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The International Magazine for the Wire & Cable Industries



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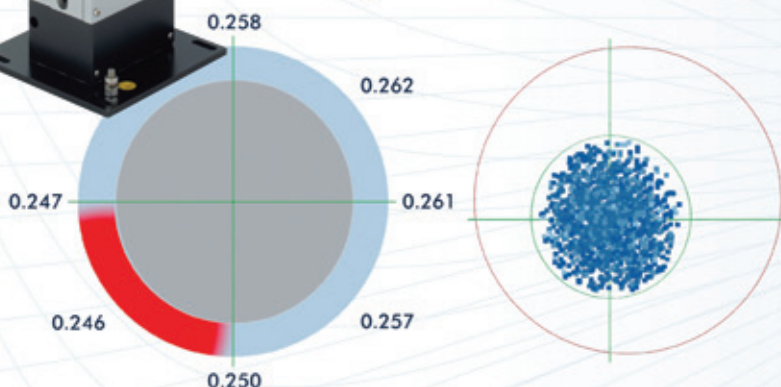
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you like them.«

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Head of Performance Improvement Department at SIKORA

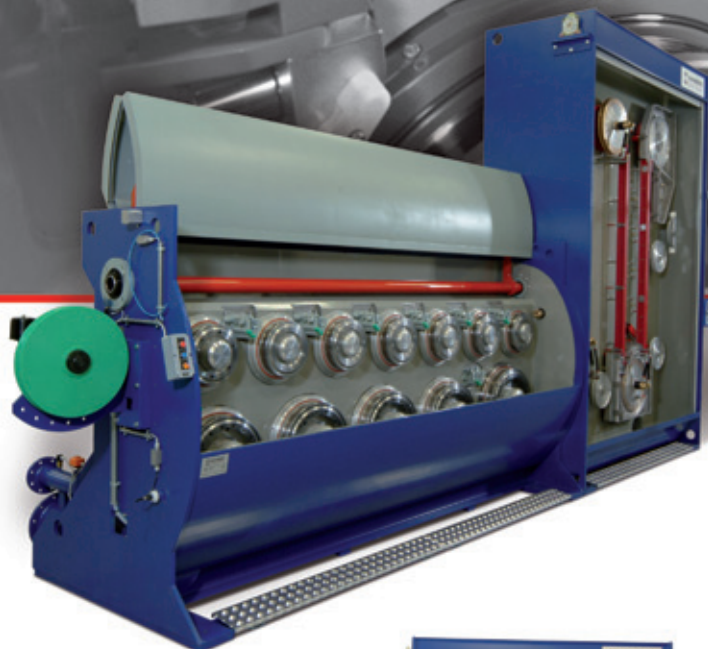
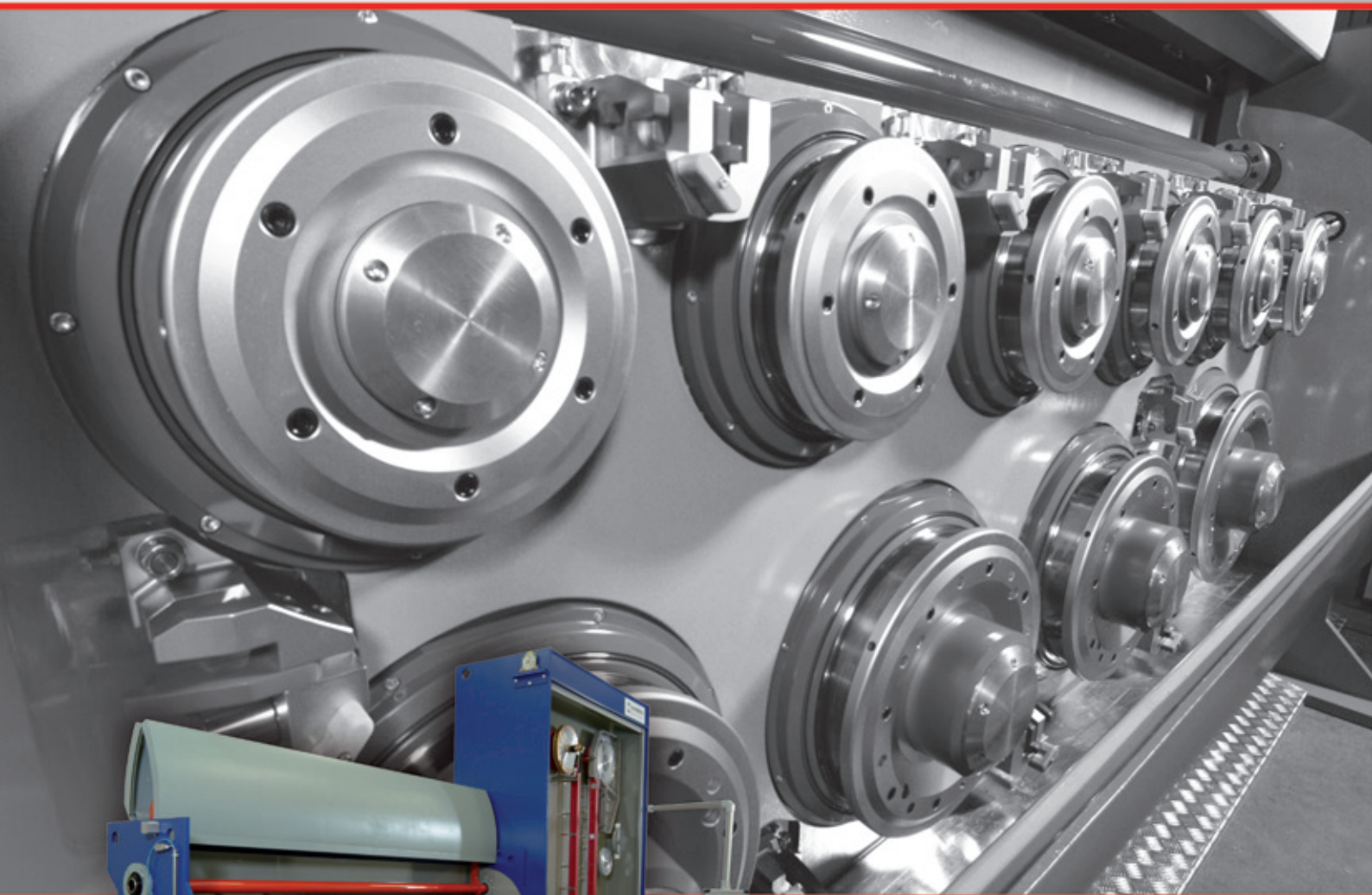


CENTERVIEW 8000 measures online the wall thickness, eccentricity, outer diameter and ovality of all types of round, single conductors and cables with a solid or stranded conductor in a diameter range from 0.05 to 25 mm.

The extension of the cloud diagram is an indicator for the standard deviation of the eccentricity.



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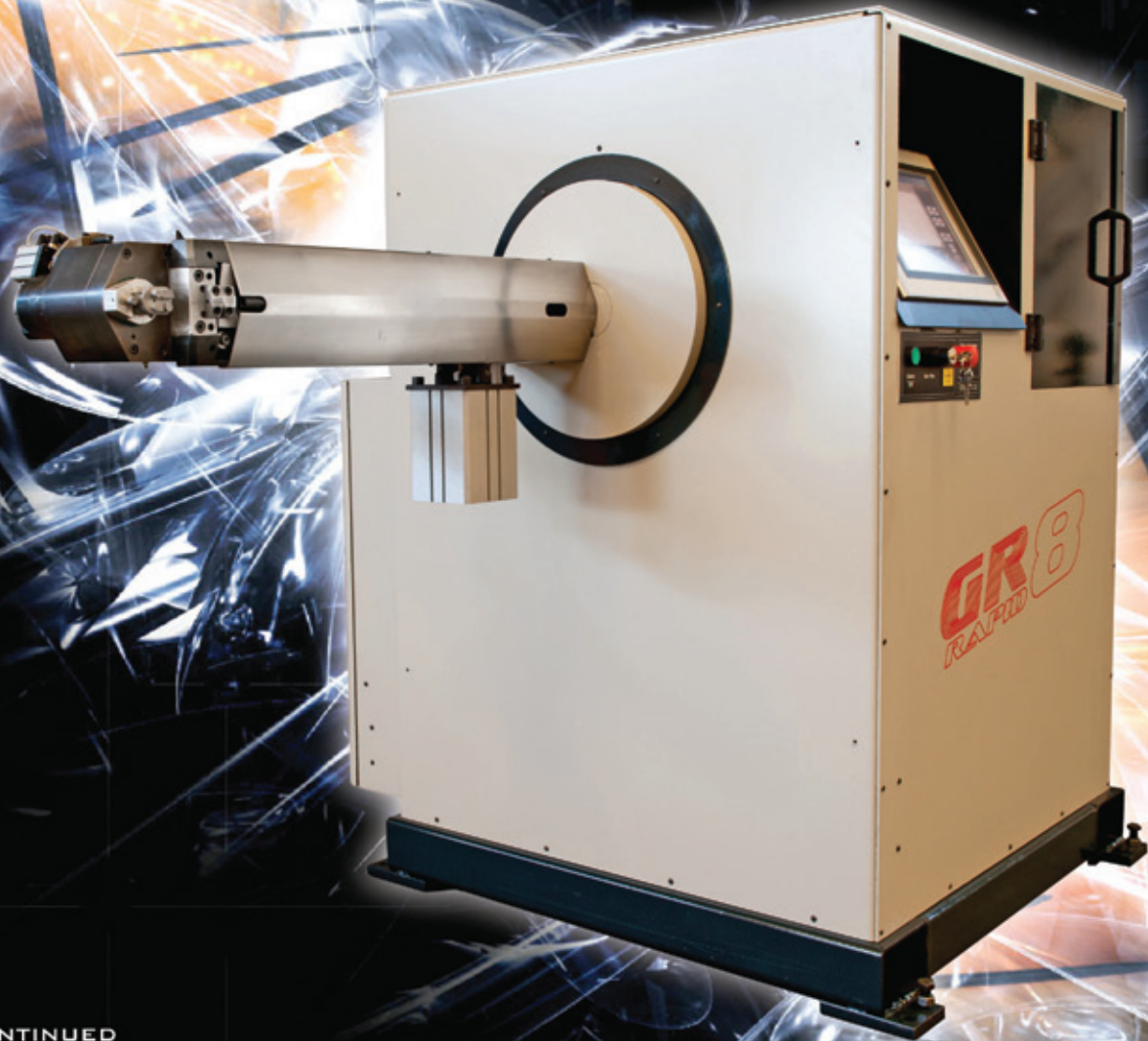
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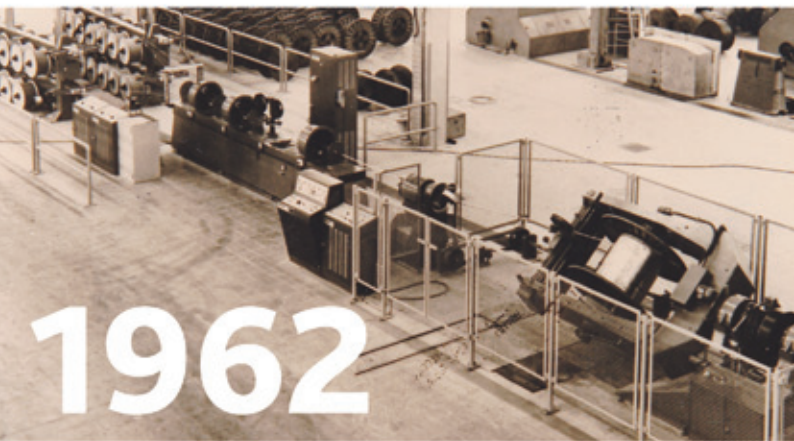
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See page 127 for further details

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A new year of new challenges ahead

I WOULD obviously like to welcome you all to 2012 with a brighter and colourful EuroWire, and to wish you all a happy and prosperous new year.

Two stories which stick out from this issue of EuroWire are where companies have been faced with very differing challenges.

Firstly there is the case of Modular Wiring Systems undertaking work at the Grade I Listed King's Cross Station in London, UK, (see page 9).

Not only did the company have to work to English Heritage's strict guidelines, the work had to be undertaken at one of the world's busiest stations while it remained open.

Add to this a shortage of storage space for materials on-site meaning that materials had to be delivered and used almost immediately.

Everything would have to have been planned with military precision and Modular Wiring Systems can be justifiably proud of the achievements.

A little more modern and easier for the work out for the company, but Nexans has again been flexing its sponsorship muscle with the Louvre-Lens project in France. (See page 20).

Nexans are providing the cables and work for the project which basically sees the Louvre transported using multimedia and displayed in Lens.

This innovative project, scheduled for completion by the end of the year, will see the French company supply low and medium voltage power cables and data transmission cables for the building and surrounding land in a bid to preserve works of art.

A new year, new outlook and new challenges, all of which I'm sure the wire and cable industry is well prepared for.



David Bell
 Editor

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Jean-Paul Sartre

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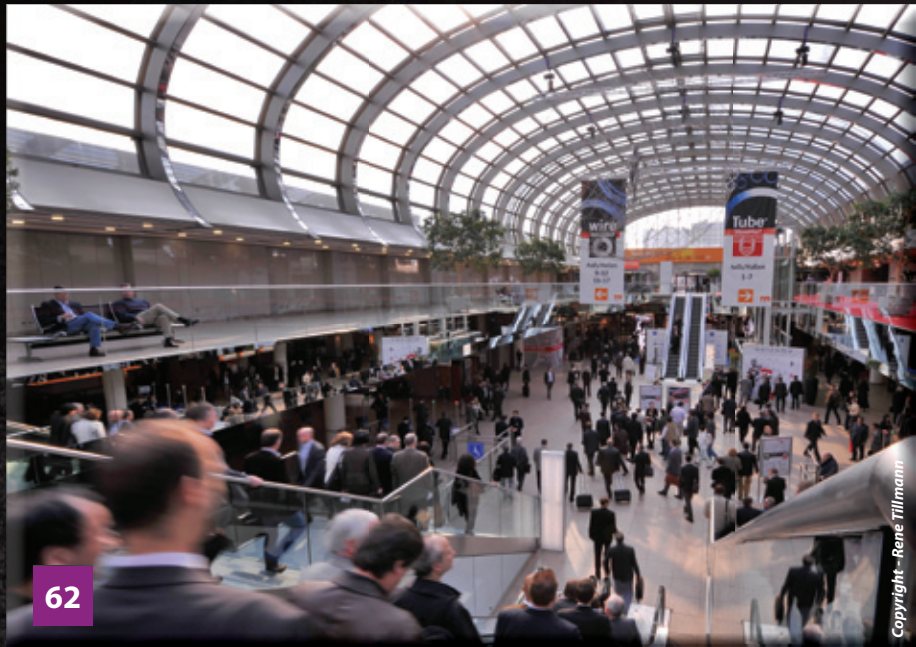
26 - 30 March 2012,
Düsseldorf, Germany
Booth 11 D43

Zumbach

Our technology, your vision

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Стивен Пирсон, компания «Тайко электроникс» (г. Гринсборо), и
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Por Stephen Pearson,
Tyco Electronics, Greensboro,
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Beta Lasermike, Dayton

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- wire Düsseldorf 2012 Show issue
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Getting Technical

Quality materials can improve reliability of distribution cables

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dates for your diary ...

wire 2012

March 2012

26–30: **wire/Tube Düsseldorf** –
trade exhibition –

Düsseldorf, Germany

Organisers:

Messe Düsseldorf GmbH

Fax: +49 211 45 60668

Email:

wire@messe-duesseldorf.de

Website: www.wire.de

2012

May 2012

22–23: **Wire Expo** – trade exhibition
– Dallas, USA

Organisers:

Wire Association International

Fax: +1 203 453 8384

Email: info@wirenet.org

Website: www.wirenet.org

June 2012

19–21: **Guangzhou Wire and Tube**
– trade exhibition – Guangzhou,
China

Organisers:

Julang Exhibition Co Ltd

Fax: +86 203 862 0790

Email: meiwen@julang.com.cn

Website: www.julang.com.cn

September 2012

25–28: **wire/Tube China** – trade
exhibition – Shanghai, China

Organisers:

Messe Düsseldorf China Ltd

Fax: +86 216 169 8301

Email: www.shanghai@mdc.com.cn

Website: www.mdc.com.cn

October 2012

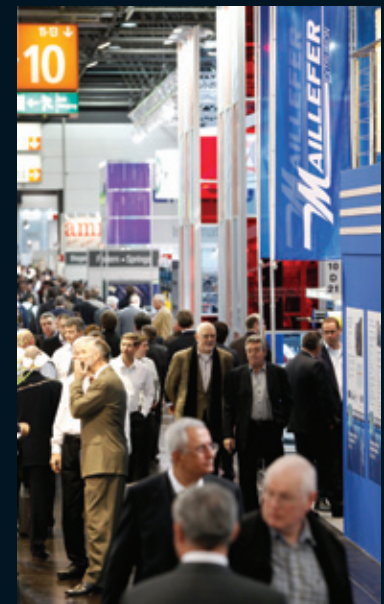
30–1 Nov: **wire and Cable India/
Tube India** – trade exhibition –
Mumbai, India

Organisers: Messe Düsseldorf India

Fax: +91 112 697 1746

Email: info@md-india.com

Website: www.md-india.com



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▲ *Modular Wiring Systems – helping to upgrade King's Cross Station's power and lighting system*

New meets old as Modular wiring keeps everything on track

MODULAR Wiring Systems, a subsidiary of electrical cable manufacturer Tratos Ltd, has designed, manufactured and supplied modular power and lighting distribution systems for King's Cross Station in London, a Grade I listed building.

Working to English Heritage's strict guidelines to protect the station building whilst also transforming it into a world class transport hub, Modular designed the distribution systems to

run mainly underfloor through key parts of the Western Range. Such restrictions require exceptional system flexibility, which was found in Modular Wiring Systems' products and design process.

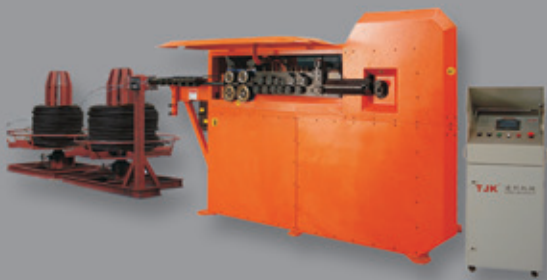
Logistics was also an important factor in this prestigious installation due to limited on-site storage, requiring on-site delivery of materials. This is made possible by the offsite pre-fabrication of the system, including pre-wired

distribution boards, which can then be stored and delivered to site at the exact time and date specified by the client.

Other benefits of a modular wiring system are quick installation with reduced labour requirements, whilst actually improving the quality of the finished system as potential risks posed by on-site conditions are eliminated.

Modular Wiring Systems – UK
Fax: +44 1753 566 701
Email: info@modwire.com
Website: www.modularwiring.com

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Fainplast leading player in renewable energies

FAINPLAST Srl – a leading company in the field of plastics with a strong vocation for innovation – has been investing in the field of renewable energies, an area in continuous expansion thanks in no small part to government subsidies.

The company has developed a wide range of crosslinkable halogen free compounds (XLPO-HFFR) with high thermal and mechanical properties that are used in the production of solar cables intended for solar panels and for those applications requiring low emissions of toxic fumes in case of fire (railways, ships, airports, etc).

These materials, besides guaranteeing high flame, abrasion and moisture resistance and very low fumes emissions, offer very long lasting performances, even though they remain exposed to all types of weather.

The added value that Fainplast gives to this type of compound lies in the crosslinking method, the so-called Sioplas method. The crosslinking process begins by adding a catalyst in a percentage varying from one per cent to seven per cent during extrusion.

The Sioplas method is not only synonymous with effectiveness but



▲ The Fainplast head office

also with efficiency. In fact, it does not require large investments for manufacturers and can be implemented through a normal PVC production line. For customers this is therefore an excellent solution, cheaper than other cable production methods.

In addition, several companies have already obtained important international

certifications using Fainplast halogen free compounds, such as the German TÜV and VDE. Besides these certifications, this material allows certification to the French UTE and the Italian CEI 20–91.

Fainplast Srl – Italy
Fax: +39 0736 403 807
Email: info@fainplast.com
Website: www.fainplast.com

Radiation hardened fibres

Draka has developed two new radiation hardened fibres, Super RadHard single-mode fibre (SRH-SMF) and Super RadHard multimode fibre (SRH-MMF), said to offer substantially improved performance.

Draka SRH-SMF and SRH-MMF radiation hardened fibres are built using fluorine as a dopant in the core region, replacing the germanium used in previous versions of RadHard fibre. Fluorine greatly improves the radiation induced attenuation (RIA). For the SRH-MMF the refractive index profile still has graded-index design, combining high bandwidth (even during and after irradiative circumstances) with low radiation induced attenuation.

For over a decade Draka has been active in the area of radiation

hardened optical fibres. A series of RadHard single-mode fibres (RH-SMF) and graded-index multimode fibres (RH-MMF) have been approved by the USA Department of Defense (DoD) complying with MIL-PRF-49291 specifications. The Draka Eindhoven fibre plant is MIL-790 quality assurance certified.

As well as military applications, Draka regular RadHard fibre has been used in other irradiative environments, including CERN's Large Hadron Collider (LHC) where over 1,500km of RH-SMF is installed inside the LHC tunnel, and in the LHC ATLAS detector.

Draka Communications – Netherlands
Email: info@draka.com
Website: www.draka.com

Trasfor acquisition is completed

ABB has completed its acquisition of the Trasfor Group. Trasfor is a leading producer of dry-type transformers and inductors for low-voltage and medium-voltage applications.

The company makes specialised products for drives, railway rolling stock, offshore wind power and other renewable energy based power generation and for a range of industries including marine, oil and gas.

The acquisition strengthens ABB's transformer business, broadens the customer offering and extends the company's market presence.

ABB Ltd – Switzerland
Fax: +41 433 174 420
Email: info@abb.com
Website: www.abb.com

Borealis receives product leadership award

Borealis was recently awarded the Frost & Sullivan 2011 Europe Product Leadership award in the high voltage direct current (HVDC) cable insulation market during an awards banquet in London.

The award is a recognition of Borealis' accomplishments in the HVDC cable insulation market, where Borealis has played a pioneering role by introducing crosslinked polyethylene (XLPE) based insulation compound Borealis Superclean™ LE4253DC.

As a result of its high electrical breakdown properties, Superclean™ LE4253DC brings

performance reliability improvements to HVDC cables. The compound offers a balance between space charge accumulation, conductivity and DC breakdown strength and allows cost effective manufacturing in conventional CV lines.

HVDC cables made with LE4253DC/LE0550DC from Borealis are qualified and meet Cigré recommendations.

Marc Hubert, vice president for Borealis Wire & Cable said: "Borealis is the only company with a track record of 45 years of experience in developing and

manufacturing XLPE and supplying compounds for HVDC XLPE cables for more than ten years. The Frost & Sullivan Product Leadership award confirms that Borealis maintains its continued focus on innovation to meet market demands."

According to the Frost & Sullivan report, the market has slowly witnessed a shift from traditional mass impregnated paper (MIP) insulation to much more advanced extruded polymeric insulation systems based on XLPE.

The main challenge for the market participants has been in adapting the products to be used on conventional cable production lines for HVDC applications.

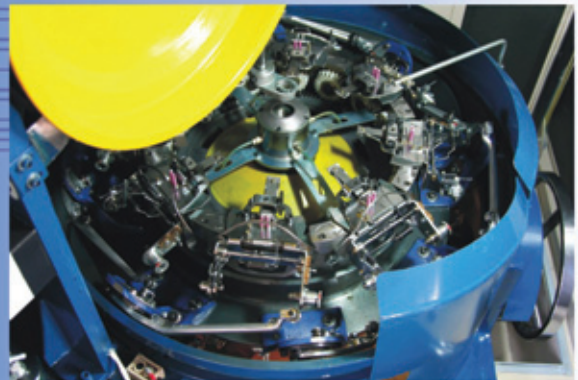
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▲ Evonik has it certified

Evonik hitting the standard

EVONIK Industries subsidiary APT Europe GmbH has been successfully certified according to EN ISO 13485:2003.

This international standard specifies requirements for the quality management systems of medical device manufacturers and their suppliers.

Compared to ISO 9001, ISO 13485 places particular emphasis on ensuring consistent product quality and controlling and verifying all relevant processes, as well as documentation and traceability.

Manufacturers of medical devices must ensure that their suppliers comply with the requirements of EN ISO 13485.

This certification simplifies the mandatory supplier qualification process for Vestakeep® customers.

Besides ensuring consistent product quality, Evonik is also making a significant contribution to reducing customer expenditures for medical device registration.

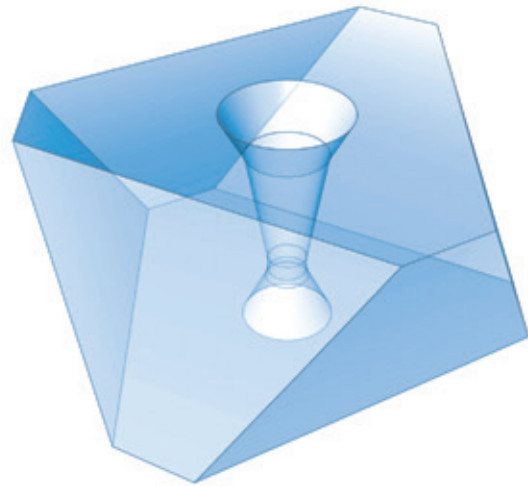
The product portfolio of Evonik includes stock shapes made of Vestakeep® medical grades for the manufacturing of biocompatible and biostable products.

Dr Herbert Groothues, Regulatory Affairs Vestakeep®, said: "We believe that our decision to become ISO 13485 certified is a proactive one that not only anticipates the demands of our customers but also demonstrates our commitment to providing quality services."

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New recruits for Allied

Allied Wire and Cable continues to thrive, hiring new account representatives at three of its locations across the US.

With more representatives at each location, Allied can now provide better service than ever.

Paul Lawruk is the newest account representative at Allied's Headquarters in Pennsylvania.

Allied's newest location, Las Vegas, welcomes Kristy Ventura.

And Ryan Baldinelli is a recent addition to Allied's New England branch, and to the wire and cable industry.

Allied Wire and Cable – USA
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Website: www.awcwire.com

Matthew gets new \$10,000 scholarship

ALLIED Wire & Cable has announced Matthew Rayner as the first beneficiary of its new company-run scholarship programme. Matthew is the son of Ron Rayner, a warehouse associate at Allied's headquarters in Collegeville, Pennsylvania, USA since 2008.

The scholarship programme, which will run annually, is open to children of full-time AWC employees with at least three years on the job.

Students are eligible to apply for the \$10,000 scholarship during their senior year of high school, and they must be college or university-bound and have a minimum GPA of 3.0. Scholarships are awarded based on both merit and financial need, and are payable over the course of the student's college career.

Matthew Rayner is a freshman at Penn State Abington. To help cover the cost of tuition, he will be awarded a cheque for \$2,500.

As long as he maintains a 3.0 GPA or higher, he will receive one cheque each year during his four-year college programme, for a scholarship totalling \$10,000.

Mr Rayner said, "Receiving the Allied Wire Scholarship is a great accomplishment in my academic



▲ Matthew Rayner is presented with his scholarship cheque

career. I appreciate Allied Wire giving me opportunity (to be) the first ever recipient of this award, and it is something that I will always appreciate."

Tim Flynn, Allied's CEO, said, "Allied Wire & Cable has always has taken pride in helping those with needs in our community. The opportunity to help an

immediate member of the Allied family achieve greatness is very rewarding. We wish Matt the very best and we know he will make us all proud."

Allied Wire & Cable is a family owned and operated wire and cable distributor and value added manufacturer.

Allied services many of the largest industries in the country, including the government and the military, as well as the aerospace, automotive and telecommunications industries.

The company offers customisation services, including cut and strip, printing, dyeing, striping and twisting.

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Dow sign-up a new partner

DOW Electrical & Telecommunications has announced that an agreement has been reached with Uncomtech Group to become a Dow Inside licensee.

Uncomtech, the largest cable holding company in Russia based on copper conversion, joins Sevkaabel Holding to become the second Dow Inside licensee in the Russian Federation.

Filip Tauson, commercial director Europe/Middle East/Africa, Dow Electrical & Telecommunications, said: "Dow Inside is a key component of our strategy to continue to grow and

provide our customers with the support and innovative technology they need to succeed, and we are delighted to welcome Uncomtech to our Dow Inside partnership programme."

Dow Inside, a recent initiative benefiting cable manufacturers, utilities and telecommunications firms alike, further reinforces Dow's commitment to these industries. This is achieved by helping provide better cable reliability and long service life based on exceptional materials, dedicated R&D, deep industry knowledge and close working relationships with cable manufacturers,

utilities and other power industry influencers.

"This partnership gives us important advantages in terms of materials, technologies, supply and support. We will be able to differentiate our cables and provide our customers with high quality, long-life cables that meet strict international quality standards," added Andrey Pisanny, financial director, Uncomtech.

Under the terms of the agreement, Uncomtech will use Dow Endurance™ insulation, semiconductive and jacketing materials to manufacture medium, high and extra high voltage power cables. In exchange, Dow Electrical & Telecommunications will provide advanced technology, proven products and enhanced service that will help give both companies a competitive edge in this demanding and growing market.

Europacable makes Brussels presentation

Europacable was invited to present its Concept of Partial Undergrounding at the Eurelectric Transmission and Distribution Technology Day in Brussels. In addition to building future HVDC electricity highway systems, Europe needs to upgrade its meshed 380kV AC networks and partial undergrounding can contribute to upgrade these existing links faster.

Europacable – Belgium

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Website: www.europacable.com

Dow Electrical and Telecommunications – USA

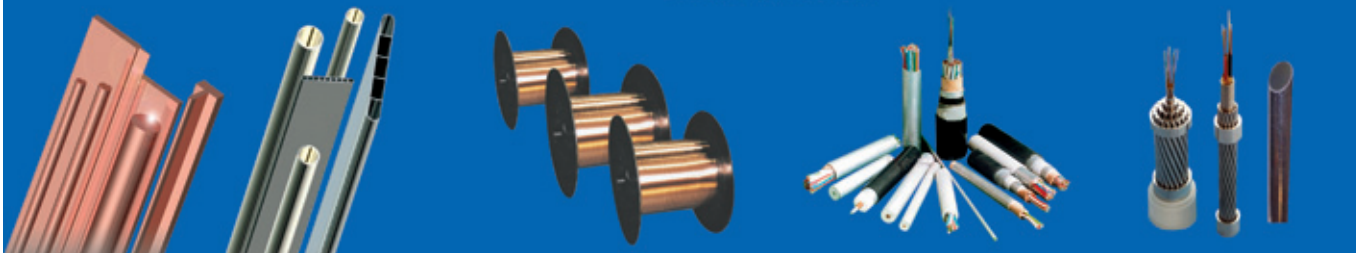
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Continuous Extrusion & Cladding Machinery For Copper And Aluminum



Dalian Konform Technical Company Ltd-China has started systematic researches in the continuous extrusion and cladding technology since 1984. The equipments have been widely applied to make Copper & Aluminum Rectangular Conductor, Busbar, Aluminum Round & Multi-void Tube, As wire & Sheathed Cable, etc. Now over 1000 lines have been supplied to over 40 countries, including USA, Germany, Japan, Italy, UK, Brazil, Poland, and so on.



Email: songby@konform.cn

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The reel specialists

BOFFI has specialised in manufacturing wooden reels since 1920.

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The product range includes:

- Reels made of spruce for wires, electric cables, fibre optic, and steel cables, plates, welding wire, tape, piping, ropes, etc
- Treated according to the ISPM 15 FAO International Standard and

DolWin2 maintenance secured

ABB has secured a contract from the Dutch-German transmission system operator, TenneT, to provide maintenance services for the DolWin2 link, built to take power from North Sea wind farms to the grid of mainland Germany.

DolWin2 will deploy an offshore high-voltage direct current (HVDC) system with a rating of over 900MW, keeping electrical losses to below 1% per converter station. The completed link will be capable of supplying over 1.5 million households with wind-generated electricity, *Energy Business Review* confirmed.

Under the three-year contract, which has extension options, ABB will keep up the land- and sea-based HVDC converter stations connecting the wind farms via an offshore platform to the grid. DolWin2 links the 400MW Gode Wind II wind farm and other offshore wind farms to the grid.

Scheduled to be operational in 2015, DolWin2 will have onshore and offshore HVDC converter stations and 135km of underwater and underground DC cables.

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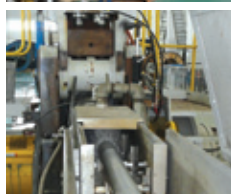
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- Components in iron (dished washers, bushes with plate, tie rods, bolts, nails)

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Combining FTTH with environmental control

DRAKA, part of the Prysmian Group, has announced that its Swiss partner Drahtex AG has completed the initial phase of a rural community fibre network combining fibre-to-the-home (FTTH) with environmental control for the village of Hünenberg in Zug, Switzerland.

Part of a showcase renewable energy project, Draka fibre connectivity not only ensures high speed broadband services to community residents, it forms the backbone to supply and control a substantial part of the energy demands of Hünenberg. The village biogas plant, one of the largest plants in Europe, provides 15% of energy requirements. Its gas turbine, powered by biogas, will provide the community with nearly 600kW of energy (300kW of electrical and 300kW of thermal energy).

"This is an entirely self-financed renewable energy project in which

fibre interconnectivity plays a key role," explained Roland Kurmann, chairman of Drahtex. "It's a cooperative venture which brings community stakeholders together to invest in a future-orientated energy approach for the citizens of Hünenberg."

With 9,000 inhabitants spread over an area of 18.5km², Hünenberg has a high proportion of agricultural activity. Draka JetNetXS blowing technology helped deploy the underground fibre infrastructure running alongside the biogas distribution network over a total network length of 4.5km. Despite the challenge of jetting fibre over distances up to 5km, the fibre optic network has been installed rapidly and successfully and because of the efficiency of the Draka JetNetXS technique, the network can be easily expanded to meet future community energy management requirements as the output of the plant expands.

Fibre interconnected, every component in the biogen heating plant is fully automated, with remote control availability from various sites. All processes within the plant can be monitored and controlled at any time.

In addition to animal manure supplied by the farmers, the biogas plant is fed with other readily available natural waste products in order to increase its efficiency. They include grass, lawn-clippings, and biogenic industrial waste such as vegetable and food scraps from industry, restaurants and inhabitants. Added to this are the leftovers of the local agricultural industry, such as spent grains, pomace and the remainders of the milling industry.

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State-of-the-art art...

NEXANS has partnered with the new Louvre-Lens Museum in the north of France.

Under a competence sponsorship agreement, the group will meet all the cable needs of the new museum by supplying free of charge low and medium voltage power cables, as well as data transmission cables and systems for the 28,000m² building and the 22 hectares of grounds.

The value of this contribution is estimated at between €700,000 and €1m over three years.

Nexans is providing the new museum with cables that meet the most stringent requirements in terms of strength, durability, energy efficiency, fire performance and ultra-high speed data transmission capability.

Easy to install and fully recyclable at end-of-life, Nexans' cables directly contribute to the performance and safe operation of the premises and their communication networks.

Nexans is supplying cables as construction work progresses and needs emerge on the Louvre-Lens site.

Work is scheduled for completion by the end of 2012.

"In supporting the Louvre-Lens Museum, we are proud to bring our best expertise to bear on an innovative project which combines technology, sustainable development, and the promotion of art to a very wide audience", said Frédéric Vincent, CEO of Nexans.



▲ Above. An artist's impression of how the Louvre-Lens project will look when complete and, inset, work already underway at the site

The Louvre-Lens project will adopt a fresh, innovative approach to showcasing the Louvre's magnificent collections.

The new museum will leverage state-of-the-art technologies to preserve works of art and ensure both their safety

and that of the public. The exhibits will be presented using new multimedia devices.

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- Reinforced non-conductive water-blocking tape CHDZD



2. Semi-conductive Water-blocking tape

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- Single-side semi-conductive water-blocking tape CBDZD
- Semi-conductive laminated water-blocking foam tape CBHZD
- Single-side semi-conductive water-blocking woven tape CBDWD
- Reinforced semi-conductive water-blocking tape CHBSD
- Marine water-blocking tape CMBZD



3. Binding, Bedding, Barrier & Separating tape

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- High strength Woven tape CHB
- Semi-conductive nylon tape CBNLD
- Semi-conductive non-woven tape CBZD
- Semi-conductive woven toteron tape CBHD
- Flame-retardant tape CFR

4. Yarns

- Water-blocking yarn CZS
- High tension polyester yarn HZT
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Implementing tomorrow's technology today

ewl and Swisscom have embarked on a project to construct a comprehensive fibre-to-the-home (FTTH) network by 2014. The special cables and wall outlets that are required for the installation of optical fibres in homes all come from Dätwyler.

Over the past year, ewl (which stands for 'energy water Lucerne') has been working jointly with Swisscom on a project to establish a FTTH network in the coverage area of ewl. Swisscom is responsible for laying the cables between the districts within the city, whilst ewl looks after the last mile distribution of the fibre optic cables to the individual apartments and properties.

For this forward-looking project, ewl is using special fibre optic cables and wall outlets in the buildings. For the in-house wiring ewl decided to use as thin an FTTH cable as possible with a flame-retardant yellow sleeve and four fixed fibres with a maximum diameter of 0.6mm each. In terms of its design, the FTTH wall outlet needed to correspond to the existing installations and was to be as flat as possible.

In addition to a window for the label, dust protection caps and connectors with laser protection, pre-fabricated pigtailed, designed for shrink and crimp splice protection as well as an integrated, generously proportioned fibre tray were called for. The wall outlet was to ensure the easiest possible handling during installation.

A decision was made in favour of Dätwyler because the long-standing supplier to ewl was able to provide the right FTTH products at the required quality and price.



▲ Dätwyler is supplying cables and wall outlets for the ewl/Swisscom FTTH project in Lucerne

Another decisive factor was the company's extensive optical fibre know-how, experience gained from other FTTH projects, and the fact that the Altdorf team had the necessary flexibility and resources available to deliver the required quantity at the desired point in time.

By the summer of 2011 Dätwyler had already delivered more than 500km of FTTH in-house cable and around 12,000 outlets. In order to ensure that everything went smoothly, ewl put the whole of the logistics operation in the hands of Kablan AG, a company based in Ostermundigen, Switzerland.

The products were installed by ewl's installation partners Cablex AG and Network 41 AG, sourcing the required

material directly from Kablan. The specific design of the Dätwyler cables and outlets means that the installation companies can carry out rapid installation. For example, it is comparatively easy to lay the FTTH in-house cable, with an external diameter of only 2.8mm, in the riser ducts that are in most cases already occupied by other cables. By the end of 2014 all 42,500 users should be connected to the FTTH network.

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Componenta starts statutory negotiations

Componenta, a metal sector company with international operations and production plants located in Finland, Turkey, the Netherlands and Sweden, started statutory negotiations, as stipulated in the Finnish Act on Cooperation in Undertakings, in Componenta Finland Ltd Nisamo on 18th October 2011.

The company is planning to terminate operations of the business unit. Profitability of the machine shop located in Lempäälä, Finland has been weak for

a long period of time and its cash flow is negative. In addition, the business unit's order book and future outlook are weak.

Negative development of production volumes has mainly been caused by changes in wind power customer segment.

The statutory negotiations cover the Nisamo machine shop personnel, in total 34 people. Actions based on negotiations will be realised during the second quarter of 2012 at the latest.

One-time costs of possible terminating of operations are expected to be €2.8mn. The company stated that to achieve its strategic goals of growing together with customers and being the preferred casting solutions provider for its customers, it has to have competitive, profitable operations with a corporate structure that supports them.

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Sedgewall wins bespoke cable supply

INSTALLATION of many new green street cabinets began in October after Dunstable, UK-based manufacturer Sedgewall Communications supplied bespoke cabling to CTDI, based in Milton Keynes. The cabling is an important component in the cabinets, which are part of a new fibre optic Internet project being rolled out around the UK.

The sale comes as part of CTDI's Project ECI Street Cabinet, which will eventually see a huge increase in the number of green cabinets that carry fibre optic Internet and telephone signals to homes.

Sedgewall landed the tender by outbidding other cable suppliers. The win marked a significant new customer for sales account manager Steve Whitney who joined the company in 2011.

Mr Whitney, who has many years' experience in providing technical and engineering solutions, said "Sedgewall's extensive knowledge and expertise was essential in advising the customer fully on the variety and lengths of cable required for the job. Ensuring the materials are prepared and stripped to meet the customer's needs is all part of our service and we hope to be able to work with this customer again in the future. It is quite an achievement to think that we have the ability to supply the cable for every telecoms cabinet in the UK."

Darran Cordery, operational programme manager at CTDI, commented, "We had a choice of cabling suppliers, but Sedgewall's customer service and quality



▲ Cabinet production at CTDI

standards won the day. Samples were turned around very quickly and their on-going contact and support is much appreciated."

The last quarter of 2011 alone saw CTDI needing to satisfy an order for 3,000 finished cabinets. Each cabinet contains an intricate series of cables supplied in two bespoke connection combinations, and they are put through a rigorous series of tests and checks at CTDI's premises before being dispatched for commissioning on-site.

Sedgewall Communications has a clean factory in Dunstable, Bedfordshire, with anti-static flooring throughout the production environment.

It handles products from concept to completion, all manufactured according to and beyond BS EN 9100 and BS EN ISO 9001:2008 standards.

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Rotating machinery from Spain

Flymca is a Spanish rotating machinery manufacturer, building equipment for the wire and cable industry.

Its production range includes machinery such as tubulars, skips, rigids, planetary stranders, bow cablers, drum twisting lines, double and simple twist bunchers, and all the ancillary equipment necessary to complete lines for the production of electrical, submarine and off-shore cables and steel ropes.

The company also manufactures lines for the production of CTC transposed cables. Flymca produces its machinery entirely in its own plants in Spain, to ensure quality requirements are fulfilled.

Sister company Flyro deals with used machinery for all fields of cable production, including drawing, extrusion, cabling and jacketing.

Its team can revamp existing machinery to adapt facilities to new standards and market requirements.

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Dow announces strategic manufacturing investments

AS part of its commitment to develop breakthrough solutions for global energy needs, Dow Electrical & Telecommunications, a business unit of the Dow Chemical Company, has announced a series of strategic investments in assets that serve customers in the wire and cable sector.

The investments include modernisation of its manufacturing facilities in Seadrift, Texas, USA, and Schkopau, Germany.

These modernisations complement on-going improvements that have already advanced the quality and consistency of materials produced by the business, ensuring production of reliable, long-life cables that stand up to demanding performance requirements worldwide.

The improvements at Seadrift consist of new technology and enhanced capabilities to produce Dow Endurance™ HFDC 4202 EC insulation, Dow's next generation medium voltage (MV) offering, as well as jacket and insulation compounds for high voltage (HV) and extra high voltage (EHV) applications.

A major reactor turnaround on one of two reactors has begun with the second reactor scheduled later in 2012.

Upgraded process controls also are being implemented, along with next

generation Most Effective Technology (MET) for reaction and crosslinkable polyethylene material facilities.

In Schkopau, similar MET for crosslinkable polyethylene power cable insulation production is being executed along with industry leading product quality control systems that also will be leveraged to the Seadrift facility.

These proprietary measures are being undertaken as part of continuous improvement efforts to help ensure stringent materials cleanliness that is especially crucial to the superclean compounds expected for HV and EHV cable applications.

"Our commitment to the power industry has helped us enjoy a leadership position in technology for medium voltage applications for nearly six decades," said Tim Laughlin, general manager, Dow Electrical & Telecommunications.

"Higher voltage applications continue to grow in every region of the world, and this modernisation project will enable us to achieve increased reliability, performance and capacity enhancements – especially in our HV and EHV product lines."

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Wire trade fair for Brazil

MESSE Düsseldorf and its partner Grupo Cipa have launched a new trade fair for the wire and cable industry in Brazil. The first staging of wire South America will take place from 8th-10th October 2013 at the Imigrantes Expositivos Exhibition Centre in São Paulo (concurrently with the Tubotech international trade fair for pipes, valves, fittings and components).

Messe Düsseldorf is renowned as the organiser of wire and Tube, the world's leading trade fairs in the international wire, cable and tube sector, held every two years in Düsseldorf, Germany. Internationally, Messe Düsseldorf has many years of experience in organising trade fairs for both industries in Dubai, United Arab Emirates; Bangkok, Thailand, South-East Asia; São Paulo, Brazil; Shanghai, China; Mumbai, India; and Moscow, Russia.

Werner M Dornscheidt, chairman and CEO of Messe Düsseldorf, welcomed the new addition to the international trade fair

programme: "We already contribute our expertise in organising high-tech trade fairs around the world. On the basis of WiCAB, which took place from 4th-6th October 2011 in São Paulo as part of Tubotech we, in cooperation with our partner Grupo Cipa, are developing wire South America as an independent trade fair customised to meet the local needs in the region. For our customers this is a gateway to give them access to the growth market of South America – at an economically ideal time."

The timing for the launch of the trade fair could not be better. The Brazilian economy saw its strongest growth with 7.5% in 2010. For 2011, economists forecast a growth rate of a little less than 4%.

Brazil is now the seventh-largest economy in the world (ahead of countries such as Spain, Italy, India and Russia) and could reach similar levels as economically leading countries such as Great Britain and France within the next three years.

Brazil's annual exports increased by some 33.9% and reached \$242.5bn in the past twelve months. Due to the country's infrastructure projects including railways, ports, airports, power stations and hotels, the Brazilian industry needs to invest in technology and innovation in order to be able to compete on the international export market. (Source: AWO, The Foreign Trade and Investment Organisation of the Austrian Chamber of Commerce.)

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Illinois firms poised to help build Smart Grid

MANUFACTURING, construction, high-tech and service businesses across Illinois are planning to ramp up operations to help strengthen and modernise the state's electric grid.

Several prominent business owners joined ComEd in calling for Governor Quinn to approve the Illinois Energy Modernisation Act (SB 1652), and shared their plans for expansion if SB 1652 becomes law.

The bill, passed by the General Assembly last spring, will usher in \$2.6bn of investment in Illinois to strengthen and modernise the Illinois electric grid, creating thousands of jobs.

"The investment outlined in the bill presents state government leaders with a historic opportunity to grow the economy, create jobs and accelerate the growth of a new economic sector," said Anne Pramaggiore, president and chief operating officer, ComEd.

She also pointed out that the bill not only encourages job growth, it also mandates job creation. "SB1652 has provisions that require the creation of 2,000 real jobs at the peak of construction or we pay a penalty," she added.

Illinois manufacturing business will increase as utilities begin work to modernise the grid. General Cable, a manufacturer and supplier of copper, aluminium and fibre optic wire and cable products will likely need to increase its workforce to meet demand, according to company vice president Patrick Gorman: "Based on utility estimates, building Illinois' smart grid could require more than 17 million conductor feet of General Cable's medium-voltage distribution cable, primarily produced at our plant in Du Quoin, and we're going to need to bolster our workforce to make that happen."

General Cable also is a major supplier of cable to the wind and solar markets with transmission solutions that link green power sources to the grid.

Its Du Quoin plant manufactures cables that connect wind turbines together in wind farms and collection system cables that accumulate the energy they create.

INTREN, a Union, Illinois-based company that employs 300 Illinois residents, builds and maintains overhead power lines and installs underground lines. The company will be looking to increase its workforce as infrastructure improvements outlined in the bill move forward.

INTREN owner Loretta Rosenmayer anticipates that to meet increased demand for her company's services, she will need new employees. "Enactment of this legislation will create a new engine for economic growth in the state, potentially leading companies like INTREN and others that service the utility industry to create hundreds, if not thousands of new manufacturing jobs for the equipment associated with new investments in smart grid technologies," she said.

Meade Electric, which designs, builds and maintains electric and other utility systems, is a century-old Illinois-based company employing more than 1,300 Illinois residents from 80 different trade unions. Meade expects demand for its services to increase dramatically if SB 1652 becomes law.

Meade Electric and INTREN both anticipate increasing their local workforces, employing IBEW linemen, technicians and other specialists to feed demand for people that will implement the \$2.6bn investment programme.

"The truth is, many linemen and

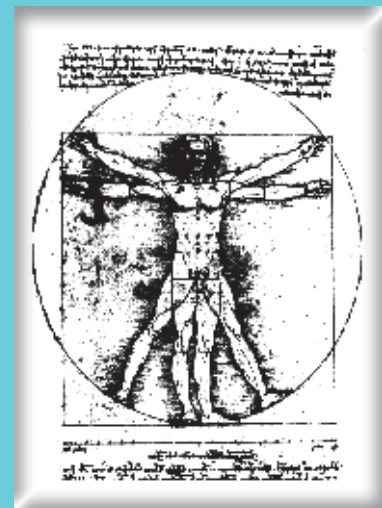
specialists have had to look for out-of-state jobs because the work simply hasn't been here," said Robert Pearson, IBEW business manager, and chairman of the IBEW's international executive council.

"If SB 1652 becomes law, we would love to bring Illinois linemen back home to help modernise the grid and update the infrastructure that will support it."

ComEd (Commonwealth Edison Company) is a unit of Chicago-based Exelon Corporation. The company provides service to approximately 3.8mn customers across northern Illinois – around 70 per cent of the state's population.

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HPH bell-type annealing plant for NLMK

LOI Thermprocess has received from the Russian steel company NLMK a contract for the supply of a new HPH® (high performance hydrogen) bell-type annealing plant.

Under the contract, LOI is to supply 23 annealing bases, 12 gas-fired heating hoods and ten cooling hoods, including all the necessary ancillary facilities for the company's Lipetsk plant.

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Landmark deal with phone giants

WIDNES, UK-based Hutchinson Engineering is celebrating its largest ever contract win since the firm began 32 years ago, having been awarded a deal worth an estimated £8mn by telecommunications giants Telefonica UK and Vodafone.

As part of the joint project known as Cornerstone, the two mobile phone operators have tasked Hutchinson Engineering with the design and manufacture of around 60 masts per month to meet the growing demands of network traffic and ensure strong coverage for both sets of customers.



▲ Dean Drinkwater, managing director of Hutchinson Engineering

Dean Drinkwater, managing director of Hutchinson Engineering, which operates across three sites in Widnes, said: "We have been manufacturing masts for the telecoms industry for more than a decade and this latest contract win is testament to our leading position in the marketplace.

"Our innovative structure designs are the most technically advanced giving clients a wider choice of antenna and radio options.

"We're proud of the fact that we build what are considered to be among the most aesthetically pleasing telecoms structures in the UK."

Mr Drinkwater continued, "Indeed it is a milestone in Hutchinson's history that we have secured this contract win – worth around £8 million – as it will also lead to job creation among our fabricators, welders, labourers and operatives."

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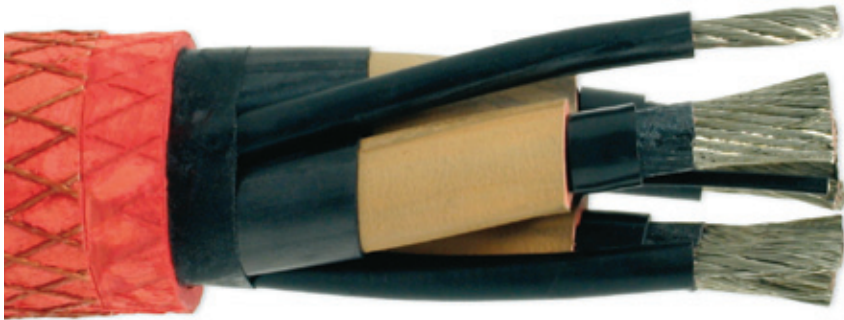
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▲ Tratos reeling cable

High speed cranes to feature Tratos reeling cable

KONECRANES has awarded cable manufacturer and supplier Tratos a contract to supply medium voltage rubber insulated and sheathed drum reeling cables for its Automated Stacking Cranes (ASC), to be used at the new Muelle Prat container terminal in Spain.

Following the takeover of the Muelle Prat container terminal from the Barcelona Port Authority, Terminal Catalunya SA (TERCAT) – a member of the Hutchison Port Holdings (HPH) Group – has started construction of a new 1,000m long quay featuring 18 container stacking blocks with 36 one-over-five ASCs.

The ASCs will be supplied by Konecranes each with 450m of Tratosflex cable, which has been specifically designed for high speed reeling.

Tratosflex features a unique internal cable design, with the structure tightened against the internal relative movement.

This prevents the cable from twisting and leading to possible breakage – extremely dangerous when reeling at speeds up

to 300m/m. At Muelle Prat operational speeds will be 270m/m.

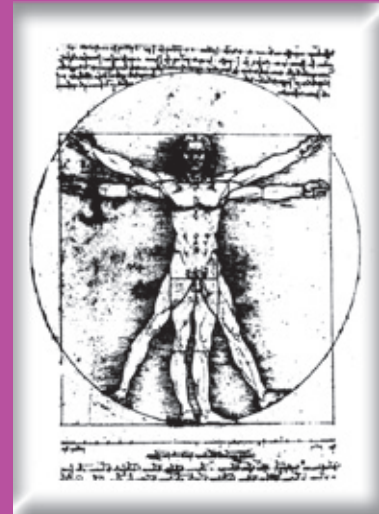
As a result of this sophisticated, reliable design, Konecranes now regularly specifies Tratosflex cable for its ASCs worldwide.

The first Muelle Prat berth was expected to commence commercial operations in late 2011/early 2012 after a short period of testing and commissioning of the container handling equipment and the terminal operating system. It is expected to have an annual handling capacity of 1.5mn TEU.

Tratosflex is part of a range of Tratos cables to suit all types of reeling applications, whether on drum reeling, festoon or vertical. The cables can supply power, control and signalling functions including fibre optic cables and components.

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Technology

▶ A wire-based advance in audiology, well established in Europe, is gaining ground with US advocates for the hearing-impaired

A hearing loop, typically installed on the floor around the periphery of a room, is a thin strand of copper wire radiating electromagnetic signals that can be picked up by a tiny receiver built into hearing aids and cochlear implants. When the receiver is turned on, the hearing aid receives only the sounds coming directly from a microphone, not the background sound-spatter.

As noted by John Tierney of the *New York Times*, advocacy groups for the tens of millions of hearing-impaired Americans have recognised the potential of the technology, already in wide use in Northern Europe. He observed: "As loops are installed in stores, banks, museums, subway stations, and other public spaces, people who have felt excluded are suddenly back in the conversation." ("A Hearing Aid That Cuts Out All the Clatter," 23rd October).

The Midwest leads the movement to embrace the hearing loop, but New York is starting to catch up. According to the *Times*, loops have been installed at the ticket windows of Yankee Stadium and Citi Field, at the Apple store in SoHo, and at exhibits and information kiosks at the Metropolitan Museum of Art, the American Museum of Natural History, and the Ellis Island Immigration Museum.

Mr Tierney wrote: "Even in that infamous black hole of acoustics – the New York subway system – loops are being placed in about 500 fare booths, in what will be the largest installation in the United States."

Basic induction-loop technology has been around for decades as a means of relaying signals from a telephone to a tiny receiver – a telecoil, or t-coil – that can be attached to a hearing aid. As telecoils became standard on hearing aids sold in Britain and Scandinavia, they were also used to receive signals from loops connected to microphones in halls, stores, taxis, and many other spaces.

The delay in the adoption of the hearing loop in the United States is probably explained by the \$50 add-on cost of a telecoil, formerly an optional accessory to a hearing aid.

But, according to the *Times*, today telecoils are built into two-thirds of the hearing aids on offer. Thus the number of Americans able to benefit from loops is growing, and suggests a sizable developing market.

▶ "This isn't just about disability rights – it's about good customer service," the *Times's* Mr Tierney was told by Janice Schacter Lintz, who heads the Hearing Access Program, a New York-based group that is promoting the use of hearing loops. Noting that the first baby-boomers turn 65 this year – and that more than 30 per cent of people over 65 have some hearing loss – Ms Schacter Lintz said: "That's a big group of customers who won't go to museums or theatres or restaurants where they can't hear. Put in a loop, and they can hear clearly without . . . wearing a special headset."

▶ Mr Tierney reported that hearing loop systems are more complicated to install than the assistive-hearing systems in common use, which beam infrared or FM signals to special headsets or neck loops that must be borrowed from the hall. Installing a loop in an auditorium typically costs \$10 to \$25 per seat, an initial outlay that may discourage the facility manager. But, Mr Tierney wrote: "Advocates for the loops argue that the cost per user is lower over the long run."

Energy

▶ Helping to meet a demand for electricity from renewable sources, a young battery-storage technology holds promise for wind farms

To many Americans a wind farm is no longer a novelty. But Laurel Mountain, which opened on a windy ridge in Elkins, West Virginia, in late October, is unusual for an auxiliary element: a cluster of big steel boxes containing 1.3 million batteries. This is plausibly claimed to be the largest battery installation attached to the power grid in the continental United States. As reported by Matthew L Wald in the *International Herald Tribune*, both the wind farm – whose 61 turbines stretch out over 12 miles, generating up to 98 megawatts of electricity – and the battery project were developed by AES Corp (Arlington, Virginia). AES says the battery installation at Laurel Mountain is intended to function as a kind of shock absorber, making variations in wind energy production a little less jagged and the farm's output more useful to the grid. ("Batteries at a Wind Farm Help Control Output," 28th October).

Power systems have always faced fluctuations in demand. Mr Wald noted that, as they incorporate more wind into the mix, they will have to cope with supply fluctuations as well. Other power sources, mainly natural gas plants, can be tapped in time of need. But such plants take longer to ramp up and ramp down than a wind farm or a field of solar panels.

Transatlantic cable

"That's the challenge you have in running the power system," Mr Wald was told by Mark T Osborn, a General Electric executive who is working on a similar installation in Oregon. "Storage has been thought about for years, but the costs have always been too high. Now when you're trying to integrate more renewable resources, storage becomes more necessary." Even in the millions, though, batteries are not up to storing a night's wind production and giving it back during the day. Nor can they supply power when the wind turbines are idle for more than a few minutes. The batteries are so small – between C and D cell in size – that the wind farm could fully charge them in as little as 15 minutes. Even at a time of peak demand the energy stored would be worth only a few hundred dollars. Wrote Mr Wald: "The economics can be likened to storing tap water in a solid gold vessel."

Eventual profits, bigger projects

But the batteries perform two other tasks that hold promise for the energy industry. According to AES, rather than storing power on a daily basis the installation will justify itself by storing energy for minutes at a time, repeatedly. In the space of an hour, the output from the wind farm could go from 98mW to zero.

"In any short couple-minute interval, it could vary 20 or 30 or 40 per cent," said John M Zahurancik, vice president for operations and deployment at AES Energy Storage. By smoothing out the changes the batteries would enable the rest of the grid to catch up. The battery installation at Laurel Mountain is also expected to prove useful with a different kind of grid stabilisation: keeping the alternating current system correctly synchronised.

To hold the system as close to 60 cycles as possible the regional grid operator, PJM Interconnection, sends a signal every four seconds, instructing that power to be added or withdrawn as needed.

► "Experts foresee other roles as the grid evolves," Mr Wald wrote. "For example, PJM operates a real-time market in which electricity is priced in five-minute blocks. At a given location, the price from one block to the next can vary significantly." A big battery array could make money in that market, according to David L Hawkins, a senior consultant at KEMA, the energy consultancy based in Arnhem, the Netherlands. "It's kind of like being a day trader on Wall Street," Mr Hawkins told the *Herald Tribune*. "If you see a \$30 price spread, you can make some interesting trades doing it over and over in the course of a day."

Postscript...

► On 9th November, in the same publication, Mr Wald reported that between 3rd October and 18th October the battery installation at the Laurel Mountain wind farm was the site of a big bird kill. Some 500 nocturnal migrants of 30-plus species were found to have "either collided with structures at the [electrical] substation or circled to the point of exhaustion," according to a report by a wildlife biologist with the Canadian consulting service Stantec. The report, for the US Fish and Wildlife Service, a bureau of the Dept of Interior, said that the birds had not been killed by the blades of the wind machines; rather, they seemed to have been drawn to lights around the storage batteries and the associated substation.

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"It appears lighting at the battery storage facility was the culprit," Kelly Fuller, the wind campaign coordinator at the American Bird Conservancy (Plains, Virginia), told the *Herald Tribune*. "It's going to be very important as battery storage goes forward that the lesson is learned and this doesn't happen at other facilities." Noting that this largest bird kill at a US wind facility was the third such incident in West Virginia, the conservancy suggested that the solution was to turn off the lights. In fact, wrote Mr Wald: "That is what technicians at the site did after discovering the dead birds."

Automotive

▶ Constrained by a rising yen, Toyota may shift 'a significant amount' of production from Japan to the US

"If demand in Japan recovers, we will continue and work to maintain production of three million units" there, said Toyota Motor Corp president Akio Toyoda on 17th November. "If most of it becomes exports, shifting a significant amount of production to the US may be considered."

As reported by Anna Mukai and Alan Ohnsman of *Bloomberg News*, Mr Toyoda was in Blue Springs, Mississippi, for the official opening of an \$800 million plant where 150,000 Corolla compact cars will be assembled annually. Toyota officials said the facility will employ some 2,000 people. The Japanese auto maker has seen its profitability erode with the appreciation of

the yen to a post-World War II high versus the American dollar. A stronger yen hurts the overseas competitiveness of Japanese manufacturers and reduces the value of earnings when overseas profits are translated to yen. In the six months before the Blue Springs plant was opened the yen gained more than 9% against the US dollar.

According to the Japan Automobile Manufacturers Association, the yen's appreciation against the dollar and euro slashed Japanese auto makers' profit by \$4.3 billion in the first half of last year. The stronger yen, as well as the parts shortages that followed the 11th March earthquake and tsunami in Japan, contributed to Toyota's first-half loss of its global leadership in auto sales to General Motors of the US. "If the yen continues to stay strong, Toyota will collapse," Mr Toyoda told reporters in Mississippi. In mid-November, Toyota's North American plants were running overtime again after briefly slowing as the months-long flooding in Thailand reduced supplies of parts. "Early on, we didn't know how bad it could be," Jim Lentz, president of the US unit Toyota Motor Sales, told the *Bloomberg* reporters. "[But] whatever impact it had is behind us."

Manufacturing

▶ New activity in the old factory towns of Northeast Ohio is contributing importantly to a regional recovery from recession

According to an economic analysis released on 14th November by Team Northeast Ohio, a private economic development



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agency, manufacturing is helping to pull the 18 counties of the region out of the US recession faster than in most of the rest of the state and nationwide. The study found that employment in the region grew by 1.5 per cent to that point in the year. Meanwhile, unemployment fell to 8.5 per cent, below both the statewide rate of 8.8 per cent and the national rate of 9.1 per cent. Jacob Duritsky, director of business attraction at Team NEO, told the *Cleveland Plain Dealer* that, while the region saw employment increase by 1.2 per cent from the second to third quarter of 2011, much of that increase could have been a seasonal hiring spike. He saw a stronger barometer in the year-over-year increase of 30,000 jobs. About 8,000 of those jobs were in manufacturing: a "Cleveland-Akron-Youngstown tradition," in Mr Duritsky's view, that now accounts for 18 per cent of the regional economy.

The *Plain Dealer's* Robert L Smith reported that Mr Duritsky believes the numbers were likely buoyed by new steel jobs in Lorain and Youngstown and by busy production lines at General Motors plants in Lordstown. But the Team NEO director credits "new manufacturing savvy," as well, according to Mr Smith. ("Northeast Ohio Is Manufacturing Its Way Out of the Great Recession," 14th November). Mr Smith continued: "The regional economy is being strengthened by companies that successfully transitioned from traditional to advanced manufacturing, a trend represented by venerable employers like GrafTech [carbon and graphite products] and Astro Manufacturing [wire EDM], Team NEO contends. Meanwhile, innovative companies like Lubrizol have made the region a national leader in specialty chemicals."

➤ That is not to say that the good times have returned to Northeast Ohio. As noted by the *Plain Dealer*, Team NEO's broad view of Greater Cleveland does not reflect the experience of every community. About two weeks earlier, the US Labor Department released statistics showing zero job growth in the Cleveland-Elyria-Mentor metro area in the year to 30th September 2011. Still, Mr Smith observed, Northeast Ohio competes as a region, and Team NEO found that the region has added 40,000 jobs since the bottom of the recession in 2009. Some observers – like Edward Hill, a professor of economics and the dean of the College of Urban Affairs at Cleveland State University – see a section of the country poised to rise with the times. Observing that a region that manufactures is a region that exports, he cited a trend that is making American products cheaper overseas. "The declining dollar [is] great for parts of the country that make stuff," said Mr Hill.

Steel

▶ The London Metal Exchange requires more storage space in the US, to the benefit of Charleston and New Orleans

A top official at the London Metal Exchange said in November that the exchange was working on plans to expand its US warehouse locations to Charleston, South Carolina. This newest American outpost for the exchange – of a total of 13 worldwide – would likely house raw steel made at a Nucor Inc mill in Darlington, also in South Carolina. The LME's other US facilities for storing and distributing steel billet are in Chicago, Detroit and New Orleans. Chris Evans, head of business development for the LME, told Reuters: "The Southeast of the states is very important for the steel market in the USA and we need to be part of that." As reported by John McDermott in the *Charleston Post and Courier* (10th November), Charleston can be viewed

as an ideal location for a Southeast distribution point because of the number of steel makers that already operate near the port. Dallas-based Commercial Metals Co – one of three US companies that make billet approved for LME-bonded storage warehouses – has a mill in nearby Cayce. While declining to comment on the LME initiative, the South Carolina State Ports Authority confirmed the hospitality of its ports to such bulky, non-containerised cargo as long, rectangular bars of raw steel. SPA spokesman Byron Miller told the *Post and Courier*: "We're dedicated to this business and aim to see it grow."

➤ Another interested party in the Southeast is Louisiana, whose own Port of South Louisiana already handles the largest tonnage of shipping of all US ports. And matters of metal storage are attracting attention in New Orleans, still struggling in the aftermath of the disastrous Hurricane Katrina of 2005. The New Orleans *Times-Picayune* reported that the current interest is traceable to a programme begun in 1998, when the city became one of a limited number around the world to be designated by the LME to keep metals until manufacturers are ready to receive them. Now there are 53 New Orleans-area warehouses holding LME certification, and stockpile accumulation in structures that had stood empty for years has touched off a scramble for specialised warehouses throughout the metro area.

Rebecca Mowbray wrote: "New Orleans is the second-largest London Metal Exchange site in the country behind Detroit, according to the exchange, and has more copper, zinc, and steel in storage than any other place," in the United States. ("Local Warehouse Space Is Bursting with Stored Metals," 13th November). Ms Mowbray added that, according to port officials, this has been excellent for the Port of New Orleans because demand for metals storage climbs when the economy is slow and imports of other goods fall off. "We're probably close to 98 per cent occupancy, which is the best ever," Kevin Kelly, owner of Port Cargo Service, a local metals warehousing business, told the newspaper. "I'm considering buying property and building warehouses if I can find good land to build on."

Elsewhere in steel...

➤ AK Steel (West Chester, Ohio) raised its prices for flat-rolled stainless steel products in the 200, 300 and 400 series, effective 1st January. The producer of flat-rolled carbon, stainless, and electrical steels said the increase would be achieved through a reduction of four percentage points in the discount for cold-rolled and hot-rolled product. Andrea Brown of *Platts* reported (17th November) that AK's base prices on automotive exhaust grades and bright anneal finishes would increase by 8 cents per pound. All raw material surcharges for stainless steel products, including those for materials under 0.015" thick, will remain in effect.

➤ Also on 17th November, *Steel Business Briefing* reported that US spot prices for wire rod had declined \$20 per ton month-on-month as domestic rod mills reacted to a further decrease in the price of scrap. Spot prices for mesh quality rod dropped to \$720-740 per ton.

Surveys

▶ A good place for a going business, the US is less hospitable to new enterprises

The annual publication *Doing Business* from the World Bank reviews regulatory environments worldwide and ranks nations

Transatlantic cable

as less or more conducive to the start-up and operation of a local firm. The most recent report, published 20th October and reflecting data measured from June 2010 through May 2011, covered 183 countries. The US was found to be the fourth-best place in the world to do business in, coming in behind Singapore, Hong Kong and New Zealand.

While that is a respectable showing, especially in light of its recent recession, the US fared less well in comparison with other countries as a place for starting a business. In 2007 it was No 4 in this category; in 2011 it was in 13th place. Most tellingly, perhaps, starting up a company in the US now costs twice as much as it did five years ago – 1.4% of per capita income versus 0.7 percent.

Writing in *Forbes*, Scott Shane noted that, given the breadth of the World Bank survey, the US needn't "get out the worry beads yet." But in his view a 13th place showing in the new-business category should cause Washington to take notice.

Few American entrepreneurs may be moving elsewhere to start companies. But Mr Shane cautioned that policies to attract more foreign entrepreneurs to the United States will falter if those entrepreneurs find it easier and cheaper to start their businesses in Australia and Canada. ("Is the US Worsening as a Place to Start a Business?," 14th November).

➤ *Doing Business* ranks economies in ten areas of business regulation, such as resolving insolvency and trading across borders. In its latest edition the report from the World Bank expanded to include the indicator "ease of getting an electrical connection." It found that electricity hook-up is most efficient in Iceland, followed by Germany, Taiwan, Hong Kong and Singapore.

The US just makes it into the *Forbes* top ten for business in 2011

The World Bank and *Forbes* have their headquarters in Washington, DC and New York City, respectively. But the US apparently enjoys less of a home-court advantage with the magazine that bills itself as "the Capitalist Tool" than with the international lending institution for capitalist programmes. The *Forbes* top ten for business in 2011 are:

- (1) Canada
- (2) New Zealand
- (3) Hong Kong
- (4) Ireland

[In late 2010, Dublin agreed to a \$112 billion loan package from the European Union and the International Monetary Fund to further increase the capitalisation of its banking sector and avoid default on sovereign debt. The government also initiated a four-year austerity plan to cut an additional \$20 billion from its budget. A return to modest growth was expected for 2011.]

- (5) Denmark
- (6) Singapore
- (7) Sweden
- (8) Norway
- (9) Britain

[London in 2010 initiated a five-year austerity programme aimed at lowering a budget deficit of over 10 per cent of Gross Domestic Product to nearly one per cent by 2015. Although Britain remains outside the European Economic and Monetary Union (EMU), the Bank of England periodically coordinates interest rate moves with the European Central Bank.]

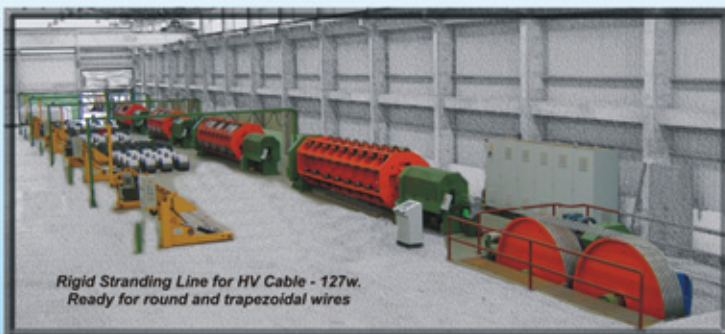
- (10) the United States

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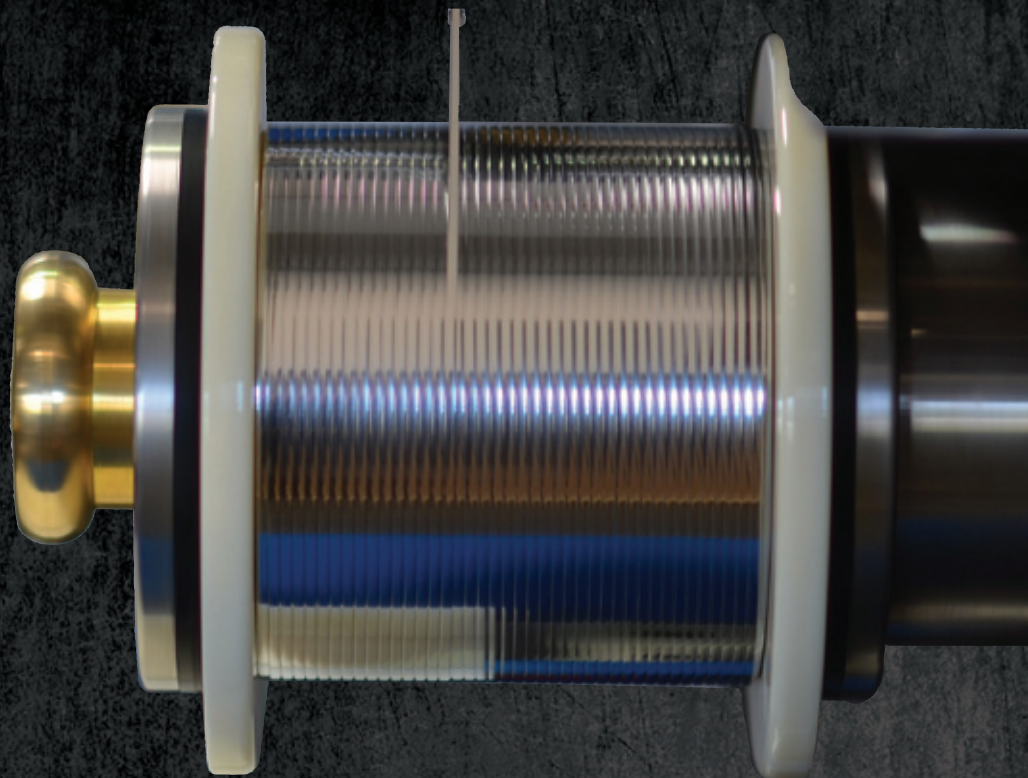
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▲ A spool of PV ribbon on Plasmait take-up

Plasma PREPLATE for PV ribbon

PLASMAIT GmbH is an Austrian supplier of plasma based heat and surface treatment machines. The management, under the leadership of Primož Eiselt, have had a green vision from well before they formed Plasmait: Primož and Peter Ziger, Plasmait's technical director, started their plasma annealing project at the Technical University in Graz as part of a dissertation in the 90s.

Plasmait was founded in 2003 and today there are over 60 plasma treatment lines installed worldwide, each of them making their contribution for cleaner environment. Plasmait machines have either replaced dirty chemical processes or are saving energy through best energy efficiency in class; in many cases both.

Plasma cleaning is a dry surface treatment that can be used as an alternative to many chemical and environment-compromising surface treatments such as acid or alkaline cleaning and deoxidation or fluxing that is used in soldering

processes. Plasmait's solutions are suitable for use in a wide range of industries from solar photovoltaics, aerospace, welding, precision electronics, to medical and steel descaling.

Perhaps the greenest of Plasmait solutions is the PlasmaPREPLATE tinning line, used for production of PV ribbon – a tinned copper ribbon used in virtually every solar panel in the world. Solar ribbon, also called PV ribbon, is soldered directly to a solar cell to conduct electricity generated in the solar cell. PV ribbon is tinned copper ribbon between 1 and 6mm wide, and from 0.08 to 0.5mm thick, with a 10-30 micron thick tin coat.

PV ribbon is required to retain a high degree of conductivity throughout the lifetime of a solar panel – typically 20-25 years. Its solder contact with the cell must withstand outdoor weather conditions that mean constant fluctuation of temperature and humidity. PV ribbon therefore commonly requires a high

degree of softness with YS (Rp0.2% < 60MPa and elongation > 25%). Good solder coating is necessary to ensure long-term corrosion protection and durable solder joint. PV ribbon also requires camber less than 0.3% and low dimensional tolerances. The quality of wire handling equipment is therefore essential.

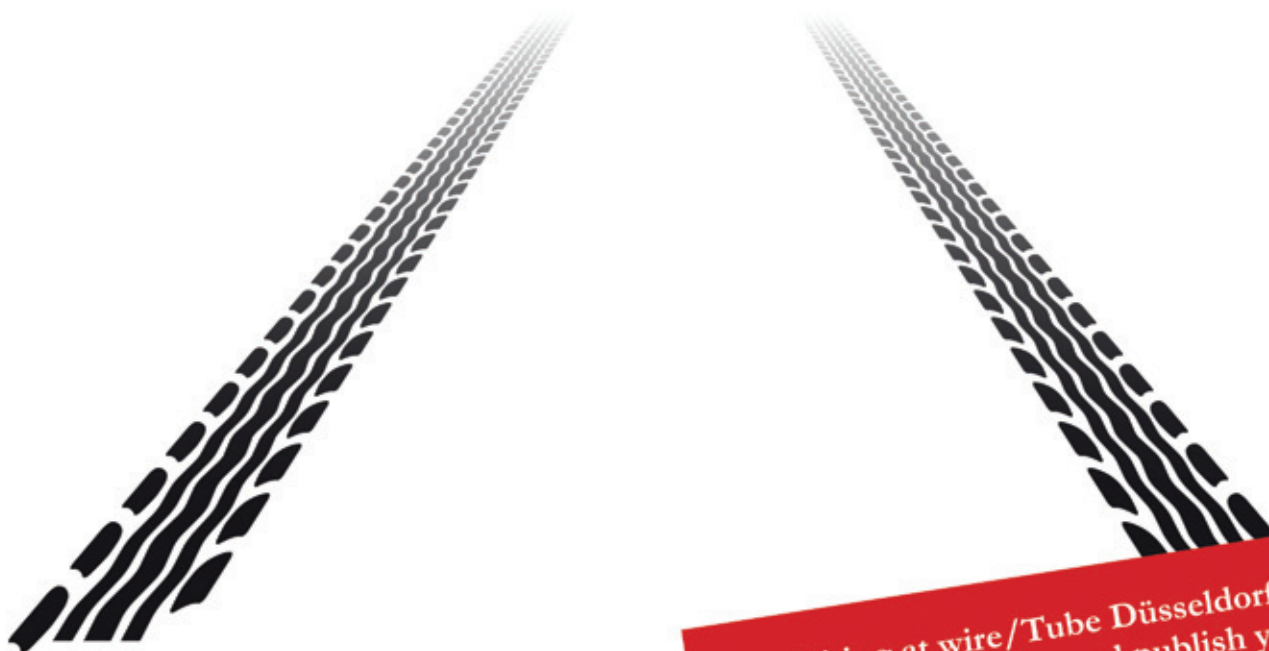
The PlasmaPREPLATE process has become a popular choice for companies in the PV ribbon industry in Europe, America and Asia. The process has been rapidly adopted by the PV ribbon industry since its introduction in 2007. Its main advantage is in the quality of the finished product. The process allows production of a ribbon with a high degree of softness and tin coat quality with low tolerances. This is only possible with a process that is fully computer controlled and assisted with multiple quality control features.

The PlasmaPREPLATE line runs at up to five times the speed of conventional lines whilst performing annealing and cleaning inline with tinning in a single run. Such a high output line requires less manpower to operate than a conventional tinning line. The process performs hot dip tinning without flux and acid re-cleaning, and also uses less energy and space.

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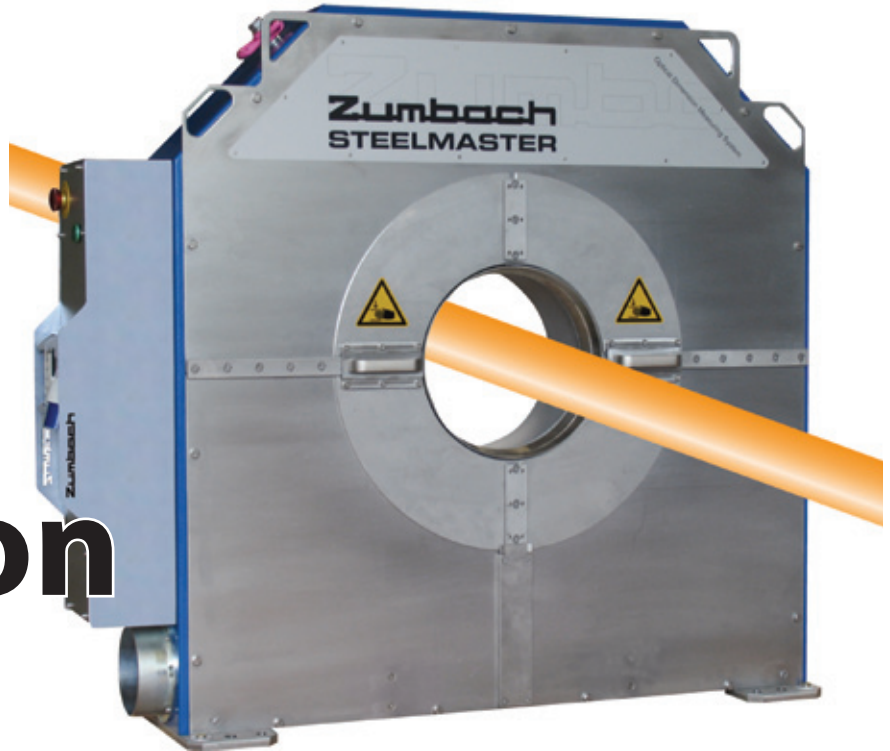


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▲ The new SMR product from Zumbach



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ZUMBACH Electronic of Switzerland presents the latest addition to its line of Steelmaster gauges.

The new SMR product line offers novel and significant advantages over other gauges, when it comes to fast and accurate capture of dimensions in longitudinal and radial direction.

SMR gauges rotate continuously at 100rpm. Up to 3 ODAC® laser heads take 2,000 measurements per second and head, fully synchronised.

This results in up to 10 complete profiles per second, which is faster than other gauges.

Alternatively, the SMR can operate in static, orientatable mode with 2,000 diameter resp. dimension measurements/s in each direction (at 100m/s this means a set of measurements every 50mm).

The mechanical concept is extremely simple and robust; no wear parts, no collector rings, no brakes, etc.

The transmission of power and signals to and from the laser heads is fully contactless.

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Two new compounds from IMCD

IMCD Business Group Plastics has extended its current product portfolio with the two new compounds from Teknor Apex Company.

Apex® P-55003 and P-55004 are jacketing compounds based on blends of polyvinyl chloride (PVC) and thermoplastic polyurethane (TPU) that provide outstanding resistance to the aggressive end-use conditions often encountered by industrial cables.

"Teknor Apex developed these new Apex PVC/TPU blends to provide durable protection for cable that is in constant movement, is subjected to rough handling, or is exposed to the aggressive substances often found in factory settings," said Mike Patel, wire and cable industry manager.

"They provide a combination of flexibility, toughness, and low temperature endurance that is well suited for a broad range of industrial applications."

Apex® P-55003 and P-55004 compounds not only have advanced abrasion resistance and excellent tensile properties associated with TPUs, but they also provide resistance to oil and chemicals, toughness at low temperatures, and elevated oxygen indices.

The two new compounds are therefore recommended for applications such as factory automation networks, industrial robots and other plant systems that call for data or control cable.

Dr Stephan Neis, IMCD's manager business unit plastics and advanced industries, said: "These new PVC/TPU blends will potentially allow us to enter applications where on one hand PVC compounds are not sufficient to match all requirements, and on the other hand pure TPU may be over-engineered and too expensive.

"Thus, the new PVC/TPU blends provide a perfect balance in properties for many industrial cable applications."

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Sparks out of bounds

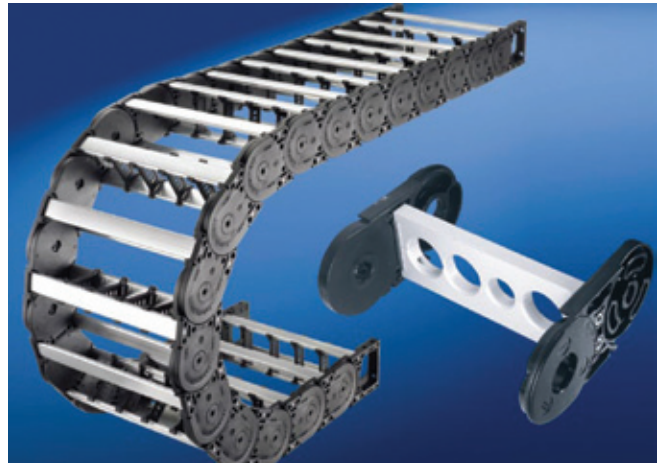
A CABLE and hose management solution was needed for an automated drill rod handler on a Bauer deep drilling rig, and other than performance and ATEX-conformity, longevity and service life were of importance.

A Kabelschlepp hybrid energy drag chain now provides the answer. Everyone has experienced static energy at some point and these electrostatic discharges are not only hazardous to people due to the shock reaction, but they can ignite flammable materials.

This also applies to machinery, tools and equipment in industrial applications such as in civil engineering and mining, refining or chemical processing. Movement and friction create a static charge, and the inevitable discharge can have devastating consequences in oil or gas production. Bauer Maschinen GmbH knows this is only too well. In product development of deep drilling devices, there are strict requirements for explosion prevention.

A vertically fitted MC 1300 type Kabelschlepp drag chain manages the required electric and hydraulic feeds on the mast of deep drilling rig TBA 300. The previous solution of grouping hose and cable in festoon bags needed replacement to fast movements in operation, and the variety of lines to be handled. The MC 1300 chain was chosen as the inner height of 87mm and the bespoke compartment width of 650mm.

The multi-variable chain is designed for tough conditions on



▲ Kabelschlepp cable carrier MC1300 with EX rated GRP chain bands and aluminium hole stays

construction sites, a rigid link design makes it extremely robust, and it is equipped with an enclosed and dirt-resistant stop system.

This stability achieved by the combination of GRP side band and aluminium cross stays also offers good conductivity to avoid excessive static charge.

The ATEX Directive stipulates that all components must have controlled discharge properties. To follow the directive, and essential for ATEX applications, the chain band is made of a special, conductive material.

The special material for this design delivers the required properties while retaining the abrasion resistance and stability. This is particularly important for the TBA 300: it is not only more cable to handle, but also larger diameters. The result is higher loads on the chain and the separators.

Apart from increased torsional stiffness and conductivity, the properties of the aluminium cross stays reduce friction. Even if cables do have appropriate sheathing and modern plastics are less abrasive, aluminium by far copes better with heavy cable. In addition, Kabelschlepp's diverse offering of stay and shelving systems covers includes hole stays (LG type).

Enclosing cable and hose they feature identical advantages in terms of conductivity and stability as other cross stay designs. In a vertical application they have the additional advantage of controlling the momentum. The hole stay pattern is designed to suit the OD of cable and hose, and friction or twisting is impossible.

Holding the media in the centreline of the radius, length variances hence movement and wear is avoided. Hanging cable and hose tends to elongate and needs readjusting from time to time. Bespoke strain relief on both ends with cable and hose clamps secure cable and hose. Compared to loose lines, invariably subject to reduced service life and chafing due to the relative movements, the service life is extended to a maximum, and cost is prevented.

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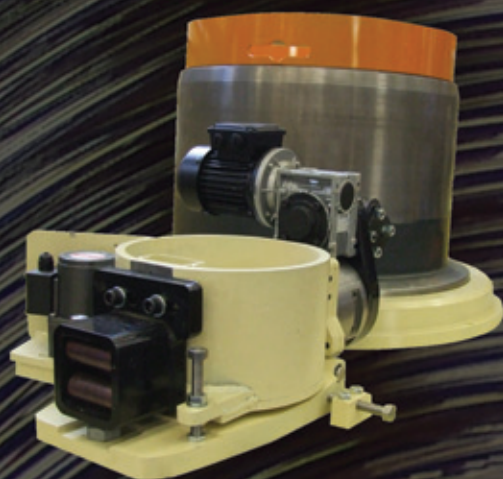
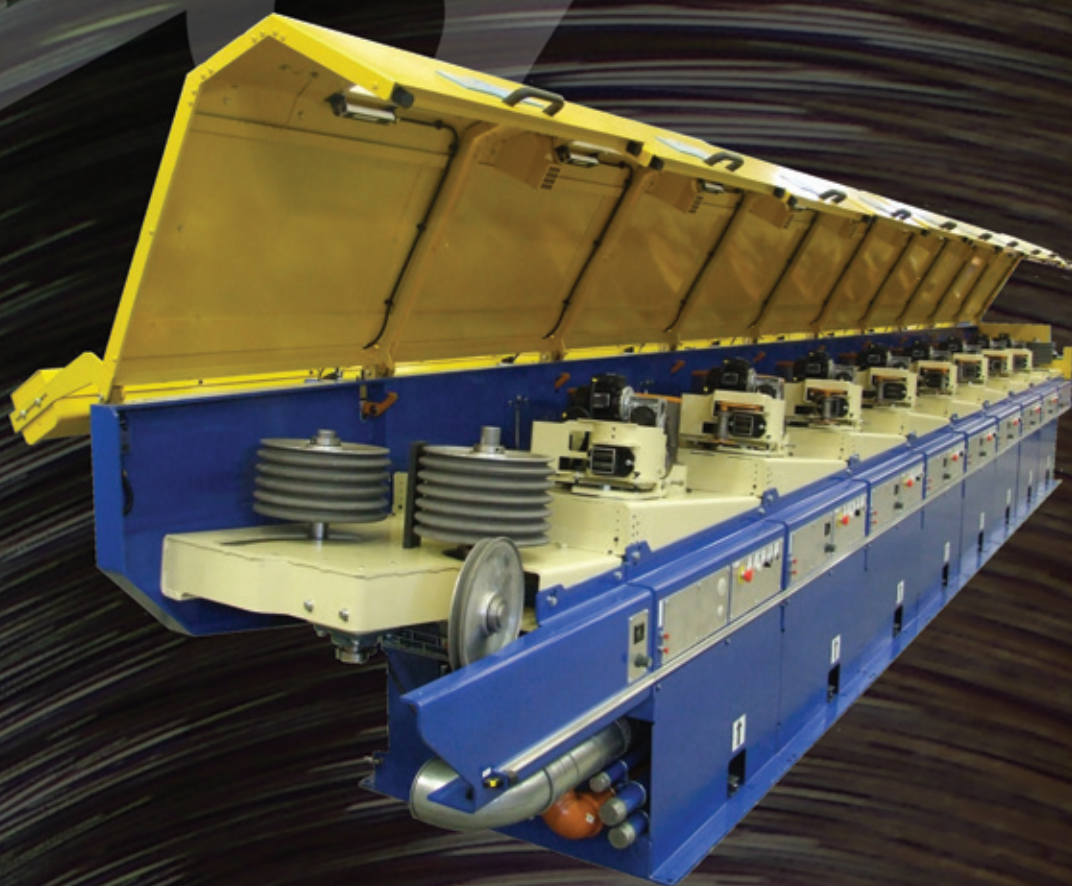
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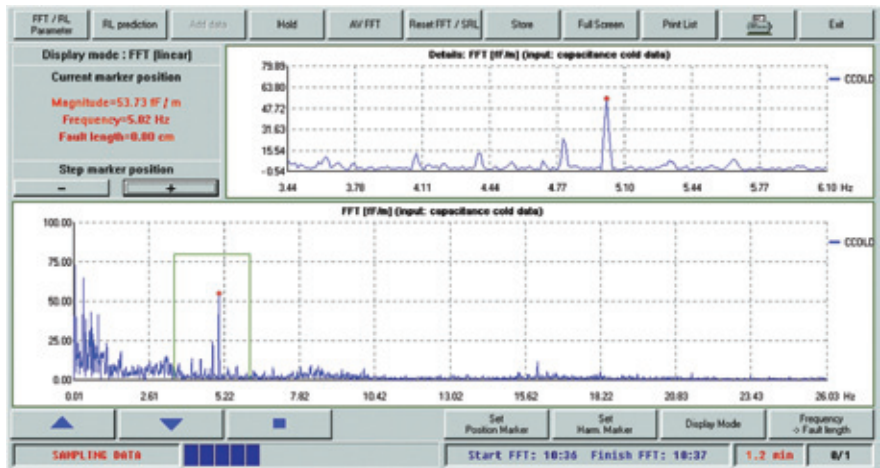
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▲ Capacitance 2000 measures the capacitance and determines periodical capacitance variations by means of Fast Fourier Transformation (FFT)

Assuring you of loss-free data transmission

FOR all LAN, coaxial, telephone or RF cables the loss-free transmission high frequency, analogue or digital signals is a major quality feature. In this context, the measurement of the capacitance plays an important role, influencing the capacitance influences the impedance of the cable for the specified frequency range.

Capacitance 2000 is a measuring device, which is installed in the cooling trough and measures the capacitance of the wire insulation precisely. At the same time, the system determines capacitance changes, provides an extremely fast measuring value update and detects bare wires.

This technology is realised by the combination of a short and two long measuring electrodes, which are integrated in a measuring tube. The short measuring electrode of 10 mm length identifies periodical capacitance variations with high spatial resolution by means of Fast Fourier Transformation (FFT).

From the FFT data, the Structural Return Loss (SRL) is determined and gives information about the expected attenuation of the RF signal during data transmission. The long measuring zone measures with high precision the average value of the capacitance.

The avoidance of periodical changes of

the cable is a precondition for an optimum attenuation characteristic, whereas the critical interval of the periods is the shorter the higher the targeted data transmission rate for the cable increases.

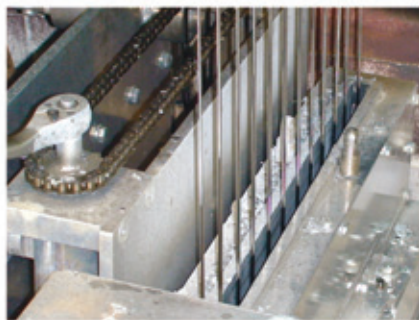
These periodical changes are determined by the multizone technology of the Capacitance 2000, as all parameters that influence quality (eg conductor diameter, foaming, outer diameter) are reflected in the capacitance. The accuracy is 0.1 pF per metre. At line speeds of up to 2,400m/min predictions of the Structural Return Loss of 3 GHz, respectively 8 GHz up to 1,300m/min are possible. In this way, the defined impedance of the cable can be reproduced accurately.

The detection of periodical capacitance variations and the prediction of the Structural Return Loss (FFT and SRL) are available as special features directly at the measuring tube via a diagnosis interface. For displaying the measuring values Sikora offers the processor systems Remote 2000 as well as the Ecocontrol 600/ 1000/2000. The presentation of FFT and SRL is possible via the Ecocontrol 1000 or 2000.

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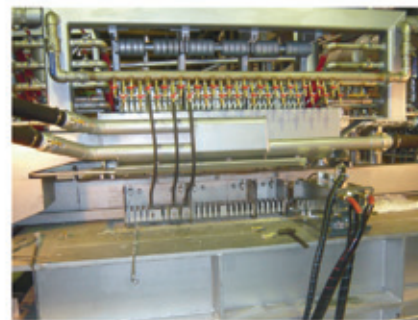
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PWT's in-depth knowledge of the wire manufacturing process has led to the development of state of the art lubricant conditioning technology. The LCM 800 is designed to guard against excessive die wear and maintain wire quality. Used lube has always been discarded but by reprocessing it the LCM 800 reduces operational costs. By emptying the die box and adding into the receiving hopper up to 60% of the lubricant can typically be re-used. The process is simple, safe, requires minimal operation and helps protect the environment.



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▲ Energy saving solutions from Stolberger

New steel taping head from Stolberger

CLIMATE protection targets of the European Union dictate a need for speedy development of offshore wind power generation.

This will certainly assume dimensions which are very soon going to entail extreme challenges to be faced by the cable industry in terms of performance and delivery competencies.

Stolberger KMB-Maschinenfabrik GmbH, an equipment supplier to the cable and wire industry, and a traditional manufacturer of cable-making and stranding machines, has also been developing and manufacturing choice tapping heads for decades.

In an effort to meet the unmistakable capacity requirements ensuing from the growth potential in the field of offshore wind power, Stolberger has now added a machine to the field-proven BTE 100/2-300 tangential steel tapping head with two tape pads and fully developed and delivered the first BTE 100/4-300 tangential steel tapping head with four tape pads.

Customised for heavy and offshore cables, this steel tapping head uses 1,000mm diameter tape pads for the first time, intended for tape widths from 20 to 100mm and cable diameters up to 260mm.

For these two tapping heads, Stolberger already build BTE 100/4-450 and BTE 100/2-450 units which are larger versions featuring 450mm free passage for 350mm diameter cables.

In addition to the submarine-cablemaking equipment, Stolberger has a range of foil tapping heads with two or four 800mm diameter tape pads for tape widths from 20 to 150 mm.

This process of submarine-cable manufacture is complemented by efficient yarn binders already in use by Stolberger that have 161 bobbins with an outer diameter of 500mm.

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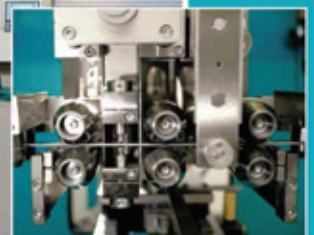
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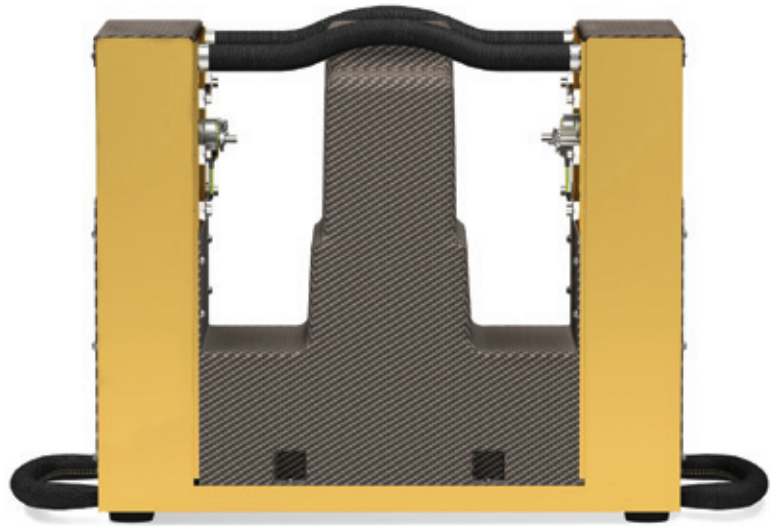
New demonstrator hits the market

FASTENER manufacturers can now simultaneously demonstrate the self-loosening behaviour of two competing bolted joints secured with lock-nuts or wedge washers using Vibrationmaster's new J150 Junker test bench dual demonstrator.

Fastener product performance can be compared and contrasted to the DIN 65151 vibration test in minutes. And because the J150 unit is portable, it is ideal for sales presentations and trade exhibitions.

"Until now, fastener buyers have been forced to rely on published test results and performance reports when specifying new fasteners for their products," explains Vibrationmaster CEO Morten Schiff.

"Now, for the first time, fastener manufacturers can actually demonstrate the resistance to self-loosening behaviour



▲ The new J150 from Vibrationmaster

of their bolted joints using wedge washers, lock nuts and other securing elements against competing anti-loosening solutions, live and in front of their clients."

The Vibrationmaster J150 Junker test bench dual demonstrator, which was successfully launched at the National Industrial Fastener Show in Las Vegas in October 2011, can simultaneously test two fasteners in ISO metric and UTS sizes.

Its innovative features include transverse vibration displacement set at $\pm 1\text{mm}$ and a frequency default of 12.5Hz.

According to Mr Schiff, an added advantage of the J150 dual demonstrator is that the self-loosening behaviour of one fastener will not impact on the other – the motor delivers the same load to each, providing two completely independent test results.

"The test bench operator can run two independent tests side by side, comparing competing products or demonstrating the performance of the same fastener in secured and unsecured conditions," he said.

"The independent performance of a single fastener to DIN 65151 can also be demonstrated."

The test rig chassis is made from high-strength aluminium with a fibre reinforced plastic cover to maximise rigidity and reduce weight for portability. Optional leather-bound handles and covers can be

custom-built, incorporating company logos, and are available in carbon fibre or Kevlar".

Weighing only 56kg (123.4lb), the J150 is easily transportable and only requires a single phase voltage standard power supply. The J150 has a handheld tablet with preinstalled software that can be used to demonstrate the test results and loosening curves of both fasteners, simultaneously in real time.

"The overall impact of the J150 dual demonstrator, with its high-end display options and superb performance, is dramatic and crowd drawing," added Mr Schiff. "And when connected to a digital projector, the hand-held tablet with its unique 'VM Test' software displays the test results live and in real-time."

"Fastener manufacturers using the J150 to demonstrate their product performance in front of live audiences when at trade shows and in client presentations will clearly differentiate themselves from their competitors."

Available to order now, the first Vibrationmaster J150 Junker test bench dual demonstrators will be delivered in early 2012.

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The non-contact laser encoder that allows makers to accurately mark wire and cable products

MANUFACTURERS today face a number of production challenges based around productivity, quality and cost reduction. At the centre of this challenge, is the ability for manufacturers to accurately measure the length and speed of wire and cable in order to better control sequential printing or marking operations.

Traditionally, manufacturing plants have used mechanical type encoders, such as contact rotary encoders or tachometers, to measure the length and speed of wire and cable during production in order to control the sequential printing on products.

The outer coatings of cables are typically marked with details including product length in the form of metre or footage marks, manufacturer's name, product and operating information.



▲ LaserSpeed non-contact length and speed encoder

Wires may indicate special numbering or coding for identification purposes. Customers rely on the accurate spacing of this information to ensure the manufacturer delivers the exact amount of product as specified.

Customers also rely on the accuracy of this information to perform critical tasks, such as laying the correct amount or length of wire or cable without needing to re-measure it.

But contact encoders are prone to mechanical and calibration problems

By Jay Luis, the worldwide marketing manager for Beta LaserMike, a leading global provider of precision measurement and control solutions for a wide range of industrial applications

which result in costly measurement errors. As such, wire and cable manufacturers are looking to non-contact measurement methods such as the LaserSpeed encoder from Beta LaserMike to accurately measure the length and speed of product during sequential printing applications.

Manufacturers are realising productivity gains with this technology by significantly reducing measurement errors and improving process control. This article gives an inside look.

Contact encoders face real measurement challenges during production

Depending on the application, mechanical contact-type encoders face a number of challenges in wire and cable production processes. First, mechanical encoders must contact the wire or cable in order to measure the length and speed of product during production.

These measurements are indirect measurements, relying on the physical contact between the mechanical encoder wheel and the product's surface. Length is calculated from the amount of rotation of the contact wheel. However, contact encoders by their very nature have several fundamental flaws that make them prone to measurement errors.

Contact encoders are subject to slippage

and calibration changes caused by variations in the diameter of the contact wheel due to dirt build-up or wear. Since the contact encoder is a mechanical device, it also experiences mechanical component failure from time to time – requiring repair and re-calibration.

The measurement error of mechanical systems will also change with production conditions, requiring the line operator to continuously check the spacing of the print and then recalibrate the contact encoder to keep the marks within specification. Product length and speed inaccuracies may be as much as 2%, or even greater, depending on the application.

Products such as CAT, CV, power, telephone, and other types of cables are very expensive to produce, and manufacturers produce millions of feet or metres of wire and cable product monthly.



▲ Contact method is prone to measurement errors

A two per cent measurement inaccuracy on this large amount of product means the plant can generate a substantial quantity of material scrap or waste. This can cost manufacturers a significant amount of money in unnecessary expense. As such, length accuracy is of paramount importance.

Non-contact approach eliminates measurement errors

Non-contact length and speed measurement systems avoid the measurement pitfalls encountered by mechanical contact systems.

Continued on pages 50 and 51

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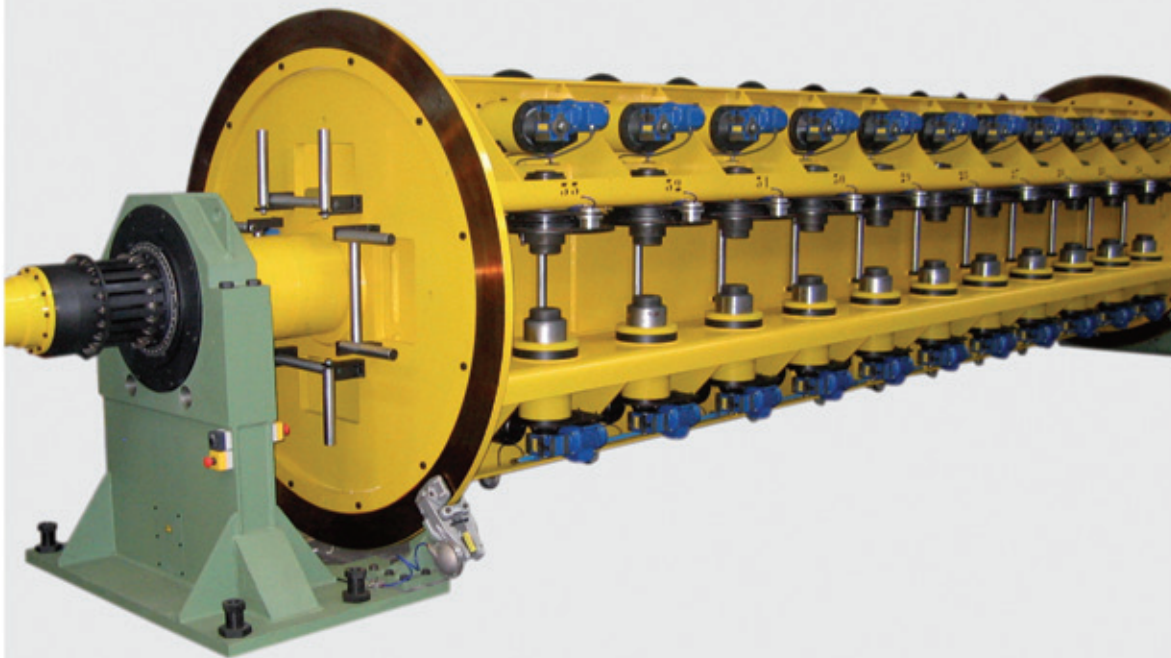
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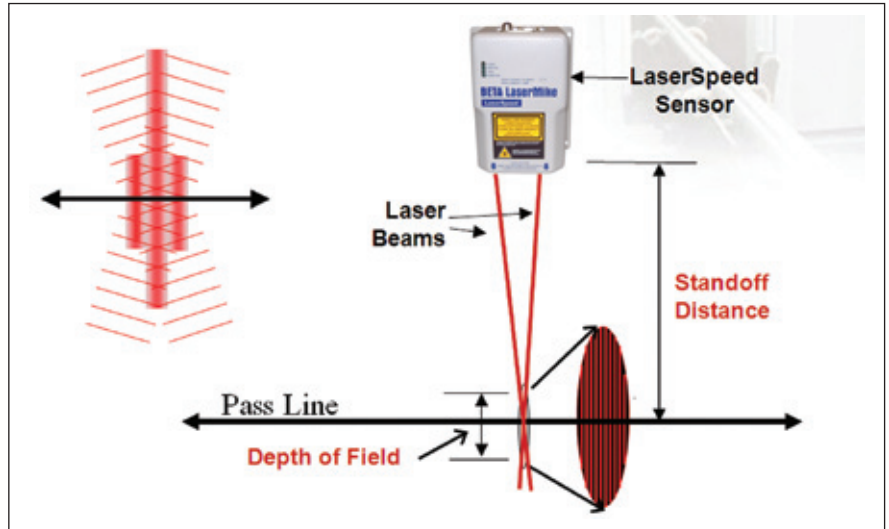
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▲ LaserSpeed uses non-contact laser technology to measure product length and speed with $\pm 0.05\%$ accuracy

For example, the LaserSpeed encoder uses a unique, laser-based measurement technique that does not make contact with the wire or cable. It is permanently calibrated and has no moving parts to wear out. The system projects a unique fringe pattern on the surface of the wire or cable. As the product moves, this movement creates a Doppler signal scattered back to the LaserSpeed system.

This Doppler information is translated into product speed and pulses are produced to determine the product length. The LaserSpeed encoder works on all types of products, regardless of colour, shape or texture. Length and speed measurements are captured with better than $\pm 0.05\%$ accuracy and $\pm 0.02\%$ repeatability.

Ensuring marking accuracy during sequential printing operations



▲ LaserSpeed encoder alongside printing system before take-up reel

Depending on the production requirement, manufacturers have installed the LaserSpeed encoder at various locations on the line. The most common place is adjacent to the printing system just after the jacket is extruded onto the wire or cable. Since the jacket is still soft and hot after the extrusion, the LaserSpeed non-contact system provides the ideal measurement method over contact mechanical encoders.

Many manufacturers have installed the LaserSpeed encoder before the capstan station or take-up reel. Situating the LaserSpeed encoder alongside the printing system where the marking occurs helps to better track the actual length and speed.

To control the sequential printing operation, the LaserSpeed encoder outputs an index pulse directly to the

printing system. Some applications may just need the encoder pulses via a quadrature output. Pulses can also be sent to a PLC system.

LaserSpeed enables manufacturers to set the desired pulse rate (ex. pulses every number of feet, metres, etc.) to meet their unique sequential printing requirements.

This enables the manufacturer to control the exact spacing between print marks with $\pm 0.05\%$ accuracy. Under controlled conditions, it is possible for LaserSpeed to approach $\pm 0.02\%$ accuracy. This level of accuracy also ensures the manufacture does not over-ship or short the customer of product. For European manufacturers, the LaserSpeed encoder is available as a MID-certified system to meet all the Measuring Instrument Directive requirements.

Setting the pace for accurate length, speed, and sequential printing

The advantages of non-contact length and speed measurement systems, such as the LaserSpeed gauge, have been proven on all types of wire and cable production processes including sequential printing applications.

This non-contact, laser-based technology eliminates those measurement errors associated with contact wheel tachometers as a result of slippage and mechanical wear.

Manufacturers that employ laser-based, non-contact measurement technology in their sequential printing operations will be on the road to increased productivity, improved product quality and real bottom-line savings.

Beta LaserMike – USA

Fax: +1 937 233 7284

Email: sales@betalasermike.com

Website: www.betalasermike.com

New bench wire twister from Eraser

ERASER'S model WT40 automatic bench wire twister is used for twisting two or more wires at lengths up to 20 feet.

The unit can twist together several small plain or terminated wires and is programmable to a desired number of twists per inch.

The maximum material bundle should not exceed an equivalent of three 14 AWG (1.63mm ϕ) insulated wires and twisting speeds are variable from 0 to 26 turns per second.

The WT40 utilises a custom holding/clamping device made to specifications individual to each application.

Eraser is celebrating its 100th anniversary in business and manufactures a wide range of industrial products including wire, cable and tubing cutters, wire and cable strippers, wire twisters, wire brush wheels, dereelers, infrared heating equipment, measuring tools, and fybRglass[®] erasers.

Eraser Inc – USA

Fax: +1 315 454 3090

Email: info@eraser.com

Website: www.eraser.com

The image shows a world map with several locations marked with logos: Moscow (WIRE), Shanghai (wire China), Bangkok (wire Thailand), and Mumbai (WIRE-CABLE INDIA ESTE). In the center, a large logo for 'wire Düsseldorf' is displayed, featuring a stylized circular graphic. Below the map is a red banner with the text 'join the best worldwide'.

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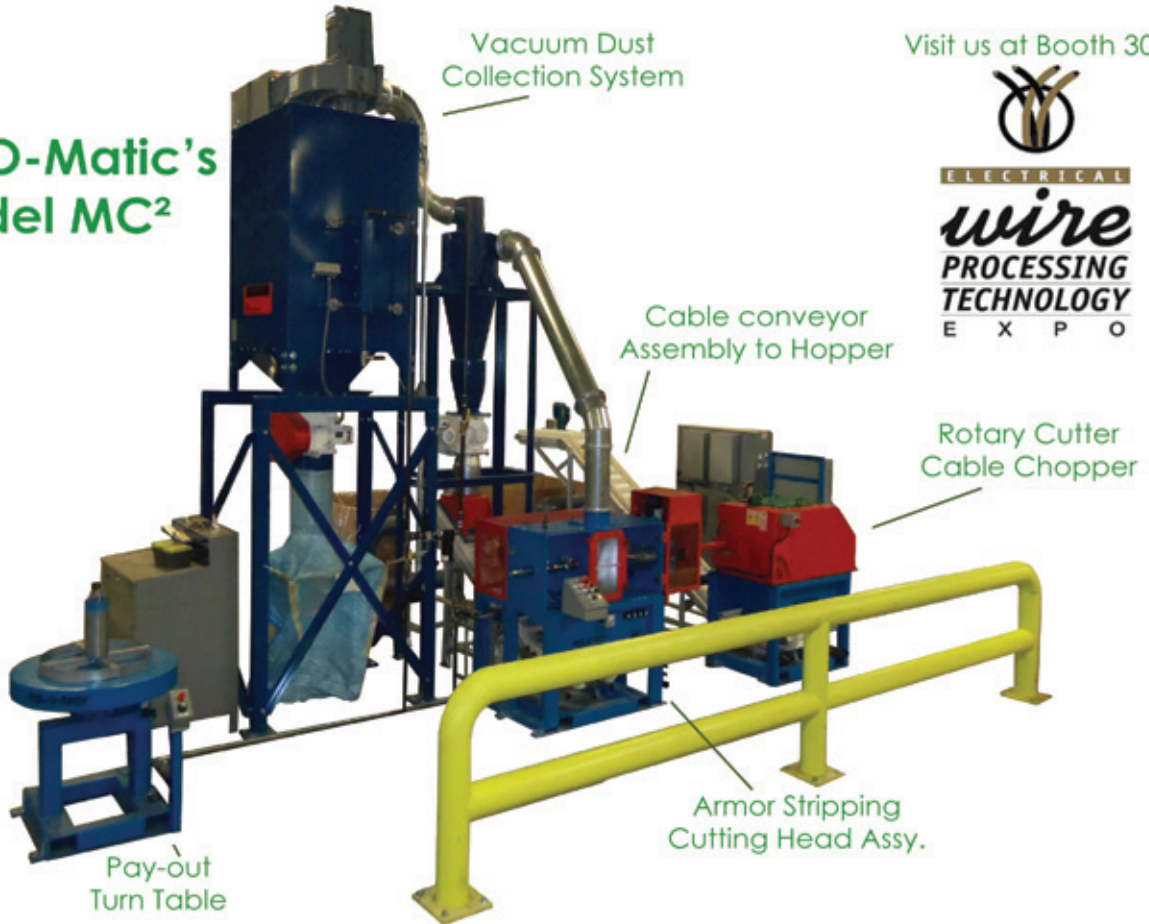

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Rodent and termite control in plastics

POLYMERIC materials cater to a plethora of applications, namely wires, cables, plastic pipelines and so on; but they also cater to a range of uninvited guests, prime among them being rodents and termites!

The incidences are interesting. Rats were blamed for a telecom blackout a few years ago in New Zealand which led to the closing of the stock exchange, as a result of which trading was halted for a day.

A survey by The Plastic Pipe Institute, USA, concluded that anti-termite requirement was essential in polymeric applications, particularly wires, cables and plastic pipelines.

Rodrepel™ and Termirepel™ – the non-toxic and non-hazardous anti-rodent and anti-termite/insect additive masterbatches developed by C Tech – have been evaluated in various applications.

These products are compliant with RoHS and REACH, and are FIFRA exempted. They are stable at high temperatures (around 400°C) thus being compatible with the process of extrusion.

They do not leach out of the polymer matrix and are effective in low dosages; they do not volatilise, and they have a long life action of 5-40 years depending upon the application. They are compatible with all kinds of polymers.

These products have been tested at various government testing institutes. The PolyOne Corporation, which distributes Rodrepel™ and Termirepel™ in the USA and Europe, has recently concluded testing them for their anti-rodent and anti-termite properties at the Indian Institute of Chemical Technology, Hyderabad, where the products were evaluated under real life testing conditions and were found to be effective.

Certain problems are universal but where there exists a problem, the solution can't be far behind! Rodrepel™ and Termirepel™ have been developed to address the problems effectively and sustainably while guaranteeing the safety of animals, humans and the environment.

C Tech Corporation – India

Fax: +91 222 430 9295

Email: info@ctechcorporation.com

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Totally automated precision layer respooling, designed for high speed and maximum production. Capable of handling plastic and fibre spools as well as wire baskets. No operator required. Digital control with multilanguage touch screen user interface and possibility of ethernet or modem connection.

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DRAWING, COPPERING, SHAVING, CLEANING

INF-2 PAIL PACKER

Highly versatile, no-twist coiling of wire into drums. Round, square, octagonal drums, up to 1000kg.

INF-4 PAIL PACKER

High speed no-twist coiling of wire into drums.
Extremely compact unit.
Round, square, octagonal drums, up to 1000kg.

INF-6 PAIL PACKER

No-twist coiling of large diameter wire.



WET DRAWING & COPPERING for steel wire.
WET DRAWING, SHAVING & CLEANING for aluminium wire.

Successful demonstration of high speed optical fibre draw process

NEXTROM, a leader in turnkey manufacturing solutions for optical preforms and fibres, and DSM Functional Materials, a market leader for optical fibre coatings, have completed trials demonstrating the latest generation of

high speed draw process technology combined with state-of-the-art optical fibre coatings.

Using DSM's DeSolite® Supercoatings, the trials at Nextrom's test facility in

Vantaa, Finland demonstrated excellent draw performance and resulting fibre performance at all speeds tested, including at 2,500m/min – 50% faster than average production speeds used globally in the industry.



▲ The drawing of a 200mm diameter preform

Process speeds of 2,500m/min were achieved in the Optical Fibre Drawing process at Nextrom's laboratory using state-of-the-art OFC 20 production technology.

Using Nextrom's OFC 20 technology together with DSM's latest-generation optical fibre coatings, the draw technology and material expertise can be seamlessly integrated into the optical fibre manufacturing solution.

Fibres drawn had excellent cure levels and consistent geometry, which are important parameters indicative of fibre draw quality.

Testing of fibres manufactured in the high speed trials exhibited excellent microbending performance, dynamic fatigue and strip force results — all key properties inherent to DeSolite Supercoatings.

"Optical fibre manufacturers are challenged with increasing capacity and efficiency to keep up with market demand while also balancing telecom carriers' heightened attention on improving both quality and performance," said Steve Schmid, global applications development manager for fibre optic materials at DSM.

"These trials confirm that advanced DeSolite Supercoatings combined with leading fibre draw process technology from Nextrom can deliver optimal value for industry demands."

Nextrom Oy – Finland
Fax: +358 9 5025 3003
Email: info@nextrom.com
Website: www.nextrom.com

Royal DSM NV – The Netherlands
Website: www.dsm.com

Going the record distance

DRAKA, part of the Prysmian Group, has announced that its Triax HD Pro+ Broadcast solution has further extended its versatility to offer true 3G HD quality capability at a conservative transmission distance of 1,700m.

The latest Draka Triax HD Pro+ Broadcast solution has been tested and approved by leading international video equipment manufacturers and broadcasting companies.

In 2010, Draka and Fischer Connectors launched an integrated Triax HD cable and connector system, which won the 'Best of IBC2010' award for innovation and cost-effectiveness.

With the involvement of camera manufacturer Grass Valley, the partners have pushed Triax limits to a record certified 1,700m, with the possibility of much longer distances through the use of a repeater.

"With our matched components approach we continue to extend the limits of Triax connectivity solutions," said Oli Hentschel, Draka product manager and studio broadcast specialist.

Draka sees that the future for Triax HD technology is to combine highly reliable signal performance with even longer transmission distances, offering a plug-and-play, camera crew-friendly solution.

Draka and Fischer Connectors introduced the Triax HD Pro+ solution to Grass Valley in 2011. With Grass Valley's model LDK 8000 3G they also achieved outstanding performance values over cable lengths exceeding 1,500m.

In order to achieve useable cable lengths for today's outdoor broadcasts, either 1080i production or for upcoming HD 1080p standards, special qualities are demanded from the Triax equipment.

From a design viewpoint, this means developing innovative variations of 3G-Triax adapters, Triax cables and Triax plugs.

Triax 11 HD Pro+ camera cable is optimised for 3G broadcast applications under extreme conditions.

It connects camera and CCU and offers an optimum transmission quality based on low attenuation, lowest DC resistance (even over long distances), a long life span and a minimal weight.

The cable is designed with a universal jacket that is flame retardant and halogen-free, and suitable for in-house and outdoor applications.

Draka Holding NV – The Netherlands

Fax: +31 20 56 89 899
Email: info@draka.com
Website: www.draka.com

Fischer Connectors – Switzerland

Fax: +41 21 800 39 24
Email: mail@fischerconnectors.ch
Website: www.fischerconnectors.com



The poster features a dark background with glowing blue and orange wire loops. The 'wire' logo is in red, with 'Düsseldorf' in white below it. A central graphic shows a cross-section of a wire. To the right, the text 'join the best' is in red, followed by '26 – 30 March 2012' and 'Düsseldorf, Germany'. Below this, it says 'International Wire and Cable Trade Fair' and 'www.wire.de'. At the bottom, there are three icons: 'wire & cable', 'springmaking', and 'fastener', each with a brief description. The main headline 'wire 2012: Focus on Innovations' is in red, followed by a welcome message and details about the event's focus on fastener and spring-making technology.

wire[®]
Düsseldorf

join the best

26 – 30 March 2012
Düsseldorf, Germany
International Wire and Cable Trade Fair
www.wire.de

wire 2012: Focus on Innovations

Welcome to the No. 1 trade fair for the wire and cable industry!

This is where you meet international experts, specialists, innovators and world market leaders of the industry. And find out about all the latest developments and ground-breaking trends in everything to do with wire and cable. At wire 2012, the focus is especially on: Fastener and spring-making technology, the most modern machinery and plant for the manufacturing of springs and fastening elements.

A firm date for your calendar – visiting wire 2012 in Düsseldorf!



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Germany
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Fax +49 (0) 211/45 60-6 68
www.messe-duesseldorf.de



The primary wire wipe system – wire cleaning and lubrication

TO complement its extensive range of wire and strip cleaning equipment GEO-Reinigungstechnik recently launched the innovative primary wire wipe system (PWW) on the European market.

The (PWW) employs a novel principle: The wire to be cleaned passes between two strips of absorbing material which move in opposite directions laterally so that a clean surface is continuously presented to the wire. The patented PWW is designed to remove visible dust and excessive lubricants from wire and strand up to 2mm in diameter or small strips.

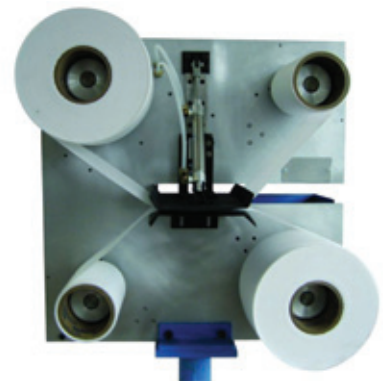
It is an economical, low-maintenance, environmentally friendly alternative

to traditional wipers such as felt pads, pieces of rag, etc, which only accumulate excessive oil, lubricants and debris.

In addition the PWW has proved successful in applying different types of lubricants and finishes, such as corrosion inhibitors, adhesion enhancers and welding wire finishing materials.

The PWW is suitable for wiping bare, tinned or plated ferrous and non-ferrous wire or strand at high line speeds.

The compact design enables space-saving installation either in-line with a wire drawing machine or in front of production equipment for bars, bolts, rivets, U-shaped



▲ The new primary wire wipe system staples, etc. The PWW is compatible with modern extruder lines as well.

Geo-Reinigungstechnik GmbH – Germany
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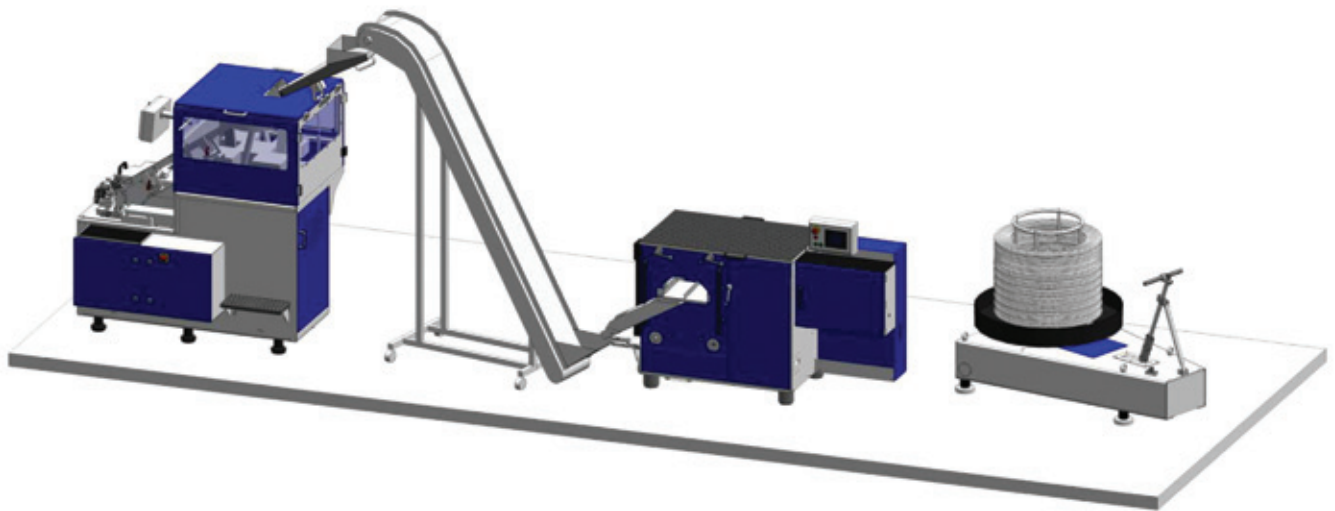
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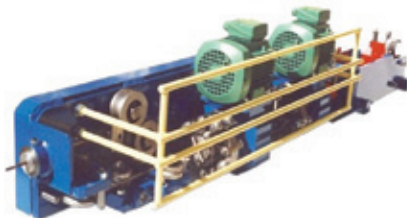
Rod dry cleaning: drawing speed continues to rise

Advertorial on behalf of Decalub

THE Dry Cleaning, Coating and Drawing (DCCD) process offers substantial cost savings, replacing conventional rod wet preparation including chemical cleaning/rinsing/wet pre-coating and drying by a new, totally dry process that presents a unique combination of simplicity and effectiveness.

The DCCD process is used in the most demanding H/C and L/C drawing applications from mechanically descaled bare rod, including 0.88-0.90%C, drawn directly without wet pre-coating chemicals, including spring wire, PC strand wire, cold heading wire, plating wire, etc.

The process operates at 'zero' maintenance cost as there is no acid, no hot liquid tanks for rod pre-coating, no hot air blowers to dry wet rod, and



▲ Rod cleaning and wire drawing by DCCD process

it operates at virtually 'zero' energy consumption.

An added benefit is the automatic control of lubrication parameters, including lubricant pressure, temperature and viscosity, enabling the use of standard high melting lubricants (+220°C/428°F) which are instantaneously converted from solid into liquefied state and deposited on bare rod, generating exceptional thermal stability at the highest drawing speed, 18m/sec for spring wire, completely

eliminating the need for phosphate and borax pre-coating chemicals and their wet substitutes.

In operation, all lubrication parameters 'communicate' together in a sensitive and automatic multi-way interaction to form a high-density strongly adherent full-film anti-wear lubricant coat, weight-adjustable, enabling frictionless drawing by physical separation of wire-die contact in all drafts.

The DCCD process revolutionises wire drawing process: customers target immediate total saving of 50-64% in production cost of drawn wire, in all drawing applications at virtually no speed limit, dictated mainly by rod pay-off and wire take up modes.

Decalub – France

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wire Düsseldorf



It's wire showtime at the

DÜSSELDORF becomes centre stage once again in March as wire 2012 gets underway at the Düsseldorf Fairgrounds.

More than 1,000 companies from 45 countries will set up show with a traditionally strong number of exhibitors from Italy, Belgium, France, Austria, the Netherlands, Switzerland, Turkey, Great Britain and Germany. A high number of registrations from Sweden have

also been received. In addition to those, US, China, India and Taiwan also have a high number of reservations as the companies take up a total of 592,000ft² of net exhibit space.

wire 2012 will present wire production and finishing machinery, tools and process engineering auxiliary materials as well as materials and special wires. Also on display will be innovations

from the areas of cable, measuring and control technology, testing technology, logistics, conveyor systems and packaging.

Manufacturers of wire, cable and fibre glass machinery as well as wire and cable producers and suppliers will occupy Halls 9 to 12, 16 and 17. Hall 15 will house fastener technology while Hall 16 will focus on spring making.

Preview 2012



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Düsseldorf Fairgrounds

Show dates:
Show opening hours:

Organisers:

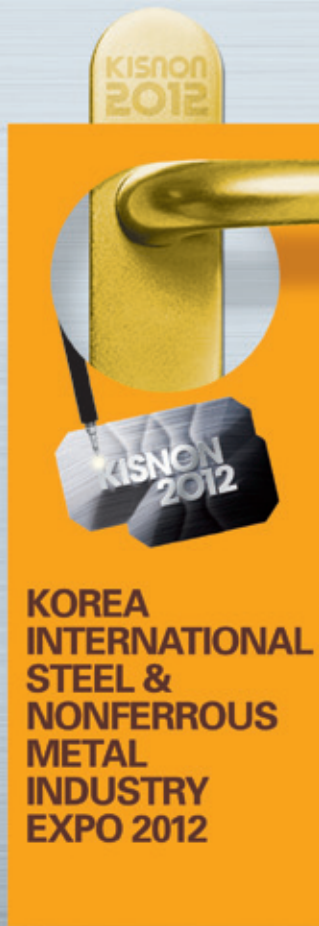
Monday 26th March - Friday 30th March 2012
9am-6pm Monday to Thursday
9am-5pm Friday
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Nonferrous Metal Refining, Copper Processing, Aluminum Processing, Zinc Processing, Nonferrous Metal Application, Magnesium Secondary Ingot, Rare Metal, Procession Products, etc.
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KOREA INTERNATIONAL WIRE & TUBE-PIPE EXPO

IWTP

2012. 9. 19(Wed)~22(Sat)
KINTEX / KOREA

○ **Wire**

Hard drawn steel wire, Mild drawn wire, Galvanized steel wire, Steel wire for cable, Coating wire, Stainless wire rod, CHQ, Fasteners, Raw materials & accessories

○ **Pipe**

Pipe, Steel pipe pile, P.V.C conduit, Flange, Valve, Hoop, Fitting, Pipe accessories etc.

○ **Tube**

Steel pipe tube, Carbon tube, Stainless tube, Titanium tube, Carbon nano-tube, Copper tube, Flexible tube, Nipple, Coupler, Fitting, Raw materials & accessories etc.

○ **Processing technology**

Cutting machine, Bending machine, Punching machine, Drawing machine, Processing machine, Heat treatment equipment, Welding machine, Process Technology Equipment, Test Technology etc.

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Organizer.



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Alphabetical list of Exhibitors

Please visit www.wire.de or email info@wire.de
(Exhibitors list correct at time of going to press)

Exhibitor.....	Hall/Stand
3View Com Inc.....	15 A12
A 1 Fence Products Company Pvt Ltd.....	16 C70
A Appiani Srl.....	11 G32
ALMT Corp.....	15 H31
ATR SpA.....	17 C20
AWM SpA Automatic Wire Machines.....	11 A22
Aachener Maschinenbau GmbH.....	15 H36
AB Hörle Trad.....	12 A40
AB Sandvik Materials Technology.....	11 G31
Acciai Speciali Zorzetto Srl.....	12 D16
Acciaierie Valbruna SpA.....	12 B13
Acciaierie Venete SpA.....	12 E76
Acenta Steel Ltd.....	12 D37
ACIMAF Italian Wire Machinery Manufacturers Association.....	11 A58
ACM A/B.....	09 E40
Acuity Products Limited.....	11 G64
ADC SARL.....	09 C02
Adelys.....	16 A25
Adtech (Shenzhen) Technology Co, Ltd.....	16 J60-02
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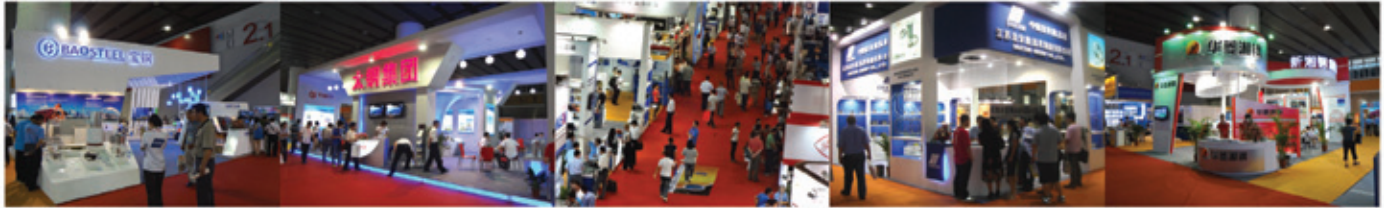
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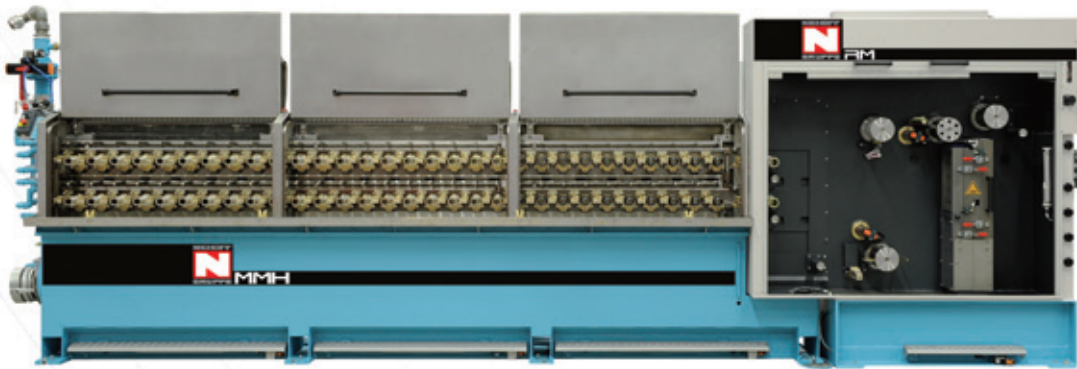
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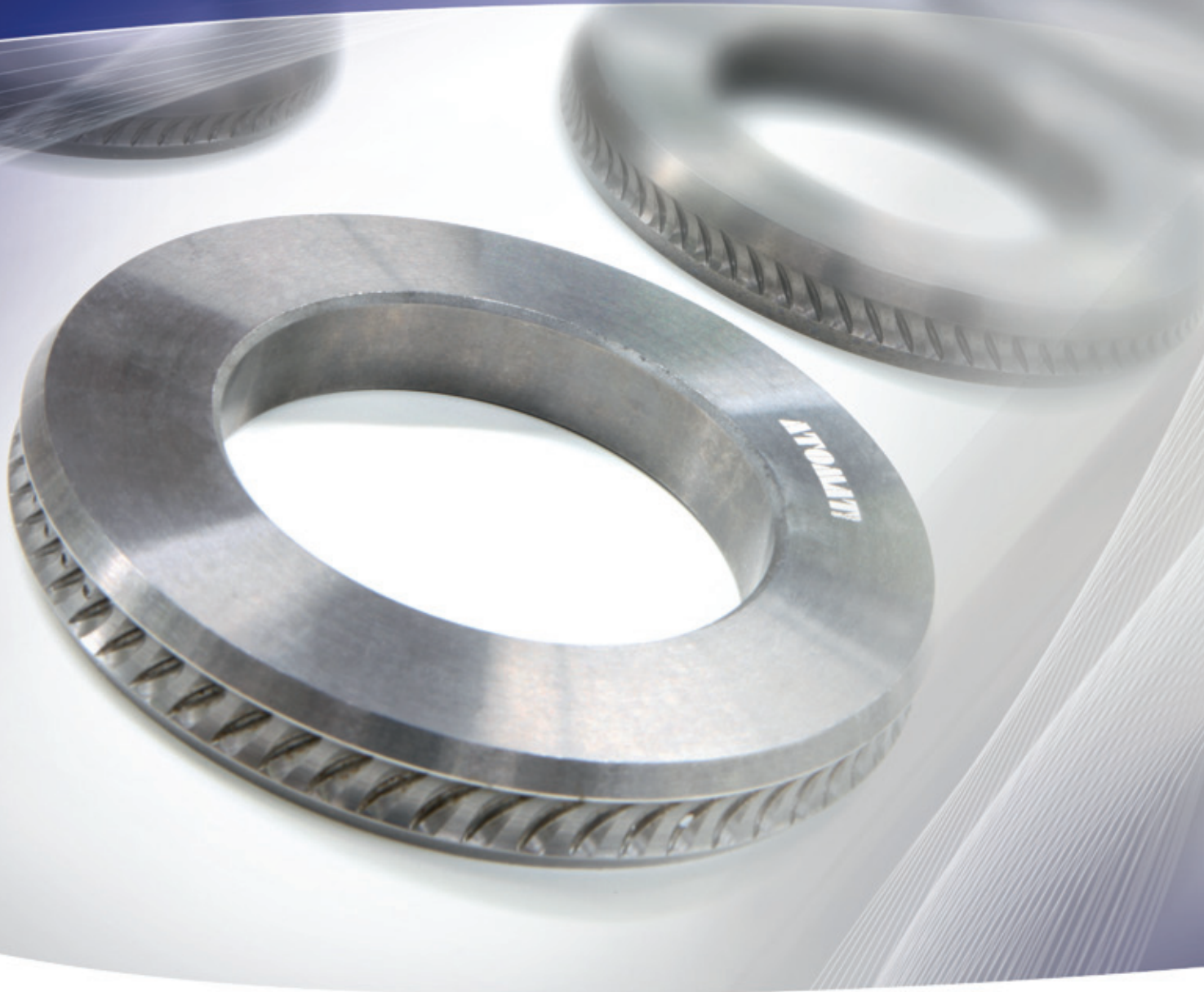
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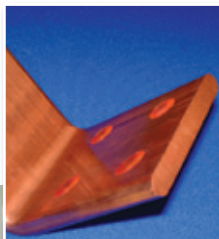
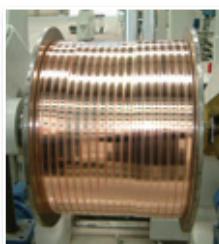
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High speed laser gauges for lay length measurement and FFT analysis for assessment of process stability

By Stephen Pearson, Tyco Electronics, Greensboro and Kenneth E Cornelison, Beta LaserMike, Dayton

Abstract

In this paper, we describe the work done to evaluate crosstalk performance in Category 5 and higher data communication cables. Specifically, a new technology was introduced that allows the accurate measurement of the lay of pairs.

In addition this technology provides information about the variability of the lay along the length of the pair. We show in this paper how the pair lay length as well as the variation of the lay affect the crosstalk performance.

Unlike designs that intentionally induce changes in lay length, the effects discovered and described occur as part of the mechanical operation of the pairing and cabling equipment.

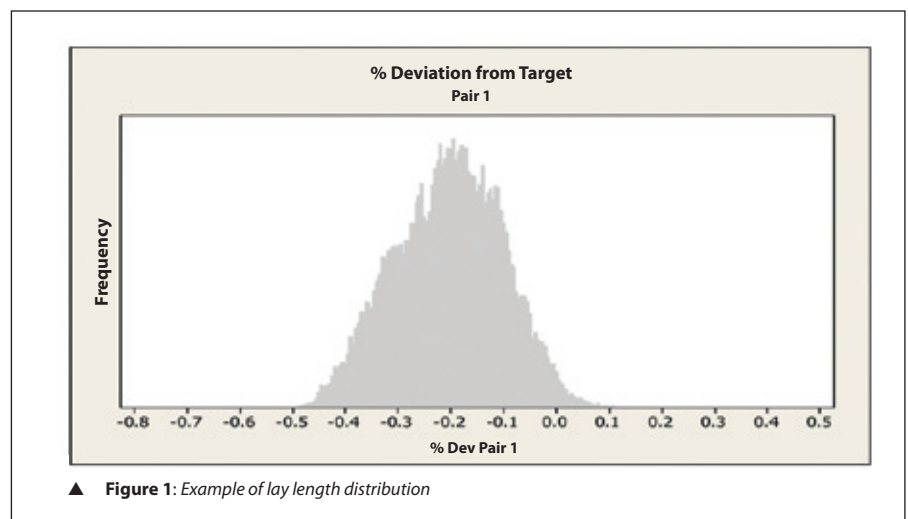
We have shown that by changing set points on the machines other than the lay setting itself, changes in the crosstalk performance of finished category cable performance occurs.

These changes in performance are also accompanied by changes in the lay length values, even with the same lay length set points on the machine.

1 Introduction

It is well known in the industry that crosstalk is a key characteristic for high performance category cables.

In many instances, manufacturers guarantee crosstalk performance better than industry standards. This high level of performance requires the implementation of a solid product design and stable manufacturing processes. It is also well known that even with a solid design,



excessive process variation will reduce crosstalk performance. Changes in performance may occur quickly in the case of a specific machine or process upset. Changes in performance may also occur slowly over the course of days or weeks that are often caused by gradual changes in the operation of the manufacturing equipment.

It is not uncommon to implement scheduled maintenance of equipment to reduce the instances of performance degradation, but the effectiveness of that maintenance to control the lay length attributes has not been understood adequately.

Another key factor affecting crosstalk performance is the consistency of lay lengths across a number of different machines. It is known, or at least previously suspected, that the lay length can be different from machine to machine.

Managing the use of different machines on a factory floor without good feedback on the actual pair lays is often a problem.

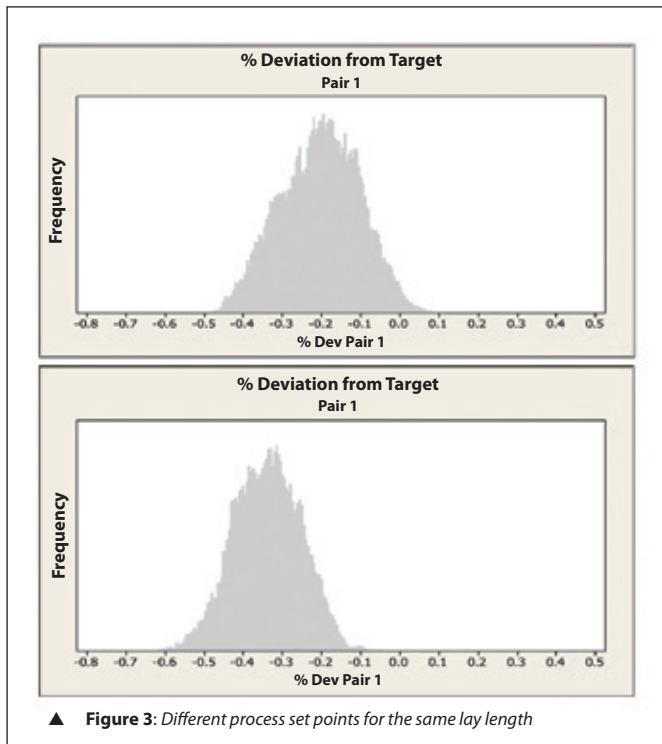
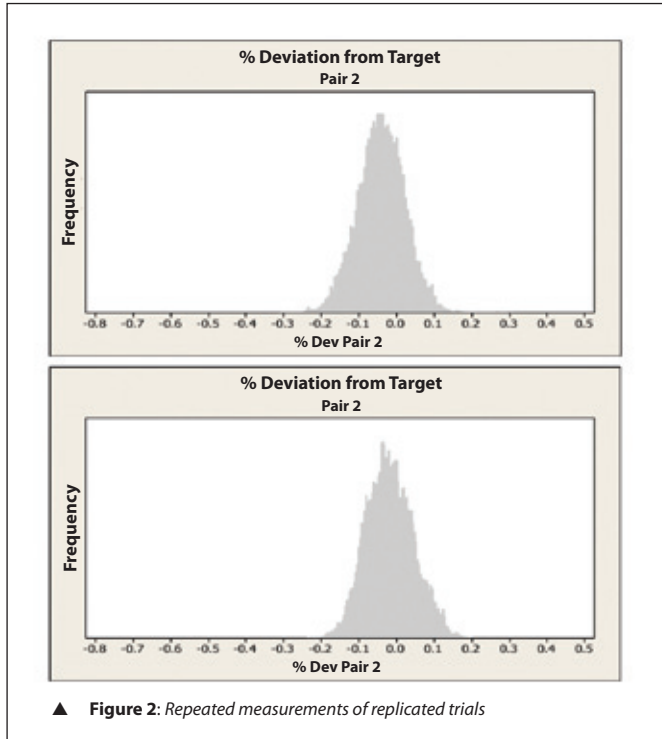
This can also be a significant barrier to production scheduling, since often only certain 'qualified' equipment can be used on specific products.

A new lay length measurement technology has been developed that allows high speed acquisition of lay length data. With this technology, lay lengths can be accurately measured across different machines.

This information can be useful in a number of ways. For instance, each machine on a production floor could then be adjusted to deliver a single desired lay value.

The variation around the nominal lay is also an important factor that contributes to the crosstalk of the completed cable. We show that effects such as the double twist bow rotation as well as the pretwist of the single wires are quite visible in the analysis of pair length variation.

In some cases, even variation caused by the rotation of the payoff and take up spool can be seen in the pair lay data.



2 Experimentation

This paper is the outcome of a joint effort of Beta LaserMike and Tyco Electronics to better understand how to measure lay lengths, and correlate those measured values to finished cable performance.

In order to develop a better understanding of the measurement capabilities, initial trials on individual pairs were conducted. After the pair lay information was gathered, data was gathered at a cabling line with simultaneous data on multiple pairs.

The measurement technology includes a rapid sample rate that allows data to be captured at a rate of several samples per lay length. This rapid sample rate allows the further processing of the data, such as FFT analysis, trend analysis, and statistical evaluation.

2.1 Pair lay studies

Initial trials were set up to measure pair lays that used a rewind line. This arrangement provided a simpler setup and allowed the measurement of pair lays across a number of twinning machines. Analysis and experiments were conducted to evaluate the measurement equipment performance as well as the differences seen across lay set points and process equipment.

2.1.1 Nominal lay of individual pairs

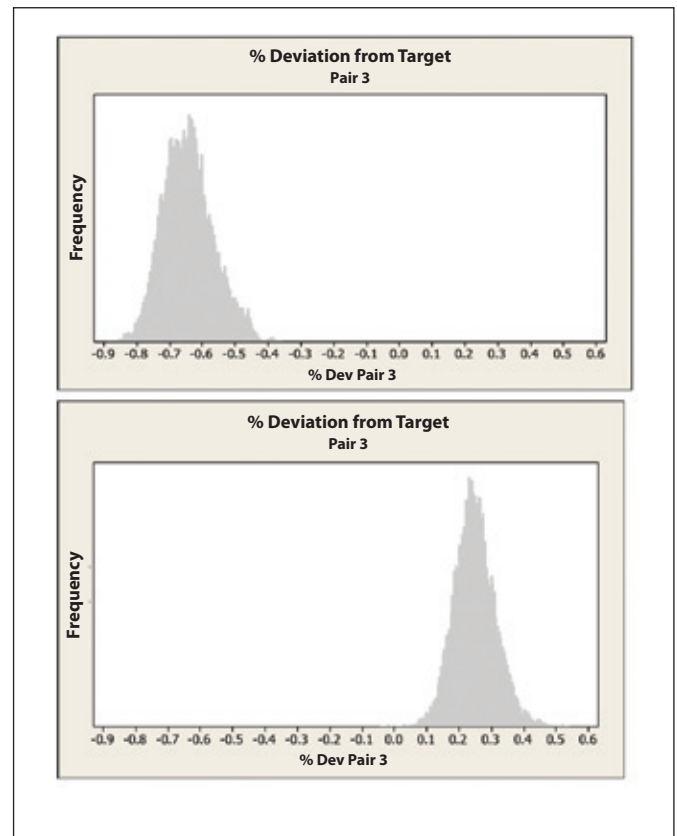
An example of the distribution of measured pair lay is shown in *Figure 1*. The data is in histogram format, with a probability density that reflects the distribution of the lay length data over the length of the pair sample. The x-axis scale has been calculated as a per cent deviation from the target to normalise the variation and the mean for all comparisons in this study. The overall lay lengths measured fall in to a rather tight band. The variation is on the order of 1% or less, and the mode of the distribution can be determined with somewhat additional precision.

2.1.2 Individual Pair Measurements

In one experiment, a single twinning machine was set to a number of process set points, but the lay length set point was unchanged. A series of pairs were made with no two set points in immediate succession, and the samples were made in replicate.

Figure 2 shows the comparison of the same lay set points measured at two different times from the same twinner, but with all other machine set points identical. This result shows high repeatability of both the twinner and the measuring technology when pairs with the same twinner, lay set point and process conditions are measured.

▼ **Figure 4:** Same lay length produced on two different machines



In another experiment, the process set points of one twinner were changed, but the lay set point was left constant. In this case, pretwist ratio and twinner bow speeds were changed. *Figure 3* shows distinct differences in the resultant lay as a result of process set points. With conventional manual or visual measurement techniques, changes this small would be quite difficult to discern.

In another experiment, two twinning machines were set to the same lay set point, and the pairs from each machine measured. *Figure 4* is an example from that experiment and shows the shift in nominal from one machine to another. In several other cases, changes on the order of a millimetre or two were readily discernable in the histogram.

2.1.3 FFT of individual pair lays

The ability of the equipment to sample at a high data rate allows lay variations to be seen on a scale of about each lay length. A surprising outcome was that a number of other variation signatures were also captured in addition to the primary lay length signature.

Waterfall analysis is a way to capture frequency signatures over time and display in an understandable format. For instance, waterfall displays are commonly used in measuring and troubleshooting SRL on primary extrusion lines. For this analysis, we also used waterfall analysis tools to better capture the variation of the pair lay over the length of the spool.

Figure 5 is an example of a waterfall FFT, with time on the horizontal axis, frequency on the vertical axis, and shading as the 'z' axis. For the 'z' axis, the lighter the colour the more intense the frequency signature is.

An expected outcome was the frequency signature from the primary lay length. A surprising outcome was the additional signature content found in the FFT waterfall. A signature is clearly visible from both the twinner bow RPM (2x lay length, 1/2 frequency) as well as the pretwist (at pretwist %) imparted on the wire before twinning. There are also a number of other unexpected signatures found within the FFT waterfall that indicate other mechanical patterns of the manufacturing equipment.

Figure 6 shows the difference in the FFT pattern when a change in the pretwist ratio is implemented. In this diagram, the signature of the primary lay and the bow speed is the same as *Figure 5*.

However, the signature for the pretwist has a shift that is consistent with the changes in the set points on the twinning machine.

2.1.4 Relationship of Process Set Points to Nominal Lay Length

Using DOE techniques with the nominal lay length as an output and a 2x2 matrix of process set points as the inputs, the relationship of set points to nominal lay could be determined. The main effect plots in *Figure 7* show that there is a strong relationship between the pretwist ratio and the lay length. The bow speed relationship is not as strong.

Interestingly there is also a sign of an interaction effect of bow speed and pretwist ratio on lay length as shown by the interaction plot in *Figure 8*.

This means that how the lay length is affected by pretwist ratio depends on what setting for bow speed has been chosen.

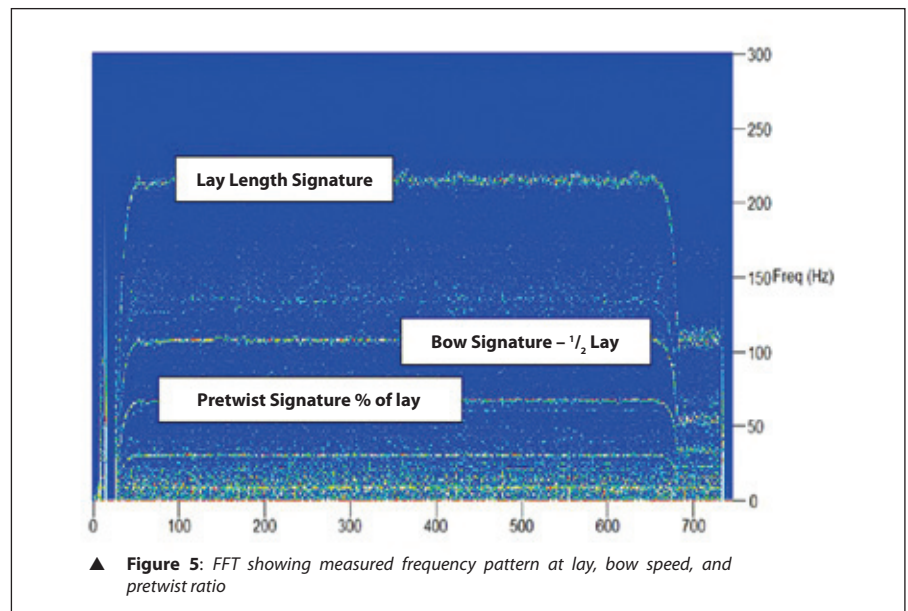
It should be noted that the amount of change in lay length accounted for by the

process pretwist ratio is still very small. Normally this might not be considered significant to crosstalk performance. Without replication of the test matrix, statistical significance of this change cannot be determined. But it does give initial indication that there may be some cause and effect in this relationship.

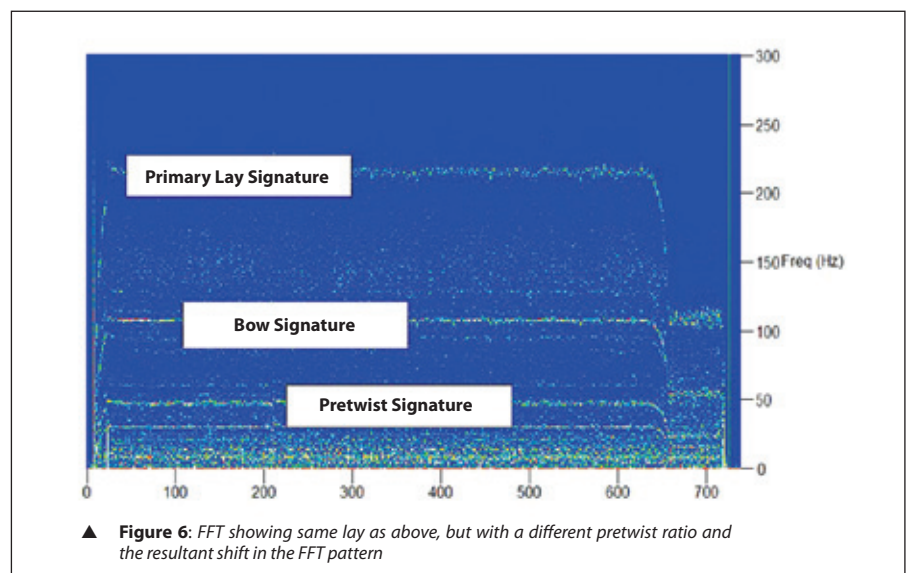
2.2 Pair Lays at Cabling Studies

Extending the experimentation of pair lays into the cabling process was necessary to confirm previous findings of individual pairs and to measure the lays of at least two individual pairs going into the cabling process at the same time.

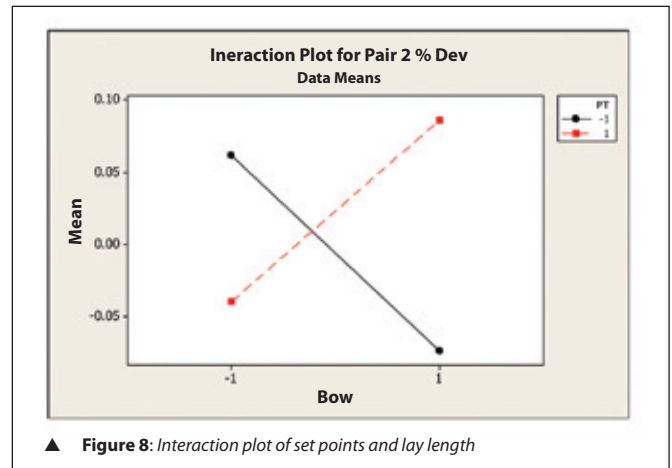
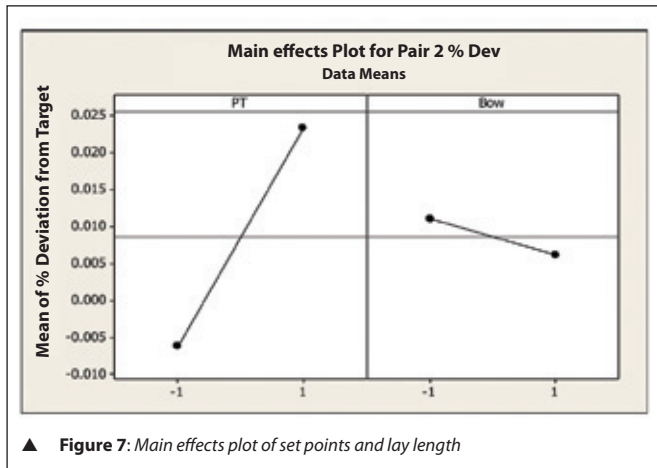
Using the process set points described in Section 2.1.2, a simple 2x2 test matrix was set up to compare the signatures of various pairs at the chosen set points of pretwist ratio and bow speed. Only two of the pairs in the cable were subjected to the 2x2 test matrix while the remaining



▲ **Figure 5:** FFT showing measured frequency pattern at lay, bow speed, and pretwist ratio



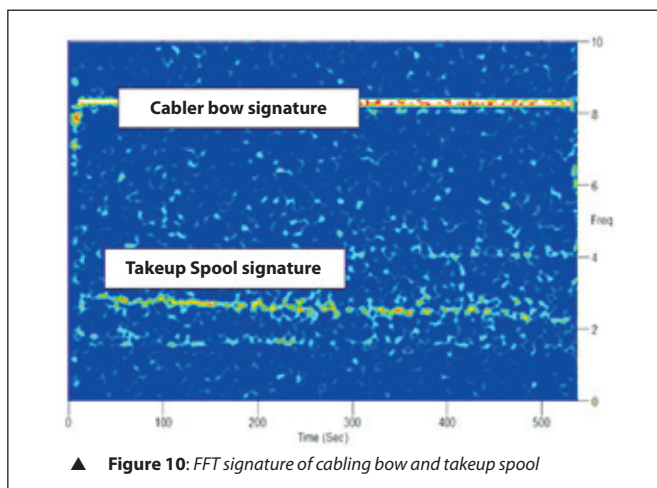
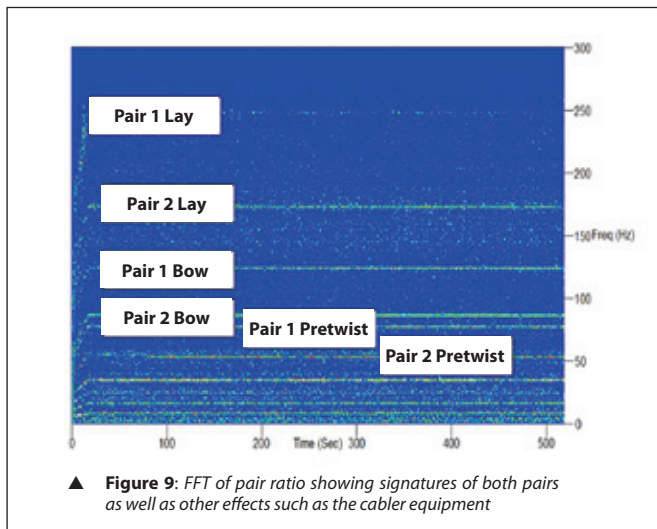
▲ **Figure 6:** FFT showing same lay as above, but with a different pretwist ratio and the resultant shift in the FFT pattern



two pairs were run under constant process settings as control points. The crosstalk interaction of the two pairs under study was the primary point of interest although the interactions with control pairs were also measured. Near End Crosstalk (NEXT) measurements were swept to a frequency of 1.2 GHz.

2.2.1 FFT of the individual pair lays at cabling

The basic form of the FFT graphs was consistent with what was found at the rewind station also described in Section 2.1.3. In this case, the FFT is performed on the ratio of two pairs measured at cabling.



In the FFT plot in *Figure 9*, the signatures are seen from both pairs in the one plot. The FFT components previously mentioned can be seen for primary lays, twinner bow speeds, and pretwist ratios in both pairs. However, at lower frequencies there are other signatures of interest. The measurement equipment is also sensitive to mechanical variations in the manufacturing equipment.

Figure 10 shows a strong component that is related to the bow of the cabling. Also visible is a sloping signature that is believed to be related to the rotation of the take up reel in the cabling. The slope is due to the increase in the take up reel barrel diameter during the run, decreasing the spool rotation rate.

The cabling bow speed is an extremely strong and steady signal that is a measure of the effect on the cabling bow on the short term cabling speed. For a perspective on the amount of cabling induced variation, the pairs entering the cabling had an 8% peak to peak variation in instantaneous speed. It is likely that much of that speed change is accommodated by short term stretching and relaxing of the pair.

2.2.2 NEXT Response for Various Process Set Points

As mentioned in Section 2.1.4, without replication actual statistical significance of performance cannot be determined. However, repeated samples were taken from the trial to validate qualitative findings noted below.

Distinct differences can be seen in some of the set points mainly in the form of spikes in the NEXT graphs. At one combination of pretwist ratio and bow speed an obvious spike appears in the NEXT graph at 80 MHz. By changing only the pretwist ratio for both pairs, this spike is reduced or eliminated.

At the opposite setting of bow speed, the change in pretwist ratio has a similar effect on a spike that is seen at about 125 MHz.

3 Conclusion

As a result of this study there were a number of important findings.

It has been shown that the high speed measurement technology used in this study provides an accurate and repeatable method for measurement of lay length value of twisted pairs.

The use of this technique over long lengths along with real time data collection of the speed of the pair provides insight, through FFT analysis, into the stability of, and patterns within, the twinning process.

Mainly, lay variation signatures are found at the fundamental pair lay length, the twinner bow speed and the pretwist speed.

The nominal lay length values are affected by changes in process set points, specifically pretwist ratio and its interaction with bow speed.

Quantitatively, these changes are relatively small. But there appears to be a relationship between the inputs and the lay lengths that would require further validation for statistical significance.

An additional and potentially larger impact to the nominal lay length can be seen between machine types.

Subsequent processes can add to or have an impact on the variation signatures. This was evident in the measurement of pairs at cabling.

Additional signatures for cabler bow speed and take up spool diameter were seen.

Finally, and most importantly, crosstalk performance is significantly affected by the process changes in these experiments.

Investigation into the changes in lay length values as well as changes in the variation signatures are needed to verify the contribution from each factor.

It is reasonable to assume that there are other process inputs that could have an impact to the lay variation as there are other unexplained signatures seen at both twinning and cabling. Their impact to crosstalk performance would require further investigation. ■

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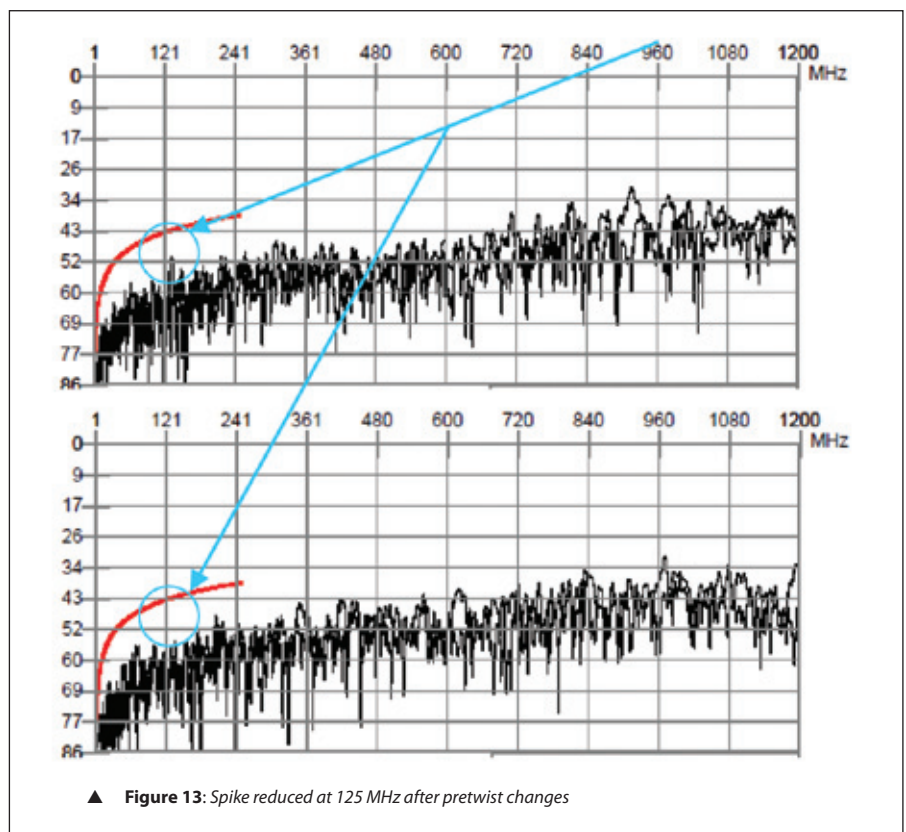
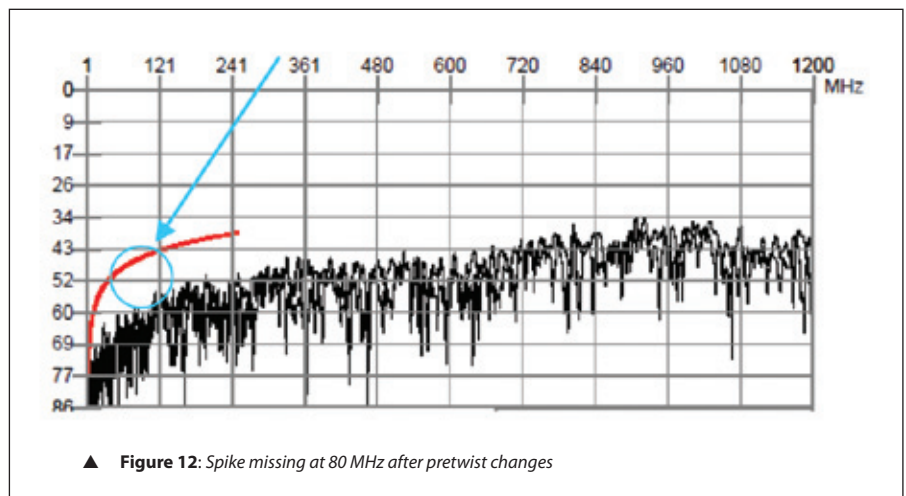
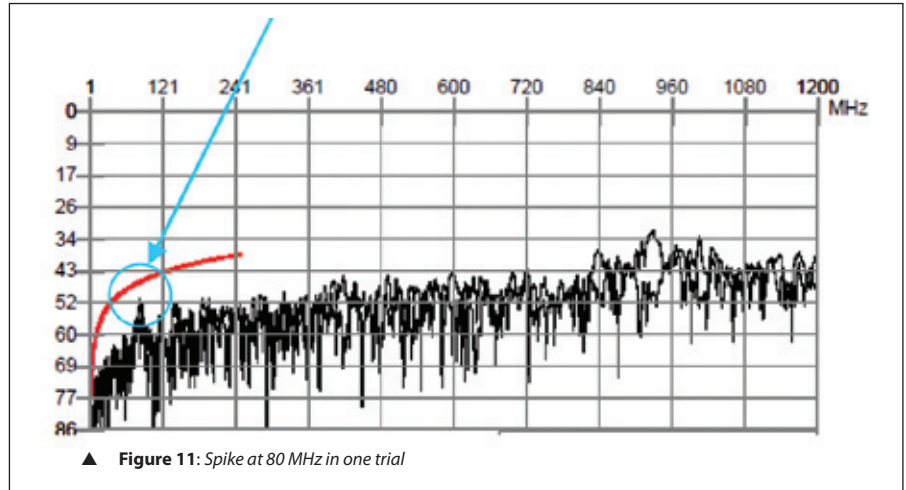
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Paul Lawruk ist der neueste Kundenberater im Hauptsitz von Allied, in Pennsylvania. Lawruk begann seine berufliche Laufbahn in der Draht- und Kabelindustrie bei Omni Cable, wo er als Kundenbetreuer tätig war.

Er wurde während seiner dortigen Tätigkeit mit AWC vertraut und erkannte den hervorragenden Kundendienst aus erster Hand, für den Allied bekannt ist. Nun freut sich Lawruk darauf Seite an Seite mit der Mannschaft von Allied arbeiten zu können.

Der neueste Standort von Allied, in Las Vegas, heißt Kristy Ventura willkommen. Zu ihrer Verlegung nach Allied Wire and Cable, äußerte sie sich so: "Es ist mir ein Vergnügen Teil der

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Ventura verfügt über ein starkes Basiswissen im Bereich Industrie mit vorherigen Positionen bei Anacapa Micro Products, R&B Welding and Grainger.

Ryan Baldinelli ist der jüngste Zugang für die Zweigstelle von Allied in New England sowie für die Draht- und Kabelindustrie. Er wurde 2011 am Castleton State College in Vermont graduiert, wo er Betriebswirtschaft und Marketing studierte. Obwohl er ein Neuling ist, bringt er eine Menge Begeisterung in seine neue Position ein.

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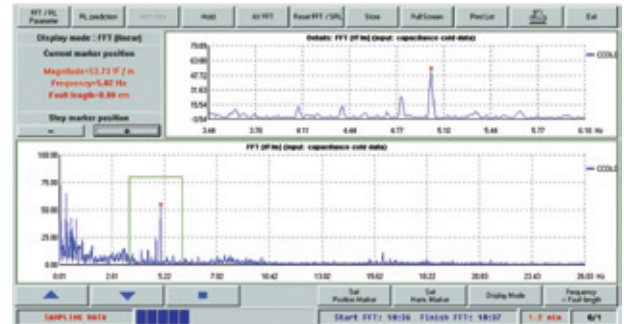


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Capacitance 2000 sichert verlustfreie Datenübertragung



▲ Capacitance 2000 misst die Kapazität und erfasst die periodische Kapazitätsschwankungen über die schnelle Fourier-Transformation (FFT)

FÜR alle LAN-, Koaxial-, Telefon- oder HF-Kabel stellt die verlustfreie, analoge oder digitale Hochfrequenz-Signal-Datenübertragung ein wichtiges Qualitätsmerkmal dar.

In diesem Zusammenhang spielt die Kapazitätsmessung eine wichtige Rolle. Die Kapazität beeinflusst die Impedanz des Kabels im speziellen Frequenzbereich und beeinflusst demzufolge wesentlich die Qualität des Kabels.

Capacitance 2000 ist ein Messgerät, das in der Kühlwanne installiert wird und die Kapazität der Drahtisolierung genau misst. Gleichzeitig erfasst das System die Kapazitätsänderungen, liefert ein extrem schnelles Messwert-Update und detektiert Blankstellen.

Diese Technik wird durch die Kombination einer kurzen und zwei langen Messelektroden realisiert, die in einem Messrohr integriert sind. Die 10mm lange Kurzmesselektrode identifiziert periodische Kapazitätsschwankungen mit hoher räumlicher Auflösung mittels schnelle Fourier-Transformation (FFT).

Von den FFT-Daten aus wird die Rückflussdämpfung (SRL) erfasst und Informationen über die vorgesehene Dämpfung des HF-Signals während der Datenübertragung geliefert. Der Langmessbereich misst mit hoher Präzision den durchschnittlichen Wert der Kapazität.

Das Vermeiden periodischer Veränderungen des Kabels ist eine Voraussetzung für ein optimales Dämpfungsmerkmal, wobei der kritische Intervall der Zeiten kürzer ist je höher die gezielte Datenübertragungsrate für das Kabel gestiegen ist.

Diese periodische Veränderungen werden durch die Multizonen-Technik der Capacitance 2000 erfasst, da sich alle Parameter, die einen Einfluss auf die Qualität haben (z. B. Leiterdurchmesser, Schäumung, Außendurchmesser), in der Kapazität widerspiegeln. Die Genauigkeit entspricht 0,1 pF pro Meter. Bei Liniengeschwindigkeiten bis zu 2.400m/min sind Vorhersagen der Rückflussdämpfung von 3 GHz, bzw. von 8 GHz bis zu 1.300 m/min, möglich. Auf diese Art kann die erfasste Impedanz des Kabels genau wiedererzeugt werden.

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Hochgeschwindigkeits-Lasermessgeräte für die Schlaglängenmessung und FFT-Analyse zur Beurteilung der Prozessstabilität

Von Stephen Pearson, Tyco Electronics, Greensboro, und Kenneth E Cornelison, Beta LaserMike, Dayton

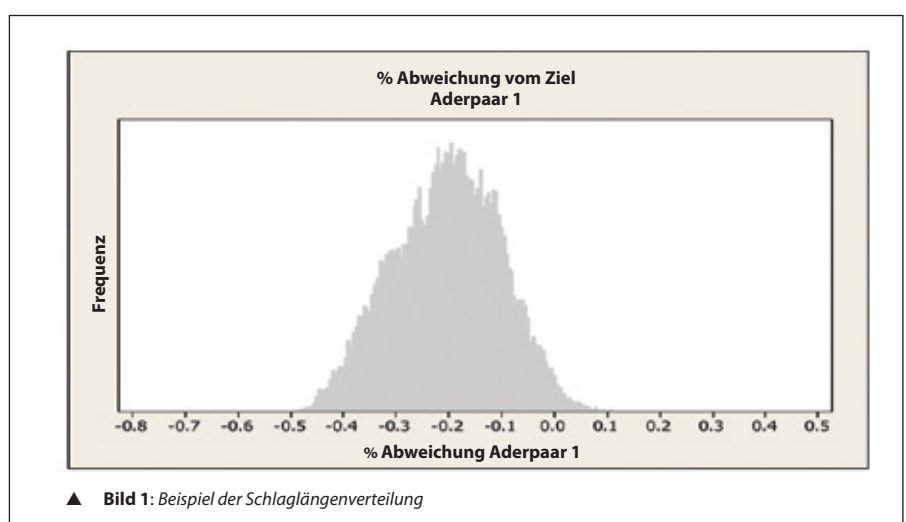
Übersicht

Dieser Artikel befaßt sich mit der Arbeit, die durchgeführt wurde, um die Nebensprechleistung bei Category 5 Kabel sowie bei höheren Datenkommunikationskabeln zu beurteilen.

Insbesondere wurde eine neue Technologie eingeführt, dank welcher eine genaue Messung des Schlags von Aderpaaren ermöglicht wird. Diese Technologie bietet darüber hinaus auch Informationen über die Veränderlichkeit des Schlags entlang der Aderpaarlänge. Der vorliegende Artikel beschreibt die Weise in der die Nebensprechleistung von der Aderpaar-Schlaglänge sowie von der Änderung des Schlags beeinflusst wird. Im Gegensatz zu den Entwürfen, die absichtlich Änderungen in der Schlaglänge veranlassen, treten die entdeckten und beschriebenen Wirkungen als Teil des mechanischen Betriebs der Paarverleilungs- und Verleilungsausrüstungen auf. Wir haben bewiesen, daß durch die Änderung der Sollwerte an den Maschinen - außer derselben Schlageinstellung - Änderungen bei der Nebensprechleistung im fertigen Category-Kabel entstehen. Diese Änderungen bezogen auf die Leistung sind auch mit den Änderungen bei den Schlaglängenwerten verbunden, sogar mit denselben Schlaglängensollwerten an der Maschine.

1 Einleitung

In der Industrie ist es wohl bekannt, daß das Nebensprechen ein Schlüsselmerkmal für leistungsfähige Category-Kabel ist.



▲ Bild 1: Beispiel der Schlaglängenverteilung

In vielen Fällen wird von den Herstellern eine höhere Garantie für die Nebensprechleistung als für Industriestandards geboten. Bei diesem hohen Leistungsniveau sind die Umsetzung eines zuverlässigen Produktentwurfs und stabile Herstellungsverfahren erforderlich.

Außerdem ist es wohl bekannt, daß auch mit einem zuverlässigen Entwurf, die Nebensprechleistung durch eine übermäßige Verfahrensänderung reduziert wird.

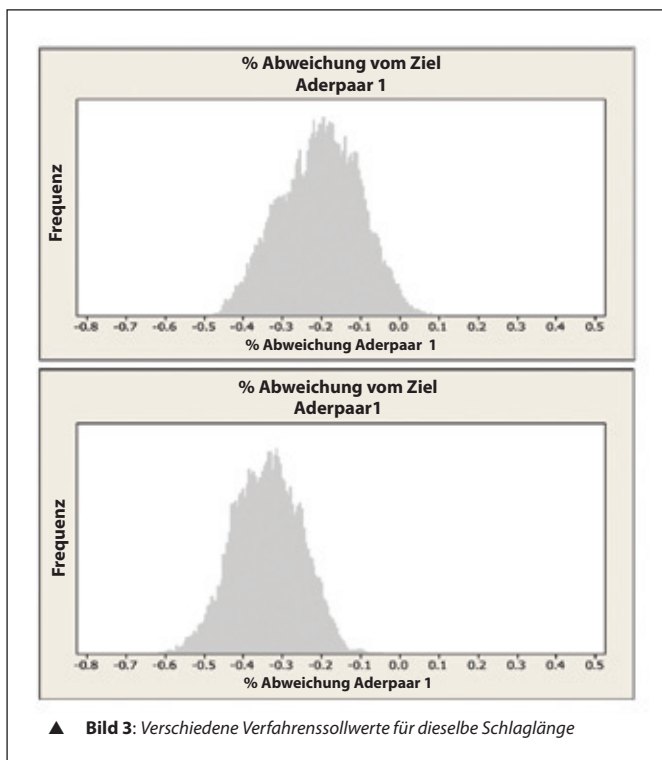
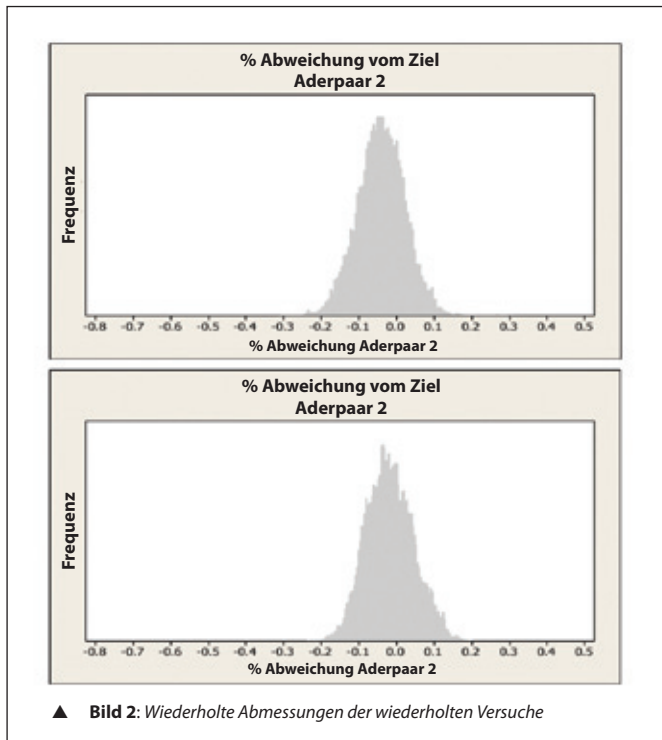
Änderungen bei der Leistung könnten sich schnell ergeben falls eine spezifische Maschine oder ein Verfahren verstellt werden.

Die Änderungen bei der Leistung können auch langsam im Laufe der Tage oder der Wochen entstehen und werden oft durch stufenweise Änderungen beim Betrieb der Herstellungsausrüstungen verursacht.

Es ist nicht unüblich, eine planmäßige Wartung der Ausrüstung zu implementieren, um die Fälle der Leistungsherabsetzung zu reduzieren, wobei jedoch die Wirksamkeit dieser Wartung um die Eigenschaften der Schlaglängen zu prüfen, nicht ausreichend verstanden wurde.

Ein weiterer Schlüsselfaktor, der die Nebensprechleistung beeinflusst ist die Beständigkeit der Schlaglängen durch zahlreiche unterschiedliche Maschinen. Es ist bekannt, oder es wurde zumindest zuvor vermutet, daß sich die Schlaglänge von einer Maschine zur anderen unterscheiden kann.

Das Leiten verschiedener Maschinen in einer Fabrikhalle ohne eine gute Rückwirkung bei den tatsächlichen Aderpaar-Schlägen, stellt oft ein Problem dar. Es kann außerdem ein deutliches Hindernis bei der Produktionsplanung sein, da öfters nur einige bestimmte



„qualifizierte“ Ausrüstungen bei spezifischen Produkten eingesetzt werden dürfen. Eine neue Technik der Schlaglängenmessung wurde entwickelt, die eine Hochgeschwindigkeitserfassung der Schlaglängendaten ermöglicht. Dank dieser Technik können die Schlaglängen durch verschiedene Maschinen genau gemessen werden.

Diese Information kann auf unterschiedliche Art und Weise nützlich sein. Zum Beispiel könnte somit jede Maschine in einer Produktionshalle eingestellt werden, um einen einzelnen gewünschten Schlagwert zu bieten. Die Änderung um den Nennschlag ist auch ein wichtiger Faktor, der zum Nebensprechen

des vollständigen Kabels beiträgt. Gezeigt wird, daß die Wirkungen wie z. B. die Doppelschlag-Bogendrehung sowie der Vordrall der Einzeldrähte ziemlich sichtbar in der Analyse der Längenänderung der Aderpaare ist. In einigen Fällen ist in den Daten des Aderpaarschlags auch die Änderung ersichtlich, die durch die Drehung der Ablauf- und Abwickelpule entsteht.

2 Versuch

Die vorliegende Unterlage ist das Ergebnis einer Zusammenarbeit zwischen Beta LaserMike und Tyco Electronics, um die Weise in der die Schlaglängen gemessen werden besser zu verstehen, und korreliert diese gemessenen Werte mit der Fertiggabelleistung.

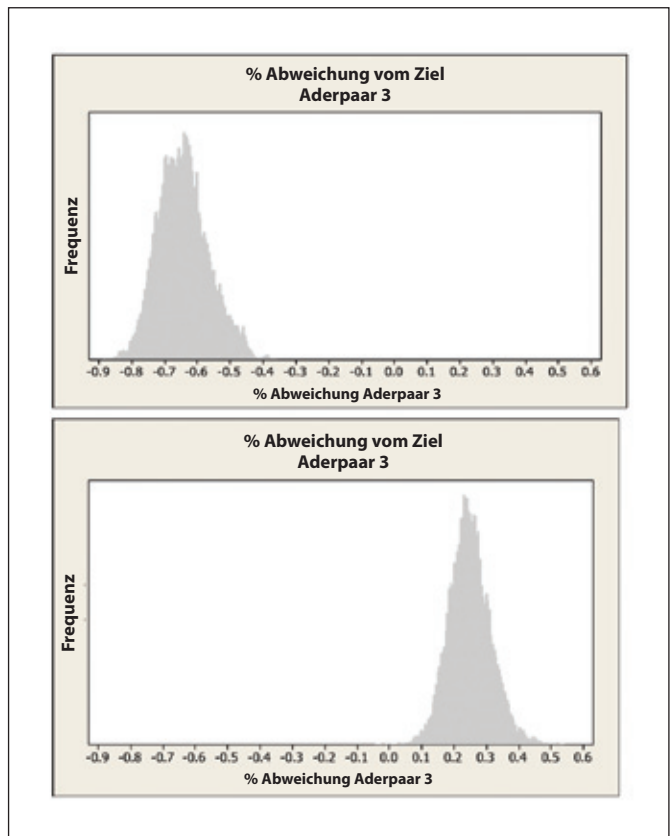
Um ein besseres Verständnis der Messfähigkeiten zu entwickeln, wurden erste Versuche auf einzelnen Aderpaaren durchgeführt. Nachdem die Informationen über den Aderpaarschlag gesammelt wurden, wurden die Daten in eine Verseilungsanlage mit simultanen Angaben der Mehrfach-Aderpaare gesammelt.

Die Messtechnik umfaßt eine schnelle Abtastrate, durch welche es ermöglicht wird, daß die Daten in einer Rate von mehreren Proben je Schlaglänge erfasst werden. Dank dieser schnellen Abtastrate wird die darauf folgende Verarbeitung der Daten ermöglicht, wie z. B. die FFT-Analyse, die Trendanalyse und die statistische Auswertung.

2.1 Studien über den Aderpaarschlag

Die ersten Versuche wurden durchgeführt, um die Aderpaarschläge in eine Umspulanlage zu messen. Diese Anordnung setzte eine einfachere Einstellung voraus und ermöglichte die Messung von Aderpaarschläge über mehrere Paarverseilmaschinen. Analysen und Versuche wurden durchgeführt, um die Leistung der Meßgeräte zu bewerten sowie die Unterschiede, die durch die Schlagsollwerte und Prozessausrüstungen beobachtet wurden.

Bild 4: Gleiche auf zwei unterschiedliche Maschinen hergestellte Schlaglänge



2.1.1 Nennschlag der einzelnen Aderpaare

Ein Beispiel der Verteilung des gemessenen Aderpaarschlags ist in *Bild 1* dargestellt. Die Daten sind im Histogrammformat, mit einer Wahrscheinlichkeitsdichte, die die Verteilung der Schlaglängendaten über die Länge der Aderpaarprobe widerspiegelt.

Der Maßstab der x-Achse wurde als eine Abweichung des Prozentsatzes von der Zielsetzung berechnet, um die Änderung und den Mittelwert für alle Vergleiche in dieser Studie zu normieren.

Die gemessenen Schlaggesamtlängen fallen in einen ziemlich engen Bereich. Die Änderung liegt etwa um 1% oder niedriger, und die Art der Verteilung kann mit einer etwas höheren Präzision festgelegt werden.

2.1.2 Messungen der einzelnen Aderpaare

In einem Versuch wurde eine einzelne Paarverseilmaschine auf eine Anzahl an Verfahrenswerte eingestellt, aber der Schlaglängensollwert blieb unverändert. Eine Reihe von Aderpaaren wurde mit zwei Sollwerten in umgehender Reihenfolge und die Proben in Wiederholung durchgeführt.

Bild 2 zeigt den Vergleich derselben Schlagsollwerte gemessen zu zwei unterschiedlichen Zeiten von der selben Paarverseilmaschine, wobei alle anderen Maschinensollwerte identisch sind.

Dieses Ergebnis zeigt eine hohe Wiederholbarkeit der Paarverseilmaschine sowie der Messtechnik, wenn Aderpaare mit derselben Verseilmaschine, Schlagsollwert und Verfahrenbedingungen gemessen werden.

In einem anderen Versuch wurden die Verfahrenswerte einer Paarverseilmaschine geändert, aber der Schlagsollwert blieb konstant. In diesem Fall wurden das Vordrallverhältnis und die Bogengeschwindigkeiten der Paarverseilmaschine geändert.

Bild 3 zeigt eindeutige Unterschiede bei dem sich daraus ergebenden Schlag als Ergebnis der Verfahrenswerte. Mit konventionellen manuellen oder visuellen Messtechniken würde es ziemlich schwierig sein derartig geringe Änderungen festzustellen.

In einem anderen Beispiel wurden zwei Paarverseilmaschinen auf demselben Schlagsollwert eingestellt und die Aderpaare von jeder Maschine gemessen.

Bild 4 ist ein Beispiel aus diesem Versuch und zeigt die Abweichung der Nennwerte von einer Maschine zur anderen. In verschiedenen anderen Fällen wurden

Änderungen von etwa ein oder zwei Millimeter im Histogramm leicht erkennbar.

2.1.3 FFT von einzelnen Aderpaarschläge

Die Fähigkeit der Ausrüstung eine Probe bei einer hohen Datenrate zu nehmen ermöglicht wiederum, daß Schlagänderungen auf einem Maßstab ersichtlich sind, der zirka jeder Schlaglänge entspricht.

Ein überraschendes Ergebnis lag darin, daß eine Anzahl von anderen Änderungslinien zusätzlich zur Linie der Primär-Schlaglänge ebenfalls erfaßt wurde.

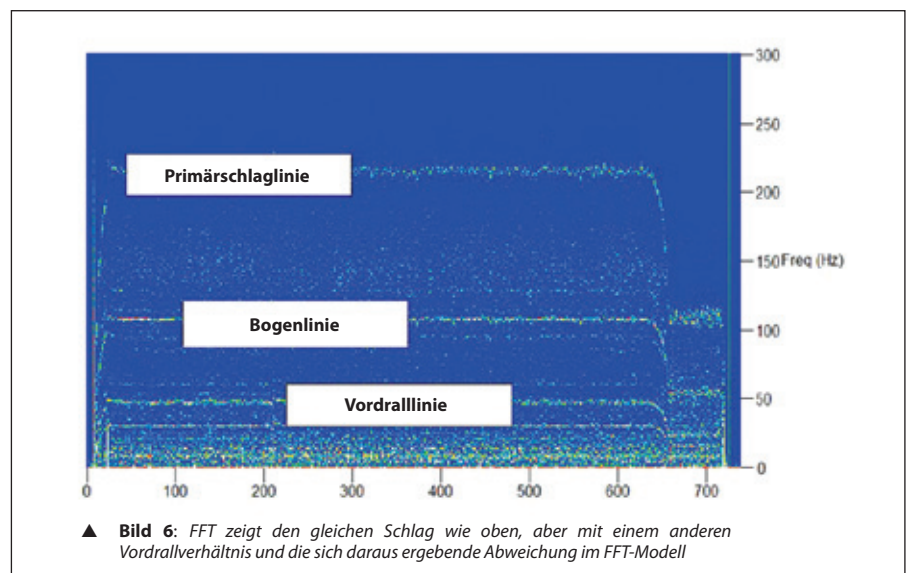
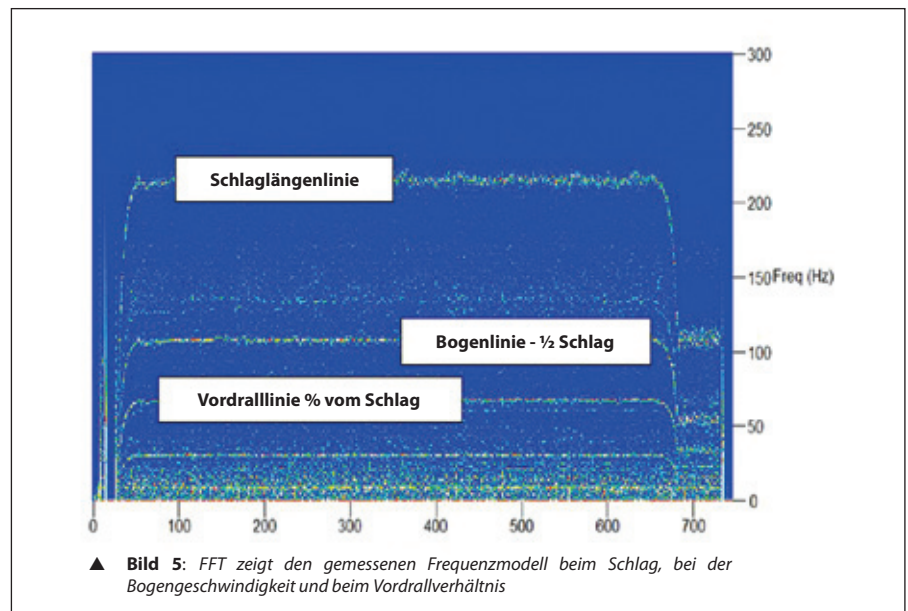
Die Wasserfallanalyse stelle eine Weise dar, Frequenzlinien im Laufe der Zeit zu erfassen und in einem verständlichen Format anzuzeigen.

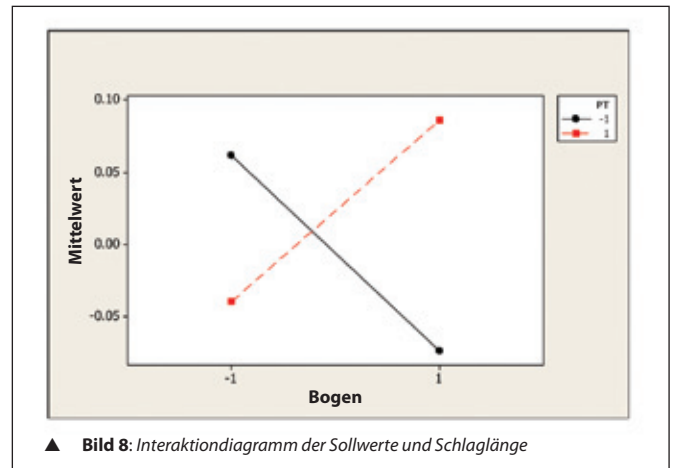
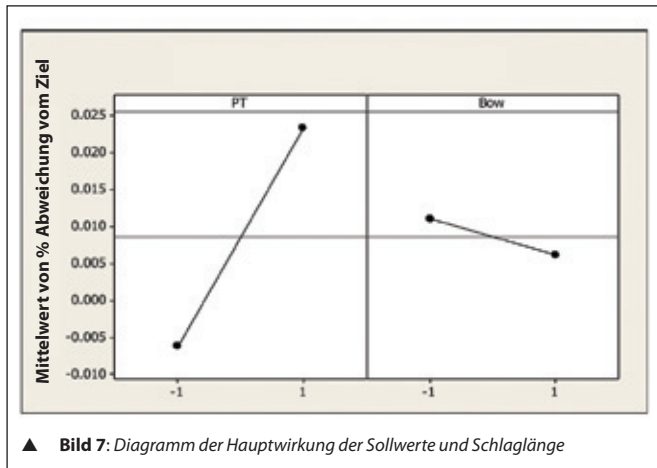
Wasserfallanzeigen werden üblicherweise zum Beispiel beim Messen und bei der Fehlersuche SRL in

Primärextrusionsanlagen eingesetzt. Bei der vorliegenden Analyse wurden von uns auch Wasserfall-Analysewerkzeuge eingesetzt, um die Änderung des Aderpaarschlags über die Länge der Spule besser zu erfassen.

Bild 5 stellt das Beispiel einer Wasserfall-FFT dar, mit Zeit auf der horizontalen Achse, Frequenz auf der vertikalen Achse und Schattierung als „z“-Achse. Bei der „z“-Achse, je heller die Farbe, desto intensiver ist die Frequenzlinie.

Ein erwartetes Ergebnis war die Frequenzlinie von der Primärschlaglänge. Ein überraschendes Ergebnis war dagegen der zusätzliche Linieninhalt, der in der FFT des Wasserfalls erforscht wurde. Eine Linie ist klar sichtlich vom U_{pm}-Wert des Bogens der Paarverseilmachines (2x Schlaglänge, ½ Frequenz) sowie vom Vordrall (bei Vordrall-%), die dem Draht vor der Paarverseilung vermittelt wird.





Außerdem gibt es viele andere unerwartete Linien, die innerhalb der FFT des Wasserfalls entdeckt wurden und die andere mechanische Modelle der Fertigungs-ausrüstung angeben.

Bild 6 stellt den Unterschied im FFT-Modell dar, wenn eine Änderung im Vordrallverhältnis implementiert wird. Im vorliegenden Diagramm, entspricht die Linie des Primärschlags und die Bogengeschwindigkeit dem Bild 5.

Jedoch weist die Linie für den Vordrall eine Abweichung auf, die mit den Sollwertänderungen auf der Paarverseilmaschine übereinstimmt.

2.1.4 Verhältnis zwischen Verfahrenssollwerten und Nennschlaglänge

Mit dem Einsatz der DOE-Technik mit der Nennschlaglänge als Ausgabe und einer 2x2 Matrize der Verfahrenssollwerte als Eingaben, könnte das Verhältnis zwischen den Sollwerten und dem Nennschlag festgelegt werden.

Die Hauptwirkungsdiagramme in Bild 7 zeigen, daß eine starke Beziehung zwischen dem Vordrallverhältnis und der Schlaglänge besteht. Das Verhältnis der Bogengeschwindigkeit ist nicht gleichfalls wichtig.

Interessant ist auch ein Zeichen der Interaktionswirkung der Bogengeschwindigkeit mit dem Vordrallverhältnis bei der Schlaglänge, wie im Interaktionsdiagramm im Bild 8 dargestellt.

Das bedeutet, daß die Weise in der die Schlaglänge vom Vordrallverhältnis beeinflusst ist, von dem abhängt, was für eine Einstellung für die Bogengeschwindigkeit ausgewählt wurde.

Dazu ist zu bemerken, daß die Anzahl der Änderungen bei der Schlaglänge, die durch das Verfahren-Vordrallverhältnis begründet wird, dennoch sehr gering ist. In der Regel sollte dies nicht als wichtig für die Nebensprechleistung betrachtet werden. Ohne Wiederholung der Prüfmatrize, kann die statistische Bedeutung dieser Änderung nicht festgelegt werden. Jedoch wird ein anfänglicher Hinweis geboten, daß es in diesem Verhältnis Ursachen und Wirkungen geben könnte.

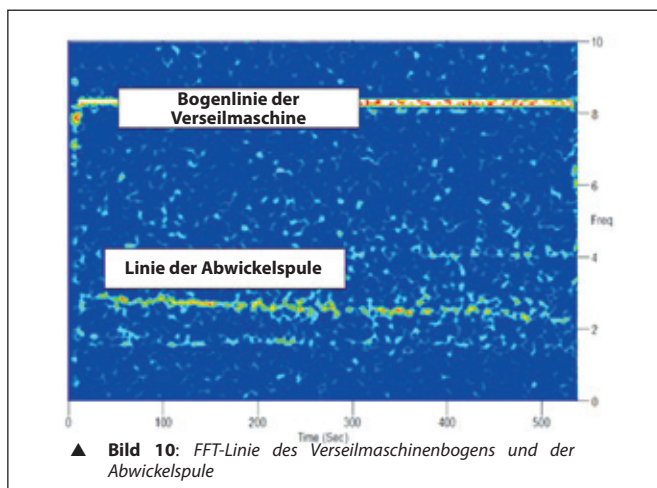
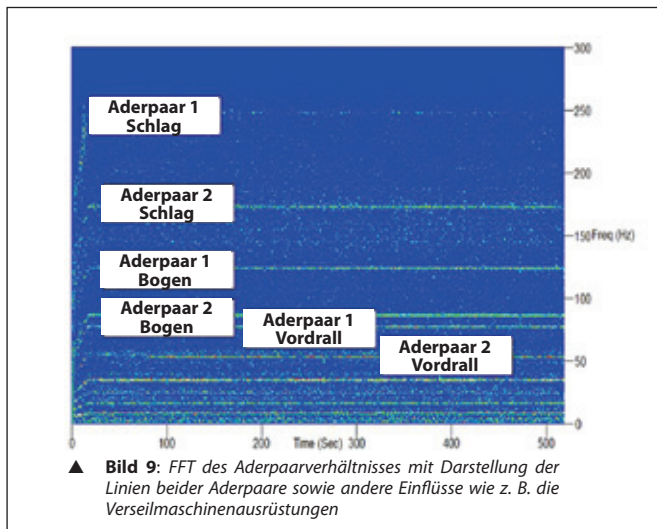
2.2 Aderpaarschläge in Verseilungsstudien

Die Erweiterung der Experimentation der Aderpaarschläge im Verseilverfahren war erforderlich, um unseren ersten Befund der einzelnen Aderpaare zu bestätigen und die Schläge von zumindest zwei einzelnen Aderpaaren zu messen, die gleichzeitig ins Verseilverfahren laufen.

Mit Einsatz der im Abschnitt 2.1.2 beschriebenen Verfahrenssollwerte, wurde eine einfache 2x2 Prüfmatrize eingestellt, um die Linien der verschiedenen Aderpaare in den ausgewählten Sollwerten des Vordrallverhältnisses und der Bogengeschwindigkeit zu vergleichen.

Nur zwei der Aderpaare im Kabel wurden der 2x2 Prüfmatrize ausgesetzt, während die restlichen zwei Aderpaare unter konstanten Verfahrenseinstellungen als Kontrollpunkte liefen. Die Wechselwirkung beim Nebensprechen der zwei analysierten Aderpaare war der grundlegende interessante Punkt, obwohl auch die Wechselwirkungen mit den geprüften Aderpaaren gemessen wurden.

Die Messungen beim Nahnebensprechen (Near End Crosstalk - NEXT) wurden schnell auf eine Frequenz von 1,2 GHz gebracht.



2.2.1 FFT von einzelnen Aderpaarschlägen bei der Verseilung

Die Grundform der FFT-Diagramme stimmt mit den festgestellten Ergebnissen der Umspulanlage überein, was ebenfalls im Abschnitt 2.1.3 beschrieben ist.

In diesem Fall, wird die FFT im Verhältnis von zwei bei der Verseilung gemessenen Aderpaaren durchgeführt.

Das FFT-Diagramm in *Bild 9* stellt die Linien von beiden Aderpaaren in einem einzigen Diagramm dar. Die zuvor genannten FFT-Komponente sind für die Primärschläge, die Bogengeschwindigkeiten der Verseilmaschine und den Vordrallverhältnisse in beiden Aderpaaren ersichtlich.

Bei niedrigeren Frequenzen sind auch andere interessante Linien vorhanden. Die Meßausrüstung ist auch gegenüber den mechanischen Änderungen in der Fertigungs-ausrüstung empfindlich.

Bild 10 zeigt einen starken Bestandteil, der sich auf den Bogen der Verseilmaschine bezieht. Sichtbar ist auch eine geneigte Linie, die als mit der Drehung der Aufwickelspule in der Verseilmaschine verbunden gilt.

Die Neigung hängt von der Steigerung des Kerndurchmessers in der Aufwickelspule während des Laufs ab, die die Spulendrehgeschwindigkeit senkt.

Die Bogengeschwindigkeit der Verseilmaschine ist ein besonders starkes und stabiles Signal, das eine Messung der Wirkung des Verseilmaschinebogens bei einer kurzzeitigen Verseilgeschwindigkeit darstellt.

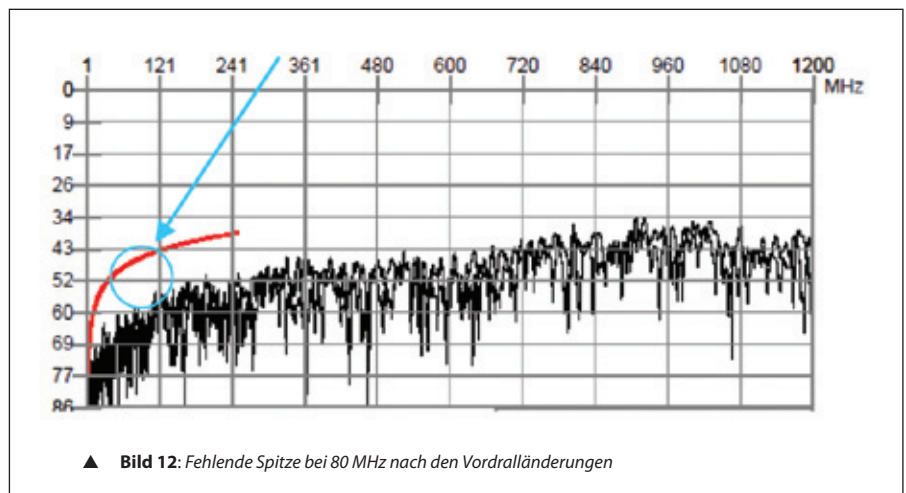
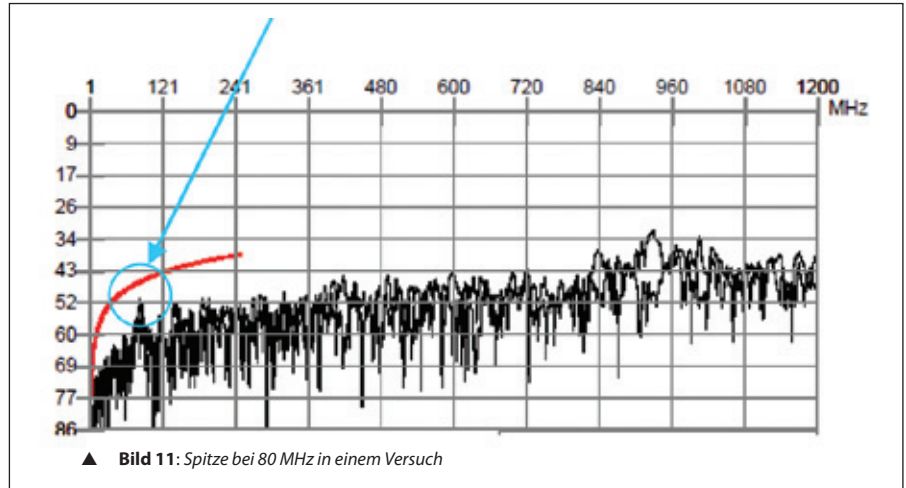
Aus der Sicht des Umfangs der von der Verseilmaschine verursachten Änderung, zeigten die in die Verseilmaschine einlaufenden Aderpaare eine 8%ige Spitze-Spitze-Änderung bei der Ist-Geschwindigkeit.

Wahrscheinlich wird ein Großteil dieser Geschwindigkeitsänderung durch die kurzzeitige Spannung und Entspannung des Aderpaars ausgeglichen.

2.2.2 NEXT-Rückmeldung für verschiedene Verfahrenssollwerte

Wie im Abschnitt 2.1.4 erwähnt, kann ohne Wiederholung die tatsächliche statistische Bedeutung der Leistung nicht festgelegt werden.

Dennoch wurden wiederholt Muster von der Probe entnommen, um die nachfolgend angegebenen qualitativen Ergebnisse für gültig zu erklären.



Eindeutige Unterschiede sind in einigen Sollwerten ersichtlich, hauptsächlich in der Form von Spitzen in den NEXT-Diagrammen. In einer Kombination des Vordrallverhältnisses und der Bogengeschwindigkeit erscheint eine offensichtliche Spitze im NEXT-Diagramm bei 80 MHz. Durch die ledigliche Änderung des Vordrallverhältnisses für beide Aderpaare, wird diese Spitze reduziert oder beseitigt.

In der gegenüberliegenden Einstellung der Bogengeschwindigkeit, hat die Änderung im Vordrallverhältnis eine ähnliche Wirkung auf die Spitze, die bei zirka 125 MHz ersichtlich ist.

3 Schlussfolgerung

Diese Studie hat zu zahlreichen wichtigen Ergebnissen geführt.

Es wurde bewiesen, daß die in dieser Studie eingesetzte Hochgeschwindigkeits-Meßtechnik eine präzise und wiederholbare Methode für die Messung des Schlaglängenwerts paarverseilter Aderpaare bietet.

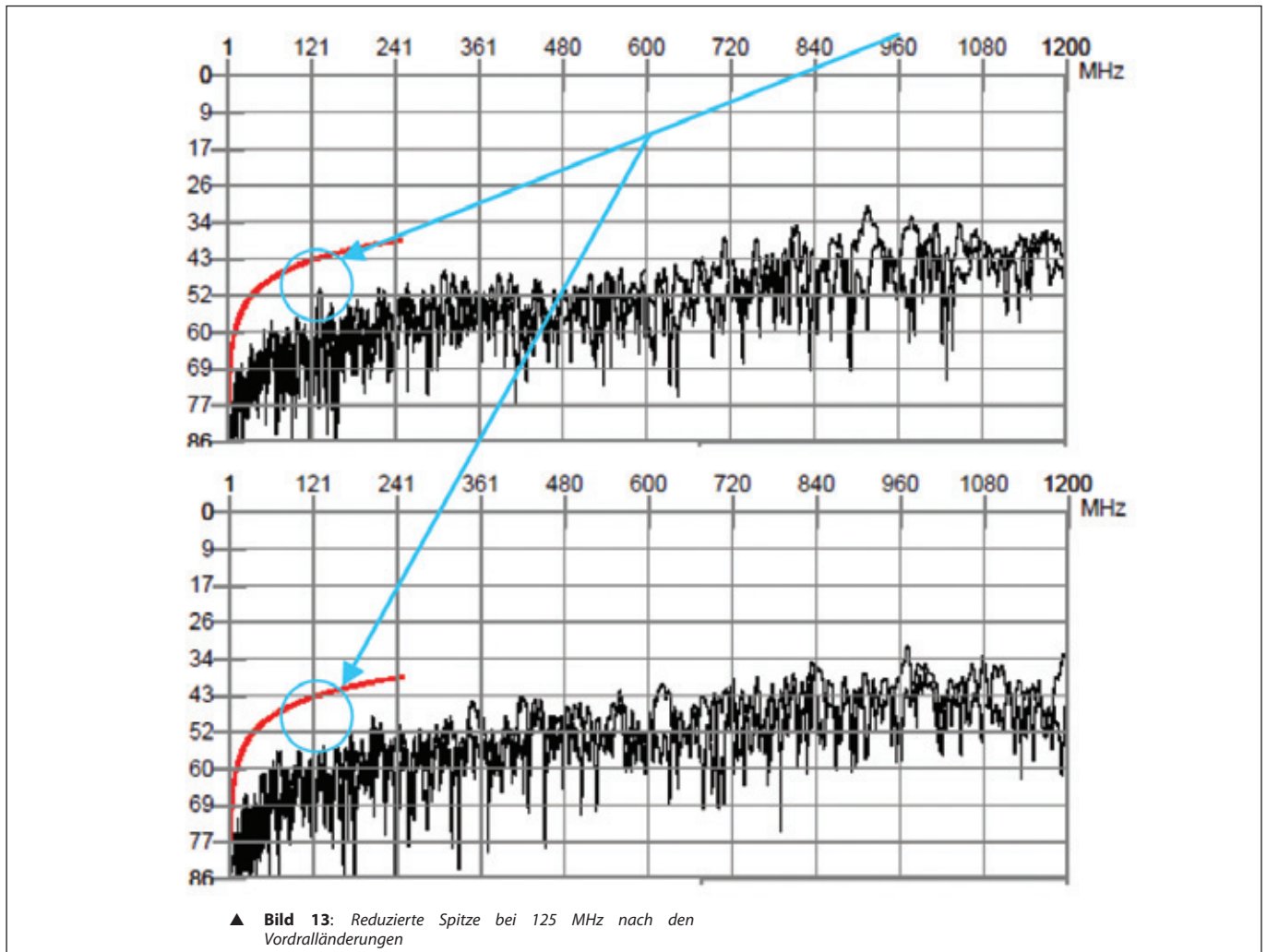
Der Einsatz dieser Technik über lange Längen, samt Echtzeit-Datenerfassung der Geschwindigkeit der Aderpaare, bietet einen Einblick, durch die FFT-Analyse, in die Stabilität des Paarverseilverfahrens und die Modelle innerhalb dieses Verfahrens.

Die Linien der Schlagänderung sind vorwiegend bei der grundlegenden Aderpaar-Schlaglänge, der Bogengeschwindigkeiten der Verseilmaschine und der Vordrallgeschwindigkeit ersichtlich.

Die Werte der Nennschlaglänge werden von den Änderungen in den Verfahrenssollwerten beeinflusst, insbesondere dem Vordrallverhältnis und dessen Wechselwirkung mit der Bogengeschwindigkeit.

Quantitativ betrachtet sind diese Änderungen relativ gering. Jedoch scheint es, daß ein Zusammenhang zwischen Eingaben und Schlaglängen besteht, für deren statistische Bedeutung jedoch eine weitere Validierung erforderlich wäre.

Einen zusätzlichen und potentiell größeren Einfluß gegenüber der Nennschlaglänge ist unter den Maschinentypen ersichtlich.



Die darauf folgenden Verfahren können die Änderungslinien erhöhen oder einen Einfluß darauf haben.

Dies war bei der Messung der Aderpaare bei der Verseilung offensichtlich. Es zeigten sich zusätzliche Linien für die Bogengeschwindigkeit der Verseilmaschine und den Durchmesser der Abwickelspule.

Schließlich, und am allerwichtigsten, die Nebensprechleistung ist wesentlich von den Verfahrensänderungen in diesen Versuchen beeinflusst. Um den Beitrag von jedem Faktor zu prüfen, sind Untersuchungen bei den Änderungen der Schlaglängenwerte sowie den Abweichungen in der Änderungslinie erforderlich.

Es ist plausibel anzunehmen, daß andere Verfahrenseingaben vorhanden sind, die einen Einfluß auf die Schlagänderung haben könnten, da weitere unerklärte Linien sowohl bei der Paarverseilung wie bei der Verseilung vorhanden sind.

Deren Einfluß auf die Nebensprechleistung würde weitere Untersuchungen erfordern. ■

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Пополнение в производственной линейке

Швейцарская компания «Цумбах электроникс» (Zumbach Electronic) представила последнюю новинку в линейке контрольно-измерительных приборов Steelmaster.

По сравнению с другими приборами новая производственная линейка SMR предлагает инновационные решения и существенные преимущества с точки зрения скорости и точности регистрации размеров в продольном и радиальном направлениях.

Приборы серии SMR вращаются с постоянной скоростью 100 об/мин. Лазерные головки ODAC® в количестве до 3 штук выполняют 2000 измерений в секунду каждая, при этом обеспечивается полная синхронизация. В результате генерируется до 10 полных профилей в секунду, то есть с большей скоростью, чем при использовании других приборов.

Кроме того, приборы серии SMR могут работать в статическом, ориентируемом режиме, выполняя 2000 относительных



▲ Изделие новой серии SMR производства компании «Цумбах»

измерений диаметра и габаритов в секунду в каждом направлении (при скорости 100 м/с это означает, что серия измерений выполняется через каждые 50 мм)

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Компания «Эллайд» набирает новых сотрудников

Компания «Эллайд уайр энд кейбл» (Allied Wire and Cable) продолжает свое развитие, взяв на работу в трех своих отделениях на территории США новых консультантов по работе с корпоративными клиентами. Расширив штат консультантов в каждом отделении, «Эллайд» может теперь предоставлять услуги на качественно новом уровне.

Пол Лорук (Paul Lawruk) – последний из вновь принятых консультантов по работе с корпоративными клиентами, получивший должность в головном офисе «Эллайд» в Пенсильвании. Лорук начал свою карьеру в проволочно-кабельной промышленности в компании «Омни кейбл» (Omni Cable), где он занимал должность менеджера по работе с корпоративными клиентами. Во время своей работы в компании он познакомился с «Эллайд уайр энд кейбл» и лично убедился в том высоком уровне обслуживания клиентов, которым славится «Эллайд». Теперь Лорук будет работать в одной команде со специалистами из компании «Эллайд».

Кристи Вентура (Kristy Ventura) радушно встретили в новом отделении компании «Эллайд» в Лас-Вегасе. Г-жа Вентура имеет большой профессиональный опыт в отрасли и ранее работала в компаниях «Анакапа микро продактс» (Anacapa Micro Products), «Ар-энд-би уэлдинг» (R&B Welding) и «Грейнджер» (Grainger).

Райан Балдинелли (Ryan Baldinelli) стал последним приобретением в штатном расписании отделения «Эллайд» в Новой Англии и в проволочно-кабельной отрасли в целом. В 2011 году он закончил Государственный колледж в Каслтоне (шт. Вермонт), где изучал коммерцию и маркетинг. Будучи молодым специалистом, свою новую должность он, тем не менее, занимает, исполненный энтузиазма.

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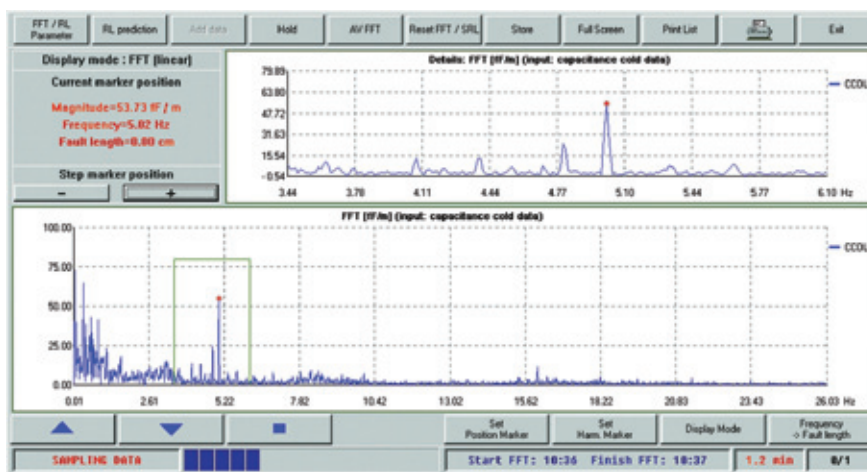
Сараситансе 2000 гарантирует передачу данных без потерь

Для всех кабелей локальных сетей передачи данных, коаксиальных, телефонных или радиочастотных кабелей главной характеристикой качества является способность без потерь передавать высокочастотные аналоговые или цифровые сигналы. В этом контексте важную роль играет возможность измерения электрической емкости. Электрическая емкость существенным образом влияет на величину сопротивления кабеля в установленном диапазоне частот и, следовательно, на качество кабельного изделия.

Сараситансе 2000 представляет собой измерительный прибор, который устанавливается в охлаждающем желобе и выполняет точное измерение электрической емкости изоляции проводов. Одновременно устройство определяет изменения электрической емкости, исключительно быстро уточняет данные измерений и обнаруживает неизолированные провода.

Представленная технология реализована путем комбинированного использования одного короткого и двух удлиненных измерительных электродов, интегрированных в измерительной трубке. Короткий 10-мм измерительный электрод позволяет определить периодические изменения электрической емкости посредством быстрого преобразования Фурье (БПФ) с высоким пространственным разрешением.

По результатам БПФ определяются структурные возвратные потери (СВП) и генерируются данные об ожидаемом затухании радиочастотного сигнала при передаче данных. В удлиненной зоне измерений производится прецизионное определение среднего значения электрической емкости. Недопущение периодического изменения емкости кабеля является непременным условием для обеспечения оптимальных параметров затухания.



▲ Прибор Сараситансе 2000 измеряет электрическую емкость и определяет периодические изменения ее значений посредством быстрого преобразования Фурье (БПФ)

Определение периодического изменения емкости производится за счет используемой в приборе Сараситансе 2000 многозонной технологии, поскольку все параметры, которые влияют на качество изделия (например, диаметр проводника, изоляции из вспененного диэлектрика, наружный диаметр), проявляются

в характеристиках электрической емкости. Точность измерений составляет 0,1 пФ/м.

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«Эвоник» покоряет стандарт

«Эй-пи-ти Юроп ГмбХ» (APT Europe GmbH), дочернее предприятие компании «Эвоник индастриз» (Evonik Industries), успешно прошло сертификацию по стандарту EN ISO 13485:2003. Этот международный стандарт определяет требования к системам управления качеством для производителей медицинских изделий и их поставщиков. По сравнению с ISO 9001 стандарт ISO 13485 уделяет особое внимание вопросам обеспечения стабильности качества продукции, регулирования всех соответствующих технологических процессов и их контроля, а также ведения документации и прослеживаемости продукции. Производители медицинских изделий должны обеспечивать соблюдение требований стандарта EN ISO 13485 со стороны их поставщиков. Сертификация упрощает для заказчиков Vestakeep® процесс обязательной аттестации поставщиков.

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Быстродействующие лазерные датчики для измерения шага скрутки и выполнения анализа на основе БПФ при оценке устойчивости технологического процесса

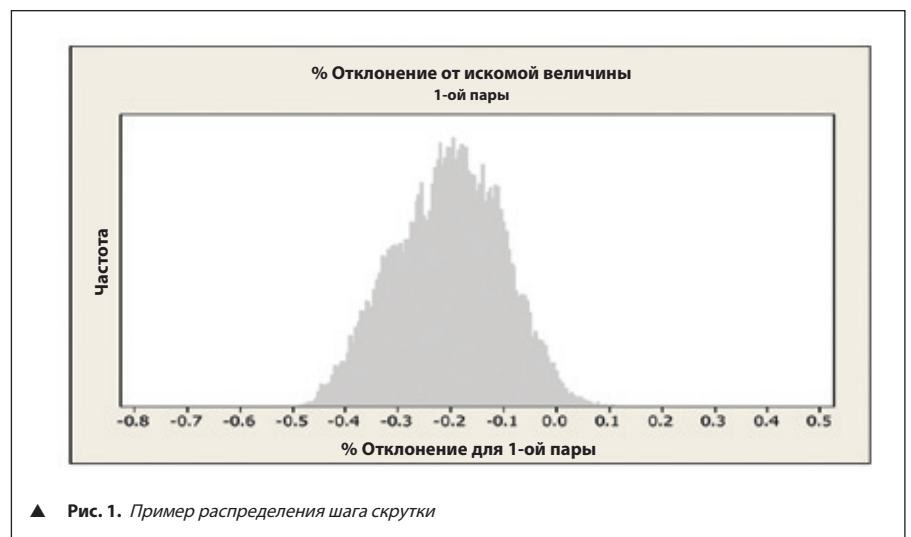
Стивен Пирсон, компания «Тайко электроникс» (г. Гринсборо), и Кеннет И. Корнелисон, компания «Бета лэйзермак» (г. Дейтон)

Аннотация

В настоящей работе авторы описывают результаты исследований по оценке устойчивости к перекрестным помехам кабелей для систем передачи данных 5-ой и более высоких категорий. В частности, была предложена новая технология, которая позволяет проводить точные измерения повивов пар. Кроме того, данная технология обеспечивает получение данных об изменениях характеристик повива по длине пары. В настоящей работе авторы дают представление о том, как шаг скрутки пары, а также стабильность повива влияют на устойчивость к перекрестным помехам. В отличие от конструктивных решений, в которых изменение шага скрутки вызывается специально, обнаруженные и описанные здесь результирующие факторы возникают в ходе механической обработки на оборудовании для парной скрутки жил и общей скрутки пар. Авторы продемонстрировали, что за счет изменения уставок оборудования, исключая параметры собственно укладки повивов, меняется устойчивость к перекрестным помехам готового кабельного изделия соответствующей категории. Указанные изменения эксплуатационных характеристик также сопровождаются изменением значений кратности шага скрутки даже при одинаковых заданных значениях шага скрутки, выставленных на оборудовании.

1. Введение

Отраслевым специалистам хорошо известно, что устойчивость к



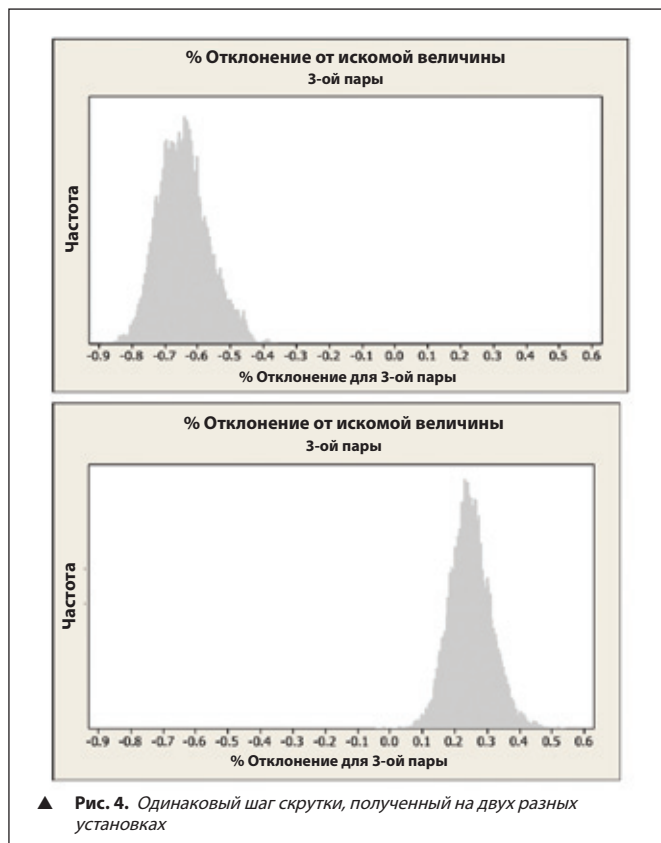
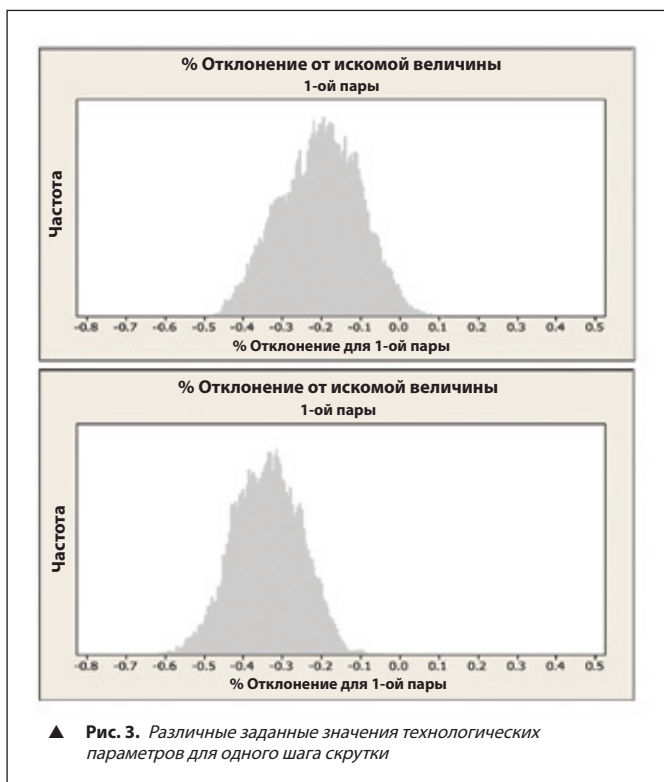
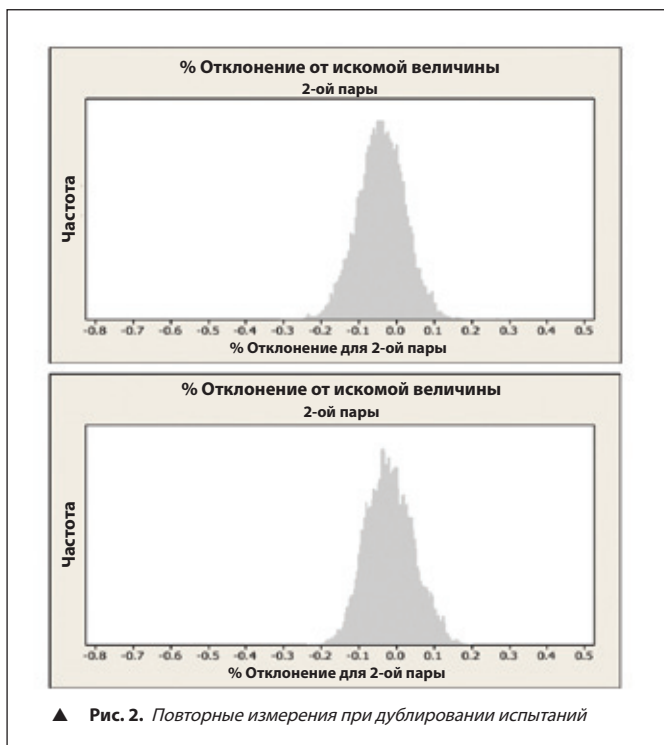
перекрестным помехам являются основным параметром для кабелей с высокими эксплуатационными характеристиками. Во многих случаях производители гарантируют устойчивость к перекрестным помехам на более высоком уровне, нежели отраслевые стандарты. Столь высокие эксплуатационные характеристики требуют использования кабельных конструкций со сплошной жилой и стабильных производственных технологий. Известно также, что даже при использовании конструкций со сплошной жилой избыточно высокий уровень изменений параметров технологического процесса приведет к снижению устойчивости к перекрестным помехам. В случае неполадок отдельного оборудования или нарушения технологических параметров могут немедленно произойти изменения в

эксплуатационных характеристиках готовой продукции. Характеристики могут также меняться не сразу, а в течение нескольких дней или недель, чему нередко способствует постепенное изменение эксплуатационных показателей производственного оборудования.

Нередко для сокращения количества случаев, связанных с ухудшением эксплуатационных характеристик, проводится планово-предупредительное обслуживание оборудования, однако эффективность такого обслуживания с точки зрения возможности контролирования параметров шага скрутки пока в достаточной мере не изучена.

Другим ключевым фактором, влияющим на устойчивость к перекрестным

помехам, является постоянство шага скрутки на разных станках. Как известно или, по крайней мере, как ранее предполагалось, шаг скрутки может меняться от станка к станку. Зачастую управление эксплуатацией различных станков на производстве осложняется отсутствием надлежащей обратной связи, позволяющей получить данные о фактических параметрах повива пар. Кроме того, это может стать существенным препятствием при производственном планировании, поскольку для выпуска отдельных видов продукции нередко



может использоваться только определенное, «аттестованное» оборудование. Новая технология измерения шага скрутки разработана для обеспечения высокоскоростного сбора данных о его параметрах. Благодаря этой технологии можно производить точные измерения шага скрутки на разных станках. Данная информация может быть полезна в различных ситуациях. Например, каждый станок на производственном участке может быть затем отрегулирован для работы под одну требуемую величину скрутки.

Отклонение от номинальной величины скрутки также является важным фактором, который способствует возникновению перекрестных помех в готовом кабельном изделии. Авторы демонстрируют, что при анализе изменений кратности шага скрутки пар весьма очевидно влияние таких факторов, как вращение дуги парной скрутки, а также коэффициент предварительной парной скрутки отдельных проводов. В некоторых случаях в параметрах повива пар может отмечаться даже влияние изменений, обусловленных вращением отдающей и приемной бобин.

2. Экспериментальные исследования

Настоящая работа является результатом совместных усилий, предпринятых компаниями «Бета лэйзермайк» и «Тайко электроникс» с целью более полного понимания методики измерений и корреляции между измеренными значениями и эксплуатационными характеристиками готовых кабельных изделий. Для создания представления об измерительных возможностях были проведены предварительные испытания отдельных пар. После получения информации о параметрах повива пар были собраны данные на линии общей скрутки с одновременной регистрацией параметров по нескольким парам.

Используемая технология измерений предусматривает высокую скорость регистрации результатов, что обеспечивает считывание данных с периодичностью в несколько замеров на один шаг скрутки. Столь высокая скорость регистрации результатов позволяет проводить последующую обработку данных, например, анализ на основе быстрого преобразования Фурье (БПФ), анализ тенденции изменения и статистическую оценку.

2.1 Изучение параметров повива пар

Предварительные испытания проводились по схеме, позволяющей измерить параметры повива пар, используемые на перемоточной линии.

Данная схема обеспечила более простую настройку и позволила произвести измерение параметров повива на нескольких машинах скрутки пар. Были проведены аналитические и экспериментальные исследования с целью оценки эксплуатационных характеристик измерительного оборудования, а также выявленных различий между заданными значениями по повивам на разном технологическом оборудовании.

2.1.1 Номинальная величина скрутки отдельных пар

Пример распределения измеренных значений параметров повива пар приведен на рис. 1. Данные представлены в форме гистограммы с функцией плотности вероятности, которая отображает распределение данных о параметрах шага скрутки на отрезке образца витой пары. Масштаб оси абсцисс определен в виде процентного отклонения от искомой величины для нормирования величины изменения и среднего значения по всем контрольным параметрам, рассматриваемым в настоящем исследовании.

Измеренные итоговые значения шага скрутки лежат в довольно узком интервале. Величина отклонения составляет порядка 1 % или меньше, при этом способ распределения можно определить с несколько большей точностью.

2.1.2 Измерения параметров отдельных пар

В одном эксперименте машина одинарной скрутки пар была настроена на несколько заданных значений технологических параметров, однако уставка шага скрутки была оставлена без изменений. Выполнено несколько витых пар, при этом повтор двух следующих подряд одинаковых заданных значений не допускался, а выборки были продублированы. На рис. 2 представлены сравнительные

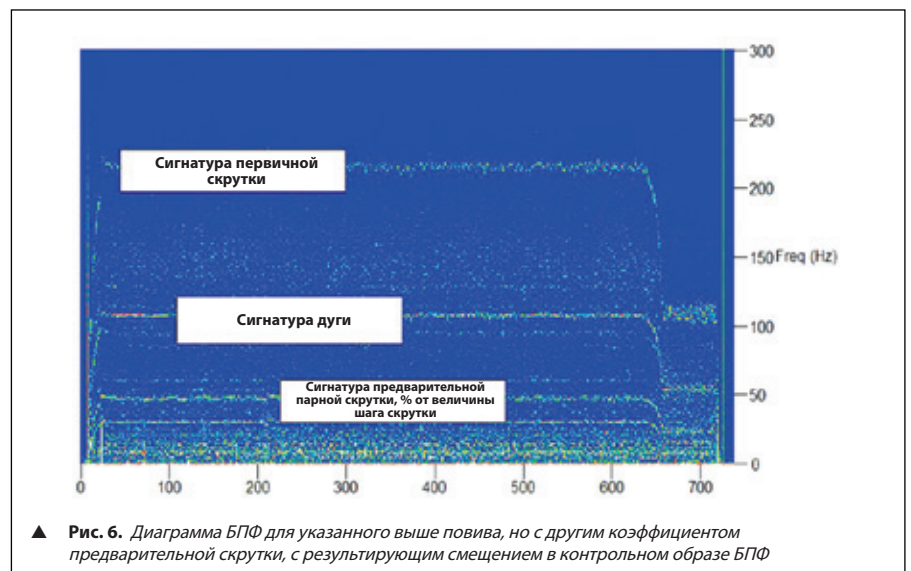
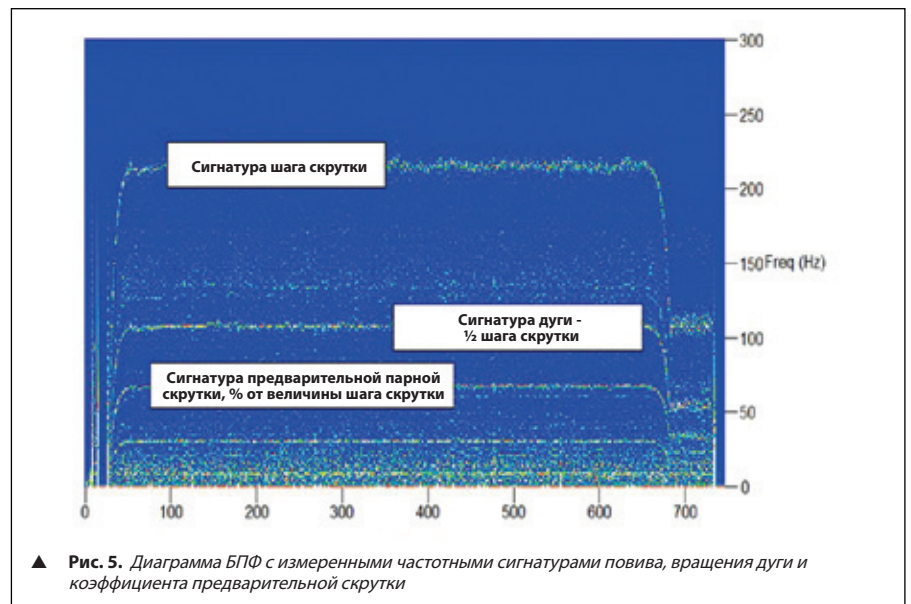
результаты двух замеров одинаковых заданных значений параметров скрутки, проведенных в разное время на одной машине скрутки пар при сохранении всех других уставок оборудования идентичными.

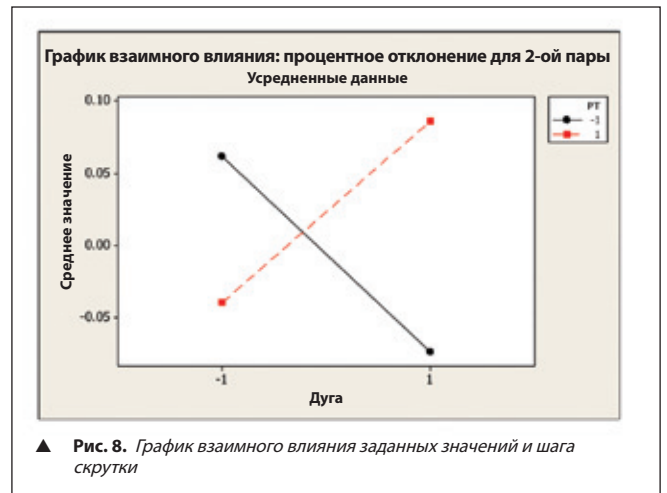
Представленные результаты указывают на высокую степень воспроизводимости как параметров машин скрутки пар, так и методов и средств измерения при выполнении замеров на витых парах, выполненных на одной и той же машине скрутки пар с одинаковыми заданными значениями параметров скрутки и при одинаковом режиме технологического процесса.

В другом эксперименте технологические уставки на одной машине скрутки пар были изменены, однако заданное значение параметров скрутки было оставлено постоянным. В данном случае были внесены изменения в значения

коэффициента предварительной скрутки и частоты вращения дуги машин скрутки пар. На рис. 3 четко видны различия в выполненном повиве, обусловленные заданными значениями технологических параметров. При стандартно используемом ручном или визуальном способе измерений выявить столь малые изменения было бы весьма сложно.

В еще одном эксперименте на двух машинах скрутки пар были выставлены одинаковые заданные значения параметров скрутки, и на парах, выполненных на каждой машине, были проведены измерения. На рис. 4 представлен пример результатов этого эксперимента, и показано изменение номинальной величины в зависимости от машины. В ряде других случаев на гистограмме были отчетливо видны изменения порядка одного или двух миллиметров.





2.1.3 Анализ параметров повивов отдельных пар на основе БПФ

Способность оборудования проводить замеры с высокой скоростью передачи данных позволяет отмечать изменения параметров скрутки почти на каждом ее шаге. Удивительным результатом стало то, что в дополнение к сигнатуре шага первичной скрутки был также зафиксирован ряд других вариационных сигнатур.

Одним из способов фиксации частотных сигнатур по времени и отображения результатов в доступном для понимания формате является каскадный анализ. Например, каскадные индикаторы широко используются для измерения и устранения структурных возвратных помех на линиях первичного экструдирования. В целях настоящего анализа авторы также использовали средства каскадного анализа для более точной регистрации изменений параметров повива пары по всей длине кабеля на бобине. На рис. 5 представлен пример каскадной диаграммы БПФ, по горизонтальной оси которой отложено время, по вертикальной оси – частота, а по оси аппликат – компенсация паразитных наводок. Чем светлее изображение по оси аппликат, тем более выражена частотная сигнатура.

В результате предполагалось получить частотную сигнатуру по шагу первичной скрутки. Результат превзошел ожидания: на каскадной диаграмме БПФ было обнаружено дополнительное сигнатурное наполнение. Сигнатура отчетливо видна как при вращении дуги машины скрутки пар (шаг скрутки: 2D, при половинной частоте), так и при предварительном кручении (при отклонении от установленного коэффициента предварительной скрутки) жил перед скруткой пар. На каскадной диаграмме БПФ также обнаружен ряд других непредвиденных сигнатур, которые указывают на

дополнительные механические особенности производственного оборудования.

На рис. 6 показаны различия в контрольном образе БПФ при изменении коэффициента предварительной скрутки. На этой диаграмме сигнатуры шага первичной скрутки и частоты вращения дуги идентичны представленным на рис. 5. Однако сигнатура коэффициента предварительной парной скрутки имеет смещение, которое соответствует изменениям заданных значений на машине скрутки пар.

2.1.4 Зависимость между заданными значениями технологических параметров и номинальным шагом скрутки

Использование методов планирования эксперимента (DOE), где номинальный шаг скрутки служит выходной величиной, а матрица 2x2 для заданных значений технологических параметров дает входные параметры, могло бы позволить определить зависимость между уставками и номинальной величиной скрутки.

Графики главных эффектов на рис. 7 свидетельствуют о том, что существует сильная зависимость между значением коэффициента предварительной скрутки и величиной шага скрутки. Зависимость от частоты вращения дуги не столь сильно выражена.

Примечательно, что отмечаются также признаки эффекта взаимного влияния частоты вращения дуги и коэффициента предварительной скрутки, сказывающегося на величине шага скрутки (см. график взаимного влияния, представленный на рис. 8).

Это означает, что то, в какой мере на шаг скрутки влияет коэффициент предварительной скрутки, зависит от

выбранной заданной величины частоты вращения дуги.

Следует отметить, что величина изменения шага скрутки, обусловленного установленным в соответствии с технологическими требованиями коэффициентом предварительной скрутки, тем не менее, весьма мала.

По идее, применительно к устойчивости к перекрестным помехам это могло бы не считаться существенным фактором. Без дублирования матрицы испытаний статистическую значимость указанного изменения определить нельзя. Однако это все же дает первичное указание на то, что данная зависимость может в определенной степени носить причинно-следственный характер.

2.2 Повивы пар при изучении параметров общей скрутки кабеля

Перенос экспериментальных работ с повивами пар на технологическую операцию общей скрутки кабеля был необходим для подтверждения предыдущих результатов, полученных по отдельным парам, и одновременно для проведения замеров параметров повивов, как минимум, двух отдельных пар, которые подавались на общую скрутку кабеля. С помощью заданных значений технологических параметров, описанных в пункте 2.1.2, простая матрица испытаний 2x2 была подготовлена для проведения сравнительного анализа сигнатур различных пар при выбранных заданных значениях коэффициента предварительной скрутки и частоты вращения дуги. Только две пары в кабеле анализировались с использованием матрицы испытаний 2x2, тогда как работа с остальными двумя парами проводилась при постоянных заданных значениях технологических параметров, взятых в качестве контрольных точек. Интерес представляло прежде всего взаимовлияние двух исследуемых пар

по перекрестным помехам, однако были также выполнены замеры взаимовлияния с контрольными парами.

Измерения уровня перекрестных помех на ближнем конце (NEXT) проводились до частоты 1,2 ГГц.

2.2.1 Анализ параметров повивов отдельных пар на основе БПФ при общей скрутке кабеля

Базисная форма диаграмм БПФ соответствовала результатам, полученным на перемоточном устройстве и также описанным в пункте 2.1.3. В данном случае анализ на основе БПФ выполняется по коэффициенту скрутки двух пар, измеренному при общей скрутке кабеля.

На диаграмме БПФ, представленной на рис. 9, одновременно видны сигнатуры обеих пар. Также для обеих пар можно наблюдать ранее рассмотренные компоненты БПФ по первичной скрутке, частоте вращения дуги машины скрутки пар и коэффициенту предварительной скрутки.

Однако при более низких частотах присутствуют и другие сигнатуры, которые представляют интерес. Измерительная аппаратура также чувствительна к изменениям механических характеристик производственного оборудования. На рис. 10 отчетливо выражена компонента, связанная с дугой крутильной машины. Заметна также наклонная сигнатура, которая, как считается, связана с вращением намоточного барабана крутильной машины. Наклон обусловлен увеличением диаметра бочки намоточного барабана в процессе работы, в результате чего скорость вращения бобины снижается.

Частота вращения дуги крутильной машины характеризуется чрезвычайно сильным и постоянным сигналом, который определяет степень влияния на дугу крутильной машины по кратковременной скорости общей скрутки кабеля. С целью оценки величины изменений, вызванных работой крутильной машины для пар, подаваемых на крутильную машину, диапазон пиковых колебаний значений мгновенной скорости был установлен на уровне 8 %. Вероятно, что указанные изменения скорости по большей части гасятся кратковременным растяжением витой пары и снятием напряжений в структуре ее материала.

2.2.2 Уровень переходных помех на ближнем конце (NEXT) при различных заданных значениях технологических параметров

Как указано в пункте 2.1.4, без проведения дублей (повторных испытаний) фактическая статистическая значимость эксплуатационных характеристик не может быть определена. Однако для оценки указанных ниже количественных результатов испытаний был произведен повторный отбор выборок.

В ряде заданных значений наблюдаются четкие различия, причем преимущественно в форме всплесков, присутствующих на графиках NEXT. При одной комбинации значений коэффициента предварительной скрутки и частоты вращения дуги на диаграмме NEXT при 80 МГц возникает заметный всплеск. За счет изменения только значения коэффициента предварительной скрутки для обеих пар этот всплеск уменьшается или пропадает совсем. При другом заданном значении частоты вращения дуги изменение коэффициента предварительной скрутки аналогичным образом влияет на всплеск,

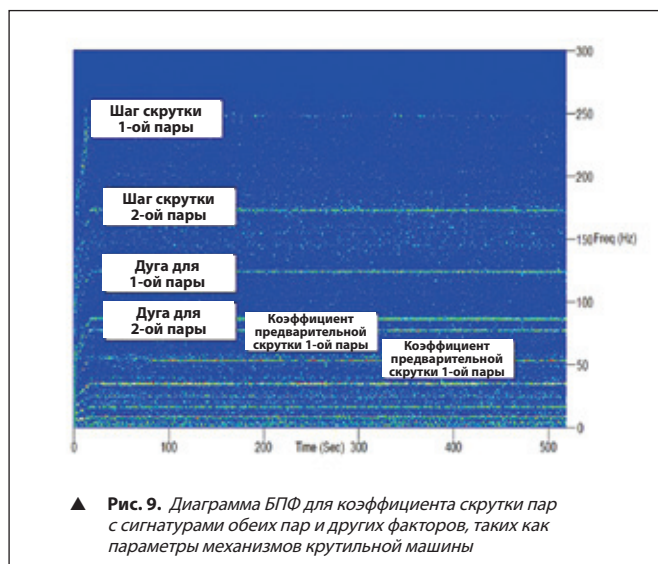
что можно видеть приблизительно при 125 МГц.

3. Заключение

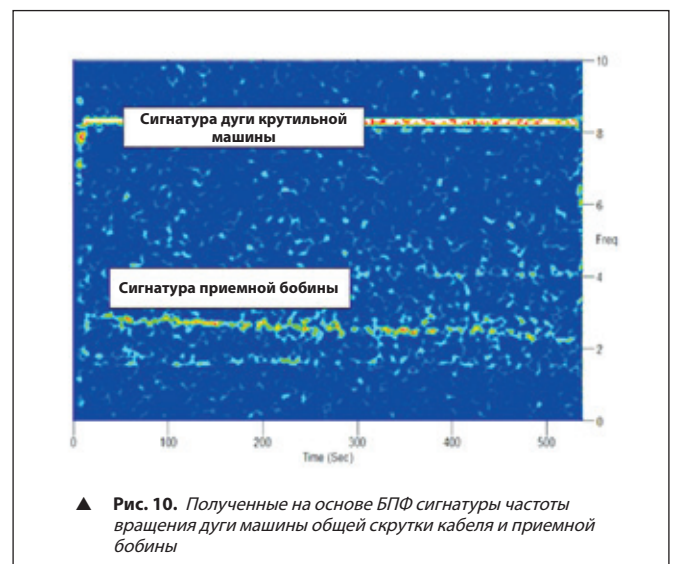
В рамках настоящего исследования был получен ряд важных результатов. Продемонстрировано, что высокоскоростная технология измерения, использовавшаяся в проведенном исследовании, обеспечивает точный и воспроизводимый метод определения величины кратности шага скрутки витых пар.

Использование этой метода на больших отрезках кабеля наряду со сбором данных о скорости скрутки пар в режиме реального времени дает посредством анализа на основе БПФ возможность понять вопросы обеспечения стабильности и особенности процесса скрутки пар. Вариационные сигнатуры скрутки можно обнаружить преимущественно применительно к шагу первичной скрутки пар, частоте вращения дуги машины скрутки пар и скорости предварительной парной скрутки.

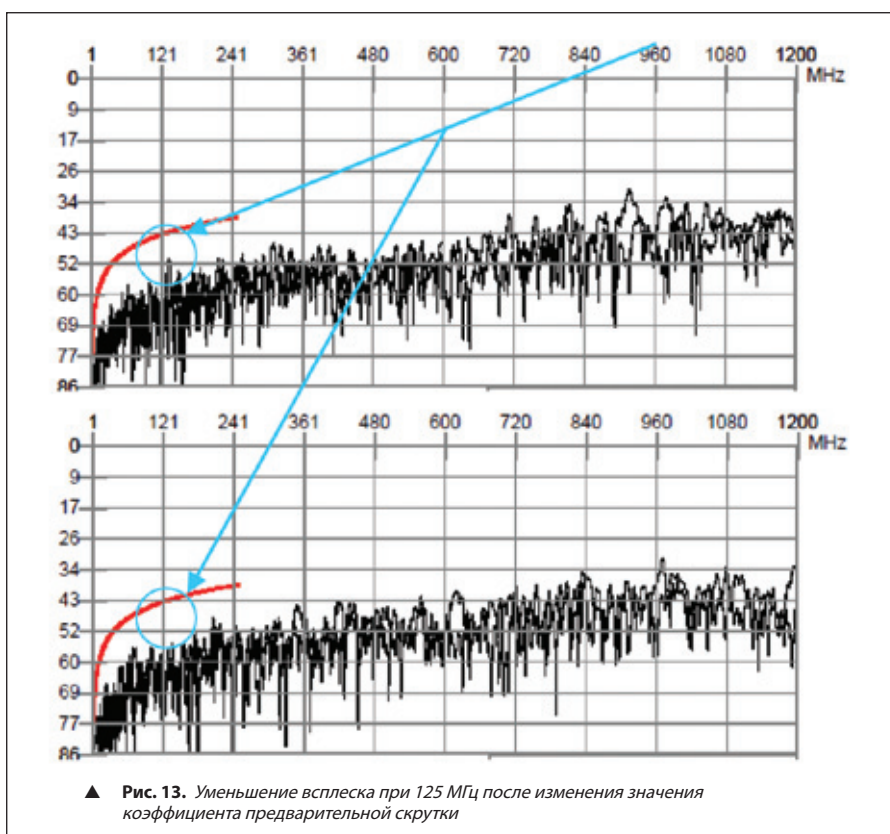
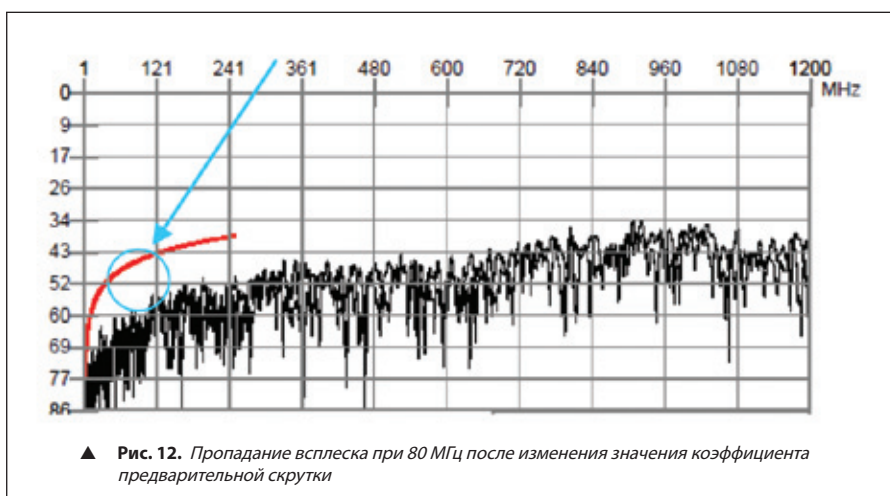
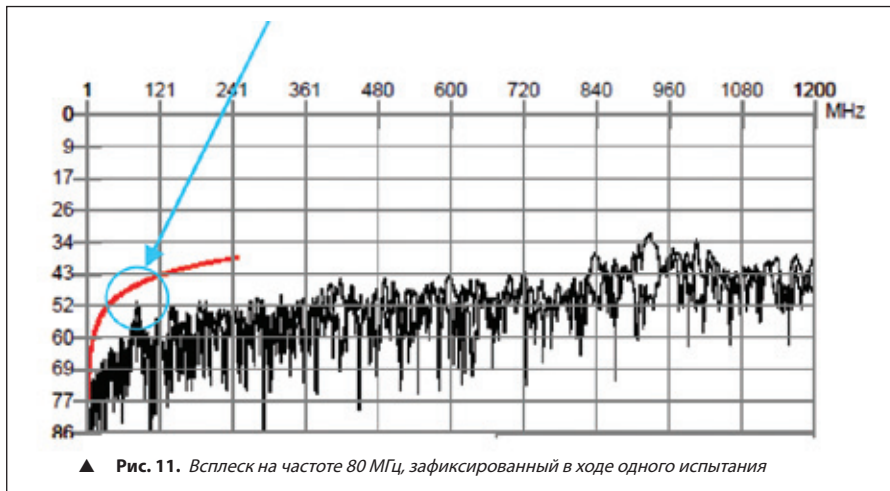
Номинальные значения кратности шага скрутки меняются в зависимости от изменения заданных значений технологических параметров, в частности, коэффициента предварительной скрутки и его сопряженности с частотой вращения дуги. В количественном выражении эти изменения относительно невелики. Однако, судя по всему, между входными параметрами и величиной шага скрутки существует зависимость, которая потребовала бы дополнительного подтверждения для обеспечения статистической значимости. Еще одним,



▲ Рис. 9. Диаграмма БПФ для коэффициента скрутки пар с сигнатурами обеих пар и других факторов, таких как параметры механизмов крутильной машины



▲ Рис. 10. Полученные на основе БПФ сигнатуры частоты вращения дуги машины общей скрутки кабеля и приемной бобины



причем потенциально более серьезным фактором, влияющим на номинальную величину шага скрутки, представляется разница характеристик отдельных типов станков.

Последующие технологические операции могут способствовать увеличению вариационных сигнатур или оказывать на них иное воздействие. Это стало очевидным при проведении замеров параметров пар в процессе общей скрутки кабеля. Появились дополнительные сигнатуры частоты вращения дуги крутильной машины и диаметра приемной бобины.

И наконец, самое главное: в проведенных экспериментах на устойчивость к перекрестным помехам в значительной мере влияют изменения технологических параметров. Для подтверждения степени влияния каждого фактора необходимо изучить изменения значений кратности шага скрутки, а также изменения в вариационных сигнатурах.

Разумно предположить, что существует ряд других входных технологических уставок, которые могли бы влиять на изменение параметров скрутки, поскольку как при парной скрутке жил, так и при общей скрутке кабеля наблюдаются дополнительные, ничем необъяснимые сигнатуры. Для определения степени их влияния на устойчивость к перекрестным помехам потребовалось бы провести дополнительные исследования. ■

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Zumbach lance un nouveau produit sur le marché

LA société suisse Zumbach Electronic présente le tout dernier produit de sa ligne de mesureurs Steelmaster.

La nouvelle ligne de produits SMR offre de nouveaux et importants avantages par rapport aux autres mesureurs en ce qui concerne la détection rapide et précise des dimensions en direction longitudinale et radiale.

Les mesureurs SMR sont caractérisés par une rotation continue à 100rpm. Ils sont équipés de 3 têtes laser ODAC®, entièrement synchronisés, qui effectuent 2 000 mesures par seconde chacune. Ce dispositif est conçu pour mesurer jusqu'à 10 profils complets par seconde, en résultant plus rapide par rapport à d'autres mesureurs.

En alternative, les mesureurs SMR peuvent fonctionner en mode statique, orientable avec la possibilité d'effectuer 2 000 mesures par seconde du diamètre ou d'autres dimensions dans chaque direction (à 100m/s cela entraîne une série de mesures tous les 50mm).

La conception mécanique est très simple et robuste; il n'y a aucune partie d'usure ni aucun anneau collecteur, ni freins,



▲ Nouveau mesureur SMR de Zumbach

etc. La transmission de puissance et de signaux vers et du laser a lieu sans aucun contact. Les mesureurs SMR n'exigent pas d'entretien.

Le logiciel Steelmaster présente les toutes dernières caractéristiques suivantes:

- Fonction EPM pour l'affichage de la section réelle, avec des déviations de

forme polygonale et asymétrique

- Fonctions spécifiques pour laminages à trois rouleaux
- Calcul des chutes de tête et de queue
- Écrans flexibles et personnalisés

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Nouveaux engagements pour Allied

Allied Wire and Cable continue à prospérer en embauchant de nouveaux conseillers pour ses trois filiales aux États-Unis. La présence de plusieurs représentants au sein de chaque filiale permet à Allied d'offrir un meilleur service à la clientèle par rapport au passé.

Paul Lawruk est le dernier responsable commercial du siège central de Allied en Pennsylvanie. Lawruk a commencé sa carrière dans le secteur du câble et du fil auprès de la société Omni Cables, où il a opéré en tant que directeur de la clientèle. Durant cette période il a familiarisé avec AWC et il a connu de première main l'excellent service offert aux clients pour lequel la société Allied est renommée. Actuellement Lawruk est impatient de collaborer côte à côte avec l'équipe de Allied.

La nouvelle filiale de Allied à Las Vegas donne la bienvenue à Kristy Ventura. Ventura se fait forte d'une vaste expérience dans le secteur industriel et de ses fonctions précédentes chez Anacapa Micro Products, R&B Welding and Grainger.

Enfin, Ryan Baldinelli, est le dernier achat de la filiale de Allied dans le New England, ainsi que du secteur du fil et du câble. Baldinelli, a obtenu sa maîtrise en 2011 au Castleton State College dans le Vermont, où il a étudié commerce et marketing et bien que débutant, il affronte sa nouvelle fonction avec un grand enthousiasme.

Allied Wire and Cable – États-Unis

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Website: www.awcwire.com

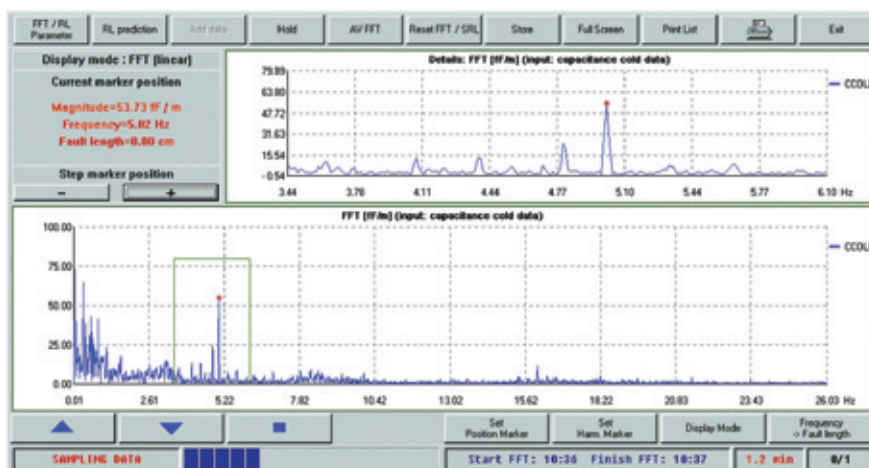
Capacitance 2000 garantit la transmission des données sans perte

LA transmission sans perte de signaux analogiques ou numériques, à haute fréquence, représente un facteur essentiel en termes de qualité pour tout type de câble LAN, coaxial, téléphonique ou RF. Dans ce contexte, la mesure de la capacité joue un rôle décisif. La capacité influence de façon significative l'impédance du câble dans la gamme de fréquences spécifiées, et donc la qualité du câble.

Installé dans la goulotte de refroidissement, Capacitance 2000 est un dispositif conçu pour mesurer avec précision la capacité de l'isolement du fil. Le système détermine en même temps les variations de la capacité, effectue la mise à jour des mesures à très haute vitesse et relève les fils nus.

Cette technologie est appliquée en associant une électrode de mesure court et deux longs qui sont incorporés dans un tube de mesure. L'électrode de mesure court de 10 mm de longueur relève les variations de capacité périodiques avec une résolution spatiale au moyen de l'analyse FFT (Transformée de Fourier Rapide).

En partant des données FFT on établit l'affaiblissement d'adaptation structurelle (Structural Return Loss ou SRL), qui



▲ Capacitance 2000 mesure la capacité et détermine les variations périodiques de capacité au moyen de l'analyse FFT (Transformée de Fourier Rapide)

fournit des informations concernant l'affaiblissement prévu du signal RF durant la transmission des données. Le champ des électrodes long calcule avec haute précision la valeur moyenne de la capacité.

L'élimination des variations périodiques du câble est une condition préalable pour obtenir un affaiblissement optimal alors que plus l'intervalle critique des périodes est court, plus la vitesse de transmission des données ciblée pour le câble est élevée.

Ces variations périodiques sont déterminées au moyen de la technologie multizones du mesureur Capacitance 2000 étant donné que la totalité des paramètres influençant la qualité (par exemple le diamètre des conducteurs, le mousage, le diamètre extérieur) se reflètent sur la capacité.

La précision est de 0,1 pF par mètre. Avec des vitesses de la ligne arrivant jusqu'à 2 400m/min et 1 300m/min l'on peut prévoir un affaiblissement d'adaptation structurelle respectivement de 3GHz et 8GHz. Cela permet de reproduire avec précision l'impédance du câble.

Evonik obtient la certification

APT Europe GmbH, filiale de Evonik Industries, a récemment reçu la certification EN ISO 13485:2003. Cette norme internationale définit les spécifications exigées par les systèmes de contrôle de la qualité utilisés par les fabricants et par les fournisseurs d'instruments médicaux. Par rapport à la norme ISO 9001, la norme ISO 13485 met l'accent sur la garantie d'une qualité constante et sur le contrôle de la totalité des processus correspondants ainsi que sur la documentation et la traçabilité.

Les fabricants d'instruments médicaux doivent garantir que les spécifications de la norme EN ISO 13485 sont respectées également par leurs fournisseurs. Cette certification simplifie la procédure de classification obligatoire requise aux fournisseurs pour les clients de Vestakeep®.

Evonik – Allemagne
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Website: www.evonik.com

Le relèvement des variations de capacité périodiques et la prévision des affaiblissements d'adaptation structurelle (FFT et SRL) sont des fonctions spécifiques disponibles directement dans le tube de mesure au moyen d'une interface diagnostique. Pour l'affichage des valeurs des mesures, Sikora offre des unités centrales Remote 2000 et Ecocontrol 600/1000/2000. Le graphique de l'analyse de FFT et la prévision SRL peuvent être affichés au moyen de l'Ecocontrol 1000 ou 2000.

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Mesureurs laser haute vitesse pour la mesure du pas de câblage et analyse FFT pour l'évaluation de la stabilité du processus

Par Stephen Pearson, Tyco Electronics, Greensboro, et Kenneth E Cornelison, Beta LaserMike, Dayton

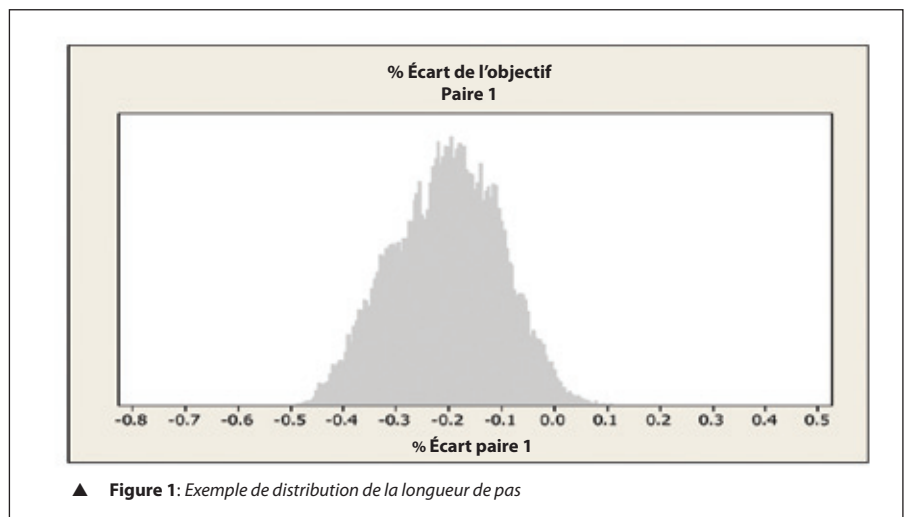
Résumé

Le présent article décrit le travail effectué pour évaluer les performances de diaphonie dans les câbles de communication de données de la catégorie 5 et outre. Il présente en particulier une nouvelle technologie permettant de mesurer avec précision le pas de câblage des paires. En outre, cette technologie offre des informations concernant la variabilité du pas par rapport à la longueur des paires.

L'article décrit également l'influence de la longueur de pas des paires et de la variation du pas sur les performances de diaphonie. Contrairement aux projets entraînant intentionnellement des variations de la longueur de pas, les effets observés et décrits dans le présent article sont causés par le fonctionnement mécanique des équipements de pairage et de câblage. Il a été démontré qu'en modifiant des valeurs de consigne des machines sans varier la configuration du pas, il y a des changements dans les performances de diaphonie dans le câble de catégorie fini. Ces changements de performance sont également associés à des variations de valeurs de la longueur de pas, même en maintenant les mêmes valeurs de consigne de la longueur de pas configurées dans la machine.

1 Introduction

Il est notoire que dans le secteur industriel la diaphonie est une caractéristique clé pour les câbles de catégorie hautes performances.



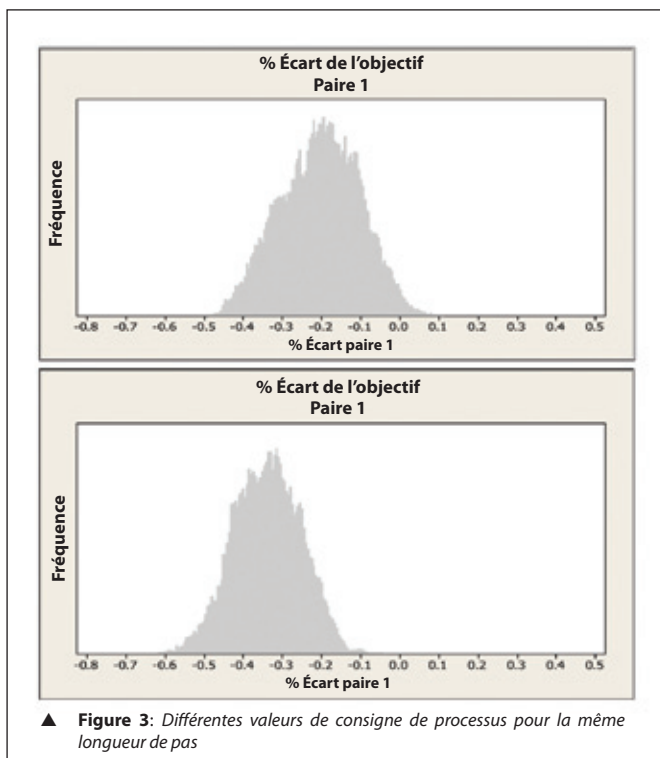
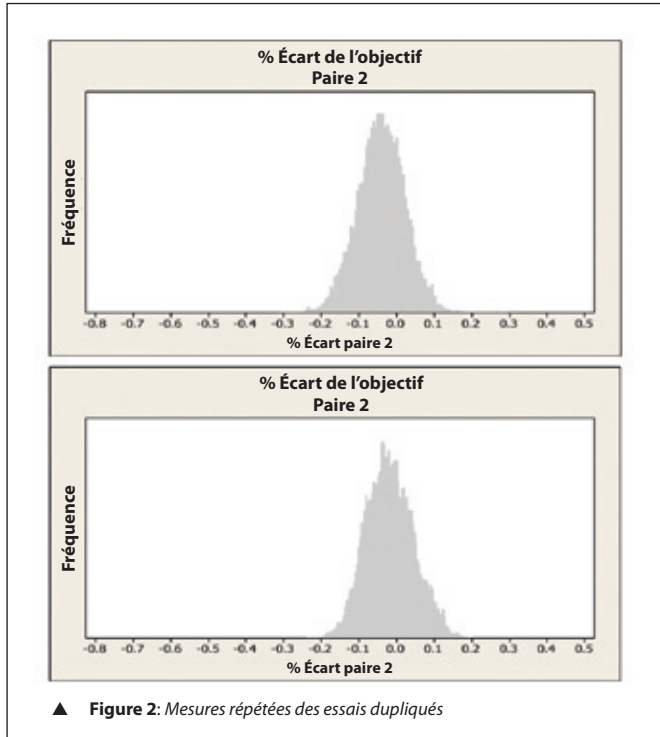
Dans plusieurs cas, les fabricants garantissent des performances de diaphonie meilleures par rapport aux standards industriels. Ce haut niveau de performances exige la réalisation d'un projet de produit fiable et des processus de fabrication stables. Il est également notoire que même dans le cas d'un projet fiable, une variation excessive du processus réduit les performances de diaphonie.

Les variations des performances peuvent avoir lieu rapidement dans le cas d'altération du fonctionnement d'une machine spécifique ou d'un processus. Les variations des performances peuvent également se vérifier lentement, pendant des jours ou des semaines, souvent à cause de modifications graduelles du fonctionnement de l'équipement de production.

Il n'est pas inusuel de réaliser un entretien programmé de l'équipement pour réduire les cas de dégradation des performances; toutefois, l'efficacité de cet entretien n'a pas encore été comprise suffisamment pour contrôler les caractéristiques de la longueur de pas.

Un autre facteur clé qui influence les performances de diaphonie est l'uniformité de la longueur de pas parmi différentes machines. On sait, ou du moins l'on a supposé que la longueur de pas peut varier d'une machine à l'autre.

La gestion de machines différentes dans un même atelier sans un feedback satisfaisant en ce qui concerne les longueurs de pas effectives représente souvent un problème. Cela peut également empêcher de façon significative la programmation de la production, étant donné que, pour



les produits spécifiques, seuls des équipements “qualifiés” peuvent être utilisés. Une nouvelle technologie a été développée permettant la saisie de données de la longueur de pas à haute vitesse. Grâce à cette technologie, il est possible de mesurer avec précision la longueur de pas de machines différentes.

Cette information peut être utile de différents points de vue. Par exemple, chaque machine présente dans un atelier de production peut être réglée pour obtenir une valeur de longueur de pas déterminée.

En outre, la variation du pas nominal représente un facteur essentiel qui contribue à la diaphonie du câble fini.

Dans le présent article il est démontré que les effets tels que la rotation de l'arc à double torsion ou la prétorsion de fils individuels, sont complètement visibles durant l'analyse de la variation de la longueur de pas des paires. Dans certains cas, dans les données de la longueur de pas des paires, il est également possible d'identifier la variation causée par la rotation de la bobine d'enroulement et de déroulement.

2 Expérimentation

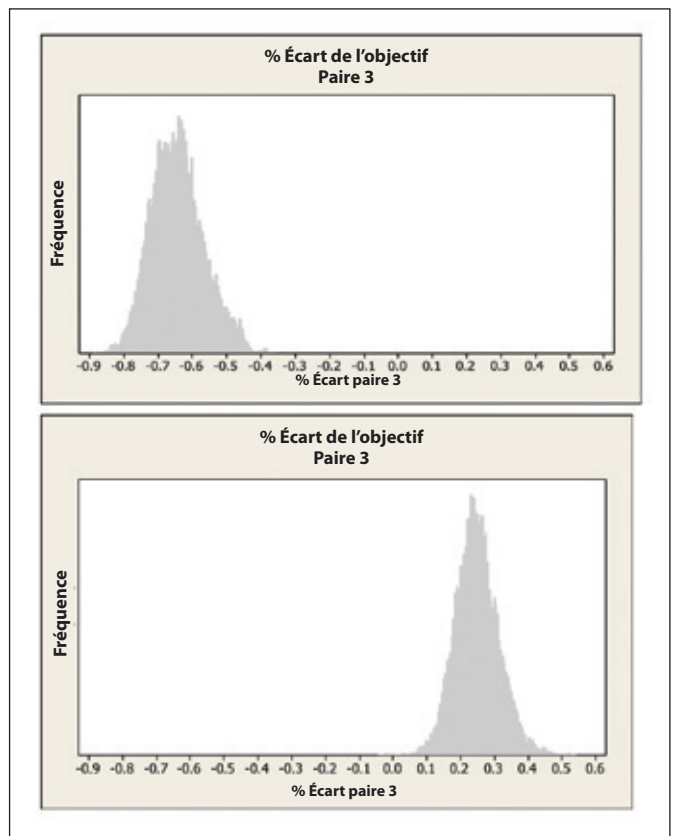
Le présent article est le résultat d'une collaboration entre Beta LaserMike et Tyco Electronics visant à mieux comprendre comment mesurer la longueur de pas et comment mettre en relation les valeurs mesurées avec les performances du câble fini. Afin de mieux comprendre les capacités de mesure, des essais préliminaires ont été effectués sur des paires individuelles. Après avoir saisi les données concernant la longueur de pas de la paire, les données d'une ligne de câblage avec les données simultanées des plusieurs paires ont été elles aussi saisies.

La technologie de mesure offre une fréquence des tests rapide permettant de saisir les données à une vitesse de plusieurs échantillons par longueur de pas. Cette fréquence d'essai rapide permet l'élaboration successive des données telles que l'analyse FFT, l'analyse des tendances et le calcul statistique.

2.1 Études du pas des paires

Les essais préliminaires ont été préparés pour mesurer les longueurs de pas des paires dans une ligne de rebobinage. Cette solution permettait une configuration d'essai plus simple et la mesure de la longueur de pas des paires à travers différentes machines de pairage. Les analyses et les expériences ont été effectuées pour évaluer les performances de l'équipement de mesure et les différences relevées dans les valeurs de consigne de la longueur de pas et de l'équipement de processus.

▼ **Figure 4:** Même longueur de pas produite dans deux machines différentes



2.1.1 Pas nominal des paires individuelles

Un exemple de la distribution du pas de la paire mesuré est représenté à la Figure 1. Les données sont fournies en format d'histogramme avec une densité de probabilité qui reflète la distribution des données de la longueur de pas sur la longueur de l'échantillon de la paire. L'échelle de l'axe x a été calculée comme écart procentuel de l'objectif pour normaliser la variation et la moyenne pour la totalité des comparaisons dans cette étude.

Les longueurs de pas totales mesurées font partie d'une gamme plutôt limitée. La variation est de l'ordre de 1% ou moins, et le mode de distribution peut être déterminé avec une précision majeure.

2.1.2 Mesures de paires individuelles

Lors d'une expérience, dans une machine de pairage, différentes valeurs de consigne de processus ont été configurées, mais la valeur de consigne de la longueur de pas est restée invariée. Une série de paires a été réalisée avec deux valeurs de consigne en succession immédiate et les échantillons ont été répliqués.

La Figure 2 illustre la comparaison des mêmes valeurs de consigne du pas mesurées en deux moments distincts dans la même machine de pairage, mais avec les autres valeurs de consigne de la machine identiques. Ce résultat montre une capacité élevée de répétabilité de la machine de pairage et de la technologie de mesure lorsque sont mesurées des paires avec la même machine de pairage, les mêmes valeurs de consigne et les mêmes conditions de processus.

Au cours d'une autre expérience les valeurs de consigne du processus d'une machine de pairage ont été modifiées, tout en maintenant constante la référence de la longueur de pas. Dans ce cas, le rapport de prétorsion et les vitesses de l'arc de la machine de pairage ont été modifiés.

La Figure 3 illustre les différences du pas en résultant à la suite des valeurs de consigne du processus. Avec les techniques de mesure manuelles ou visuelles traditionnelles il serait plutôt difficile de relever des modifications si faibles. Lors d'une autre expérience encore deux machines de pairage avec la même valeur ont été configurées et les paires de chaque machine ont été mesurées.

La Figure 4 illustre un exemple de cette expérience et montre la variation des valeurs nominales d'une machine à l'autre. Dans plusieurs autres cas, il était facile d'identifier sur l'histogramme des variations de l'ordre d'un millimètre ou deux.

2.1.3 Analyse FFT de pas de paires individuelles

La capacité de l'équipement d'utiliser des échantillons à une vitesse de données élevée permet d'afficher les variations de pas sur une échelle de mesure dans presque chaque longueur de pas.

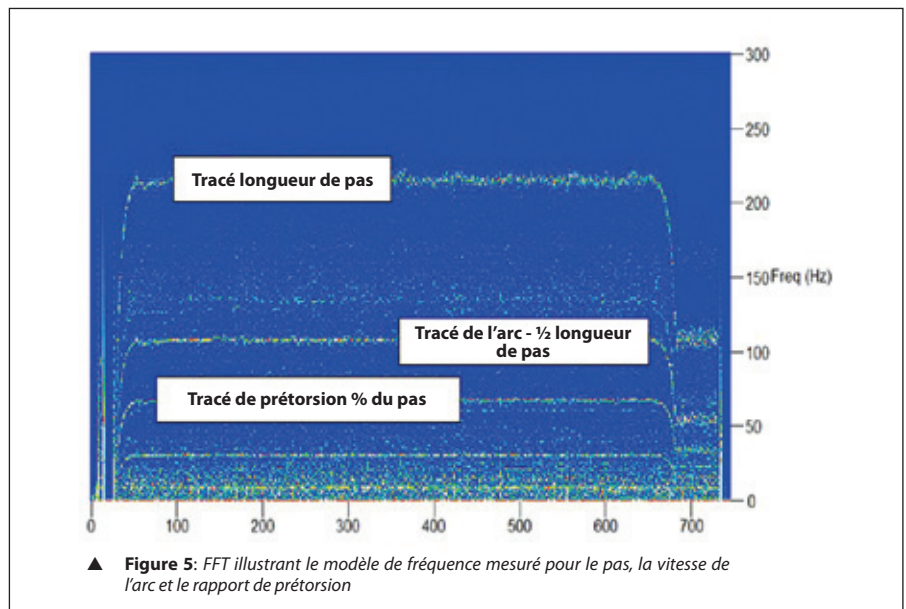
Un résultat surprenant est représenté par le fait que de nombreuses tracés de variations additionnelles ont été saisis en plus du tracé de la longueur de pas primaire.

L'analyse en cascade est une méthode pour saisir les tracés de fréquence dans le temps et de les afficher sous un format compréhensible. Par exemple, les affichages en cascade s'utilisent généralement pour la mesure et pour le diagnostic des pannes SRL dans les lignes d'extrusion primaires. Pour l'analyse en objet, des instruments d'analyse en cascade ont été également utilisés pour

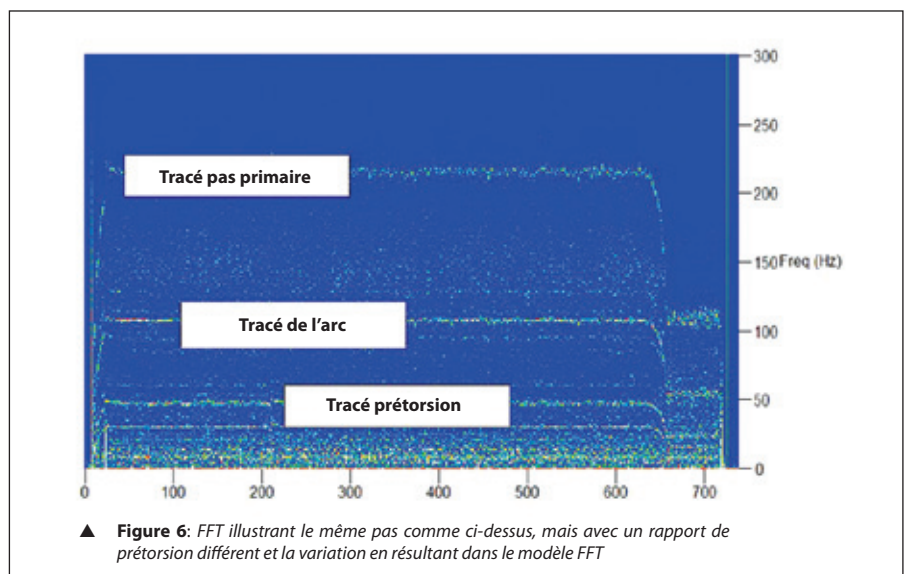
mieux saisir la variation de pas de la paire par rapport à la longueur de la bobine. La Figure 5 illustre un exemple d'une analyse FFT en cascade, où le temps est indiqué avec l'axe horizontal, la fréquence avec l'axe vertical et la nuance avec l'axe «z». Pour l'axe «z», plus la couleur est claire et plus intense est le tracé de la fréquence.

Un résultat attendu était le tracé de la fréquence de la longueur de pas primaire. Un résultat surprenant est représenté par le contenu des tracés supplémentaires rencontrés dans la cascade de l'analyse FFT. Soit le tracé de la valeur RPM de l'arc de la machine de pairage (2x longueur de pas, 1/2 fréquence) et de la prétorsion (% de prétorsion) appliquée au fil avant le pairage.

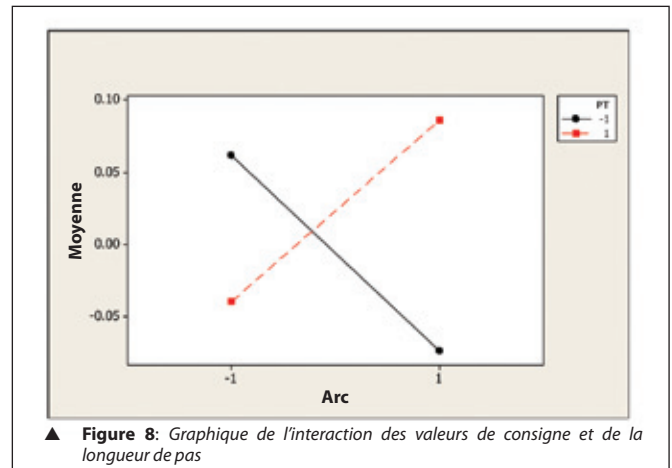
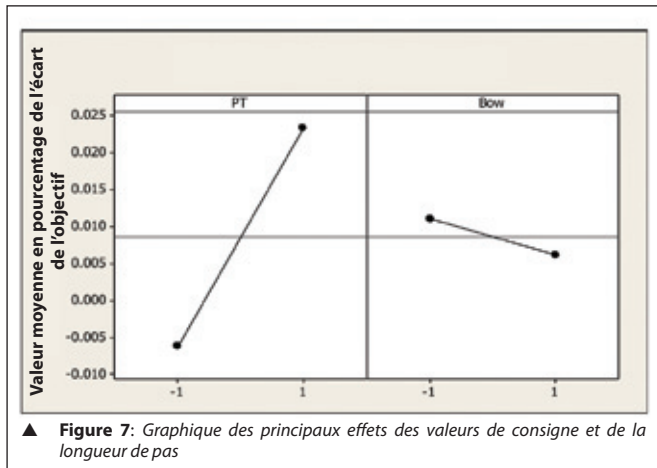
Il y a également d'autres tracés non prévus dans la cascade de l'analyse FFT indiquant d'autres modèles mécaniques de l'équipement de production.



▲ Figure 5: FFT illustrant le modèle de fréquence mesuré pour le pas, la vitesse de l'arc et le rapport de prétorsion



▲ Figure 6: FFT illustrant le même pas comme ci-dessus, mais avec un rapport de prétorsion différent et la variation en résultant dans le modèle FFT



La Figure 6 illustre la différence dans le modèle FFT lorsque l'on réalise un changement du rapport de pré-torsion. Dans ce diagramme, le tracé du pas primaire et de la vitesse de l'arc est égale à ceux de la Figure 5. Toutefois, le tracé de la pré-torsion présente une variation cohérente avec les modifications des valeurs de consigne de la machine de paillage.

2.1.4 Relation entre les valeurs de consigne du processus et la longueur de pas nominale

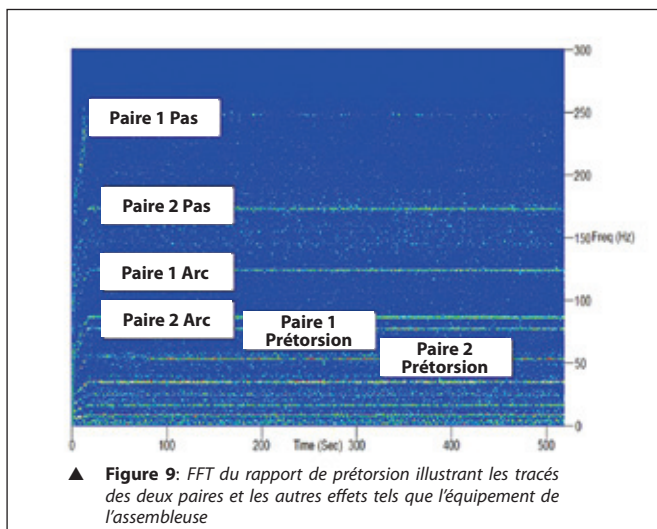
En utilisant les techniques DOE avec la longueur de pas nominale comme donnée de sortie, et une matrice 2x2 des valeurs de consigne de processus comme données d'entrée, il est possible

de déterminer la relation entre les valeurs de consigne et le pas nominal. Les graphiques des effets principaux représentés à la Figure 7 démontrent qu'il existe une forte relation entre le rapport de pré-torsion et la longueur de pas. La relation avec la vitesse de l'arc n'est pas si importante.

Il faut également remarquer qu'il existe un signal d'un effet d'interaction entre la vitesse de l'arc avec le rapport de pré-torsion sur la longueur de pas, comme illustré dans le graphique de l'interaction de la Figure 8.

Cela signifie que l'influence du rapport de pré-torsion sur la longueur de pas dépend du choix de la vitesse de l'arc.

Il faut remarquer que l'entité de la variation de la longueur de pas due au rapport de pré-torsion du processus est toutefois très limitée. Généralement, cela pourrait ne pas être considéré significatif en termes de performances diaphoniques. Sans reproduire la matrice d'essai, il n'est pas possible de déterminer la signification statistique de ce changement. Toutefois, cela fournit une indication préliminaire en ce qui concerne l'existence de causes et d'effets dans cette relation.



2.2 Pas de la paire dans les études sur le câblage

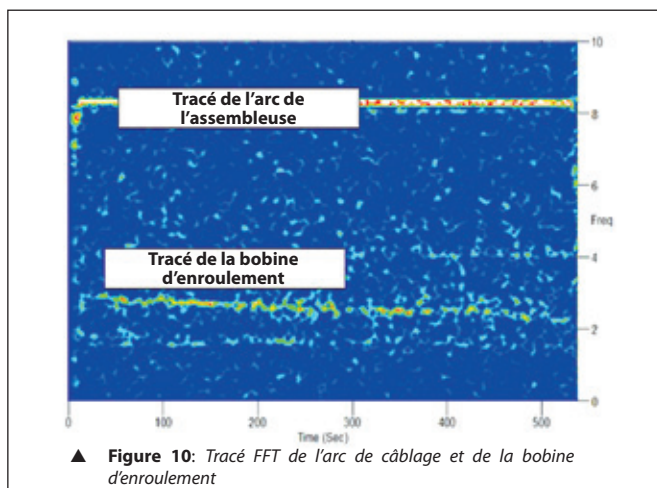
Il était nécessaire d'étendre des expériences des pas des paires dans le processus de câblage pour confirmer les résultats précédents dans les paires individuelles et mesurer les pas d'au moins deux paires individuelles élaborées en même temps durant un processus de câblage.

En utilisant les valeurs de consigne décrites dans la Section 2.1.2, une simple matrice d'essai 2x2 a été prévue pour comparer les tracés de paires différentes avec des valeurs de consigne déterminées du rapport de pré-torsion et de la vitesse de l'arc. Seules deux paires dans le câble ont été soumises à la matrice d'essai 2x2, alors que les deux autres paires ont été élaborées avec des configurations de processus constantes comme valeurs de contrôle. L'interaction de la diaphonie des deux paires examinées a été le point d'intérêt primaire, bien que les interactions avec les paires de contrôle aient été mesurées. Les mesures de la paradiaphonie (NEXT) ont été amenées à une fréquence de 1,2GHz.

2.2.1 Analyse FFT de pas de paires individuelles durant le câblage

La forme de base des graphiques FFT était cohérente avec les résultats vérifiés dans la station d'enroulement décrite également dans la section 2.1.3. Dans ce cas, l'analyse FFT a été effectuée sur le rapport des deux paires mesurées durant le câblage.

Le graphique FFT de la Figure 9, illustre les tracés des deux paires dans un seul graphique. Les composants FFT mentionnés



précédemment peuvent être vus pour les pas primaires, les vitesses de l'arc de l'assembleuse et les rapports de prétorsion dans les deux paires.

Toutefois, à des fréquences inférieures il existe d'autres tracés intéressants.

L'équipement de mesure est également sensible aux variations mécaniques de l'équipement de production.

La Figure 10 illustre un composant fort qui est relatif à l'arc de l'assembleuse.

En outre, un tracé incliné pouvant être mis en relation à la rotation de la bobine d'enroulement dans l'assembleuse est visible.

L'inclinaison est due à l'augmentation du diamètre du tambour de la bobine d'enroulement durant le fonctionnement, qui réduit la vitesse de rotation de la bobine.

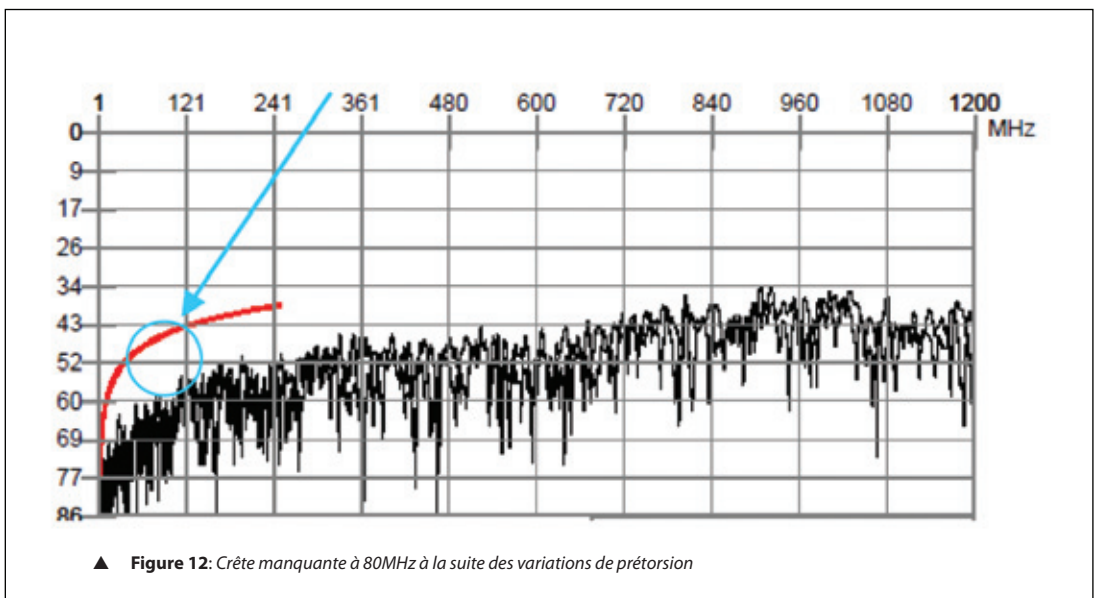
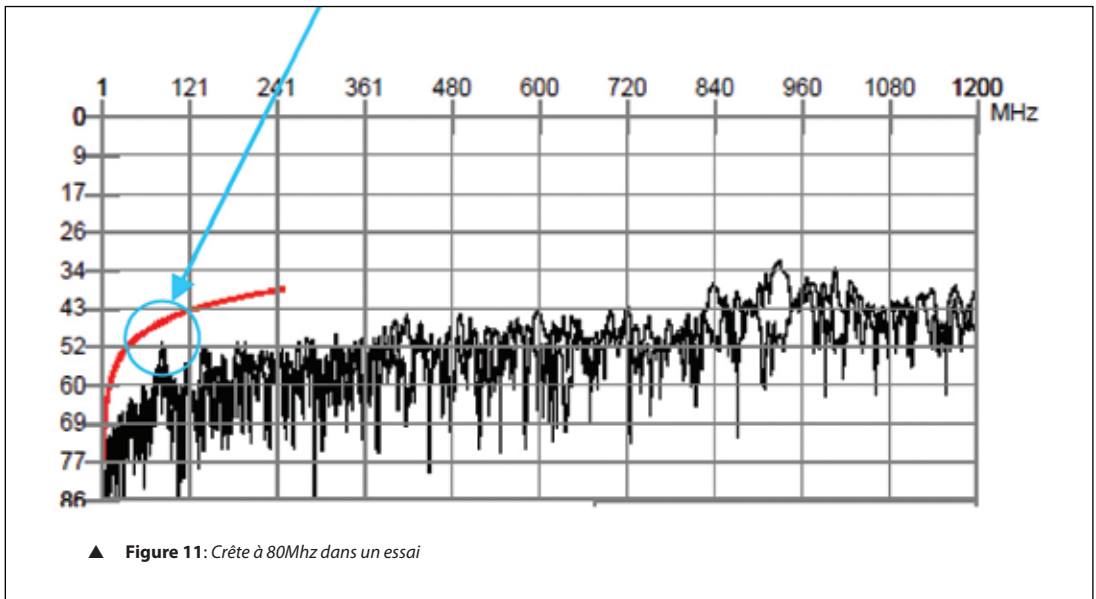
La vitesse de l'arc de l'assembleuse est représentée par un signal extrêmement fort et constant qui est une mesure de l'effet sur l'arc de l'assembleuse dans la vitesse de câblage à court terme. Du point de vue de l'entité de la variation induite par l'assembleuse, les paires introduites dans l'assembleuse présentaient une variation de 8% crête à crête de la vitesse instantanée.

Il est probable qu'une bonne partie de cette variation de vitesse sera compensée par un allongement et par une relaxation de la paire à court terme.

2.2.2 Réponse de la paradiaphonie pour différentes valeurs de consigne de processus

Comme mentionné dans la Section 2.1.4, sans reproduire la matrice d'essai il n'est pas possible de déterminer la signification statistique effective des performances.

Toutefois, des échantillons répétés ont été pris pour confirmer les résultats qualitatifs indiqués ci-après.



Certaines valeurs de consigne peuvent présenter des différences claires, principalement sous la forme de crêtes, dans les graphiques NEXT.

Une combinaison du rapport de prétorsion et de la vitesse de l'arc montre clairement une crête dans le graphique NEXT à 80MHz. En modifiant uniquement le rapport de prétorsion des deux paires, cette crête est réduite ou éliminée.

Dans la configuration contraire de la vitesse de l'arc, la variation du rapport de prétorsion présente un effet similaire dans une crête qui peut être observée à environ 125MHz.

3 Conclusions

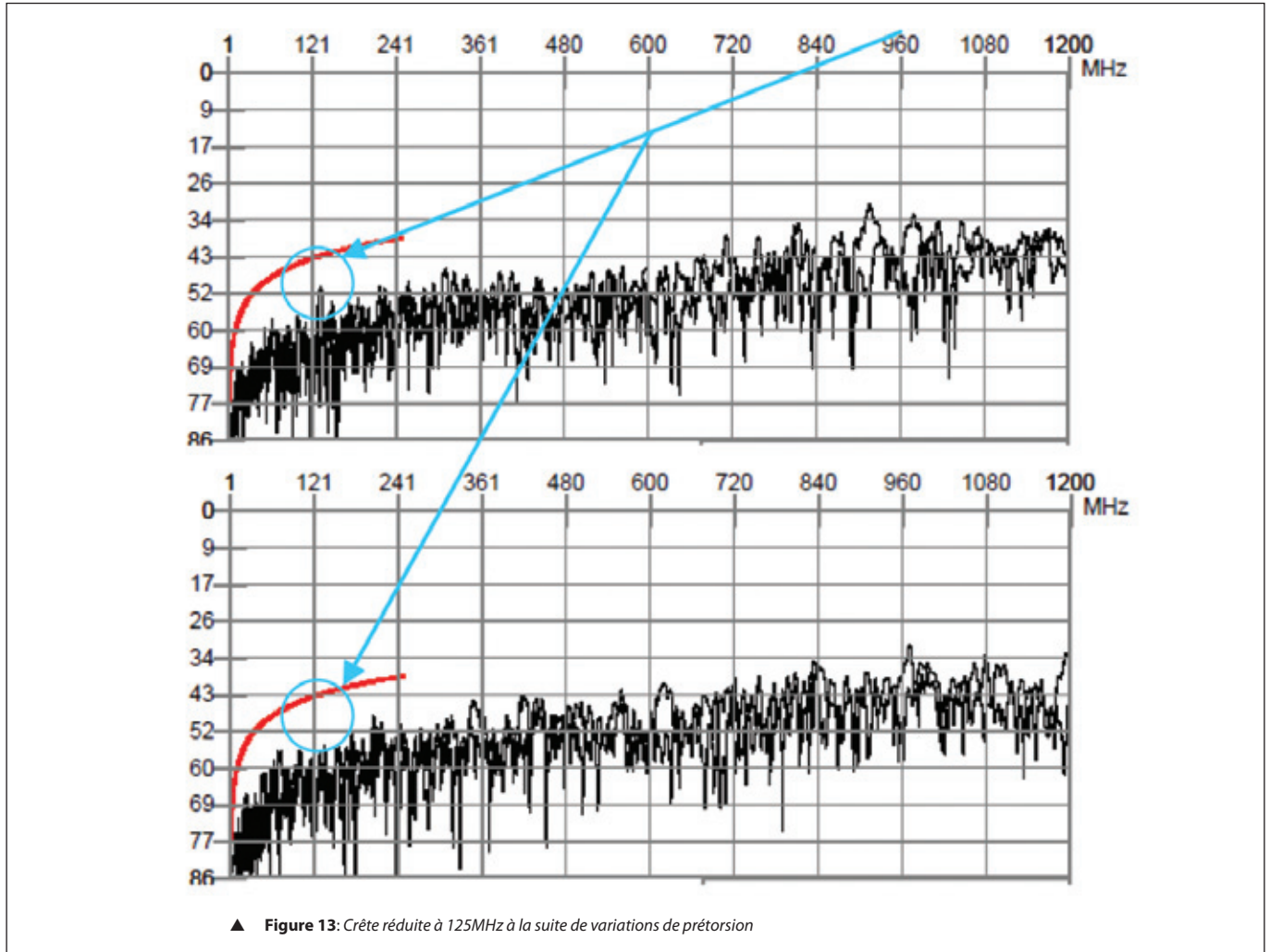
Cette étude a produit une série de résultats importants. Il a été démontré que

la technologie de mesure à haute vitesse utilisée dans la présente étude, offre une méthode précise et répétable pour la mesure de la valeur de la longueur de pas des paires torsadées.

L'utilisation de cette technique pour des sections longues avec la collecte des données en temps réel de la vitesse de la paire offre un aperçu, à travers l'analyse FFT, de la stabilité et des modèles du processus de pairage.

Principalement, on rencontre des tracés de variation du pas à la longueur de pas de la paire fondamentale, à la vitesse de l'arc de la machine de pairage et à la vitesse de prétorsion.

Les valeurs de la longueur de pas nominal sont influencées par les variations des valeurs de consigne de processus, en particulier le rapport de prétorsion et



▲ Figure 13: Crête réduite à 125MHz à la suite de variations de prétorsion

son interaction avec la vitesse de l'arc. Du point de vue quantitatif, ces variations sont relativement limitées.

Toutefois, il apparaît qu'il existe une relation entre les données d'entrée et les longueurs de pas qui exigeraient une validation supplémentaire pour obtenir une signification statistique.

On peut également observer un impact supplémentaire et potentiellement plus important sur la longueur de pas nominale entre les différents types de machines.

Des processus successifs peuvent augmenter ou influencer les tracés de variation. Cela était évident dans la mesure des paires durant le câblage.

Des tracés de variations additionnelles ont été remarqués pour la vitesse de l'arc de l'assembleuse et du diamètre de la bobine d'enroulement.

Enfin, il faut remarquer que dans ces expériences, les performances de la diaphonie sont influencées significativement par les variations de processus.

Pour vérifier la contribution de chaque facteur, il faut examiner en détail les variations des valeurs de la longueur de pas ainsi que des modifications des tracés de variation.

Il est raisonnable de supposer qu'il existe d'autres données d'entrée de processus pouvant influencer la variation du pas, d'autres tracés inexplicables durant le pairage et le câblage ayant été observés.

Leur influence sur les caractéristiques de la diaphonie exige une analyse supplémentaire. ■

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Zumbach lancia un nuovo prodotto sul mercato

LA società svizzera Zumbach Electronic presenta l'ultimo prodotto della sua linea di misuratori Steelmaster.

La nuova linea di prodotti SMR offre nuovi e significativi vantaggi rispetto ad altri misuratori per quanto riguarda il rilevamento di dimensioni rapido e preciso in direzione longitudinale e radiale.

I misuratori SMR sono caratterizzati da una rotazione continua a 100rpm. Sono equipaggiati con 3 teste laser ODAC®, completamente sincronizzate, che effettuano 2.000 misurazioni al secondo ciascuna. Questo dispositivo è progettato per misurare fino a 10 profili completi il secondo, risultando molto più veloce rispetto agli altri misuratori.

In alternativa, i misuratori SMR possono funzionare in modalità statica, orientabile con possibilità di effettuare 2.000 misurazioni al secondo del diametro o di altre dimensioni in ciascuna direzione (a 100m/s questo comporta una serie di misurazioni ogni 50mm).

La concezione meccanica è molto semplice e robusta; non vi sono parti di usura né collettori, né freni, ecc.. La trasmissione di potenza e di segnali verso e dalle teste laser avviene senza alcun contatto. I misuratori SMR non richiedono praticamente alcuna manutenzione.



▲ Nuovo misuratore SMR di Zumbach

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Website: www.zumbach.com

Nuovi ingaggi per Allied

Allied Wire and Cable continua a prosperare ingaggiando nuovi consulenti per tre delle proprie sedi negli Stati Uniti. Con più rappresentanti in ciascuna sede, Allied è ora in grado di offrire un servizio migliore rispetto al passato.

Paul Lawruk è l'ultimo responsabile commerciale della sede centrale di Allied in Pennsylvania. Lawruk iniziò la propria carriera nel settore del cavo e del filo presso la società Omni Cables, dove operò in qualità di responsabile della clientela. Durante tale periodo familiarizzò con AWC e conobbe da vicino l'eccellente servizio offerto ai clienti per il quale è nota la società Allied. Ora Lawruk è impaziente di collaborare fianco a fianco con il team di Allied.

La nuovissima sede di Allied a Las Vegas da il benvenuto a Kristy Ventura. Kristy ha così commentato il suo ingresso in Allied Wire and Cable: "È un piacere per me far parte di un

gruppo che non solo mi fa sentire come un membro di una famiglia, ma è anche desideroso di servire i nostri clienti con un sorriso." Ventura vanta una vasta esperienza nel settore industriale con precedenti incarichi presso Anacapa Micro Products, R&B Welding and Grainger.

Infine, Ryan Baldinelli, è l'ultimo acquisto della filiale di Allied nel New England, nuovo anche nel settore del cavo e del filo. Baldinelli, laureatosi nel 2011 presso il Castleton State College in Vermont, ove ha studiato commercio e marketing, sebbene principiante, sta affrontando il suo nuovo incarico con gran entusiasmo.

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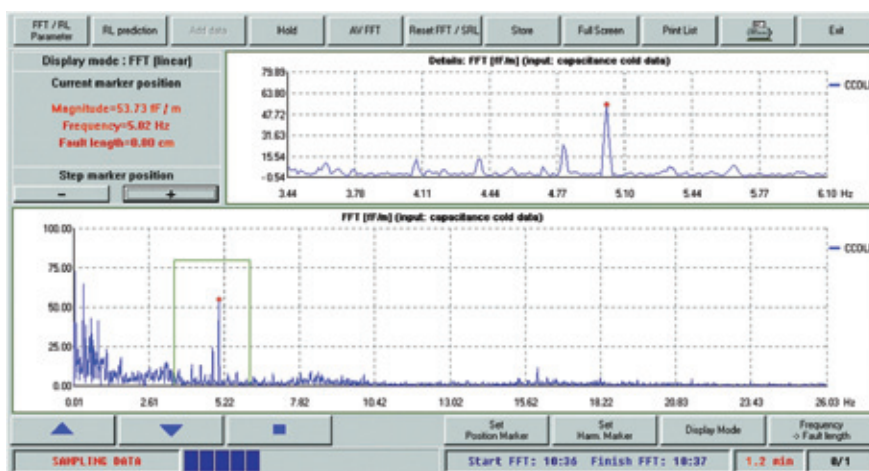
Capacitance 2000 garantisce la trasmissione dei dati senza perdita

LA trasmissione senza perdita di segnali analogici o digitali, ad alta frequenza, rappresenta un fattore essenziale in termini di qualità per ogni tipo di cavo LAN, coassiale, telefonico o RF. In questo contesto, la misurazione della capacitance gioca un ruolo decisivo. La capacitance influenza in modo significativo l'impedenza del cavo nella gamma di frequenze specificata e, pertanto, la qualità del cavo.

Capacitance 2000 è un dispositivo che si installa nel canale di raffreddamento e misura con precisione la capacitance dell'isolamento del filo. Allo stesso tempo, il sistema determina le variazioni della capacitance, aggiorna le misure ad altissima velocità e rileva i conduttori nudi.

Questa tecnologia viene applicata combinando un elettrodo di misura corto con due lunghi, che sono incorporati in un tubo di misura. L'elettrodo di misura corto di 10 mm di lunghezza rileva le variazioni di capacitance periodiche con un'elevata risoluzione spaziale mediante l'analisi FFT (Trasformata Rapida di Fourier).

Partendo dai dati FFT si determina la



▲ Capacitance 2000 misura la capacitance e determina le variazioni periodiche di capacitance mediante l'analisi FFT (Trasformata Rapida di Fourier)

perdita cumulativa di riflessione (SRL, Structural Return Loss), la quale offre delle informazioni sull'attenuazione prevista del segnale RF durante la trasmissione dei dati. Il campo degli elettrodi lunghi calcola con elevata precisione la media della capacitance.

L'eliminazione delle variazioni periodiche del cavo è un prerequisito per ottenere un'attenuazione ottimale mentre quanto più breve è l'intervallo critico dei

periodi, tanto maggiore è la velocità di trasmissione di dati del cavo desiderata.

Tali variazioni periodiche vengono determinate mediante la tecnologia multizona del misuratore Capacitance 2000 poiché tutti i parametri che influenzano la qualità (es. il diametro dei conduttori, la schiumatura, il diametro esterno) si riflettono sulla capacitance. La precisione è di 0,1 pF il metro. A velocità di linea fino a 2.400m/min. e 1.300m/min. si può prevedere un perdita cumulativa di riflessione rispettivamente di 3GHz e 8GHz. Ciò consente di riprodurre con precisione l'impedenza del cavo.

Il rilevamento delle variazioni di capacitance periodiche e la previsione delle perdite cumulative di riflessione (FFT e SRL) sono funzioni specifiche disponibili direttamente nel tubo di misura tramite un'interfaccia diagnostica. Per la visualizzazione dei valori delle misure, Sikora offre i sistemi di elaborazione Remote 2000 ed Ecocontrol 600/1000/2000. Il grafico dell'analisi di FFT e la previsione SRL possono essere visualizzati mediante Ecocontrol 1000 o 2000.

Evonik ottiene la certificazione

APT Europe GmbH, filiale di Evonik Industries, ha ottenuto recentemente la certificazione EN ISO 13485:2003. Questa norma internazionale definisce i requisiti richiesti per i sistemi di controllo della qualità utilizzati dai fabbricanti e dai fornitori di strumentazioni medicali.

Rispetto alla norma ISO 9001, la norma ISO 13485 dà particolare rilievo alla garanzia di qualità costante del prodotto e al controllo di tutti i relativi processi nonché alla documentazione e alla tracciabilità.

I fabbricanti di strumentazioni medicali devono garantire che anche i loro fornitori rispettino i requisiti della norma EN ISO 13485. Tale certificazione semplifica la procedura di classificazione obbligatoria richiesta ai fornitori per i clienti di Vestakeep®.

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Misuratori laser ad alta velocità per la misurazione della lunghezza di passo e analisi FFT per una valutazione della stabilità del processo

A cura di Stephen Pearson, Tyco Electronics, Greensboro, e Kenneth E Cornelison, Beta LaserMike, Dayton

Riassunto

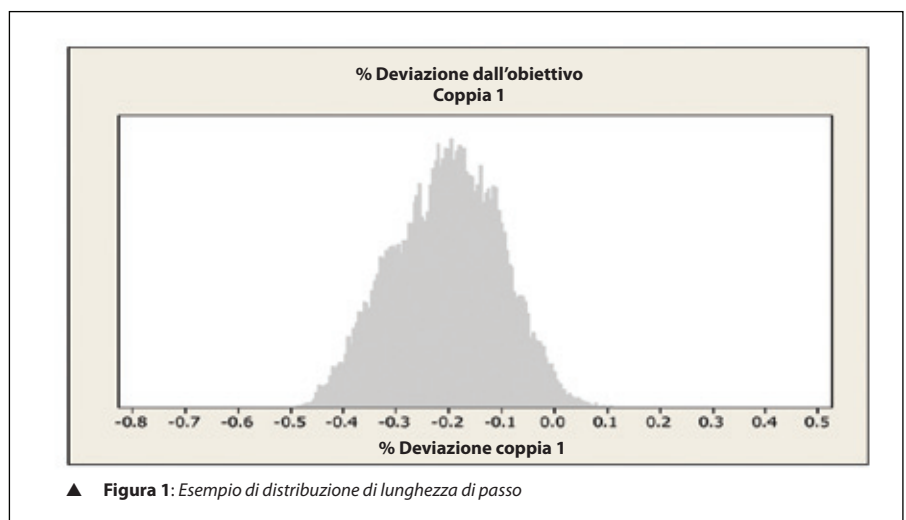
Il presente articolo descrive il lavoro effettuato per valutare le prestazioni di diafonia nei cavi per comunicazione di dati di categoria 5 e superiore.

In particolare, viene presentata una nuova tecnologia che consente di misurare con precisione il passo delle coppie. Questa tecnologia offre inoltre informazioni sulla variabilità del passo rispetto alla lunghezza della coppia.

L'articolo illustra come la lunghezza di passo della coppia e la variazione del passo influenzano le prestazioni di diafonia. Contrariamente ai progetti che inducono intenzionalmente delle variazioni della lunghezza di passo, gli effetti osservati e descritti nel presente articolo sono causati dal funzionamento meccanico degli equipaggiamenti di cordatura e cablaggio.

È stato dimostrato che modificando i valori di riferimento delle macchine senza variare la configurazione del passo, si verificano variazioni di prestazioni di diafonia nel cavo di categoria finito.

Tali cambiamenti di prestazione sono associati anche a variazioni dei valori della lunghezza di passo, persino mantenendo gli stessi valori di riferimento della lunghezza di passo configurati nella macchina.



▲ Figura 1: Esempio di distribuzione di lunghezza di passo

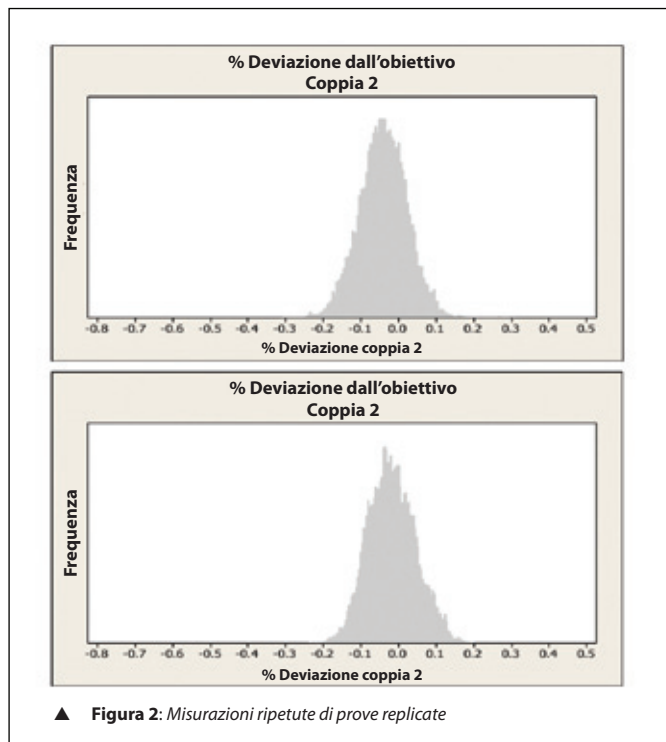
1 Introduzione

È noto che nel settore industriale la diafonia è una caratteristica chiave per i cavi di categoria di alte prestazioni. In numerosi casi, i fabbricanti garantiscono prestazioni di diafonia migliori rispetto agli standard industriali. Questo alto livello di prestazioni richiede la realizzazione di un progetto di prodotto affidabile e processi di fabbricazione stabili. È inoltre noto che, anche nel caso di un progetto affidabile, un'eccessiva variazione del processo riduce le prestazioni di diafonia. Le variazioni di prestazioni possono verificarsi rapidamente in caso di alterazione del funzionamento di una macchina specifica o di un processo.

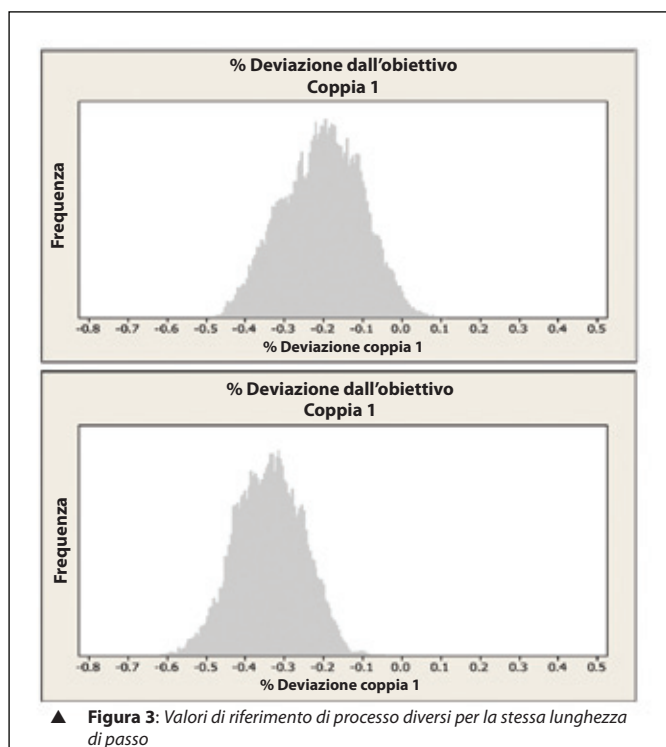
Le variazioni delle prestazioni possono inoltre verificarsi lentamente, durante giorni o settimane, spesso a causa di modifiche graduali del funzionamento dell'equipaggiamento di produzione.

Non è inusuale realizzare una manutenzione programmata dell'equipaggiamento per ridurre i casi di peggioramento delle prestazioni; tuttavia non è stata ancora compresa adeguatamente l'efficacia di tale manutenzione nel controllo delle caratteristiche della lunghezza di passo.

Un altro fattore chiave che influenza le prestazioni di diafonia è l'uniformità della lunghezza di passo in macchine diverse.



▲ **Figura 2:** Misurazioni ripetute di prove replicate



▲ **Figura 3:** Valori di riferimento di processo diversi per la stessa lunghezza di passo

È noto, o in passato è stato perlomeno supposto, che la lunghezza di passo può variare da macchina a macchina. La gestione di macchine diverse in una stessa officina senza un soddisfacente feedback sugli effettivi passi delle coppie costituisce spesso un problema. Ciò può inoltre costituire un serio impedimento alla programmazione della produzione, giacché, per prodotti specifici, possono essere utilizzati unicamente alcuni equipaggiamenti "qualificati".

È stata sviluppata una nuova tecnologia che consente l'acquisizione ad alta velocità dei dati di lunghezza del passo. Grazie a questa tecnologia, è possibile misurare con precisione la lunghezza di passo di macchine diverse.

Questa informazione può essere utile in molti casi. Ad esempio, ciascuna macchina presente in un'officina di produzione può essere regolata per ottenere un determinato valore di lunghezza di passo.

La variazione del passo nominale costituisce inoltre un fattore importante che contribuisce alla diafonia del cavo finito. Nel presente articolo si dimostra che gli effetti quali la rotazione dell'arco a doppia torsione o la pretorsione di fili singoli, sono abbastanza visibili durante l'analisi della variazione della lunghezza di passo delle coppie. In alcuni casi, nei dati del passo delle coppie, è possibile anche individuare la variazione causata dalla rotazione della bobina di svolgimento e avvolgimento.

2 Sperimentazione

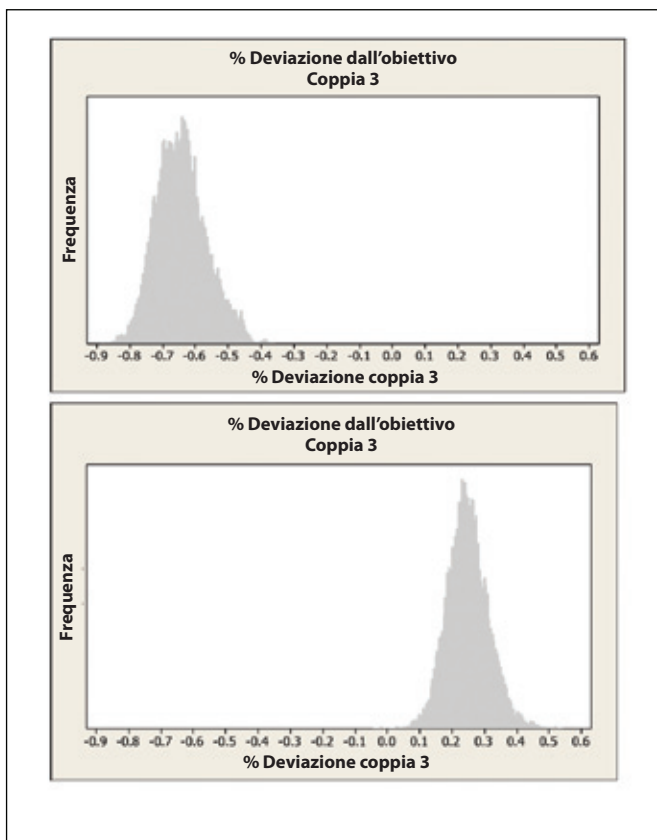
Il presente articolo è il risultato di una collaborazione fra Beta LaserMike e Tyco Electronics per comprendere meglio come misurare la lunghezza di passo e come porre in relazione i valori misurati con le prestazioni del cavo finito. Per capire meglio le capacità di misurazione sono state effettuate delle prove iniziali su coppie singole. Dopo aver raccolto le informazioni sul passo della coppia, sono stati raccolti i dati in una linea di cablaggio con i dati simultanei di varie coppie.

La tecnologia di misurazione offre una rapida frequenza di prova che consente di catturare i dati ad una velocità di diversi campioni per lunghezza di passo. Questa rapida frequenza di prova consente la successiva elaborazione dei dati come l'analisi FFT, l'analisi delle tendenze e il calcolo statistico.

2.1 Studio sul passo delle coppie

Le prove iniziali sono state impostate per misurare le lunghezze di passo delle coppie in una linea di riavvolgimento. Questa soluzione offriva una configurazione più semplice e consentiva

▼ **Figura 4:** Stessa lunghezza di passo prodotta in due macchine distinte



la misurazione delle lunghezze di passo delle coppie attraverso varie macchine di cordatura. Le analisi e gli esperimenti sono stati condotti per valutare le prestazioni dell'equipaggiamento di misurazione e le differenze evidenziate nei valori di riferimento del passo e dell'equipaggiamento di processo.

2.1.1 Passo nominale di coppie singole

Un esempio della distribuzione del passo della coppia misurato è illustrato nella Figura 1.

I dati sono in formato di istogramma con una densità di probabilità che riflette la distribuzione dei dati della lunghezza di passo sulla lunghezza del campione della coppia.

La scala dell'asse x è stata calcolata come deviazione percentuale dell'obiettivo per normalizzare la variazione e la media per tutte le comparazioni nel presente studio.

Le lunghezze di passo totali misurate rientrano in una fascia piuttosto stretta. La variazione è nell'ordine dell'1% o meno, e la modalità di distribuzione può essere determinata con precisione maggiore.

2.1.2 Misurazioni di coppie singole

In un esperimento, in una singola cordatrice sono stati configurati diversi valori di riferimento di processo, ma il valore di riferimento della lunghezza di passo è stato lasciato invariato.

Una serie di coppie è stata prodotta con due valori di riferimento in successione immediata, ed i campioni sono stati replicati.

La Figura 2 illustra la comparazione degli stessi valori di riferimento del passo misurati in due momenti distinti nella stessa cordatrice, ma con tutti gli altri valori di riferimento della macchina identici.

Questo risultato mostra un'elevata capacità di ripetibilità sia della cordatrice sia della tecnologia di misurazione quando vengono misurate coppie con la stessa cordatrice, gli stessi valori di riferimento e le medesime condizioni di processo.

In un altro esperimento, sono stati variati i valori di riferimento del processo di una cordatrice, mantenendo costante il riferimento del passo. In questo caso, il rapporto di pretorsione e le velocità dell'arco della cordatrice sono state modificate.

La Figura 3 illustra le differenze distinte del conseguente passo come risultato dei valori di riferimento del processo. Con le tecniche di misurazione manuali o visive tradizionali, sarebbe piuttosto difficile rilevare modifiche così lievi.

In un altro esperimento sono state configurate due cordatrici con lo stesso valore di riferimento e sono state misurate le coppie di ciascuna macchina. La Figura 4 illustra un esempio di questo esperimento e mostra la variazione dei valori nominali da una macchina ad un'altra.

In numerosi altri casi, si potevano facilmente individuare sull'istogramma variazioni dell'ordine di un millimetro o due.

2.1.3 Analisi FFT di passi di coppie singole

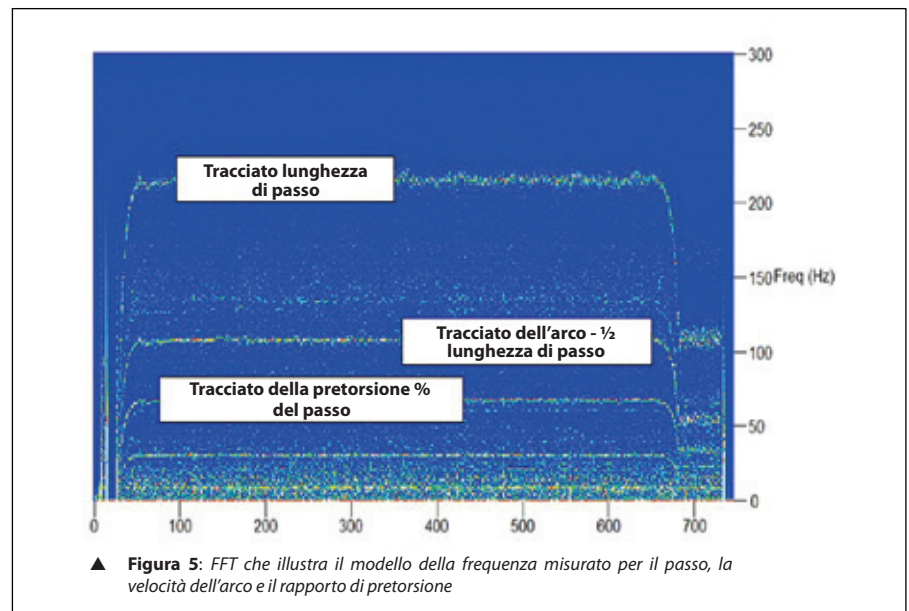
La capacità dell'equipaggiamento di prendere campioni ad un'elevata velocità di dati consente di visualizzare le variazioni del passo su una scala di misurazione in quasi ogni lunghezza di passo. Un risultato sorprendente è rappresentato dall'individuazione di un numero di altri tracciati di variazioni in aggiunta al tracciato della lunghezza di passo primaria.

L'analisi a cascata rappresenta un modo per rilevare i tracciati della frequenza nel tempo e di visualizzarli in un formato comprensibile.

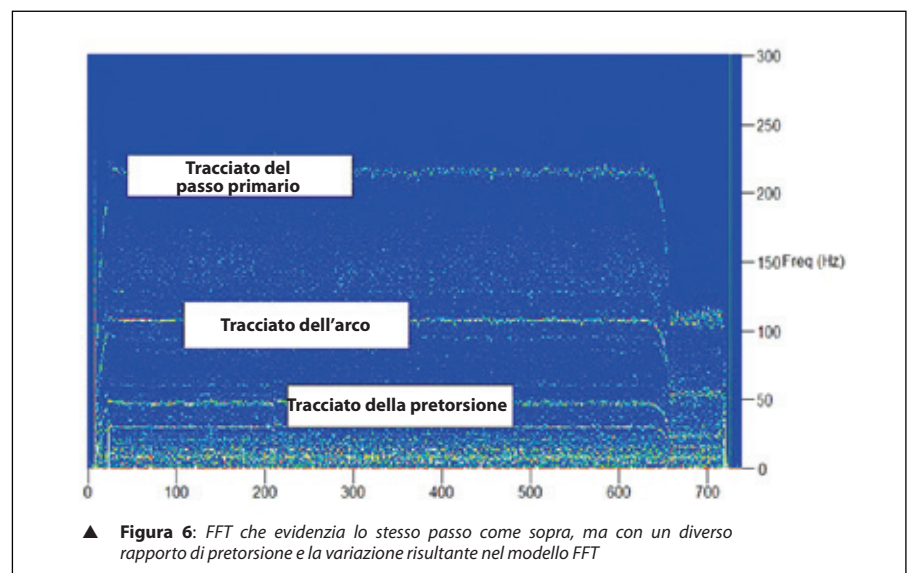
Ad esempio, le visualizzazioni a cascata si utilizzano generalmente per la misurazione e la ricerca guasti dei difetti SRL nelle linee di estrusione primarie. Per l'analisi in oggetto, furono utilizzati strumenti di analisi a cascata per meglio rilevare la variazione del passo della coppia rispetto alla lunghezza della bobina.

La Figura 5 illustra un esempio di una analisi FFT a cascata, dove il tempo è indicato con l'asse orizzontale, la frequenza sull'asse verticale e la zona ombreggiata come asse "z". Per l'asse "z", più chiaro è il colore, più intenso è il tracciato della frequenza.

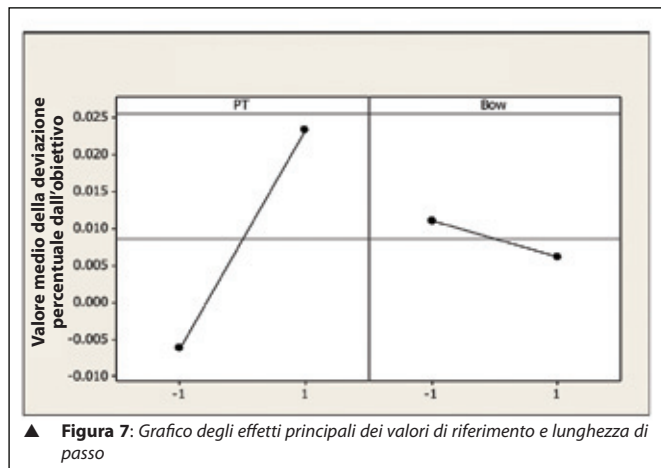
Un risultato atteso era il tracciato della frequenza della lunghezza di passo primaria.



▲ Figura 5: FFT che illustra il modello della frequenza misurato per il passo, la velocità dell'arco e il rapporto di pretorsione



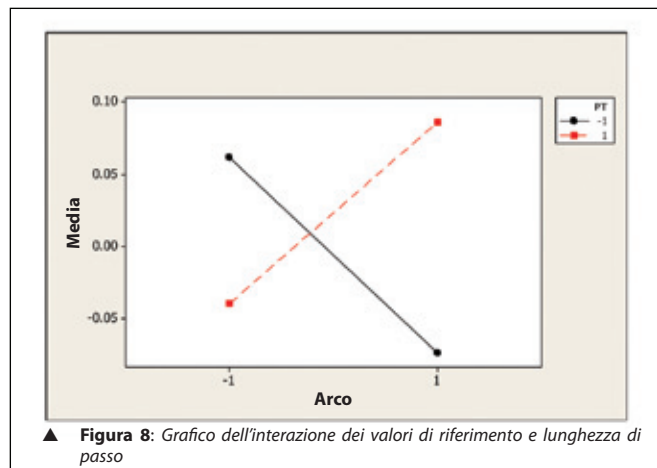
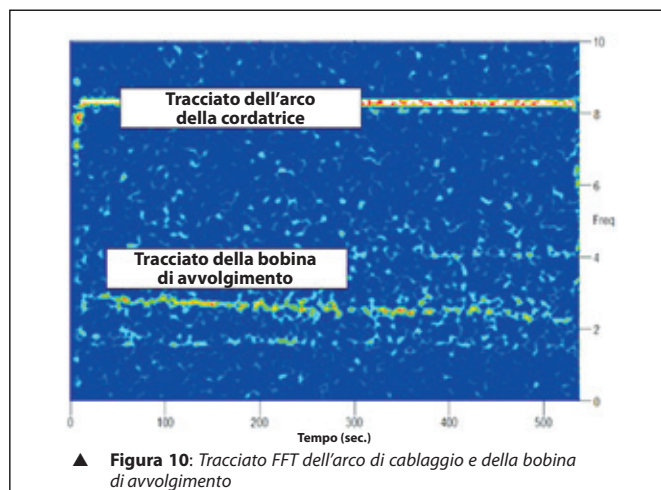
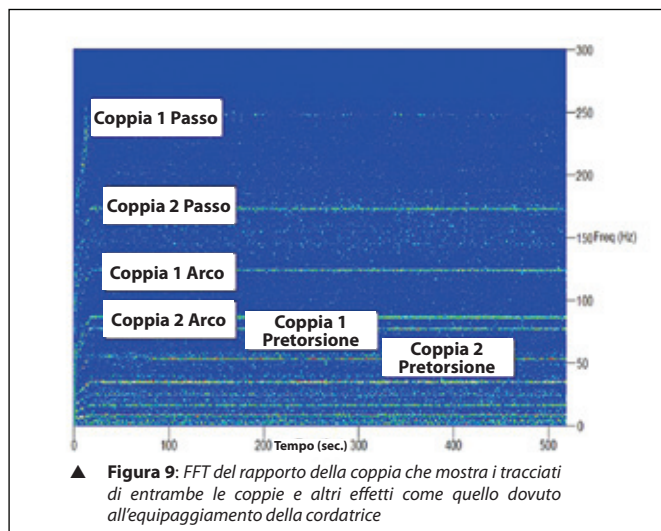
▲ Figura 6: FFT che evidenzia lo stesso passo come sopra, ma con un diverso rapporto di pretorsione e la variazione risultante nel modello FFT



Un risultato sorprendente fu invece il contenuto dei tracciati aggiuntivi riscontrati nella cascata dell'analisi FFT. Sono chiaramente visibili sia il tracciato del valore RPM dell'arco della cordatrice (2x lunghezza di passo, 1/2 frequenza) e della pretorsione (% di pretorsione) applicata al filo prima della cordatura.

Vi sono inoltre vari altri tracciati non previsti nella cascata della FFT che indicano altri modelli meccanici dell'equipaggiamento di produzione.

La Figura 6 illustra la differenza nel modello FFT quando si realizza un cambiamento del rapporto di pretorsione.



In questo diagramma, il tracciato del passo primario e della velocità dell'arco sono uguali a quelli della Figura 5. Tuttavia, il tracciato della pretorsione presenta una variazione coerente con le modifiche dei valori di riferimento della cordatrice.

2.1.4 Relazione fra i valori di riferimento del processo e la lunghezza di passo nominale

Utilizzando tecniche DOE con la lunghezza di passo nominale come dato finale, e una matrice 2x2 dei valori di riferimento del processo come dati iniziali, è possibile determinare la relazione fra i valori di riferimento e il passo nominale.

I grafici degli effetti principali nella Figura 7 evidenziano che esiste una forte relazione fra il rapporto di pretorsione e la lunghezza di passo. La relazione con la velocità dell'arco non è altrettanto importante.

È interessante notare che esiste anche un segnale di un effetto dell'interazione della velocità dell'arco con il rapporto di pretorsione sulla lunghezza di passo, come illustrato nel grafico dell'interazione della Figura 8.

Ciò significa che la scelta della velocità dell'arco determina il modo in cui il rapporto di pretorsione influenza la lunghezza di passo.

Va notato che l'entità della variazione della lunghezza di passo dovuta al rapporto di pretorsione del processo è tuttavia molto limitata. Generalmente, ciò potrebbe non essere considerato significativo dal punto di vista delle prestazioni di diafonia. Senza riprodurre la matrice di prova, non è possibile determinare il significato statistico di tale variazione. Tuttavia, ciò fornisce un'indicazione iniziale che potrebbero esistere cause ed effetti in questa relazione.

2.2 Passi della coppia negli studi sul cablaggio

Era necessario estendere gli esperimenti dei passi della coppia nel processo di cablaggio per confermare i risultati precedenti delle coppie singole e misurare i passi di almeno due coppie singole elaborate nello stesso tempo durante un processo di cablaggio.

Utilizzando i valori di riferimento del processo descritti nella Sezione 2.1.2, fu preparata una semplice matrice di prova 2x2 per effettuare una comparazione fra i tracciati di varie coppie a determinati valori di riferimento del rapporto di pretorsione e della velocità dell'arco.

Solo due coppie del cavo furono sottoposte alla matrice di prova 2x2, mentre le altre due coppie furono elaborate con configurazioni di processo costanti come valori di controllo. L'interazione della diafonia delle due coppie esaminate fu il punto di interesse primario, sebbene furono anche misurate le interazioni con le coppie di controllo.

Le misurazioni della paradiafonia (NEXT) furono portate ad una frequenza di 1,2GHz.

2.2.1 Analisi FFT di passi di coppie singole durante il cablaggio

La forma di base dei grafici FFT era coerente con i risultati verificati nella stazione di avvolgimento descritta anche nella Sezione 2.1.3.

In questo caso, l'analisi FFT fu effettuata sul rapporto delle due coppie misurate durante il cablaggio.

Il grafico FFT della Figura 9, illustra i tracciati di entrambe le coppie in un unico grafico.

Si possono apprezzare le componenti FFT precedentemente menzionate per i passi primari, le velocità dell'arco della cordatrice e i rapporti di pretorsione in entrambe le coppie.

Tuttavia, a frequenze inferiori esistono altri tracciati interessanti.

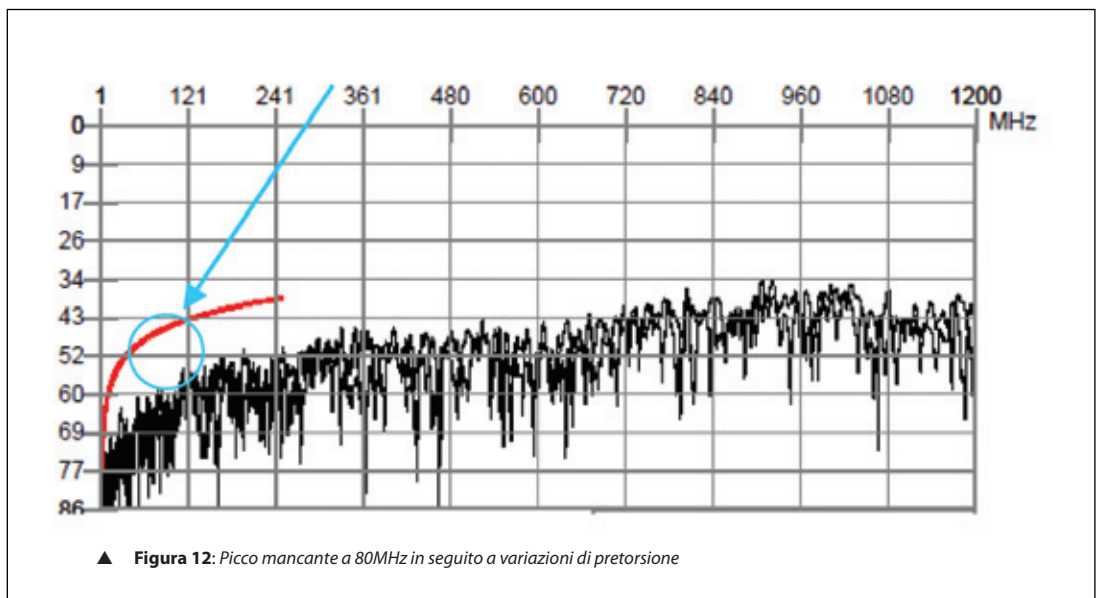
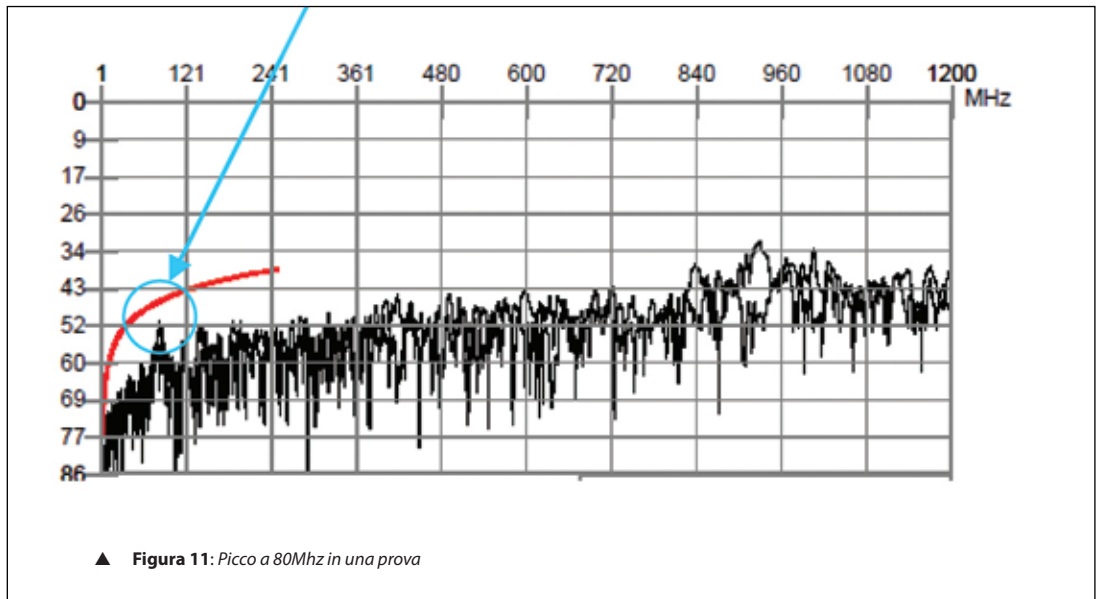
L'equipaggiamento di misurazione è inoltre sensibile alle variazioni meccaniche dell'equipaggiamento di produzione.

La Figura 10 illustra una componente forte in relazione all'arco della cordatrice. È inoltre visibile un tracciato inclinato che può essere posto in relazione alla rotazione della bobina di avvolgimento nella cordatrice.

L'inclinazione è dovuta all'aumento del diametro del tamburo della bobina di avvolgimento durante il funzionamento, che riduce la velocità di rotazione della bobina.

La velocità dell'arco della cordatrice è un segnale estremamente forte e costante che rappresenta una misura dell'effetto sull'arco della cordatrice con una velocità di cablaggio a breve termine.

Da un punto di vista dell'entità della variazione indotta dalla cordatrice, le coppie che entrano nella cordatrice presentavano una variazione di un 8% da picco a picco della velocità istantanea.



È probabile che una buona parte di questo cambio di velocità sia compensato da un allungamento ed un rilassamento della coppia a breve termine.

2.2.2 Risposta della paradiafonia per diversi valori di riferimento di processo

Come menzionato nella Sezione 2.1.4, senza riprodurre la matrice di prova non è possibile determinare il significato statistico effettivo delle prestazioni.

Tuttavia, sono stati presi campioni ripetuti della prova per convalidare i risultati qualitativi indicati qui di seguito.

Alcuni valori di riferimento possono presentare differenze nette, principalmente sotto forma di picchi, nei grafici della paradiafonia. In una combinazione del rapporto di pretorsione e velocità dell'arco, appare un picco evidente nel grafico NEXT a 80MHz.

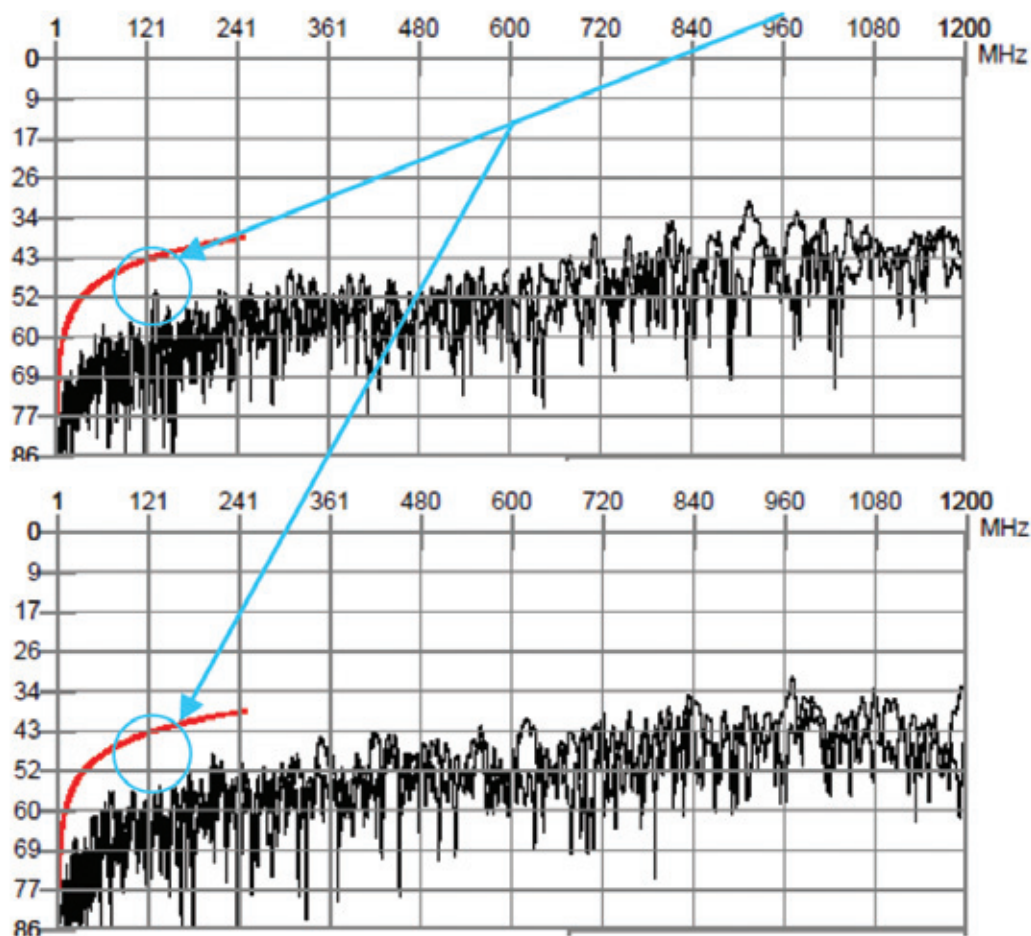
Modificando solo il rapporto di pretorsione di entrambe le coppie, questo picco viene ridotto o eliminato.

Nella configurazione contraria della velocità dell'arco, la variazione del rapporto di pretorsione presenta un effetto simile in un picco che si può vedere approssimativamente a circa 125MHz.

3 Conclusioni

Questo studio ha prodotto una serie di risultati importanti.

È stato dimostrato che la tecnologia di misurazione ad alta velocità utilizzata nel presente studio offre un metodo preciso e ripetibile per la misurazione del valore della lunghezza di passo di coppie intrecciate. L'utilizzo di questa tecnica per tratti lunghi unitamente alla raccolta



▲ **Figura 13:** Picco ridotto a 125MHz in seguito a variazioni di pretorsione

di dati in tempo reale della velocità della coppia aiuta a capire meglio, attraverso l'analisi FFT, la stabilità e i modelli del processo di cordatura.

Principalmente, si incontrano tracciati di variazione del passo alla lunghezza di passo della coppia fondamentale, alla velocità dell'arco della cordatrice e alla velocità di pretorsione.

I valori della lunghezza di passo nominale sono influenzati dalle variazioni dei valori di riferimento del processo, nello specifico il rapporto di pretorsione e la sua interazione con la velocità dell'arco.

Quantitativamente, queste variazioni sono relativamente limitate. Tuttavia, sembra che esista una relazione fra i dati iniziali e le lunghezze di passo che richiederebbero un'ulteriore convalida per ottenere un significato statistico.

Si può osservare un impatto aggiuntivo e potenzialmente più importante sulla lunghezza di passo nominale fra tipi di macchine distinti.

Processi successivi possono aumentare i tracciati di variazione o influenzare gli stessi. Ciò appariva evidente nella misurazione delle coppie durante il cablaggio. Furono notati dei tracciati aggiuntivi per la velocità dell'arco della cordatrice e il diametro della bobina di avvolgimento.

Infine, e ancor più importante, in questi esperimenti le prestazioni di diafonia sono influenzate significativamente dalle variazioni di processo.

Per verificare il contributo di ciascun fattore, è necessario uno studio delle variazioni dei valori della lunghezza di passo così come dei cambiamenti dei tracciati di variazione.

È ragionevole supporre che esistano altri dati di processo iniziali che possono influenzare la variazione del passo, poiché vi sono altri tracciati non chiariti, sia durante la cordatura, sia durante il cablaggio.

Il loro impatto sulle caratteristiche della diafonia richiede ulteriori approfondimenti. ■

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Zumbach lanza al mercado un nuevo medidor

LA empresa suiza Zumbach Electronic presenta el último producto de su línea de medidores Steelmaster.

La nueva línea de productos SMR ofrece funciones de captura de dimensiones rápidas y precisas en sentido longitudinal y radial, que representan nuevas e importantes ventajas respecto a otros medidores.

Los medidores SMR giran a 100r.p.m. de manera continua. Están equipados con hasta 3 cabezales láser ODAC*, totalmente sincronizados, que realizan 2.000 medidas/segundo cada uno, lo que representa hasta 10 perfiles completos por segundo, es decir, más rápido respecto a otros medidores.

Si se desea, el SMR puede funcionar en modo estático orientable haciendo 2.000 medidas/s del diámetro u otras dimensiones en cada dirección (a 100m/s significa una serie de medidas cada 50mm).

El diseño mecánico es muy simple y robusto. No lleva piezas que se desgasten, ni anillos colectores, ni frenos, etc.

La transmisión de potencia y señales hacia y desde los cabezales láser se hace totalmente sin contacto. Los medidores SMR no requieren prácticamente mantenimiento.



▲ Nuevo medidor SMR de Zumbach

El software Steelmaster cuenta con las últimas novedades siguientes:

- Función EPM para visualización de la sección real, con desviaciones de forma poligonal y asimétrica
- Funciones especiales para laminadores de tres rodillos

- Cálculo del despunte de cabeza y cola
- Flexible, pantallas personalizadas

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Allied contrata nuevos representantes

Allied Wire and Cable sigue prosperando y contratando nuevos representantes para tres de sus sedes de Estados Unidos. Al tener más representantes en cada sede, Allied puede ofrecer ahora mejor servicio que nunca.

Paul Lawruk es el último representante de cuentas contratado en la oficina central de Allied en Pensilvania. Lawruk inició su carrera en el sector del cable y alambre en la empresa Omni Cables, donde trabajó como director de administración.

Durante ese tiempo se familiarizó con AWC y conoció de cerca el excelente servicio de atención al cliente por el que es conocida Allied. Ahora, Lawruk espera trabajar de cerca con el equipo de Allied.

Por su parte, la sede más nueva de Allied, en Las Vegas, da la bienvenida a Kristy Ventura. Refiriéndose a su ingreso en Allied Wire and Cable, comenta: "Es un placer para mí formar parte

de un grupo que no sólo me hace sentir como uno más de la familia, sino que además disfruta atendiendo a los clientes con una sonrisa." Ventura cuenta con una gran experiencia en el sector industrial tras varios puestos ocupados anteriormente en Anacapa Micro Products, R&B Welding y Grainger.

Por último, tenemos a Ryan Baldinelli, otro empleado incorporado recientemente a la sucursal de Allied en New England, novato además en el sector del cable y alambre. Baldinelli, que acaba de licenciarse en 2011 en el Castleton State College de Vermont, donde estudió empresariales y marketing, se estrena ocupando su nuevo puesto con gran entusiasmo.

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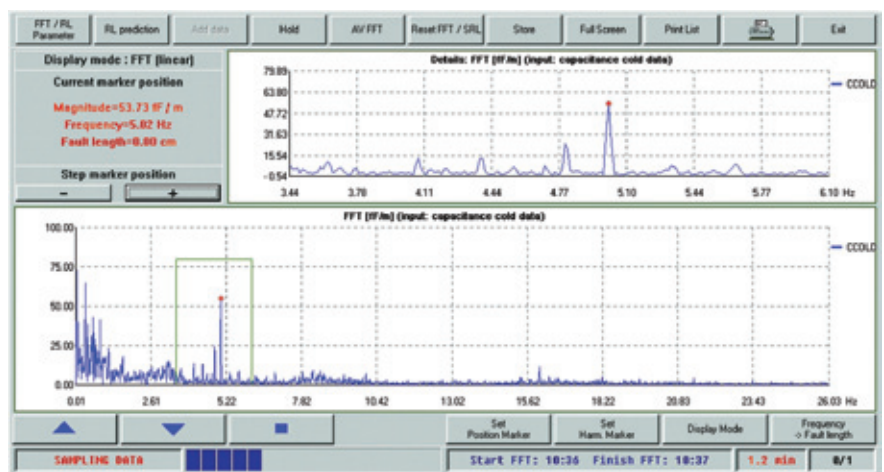
Capacitance 2000 garantiza transmisión de datos sin pérdida

LA transmisión sin pérdida de señales de alta frecuencia, analógicas o digitales representa un factor muy importante en términos de calidad para cualquier tipo de cable LAN, coaxial, telefónico o RF. En este escenario, la medida de la capacitancia juega un papel decisivo. La capacitancia afecta a la impedancia del cable en la gama de frecuencia especificada y, por tanto, a la calidad del cable significativamente.

Capacitance 2000 es un dispositivo de medida, que se instala en el canal de enfriamiento y mide la capacitancia de la cubierta de aislamiento del cable con precisión. Asimismo, el sistema determina las variaciones de capacitancia, actualiza las medidas a altísima velocidad y detecta los conductores desnudos.

Esta tecnología es implementada combinando un electrodo de medida corto con dos largos, que son medidos dentro de un tubo de medida. El electrodo corto de 10mm de longitud detecta las variaciones de capacitancia periódicas con una elevada resolución espacial mediante análisis FFT (Transformada Rápida de Fourier).

A partir de los datos FFT, se determina la pérdida de retorno estructural (SRL, Structural Return Loss), que informa sobre la



▲ Capacitance 2000 mide la capacitancia y determina las variaciones periódicas mediante análisis FFT (Transformada Rápida de Fourier)

atenuación esperada de la señal RF durante la transmisión de datos. Los electrodos largos calculan con alta precisión la media de la capacitancia.

La eliminación de las variaciones periódicas del cable es un requisito previo si se quiere tener una excelente atenuación. En cambio, cuanto más corto es el intervalo crítico de los periodos, mayor es la velocidad buscada de transmisión de datos del cable.

Estas variaciones periódicas son determinadas mediante la tecnología multizona del medidor Capacitance 2000, ya que todos los parámetros que afectan a la calidad (ej. diámetro del conductores, espumación, diámetro exterior) se reflejan en la capacitancia. La precisión es de 0,1pF por metro. A velocidades de línea de hasta 2.400m/min y 1.300m/min se puede prever una pérdida de retorno estructural de 3GHz y 8GHz, respectivamente. Esto permite reproducir con precisión la impedancia del cable.

La detección de variaciones de capacitancia periódicas y la previsión de pérdida de retorno estructural (FFT y SRL) son funciones especiales disponibles directamente en el tubo de medida mediante una interfaz de diagnóstico. Para mostrar las medidas Sikora propone los sistemas de procesamiento Remote 2000 y Ecocontrol 600/1000/2000. El gráfico de análisis FFT y previsión de SRL pueden ser visualizados mediante el Ecocontrol 1000 ó 2000.

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Evonik se certifica

APT Europe GmbH, subsidiaria de Evonik Industries, ha recibido la certificación EN ISO 13485:2003. Esta norma internacional establece los requisitos que deben cumplir los sistemas de control de calidad utilizados por los fabricantes de equipos médicos y sus proveedores.

En comparación con la ISO 9001, la ISO 13485 pone un énfasis especial en la garantía de calidad constante del producto y en el control y verificación de todos los procesos relacionados, además de la documentación y trazabilidad.

Los fabricantes de equipos médicos deben garantizar que sus proveedores cumplan los requisitos de la EN ISO 13485. Esta certificación simplifica el proceso de clasificación de proveedores por el que deben pasar los clientes de Vestakeep®.

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Medidores láser de alta velocidad para la medición de la longitud de paso y análisis FFT, diseñados para evaluar la estabilidad del proceso

Por Stephen Pearson, Tyco Electronics, Greensboro, y Kenneth E Cornelison, Beta LaserMike, Dayton

Resumen

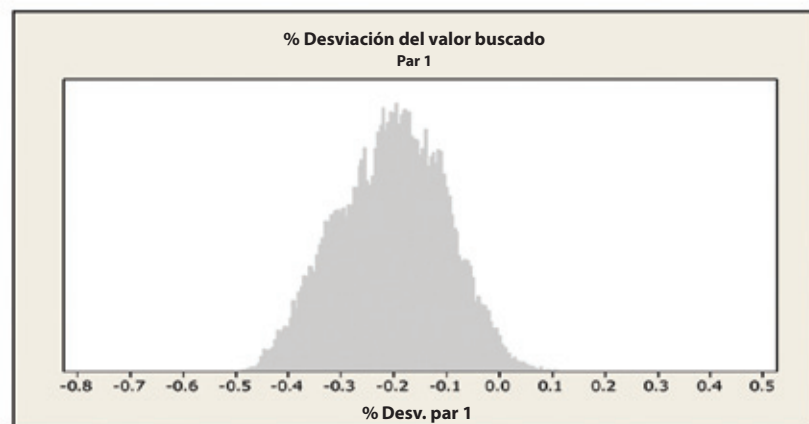
En este artículo se describe el trabajo realizado para evaluar las prestaciones de la diafonía en cables de comunicación de datos de categoría 5 y superior. En particular, se presenta una nueva tecnología que permite medir con precisión la longitud del paso de cableado de los pares.

Esta tecnología también ofrece información sobre la variabilidad del paso a lo largo de la longitud del par. Se describe cómo afectan a las prestaciones de la diafonía la longitud y la variación de paso de cableado del par.

Contrariamente a los diseños que aplican intencionadamente cambios de longitud de paso, los efectos que aquí se observan y describen son causados por el funcionamiento mecánico de los equipos de pareado y cableado.

Se mostrará que modificando los valores de referencia de las máquinas sin variar la configuración de la longitud de paso, las prestaciones de la diafonía en el cable de categoría acabado varían.

Estos cambios observados en la diafonía se acompañan también de cambios en los valores de la longitud de paso, incluso manteniendo los mismos valores de longitud de paso predeterminados de la máquina.



▲ Figura 1: Ejemplo de distribución de longitud de paso

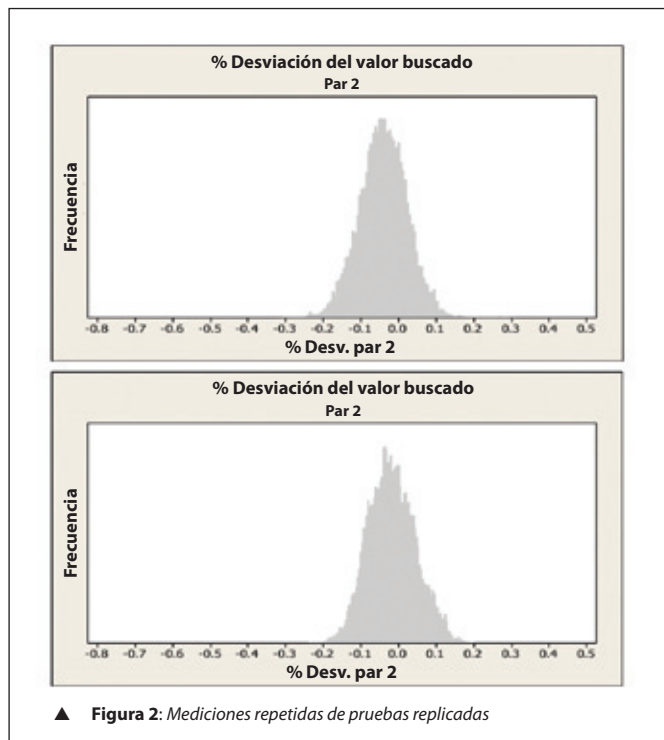
1 Introducción

En el sector industrial se sabe bien que la diafonía es una característica clave para los cables de categoría de altas prestaciones. En muchos casos, los fabricantes garantizan prestaciones de la diafonía superiores a las de los estándares industriales. Estas altas prestaciones requieren la implementación de un diseño de producto fiable y procesos de fabricación estables. Se sabe también que incluso con un diseño fiable, una variación excesiva en el proceso reduce las prestaciones de la diafonía. La variación de las prestaciones puede producirse rápidamente en caso de alteración del

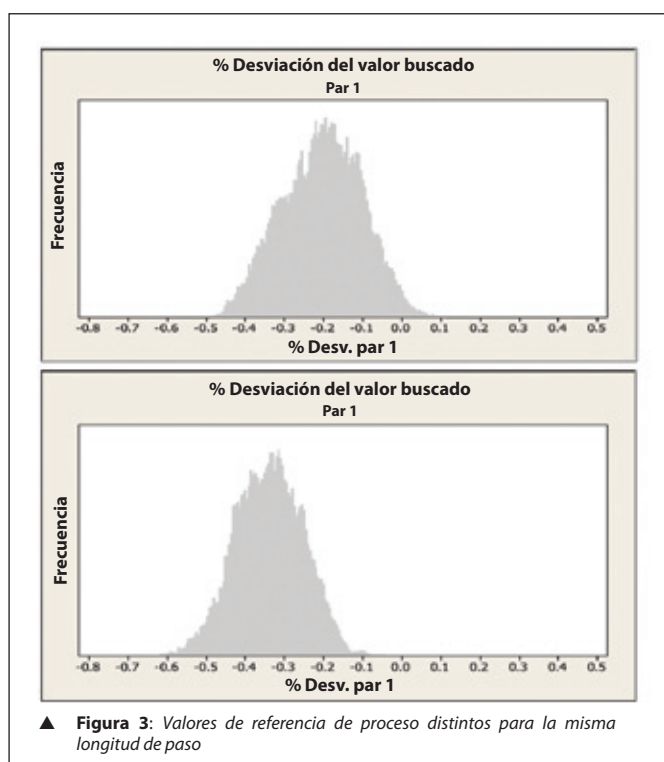
funcionamiento de una máquina o de un proceso. La variación de las prestaciones también puede ocurrir lentamente, a lo largo de días o semanas, a menudo debido a cambios graduales del funcionamiento del equipo de fabricación.

No es raro programar el mantenimiento periódico del equipo para reducir los casos de empeoramiento de las prestaciones, pero todavía no se ha llegado a entender bien cómo influye dicho mantenimiento en el control de las características de la longitud de paso.

Otro factor clave que afecta a las prestaciones de la diafonía es la



▲ **Figura 2:** Mediciones repetidas de pruebas replicadas



▲ **Figura 3:** Valores de referencia de proceso distintos para la misma longitud de paso

coherencia de la longitud de paso en distintas máquinas. Se sabe, o por lo menos se sospecha, que la longitud de paso puede variar de máquina a máquina. La gestión de distintas máquinas en una misma fábrica sin un buen informe sobre los efectivos pasos de cableado de los pares a menudo supone un problema.

Esto también puede representar un serio inconveniente para programar la producción, dado que, para productos específicos, sólo se puede usar un cierto equipo "cualificado".

Se ha desarrollado una nueva tecnología que permite adquirir los datos de longitud de paso a alta velocidad. Gracias a esta tecnología se puede medir con precisión la longitud de paso de

cableado de distintas máquinas. Esta información puede ser útil en muchos casos. Por ejemplo, cada máquina de una fábrica puede ser ajustada para obtener un determinado valor de longitud de paso.

La variación de la longitud de paso nominal también es un factor importante que afecta a la diafonía del cable acabado. En este artículo se demuestra que ciertos efectos, como la rotación de la lira de doble torsión o la pretorsión de alambres, pueden ser observados fácilmente en el análisis de la variación de la longitud de paso de los pares.

En algunos casos, en los datos del paso de los pares, se puede ver incluso la variación causada por la rotación de la bobina de desenrollado y enrollado.

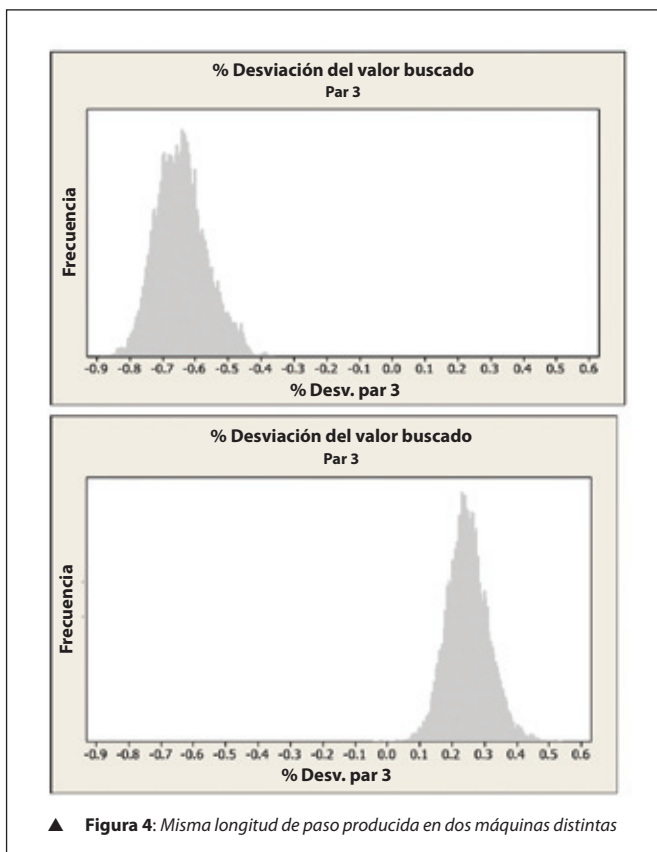
2 Experimentación

Este artículo es el resultado de una colaboración entre Beta LaserMike y Tyco Electronics propuesta para comprender mejor cómo se debe medir la longitud de paso de cableado y poner en relación los valores medidos con las prestaciones del cable acabado. Para comprender mejor las capacidades de medición, se efectuaron una serie de pruebas iniciales en pares sueltos.

Después de recoger los datos sobre la longitud de paso de los pares, en una línea de cableado se recogieron datos referentes a varios pares al mismo tiempo.

La tecnología de medición ofrece alta velocidad de muestreo que permite capturar datos a una velocidad de varios muestreos por longitud de paso.

Esta elevada velocidad de muestreo permite el procesamiento de datos sucesivo, como el análisis FFT, el análisis de tendencias y el cálculo estadístico.



▲ **Figura 4:** Misma longitud de paso producida en dos máquinas distintas

2.1 Estudios sobre la longitud de paso de los pares

Las pruebas iniciales fueron preparadas para medir las longitudes de paso de los pares en una línea de rebobinado. Esta solución permitió simplificar la preparación y medir la longitud de paso de los pares en varias máquinas de pareado. Los análisis y experimentos fueron realizados para evaluar las prestaciones del equipo de medición y las diferencias observadas en los valores de referencia del paso y en el equipo de proceso.

2.1.1 Longitud de paso nominal de pares sueltos

Un ejemplo de la distribución del paso de cableado del par medida está ilustrado en la *Figura 1*. Los datos aparecen en formato de histograma con una densidad de probabilidad que refleja la distribución de los datos de la longitud de paso a lo largo del par de muestra. La escala del eje x ha sido calculada como desviación porcentual del objetivo para normalizar la variación y la media para todas las comparaciones incluidas en este estudio.

Las longitudes de paso totales medidas están incluidas en una banda bastante estrecha. La variación es del orden de un 1% o menos, y el modo de distribución puede ser determinado con algo más de precisión.

2.1.2 Mediciones de pares sueltos

En un experimento se configuraron varios valores de referencia de proceso en una pareadora, pero se dejó invariado el valor de referencia de la longitud de paso.

Una serie de pares fueron producidos con dos valores de referencia en sucesión inmediata, y las muestras fueron replicadas.

La *Figura 2* muestra la comparación de los mismos valores de referencia del paso medidos en dos momentos distintos en la misma pareadora, pero con todos los demás valores de referencia de la máquina idénticos. Este resultado muestra una alta repetibilidad de la pareadora y de la tecnología de medición cuando se miden pares con la misma pareadora, con los mismos valores de referencia y en las mismas condiciones de proceso.

En otro experimento, se cambiaron los valores de referencia de proceso de una pareadora, dejando constante el valor de referencia de la longitud de paso. En este caso, la relación de pretorsión y las velocidades de la lira de la pareadora fueron cambiadas.

La *Figura 3* muestra diferencias distintas en el paso resultante a consecuencia de los valores de referencia de proceso.

Con técnicas de medición manuales o visuales convencionales, cambios tan pequeños como estos serían difíciles de detectar.

En otro experimento se configuraron dos pareadoras con el mismo valor de referencia y se midieron los pares fabricados por cada máquina.

La *Figura 4* es un ejemplo de este experimento y muestra el cambio de los valores nominales de una máquina a otra. En otros tantos casos, cambios del orden de un milímetro o dos eran visibles fácilmente en el histograma.

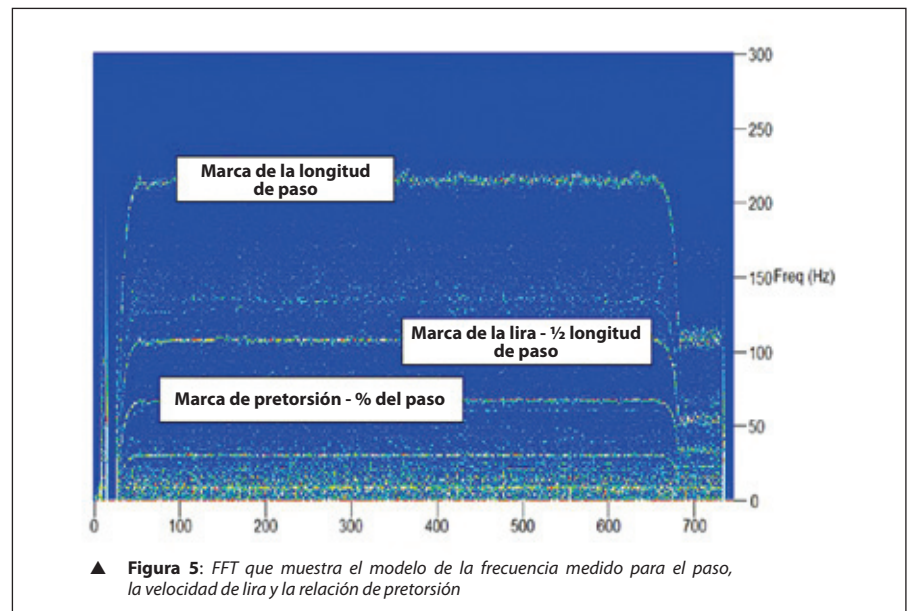
2.1.3 Análisis FFT de pasos de pares sueltos

La capacidad del equipo para tomar muestras a una alta velocidad de datos permite ver las variaciones del paso en una

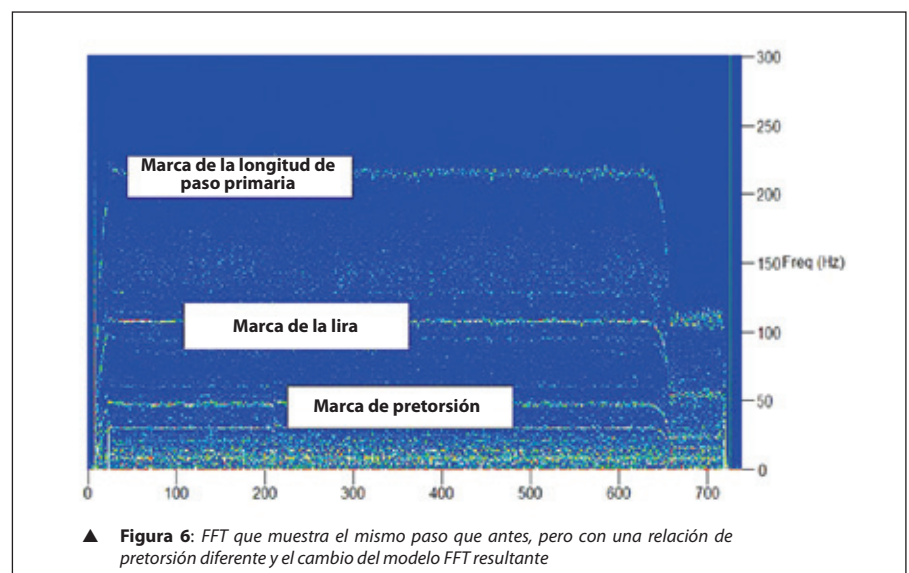
escala de medición de casi cada longitud de paso. Un resultado sorprendente fue que se detectaron otras marcas además de la marca de la longitud de paso primaria.

El análisis en cascada es un modo para detectar marcas de la frecuencia con el pasar del tiempo y visualizarlas en un formato comprensible. Por ejemplo, las visualizaciones en cascada se usan normalmente para la medición y la búsqueda de defectos SRL en líneas de extrusión primarias. Para este análisis se utilizaron instrumentos de análisis en cascada para capturar mejor la variación del paso del par a lo largo de la bobina.

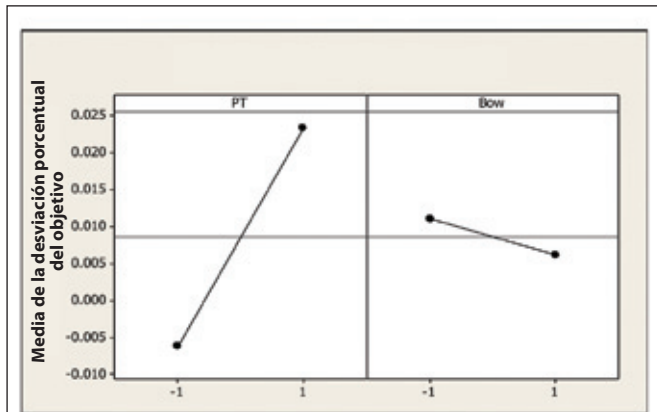
La *Figura 5* es un ejemplo de un análisis FFT en cascada, con el tiempo en el eje horizontal, la frecuencia en el eje vertical y el sombreado como eje "z", cuanto más claro es el color, más intensa es la marca de la frecuencia.



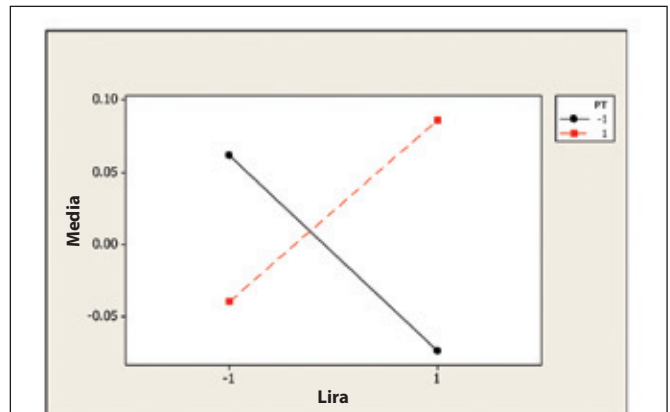
▲ **Figura 5:** FFT que muestra el modelo de la frecuencia medido para el paso, la velocidad de lira y la relación de pretorsión



▲ **Figura 6:** FFT que muestra el mismo paso que antes, pero con una relación de pretorsión diferente y el cambio del modelo FFT resultante



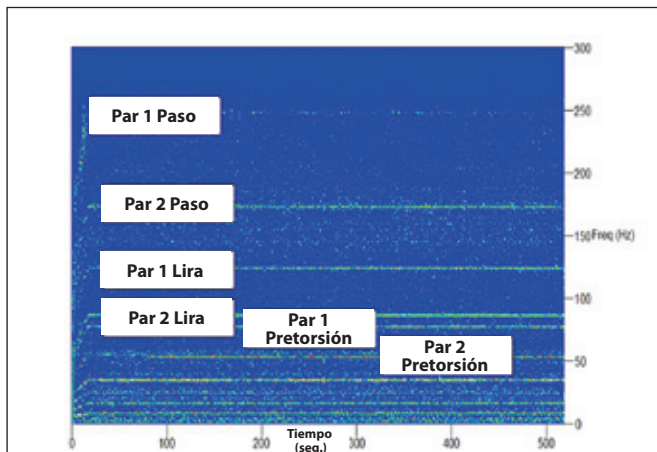
▲ **Figura 7:** Trazado de los efectos principales de valores de referencia y longitud de paso



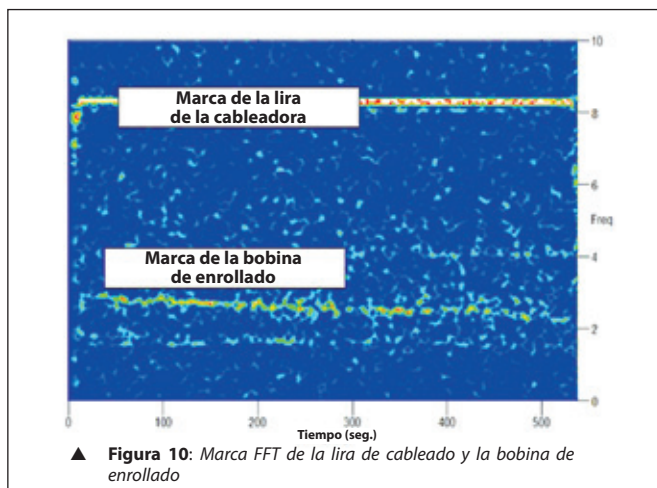
▲ **Figura 8:** Trazado de la interacción de valores de referencia y longitud de paso

Un resultado esperado era la marca de la frecuencia de la longitud de paso primaria. Un resultado sorprendente fue el contenido de las marcas adicionales encontradas en la cascada del análisis FFT. Se puede ver claramente la marca de las RPM de la lira de la pareadora (2x longitud de paso, 1/2 frecuencia) y de la pretorsión (% de pretorsión) aplicada al alambre antes del pareado. Hay también otras marcas inesperadas en la cascada de la FFT que indican otros modelos mecánicos del equipo de fabricación.

La *Figura 6* muestra la diferencia que se aprecia en el modelo FFT cuando se implementa un cambio de relación de pretorsión.



▲ **Figura 9:** FFT de la relación del par que muestra las marcas de ambos pares y otros efectos como el debido al equipo de cableado



▲ **Figura 10:** Marca FFT de la lira de cableado y la bobina de enrollado

En este diagrama, la marca del paso primario y de la velocidad de la lira son iguales a las de la *Figura 5*. Sin embargo, la marca de la pretorsión presenta una variación que es coherente con los cambios de los valores de referencia de la pareadora.

2.1.4 Correlación entre los valores de referencia de proceso y la longitud de paso nominal

Usando técnicas DOE con la longitud de paso nominal como dato final y una matriz 2x2 con valores de referencia de proceso como datos iniciales, se podría determinar la relación entre los valores de referencia y el paso nominal.

Los trazados de los efectos principales ilustrado en la *Figura 7* muestran que hay una estrecha correlación entre la relación de pretorsión y la longitud de paso. En cambio, la correlación no es tan estrecha con la velocidad de la lira.

Es interesante notar que también hay una señal de un efecto de la interacción de la velocidad de la lira con la relación de pretorsión sobre la longitud de paso, como se puede ver en el trazado de la interacción de la *Figura 8*.

Esto significa que la velocidad de la lira elegida determina el modo en que la relación de pretorsión afecta a la longitud de paso.

Nótese que la variación de la longitud de paso debida a la relación de pretorsión del proceso es, de todos modos, muy pequeña. Normalmente, podría no ser considerada significativa para las prestaciones de la diafonía. Sin reproducir la matriz de prueba, el significado estadístico de esta variación no puede ser determinado. Sin embargo, indica de alguna manera que puede haber algunas causas y efectos en esta relación.

2.2 Longitudes de paso del par en estudios sobre cableado

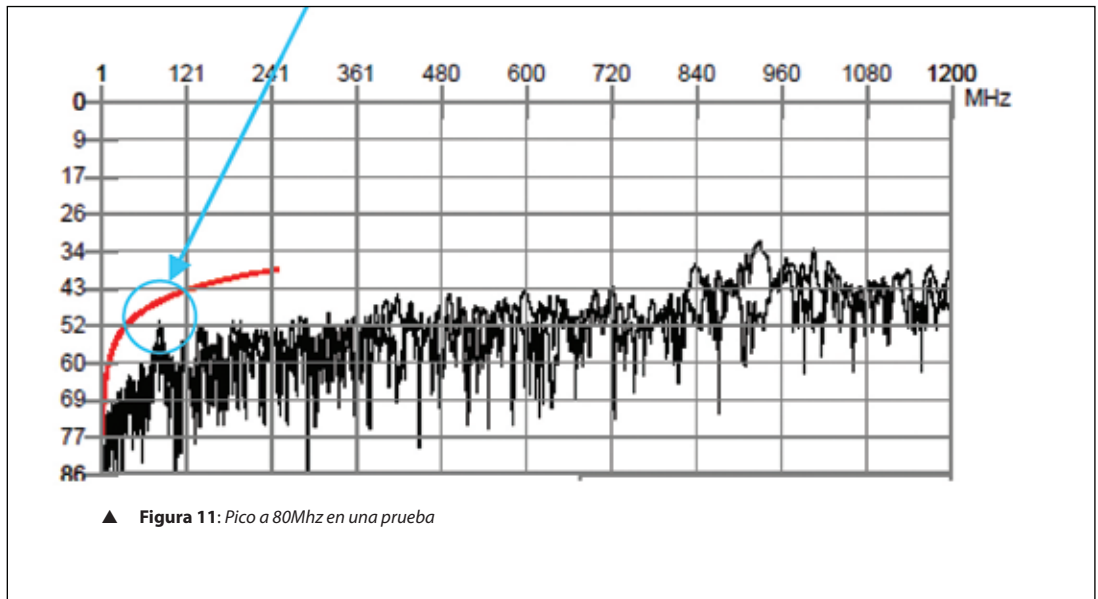
Era necesario ampliar los experimentos de las longitudes de paso del par en el proceso de cableado para confirmar los resultados anteriores de los pares sueltos y medir la longitud de paso de por lo menos dos pares sueltos elaborados al mismo tiempo durante un proceso de cableado.

Usando los valores de referencia de proceso descritos en la Sección 2.1.2, se preparó una matriz de prueba 2x2 simple para comparar las marcas de varios pares a determinados valores de referencia de la relación de pretorsión y de la velocidad de lira. Sólo dos pares del cable fueron pasados por la matriz de prueba 2x2, mientras que los otros dos pares fueron elaborados aplicando configuraciones de proceso constantes como valores de control. La interacción de la diafonía de los dos pares examinados fue el punto primario de interés, aunque se midieron también las interacciones con los pares de control.

Las mediciones de la paradiafonía (NEXT) fueron llevadas a una frecuencia de 1,2GHz.

2.2.1 Análisis FFT de las longitudes de paso de pares sueltos durante el cableado

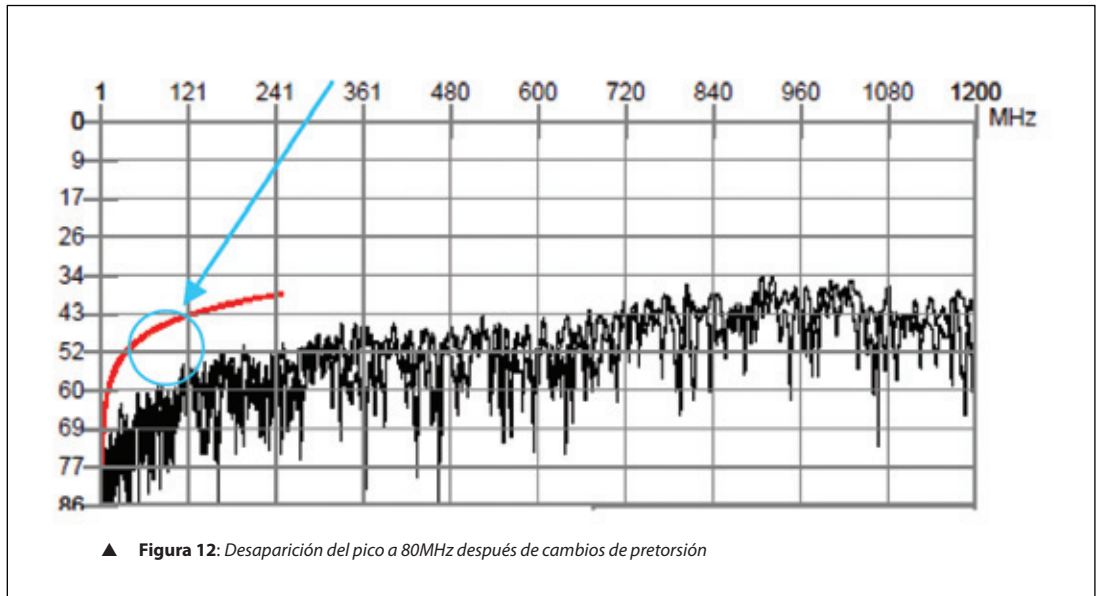
La forma de base de los trazados FFT era coherente con los resultados obtenidos en la estación de rebobinado descrita también en la Sección 2.1.3. En este caso, el análisis FFT se refiere a la relación de los dos pares medidos durante el cableado.



▲ Figura 11: Pico a 80Mhz en una prueba

El trazado FFT de la Figura 9 muestra las marcas de los dos pares en un solo trazado. Se pueden ver los componentes FFT citados para las longitudes de paso primarias, las velocidades de la lira de la pareadora y las relaciones de pretorsión en ambos pares.

Sin embargo, a frecuencias más bajas se observan otras marcas interesantes. El equipo de medición también es sensible a las variaciones mecánicas del equipo de fabricación.



▲ Figura 12: Desaparición del pico a 80MHz después de cambios de pretorsión

La Figura 10 muestra un componente fuerte que está relacionado con la lira de la cableadora. Se puede ver también una marca inclinada que puede estar relacionada con la rotación de la bobina de enrollado de la cableadora.

La inclinación es debida al aumento del diámetro del tambor de la bobina durante el funcionamiento, que reduce la velocidad de rotación de la bobina.

La velocidad de la lira de la cableadora es una señal extremadamente fuerte y constante que representa una medida del efecto en la lira de la cableadora a la velocidad de cableado a corto plazo.

Por lo que se refiere a la variación inducida por la cableadora, el par entrante en la cableadora tenía una variación de un 8% de pico a pico de la velocidad instantánea. Es probable que una buena parte de este

cambio de velocidad sea compensado por el alargamiento y la relajación a corto plazo del par.

2.2.2 Respuesta de la paradiafonía para varios valores de referencia de proceso

Como se dijo en la Sección 2.1.4, sin reproducir la matriz de prueba no se puede determinar el significado estadístico de las prestaciones. Sin embargo, se tomaron varias muestras durante la prueba para convalidar los resultados cualitativos indicados a continuación.

Se pueden apreciar varias diferencias en algunos de los valores de referencia principalmente en forma de picos en los trazados de la paradiafonía. En una combinación de la relación de pretorsión con la velocidad de lira se observa claramente un pico en el trazado de la

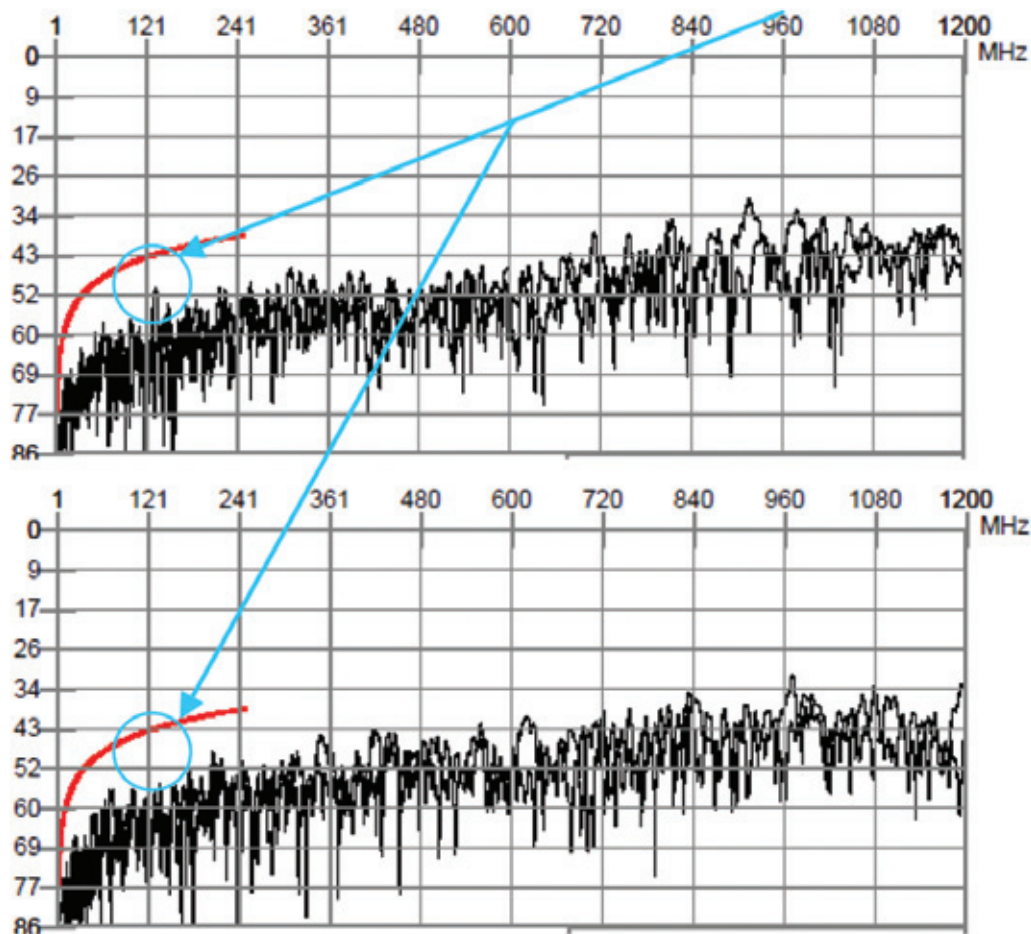
paradiafonía a 80MHz. Con sólo cambiar la relación de pretorsión de ambos pares, el tamaño de dicho pico disminuye o incluso desaparece.

En la configuración de velocidad de la lira contraria, el cambio de la relación de pretorsión presenta un efecto similar en un pico que se puede ver a aproximadamente 125MHz.

3 Conclusiones

Este estudio ha llevado a importantes conclusiones.

Se ha mostrado que la tecnología de medición a alta velocidad usada en este estudio ofrece un método repetible de alta precisión para medir la longitud de paso de pares trenzados.



▲ **Figura 13:** Disminución del pico a 125MHz después de cambios de pretorsión

El uso de esta técnica en tramos largos, junto con la recogida de datos en tiempo real de la velocidad del par, ayuda a comprender mejor la estabilidad y los modelos del proceso de pareado a través del análisis FFT.

Principalmente, se observaron marcas de variación del paso a la longitud de paso del par fundamental, a la velocidad de la lira de la pareadora y a la velocidad de pretorsión.

Los valores de longitud de paso nominal son influenciados por los cambios de los valores de referencia de proceso, en concreto, la relación de pretorsión y su interacción con la velocidad de la lira.

Cuantitativamente, son cambios relativamente pequeños. Pero hay una correlación entre los datos iniciales y las longitudes de paso que requieren otra convalidación más para tener significación estadística.

Se puede observar un impacto adicional y potencialmente más fuerte en la longitud de paso nominal entre distintos tipos de máquinas.

Los procesos sucesivos pueden añadir marcas de variación o tener un impacto en las mismas.

Esto fue evidente en la medición de los pares durante el cableado. Se notaron marcas adicionales para la velocidad de la lira de la cableadora y el diámetro de la bobina de enrollado.

Por último, y mucho más importante, en estos experimentos las prestaciones de la diafonía son influenciadas significativamente por los cambios de proceso.

Es necesario llevar a cabo un estudio de los cambios de los valores de longitud de paso y de los cambios en las marcas de variación para verificar cómo influye cada factor.

Es razonable suponer que hay otros datos de proceso iniciales que pueden influenciar la variación del paso porque se han encontrado otras marcas inexplicables durante el pareado y el cableado.

Su impacto en las características de diafonía sería objeto de mayor estudio. ■

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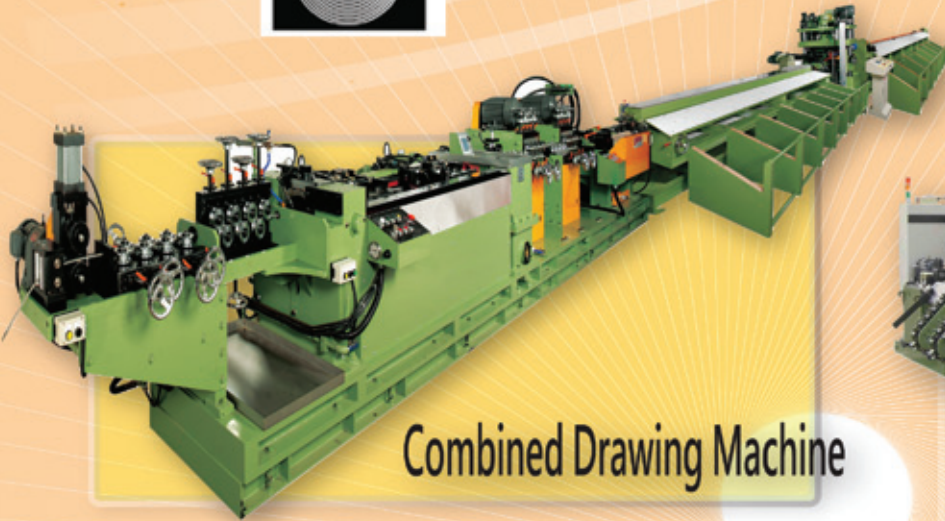
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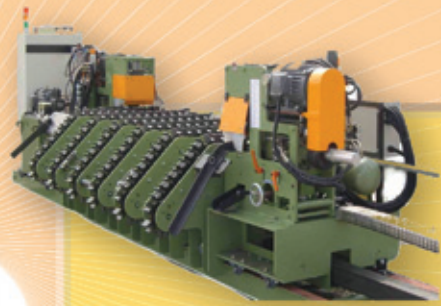
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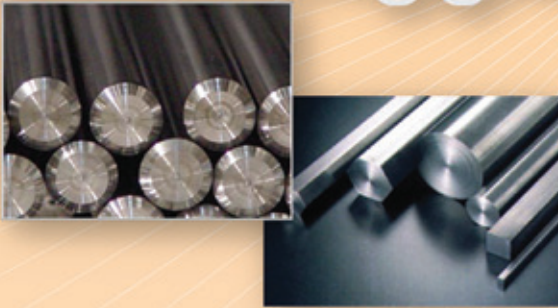


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