters.

Featuring Amphenol's patented RAD-SOK system, which provides a higher current flow through a smaller connector, the NEPTUNE line is equipped with plugs and receptacles from 30 amps to 400 amps at 600 volts and has a dielectric strength of 1,800 volts.

Its lightweight, rugged aluminum hardware is precision machined from high-tensile strength bar stock and finished with a hard coating to 40 points on the Rockwell C scale. The connectors have an operating temperature of -67°F to +225°F and are heat resistant to +750°F.

Amphenol's expanded line of IP68-8 rated connectors features armored and sheathed cable built to IEE-45/UL1309, IEC, BS, DIN and JIC standards as well as

*Continued on page 48*



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NEWS PLUGS **continued**

Continued from page 47

unarmored cables and flexible cables, including S, SO, SOOW-A, W and G-GC types. To eliminate cumbersome handling and sealing of inserts with conductors attached, NEPTUNE features ample wiring space for the cable housings to slip over the conductors after termination.

The contact inserts are interchangeable and reversible to suit specific needs. The contacts are made from nickel silver alloy plating with optional gold plating available. Conductors are readily terminated to easily accessible pressure wire terminals. NEPTUNE connectors are resistant to 60 Gs, exceeding MIL-STD-167-1 vibration standards.



**Amphenol's NEPTUNE Connectors with RADSOK Technology**

All receptacles come standard with threaded environmental dust caps. All plugs feature a mechanical clamp back-shell and sealing grommets with optional covers.

With millions of parts in the field, Amphenol's RADSOK technology has proven to be very reliable, with nearly no reported connection failures in Amphenol RADSOK-designed applications. Utilizing the tensile strength properties of the flat, high conductivity alloy grid for the high

normal forces required for conductivity, RADSOK provides a large conductive surface area. This results in a correspondingly low voltage drop and low temperature rise while maintaining low insertion forces. RADSOK sizes used in NEPTUNE include #12, #10, #4, #1/0, #4/0 and #350 MCM.

For more information, please visit <http://www.amphenol-industrial.com> or e-mail [rpedrzzini@amphenol-aio.com](mailto:rpedrzzini@amphenol-aio.com).

#### **Delta Group Electronics' Florida Facility Earns AS9100 Registration**

Delta Group Electronics, Inc. announced that its Florida facility has received the highly-regarded AS9100 quality designation by Underwriters Laboratories, Inc. (UL). With this certification, Delta Group has earned AS9100 certification at four of the company's five operations. All facilities are also ISO9001:2008 certified.

The ISO 9000 Series Standard is an internationally-recognized quality man-

agement system developed by the International Organization for Standardization (ISO). The ISO 9001:2008 registration defines the quality system requirements for a company to achieve the expectations of its customers and to provide a culture focused on continued quality improvement. Developed in 1997 by the American Aerospace Quality Group to promote quality standards across all aspects of air transportation, the AS9100 standard is directly aligned with the ISO 9001 requirements. The AS9100 registration contains additional requirements, clarification and interpretation of a company's quality system.

Delta Group Electronics initiated its quality certification process in 2000 and completed this first stage in 2001 by receiving ISO 9001:2000 designations at each of its then three facilities in New Mexico, California and Florida. In order to meet the needs of its customers and to enhance its overall quality system, Delta

Group pursued the AS9100 upgrade such that the California, New Mexico, Arkansas and Florida facilities are now operating under this registration, with and Texas operating under the ISO 9001:2008 registration. After receiving notice of the Florida designation, Tod Cummins, Delta Group's Director of Corporate Quality, commented that "the AS9100 certification for Florida highlights the company's long-term commitment to providing superior quality to our customers. The Florida staff should be commended for achieving the registration requirements of the AS9100 standard. This achievement allows us to objectively demonstrate our goal to exceed customer requirements and industry standards for quality product assembly."

Founded in 1987, Delta Group Electronics, Inc. is a full-service Electronic Manufacturing Services (EMS) company offering turnkey services for its customers in the aerospace, defense and commercial industries. Based in Albuquerque, New Mexico, the Company also has assembly operations in San Diego and Dallas, as well as Rockledge, Florida and Fayetteville, Arkansas, with administrative offices in St. Louis. For more information about Delta Group, visit its website at [www.deltagroupinc.com](http://www.deltagroupinc.com) or call Ron Reef at (321) 631-0799.



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Finally, a lightweight tool that delivers the power required for crimping! The small head offers incredible flexibility and the ability to reach into tight spaces. As an added convenience, the crimping head can be rotated to nearly any angle, allowing the operator to identify the most comfortable position for the job.

Despite the lightweight of the power unit, the tool can produce approximately 250 crimps between charges. This is made possible through a ten ounce, 10.8 Volt Lithium-Ion battery that can re-charge in only 25 minutes, thereby giving plenty of time for production.

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**A**s the economy becomes increasingly dependent on high-speed data communications of growing size and complexity, the medium of choice for most private networks is fiber optic cable. However, because this cable is often installed outdoors or underground it must be built to withstand a variety of physical threats, from extremely harsh weather conditions to the rigors of installation, the field of battle, intentional acts of destruction, and even mouthy rodents.

Two of the more significant advancements in the durability and security of fiber optic cables for harsh environments includes indoor/outdoor tight-buffered cable and armored jacket cable manufactured by Optical Cable Corporation (OCC®) of Roanoke, VA.

OCC's durable, lightweight indoor/outdoor tight-buffered cable is ideal for commercial applications, military tactical field use and industrial applications such as mining and petrochemical.

Unlike loose-tube gel-filled fiber optic cables preferred for long distance telco applications, the indoor/outdoor tight-buffered cable does not require a splice between indoor and outdoor cable at the building's entrance making for a faster, cleaner installation. This makes it ideally suited for moderate transmission such as telco local loop, LANs, SANs, COLOS, and point-to-point links in cities, buildings, factories, office parks and on campuses.

"When I first saw the OCC tight-buffered cable it was being used by military applications where it was run across battlefields," says Jim Aubert, president of Summit Data Systems, a compa-

ny that has installed cable systems for large corporations, as well as smaller industrial, retail, pharmaceutical and government facilities for over 15 years. "In those situations the military doesn't want to mess with loose-tube connections. They want cable that terminates quickly. Plus, the cable was subjected to a very harsh environment where it might be pounded by vehicles and other equipment. So we knew it was a very tough product."

Ruggedized tight-buffered fiber optic cable is well-suited to aerial applications as well. One of the more extreme examples of this application is the "Flying Camera" used to broadcast football games and other sporting events. Not only is reliability a must for these broadcasts, but also the cable-mounted camera rig flies at speeds of up to 80 miles per hour in all types of weather conditions.

For rougher, direct-burial applications or where rodent protection is required, corrugated steel tape (CST) armored cable is available. In addition, an interlocking armor option is available that features a flexible, lightweight aluminum sheath applied to cable to make it cut and kink resistant.

According to Aubert, even though standard tight-buffered cable offers good protection, Summit Data Systems typically recommends armored fiber optic cable.

"We consider armored cable to be a good security measure," Aubert says. "Not long ago we installed the fiber optic network in a county courthouse where there was a concern that some outsider might commit a malicious act such as

cutting through the cable with a knife to disrupt communications and security. With armored cable, that's not possible."

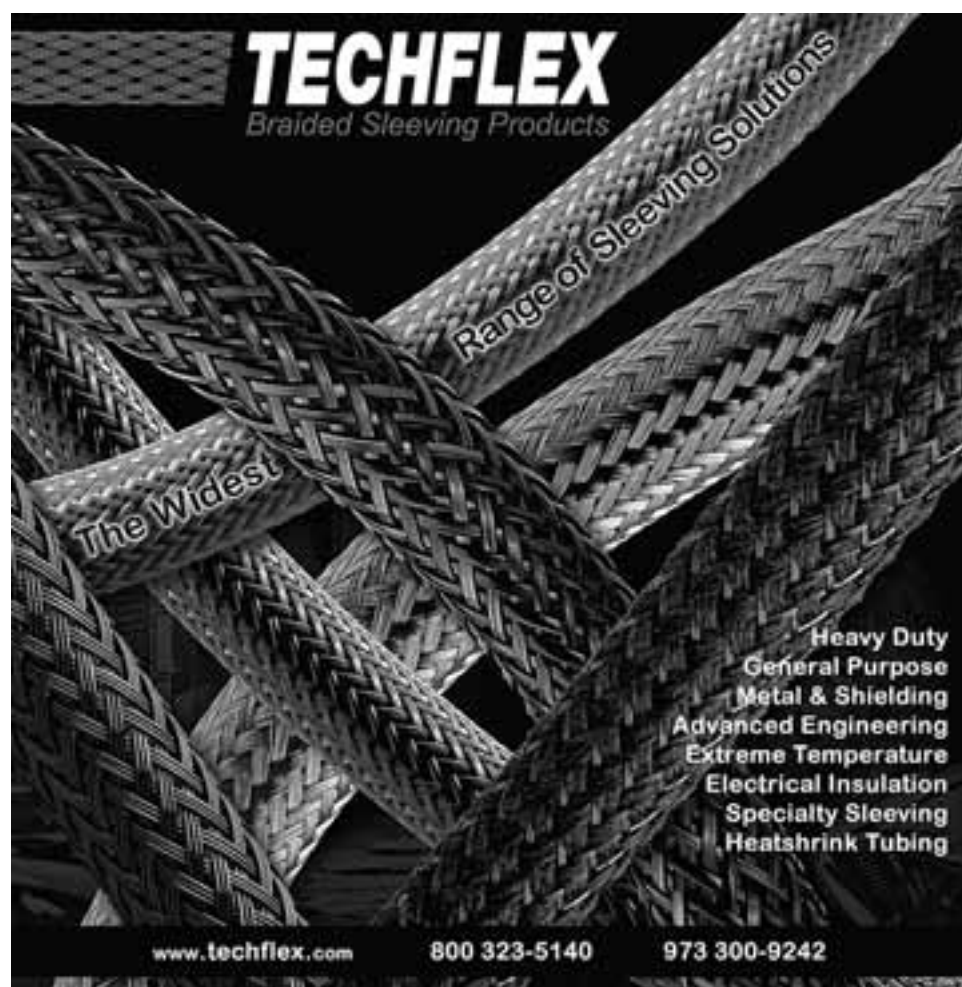
In many cases, armored indoor/outdoor tight-buffered cable eliminates the need for innerduct conduit installation, thereby reducing costs.

"There is no down side to installing armored cable," says Aubert. "It is less expensive to install plenum-rated interlocked armored than standard plenum-rated cable installed in plenum-rated

innerduct, it takes up less space in the cable tray and increases the protection and security of the cable.”

OCC indoor/outdoor tight-buffered fiber optic cables meet the functional requirements of ICEA-S-83-596, ICEA-S-104-696, GR-409-CORE, TIA-568 and TIA-598. All cable is backed by an OCC warranty if the cable is installed by an OCC certified installer.

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NEWS PLUGS continued



Resilient Coiled Cable Able to Withstand Temperatures of 55° Below Zero Now Available From Philatron

Freezing cold is one of the most demoralizing conditions for humans and machines alike. Unfortunately, neither we nor the machinery that we depend on are given the choice of hibernation. The rugged individuals that perform tasks in cold environments, as well as the skilled drivers that operate vehicles in adverse winter conditions require equipment that is on par with their mettle. Philatron Wire & Cable is therefore proud to announce the availability of coil cable products that can withstand, and function effectively at sub-zero temperatures as low as -55°F.

“We have been perfecting the art of producing the best coil cables that money can buy. A cable looks simple enough, but the components contained within all have to work together and last,” commented Philatron President and CEO Phillip Ramos, Jr. Mr. Ramos went on to explain the importance of the proper material that encloses the cable, also known as jacketing, which plays a large role in its functionality. This jacketing is the first barrier between the elements and the crucial contents which transfer energy, data, or both. In the case of Philatron’s ability to create a coil cable that can do its job under adverse temperatures, the proper combination of substances, temperatures,

and cumulative experience resulting from decades of hard work are all contributing factors.

About Philatron Wire and Cable: Philatron Wire and Cable is an award winning family owned manufacturer located in Santa Fe Springs, Ca (Los Angeles County). In 2008 Philatron won the prestigious Orange County Medium Family of the Year Award. With over 37 years of success and offering more than a combined 150 years of electrical engineering experience - company founder, Phil Ramos, Jr. states, “The responsibility of manufacturing safety and electrical current is our main concern from the beginning of manufacturing to the end users of our product”.

For more information visit [www.philatron.com](http://www.philatron.com).

Ty-Rap® Extra High Temperature Cable Ties Provide Economical Alternative to Metallic Fasteners

Ty-Rap® Extra High Temperature Cable Ties from Thomas & Betts are made of an advanced heat-resistant nylon and provide a cost-effective alternative to expensive metallic fasteners in high-temperature applications. They are suitable for applications ranging from minus 40 degrees Fahrenheit (minus 40 degrees Celsius) to 302 degrees Fahrenheit (150 degrees Celsius). The Ty-Rap Extra High Temperature Cable Ties feature a smooth, low-profile head that resists snagging when the bundle is pulled, and an unlimited tensioning range to ensure the proper fit. Ty-Rap cable ties feature an exclusive non-magnetic, stainless steel locking wedge in the head that replaces ordinary nylon catches

to secure the tie with a “Grip of Steel.”

“Ty-Rap Extra High Temperature Cable Ties are ideal for OEM and industrial MRO applications where excessive temperatures are a reality,” said Rachelle Weiss, product manager for Thomas & Betts. “With performance equal to or better than more expensive metallic fasteners, Ty-Rap Extra High Temperature Cable Ties offer

value and peace-of-mind reliability in critical applications. They also are quicker to install than metallic fasteners, lacing cord or tape, saving time and helping reduce costs.”

For more information about Thomas & Betts’ Ty-Rap Extra High Temperature Cable Ties, visit [www.tnb.com](http://www.tnb.com) or call (800) 816-7809.

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# State-of-the-Art Fiber Optic Cable Built to Survive Harsh Environments

As the economy becomes increasingly dependent on high-speed data communications of growing size and complexity, the medium of choice for most private networks is fiber optic cable. However, because this cable is often installed outdoors or underground it must be built to withstand a variety of physical threats, from extremely harsh weather conditions to the rigors of installation, the field of battle, intentional acts of destruction, and even mouthy rodents.

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I am not a broker and prefer to work confidentially and directly with business owners only. Brokers: please don’t respond to this ad.

Contact: [larry@rpcmfg.com](mailto:larry@rpcmfg.com)





# CALENDAR OF EVENTS

## Wire Southeast ASIA September 13-15, 2011

**Bangkok International Trade & Exhibition Center  
Bitec, Bangkok, Thailand**

Wire Southeast ASIA is consistently endorsed by the industry as Southeast Asia's leading procurement ground for the latest manufacturing equipment and technology for the wire and cable industries. This world-class trade fair will continue to address the rising demands by cutting-edge manufacturers for effective and efficient cost saving solutions. *For further information visit [www.wire-southeastasia.com](http://www.wire-southeastasia.com)*

## Assembly & Automation Technology Expo September 20-22, 2011

**McCormick Place North  
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Come see leading assembly and automation suppliers showcase the newest products and technologies for lean manufacturing, cost reduction, enhanced productivity, and six-sigma process control. Featuring assembly, custom automation systems, robotics, control software, motors, drives, motion control, and much more. *For further information visit [www.aatexpo.com](http://www.aatexpo.com)*

## National Wire Electrical Manufacturing and Coil Winding Expo September 19-21, 2011

**Gaylord Opryland  
Convention Center  
Nashville, Tennessee**

The 2011 Electrical Manufacturing & Coil Winding Expo is co-located with six other exciting expositions that are sure to bring you new prospects for your products. Both the attendees attracted by these other groups, sharing the same exhibit hall, and the exhibitors in the Advancements in Thermal Management Expo; the Antenna Systems Expo; the Battery Power Expo; the Energy Efficiency Expo; the Remote Site Expo and the new TechX USA Show will attract new prospects for your company. This is the One place for the face to face contacts that build lasting relationships and new customers. *Call 619-435-3629 for information about exhibiting or attending this mega-event.*

## IPC Midwest September 21-22, 2011

**Renaissance Schaumburg Hotel & Convention Center  
Schaumburg, Illinois**

IPC — Association Connecting Electronics Industries® will hold its annual IPC Midwest Conference & Exhibition in 2011 at the Renaissance Schaumburg Hotel and Convention Center in Schaumburg, Ill. The event will be produced solely by IPC and will feature a two-day exhibition, a technical conference and industry standards development meetings. "IPC is responding to exhibitors' needs for a regional and cost-effective exhibition and we believe the IPC Midwest Conference and Exhibition in Schaumburg does just that," explains Anthony Hilvers, IPC vice president of industry programs. "The Renaissance Center provides world-class conference and exhibition facilities with easy expressway access convenient for electronics manufacturers and suppliers in Wisconsin, Indiana, Michigan, Iowa, Minnesota and Illinois," adds Hilvers. *For further information visit [www.IPCMidwestShow.org](http://www.IPCMidwestShow.org).*

## Productronica 2011 November 15-18, 2011

**New Munich Trade Fair Center  
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19th International trade fair for innovative electronics production. productronica is the world's leading trade fair for electronics production. It is the largest exhibition of its kind, and it covers the entire process chain in electronics manufacturing. Its diverse range of exhibitors and visitors give it a unique international character. Productronica is an exceptional gathering for market leaders and newcomers alike. *For further information visit [www.productronica.com](http://www.productronica.com).*

**If you have an event you would like to have listed here, send it to Marilyn Magowan  
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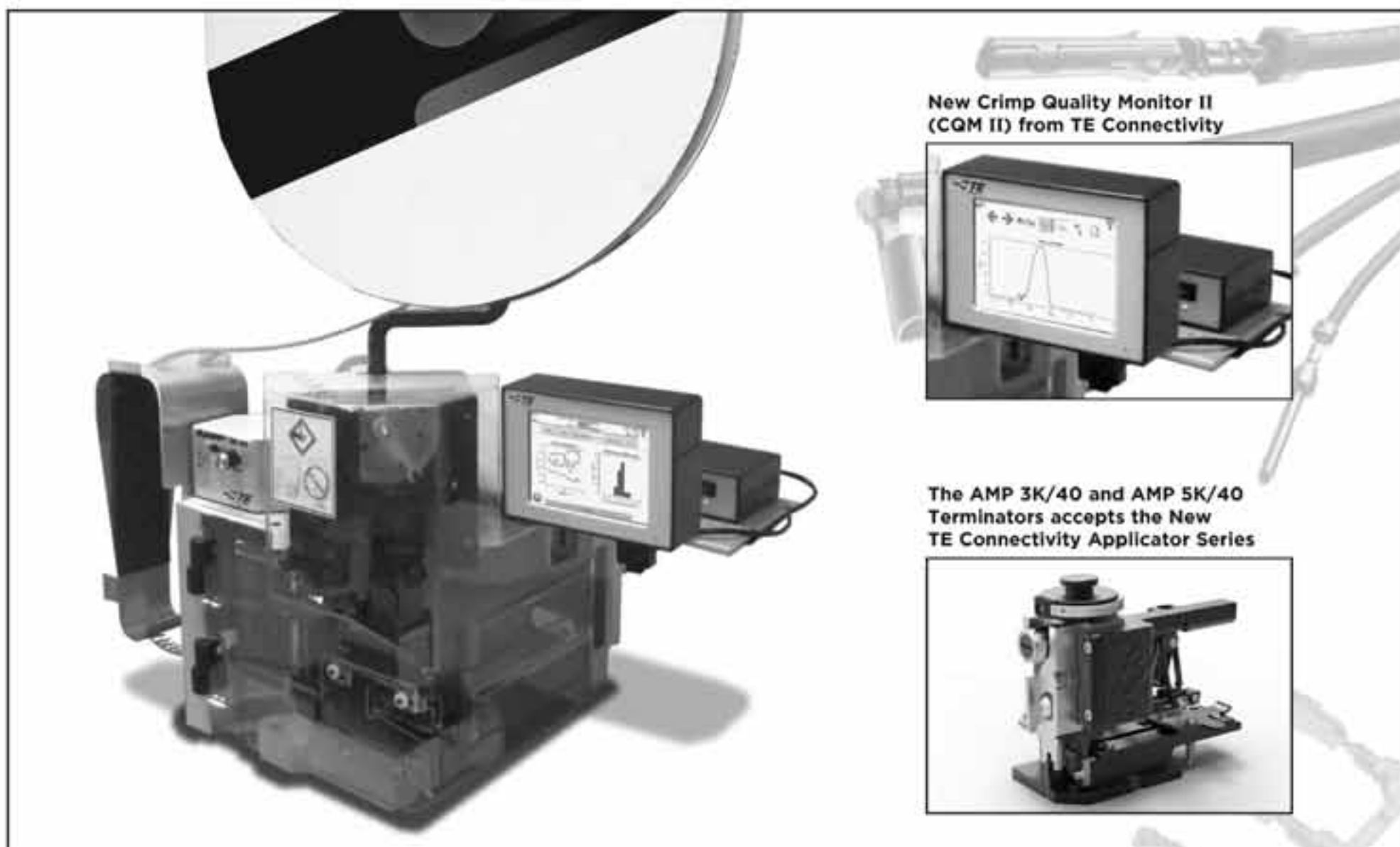
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