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Email: yujiazhen@kemaite.com

Web: www.kemaite.com

Germany

KEMAITE Material Technology GmbH

Wohlauer Str. 15 90475 Nürnberg

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铝箔（铜箔）聚酯复合带、铝箔（铜箔）聚丙烯复合带、铝箔聚氯乙烯复合带等产品具有良好的屏蔽绝缘效果，广泛应用于各类网络线、同轴电缆、机车电缆、医疗电缆及机器人电缆等领域。

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## LUBRITAPE系列

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The lubricating ALPET decreases the friction coefficient of aluminum surface or PET surface. It is used as the shielding layer for data cable and coaxial cable with significant performance of electricity and cost saving. We provide the pad and TW spool packing.

## FUSITAPE系列

自粘聚酯带、自粘铝箔（铜箔）聚酯复合带主要应用于平行对高速数据线、USB电线、极细同轴缆、柔性扁平电缆等领域，提供片状及轴装方式。

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The aluminum copolymer tape and copper copolymer tape are used for optical and telecom cable, HV cable and submarine cable. The performance of copolymer brings good bond strength and the laminate has good advantages for shielding and moisture barrier for the cable.

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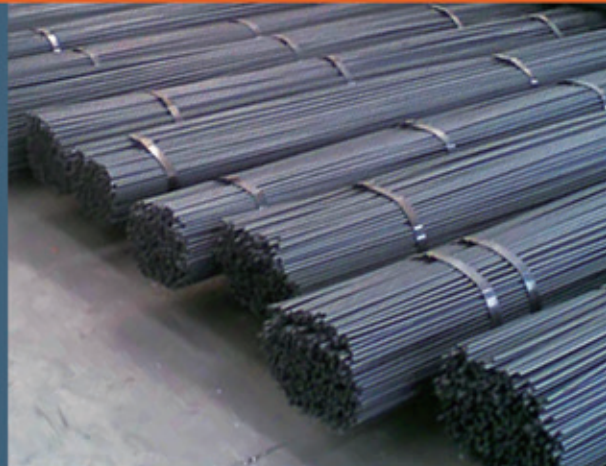




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**See page 80 for further details**

**EDITOR:** .....David Bell  
**FEATURES EDITOR (USA):** .....Dorothy Fabian  
**EDITORIAL ASSISTANT:** .....Christian Bradley  
**DESIGN/PRODUCTION:** .....Julie Tomlin  
**PRODUCTION:** .....Lisa Wright  
**SALES & MARKETING:** .....Jason Smith  
*(INTERNATIONAL)* *UK & ROW sales*  
*Giuliana Benedetto*  
*Italian speaking sales*  
*Linda Li*  
*Chinese speaking sales*

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**COORDINATOR:** .....Liz Hughes  
**ACCOUNTS MANAGER:** .....Julie Case  
**SUBSCRIPTIONS:** .....Julie Case  
**PUBLISHER:** .....Caroline Sullens  
**FOUNDER:** .....John C Hogg

#### INTRAS OFFICES

**EUROPE:** 46 Holly Walk, Leamington Spa  
 Warwickshire CV32 4HY, UK  
**Tel:** +44 1926 334137  
**Fax:** +44 1926 314755  
**Email:** eurowire@intras.co.uk  
**Website:** www.intras.co.uk  
**Website:** www.read-eurowire.com

**USA:** **ADVERTISING/MARKETING**  
 Intras USA – Doug Zirkle  
 Danbury Corporate Center,  
 107 Mill Plain Road,  
 Danbury, CT 06811, USA  
**Tel:** +1 203 794 0444  
**Email:** doug@intras.co.uk

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## Heading Stateside for Wire Expo 2016

Fresh from Düsseldorf and wire 2016, it is the turn of the USA to stage the next major exhibition, with Wire Expo taking centre stage in this issue of *EuroWire*.

Whether it's for education, networking or to cast your eyes over new developments, Wire Expo provides an ideal opportunity for the industry's professionals to gather under one roof in Uncasville, Connecticut, USA.

Organised by the Wire Association International, the three-day conference and exhibition also includes the 'Fundamentals of Wire Manufacturing' workshop, covering both ferrous and non-ferrous tracks.

The workshop is staged the day before the WAI Operations Summit and Wire Expo get underway, ensuring you miss nothing, whether you're a newcomer to the industry, or you are looking to brush up on the basics of wire manufacturing. Our coverage starts on page 38 and includes booth descriptions from some of the exhibitors.

In the other sections of this issue, Tenova LOI Thermoprocess are to be congratulated on claiming 12 new orders in the last 24 months in the heat treatment of wire rods and drawn wires part of the industry.

This includes companies from mainland Europe through to the Far East. You can read the full story on page 9.

There may not be a smooth path in working with companies in Iran since the lifting of sanctions, but more companies are looking to tap into the potentially enormous solar panel market there. See page 28.

New solutions for the high precision production of wire cut offs feature in our Technology News section, with Jouhsen-bündgens launching PrecisionCut UD2. See page 30 for more details.



David Bell  
Editor



A full-page background image featuring an astronaut in a white spacesuit floating in space. The astronaut is positioned diagonally, with their head towards the upper right. In the background, the large, reddish-orange surface of Mars is visible on the left, and a small, dark sphere (likely the Moon or another planet) is seen in the upper left. The rest of the background is a deep black space filled with stars.

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# Wire Expo

8<sup>th</sup> - 9<sup>th</sup> June

**Wire Expo** – trade exhibition –  
Uncasville, Connecticut, USA

**Organisers:** Wire Association  
International

**Fax:** +1 203 453 8384

**Email:** sales@wirenet.org

**Website:** www.wireexpo16.com

## dates for your diary ...

### 2016

#### June

16-18 June:

**Guangzhou Wire Fair** – trade  
exhibition – Guangzhou, China

**Organisers:** Julang Exhibition Co Ltd

**Fax:** +86 203 862 0790

**Email:** shanghai@julang.com.cn

**Website:** www.julang.com.cn

#### September

26-29 September:

**wire China** – trade exhibition –  
Shanghai, China

**Organisers:** SECRI and Messe  
Düsseldorf (Shanghai) Co Ltd

**Fax:** +86 216 169 8301

**Email:** shanghai@mdc.com.cn

**Website:** www.wirechina.net

#### October

2-5 October:

**IWCS** – technical symposium – Rhode  
Island, USA

**Tel:** +1 717 993 9500

**Email:** phudak@iwcs.org

**Website:** www.iwcs.org

5-7 October:

**wire India** – trade exhibition –  
Mumbai, India

**Organisers:**

Messe Düsseldorf India Pvt Ltd

**Fax:** +91 112 697 1746

**Email:** info@wire-india.com

**Website:** www.wire-india.com

25-29 October:

**EuroBLECH** – trade exhibition –  
Hanover, Germany

**Organisers:**

Mack Brooks Exhibitions Ltd

**Fax:** +44 1727 814 401

**Email:** info@euroblech.com

**Website:** www.euroblech.com

### 2017

#### March

23-25 March:

**TEL** – trade exhibition – Istanbul,  
Turkey

**Organisers:** Voli Fuar Hizmetleri

**Fax:** +90 212 604 5051

**Email:** info@voli.com.tr

**Website:** http://tel-fair.com



bigstockphoto.com "Mahegan Sun in Uncasville, Connecticut". Copyright: Sainanritu





▲ Bell-type annealing plant for wire rod and drawn wire

## Tenova LOI Thermprocess strengthens market position

A TOTAL of 12 new orders in 24 months underlines an impressive order intake track record for Tenova LOI Thermprocess in the segment of heat treatment of wire rods and drawn wires.

The orders include the supply, erection and commissioning of bell-type annealing plants for leading companies such as Aperam (France), Voestalpine Wire (Austria and Germany), POSCO (Korea), Daeho (Korea), Hyundai Special Steel (Korea), Norm Civata (Turkey), Saarlöh AG (Germany), Jindal South West Ltd (India) and ZDB (Czech Republic).

With a bidding-conversion rate of 80 per cent the experts of Tenova LOI Thermprocess convinced a global customer base also including a number of prestigious first-time customers.

The optimisation of the annealing base and the high-capacity impeller, which provides for annealing capacity increase, substantially reduces the specific consumption at the same time.

Additional centring devices at the annealing base ensure a longer lifetime of the inner cover baffle which is put down on the base during the annealing cycle.

Thanks to a newly developed base sealing profile a longer lifetime of these special sealings has been achieved, and larger tolerances in the field of the base flange/inner cover flange are compensated.

The high-performance JET-cooling hoods patented by LOI are used in all orders. Not only do they ensure short cooling times,

but additionally extremely low noise emission values.

All plants are equipped with a modern ProView® supervisory control computer system.

The bell-type annealing plants usually comprise fail-safe base control units of Siemens type S7-300F.

For the first time the fail-safe base control unit ATS-700F, which has been developed by Tenova LOI Thermprocess, is in application.

It complements the wide model range successfully used for more than 30 years.

**Tenova LOI Thermprocess – Germany**  
**Website:** [www.loi.de](http://www.loi.de)



## InnoVites solution to software



▲ The Emtelle Group site in the Netherlands

EMTELLE Group has successfully implemented cable design software CableBuilder and the enterprise software solution Cable ERP from InnoVites in its organisation.

With the CableSuite components CableBuilder and Cable ERP, Emtelle has streamlined its entire organisation from design to delivery and invoicing. With the implementation of Cable ERP, Emtelle has been able to optimise its material and resource utilisation using the Cable ERP Master Planning module. Material consumption information is collected online through the Manufacturing Execution (MES) module in Cable ERP.

The implementation of Cable ERP and

CableBuilder has enabled Emtelle to have more transparency across the operation.

Albert Groothedde, CEO of InnoVites, said: "We are excited to see how our software contributes to the optimisation of all business critical processes within Emtelle. We want to thank Emtelle for the confidence and commitment they have shown in our organisation and products during the implementation and we are looking forward to a close and long lasting cooperation."

Billy Rae, CTO from Emtelle Group, added: "Internally, Emtelle implemented Microsoft's Dynamics AX enterprise resourcing software with the InnoVites Cable solution.

"AX/InnoVites represents a broad, scalable

and robust method of managing the everyday operations of Emtelle including inventory, warehousing, transportation, supply and demand planning, materials requirements, production, quality lifecycle management and asset management.

"Emtelle operates in a marketplace where customers expect improvements in quality and reductions in price year on year, with faster delivery and constant innovation. Whilst we continued to improve on our quality system and monitoring in Europe, using Microsoft Dynamics AX along with the InnoVites ISV Layer will help Emtelle further deliver on this requirement."

**InnoVites BV – The Netherlands**

**Website:** [www.innovites.com](http://www.innovites.com)

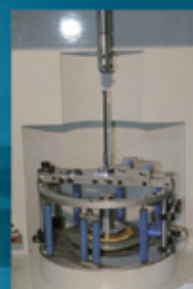
## PTFE Coaxial taping machine

*RBJ-Z series driven taping machine (vertical, horizontal) is the special equipment for producing communication cable, control cable, aircraft cable etc. This machine is specially suitable for small-tension, easily-stretching tape material, and it has the function of displaying tension change through the tension sensor.*

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*GSB-Z series heavy braider*

*WGSB series horizontal heavy braider*

*LRBJ series vertical taping machine*

*WRBJ series horizontal taping machine line*

*Extruding line*

*Pay-off and take-up*



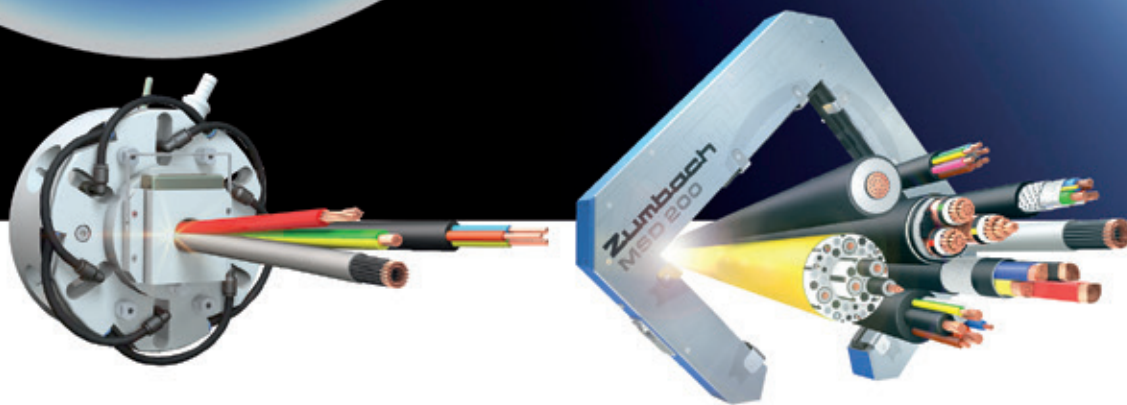
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## Power and ultra-broadband in the same cable

PRYSMIAN Group has launched its innovative solution to create integrated power-telecom networks. In its R&D laboratories, the group has developed a new cabling system able to bring power and ultra-broadband voice and data connection into homes.

The solution, developed in particular for power utilities, allows both power and an ultra-broadband digital connection up to 1 Gb/second to be delivered by the same cable.

"This is a very important innovation we're talking about, which represents an extremely effective and efficient solution to offer ultra-broadband connections to a number of users in certain areas, rapidly and at low cost," said Marcelo Andrade, R&D director at Prysmian Group.

"Since its creation, Prysmian has been one of the main players involved in the most important innovations in the cable industry, and we're now proud to offer the result of our efforts in a field that affects the quality of life of all of us."

The system consists of a cable for the transport of energy, within which fibre optics are inserted, and passive connectivity.

The system can also include an active electronic switch to allow transmission of information to the power cabinet and then to the substation, and a component to ensure the ultra-broadband connection.

There are many advantages of the integrated power-telecommunications system. Firstly, there is a strong reduction in network costs and implementation time, as trenching and civil works are reduced and potentially avoided.

Secondly, the system's performance can reach a connection speed of 1 Gb/sec or more, depending on the network configuration.

Prysmian produces around 30 million kilometres of optical fibre every year in the five centres of excellence in Italy, France, the Netherlands, North America

and Brazil. The group owns the only European technology for the production of optical fibre and is completing an investment plan of over €100m with the aim of further improving its competitiveness in the market.

It has also recently announced the construction of a new factory in Mexico for the production of optical cables.


"Prysmian's Douvrin factory is the largest factory for the production of optical fibre in Europe, and with our help, we believe Europe can boost its leadership in this strategic and highly technological sector," said Philippe Vanhille, executive vice president telecom business at Prysmian.

"We can offer Europe and the rest of the world our know-how and technologies for ultra-broadband cabling projects, like in Australia where we are helping bring faster and more reliable broadband to 90 per cent of fixed line customers."

**Prysmian Group – Italy**

**Website:** [www.prysmian.com](http://www.prysmian.com)

## Revolutionary by design



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## Innovative liquid antioxidant to improve productivity and reliability

ADDIVANT™, a polymer additive technologies company, has launched Lowinox® Fast XL, the next generation liquid antioxidant solution for the production of medium and high-voltage cross-linked polyethylene (XLPE) cables.

Developed to meet the challenges faced by the cable industry, Lowinox® Fast XL delivers new levels of productivity and cable consistency, helping lower the total cost of ownership for the cable industry.

Lowinox® Fast XL has been designed to provide an optimal balance between scorch protection and crosslinking speed to enable cable manufacturers to increase line speeds, improving productivity gains without compromising on the reliability and quality which is critical for cable longevity.

Manufactured in Germany, it meets all of the necessary quality and high cleanliness standards needed for today's medium, high and extra high voltage XLPE compounds.

John Steitz, Addivant's president and CEO, said: "We are very excited to add Lowinox® Fast XL to our strong portfolio of antioxidants and additives used in today's wire and cable industry."

The new solution builds on Addivant's reputation for technology and quality, with industry benchmarks such as Lowinox® TBM6, which has 40 years of proven success in the most demanding power cable applications.

"Lowinox® Fast XL has been extensively researched and tested, confirming that it overcomes the handling and consistency issues related to the use of conventional liquid antioxidants.

"Cable producers will see clear benefits in terms of higher throughput, lower costs through formulation optimisation and less off-grade production due to improved cable consistency."

To meet the growing demand for cables in the energy, ICT and transportation sectors, suppliers are increasingly asked to deliver systems which provide high reliability, cost effectiveness, safety and a minimised environmental impact.

Addivant is well positioned to help meet these challenges with a broad range of solutions, from high performance speciality antioxidants for insulation and semi-con, to metal deactivators and compatibilisers for HFFR cables.

**Addivant – USA**

**Website:** [www.addivant.com](http://www.addivant.com)



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## ACI's warning on LSF cables

WITH the terms LSF and LSHF often interchanged due to the misconception that they are acronyms for the same thing, the Approved Cables Initiative (ACI) is warning contractors and installers to be cautious of cable labelled or described as LSF as this does not mean "halogen-free".

The ACI believes that the two terms – LSF and LSHF – are routinely and sometimes deliberately misused, and contractors wanting to purchase halogen-free cable should look for LSHF (or manufacturers' equivalents) to ensure compliance.

LSF (Low Smoke and Fume) was developed nearly 40 years ago in response to a demand for a cable product that, if burned, offered lower hazard levels than existing PVC. Such materials were a first attempt to answer the call for cables which would give off lower amounts of acidic and corrosive gases in a fire, but these cables were not and are still not halogen free.

LSHF (Low Smoke Halogen-Free) materials have excellent flame resistance but, when affected by fire, have low emission of smoke and low emission of corrosive gases or have halogen-free materials. Such materials are not based on PVC.

In the UK, LSHF cables for fixed wiring applications are most commonly available to the following standards:

- BS EN 50525-3-41 – Single core wiring cables (although the standard does not include chemical tests for halogens specifically)
- BS 7211 – Flat wiring cables (only tested for pH and conductivity of smoke and not specifically for halogens)

- BS 6724 – Armoured 1kV cables (only tested for pH and conductivity of smoke and not specifically for halogens)
- BS 8573 – Non-armoured 1kV cables (only tested for pH and conductivity of smoke and not specifically for halogens)

The most relevant standards that cables might need to conform to in order to achieve LSHF rating are:

- BS EN 61034-2 (smoke emission)
- BS EN 60754-2 (pH and conductivity)
- BS EN 50525-1/BS EN 60754-1 (halogens)

BS 7671 (The Wiring Regulations) gives in Table 4A3 of the edition amended in 2015, a complete list of the specified standards with suitable cables for fixed wiring. All of these are either LSHF or PVC types. There are none that relate to the original concept of LSF.

To be sure of the correct cable choice where Low Smoke Halogen-Free is specified, the ACI is advising contractors and installers to:

- Check that your LSHF is genuinely halogen-free and is manufactured to the appropriate standard
- Avoid anything described as "Low Smoke and Fume" or just LSF
- Look for independent third party approval via bodies such as BASEC.

**Approved Cables Initiative – UK**  
**Website:** [www.aci.org.uk](http://www.aci.org.uk)

## Various Mesh Welding Machines

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**GSA-80L**

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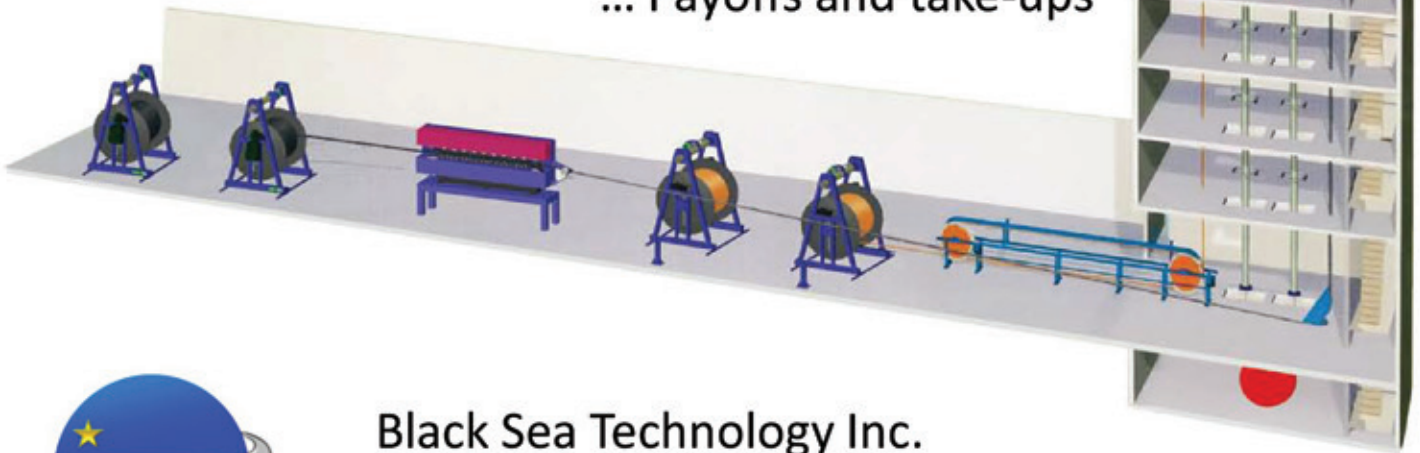


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## Website for merged company

FOLLOWING the merger of Freudenberg Nonwovens and Freudenberg Politec Nonwovens in 2015, Freudenberg Performance Materials has launched its new website.

The site provides comprehensive information on the company's full range of products, from technical textiles and how they are produced to information about the company. The user-friendly design makes it easy to search for content.

If visitors are looking for more detailed information on the manufacturing of technical textiles, for example, all it takes is one click on the 'Materials' menu button. "As a globally leading supplier of technical textiles and a pioneer in nonwovens technology, we are showing how we make our different materials for the first time. 3D graphics illustrate the processes very well," said Holger M Steingraeber, director global communications.

For the first time, the site also offers an overview of job opportunities at Freudenberg Performance Materials worldwide.

The design of the site conforms to the



▲ A screenshot of the new Freudenberg Performance Materials website

new Freudenberg brand. It is modern and clear, and has been designed for maximum ease of use. Among other features, the website is optimised for all mobile devices and every page and product group displays a direct link to the appropriate contact person. This will ensure fast response times.

The new website can be viewed in German and English. The company plans to create microsites on specific topics. Special individual pages will also be created for innovations like lithium-ion battery separators or for issues like sustainability that are particularly important to the company.

**Freudenberg Performance Materials – Germany**  
**Website:** [www.freudenberg-pm.com](http://www.freudenberg-pm.com)

## New regional sales manager

S&E Specialty Polymers LLC, a producer of speciality plastic compounds, has expanded its sales department with the hiring of Mark Garretson as regional sales manager.

Based in Kathleen, Florida, USA, Mr Garretson will primarily represent S&E in the Southeast but will also sell to his extensive network of contacts throughout the USA and Canada.

Well known in the plastics and wire and cable industries, he has over 40 years of experience in plastics compounding.

Most recently he was managing director for Flynn-Garretson Associated Companies LLC, where he represented numerous manufacturing and supply partners.

Prior to that he was national account manager for Mexichem/Bayshore, and manager sales and marketing for Spartech Corporation, Kearny.

**S & E Specialty Polymers – USA**  
**Website:** [www.sespolymers.com](http://www.sespolymers.com)

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## Strengthening management team

CRAIG Rika has joined the management team at drawing die and tooling manufacturer Bar Products & Services Ltd, based in the UK.

Craig is the son of the current chairman and managing director, Steven Rika.

He is re-joining the company after spending his formative years as a professional sportsman, having played cricket, rugby union and rugby league all at professional level.

He worked for the company on a part-time basis in between his sporting

commitments. He then fulfilled his teenage ambition of becoming a police officer, a role he undertook for 15 years before returning to the family business to work with his brother-in-law, Glenn Rika-Rayne.

His appointment will allow Steven Rika to concentrate on future developments.

**BAR Products and Services – UK**  
**Website:**

[www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Craig Rika

## New agency

Wire and Cable Consulting LLC is a newly formed agency established by Thomas J Rosen to serve wire and cable manufacturers as well as industry suppliers in North America and Europe.

According to Mr Rosen, services will include market and business development, strategic advising, and sales representation with select companies in the industry. The firm is currently aligning with principals and industry partners and plans to launch a website soon. Mr Rosen has nearly 40 years of industry expertise involving senior level account and market development, new product development, and supply chain management.

He is currently president of the board of Wire and Cable Manufacturers Alliance (WCMA) and a lifetime member of the Wire Association International. He has published an article on micro-diameter tubing for medical applications, and was a leader of a team that achieved an award for one billion feet of defect-free wire from Tyco Thermal Control.

**Wire and Cable Consulting LLC – USA**  
**Email:** [www.rosen.tjr817@gmail.com](mailto:www.rosen.tjr817@gmail.com)

## On board!

Bruno Fankhauser became a member of Leoni AG's management board on 1<sup>st</sup> February.

The supervisory board of the European provider of cables and cable systems to the automotive sector and other industries has assigned responsibility for its wire and cable solutions division (WCS) to the Swiss national, who has been with the group for ten years.

**Leoni AG – Germany**  
**Website:** [www.leoni.com](http://www.leoni.com)

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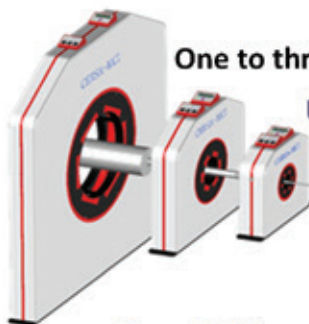
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## Clean bill of health



▲ The new purpose-built Class 7 clean room at William Hughes' UK headquarters

SINCE William Hughes, a specialist manufacturer of springs and wire components, acquired AC Services in the summer of 2015, the company has been busy establishing an 80m<sup>2</sup> high-specification clean room at its Stalbridge, Dorset, UK, headquarters.

Rated at Class 7 in accordance with ISO 14644-1, this advanced sub-contract facility is now open. It is already being used by some of the best-known manufacturers in sectors such as aerospace and hydraulics for the cleaning of small batch, precision machined and fabricated parts to meticulous standards.

"From the outset we wanted to create a facility featuring the latest, modular clean room technologies and furniture," said special processes manager Shaun Tattershall. "We have adopted the previous solvent and aqueous cleaning systems – both of which offer ultrasonic capability – used by AC Services, but pretty much everything else is new."

This includes high-grade stainless steel furniture that is designed to help minimise particulate levels. What is more, the open plan clean room has been designed for optimum product flow based on the latest lean manufacturing methodologies.

It will thus prove ideal for any company looking to sub-contract its cleaning requirements, not just from the aerospace and hydraulics industries, but also defence, nuclear, medical, electronics and oil and gas.

The new clean room, which incorporates an inspection dark room so that parts can be viewed under ultra-violet light, is already being used for oxygen-related cleaning applications, predominantly for aerospace giant Honeywell.

Typically, these comprise high-precision machined components, springs and other parts that go into oxygen equipment

such as breathing apparatus, facemasks and ducting. These parts, some of which are also used in liquid oxygen (LOX) systems, are cleaned using approved cleaning solvents and solutions.

"The existing class room specification for these products is ISO Class 8, so our ISO Class 7 facility is more than suitable – it's the equivalent of a Class 10,000 cleanroom using the Federal Standard 209E," added Mr Tattershall.

It is also worth noting that William Hughes can offer in-house cleaning verification capabilities. Here, samples are taken from batches that have been cleaned. The samples are rinsed with filtered, deionised water over a 0.45µm filter membrane.

Any particulates captured are both counted and examined under a microscope. As a result, customers are assured that their components will always meet the specified particulate count.

This confidence is vital, as a contaminated system component/assembly could result in a chemical reaction, an explosion and/or a total system or device failure.

"We take the utmost care with customer parts and ensure that all cleaning is compatible with the component being processed," added Mr Tattershall. "Cleaned items are placed into hermetically sealed bags that will not be opened again until required for further processing, such as assembly."

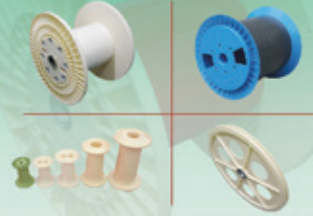
The solvent and aqueous cleaning systems within the new facility at William Hughes can accommodate precision parts up to 300 by 200mm in size. Along with metallic parts, materials such as rubbers or plastics (or a combination of these with metal) can also be cleaned.

**William Hughes Ltd – UK**  
**Website:** [www.wmhughes.co.uk](http://www.wmhughes.co.uk)

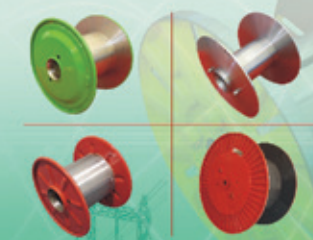
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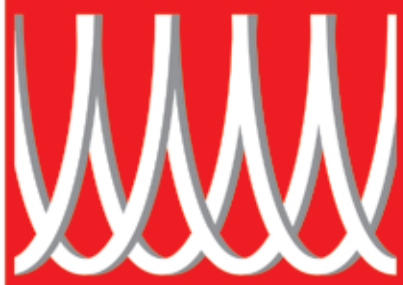
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## Distinctive and new for high quality

AS a result of the time and effort dedicated by its scientists and researchers at Repsol Technology Centre to develop the production of silane crosslinkable polyethylene grades, the company now has a new facility at its Puertollano petrochemical complex for this technique.

The compounds are produced by grafting silane into the molecular structure of low-density polyethylene (LDPE) manufactured by Repsol. Subsequently, this compound can be extruded and crosslinked during the wire coating process, creating multiple net-like intermolecular bonds, that are claimed to offer extraordinary electrical insulation performance and great resistance to high temperature and abrasion.

These new Repsol GridEffect grades are distinctive for their high quality and consistency, making them a suitable basis raw material in the development of special formulations for flame retardant or oil resistant cables, among others.

In addition, the new Repsol GridEffect PSIL210 grade, the first of this range to be marketed, stands out because its molecular structure has been specially designed to enable cross-linking at room temperature. This ability offers the cable manufacturer the possibility to obtain energy savings in addition to considerably simplifying the process.

The resulting knowledge gained during the years researching this technology has provided Repsol with the capacity to develop a whole new range of grades for different cable applications, some of which are already included in the company portfolio and will be launched soon.

### Repsol – Spain

Website: [www.chemicals.repsol.com](http://www.chemicals.repsol.com)

## New global sales manager

Steven Bates has been appointed new global sales manager at Electron Beam Technologies.

Utilising his extensive background and expertise in wire and cable markets, Mr Bates will expand and strengthen Electron Beam's global presence through new and existing business relationships, markets, and other opportunities.



▲ Steven Bates

Previously employed by Electrical Components Int, Draka and International Wire Group, Mr Bates brings a variety of electrical and electronics sales experience to Electron Beam. He has a BA degree from Michigan State University and is fluent in English, German and Spanish.

Electron Beam Technologies manufactures a wide variety of welding products and OEM speciality electron beam cross-linked cables for industry.

### Electron Beam Technologies Inc – USA

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# Transatlantic Cable

## Manufacturing

▶ China the avaricious job-eater, a theme on the US presidential campaign trail, is a figment of the candidates' imaginations

"They're stealing our jobs; they're beating us in everything; they're winning, we're losing."

The "they" here is China; and, according to Jeffrey Rothfeder of the *New Yorker*, the sentiments are a fair summary of views held by presidential hopeful Donald J Trump. Not only have these struck a chord with many Americans; they have also, wrote Mr Rothfeder, resonated so well that other aspirants to the White House have "have felt compelled to demonstrate a properly high level of indignation toward China's economic prowess."

In particular, the notion of a flourishing Chinese manufacturing industry, grown fat at the expense of struggling US workers, has weight with unemployed and underemployed Americans – including many who were pink-slipped during the 2007-2009 recession. But is it warranted? Mr Rothfeder, who thinks not, marshalled some facts in aid of a more accurate analysis. ("Why Donald Trump Is Wrong About Manufacturing Jobs and China," 14<sup>th</sup> March)

Among the strong indications that global manufacturing is trending positive for the USA, the *New Yorker* contributor noted the following:

- ▶ Factory jobs are on the rise in North America; and many of these new jobs are coming back from China, which in fact is straining to maintain its manufacturing capacity. Since March 2010, when manufacturing employment in the USA hit a bottom of 11.45 million jobs, nearly a million new factory positions have been created, most of them in the Southern states – particularly North Carolina, South Carolina and Tennessee.

Better still, wrote Mr Rothfeder: "The jobs are typically good ones. Across that same five-year period, average hourly manufacturing wages have increased over ten per cent, to more than \$20. On the whole, US manufacturing, as measured by the Purchasing Managers' Index, has steadily expanded."

- ▶ Meanwhile, according to New York-based Quanton Data, which tracks global job postings by industry, open manufacturing positions in China have been dropping steadily since 2012, and are down nearly six per cent in

that time. In January, the country's Ministry of Commerce reported that factory activity had contracted for six months, falling to a three-year low.

In addition, foreign direct investment in Chinese manufacturing was flat for all of 2015, while China's balance of trade with the USA barely budged – despite the strong dollar. Moreover, China's exports tumbled in February by 25 per cent, after falling 11 per cent in January.

To Mr Rothfeder, the picture that emerges from these statistics is much more nuanced than the one the presidential candidates are presenting. "It reveals China to be something less than a rapacious economic winner," he wrote, "and the US to be enjoying an industrial resurgence that seemed unimaginable a decade ago."

What is perhaps the biggest impetus to American manufacturing? Mr Rothfeder identified this as the move toward "reshoring," and again collected some persuasive numbers:

- ▶ In recent years, companies have increasingly been bringing manufacturing jobs back to the USA from China and elsewhere. The practice received a big boost in 2012 with General Electric's announcement that it was investing \$1 billion in an appliance plant in Louisville, Kentucky. The plant would reshore 4,000 jobs that had been moved to China and Mexico and add, over time, nearly 20,000 factory positions at the plant's regional suppliers.
- ▶ Reversals like this are apparently part of a broader trend. According to data provided to Mr Rothfeder by the Reshoring Initiative, over the past five years some 100,000 manufacturing jobs have returned to the USA from overseas, 60 per cent of them from China. If new US plants opened by companies headquartered elsewhere (ie foreign direct investment in manufacturing) are included, the total jumps to 250,000. An additional 50,000 jobs were saved when companies that had planned to go offshore changed their minds.

Harry Moser, the president of the Chicago-based non-profit trade organisation, told the *New Yorker* that, since 2007, the annual increase in the number of American companies offshoring has dropped from six per cent to 2.5 per cent; and that, over the past couple of years, for every new job offered by US companies overseas one had been reshored.

A strong attraction for these firms is the quality of the USA workforce – its productivity and easy familiarity with lean-factory principles – as well as its ability to adapt quickly to changes in domestic consumer demand.

# Transatlantic cable

- Meanwhile, hourly manufacturing wages in China rose about 12 per cent a year, on average, between 2000 and 2013, much reducing the traditional Chinese advantage in labour costs. With the ready availability of inexpensive oil and natural gas in the USA, the average cost of production there is now only five per cent higher than in China, according to a Boston Consulting Group report cited by Mr Rothfeder. For most businesses, he wrote, "the calculus in favour of reshoring or maintaining existing US operations is obvious."
- All the "campaign-trail bluster" about winning back jobs from China is the more repellent to Mr Rothfeder for the appeal it holds for the many blue-collar American workers whose manufacturing universe has been altered beyond recognition by technology and globalisation. Their former jobs are gone forever.

For those seeking one very big job – the presidency of the United States – he observed, "saying 'China' over and over is far easier than understanding the relationship between its economy and ours."

Manufacturers in various places are preparing to ride a new old friend – the bicycle – to a potentially lucrative market

The bicycle industry worldwide was worth \$48 billion in 2014, driven by the sale of some 133 million bikes. It is expected to reach an estimated \$65 billion by 2019 on the back of rising fuel prices and growing traffic congestion. These statistics, supplied by the Adelaide-based news service *The Lead South Australia*, are significant well beyond the region that has hosted

the big cycling race Tour Down Under since 1999, producing champion riders including Rohan Dennis, Stuart O'Grady and Jack Bobridge. But they have particular resonance locally, where General Motors Holden's car manufacturing plant in Adelaide will close next year with a loss of thousands of jobs: at the plant but also at component manufacturers that have supplied it for decades.

As South Australia's traditional car making sector winds down, a high-end bike manufacturing industry is breaking out ahead of that trend. *The Lead's* Caleb Radford reported on companies that are taking advantage of the state's industrial strength and access to university testing facilities to produce brands that can command \$3,500 for a wheelset. ("Bicycle Manufacturing on Rise as Cars Take Back Seat," 2<sup>nd</sup> March). Custom-made titanium bicycles from Astir Frames are assembled in Adelaide from imported parts. Founder James Moros said the decline of the automotive industry was opening doors for him. "If there are factory machines that are idle, I'll ask to use them," he told Mr Radford. "I'm not scavenging. I'm utilising available equipment that other people aren't using at the time." Another company finding success in South Australia is Bouwmeester Composites, which makes high-performance carbon fibre wheels for off-road racing bikes. Founder and CEO Mello Bouwmeester brought the composites work to Adelaide after previously manufacturing overseas.

Finch Composites, which is testing a prototype carbon wheel equipped with disc brakes for racing bikes, is looking to partner with auto parts suppliers suddenly open to new business opportunities. Co-founder Ben Tripodi said that, for the present, the Adelaide-based company is concentrating on local business. But, he told *The Lead*, "We do really want to target the American market."



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# Transatlantic cable

- In the USA, Ford Motor Co is carving out a speciality within a speciality: a bicycle device for people who do not have full use of their legs. The carmaker has taken out a patent for an automatic kickstand, described as a "telescopically deployed support arm," that would mean cyclists would never need to put their feet down. As reported on CNBC.com (1<sup>st</sup> March), a disabled cyclist noted that the Ford kickstand could also benefit the elderly and others with balancing problems while stationary, who now depend on adult tricycles. "Trikes" are an increasingly common sight in retirement communities.

Ford's application to the US Patent Office says its automatic device could help as well with problems encountered by able-bodied cyclists. For example, it reads, "A shoelace can get tangled on a pedal shaft or a foot can get stuck in a toe clip, causing the rider along with the bicycle to fall to the ground."

- Two British companies have teamed up to create the world's first 3D-printed titanium bike frame. Renishaw, a Gloucestershire manufacturer of additives, joined forces with Empire Cycles (Lancashire) to build the titanium MX-6 Evo mountain bike. Empire already offers a production aluminium version of the MX-6.

As reported by Ben Coxworth of the technology site *Gizmag* (8<sup>th</sup> February), the frame was built using a laser-melting machine manufactured by Renishaw. A high-power ytterbium fibre laser selectively fused particles of a titanium alloy powder. Layers of the fused-together particles were then built up to form the finished sections of the frame. The sections were bonded together with an adhesive. At three pounds the finished Evo frame was reported as weighing 33 per cent less than an aluminium counterpart, for a very

high strength-to-weight ratio. When its seatpost bracket was tested, it reportedly exceeded the EN 14766 mountain bike strength standard by six times.

## Steel

### Anti-dumping action gives USA steel producers a boost – and additional help appears to be on the way

For the second time this year, the USA issued preliminary duty orders on foreign steel producers following its determination of unfair pricing on their cold-rolled steel sold in the United States.

On 1<sup>st</sup> March, the Department of Commerce (DOC) imposed tariffs of 266 per cent on those imports from China, with lesser penalties on product from Japan (71 per cent), Brazil (39 per cent), India, Korea, Russia and the United Kingdom. After the announcement, AK Steel (West Chester, Ohio) led a domestic steelmaker rally, surging 7.2 per cent to a seven-month high while shares in Pittsburgh-based US Steel Corp (USS) climbed 6.6 per cent. But according to John Morgan, a contributor to the investment newsletter *Seeking Alpha*, they are only the first of the USA producers set for "a renaissance of sorts" as a result of the anti-dumping duties.

In Mr Morgan's view, with the domestic steel companies already trimmed down by extensive cost retrenchments and plant closings, the entire "lumbering" USA industry stands to benefit. Accorded relief from a surge of imports that helped push down domestic prices to six-year lows, the steelmakers should see improvement in their negative operating margins; their heavy debts should ease. The optimism seems justified. According to the United Steelworkers union, foreign producers captured an estimated one-third of the US steel market in 2015. The gains of the domestic producers – newly and suddenly competitive – could be impressive.

And Mr Morgan noted that more anti-dumping protection is in the wings. Even as the duties on cold-rolled steel were imposed, a second steel trade case pending with the DOC alleges dumping of hot-rolled steel by some of the same nations, with a final determination expected in late May. Yet a third case alleges subsidisation and dumping of corrosion-resistant steel onto the American market by foreign producers, also with a decision set for May. ("It's Not Too Late to Shop for a Basket of Steel," 9<sup>th</sup> March)

- In addition to USS and AK Steel, likely gainers mentioned by *Seeking Alpha* include Steel Dynamics (Fort Wayne, Indiana); Schnitzer Steel (Portland, Oregon); and Cliffs Natural Resources – not in fact a steel producer but a Cleveland, Ohio-based supplier of iron ore pellets to the North American steel industry. Steel Dynamics will be bolstered by its emphasis on sales to the busy housing and construction industries. As for Schnitzer, a recycler of scrap metal, the disappearance of low-priced foreign steel should mean a real boost to margins and customer demand. While AK Steel should continue benefiting from its emphasis on sales to the strong automotive market, USS may see shrinking gains because of its heavier reliance on business from ailing energy drillers and its larger percentage of sales in Europe.

- In another hopeful sign for the domestic industry noted by Mr Morgan, in mid-March hot-rolled sheet prices in the USA had apparently reversed their decline from a recent bottom of \$340 per ton.



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# Transatlantic cable

## Telecommunications

▶ The US embargo still in place against Iran disrupts the global supply chain of a major Chinese telecom equipment company

"ZTE, China's largest listed telecommunications equipment manufacturer, could face severe component supply problems from this month, based on a reported plan by the US government to slap export restrictions on the company for alleged violations of longstanding American trade sanctions on Iran."

Writing in the *South China Morning Post* for 7<sup>th</sup> March, Bien Perez anticipated by a scant day the US action against Zhongxing Telecommunications Equipment Corp (Shenzhen, China). Effective 8<sup>th</sup> March, the Bureau of Industry and Security (BIS) of the Department of Commerce added the company and two of its affiliates – one in China, one Iran-based – to the BIS Entity List.

The USA imposes export restrictions and licence requirements on those on its list, effectively restricting their access to items of US-origin and some others. The curbs apply to any company worldwide that wants to ship American-made products to ZTE in China. ("ZTE Faces US Export Restrictions Over Iran Surveillance System Deal," 7<sup>th</sup> March)

The action against ZTE was taken under a US embargo on trade with Iran imposed in response to the seizure of the American embassy in Tehran in 1979. Its export controls and sanctions are separate from the international sanctions imposed on Iran over its nuclear programme in 2006 and lifted in January 2016.

As reported by the legal issues site *JDSupra*, BIS investigators claim to have obtained internal ZTE documents that provide an overview of US export-control rules and describe the risks for ZTE in doing business in sanctioned countries – as well as recommendations for circumventing them. BIS alleges that ZTE set up shell companies in order to conceal the company's role in transactions with Iran.

According to *JDSupra*, BIS cites one document noting that "the biggest advantage [of this model] is that it is more effective, [making it] harder for the US Government to trace it or investigate the real flow of the controlled commodities."

BIS "took the unusual step" of making public these materials, marked Top Secret and Highly Confidential by ZTE. ("US Export Controls Restrictions Imposed on Chinese Telecommunications Giant ZTE," 11<sup>th</sup> March)

ZTE Corp is the world's fifth-largest telecom equipment and systems company, behind only Ericsson, Huawei, Alcatel-Lucent and Nokia Siemens. In laying out the ramifications of the BIS designation, given ZTE's market position, *JDSupra* said it expects wide-ranging repercussions on customers and companies throughout the global telecom supply chain. According to the *Wall Street Journal*, ZTE sold nearly 50 million smartphones worldwide in 2015. Bloomberg reported that ZTE depends on American suppliers for 43 per cent of the inputs for the handsets and networking equipment it makes in China, procuring American goods worth more than \$450 million per quarter.

Following the announcement of the BIS action against ZTE, China's Ministry of Commerce issued a public statement expressing its "strong dissatisfaction and objection" to the USA export restrictions.

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# Transatlantic cable

- The effects were not long in being felt by ZTE. On 16<sup>th</sup> March, *Reuters* in Shanghai reported that the Chinese company would delay publication of its annual results.

ZTE said in a filing to the Hong Kong stock exchange that it took the action "pending a thorough self-assessment on the potential impacts of the measures on the business and operation of the group."

The annual board meeting was likewise postponed, and the 7<sup>th</sup> March suspension of ZTE's Hong Kong-listed shares – which had dropped 20 per cent since the New Year – was continued. ZTE in January had posted preliminary net profit for 2015 of \$583 million, a 43.5 per cent rise from 2014.

*Reuters* also reported that, after the failure of a costly lobbying effort to allay concerns about the firm, ZTE intended to appeal the USA export restrictions.

## Energy

German companies are set to tap a potentially enormous solar panel market in Iran, where the sun shines 300 days a year

Even with the lifting of international economic sanctions against Iran, not every company seeking to exploit the new potential has a smooth path. But German makers of solar panels have friends in high places helping them to seize the moment. As noted by Brian Parkin of *BloombergBusiness*, the government of Chancellor Angela Merkel is mobilising. Economy and Energy Minister Sigmar Gabriel was to travel to Tehran on 2<sup>nd</sup> May, at the head of a large German economic delegation, and solar would figure prominently in his pitch to the Iranians.

Mr Gabriel would be bolstered by a 134-page government-commissioned report from the Berlin-based industry group BSW Solar and paid for by Germany's Foreign Office. It found that German companies are considered among the most trustworthy in Iran. Given Iran's reinstatement of 20-year power purchase agreements and its setting of feed-in-tariffs at "highly profitable" rates of \$0.33 per kilowatt-hour, German solar firms are seen to have a "huge" sales opportunity.

"The political will in Iran to realise success in this market is abundantly clear," wrote Jörg Mayer, report author and head of BSW, which collaborated with the Tehran-based Iran-Wind Group on data collection. "What counts now for German firms is the speed and determination to build business relations" with Iran. ("Made in Germany" Means Money for Solar Panel Makers Eyeing Iran," 4<sup>th</sup> March)

Germany is already Iran's largest European trading partner, with a shared history of four centuries of trade. While their commercial ties frayed in the decade of nuclear sanctions against Iran, business between the two countries has begun to return. And renewable energy bulks large in the thinking of the president Iran installed in 2013, Hassan Rouhani. Iranian plants yielded just 150 megawatts of clean power last year.

Mr Parkin reported that the Rouhani government wants to lift installed renewable energy capacity to 5 gigawatts by 2020, equal to about five per cent of Iranian annual power generation.

He noted further that some 80 per cent of Iran's territory, which experiences 300 days a year of sunshine, is deemed by BSW to be especially suited to solar power.

"In many cases, it's cheaper and easier to install than other renewable technologies," M M Warburg analyst Arash Roshan Zamir told *Bloomberg*. There is, he said, "massive potential for solar."

- Elsewhere in Iran's solar initiative, the country is seeking investors for the creation of a polysilicon industry of its own, to exploit its large reserves of this important element in solar photovoltaics. The BSW report observed that most solar panels currently in service in Iran are Chinese-made.

According to the Solar Energy Industries Association (SEIA), tax incentives and price reductions will support an estimated 119 per cent increase in solar installations in the USA in 2016. Congress has extended a 30 per cent federal Investment Tax Credit (ITC) for all types of solar projects through to 2019, and the price of solar panels has dropped by 67 per cent since 2010. Taken together, Washington DC-based SEIA believes these factors could make solar an increasingly attractive option for businesses and homeowners, and foresees growing demand in commercial and residential markets. This year, SEIA said on 9<sup>th</sup> March, utility-scale customers will account for 74 per cent of solar installations.

Currently, solar power supplies one per cent of American energy needs. By 2020, SEIA predicts, solar will account for 3.5 per cent of the nation's power output. For this and its other projections, the trade group relies on research conducted jointly with Boston-based GTM Research. Calling the 119 per cent growth projected by SEIA "staggering," Barbara Vergetis Lundin of *Smart Grid News* (10<sup>th</sup> March) obviously concurs in the trade group's view of 2016 as "a banner year" for the USA solar market. Some 16 gigawatts of solar will be installed in the country in 2016 – more than double the 7.3 GW installed in 2015, itself a record-breaking year for solar.

On the non-residential side, the projection is for photovoltaics (PV) demand to be supported "by a triple-digit-megawatt pipeline of community solar projects," wrote Ms Vergetis Lundin. Colorado, Massachusetts and Minnesota will collectively install more than 100 MW of community solar this year. Looking ahead to 2017, the residential and non-residential PV markets are both seen as growing year-over-year. But the SEIA report cautions that US solar can be expected to drop on an annual basis due to a pull-in of utility PV demand this year.

"As the double-digit-gigawatt utility PV pipeline is built out in 2016, utility solar is expected to experience a reset in 2017," said Cory Honeyman of GTM Research, noting that the market will shrink to a still-impressive 10 gigawatts. But, between 2018 and 2020, the senior analyst expects the extension of the ITC to reboot market growth for utility PV and support continued growth in distributed solar as a growing number of states reach grid parity.

- By 2021, GTM Research expects the American solar market to surpass 100 cumulative gigawatts, with an annual install rate of 20GW or more. "This is a new energy paradigm," SEIA president and CEO Rhone Resch told *Smart Grid News*. "The solar industry officially has a seat at the table with the largest energy producers."

Ms Vergetis Lundin would presumably not argue with this. An article of hers in the same journal (26<sup>th</sup> January) was entitled, "No More Niche: Is Solar the Next Uber?"

**Dorothy Fabian**  
USA Editor





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▲ The PrecisionCut MJC9 from Jouhsen-bündgens

## Precision and high speed

JOUHSEN-BÜNDGENS has launched new solutions for the high-precision production of wire cut offs. The PrecisionCut UD2 with a flexible modular system as well as the PrecisionCut MJC9 for precise short cut offs enable a more economical production for wire users due to high processing speeds and short changeover times.

The straightening and cutting machine PrecisionCut UD2 is designed as a flexible modular system. The possibility to use different sizes of straighteners on one machine warrants short changeover times for a wide range of applications. As a result, manufacturers can produce materials with varying material strengths and diameters very economically.

The UD2 is suitable to produce short and

long bars from 5 to 4,000mm as well as to run wire diameters in the range 0.05 to 4mm. The rigid machine design achieves an output performance of up to 500 parts per minute.

With the PrecisionCut MJC9, Jouhsen-bündgens offers the wire industry a machine concept optimised for the manufacturing of precise, rectangular, short cut offs at high speeds: up to 600 parts per minute with lengths of 1.5 x d up to 70mm.

The cut off system in the MJC machine works with a "bush-bush" system, which realises in combination with the exact infeed rectangular and burr-free cut offs. Users can process wires with diameters between 3.5 and 9.3mm.

Whether straightening and cutting, electro fission, end machining, cold forming or point grinding – Jouhsen-bündgens machines process wires with the smallest tolerances at high speeds. The demand for Jouhsen-bündgens technology has also increased with the continued drive for component miniaturisation.

The equipment produces parts for the electronics or the automotive industry: drive and cam chains, bearings or pins. For medical applications, lancets, cannulas and surgical needles are often cut, ground and loaded into magazines at a high speed of hundreds of parts per minute.

**Jouhsen-bündgens – Germany**  
**Website:** [www.jouhsen.de](http://www.jouhsen.de)

## Compatible with a range of assemblies

SJOGREN Industries has introduced a newly designed wire puller that is compatible with a range of different wire pulling assemblies.

The design is notable for the ergonomic handle which, in conjunction with a locking function that keeps the puller jaws open, enables the operator to easily hold the puller in one hand while inserting the wire with the other hand.

The jaws are locked open by use of a slide plate which retracts the upper jaw. While still holding the wire in position with one hand, the operator can close the jaws with the other by using the one-touch thumb release mechanism located just above the handle. This insertion process allows the operator to spend less time on set-up.

Another design feature of the new Sjogren Puller is its pivoting head, which allows for in-line pull from the die box as well as tangential on the capstan.

This built-in feature prevents the need to add a separate clevis attachment to



▲ The newly designed wire puller

the puller assembly, and is particularly valuable when drawing brittle material.

Sjogren also enhanced the cost-efficiency of the puller jaws by designing them with two work surfaces: one which is utilised when the jaw is in the upper position, and one which is used when in the lower position.

This dual-use design effectively doubles the working life before replacement, as upper and lower jaws can simply swap position.

The Sjogren Puller is compatible with a variety of puller assemblies, and is suitable for use on capstans ranging in diameter from 16" to 30"/406mm to 762mm (counter clockwise rotation) and working with wire diameters of 0.06" to 0.25"/1.5mm to 6.3mm.

## The Bullet II from Guill Tool

Guill Tool introduced The Bullet® in 2015, a new extrusion head with fixed centre design, multi-port spiral flow design and gum space adjustment, plus the added feature of no fastening hardware, so cleaning and restart are easier and faster than a conventional head. Now there is the unique and patented tool, The Bullet II.

The Bullet II allows quick tooling changes, as the tips remove from the back and the die removes from the front of the unit. The absence of fastening hardware eliminates leaking, as does the taper body and deflector design pioneered by Guill.

High- and low-volume applications are suitable for this head and are accommodated with the simple, easy changing of just one component. A family of crosshead designs is available and users can specify the "calibre", ie the maximum die ID.

A vacuum chamber and kit for assembly and disassembly are included with the unit.

**Guill Tool & Engineering – USA**

**Website:** [www.guill.com](http://www.guill.com)

**Sjogren Industries – USA**

**Website:** [www.sjogren.com](http://www.sjogren.com)



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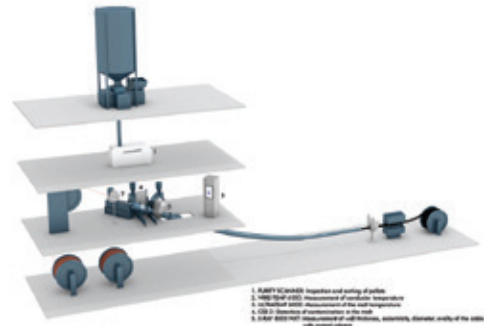


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## Process stability and reliability



▲ Figure of a CCV line with measuring devices for quality assurance (examples)

MODERN optical fibre pairs are used as subsea cables for transatlantic data transmission, and data transmission rates of 160 gigabits per second can be reached. Subsea cables are also indispensable for the power supply sector. Due to the trend toward renewable energy, ever-increasing offshore wind farms are built off the coasts and the produced electricity has to be transported back to the mainland.

Subsea cables have to fulfil two main tasks: the transmission of energy and the transfer of data.

A wide range of cables can be used for this purpose. Whilst cables with a voltage of up to 150kV are often used for the energy transmission of offshore wind farms, for example, islands in the Mediterranean Sea are connected to the electricity network with a voltage of 30-60kV.

These cables, however, always have two things in common. They have to be manufactured for long distances with a minimum number of joints in order to avoid possible breakdown risks. Also, due to the high voltage and the difficult maintenance of subsea cables, the production process has to meet extremely high demands.

Subsea cables are fitted with special high voltage insulation materials of the utmost purity in order to meet the high quality demands. The majority are manufactured in CCV lines (catenary continuous vulcanisation). In this field, X-ray technology from Sikora has ensured a reliable quality control during the production process for more than two decades.

The measuring devices X-Ray 8000 NXT and X-Ray 6000 are especially interesting for the efficient measurement of the wall thickness of up to three insulation layers, and the concentricity, the diameter and the ovality of XLPE cables during the production process. Using the graphical visualisation of measuring values on the display and control devices of the Ecocontrol Series, the operator centres the crosshead to ensure the highest quality.

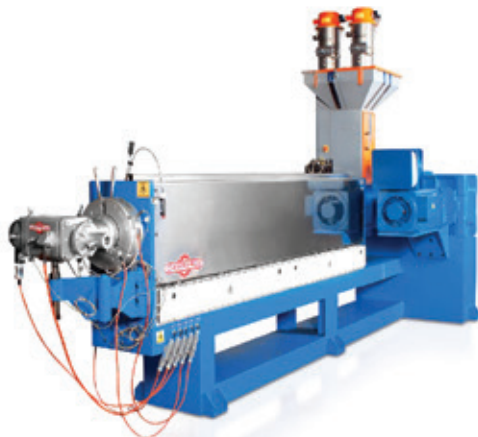
20 years ago, special devices were used for the examination of the PE/XLPE melt in cable production lines. The Purity Scanner now complements this process. The device inspects the raw material before it enters the extrusion process, and sorts out contaminated material. The scanner detects organic and metallic contaminations from 50µm, with an effective throughput of up to several tons per hour.

**Sikora AG – Germany**  
Website: [www.sikora.net](http://www.sikora.net)

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▲ The new RS20 sensor

## Success with the latest RS20 rotating system

AFTER the launch of the new RS20 sensor – eddy current testing systems with rotating mechanics – a number of machines have been installed at several key customers and with good results showing in various applications.

The system is primarily being used at manufacturers of steel bars or in wire drawing lines applications. The advantage of the system lies in the variable stepped probe discs that can be specifically tailored to the needs of customers for each application and each diameter.

The relevant test equipment is available in different variants, from a simple one-channel to a complex ten-channel version. This enables materials testing for transverse orientated defects, longitudinal orientated defects or the combination of both defect types.

**Pruftechnik Dieter Busch AG – Germany**

**Website:** [www.pruftechnik.com](http://www.pruftechnik.com)

## LaserLinc new TLAser103™ laser micrometer

LASERLINC Inc, an American manufacturer of technology for precision measurement of diameter, ovality, wall thickness, concentricity, eccentricity and inside diameter, has launched the TLAser103™ scanning laser micrometer – a new single-axis laser gauge for the inspection of small diameters quickly and accurately.

The TLAser103™ micrometer gauges the smallest products such as fine wire and monofilament with diameters as low as 0.0006" (0.015mm/15µm).

Features include:

- Fast inspection – 1,200 per second. Example: a wire moving at 100 feet per minute (20 inches/second), the measurement rate of 1,200 Hz yields a measurement every 0.017" of product
- Repeatability (two second) –  $\pm 0.000001"$  ( $\pm 0.025\mu\text{m}$ )
- Positional Error –  $\pm 0.00001"$  ( $\pm 0.25\mu\text{m}$ )
- Interfaces with Total Vu™ software – for complete product and process monitoring and control
- Interfaces with SmartLinc™ processors – for industrial communications with PLCs, HMIs and similar devices
- Ethernet connectivity – with NetLinc™ interface

Jeff Kohler, vice president of LaserLinc, said: "The robust design of the TLAser103™ laser micrometer ensures reliable inspection of very small parts at a fast rate, even in harsh manufacturing environments."

**LaserLinc Inc – USA**

**Website:** [www.laserlinc.com](http://www.laserlinc.com)

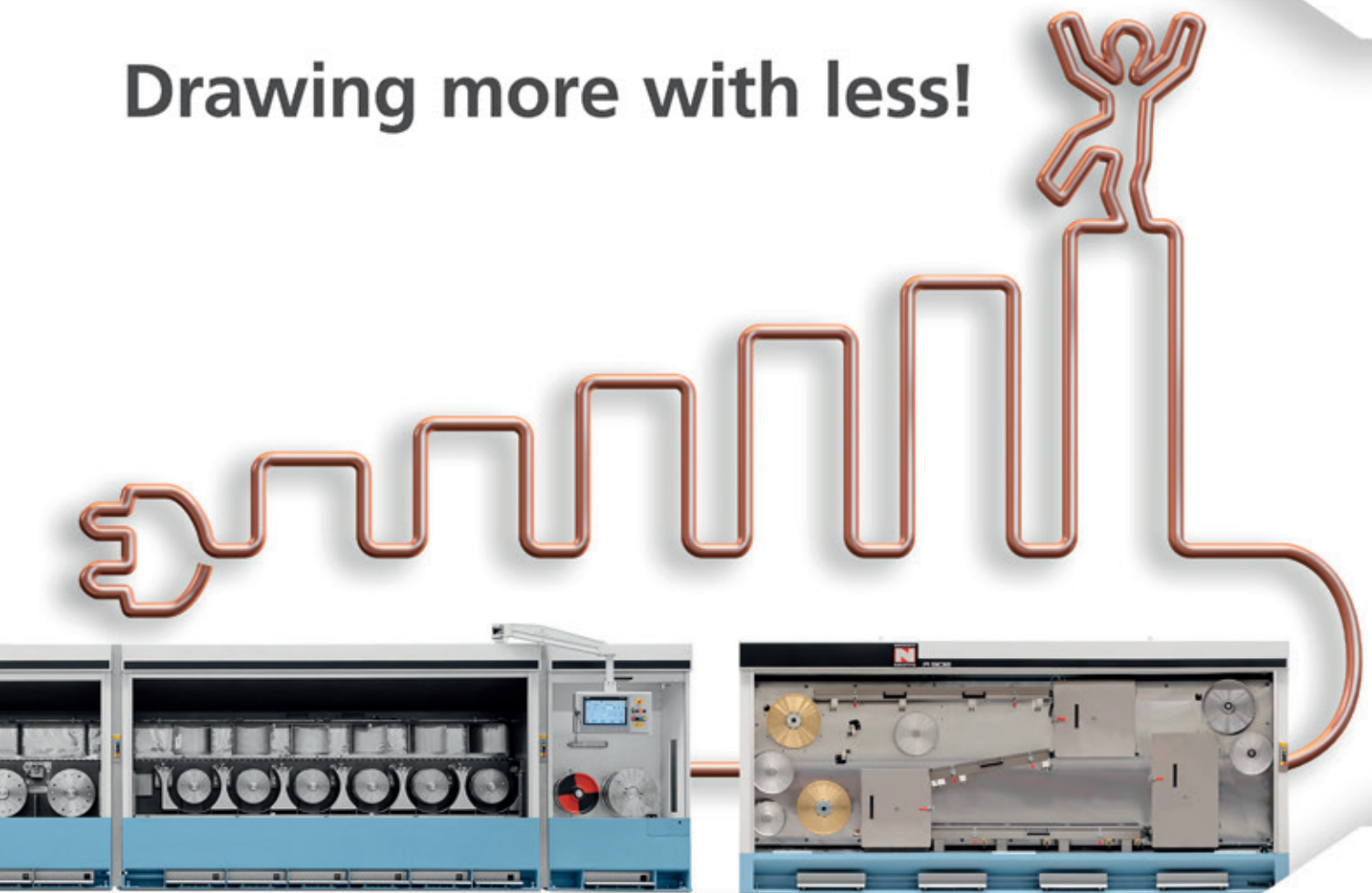


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# Drawing more with less!



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The MSM 86 is designed to be combined with the new R 502 continuous resistance annealer. With an annealing power of 530 kW, the R 502 is the most powerful NIEHOFF annealer to date. Power consumption is reduced by 20% compared to state-of-the-art DC annealers due to the newly developed voltage control system NAC (Niehoff Annealing Controller) and the AC annealing principle.

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## New tapes for the aerospace composite industry

DeWAL Industries has introduced a new line of high temperature, silicone-free adhesive tapes for the aerospace composite industry.

The tapes are suitable for low out-gassing applications requiring EMS 595. The group includes a woven glass tape, a foil/glass laminate tape, a red polyester tape and high density PTFE.

It is becoming an ever-increasing problem in sensitive manufacturing processes to introduce silicone elements. DeWAL has addressed this issue by formulating the most popular tapes in versions which contain no silicone. While suitable for the aerospace composite industry, they are additionally used in automotive and electronic applications where silicone can also be of concern.

DeWAL's new polyester tapes for composite lay-up are DW 915-1 and DW915-2. They are 100 per cent silicone-free, offering a high temperature, high bond, clean release acrylic adhesive. Both

pass the ASTM E595 low out-gassing test for no out-gassing contamination

They use a 1mm film and 2mm film, respectively, and both are very conformable.

DeWAL's PTFE tape for use as composite tool coat is DW716-2HD. The printable glass tape DW379 is used in aerospace blanket seaming and also as a wire harness and transformer wrap.

The fourth tape in this new series, DW417, is a flexible dead soft foil supplied on a release liner. The aluminium laminate makes it an ideal heat shield tape.

As with the polyester tapes, the other three tapes also pass the EMS 595 requirement and offer low out-gassing, silicone-free operation.

**DeWAL Industries – USA**  
**Website:** [www.dewal.com](http://www.dewal.com)

## Versatile easylock fast clamping system

ORIGINALLY developed for the food industries, the Uhing-easylock® clamping system has long since found its way into other sectors as well. It is sought after for production processes using winders or coilers or where safe and efficient clamping or locking is essential.

A classical application for the Uhing-easylock are the processes in the wire and cable industries where the torque transfer the clamping system provides is of particular importance. The axially displaceable Uhing-easylock features a clamping ring that, when subjected to axial tensioning forces, tilts on the shaft and engages with it. The locking effect is proportional to the tensioning force.

In packaging technology, the Uhing-easylock holds and locks roll cores of foils and other material, and it is also used to quickly adjust material guides. As operating the clamping module does not require any tools, the work environment remains free of utensils such as wrenches. Changing the clamping module occurs quickly and easily with only one hand.

The vibration proofness of the Uhing-easylock clamping module is a key feature in static applications where high locking forces are required, for example in screening machines.

Once again, the module convinces by its easy and effective handling. It can be unlocked quickly with only one hand and mounted in a very short time after a screen change, and screening can continue.

A special positive release add-on module was developed for the Uhing-easylock fast clamping system. It makes changing filled spools easier if the clamping disc



▲ The easylock EL10 from Uhing

should fail to unlock. This can happen if a residual force still acts against the tensioning wheel although it was fully turned back.

A residual force may remain if, for example, a spool still rests on the pintle after unclamping, or if the spool has expanded during winding. As a result, the locking ring may fail to return to its perpendicular position, which makes unlocking difficult or totally impossible.

The positive release becomes effective when the clamping wheel is turned to its rear limit position, which is done with one hand only.

"The compact Uhing-easylock® clamping module features an axially symmetric, modular design," said Jörg Wadehn, Uhing technical director. "In this way, it can be easily adapted to suit the respective

clamping task. The simple transmission of braking moments to the roll or spool also translates to a high degree of safety in case an emergency stop is needed."

The lightweight, ergonomically designed clamping module generating high locking forces on a plain shaft is suited for static applications but also for driven shafts with unmachined surfaces.

It comes in ten different sizes for shaft diameters between 10 and 40mm; the clamping module with integrated positive release is available for shaft diameters between 25 and 40mm. The required surface hardness of the shaft is at least 55 HRC for a surface roughness Ra of 0.2-0.4 µm.

**Joachim Uhing GmbH & Co KG – Germany**  
**Website:** [www.uhing.com](http://www.uhing.com)

## The latest diameter measurement devices

THANKS to the compact design, the ODAC® 14XY measuring heads from Zumbach can be used in virtually every manufacturing process in the wire and cable industry, the plastics and rubber industry as well as the steel and metal industry.

The technological basis considered for these measuring heads is the latest technology, with laser diodes as light sources combined with intelligent and powerful measured-value processors which facilitate a simple and flexible integration. Zumbach's long-standing experience of in-line measuring technology, combined with high production figures, results in a product with an excellent price-performance ratio, according to the manufacturer.

Among the features are single scan calibration (CSS), single scan monitoring and high data rate output of up to 125 data packages per second. The measuring heads can be used with all line speeds. Vibrations during production have no noticeable influence on measurements.

Specially suited for fine and extra-fine



▲ ODAC 14XY measuring head with optional local display LOC 01

wires, enamelled wires, cables, steel cords, fibres, medical tubing, extruded plastic or rubber products.

The ODAC 14XY models are available for two measuring ranges:

- Micro version from  $\varnothing$  0.015 to 3mm (0.0006 to 0.12"). Thanks to the use of a special laser, these versions can measure smallest diameters within the micrometre range.

- Standard version from  $\varnothing$  0.06 to 16mm (0.0024 to 0.64")

All the measuring heads of the ODAC series have adaptive signal processing (patent DE3111356), which makes subsequent regular re-calibrations superfluous. Only in instances of component exchange or compliance to calibration regulations ISO 9000/9001, etc would re-calibration be required.

All the relevant parameters for accuracy are continuously monitored by the measuring system and automatically compensated. This is valid in particular for possible long-term changes of the behaviour of the scanner motor or the measuring electronics.

Flexible communication integration:

- Serial RS-232 /-422 /-485
- Ethernet TCP/IP
- Profibus DP
- Profinet IO V2.3
- J/J-M (digital, for connection to Zumbach USYS processors)

**Zumbach Electronic AG – Switzerland**  
**Website:** [www.zumbach.com](http://www.zumbach.com)



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# **WAI OPERATIONS SUMMIT WIRE EXPO 2016**

*~ a wire & cable industry solution center ~*

**EXHIBITS, education and bright ideas! It's all at this year's Wire Expo at the Mohegan Sun Casino Resort, Uncasville, Connecticut, USA, from 7<sup>th</sup> to 9<sup>th</sup> June. Organised by the Wire Association International, Wire Expo is held biennially and incorporates operational paper presentations, a comprehensive exhibition, and demonstrations, and provides plenty of networking opportunities for industry professionals.**

**On the following pages are just some of the exhibitors attending this year's show. The conference runs from Tuesday, 7<sup>th</sup> June, with the exhibition getting underway on Wednesday, 8<sup>th</sup> June.**





# Wire Expo 2016 Exhibitors



## American Kuhne Booth: 818

American Kuhne will exhibit examples of market-driven innovation. The American Kuhne FlipOpen™ feed section for rubber and silicone extrusion provides quick and complete access to all feed section components for easy cleaning, adjustment and maintenance.



▲ The SMED Quick-Change™ dual head from American Kuhne

American Kuhne SMED Quick-Change™ design options minimise change-over time and maximise production availability. These include: rapid screw change via quick-mount pusher; fast material change via rotary hopper design; and instant tooling change via dual-hinge design.

**American Kuhne – USA**

**Website:** [www.amerikankuhne.com](http://www.amerikankuhne.com)



## Bow Technology Booth: 103

Based on more than 60 years' experience in double twist, Bow Technology – a member of the Gauder Group – designs and manufactures high-technology bows in a technical partnership with renowned cable makers.

The dedicated team carries out comparative analysis and trials to customise and upgrade obsolete designs, as well as technical studies of bow parks.

The result is a wide range of over 500 customised bow designs – as well as the exclusive and patented GreenBow2 enabling energy savings.



▲ Bow Technology large bows

All are available for more than 25 well-known brands of double twist machines (560-2,500mm) such as Cortinovis, Lesmo and Niehoff.

**Bow Technology – France**

**Website:** [www.bowtechnology.com](http://www.bowtechnology.com)



## Cable Services & Systems Booth: 103

The C2S division of the Gauder Group takes care of all wire and cable production lines, whatever the brand of the rotating equipment. C2S recently reinforced its engineering and commissioning team with ex-Lesmo and ex-Cortinovis engineers.



▲ C2S services and upgrades

70,000 identified spare parts references are distributed worldwide through four logistic platforms, including high technology bows.

A team of over 55 technicians is continuously trained to handle troubleshooting and urgent repairs.

The division also offers dedicated services such as periodical visit contracts, transfer and restart operations of complete lines, training and consulting possibilities.

C2S is also being assigned upgrading projects for all brands, either mechanical/

electrical interventions or process improvements with transfer of know-how.

**Cable Services & Systems – France**

**Website:**

[www.cable-services-systems.com](http://www.cable-services-systems.com)



## Clinton Instrument Company Booth: 609

The Clinton Instrument Company, specialist in spark test technology for the wire and cable industry and inventor of the high frequency sine wave spark tester, will be exhibiting its newest offering, the model HF-15B high frequency sine wave spark tester, the flagship model of the new B-series.

This new design combines the latest in control technology with the robust and reliable 3kHz spark test platform.

There are many new features of the HF-15B, including a split electrode design for easy string up, and digital signal processor (DSP)-based voltage regulation and fault detection.

The fault detection circuit has been upgraded and test voltage is now monitored directly from the electrode, instead of a transformer winding.

The fault circuitry can now differentiate between four types of fault conditions: simple pinholes, a series of closely spaced pinholes, direct metal contact from the centre conductor to the electrode, and gross lengths of bare wire.

The new "RC" controller comes fixed to the unit, but can be detached and mounted remotely up to 60 metres away from the test module/electrode.

It has a large alphanumeric display/user interface and can be rotated in its bracket to accommodate different viewing angles. The display makes configuration of the equipment easy; all configuration parameters can be changed directly from the front panel menu structure.

Once configured, the system can be passcode protected. In cases where a local display is not required, or centralised process control is desired, the equipment can be configured and controlled directly from PLCs or computers using Modbus RTU (RS-485 full duplex).

7 – 9 June



▲ The new HF-15B series from Clinton

Optional communication protocols include Ethernet/IP, Profinet, and Profibus, Modbus TCP and analogue communications, making the system compatible with previous Clinton equipment with analogue control.

When simple control output is all that is required, there are four sets of relay contacts that provide information without requiring advanced

programming. These include “high voltage ON” signals to alert operators of the presence of high voltage, a fault relay which actuates when a fault is detected, a “Voltage Watchdog” which will change state when the test voltage has risen above or dropped below a preset level, and a “Bare Wire Alarm” which will signal when long lengths of bare wire are detected.

Clinton will also exhibit and demonstrate the STCAL automatic spark tester calibration system. The STCAL system will calibrate high frequency AC, mains frequency AC, and DC spark testers to all major specifications. Calibration is automatically performed and documented on all of Clinton’s new B-Series spark testers and selected A-Series models. Manual or assisted calibration can be performed on older Clinton units as well as equipment manufactured by others.

When paired with Clinton’s model SM sensitivity tester, a complete calibration solution to IEC and NEMA standards is provided.

**Clinton Instrument Company – USA**  
**Website:** [www.cicsparkers.com](http://www.cicsparkers.com)



## Condat Booth: 117

With over 160 years of expertise, Condat’s extensive lubricant range is recognised as a global reference for the wire drawing industry. Its Vicafil and Steelskin range gathers together a wide choice of wire drawing soaps, surface treatment, neat and soluble oils, and degreasing products.

Condat will exhibit its new developments for safer lubricants for both operators and the environment, such as:

- For high carbon steel, steelcord, spring wire, ropes and PC strand: wire dry drawing lubricants with low or zero borax (sodium tetraborate pentahydrate) – Vicafil Sumac 5 and Vicafil Santale 6
- For low carbon steel, wire to be galvanised and CO<sub>2</sub> welding: minimising the use of titanium dioxide in dry drawing lubricants – Vicafil Decal 440
- For stainless steel spring wire and cold heading wire: products with new formulations in its range of drawing oils and greases so that they are not labelled under the GHS regulations and avoid the use of short and medium chain length chlorinated paraffins



# OCG™ – extending the life of your overhead line conductors



OCG™ is a world-beating range of cold-applied greases for the protection of overhead line conductors. Fully compliant with all international specifications, the range delivers unrivalled protection against fretting, multi-metal corrosion and high temperature oxidation.

OCG™ greases deliver significant cost savings, extending conductor life and delaying the need for the costly renewal of infrastructure.

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Condac proposes whenever possible low HSE impact technologies, using formulations with least severe labelling possible. The show will also be the opportunity to highlight the company's specific offer for electrical wire and cable, including:

For aluminium wire drawing, the Vicafilm TFA neat oils range has been designed to offer both low residues and extended operating life. Its specifically formulated additives package minimises thermal oxidation, maintaining longer lubricant performance. The bath life is increased and maintenance costs reduced.

For the drawing of bare copper wires, Vicafilm TCU concentrated soluble lubricants provide consistent and reliable performance. The high lubricity of the emulsions reduces wire breakage while the additives package has been formulated to keep the machine clean, reduce foaming and increase the emulsion stability.

A full range of complementary products that helps in the management of the bath are available, including products to clean installations, bath maintenance additives as well as protection products for bare wires in order to avoid corrosion and extend shelf life.



▲ Condac – responsible dry drawing lubricants

2016 represents the 20-year anniversary of Condac Corporation's presence in the USA, serving the wire drawing industries across North America.

**Condac – France**  
**Website:** [www.condac.fr](http://www.condac.fr)

**Daloo**  
**Booth: 103**

Daloo, a member of the Gauder Group, is the logical extension of the group's global offer for cable producers wanting an attractive alternative between new machines made in Europe – with higher cost – and second-hand machines – without guaranteed performance. Its complete stranding lines and accessories for the production of power and



▲ Daloo large pay-offs and take-ups

communication cables are delivered worldwide. This includes rigid cage stranders, taping lines, rewinding lines, take-ups and pay-offs, pulling caterpillars and tubular stranders. The designs, as well as the manufacturing (in Changzhou, China), are based on European experience (proven Gauder Group methods) following strict quality criteria. On the stand will be a large portal type take-up (4,000mm/35 tons).

**Daloo – China**  
**Website:** [www.daloo-machines.com](http://www.daloo-machines.com)

**Flymca and Flyro**  
**Booth: 420**

Flymca continues to offer its well-known range of machines with customised solutions for stranding and cabling purposes. Standard machinery is adapted to customers' needs, thanks to many years' experience of the workforce, and using the available facilities to study projects with 3D designs and finite elements. This is all done with modern CNC machinery for parts fabrication, and a well-prepared test laboratory.

Last year ended with new growth thanks to special machinery for stranding CTC (continuous transposed conductors) and

▼ Full order books for the current year



big closers for steel wire ropes, together with new cable manufacturing plants established in North Africa.

Although a new year means new challenges, the company already has a full capacity of orders for 2016, and investment in the business continues. Customers can also find a large stock of related used and refurbished equipment from sister company Flyro.

**Flymca & Flyro – Spain**  
**Website:** [www.flymca.com](http://www.flymca.com)  
**Website:** [www.flyro.com](http://www.flyro.com)

**Gauder**  
**Booth: 103**

Gauder SA, on which the Gauder Group was founded, is at the head of the largest stock of machines for the wire and cable industry in Europe.

"Creating solutions together", the company is an ideal partner to set up "ready to manufacture processes" from its warehouse housing over 1,000 machines (drawing, stranding/cabling, screening/taping/armouring, wire coating, extruding, coiling/rewinding) for the production of wires, conductors, cables, ropes or steel products.



▲ Gauder second-hand reconditioning equipment

The Belgium-based supplier is a key player in reconditioning second-hand machines. The company has specific know-how in revamping lead extruders. The company also markets new Mapré extruders ranging from 38 to 150mm, complete with accessories.

A free shuttle service is organised daily from the stand to see the stock in 20,000m<sup>2</sup> warehouses, as well as to see a reconditioned drum twister for power cable.

Visitors can see the online stock at [www.gauderonline.com](http://www.gauderonline.com) to prepare for the visit. On the stand will be a reconditioned gearbox for lead extrusion.

**Gauder – Belgium**  
**Website:** [www.gauderonline.com](http://www.gauderonline.com)

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### Keir Manufacturing Booth: 804

Keir Manufacturing Inc is a USA-based manufacturer of high-purity 99.8 per cent alumina ceramic guides, the Frontiersman™ line of air wipes, and Composite Flyer Bows, serving the global wire and cable industry.

These items will be displayed and highlighted at Wire Expo. The company is dedicated to making products that enable manufacturing processes to run more efficiently and productively through the application of leading edge materials. Its solutions are focused on continuous process improvement, energy savings and longer operating life.

Keir's patented SureShot and SplitShot air wipes provide an effective drying method that does not depend on high-volume air consumption. Their efficient design yields effective drying using a very low volume of compressed air and lasts longer than other brands due to the rugged ceramic insert lining the wire path. This equates to more than 25 per cent reduction in compressed air usage and an operating life of years versus months.

Keir's triaxially braided composite standard and BackBone™ flyer bow constructions have greater durability than layered/laminated designs allowing them to take more hits and endure higher stress, yielding increased operating life and less machine downtime.

The more aerodynamic BackBone™ design functions at lower power consumption and higher TPM with improved wire quality and a further reduction in bow breakage. Up to 40 per cent less energy (AMPS) is used along with a decrease in wire scrapped.

**Keir Manufacturing Inc – USA**  
**Website:** [www.keirmfg.com](http://www.keirmfg.com)



### Magnetic Technologies Booth: 303

Magnetic Technologies Ltd, USA, is now offering open loop constant tension payoffs with non-contact ultrasonic sensor using electric hysteresis brakes, in addition to the traditional constant tension permanent magnet hysteresis brakes.

The new offering incorporates one of the company's ten sizes of electric hysteresis brakes plus programmable power supply,

non-contact ultrasonic probe (for diameter calculation), and spool support. Also available are custom re-spoolers using the same technology. Electric hysteresis brakes are DC current controlled brakes where the current supplied to the coils creates drag torque in proprietary magnetic materials nearly linearly throughout their torque range.

A constant current programmable power supply having a 0-10VDC follower input is used to power the brake. This power supply is programmed to supply a specific output current depending on the torque demanded by the specific brake program. Ultrasonic probes having 0-10VDC output are used to supply the control voltage based on payoff diameter. The power supply also features E-Stop and end of tape sensor capabilities.

The new payoff system and re-spooler will be featured at Wire Expo.

**Magnetic Technologies Ltd – USA**  
**Website:** [www.magnetictech.com](http://www.magnetictech.com)



### Mathiasen Machinery Booth: 1016

Mathiasen Machinery Inc (MMI) buys and sells used wire and cable machinery internationally. Machinery is purchased for inventory or it can be sold on an exclusive basis. MMI has interest in locating individual machines, complete lines or entire plants.

Consignments, warehousing, appraisals and liquidation services are also offered. MMI has buyers seeking all types of good quality used wire and cable machinery, serving the domestic and international ferrous and non-ferrous wire machinery markets.

The booth will display photographs of a wide variety of second-hand machinery. Customers are encouraged to bring their surplus machinery list and photos for evaluation.

**Mathiasen Machinery Inc – USA**  
**Website:** [www.mathiasen-machinery.com](http://www.mathiasen-machinery.com)



### NDC Technologies Booth: 502

NDC Technologies will be presenting its broad range of Beta LaserMike in-process and off-line dimensional monitoring systems for wire and cable. NDC will present the latest AccuScan



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6012 four-axis diameter and ovality gauge, innovative LayScan lay length measurement system and most recent DCM ES-2G four-pair LAN/data cable testing system.

The Beta LaserMike AccuScan 6012 is a four-axis scanning diameter and ovality gauge that provides high measurement accuracy to ensure wire and cable products meet tight design and quality specifications.

With communication cables, such as coaxial and twisted-pair LAN products, any error in the diameter or roundness of the conductor or insulation directly impacts the cable's performance characteristics – rendering the product useless for the designed application.

The AccuScan 6012 solves this by providing comprehensive measurement coverage on wire and cable products up to 12mm. It offers several distinct advantages not found in competitive diameter and ovality gauges, such as:

- Improved ovality accuracy up to 100 per cent, unlike three-axis gauges
- Delivers an average ovality measurement 42 per cent closer to 100 per cent accuracy than three-axis gauges

- Provides the highest flaw detection accuracy with 25 per cent improvement over three-axis gauges

The latest version LayScan accurately and consistently measures the lay length of twisted pairs in data communication cables, such as Cat 5e/6/6a/7a products. It solves scrap, costly rework and productivity loss problems due to manual, time-consuming lay length measurement methods and crosstalk performance issues from lay variations.

LayScan can be used to measure the four pairs at the cabler or to measure an individual pair at a twinner to confirm the accuracy of twisted-pair cable construction during production. A data acquisition and control system effectively collects and processes each lay length and enables the use of off-line analysis tools such as trend charts, statistical analysis or FFT analysis to readily observe, measure and report systematic lay variations.

LayScan measures lay lengths up to 25.4mm at throughput speeds up to 152.4m/min with a measurement accuracy to within 1mm on the same twisted pair. LayScan can be used in conjunction with the Beta LaserMike SRL



▲ The range on display from NDC Technologies

Pro structural return loss measurement system for a total on-line cable performance quality solution. SRL Pro can be used before and/or after the extruder to identify potential causes of structural return loss problems on data communication cables.

The most recent DCM ES-2G testing platform extends the high-frequency measurement range to test Cat 5e/6/6a/7/7a cables up to 2.2 GHz. This bench-top system is also optimised to test next-generation 40 Gb/s Cat 8 cables. The base unit includes automatic four-pair switching and the baluns

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needed to interface the cable under test to an external vector network analyser for fast cable testing. Testing can be performed in less than three minutes.

The DCM ES-2G cable testing system is also equipped with innovative technology that eliminates the effect of jacket removal on reflection measurements, such as input impedance and return loss. The heart of the system is the Windows®-based software engine that includes a simple-to-use test program with automatic comparison to the test specification, full test reporting and data management.

**NDC Technologies - USA**

**Website:** [www.ndc.com/betalasermike](http://www.ndc.com/betalasermike)



**Paramount Die Company  
Booth: 212**

Paramount Die is more than just a die company, with its sales engineers averaging over 20 years of experience in the wire industry. In addition to helping its customers with their die needs, Paramount offers expertise in all areas of the wire drawing process.

Several wire industry trends have shaped the company's development over the past five years. Perhaps the most dramatic has been the ever-growing trend for wire drawers to outsource their finished die requirements.

This shift has caused wire drawers to become somewhat more dependent on die suppliers, placing great pressure on the company to increase capacity for die finishing, to reduce finished die costs, and to improve lead times.

Realising these trends and consistently aiming to meet customers' needs, Paramount has been able to reduce die costs in two ways. The first is by standardising on cost-effective carbide inserts. The second is by improving quality and increasing capacity through automation.

Many of the company's highly automated machines run on lights-out operation, meaning that they will continue to produce as long as there is raw material being fed into the system. The automated production equipment combines high volume speed and efficiency with accuracy and repeatability. Because of its investment in immediately available inventory, average lead times have been reduced from three weeks to less than a few days.

As the company continues to grow globally as a high volume producer of carbide drawing dies, it becomes very important for it to continually invest in new manufacturing technology.

Paramount is also a supplier of eco-friendly products to the wire industry as its die design allows the carbide insert to be easily recycled. Thousands of kilograms of used inserts are returned to Paramount each year to be graded, sorted and transformed into good-as-new condition.

The company will exhibit a full line of wire drawing dies and related equipment. Products featured include the TR-Series carbide drawing inserts, shape dies, extrusion dies, polycrystalline diamond dies, ParaLoc™ pressure and non-pressure holders, as well as accessories.

**Paramount Die Company - USA**

**Website:** [www.paradie.com](http://www.paradie.com)



**Pourtier  
Booth: 103**

Pourtier, France, develops and produces high quality stranders, cablers and armouring lines for ferrous and non-ferrous cables.

These machines are made in Europe with the highest standards in design and manufacturing for the production of all types of power cables, from low and medium voltage up to high and extra-high voltage, overhead cable (including new development with various shaped wires) and insulated cable, AC type (using high quality Milliken conductor) or DC type (using large round compacted cross sections).



▲ Pourtier tubular stranders, 250-800mm

Pourtier has recently made achievements in the field of submarine and umbilical cables with the supply of large armouring lines and laying-up lines. The company is continuously extending its range of machinery to meet customers' needs.

Leaders in rotating machines, Pourtier and Setic (also a member of the Gauder Group), are offering a wide range of

twisting/stranding solutions to cable makers and steel rope producers.

On display on the stand will be a tubular strander module for power cable and steel rope.

**Pourtier - France**

**Website:** [www.pourtier-setic.com](http://www.pourtier-setic.com)



**PWM  
Booth: 403**

PWM's extensive range of manual cold welding machines will be on show, presented by Joe Snee Associates, exclusive distributor for PWM in the US and Canada.

PWM's largest manual machine, the M101, for welding copper wire 1mm to 3.6mm (0.04" to 0.141") and aluminium 1mm to 5mm (0.04" to 0.197") is also used to weld profiles and strips for armouring lines. The M101 is low maintenance, quick and easy to operate and can be used on a workbench or supplied with an optional cart.

The smaller BM30 model, for use on a workbench or cart, provides strong, reliable welds on non-ferrous wire 0.3mm to 1.8mm (0.011" to 0.071") diameter.



▲ The M101, PWM's largest manual machine

PWM's handheld M10, M25 and M30 machines are comfortable to hold and simple to operate, using finger or hand pressure. Welding capacities range from 0.1mm to 1.8mm (0.0039" to 0.071").

PWM also produces powered cold welders for bonding copper wire and rod

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from 0.3mm (0.011") to 25mm (0.984") and aluminium to 30mm (1.181").

Joe Snee Associates is also the New England representative for NDC (Beta LaserMike), a global provider of measurement and control solutions; and AW Machinery, which produces ancillary equipment used on extrusion lines, from pay-off to take-ups and complete control systems.

**PWM Ltd – UK**

**Website:** [www.pwmltd.co.uk](http://www.pwmltd.co.uk)

**Joe Snee Associates – USA**

**Email:** [joe@jsnee.com](mailto:joe@jsnee.com)

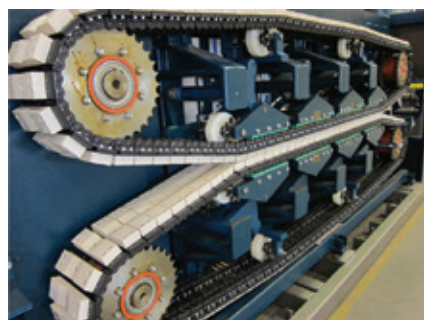


### **Queins Machines, Stolberger-KMB Booth: 602**

Queins Machines GmbH together with Stolberger-KMB, both Germany-based companies, will show a number of large sized pictures and videos of delivered machines for the rope and cable industry.

The main products are all high-speed stranding machines, machines for CTC conductors, pay-offs/take-ups, taping heads, and disc- and belt-type caterpillars/capstans.

▼ *The chain-type capstan with two-ton pull from Queins*



Further information on the range of different manufactured lines for special applications such as power transmission, steel rope applications, subsea cables and other fields, can be given during the exhibition. The second-hand department offers a full choice of machines and equipment for the wire and cable industry.

**Queins Machines GmbH – Germany**

**Website:** [www.queins.com](http://www.queins.com)

**Stolberger-KMB – Germany**

**Website:** [www.stolberger.com](http://www.stolberger.com)



### **Rosendahl and Nextrom Booth: 603**

Industry 4.0 – also known as 'Smart Factory' – is becoming reality and opening new doors for both suppliers and manufacturers.



▲ *Rosendahl extrusion line for high temperature materials*

Rosendahl and Nextrom take this revolution seriously and are proud to show the opportunities with its technology, not only for a single investment, but for the entire product life cycle.

Rosendahl and Nextrom have undertaken technological developments in:

- processing high-temp materials and silicone rubbers

- producing loose tubes with fibre overlength control at extremely high speeds
- recycling helium during fibre draw
- VAD/OVD preform technology



▲ *Nextrom's high performance loose tube line OFC40*

**Rosendahl and Nextrom GmbH – Austria**

**Website:** [www.rosendahlnextrom.com](http://www.rosendahlnextrom.com)



### **Setic Booth: 103**

Setic designs and manufactures high quality double twist bunchers/stranders for power cable and automotive industries, as well as complete solutions to produce special/LAN cables with enhanced performances (in one step or two steps according to product mix).

The company is continuously developing new lines and concepts for non-ferrous cables in order to meet customers' needs,

▼ *Setic backtwist pairing/quadding, 800mm*



>>>



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such as tandem "mica taping/bunching", special high-speed lines for battery cable, and new high speed lines for special and instrumentation cables.

Setic combined with Pourtier (also a member of the Gaudier Group) offer a wide range of twisting/stranding solutions to cable makers. On the stand will be a backtwist pairing/quadding line for special and data cables.

**Setic - France**

**Website:** [www.pourtier-setic.com](http://www.pourtier-setic.com)



## **Sikora Booth: 1015**

Sikora is presenting a full programme of non-contact measuring and control devices for quality assurance and cost reduction in the wire and cable industry.

The company will showcase the Wire-Temp 6000, a non-contact conductor temperature measurement system that is now also available for diameters up to 50mm and suitable for installation in CV lines. Another highlight will be the X-Ray 6000 Pro for online measurement of wall thickness, concentricity and diameter of up to three layers of different material for increased process stability, quality and cost saving during the production of cables.



▲ The X-Ray 6000 Pro measures diameter, ovality, wall thickness and concentricity of cables

In addition, Sikora will present its broad product range of devices for classic and high-end diameter measurement with the Laser Series 2000/6000. The precise and reliable Lump 2000 devices with double sensor technology for lump detection on the product surface will also be shown.

**Sikora International Corp - USA**

**Website:** [www.sikora.net](http://www.sikora.net)



## **Sjogren Wire Tooling Booth: 707**

Sjogren Wire Tooling has introduced several new innovations that represent new opportunities to increase spindle uptime. These innovations include two new products: the spindle cartridge wire straightener, and the new wire puller. It also includes three technological advancements that can be applied in different ways depending on each operation's specific requirements: static wire guide technology, heat treat and coating technology, and high-speed cartridge assembly.

**Spindle cartridge wire straightener:** Designed to simplify the difficulties of straightening high-carbon wire with >0.1mm diameter, the spindle cartridges enable the rollers to turn on the bearings' inner race to allow an increase in line speed of +30 per cent over conventional rollers. Its unique non-opening design also reduces the downtime required to re-string the straightener to a fraction: a task that typically takes a half an hour or more can now be done in roughly five minutes.

**New wire puller:** This puller is designed to improve shop-floor efficiency and operator safety. Its distinctive ergonomic handle and jaws that easily lock open allow the operator a free hand to insert the wire while holding the puller in the other. The pivoting head reduces wire breakage by allowing both direct pull from the die box and tangential pull on the capstan. Because the puller jaws have two work surfaces, they can perform once in the upper position and once in the lower position, providing 200 per cent longer work life before requiring replacement over conventional puller jaws.

**Static wire guide technology:** Bearing failure in wire guides (dancer rolls, traversing guides, roller boxes, etc) is a common cause of downtime in the dry drawing process. Sjogren's new static wire guide technology solves this problem: instead of rotating, the wire is guided by two carbide rails. A prototype has been in continuous operation at a USA wire mill for over 14 months, taking the place of bearing-based guides that required downtime for replacement/service every eight weeks.

**Heat treat and coating technology:** Sjogren has developed a proprietary heat treat and coating process for straightener rollers that achieves a groove surface hardness of HV 2500. Compatible with any straightener and any wire diameter or shape, it offers a lower cost than carbide



▲ The spindle cartridge straightener from Sjogren

rollers and an extended working life over standard heat treat processes.

**High-speed cartridge assembly:** This innovative roller design improves the performance of any straightener by maintaining tighter wire centreline tolerances with a longer working life over conventional rollers. Two pre-loaded bearings in the assembly reduce wobble to provide accuracy at faster line speeds.

The roller surface is typically treated with Sjogren's proprietary heat treat and coating process; however, the assembly is compatible with any roller surface material an operation requires.

**Sjogren Wire Tooling - USA**

**Website:** [www.sjogren.com](http://www.sjogren.com)



## **Wire & Plastic Machinery Corporation Booth: 410**

Wire & Plastic Machinery Corporation deals in second-hand wire, cable and optical fibre manufacturing equipment.

Featuring a comprehensive range of machinery with over 30,000 items in stock, equipment is offered as-is, checked for operability or completely reconditioned to customer specifications.

Machinery is available for: rod breakdown to fine wire drawing machines, stranders, bunchers, extrusion and jacketing lines, braiders, planetary and single-twist cablers, drum twisters, payoffs, take-ups, caterpullers, rewind lines, and more.

Wire & Plastic Machinery has eight North American locations with complete rebuilding facilities in Bristol, Connecticut, and Bonham, Texas.

**Wire & Plastic Machinery Corporation - USA**

**Website:** [www.wireandplastic.com](http://www.wireandplastic.com)

7 – 9 June



## Zumbach Electronic Booth: 100 and 614

Zumbach will showcase its extensive portfolio of dimensional measurement and inspection systems for wire drawing, wire insulating and cable jacketing processes as well as for rod and bar mills.

In order to achieve high precision and best price-performance ratio, different technologies such as laser scanning, X-ray, ultrasound, light-section technique and linear sensor technology are used.

The production of offshore flexibles involves complex processes requiring varying individual performances for quality control.

Any deviations from the required standards can risk serious consequences if failure occurs, depending on the application scenarios.

In order that the risks for future product failure are eliminated during the manufacturing processes, such as wire drawing, profile rolling/extruding, stranding and sheathing, Zumbach provides reliable solutions for the measurement of all critical parameters.

The versatile high-tech ultrasonic system Wallmaster offers application-specific solutions for measuring and monitoring wall thickness.

The measuring data processor with touchscreen display gathers data and QC fully automatically. In combination with ultrasonic UMAC® scanners and various ODAC® diameter measuring gauges as well as with error detectors, the measuring and monitoring scale can be expanded to outside and inside diameter, statistics, SPC and processor communication.

Using Zumbach's Wallmaster measurement and control systems, manufacturers can economise their expenditure of raw materials. The ROI is achieved within a few months. The use of these systems also allows reduction of the start-up time.

One of the highlights on the stand will be the new ultrasonic scanners for flexible diameter adjustment. In this novel construction (patent pending) the traducers can be either individually or simultaneously adjusted to the best possible measuring position within seconds.

The scanners represent a smart and simple solution for full non-contact,



▲ 3-axis ODAC 550 system, measuring an offshore cable of 500mm OD

in-line eccentricity and wall thickness measurement of cable jackets, tubes and hoses.

A complete line of measurement and control equipment for any on-line and manufacturing process will also be on display:

- New 1, 2 and 3 axis diameter gauges of the high precision ODAC® series for any wire and cable. New models with special beam geometry, fault detection function and high scan rate
- The advanced ODEX® concentricity and diameter gauge for wire extrusion. Fully non-contact, based on magnetic and laser technology
- New LSV length and speed gauges for down-to-zero speed measurement
- New spark tester AC and DST systems
- Advanced KW fault detectors with new local BAE control and display unit
- New economic, modular high performance USYS IPC data acquisition, processing and display units
- Rayex® D series: Zumbach's X-ray measuring and control system for CV lines, for wall thickness (three layers), eccentricity and diameter/ovality for CV lines
- Profilemaster® series: high-end, non-contact profile and shape measurement, combining laser and CCD technology for shaped wire and any other profile

**Zumbach Electronic AG – Switzerland**  
**Website:** [www.zumbach.com](http://www.zumbach.com)

## SCIENCE BEHIND WIRE DRAWING AND COMPACTING VITRIFIED NANOCRYSTALLINE TECHNOLOGY VNT NANO DIES

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- Carbide Pressure Die
- Carbide Split & Enamelling Dies, Sector Die
- Ceramic Tools/Pulleys
- Die Polishing Machine for PCD, ND & Carbide Dies Designed in Italy & made in India
- Extrusion Tools (PCD & Carbide) Tips & Dies
- Lubricants for Copper /Aluminium/Steel/CO2
- Microscope for Inspecting Drawing Dies
- Ultrasonic Die Cleaning System
- Spiral Brushes & Buncher Bows & Cross Head
- Die Checking Go-No-Go Pins

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# Wire cleaning & treatment

Lubricant residues need to be removed from drawn wire before galvanising, cladding, welding or any other finishing operation can proceed successfully.

This simply stated rule supposes an immense amount of knowledge: of materials (steel, stainless, copper, nickel, titanium); processes (plasma, anodic, electrolytic, magnetic, electronic, hydraulic); hybrid functions (descaling/annealing, deglassing, pickling, passivating, corrosion inhibition, sanitation); plus salts and acids, thickeners and surfactants. It also requires a sure grasp of cleaning tanks, pumps, filters, oil skimmers and air-wipes.

Cleaning and treatment make a natural pairing in a state-of-the-art wire mill. The products and services reviewed in this section are offered by suppliers who know their specialities: both of them.

Photo courtesy of Boeckmann Engineering GmbH



# Wire dry cleaning enables direct galvanising

The BH-S is a green dry cleaning process of great potential, used in-line in the most demanding applications, allowing high cleaning speed with all steel wires (including 0.90%C), mechanically descaled or acid cleaned, bare or pre-coated, drawn with calcium and sodium lubricants.

Applications include wire cleaning from solid lubricant residue, or other contaminants (rust and scale), prior to galvanising, metallic coatings, Al or Cu cladding, heat treatment, etc, and wire rod cleaning prior to drawing.

The development of BH-S wire dry cleaning system provides the combination of simplicity and effectiveness, replacing the most costly operations in the wire cleaning process, including replacement of acid, ultrasonic and other wet chemicals, generating substantial cost savings, environmental benefits and improvement in productivity of clean H/C and L/C wires.



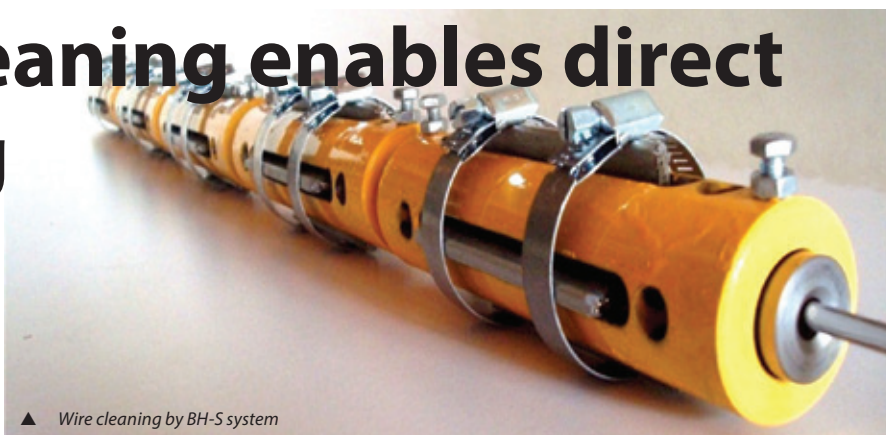
▲ Wire cleaning by PWC system in dual core configuration

The BH-S system is particularly recommended for cleaning applications in which a conventional process is inappropriate, especially with wires drawn upon severe conditions resulting in increased heat and burned lubricant tightly bound to the wire surface and embedded in micro-cavities.

Basically, the BH-S is a smooth and sensitive multi-layer micro-shaving/abrading that finely impacts wire surface separating lubricant residue or other contaminants from the base material, evacuating away dispersed contaminants by moving wire, exiting the unit extra clean of white-metal appearance at extreme speed, and operating at virtually zero energy consumption.

**Decalub – France**

**Website:** [www.decalub.com](http://www.decalub.com)



▲ Wire cleaning by BH-S system



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**Head Office:**  
2B, Pretoria Street, Kolkata - 700 071  
Tel: +91-33-22823744 / 45 / 8818, Fax: +91-33-22823739, Email: [kolkata@kkalpana.co.in](mailto:kolkata@kkalpana.co.in)

**Sales & Marketing Office:**  
106, Laxmi Plaza, Laxmi Industrial Estate, New Link Road, Andheri (W), Mumbai - 400 053  
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## High frequency solution

The request for cleaning processes in the wire industry is continuously increasing, along with the need for increased quality requirements.

Cleaning is used for stainless steel, low and high carbon steel, aluminium alloy, and copper wire to remove calcium and sodium stearate lubricant coming from the dry drawing machine, lubricant oil from a wet drawing machine or forming process, etc.

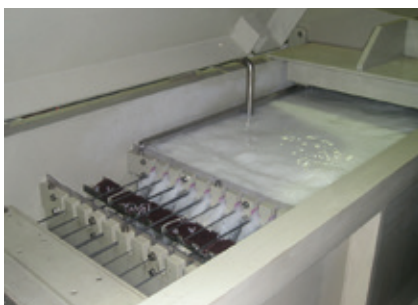
Ultrasonic cleaning has become popular and has been adopted by many wire producers worldwide.

Ultrasonic cleaning uses high frequency sound waves. During the activity, called cavitation, micro-size bubbles form, grow and implode due to alternating positive and negative pressure waves. Just prior to the bubble implosion, there is a tremendous amount of energy stored inside the bubble itself.

The implosion event occurring near a hard surface changes the bubble into a jet which travels at a speed of approximately 400km/h towards the hard surface. Because of the inherent small size of the jet, ultrasonic cleaning has the ability to reach into small crevices and remove entrapped soils very effectively.

The basic components of an ultrasonic cleaning system include some ultrasonic transducers, an electrical generator and a tank containing the cleaning solution.

The ultrasonic generator converts a standard electrical frequency of 50 or 60Hz into the high frequencies required. The higher the frequency, the smaller the bubbles during the cavitation will be.



▲ View of air wiping and the rinsing device

The transducers are constituted of PZT elements (Pb-Zr-Ti) which converts the electrical energy in mechanical vibrations by piezoelectric action.

Generally speaking, for the majority of the applications in the wire industry, alkaline solutions are preferred to remove oily matter, and phosphoric acid-based solutions preferred to remove stearate soaps.

Higher temperatures result in higher cavitation intensity and better cleaning. However, if the solution temperature closely approaches the boiling point of the solution, the liquid will boil in the negative pressure areas of the sound waves, reducing or eliminating the cavitation effect. Working around 60°C (140°F) offers an excellent compromise.

Sirio recommends that the baths be made of polypropylene, with one reservoir and one overflow bath in order to avoid any inflexion of the wire.

One vertical pump transfers the solution from the reservoir to the overflow bath.

**Sirio Wire Srl – Italy**  
**Website:** [www.siriowire.it](http://www.siriowire.it)

## Extraordinary results

Over the past few years, Boockmann's still relatively new Helicord® technology for wire and cable surface processing has been implemented successfully in industrial production lines.

Particularly noteworthy applications are welding wire finishing, removal of misprints from cable, removal of metal particles from strands, removal of drawing lubricants and metal particles before extrusion, and various cleaning and lubricating applications in special wire such as for food or medical use.

The main advantages of Helicord as compared to other technologies are the multiple 360° contact between wire and cleaning medium, a constantly refreshed cleaning medium, and efficiency of the process being independent from wire speed.

Helicord machines can be equipped with a pump and heating, and are available as one-step (NB57) or two-step (NB58) models, allowing for up to two subsequent processes (eg abrasive cleaning and subsequent finish application). Special models for low tensile forces, ie small wire diameters, are also available.

NB57W and NB58W models were designed for installation directly before the winder. A traversing process zone that can be connected to the traverse of the winder allows for minimum space requirements and avoids stress on the wire after the finishing process.

The most promising application is welding wire finishing with simultaneous coating and removal of particles. New types of fully impregnated finishing cords used to transfer active components (such as lubricants, corrosion inhibitors and arc stabilisers) have been a huge success.

**Boockmann Engineering GmbH – Germany**  
**Website:** [www.boockmann.com](http://www.boockmann.com)

## A unique partner for wire cleaning

Candor Sweden AB specialises in advanced wire cleaning and plating plants for various applications. Founded as a chemical supplier, its combination of know-how in chemical processes and advanced equipment for cleaning and plating of wire makes it a good choice in the market.



▲ A Candor MIG wire cleaning plant with the Candojet HW as pre-cleaning followed by an ultrasonic acid treatment for an effective cleaning at high speed up to 15-20m/s

It has a wide selection of wire cleaning plants to offer, such as hot water spray cleaning, ultrasonic cleaning and electrolytic cleaning. Which technology to use is a balance between wire speed, cleaning requirements, type of lubricant used and environmental aspects.

In many cases, especially for high-speed applications, the processes can be combined as separate steps after each other in a plant. By this way a hot water cleaning unit can be dedicated to remove sodium-based lubricants and an acid ultrasonic or electrolytic process can make the fine tuning of the already pre-cleaned wire if required.

**Candor Sweden AB – Sweden**  
**Website:** [www.candorsweden.com](http://www.candorsweden.com)

▼ Helicord® technology has been successfully implemented in industrial production lines



# Optical Wrap Defect Inspection for Cable

By Craig Girdwood and Andrew McCloskey, Taymer International

## Abstract

The optical wrap defect inspection system significantly improves the quality control of wrapped cable. The surface and wrapping structure of the cable is continuously monitored by a machine vision system at production line speed. The wrap surface can be viewed live and/or recorded for 100 per cent of the cable length. Surface and wrapping defects are identified, and images of the defects are recorded together with position information.

Wrapping information including wrapping angle and overlap percentage can be monitored for changes. This technology improves the quality of the cable produced and prevents defective products from reaching the customer.

## 1 Introduction

A critical quality issue created during the production of wrapped cable is surface defects and wrapping defects. Potential surface defects include scratches or holes, and potential wrapping defects include uneven wrapping, incorrect wrapping angle, tape peeling and tape tears. These defects are not only a cosmetic problem, but they can lead to the core being exposed to the surroundings, resulting in short circuits and failure of equipment.

By identifying and detecting these defects during the production process, immediate corrective action can be performed and defective sections of product can be repaired or discarded. Utilising the constant and immediate feedback from the machine, operators and process engineers are able to pinpoint the root cause of the defects.

The wrap defect inspection system utilises one or more high-speed cameras capturing real-time images of wrapped cable surfaces. The wrap inspector software is able to accurately measure

wrapping distance and angle, as well as determine both the type and size of a wide range of surface defects and wrapping defects. Surface and wrapping defects as small as 0.1mm can be detected and an alarm triggered. When a defect is detected a digital image is enhanced, magnified and displayed on a remote monitor, enabling the operator to verify the defects. This allows operators to determine the type of defect, to identify false positives (eg, a water droplet), or even detect surface blemishes (eg, surface discolouring, scratches).

The wrapping angle and distance measurements for the entire cable are saved to a database along with a record of any surface or wrapping defect information. The defect information includes defect type, size and location on the cable in metres or feet. This allows defects to be isolated quickly by operators after production is completed.

The wrap inspector system is able to be easily integrated into existing production lines and performs well for various types of wrapped cables and convoluted armouring. The wrap inspector system makes sure that any problems are discovered prior to any defective products being sent to customers.

The lifetime of the lights can be over 50,000 hours of usage and they are the only consumable part.

## 2 Current Defect Detection Technique Limitations

### 2.1 Laser Diameter Gauges

A laser diameter gauge is used to detect bulges, and neck-downs. The machine uses a laser and shadow technology to measure the diameter of the cable. The diameter measurement is extremely accurate and can be used to classify bulges or neck-downs.

However, there is no way to truly know if the defect detected is an actual defect. For example, a dust particle or water droplet on the cable would increase the diameter measurement, resulting in a false positive.

### 2.2 Spark Tester

A spark tester is equipment that can be used to detect pinhole-type defects. The machine creates a spark when there is a pinhole that exposes the core of the cable – conductive metal. However, if a pinhole does not expose the core, the spark is not created. But the pinhole that is not a through hole is still a defect since over time the pinhole could expand and expose the core of the cable. Also, for products without a core (pipe, hose, tubing) or products without a conducting core (fibre optic cable), spark testers are not applicable.

### 2.3 Vision Systems

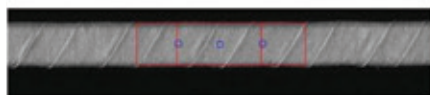
Prior configurations of surface defect detection systems were unable to identify and measure convolutions of the product. These systems were limited to ignoring the convolutions to identify significant defects such as pinholes or significant bulges or shape changes. The wrap inspection system has been improved with additional image processing software and alternative camera configurations that identifies the wrapped cable profile and can measure parameters and detect variations in the wrapping that are considered defects.

## 3 Machine Vision Inspection System

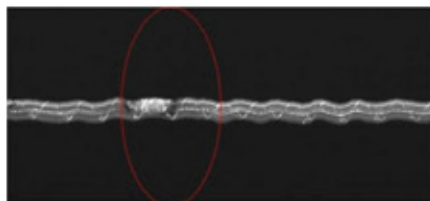
### 3.1 Optical Mechanical Design

The wrap defect inspection system consists of one or more high resolution cameras and adequate lighting to capture images of cable moving at speeds more than 1,200 feet (400 metres) per minute. Using multiple cameras, 360-degree coverage of the cable surface can be achieved. The system produces high quality images at these speeds with a very high frame rate.

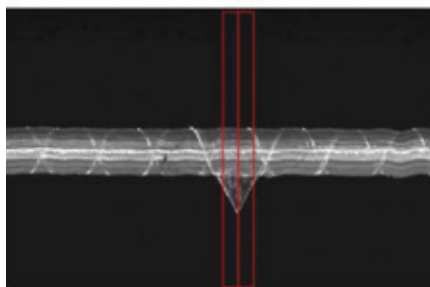




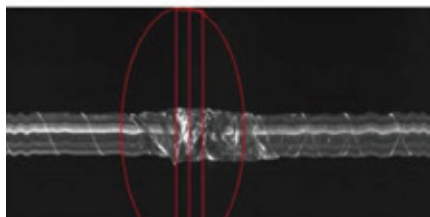
▲ Figure 1: Uneven wrapping



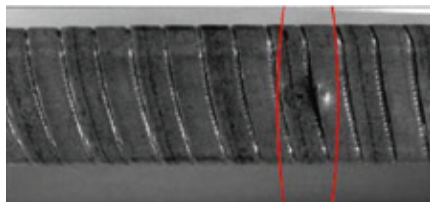
▲ Figure 2: Surface blemishes



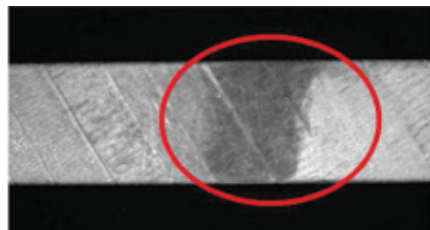
▲ Figure 3: Tape peeling



▲ Figure 4: Tape wrinkle



▲ Figure 5: Armour puckering



▲ Figure 6: Discolouration

The frame rate is synchronised with an encoder and speed algorithm. The lighting varies depending on the application.

The factors in consideration are the reflectivity of the material, surface profile, colour, line speed and camera type.

To ensure consistency in the images, the setup features an enclosure to prevent ambient lighting, outside particles, etc from affecting the results. Vibration of the cable is minimised by cable guides, preventing images from being out of focus.

An advanced algorithm is used to process the images for cable wrap inspection. A typical algorithm is capable of detecting surface and wrapping defects such as scratches, holes, uneven wrapping, incorrect wrapping angle, tape peeling and tape tears.

The algorithm requires analysis of the pixels of the image and grouping them for further interpretation. If a defect is detected, an alarm will notify the operator and an error report is saved to the on-going data log. The defect will also show up on the display for operators to clarify.

### 3.2 Improving Quality Assurance

*Suitable for any type of products:* Since the surface defect detection system with accurate diameter measurement uses machine vision, it can be used to inspect the surface for many types of wrapped products or convoluted profiles.

It is the most thorough method of detecting wrapping and surface flaws available and the advanced algorithm can help classify the type of defects accordingly.

*Reduced defects:* The system can provide the operator with a view of current surface images as well as both the most recent defects with defect dimensions and the current cable diameter. This continuous stream of real-time information – especially failure data – allows the operator to isolate the causes of wrap imperfections. Identifying when and how a defect occurs will allow the technical staff to learn the root cause of defects and reduce their occurrence.

*Quality assurance:* The system will continuously monitor the wrapping of the cable for both overlap distance and wrapping angle, and the measurements can be recorded for later analysis. Images of wrapping and surface defects are captured and saved to a hard disk for use in quality reports.

The wrap inspector system's display makes it easy for engineering and production supervisors to examine potential defects without having to see the defect on the actual cable itself. Defect images are saved together with location information allowing operators to quickly find and eliminate defects before they reach customers or fail in the field.

### 3.3 Limitations

There are a few limitations to the wrap defect inspection system:

- Sometimes significantly different wrapping types will require adjustment to the optical setup or software changes

- Since the camera is looking at the surface, water droplets/grease/dust particles will be detected as defects by the system. Generally, this can be fixed with a well-placed air wipe. Alternatively, the system sensitivity can be decreased, which may result in some of the smaller defects passing through the filter

### 3.4 Test Results

The wrap defect inspection system is a modified version of the surface inspection system that is used in numerous production lines around the world to detect surface defects on wire and cable.

Some samples images of defects and wrap measurements can be seen in Figures 1 to 6.

## 4 Conclusions

With a wrap defect inspection system, imperfections in the wrapped cable surface will be detected and the cable will be wrapped correctly, to show overlap distance and angle. The system provides several benefits:

- Suitable for any type of wrapped wire/cable and convoluted armouring
- Ensure the customer will not get defective products, improving customer relationship and confidence
- Reduce rework and eliminate cable waste resulting in material cost and labour cost
- Assist in internal improvement to production process to reduce defects
- Ensure cable overlap ■

*Paper courtesy of the 64<sup>th</sup> IWCS Technical Symposium, Atlanta, Georgia, USA, November 2015*

**Craig Girdwood and  
Andrew McCloskey  
Taymer International Inc**  
Markham, Ontario  
Canada

**Tel:** +1 905 479 2614

**Email:** [craig.girdwood@taymer.com](mailto:craig.girdwood@taymer.com)

**Website:** [www.taymer.com](http://www.taymer.com)

## Kompatibel mit einer Auswahl an Vorrichtungen

Sjogren Industries hat einen neu gestalteten Drahtzieher eingeführt, der mit einer Auswahl verschiedener Drahtziehvorrichtungen kompatibel ist. Bei dieser Konstruktion ist der ergonomische Griff bemerkenswert, mit dem - in Verbindung mit einer Sperrfunktion, die die Klemmbacken des Drahtziehers offen hält - der Bediener den Drahtzieher leicht in einer Hand halten kann, während mit der anderen Hand der Draht eingeführt wird.

Die Klemmbacken sind in offener Position blockiert durch den Einsatz einer Schieberplatte, die die obere Klemmbacke zurückzieht. Während der Draht noch mit einer Hand in der Position gehalten wird, kann der Bediener die Klemmbacken mit der anderen Hand schließen durch Einsatz des One-Touch Daumenauslösers, der gleich über dem Griff positioniert ist. Aufgrund dieses Verfahrens der Einführung braucht der Bediener weniger Zeit für die Einstellung.

Ein weiteres Konstruktionsmerkmal des neuen Drahtziehers von Sjogren ist sein Drehkopf, der das Inline-Ziehen vom Ziehsteinkasten sowie quer am Abzug ermöglicht. Diese integrierte Funktion vermeidet das Hinzufügen eines gesonderten Gabelkopfs in die Drahtziehbaugruppe und ist besonders zweckmäßig, wenn spröder Werkstoff gezogen wird.

Sjogren hat auch die Kosteneffizienz der Klemmbacken des Drahtziehers verbessert, indem sie mit zwei Arbeitsflächen konzipiert wurden: eine davon wird benutzt, wenn sich die Klemmbacke in der oberen Position und die andere, wenn sie sich in der unteren Position befindet.



▲ Der neue gestaltete Drahtzieher

Diese Konstruktion mit Doppelnutzung verdoppelt tatsächlich die Lebensdauer vor dem Ersatz, da die unteren und oberen Klemmbacken ihre Position leicht tauschen können. Der Drahtzieher von Sjogren ist mit einer Vielzahl von Drahtziehvorrichtungen kompatibel, und eignet sich für den Einsatz in Ziehscheiben, mit einem Durchmesser von 16" bis 30"/406mm bis 762mm (Linkslauf) und Drahtdurchmesser von 0,06" bis 0,25"/1,5mm bis 6,3mm.

**Sjogren Industries – USA**

**Website:** [www.sjogren.com](http://www.sjogren.com)

### Verstärkung der Geschäftsleitung

Craig Rika ist in die Geschäftsleitung des Herstellers von Ziehsteinen und -werkzeugen, Bar Products & Services Ltd, mit Sitz im Vereinigten Königreich, eingetreten.

Craig ist der Sohn des derzeitigen Vorsitzenden und Geschäftsführers, Steven Rika.

Er ist wieder ins Unternehmen eingestiegen nachdem er seine Entwicklungsjahre als Cricketspieler und in der Rugby-Union und Rugby-Liga auf Profi-Ebene verbrachte.

Er arbeitete für das Unternehmen auf Teilzeitbasis zwischen seinen sportlichen Verpflichtungen. Danach verwirklichte er seinen Jugendtraum Polizist zu werden und verpflichtete sich für 15 Jahre, bevor er in das Familienunternehmen zurückkehrte, um gemeinsam mit seinem Schwager, Glenn Rika-Rayne, zu arbeiten.

Durch seine Ernennung wird sich Steven Rika auf zukünftige Entwicklungen konzentrieren können.

**BAR Products and Services – UK**

**Website:** [www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Craig Rika



## Erfolg mit dem neuesten Rotiersystem RS20

Nachdem der neue RS20 Sensor – Wirbelstromprüfsysteme mit Rotiermechanik – auf den Markt gebracht wurde, sind mehrere Maschinen bei verschiedenen wichtigen Kundengruppen installiert worden und zwar mit guten Ergebnissen, die sich in unterschiedlichen Anwendungen zeigten.

▼ Der neue RS20-Sensor



Das System wurde vor allem bei Herstellern von Stabstahl oder Anwendungen in Drahtziehlinien eingesetzt. Der Vorteil dieses Systems liegt in den Sensorscheiben mit variierbaren Größen, die speziell auf die Kundenanforderungen für alle Anwendungen und jegliche Durchmesser zugeschnitten werden können.

Die entsprechende Prüfausrüstung steht in verschiedenen Varianten zur Verfügung, von der einfachen einkanaligen bis hin zur komplexen zehnkanaligen Version. Damit wird die Materialprüfung für quer- sowie längsorientierte Fehler oder die Kombination beider Fehlertypen ermöglicht.

**Prüftechnik Dieter Busch AG – Deutschland**  
Website: [www.pruftechnik.com](http://www.pruftechnik.com)

## Beste Präzision und hohe Geschwindigkeit

Jouhsen-bündgens hat neue Lösungen für die hochpräzise Fertigung bei Abschnitten für Drähte auf den Markt gebracht. Die PrecisionCut UD2 mit einem flexiblen Baukastensystem sowie die PrecisionCut MJC9 für präzise Kurzabschnitte ermöglichen Drahtverarbeitern durch kurze Wechselzeiten und hohe Verarbeitungsgeschwindigkeiten eine wirtschaftlichere Produktion.

Die Richt- und Abschnidemaschine PrecisionCut UD2 ist als flexibles Baukastensystem ausgelegt. Die Möglichkeit verschiedener Größen von Richtapparaten auf einer einzigen Anlage einzusetzen, gewährleistet kurze Wechselzeiten bei einem weiten Anwendungsbereich. Hersteller können dadurch Werkstoffe mit variierender Festigkeit und Durchmessern sehr kostengünstig fertigen.

Die UD2 eignet sich für die Fertigung kurzer und langer Stangen von 5 bis 4.000mm sowie um Drahtdurchmesser im Bereich 0,05 bis 4mm zu betreiben. Das robuste Maschinenkonzept realisiert eine Ausgangsleistung von 500 Teilen pro Minute. Mit der PrecisionCut MJC9 bietet Jouhsen-bündgens Drahtverarbeitern ein Maschinenkonzept speziell für die Fertigung präziser, rechtwinkliger Kurzabschnitte bei hohen Geschwindigkeiten: bis zu 600 Teile pro Minute mit Längen von 1,5 x d bis 70mm. Das Abschnittssystem in der MJC-Maschine arbeitet mit einem „Buchse-Buchse-System“, das eine Kombination mit der genauen Zuführung rechtwinkliger und gratfreier Abschnitte realisiert. Anwender können Drähte mit Durchmessern zwischen 3,5 und 9,3mm verarbeiten.



▲ PrecisionCut MJC9 von Jouhsen-bündgens

Ob Richten und Abschniden, thermisches Reißen, Endenbearbeitung, Kaltumformen oder Spitzenschleifen – weltweit verarbeiten Jouhsen-bündgens-Maschinen Drähte mit geringsten Toleranzen in hoher Geschwindigkeit. Mit der weiter steigenden Miniaturisierung von Bauteilen steigt auch die Nachfrage nach der Technologie von Jouhsen-bündgens. Auf den Anlagen werden Bauteile für die Elektronik oder den Automobilbau; Antriebs- und Steuerketten, Wälzlager oder Stifte gefertigt. Für medizinische Anwendungen werden Lanzetten, Kanülen oder chirurgische Nadeln oft hundertfach pro Minute bei hoher Geschwindigkeit geschnitten, geschliffen und magaziniert.

**Jouhsen-bündgens – Deutschland**

Website: [www.jouhsen.de](http://www.jouhsen.de)

# Optische Inspektion von Defekten bei der Kabelumwicklung

Von Craig Girdwood und Andrew McCloskey, Taymer International

## Übersicht

Das System der optischen Inspektion von Defekten bei der Umwicklung verbessert deutlich die Qualitätskontrolle umwickelter Kabel. Die Struktur der Oberfläche und der Umwicklung des Kabels wird ständig durch ein Bildverarbeitungssystem (MVS) bei Produktionsliniengeschwindigkeit erfasst. Die Oberfläche der Umwicklung kann direkt angezeigt und/oder für 100 Prozent der Kabellänge erfasst werden.

Defekte bei der Oberfläche und bei der Umwicklung werden erkannt, und die Bilder der Defekte werden zusammen mit der Positionsinformation aufgezeichnet.

Die Informationen über die Umwicklung, darunter der Umwicklungswinkel und der Überlappungsprozentsatz, können auf eventuelle Veränderungen überwacht werden. Diese Technik verbessert die Qualität des hergestellten Kabels und verhindert, dass der Kunde mangelhafte Produkte erhält.

## 1 Einleitung

Eine kritische Qualitätsfrage, die während der Produktion umwickelter Kabel entsteht, betrifft die Defekte bei der Oberfläche und bei der Umwicklung.

Mögliche Oberflächendefekte sind Kratzer oder Löcher, während mögliche Defekte bei der Umwicklung eine unregelmäßige Umwicklung, einen falschen Umwicklungswinkel, das Bandschalen und Bandrisse einschließen.

Diese Defekte stellen nicht nur ein äußeres Problem dar, sondern können auch dazu

führen, dass die Kabelseele der Umgebung ausgesetzt wird, was Kurzschlüsse und Geräteausfälle auslöst.

Durch die Erkennung und Feststellung dieser Defekte während der Produktionsverfahren können sofort Korrekturmaßnahmen ergriffen und die mangelhaften Teile des Produkts repariert oder beseitigt werden. Dank der kontinuierlichen und sofortigen Rückmeldung von der Maschine, können Bediener und Prozessingenieure die Hauptursache der Defekte genau feststellen.

Das System der Inspektion von Defekten bei der Umwicklung setzt eine oder mehrere Hochgeschwindigkeitskameras ein, die in Echtzeit Aufnahmen der Oberflächen umwickelter Kabel erfassen.

Die Software des Systems der Inspektion bei der Umwicklung kann mit Präzision den Abstand und den Umwicklungswinkel messen sowie den Typ und die Abmessungen einer großen Auswahl an Defekten bei der Oberfläche und bei der Umwicklung feststellen. Diese Defekte, mit Abmessungen bis 0,1mm, können erkannt werden und ein Alarm kann somit ausgelöst werden. Wird ein Defekt erkannt, so wird ein digitales Bild erweitert, vergrößert und auf einem Remote-Bildschirm angezeigt und der Bediener kann die Defekte prüfen.

Dadurch können Bediener den Defekttyp bestimmen, falsch positive Ergebnisse erkennen (wie z. B. einen Wassertropfen) oder sogar Oberflächenmängel erkennen (wie z. B. Oberflächenverfärbung, Kratzer).

Die Abmessungen des Umwicklungswinkels und des Abstands für das ganze Kabel werden in einer

Datenbank zusammen in einem Datensatz mit allen Informationen zu Defekten bei der Oberfläche oder bei der Umwicklung gespeichert.

Die Defektinformationen schließen Defekttyp, -abmessung und -position am Kabel ein und werden in Metern oder Fuß angezeigt. Damit können Defekte schnell von den Bedienern isoliert werden nachdem die Produktion beendet wird.

Das System der Inspektion bei der Umwicklung kann einfach in die bestehenden Fertigungsanlagen integriert werden und zeigte hervorragende Leistungen bei verschiedenen Typen umwickelter Kabel und gewellter Bewehrung. Das System der Inspektion bei der Umwicklung stellt sicher, dass eventuelle Probleme entdeckt werden bevor mögliche mangelhafte Produkte an den Kunden gesendet werden.

Die Lebensdauer der Lichter kann über 50.000 Betriebsstunden betragen - sie sind auch nur die einzigen Verbrauchsteile des Systems.

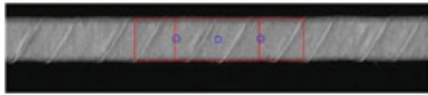
## 2 Einschränkungen der aktuellen Defekterkennungstechnik

### 2.1 Laser-Durchmessermessgeräte

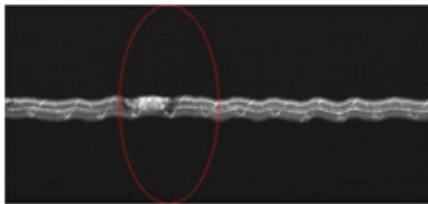
Ein Laser-Durchmessermessgerät wird eingesetzt um Wölbungen oder Einschnürungen zu erkennen.

Die Maschine setzt eine Laser- und Schattentechnik ein, um den Durchmesser des Kabels zu messen.

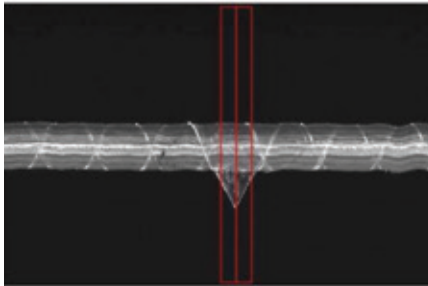




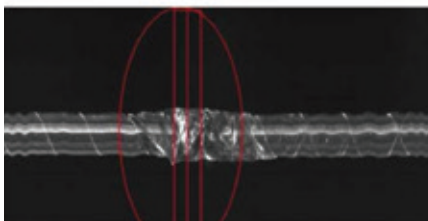
▲ Abb. 1: Unregelmäßige Umwicklung



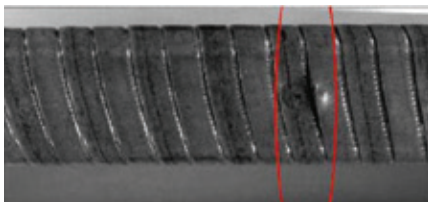
▲ Abb. 2: Oberflächenmängel



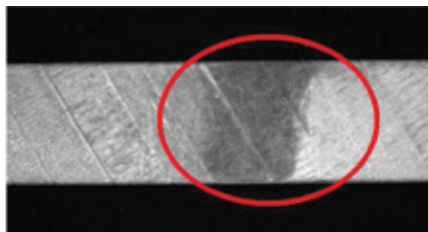
▲ Abb. 3: Bandschalen



▲ Abb. 4: Bandfalte



▲ Abb. 5: Fältelung bei Bewehrung



▲ Abb. 6: Verfärbung

Die Durchmesser messung ist äußerst präzise und kann zur Klassifizierung von Wölbungen oder Einschnürungen eingesetzt werden. Es gibt jedoch sicher keine Möglichkeit, um zu erkennen, ob der erkannte Mangel ein tatsächlicher Defekt ist. Zum Beispiel, ein Staubpartikel oder Wassertropfen auf dem Kabel würde die Durchmesser messung steigern und dies würde zu einem falsch positiven Ergebnis führen.

## 2.2 Sparktester

Ein Sparktester ist ein Gerät, das eingesetzt werden kann, um porenartige Defekte

festzustellen. Die Maschine erzeugt einen Funken wenn eine Pore vorhanden ist, die die Kabelseele – leitendes Metall – freilegt. Falls eine Pore die Kabelseele jedoch nicht freilegt, wird der Funken nicht erzeugt. Aber die Pore, die zwar nicht ein durchlaufendes Loch ist, bleibt dennoch ein Defekt, weil sie sich mit der Zeit erweitern und die Kabelseele freilegen könnte.

Ebenso sind Sparktester nicht für Produkte ohne einer Kabelseele (Rohre, Schläuche, Rohrleitungen) oder Produkte ohne einer leitenden Kabelseele (Lichtwellenleiterkabel) einsetzbar.

## 2.3 Vision-Systeme

Die Systeme der Erkennung von Defekten bei der Oberfläche älterer Generation konnten nicht die Wellungen des Produkts erkennen und messen. Diese Systeme beschränkten sich darauf, die Wellungen zu ignorieren, um wesentliche Defekte wie z. B. Poren oder größere Wölbungen oder Formänderungen zu erkennen. Das System der Inspektion bei der Umwicklung wurde mit einer zusätzlichen Bildverarbeitungssoftware und alternativen Kamerakonfigurationen verbessert, die das Profil des umwickelten Kabels erkennen sowie die Parameter messen und die Änderungen bei der Umwicklung, die als Defekte betrachtet werden, erkennen können.

## 3 Bildverarbeitungssystem

### 3.1 Optische mechanische Planung

Das System der Inspektion von Defekten bei der Umwicklung besteht aus einer oder mehreren hochauflösender Kameras und einer geeigneten Beleuchtung, um Bilder der Kabel zu erfassen, während diese bei einer Geschwindigkeit von über 1.200 Fuß (400m) pro Minute laufen.

Mit dem Einsatz von Mehrfachkameras kann eine Bedeckung der Kabeloberfläche um 360 Grad erzielt werden. Das System stellt hochwertige Bilder bei diesen Geschwindigkeiten mit einer sehr hohen Bildfrequenz her.

Die Bildfrequenz ist mit einem Encoder und Geschwindigkeitsalgorithmus synchronisiert. Die Beleuchtung variiert abhängig von den Anwendungen. Die berücksichtigten Faktoren sind das Reflexionsvermögen des Materials, das Oberflächenprofil, die Farbe, die Liniengeschwindigkeit und der Kamertyp.

Um die Einheitlichkeit der Bilder zu sichern, ist das Gerät abgedeckt, damit vermieden wird, dass die Umgebungsbeleuchtung, Fremdpartikeln

usw. die Ergebnisse beeinträchtigen. Die Vibration des Kabels wird durch Kabelführungen minimiert, um unscharfe Bilder zu vermeiden.

Ein fortschrittlicher Algorithmus wird angewendet, um die Bilder für die Inspektion bei der Kabelumwicklung zu verarbeiten.

Ein typischer Algorithmus kann Oberflächen- und Umwicklungsdefekte erkennen wie z. B. Kratzer, Löcher, eine unregelmäßige Umwicklung, einen falschen Umwicklungswinkel, das Bandschalen und Bandrisse.

Der Algorithmus erfordert eine Analyse der Pixel des Bildes und gruppiert sie für eine weitere Interpretation. Wird ein Defekt erkannt, so wird der Bediener durch einen Alarm informiert und ein Fehlerbericht wird im laufenden Datenprotokoll gespeichert. Der Defekt wird auch auf der Anzeige des Bedieners zur Klärung erscheinen.

### 3.2 Verbesserte Qualitätssicherung

Für jeden Produkttyp geeignet: Da das Oberflächenfehler-Erkennungssystem mit einer präzisen Durchmesser messung das Bildverarbeitungssystem einsetzt, kann es benutzt werden, um die Oberfläche für viele Typen umwickelter Produkte oder gewellter Profile zu inspizieren.

Es ist die gründlichste zur Verfügung stehende Methode zur Erkennung von Umwicklungs- und Oberflächenfehlern. Ein fortschrittlicher Algorithmus kann dazu beitragen, den Defektyp entsprechend zu klassifizieren.

**Reduzierung der Defekte:** Das System kann dem Bediener eine Ansicht der laufenden Oberflächenbilder bieten sowie der aktuellsten Defekte mit Defektanmessungen und den laufenden Kabeldurchmesser.

Dank diesem kontinuierlichen Fluss von Ist-Zeit-Informationen – insbesondere Daten über Defekte – kann der Bediener die Ursachen der Umwicklungsmängel isolieren. Durch das Identifizieren wann und wie ein Defekt auftritt, kann das Fachpersonal die Hauptursache der Defekte erkennen und deren Entstehen reduzieren.

**Qualitätssicherung:** Das System wird ständig die Umwicklung des Kabels sowohl in Bezug auf den Überlappungsabstand wie auf den Umwicklungswinkel überwachen – die Abmessungen können für spätere Analysen gespeichert werden. Bilder der Umwicklungs- und Oberflächen defekte werden erfasst und auf die Festplatte für den Gebrauch bei Qualitätsberichten

gespeichert. Durch die Anzeige des Systems der Inspektion bei der Umwicklung wird den Engineering- und Produktionsleitern die Prüfung potentieller Defekte erleichtert, ohne dass sie den Defekt direkt am Kabel sehen müssen. Die Bilder der Defekte werden zusammen mit Positionsinformationen gespeichert, die es den Bedienern ermöglichen, die Defekte schnell zu erkennen und vor der Ankunft beim Kunden oder bevor ein Defekt im Feld auftritt, zu beseitigen.

### 3.3 Einschränkungen

Es gibt einige Einschränkungen beim System der Inspektion von Defekten bei der Umwicklung:

- Manchmal ist bei wesentlich unterschiedlichen Umwicklungstypen eine Anpassung der optischen Einstellung oder Softwareänderungen erforderlich
- Da die Kamera auf die Oberfläche gerichtet wird, können Wassertropfen/Fett/Staubpartikel als Defekte vom System erkannt werden. In der Regel kann dies mit einem richtig positionierten Gebläse behoben werden. Alternativ kann die Systemempfindlichkeit vermindert werden, was allerdings dazu führen könnte, dass einige der kleineren Defekte durch den Filter laufen

### 3.4 Testergebnisse

Das System der Inspektion von Defekten bei der Umwicklung ist eine geänderte Version des Oberflächen-Inspektionssystems, das weltweit in zahlreichen Produktionslinien eingesetzt wird, um Oberflächendefekte an Draht und Kabeln zu erkennen. Einige Probestbilder der Defekte und Umwicklungsabmessungen sind in den Abb. 1 bis 6 ersichtlich.

## 4 Schlussfolgerungen

Mit einem System der Inspektion von Defekten bei der Umwicklung werden Mängel an der Oberfläche eines umwickelten Kabels erkannt und das Kabel richtig umwickelt, so dass der Überlappungsabstand und -winkel angezeigt werden können. Das System bietet verschiedene Vorteile:

- Für alle Typen umwickelter Drähte/Kabel und gewellter Bewehrung geeignet
- Sichert, dass der Kunde keine mangelhaften Produkte erhält, was wiederum die Kundenbeziehung sowie das Vertrauen verbessert
- Reduzierte die Nachbearbeitung und beseitigt Kabelabfälle, was sich auf die Material- und Arbeitskraftkosten auswirkt

- Trägt zur werksinternen Verbesserungen des Produktionsverfahrens bei, um die Defekte zu reduzieren
- Sichert die Kabelüberlappung ■

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**Craig Girdwood and  
Andrew McCloskey  
Taymer International Inc**  
Markham, Ontario  
Kanada  
**Tel:** +1 905 479 2614  
**Email:** [craig.girdwood@taymer.com](mailto:craig.girdwood@taymer.com)  
**Website:** [www.taymer.com](http://www.taymer.com)



# Совместимый с рядом комплектующих

Sjogren Industries представили новую разработанную установку для протягивания проводов, совместимую с рядом различных комплектующих для протягивания проводов.

Разработка примечательна удобной ручкой, которая, в сочетании с функцией блокирования, держит губку съемника открытой, позволяет оператору легко держать съемник в одной руке, вставляя проволоку другой рукой.

Губки заблокированы в открытом состоянии при использовании скользящей пластины, которая сжимает верхнюю губку. При держании провода в нужной позиции в одной руке оператор может закрыть губки, одним нажатием большого пальца активировав механизм расцепления, расположенный прямо над ручкой. Данный процесс вставки позволяет оператору тратить меньше времени на установку.

Еще одной характеристикой дизайна нового Sjogren Puller является вращающаяся головка, которая обеспечивает оперативное вытягивание из волокодержателя, а также касательную на тяговой шайбе. Данная встроенная характеристика предотвращает необходимость добавления отдельного скобочного крепления к комплектующим затягивателя, и является особенно



▲ Новая разработанная установка для натягивания проволоки

ценной при протягивании хрупкого материала.

Sjogren также повысили экономическую эффективность губок съемника при их разработке с двумя поверхностями: одна, которая используется при нахождении губки в верхнем положении и одна, которая используется в нижнем положении.

Данный дизайн двойного применения эффективно удваивает срок службы

до замены, так как нижняя и верхняя губки могут просто менять положение. Sjogren Puller совместим с рядом комплектующих для протягивания, и он подходит для применения на тяговых шайбах диаметром от 16 до 30 дюймов / 406-762 мм (при вращении против часовой стрелки) и для работы с проволокой диаметром от 0,06 до 0,25 дюймов / 1,5-6,3 мм.

**Sjogren Industries – США**  
**Вебсайт:** [www.sjogren.com](http://www.sjogren.com)

## Укрепление группы управления

Крейг Рикка присоединился к группе управления Bar Products & Services Ltd - компании-изготовителю фильер и катушек, расположенной в Великобритании.

Крейг - сын текущего президента и управляющего директора, господина Стивена Рикка.

Он вновь присоединяется к компании после проведения нескольких лет своего становления в качестве профессионального спортсмена, играющего в крикет, в союзе регби и в лиге регби на профессиональном уровне.

Он работал в компании по совместительству между своими спортивными обязательствами. Затем он воплотил свои подростковые амбиции, став полицейским, путь, который он выбрал на 15 лет до возвращения в семейный бизнес и работы со своим зятем, Генном Рикка-Рейн. Его назначение позволит Стивену Рикка сконцентрироваться на дальнейшем развитии.

**BAR Products and Services – Великобритания**  
**Вебсайт:** [www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Крейг Рикка

## Успех новейшей вращающейся системы RS20

После запуска нового сенсора RS20 - систем индукционного контроля с вращающимися механизмами - большое число установок было монтировано у нескольких ключевых заказчиков с хорошими результатами, продемонстрированными при различном применении. Первоначально система использовалась производителями стальных стержней или на линиях волочения проволоки. Преимущество системы заключается в контактных дисках с различным шагом, которые могут быть приспособлены для нужд заказчиков в любом применении и на любом диаметре. Соответствующее оборудование для контроля доступно в различных вариантах от простых одноканальных до десятиканальных версий. Данное позволяет проверять материалы на наличие поперечных и продольных дефектов или комбинации обоих типов дефектов.

**Pruftechnik Dieter Busch AG – Германия**  
**Вебсайт:** [www.pruftechnik.com](http://www.pruftechnik.com)



▲ Новый сенсор RS20

# Наилучшая точность и высокая скорость

Jouhsen-bündgens запустили новые решения для производства сечения проволоки. PrecisionCut UD2 - это гибкая модульная система, как и PrecisionCut MJC9 для точного короткого сечения, предусматривающая более экономичное производство пользователям проволоки благодаря высоким скоростям обработки и быстрой смене. Устройство выпрямления и резки PrecisionCut UD2 разработано в качестве гибкой модульной системы.

Возможность использования выпрямителей различных размеров на одной установке гарантирует быструю смену для большого числа различных применений. В результате производители могут изготавливать материалы с различной прочностью и диаметрами очень экономично.

UD2 подходит для изготовления коротких и длинных стержней от 5 до 4 000 мм, а также для обработки диаметров проволоки в диапазоне от 0,5 до 4 мм. Надежный дизайн устройства позволяет достигать производительности максимум в 500 частей в минуту.

Jouhsen-bündgens с PrecisionCut MJC9 предлагает концепцию устройства, оптимизированного для производства точного, прямоугольного, коротких отсечек на высоких скоростях для проволоочной промышленности: До 600 частей в минуту длиной 1,5 x д до 70 мм.

Система отсечек в устройстве с модульным разъемом работает с системой «вкладыш-вкладыш», которая реализована в сочетании с точными прямоугольными на подаче и без шероховатостей отсечками. Пользователи могут обрабатывать проволоки диаметром от 3,5 до 9,3 мм.

Устройства Jouhsen-bündgens обрабатывают проволоки по всему миру с самыми маленькими допусками на высоких скоростях, будь то выпрямление или резка, электроделение,



▲ PrecisionCut MJC9 от Jouhsen-bündgens

обработка концов или зачистка. Спрос на технологию Jouhsen-bündgens также вырос с постоянным стремлением к уменьшению размеров компонентов.

Оборудование производит части для электронной или автомобильной промышленности: приводы и цепи ГРМ, подшипники или шпильки. Для медицинского применения скальпели, катетеры и хирургические иглы часто режутся, затачиваются и погружаются в контейнеры со скоростью сотни частей в минуту.

**Jouhsen-bündgens – Германия**  
**Вебсайт:** [www.jouhsen.de](http://www.jouhsen.de)



# Оптический контроль дефектов обмотки кабеля

Крейг Гердвуд и Эндрю МакКлоски, Taymer International

## Аннотация

Оптическая система инспекции по выявлению дефектов оболочки существенно улучшает контроль качества кабеля с плетеной оболочкой. Структура поверхности и оболочки постоянно контролируются компьютерной видеосистемой при скорости перемещений на конвейере.

Изоляционный материал поверхности можно рассматривать в режиме работы и/или в записи 100% длины кабеля. Дефекты поверхности и оболочки определяются, а изображения дефектов записываются вместе с информацией об их расположении.

Информация об оболочке, включая угол намотки и процент нахлеста могут контролироваться на обнаружение изменений. Данная технология улучшает качество изготавливаемого кабеля и предотвращает попадание бракованной продукции к заказчикам.

## 1 Введение

Критическим вопросом при изготовлении кабеля с плетеной оболочкой является дефекты поверхности и дефекты оболочки. Потенциальные дефекты поверхности включают царапины или дырки, а потенциальные дефекты оболочки включают неровную оболочку, неправильные угол намотки, отслаивание ленты и разрывы ленты. Данные дефекты являются не только косметической проблемой, но и могут привести к незащищенной жиле, что, в свою очередь, приводит к коротким замыканиям и выходу из строя оборудования.

При определении и обнаружении данных дефектов в процессе производства могут быть осуществлены незамедлительные корректирующие действия, и бракованные участки продукции могут быть исправлены или

утилизированы. Применяя постоянную и незамедлительную обратную связь от устройства, операторы и инженеры-технологи могут определить причину дефектов.

В системе инспекции по обнаружению дефектов применяется одна или более высокоскоростная камера, регистрирующая изображения поверхностей кабелей с оболочкой в режиме реального времени. Программное обеспечение инспекции оболочки точно измеряет расстояние и угол намотки, а также определяет как тип, так и размер большого диапазона дефектов поверхности и дефектов намотки.

Дефекты поверхности и намотки начиная с 0,1 мм могут быть обнаружены при подаче сигнала. При обнаружении дефекта цифровое изображение выводится, увеличивается и отображается на удаленном мониторе, что позволяет оператору проверить дефекты. Это дает возможность операторам указать тип дефекта, определить ложное срабатывание (т.е. капля воды) или даже обнаружить дефекты поверхности (например, непрочное покрытие поверхности, царапины).

Измерения угла обмотки и расстояния для всего кабеля сохраняются в базу данных вместе с регистрацией любой информации о дефекте поверхности или обмотки.

Информация о дефекте включает тип дефекта, размер и расположение на кабеле в метрах или футах. Это позволяет операторам быстро изолировать дефекты после того, как производство завершено. Система инспекции обмотки может легко быть интегрирована в существующие производственные линии и великолепно работать с различными типами кабелей с обмоткой и спиральной оплеткой. Благодаря системе инспекции обмотки оператор может убедиться в обнаружении любых

проблем до отправки бракованной продукции заказчиком.

Срок службы освещения может быть более 50 000 часов, и это является единственным расходным материалом.

## 2 Ограничения существующей техники определения дефектов

### 2.1 Лазерные датчики контроля диаметра

Лазерный датчик контроля диаметра применяется для обнаружения выпуклостей, сужений. Оборудование использует технологию лазера и тени для измерения диаметра кабеля. Измерение диаметра является высокоточным и может использоваться для классификации выпуклостей или сужений.

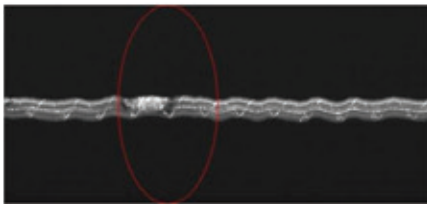
Однако, невозможно точно определить, является ли обнаруженный дефект действительно дефектом. К примеру, частица пыли или капля воды на кабеле могут увеличить диаметр измерения, что приведет к ложному срабатыванию.

### 2.2 Искровой контрольный прибор

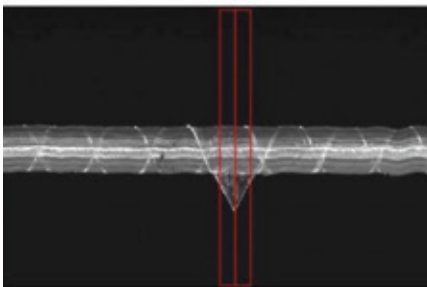
Искровой контрольный прибор - это оборудование, которое применяется для обнаружения дефектов типа крошечного отверстия. Оборудование создает искру там, где есть крошечное отверстие, которое оголяет жилу кабеля - проводящий металл. Однако, если крошечное отверстие не оголяет жилу, искра не возникает. Тем не менее, крошечное отверстие, не являющееся сквозным, все равно является дефектом, так как отверстие может увеличиться и в итоге оголить жилу кабеля. Также для продукции без жилы (трубы, кожухи, трубки) или продукции без проводящей



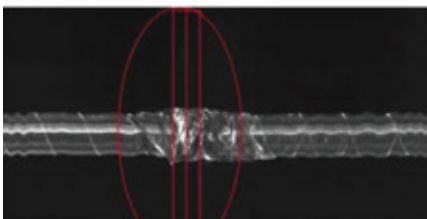
▲ Рисунок 1: Неровная обмотка



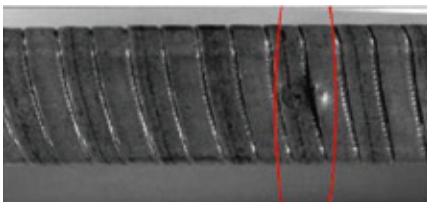
▲ Рисунок 2: Дефекты поверхности



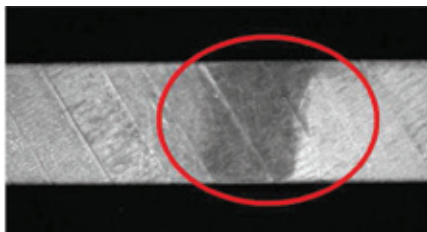
▲ Рисунок 3: Отслаивание обмотки



▲ Рисунок 4: Складки обмотки



▲ Рисунок 5: Сморщивание оплетки



▲ Рисунок 6: Обесцвечивание

жилы (волоконные оптические кабели) искровые контрольные приборы не применимы.

### 2.3 Системы изображения

Предыдущие конфигурации систем обнаружения дефектов поверхности были неспособны определить и измерить изгибы продукции. Данные системы были ограничены в части пропуска изгибов для определения значительных дефектов таких, как крошечные отверстия, или значительные выпуклости, или изменения формы. Система инспекции обмотки была

усовершенствована благодаря добавлению дополнительного программного обеспечения, обрабатывающего изображения и новых конфигураций камеры, которые определяют профиль кабеля с оболочкой и могут измерять параметры и определять изменения обмотки, которые считаются дефектами.

## 3 Автоматическая система контроля оборудования

### 3.1 Оптический механический расчет

Система контроля дефектов обмотки состоит из одной или более камер высокого разрешения и надлежащего освещения для получения изображения кабеля, движущегося со скоростью более 1 200 футов (400 метров) в минуту.

При использовании многочисленных камер может быть получен 360-градусный охват поверхности кабеля. Система создает высококачественные снимки при данных скоростях с очень высокой частотой кадров.

Частота кадров синхронизируется с преобразователем и алгоритмом скорости. Освещенность варьируется в зависимости от применения. Учитываемыми факторами являются отражающая способность материала, профиль поверхности, цвет, скорость конвейера и тип камеры.

Для обеспечения постоянства снимков настройка предусматривает кожу, защищающий от общего освещения, внешних частиц и т.д., влияющих на результаты. Вибрация кабеля минимизируется кабельными направляющими, предотвращающими потерю фокуса снимков.

Усовершенствованный алгоритм применяется для обработки снимков при контроле кабельной обмотки. Стандартный алгоритм может обнаруживать такие дефекты поверхности и обмотки, как царапины, дырки, неровную обмотку, некорректный угол обмотки, отслаивание ленты и разрыв ленты.

Для алгоритма необходим анализ пикселей изображения и группировка их для дальнейшей интерпретации. При обнаружении дефекта сигнал уведомит оператора, и отчет об ошибке сохраняется в текущем журнале регистрации данных. Дефект будет также выведен на дисплей для пояснения операторов.

### 3.2 Усовершенствование обеспечения качества

Оборудование применимо для любого типа продукции. Так как система контроля дефектов поверхности с точным измерением диаметра использует аппаратное изображение, она может применяться для контроля поверхности различных типов продукции с обмоткой или спиральными профилями.

Это самый точный доступный метод обнаружения дефектов обмотки и поверхности, а усовершенствованный алгоритм может помочь в соответствующей классификации типов дефектов.

Уменьшение брака: Система может обеспечивать изображение текущей поверхности для оператора, а также самых последних дефектов с размерами дефектов и текущим диаметром кабеля. Постоянный поток информации в режиме реального времени, особенно что касается данных о дефектах, позволяет оператору изолировать причины дефектов обмотки. Определение, когда и как возникает дефект, позволит техническому персоналу выяснить первоначальную причину дефектов и уменьшить их возникновение.

Обеспечение качества: Система постоянно контролирует обмотку кабеля как в части длины перекрывающего участка, так и угла обмотки, измерения могут быть зарегистрированы для дальнейшего анализа. Изображения дефектов обмотки и поверхности создаются и сохраняются на жестком диске для использования в отчетах по качеству.

Дисплей системы контроля обмотки упрощает изучение потенциальных дефектов специалистами по контролю расчета и производства без необходимости рассмотрения дефекта на самом кабеле. Изображения дефектов сохраняются вместе с информацией по расположению, что позволяет операторам быстро находить и устранять дефекты до их попадания заказчиками или до отказов на объекте.

### 3.3 Ограничения

У системы контроля дефектов есть несколько ограничений.

- Иногда для существенно разных типов обмотки необходима оптическая настройка или изменения программного обеспечения.
- Так как камера направлена на поверхность капли воды/жира/частицы пыли будут определяться системой как дефекты. В основном, это можно исправить благодаря правильно установленной очистке воздуха. В качестве альтернативы может быть уменьшена



чувствительность системы, что может привести к прохождению более мелких дефектов через фильтр.

### 3.4 Результаты испытаний

Система контроля дефектов обмотки является измененной версией системы контроля поверхности, которая используется в многочисленных производственных линиях по всему миру для обнаружения дефектов поверхности кабеля и проволоки. На рисунках 1-6 ниже изображены снимки образцов дефектов измерений обмотки.

## 4 Выводы

С системой контроля дефектов обмотки дефекты на поверхности обмотки кабеля будут обнаружены, и кабель будет иметь надлежащую обмотку с правильной длиной перекрывающего участка и углом обмотки. Система предоставляет несколько преимуществ:

- Подходит для любого типа кабеля с обмоткой и спиральной оплеткой
- Предотвращает попадание бракованной продукции к заказчику, улучшая отношения с заказчиком и уверенность
- Уменьшает объем переработки и отходы при производстве кабеля, что приводит к уменьшению расходов на материалы и рабочую силу
- Способствует внутреннему усовершенствованию производственного процесса при уменьшении брака
- Обеспечивает защиту кабеля ■

*Работа опубликована с разрешения 64-го Технического симпозиума IWCS, прошедшего в ноябре 2015 г. в городе Атланта штате Джорджия, США.*

**Крейг Гердвуд и Эндрю МакКлоски**  
**Taymer International Inc**  
Markham  
Онтарио  
Канада  
**Тел:** +1 905 479 2614  
**Email:** craig.girdwood@taymer.com  
**Вебсайт:** www.taymer.com

# Compatibilité avec une large gamme de dispositifs

Sjogren Industries a présenté un extracteur de fil de nouvelle conception qui est compatible avec une gamme de différents extracteurs de fil. La conception est remarquable de par sa poignée ergonomique qui associée à une fonction de verrouillage maintenant les mâchoires de l'extracteur ouvertes, permet à l'opérateur de tenir aisément le dispositif dans une main tout en introduisant le fil avec l'autre main.

Les mâchoires sont verrouillées en position ouverte au moyen d'une plaque coulissante qui retire la mâchoire supérieure. Tout en maintenant le fil en position d'une seule main, l'opérateur peut fermer les mâchoires avec l'autre en utilisant le mécanisme de déclenchement, situé juste au-dessus de la poignée, grâce à une simple pression tactile du pouce. Ce processus d'introduction permet à l'opérateur d'employer moins de temps pour la configuration.

Une autre caractéristique conceptuelle du nouvel extracteur de Sjogren est sa tête pivotante, qui permet d'effectuer la traction en ligne à partir de la matrice ainsi que tangentiellement sur le cabestan. Cette fonction intégrée élimine la nécessité d'ajouter une chape séparée au groupe de l'extracteur, et elle est particulièrement utile lors du tréfilage d'un matériau fragile.

Sjögren a également amélioré la rentabilité des mâchoires de l'extracteur grâce à leur conception à deux surfaces de travail dont une est utilisée lorsque la mâchoire est en position haute, et l'autre est utilisée lorsqu'elle est placée dans une position inférieure. Cette conception à double usage redouble efficacement la durée de vie avant le remplacement, du fait qu'il est facile d'échanger la position des mâchoires supérieures et inférieures.



▲ Extracteur de fil de nouvelle conception

L'extracteur Sjogren est compatible avec une variété de dispositifs pour extracteurs, et il est indiqué pour les cabestans ayant un diamètre allant de 16" à 30" (406mm-762mm), (rotation dans le sens antihoraire) et travaillant avec des diamètres de fil de 0,06" à 0,25" (1,5mm-6,3mm).

**Sjogren Industries – États-Unis**

**Website:** [www.sjogren.com](http://www.sjogren.com)

## Renforcement de l'équipe de gestion

Craig Rika s'est uni à l'équipe de gestion du fabricant de matrices et d'outillages de tréfilage Bar Produits & Services Ltd, basé au Royaume-Uni.

Craig est le fils de l'actuel président et directeur général M. Steven Rika.

Il a de nouveau rejoint la société après avoir passé ses années de formation en tant que sportif professionnel, à savoir comme joueur de cricket, joueur dans la Rugby Union et dans la Rugby League, et ce toujours au niveau professionnel.

Il a travaillé pour l'entreprise à temps partiel, en partageant son temps entre travail et engagements sportifs. Il a ensuite réalisé son ambition adolescente de devenir un agent de police, un rôle qu'il a recouvert pendant 15 ans avant de retourner au sein de l'entreprise familiale pour travailler avec son beau-frère, Glenn Rika-Rayne.

Sa nomination permettra à Steven Rika de se concentrer sur les développements futurs.

**BAR Products and Services – Royaume-Uni**

**Website:** [www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Craig Rika



## Le succès du dernier système de rotation RS20

Après le lancement du nouveau capteur RS20 (systèmes de contrôle par courants de Foucault avec mécanisme de rotation), un certain nombre de machines ont été installées chez plusieurs clients clés et avec de bons résultats dans plusieurs applications.

▼ Le nouveau capteur RS20



Le système est principalement utilisé chez les fabricants de barres en acier ou dans les applications de lignes de tréfilage de fil.

L'avantage du système réside dans les disques capteur de dimensions variables, qui peuvent être spécialement adaptés aux exigences des clients pour chaque application et chaque diamètre.

L'équipement d'essai correspondant est disponible dans différentes variantes, de la simple version à un canal à la version complexe à dix-canaux. Cela permet de tester des matériaux pour chercher les défauts orientés transversalement, les défauts orientés longitudinalement ou la combinaison des deux types de défauts.

**Prüftechnik Dieter Busch AG – Allemagne**  
Website: [www.prueftechnik.com](http://www.prueftechnik.com)

## Meilleure précision et haute vitesse

Jouhsen-bündgens a lancé de nouvelles solutions pour la production haute précision de sections de fil. La machine PrecisionCut UD2 équipée d'un système modulaire flexible, et la PrecisionCut MJC9 conçue pour des tronçons précis coupés courts permettent une production plus économique pour les utilisateurs de fil en raison des vitesses de traitement élevées et des temps de changement réduits.

La machine à dresser et à couper PrecisionCut UD2 est conçue comme un système modulaire flexible. La possibilité d'utiliser différentes tailles de redresseurs sur une seule installation, garantit des temps de changement brefs pour une ample gamme d'applications. En conséquence, les fabricants peuvent produire des matériaux avec des résistances et des diamètres différents de façon très économique.

La UD2 est indiquée pour produire des barres courtes et longues allant de 5 à 4 000mm, ainsi que pour traiter des diamètres de fil pour une plage allant de 0,05 à 4mm. La conception robuste de la machine permet d'obtenir un rendement maximal de 500 pièces par minute. Avec la PrecisionCut MJC9, Jouhsen-bündgens offre à l'industrie du fil un concept de machine optimisé pour la fabrication de sections de fil précises, rectangulaires, et courtes à des vitesses élevées: jusqu'à 600 pièces par minute avec des longueurs de 1,5 x d jusqu'à 70mm. Le système de coupe dans la machine MJC fonctionne actuellement avec un système dénommé "douille à douille", réalisé en combinaison avec l'alimentation précise de sections de fil rectangulaires et sans ébavures. Les utilisateurs peuvent traiter des câbles présentant des diamètres compris entre 3,5 et 9,3mm.



▲ PrecisionCut MJC9 de Jouhsen-bündgens

Que ce soit le redressement, le coupage, le processus de découpe thermique, l'usinage des extrémités, le formage à froid ou l'appointage, les machines de Jouhsen-bündgens traitent des fils ayant les tolérances les plus réduites à grande vitesse du monde entier. La demande de la technologie de Jouhsen-bündgens a également augmenté en conséquence de la croissante miniaturisation des composants. L'installation produit des composants pour l'électronique ou pour l'industrie automobile tels que: chaînes d'entraînement et à cames, roulements ou broches. Enfin, pour les applications médicales, les bistouris, les canules et les aiguilles chirurgicales sont souvent coupées, meulées et emmagasinés à haute vitesse en centaines de pièces par minute.

**Jouhsen-bündgens – Allemagne**

Website: [www.jouhsen.de](http://www.jouhsen.de)

# Inspection optique des défauts dans l'enroulement des câbles

Par Craig Girdwood et Andrew McCloskey, Taymer International

## Résumé

Le système de contrôle optique des défauts d'enroulement améliore considérablement le contrôle de la qualité de l'enroulement des câbles.

La structure superficielle et d'enroulement du câble est constamment contrôlée par un système de vision artificielle à la vitesse de la ligne de production.

La surface d'enroulement peut être visionnée directement et/ou enregistrée à 100% sur toute la longueur du câble. Les défauts superficiels et d'enroulement sont identifiés, et les images des défauts sont enregistrées ainsi que des informations concernant la position. Les informations concernant l'enroulement, y compris l'angle d'enroulement et le pourcentage de chevauchement, peuvent être contrôlées pour des modifications éventuelles.

Cette technologie permet d'améliorer la qualité du câble produit et réduit considérablement le nombre des produits défectueux pouvant être livrés au client.

## 1 Introduction

Un problème de qualité essentiel qui se pose lors de la production de câbles enroulés est représenté par les défauts de surface et les défauts d'enroulement. Des défauts de surface potentiels comprennent des rayures ou des trous, et des défauts d'enroulement peuvent comprendre un enroulement irrégulier, un angle d'enroulement incorrect, le pelage et la déchirure de la bande.

Ces défauts ne sont pas seulement un problème extérieur, mais peuvent

conduire à une exposition du noyau à l'environnement, ce qui provoque des courts-circuits et des pannes à l'équipement. L'identification et la détection de ces défauts au cours du processus de production permettent de prendre des mesures correctives immédiates et de réparer ou de rejeter les sections défectueuses du produit.

En utilisant la rétroaction constante et immédiate de la machine, les opérateurs et les ingénieurs de procédé sont en mesure d'identifier la cause de défauts.

Le système de contrôle des défauts de l'enroulement utilise une ou plusieurs caméras à grande vitesse capturant les images en temps réel des surfaces des câbles enroulés.

Le logiciel de contrôle de l'enroulement est conçu pour mesurer avec précision la distance et l'angle d'enroulement et pour déterminer le type et les dimensions d'un large éventail de défauts de surface et de défauts d'enroulement.

Il est possible de détecter des défauts de surface et d'enroulement aussi petits que 0,1 mm de dimension et de déclencher une alarme. Lorsqu'un défaut est détecté, une image numérique est améliorée, agrandie et affichée sur un écran afficheur déporté, en permettant ainsi à l'opérateur de vérifier les défauts.

Cela permet aux opérateurs de déterminer le type de défaut, d'identifier les faux positifs (comme par exemple une goutte d'eau), ou même de détecter les imperfections de surface (comme la décoloration de la surface, des rayures).

Les mesures de l'angle d'enroulement et de la distance pour la totalité du câble sont enregistrées dans une base

de données avec un registre contenant n'importe quelle information concernant les défauts de surfaces ou d'enroulement.

Les informations concernant les défauts comprennent le type de défaut, les dimensions et la position sur le câble éventuel, exprimés en mètres ou en pieds. Cela permet aux opérateurs d'isoler rapidement les défauts une fois la production terminée. Le système de contrôle de l'enroulement peut être facilement intégré dans les lignes de production existantes et présente des performances satisfaisantes avec différents types de câbles enroulés et d'armures ondulées.

Le système de contrôle de l'enroulement garantit la découverte de tous problèmes éventuels de façon à ce qu'aucun produit défectueux ne soit envoyé aux clients.

Les lumières peuvent avoir une durée de vie de plus de 50 000 heures de fonctionnement, et représentent le seul élément consommable du système.

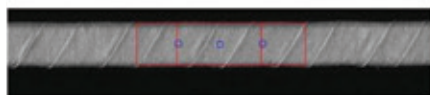
## 2 Limites de l'actuelle technique de détection des défauts

### 2.1 Mesureurs de diamètre à laser

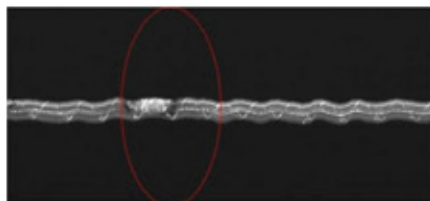
Un mesureur de diamètre à laser est utilisé pour détecter des renflements ou des étranglements éventuels. La machine utilise une technologie laser et ombre pour mesurer le diamètre du câble.

La mesure du diamètre est extrêmement précise et peut être utilisée pour classer les renflements ou les étranglements.

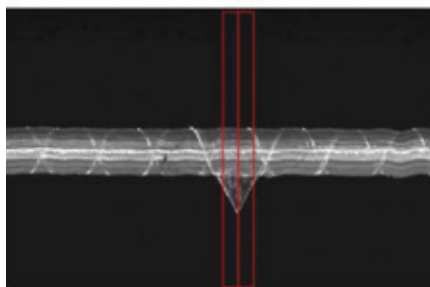




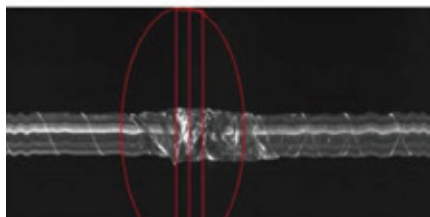
▲ Figure 1: Enroulement irrégulier



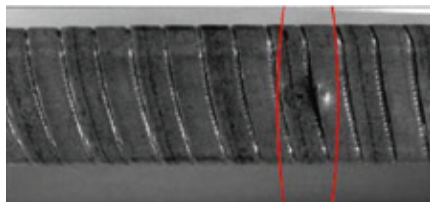
▲ Figure 2: Défauts de surface



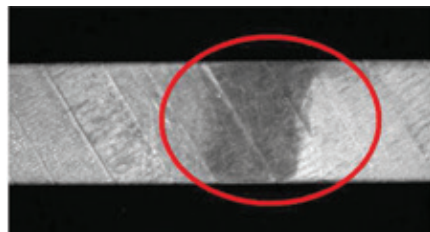
▲ Figure 3: Épluchage de la bande



▲ Figure 4: Ridage de la bande



▲ Figure 5: Plissage de l'armure



▲ Figure 6: Décoloration

Cependant, il n'y a aucun moyen de savoir vraiment si le défaut détecté est un défaut réel. Par exemple, une particule de poussière ou une goutte d'eau sur le câble augmenteraient la mesure du diamètre, ce qui provoquerait un faux positif.

## 2.2 Dispositif d'essai à l'étincelle

Un dispositif d'essai à l'étincelle est un dispositif qui peut être utilisé pour détecter des défauts du type «à trou d'épingle».

La machine crée une étincelle quand il y a un trou qui expose l'âme du câble, qui est un métal conducteur.

Toutefois, si un trou d'épingle n'expose pas l'âme du câble, l'étincelle n'est pas générée. Mais le trou, qu'il n'est pas un trou traversant, est pourtant un défaut puisque, au fil du temps, le trou d'épingle pourrait se dilater et exposer l'âme du câble.

En outre, pour les produits sans âme (tuyaux soudés, tuyaux flexibles et tubes) ou pour les produits sans âme conductrice (câble à fibre optique), les dispositifs d'essai à l'étincelle ne sont pas applicables.

## 2.3 Systèmes de vision

Les systèmes de détection de défauts de surface d'ancienne génération ne sont pas parvenus à identifier ni à mesurer les spires du produit.

Ces systèmes ont été limités à ignorer les spires pour détecter les défauts importants, tels que les petits trous, les renflements évidents ou les changements de forme.

Le système d'inspection de l'enroulement a été amélioré par l'ajout d'un logiciel de traitement d'images et d'autres configurations de la caméra qui identifient le profil du câble enroulé et peuvent mesurer des paramètres et détecter des variations dans l'enroulement qui sont considérés comme des défauts.

## 3 Système de contrôle par vision artificielle

### 3.1 Conception optomécanique

Le système de détection de défauts d'enroulement est constitué d'une ou plusieurs caméras haute définition et d'un éclairage suffisant pour capturer des images de câbles se déplaçant à des vitesses supérieures à 1 200 pieds (400 mètres) par minute.

L'utilisation de plusieurs caméras à 360 degrés permet une couverture complète de la surface du câble. Le système produit des images haute qualité à ces vitesses, avec une fréquence d'images très élevée.

Cette fréquence est synchronisée avec un codeur et un algorithme de vitesse. L'éclairage varie en fonction de l'application.

Les facteurs à considérer sont la réflectivité du matériau, le profil de la surface, la couleur, la vitesse de la ligne et le type de caméra.

À fin d'assurer l'uniformité des images, l'appareil est équipé d'une protection pour empêcher à la lumière ambiante et aux particules externes ou à d'autres facteurs d'influencer les résultats. En outre, la vibration du câble est réduite au

minimum grâce à l'utilisation de guides qui permettent d'éviter des images floues.

En ce qui concerne le traitement des images pour le contrôle de l'enroulement des câbles, un algorithme avancé est utilisé. Un algorithme typique est capable de détecter les défauts de surface et d'enroulement tels que les rayures, les trous, un enroulement irrégulier, un angle d'enroulement incorrect, des écorçages et des lacérations de la bande.

L'algorithme exige une analyse des pixels de l'image et que ceux-ci soient regroupés pour une interprétation supplémentaire. En cas de détection de défaut, l'opérateur est alerté par une alarme et un rapport d'erreur est enregistré dans le registre de données courant. Pour plus de clarté, le défaut est également affiché sur l'écran de l'opérateur.

### 3.2 Amélioration du contrôle qualité

*Indiqué pour tout type de produits:* étant donné que le système de détection de défauts de surface avec une mesure précise du diamètre utilise le système de vision artificielle, il peut être utilisé pour contrôler la surface de nombreux types de produits enroulés ou avec profils ondulés.

Il s'agit de la méthode la plus précise actuellement disponible pour détecter les défauts d'enroulement et de surface et par conséquent l'algorithme avancé peut aider à classer le type de défauts.

*Réduction des défauts:* le système peut fournir à l'opérateur un aperçu des images de la surface courante ainsi que les défauts les plus récents, les dimensions du défaut et le diamètre actuel du câble.

Ce flux continu d'informations en temps réel, en particulier les données liées aux défauts, permet à l'opérateur d'isoler les causes des imperfections de l'enroulement.

Le fait d'identifier quand et comment un défaut se produit, permettra au personnel technique de découvrir la cause principale des défauts et de réduire leur fréquence.

*Assurance qualité:* le système surveillera constamment l'enroulement du câble tant pour la distance de chevauchement que pour l'angle d'enroulement. Les mesures peuvent être enregistrées pour une analyse ultérieure.

Les images des défauts de surface et d'enroulement sont capturées et enregistrées sur un disque dur pour une utilisation dans les rapports sur la qualité.

L'écran du système de contrôle de l'enroulement permet aux superviseurs de l'ingénierie et de la production d'examiner

plus aisément les défauts sans la nécessité d'observer directement le défaut sur le câble. Les images des défauts sont enregistrées avec des informations sur la position qui permettent aux opérateurs d'identifier et d'éliminer rapidement les défauts des produits avant leur livraison aux clients ou leur échec sur le champ.

### 3.3 Limitations

Le système de contrôle des défauts d'enroulement présente quelques limitations:

- Parfois, des types très différents d'enroulement exigent une adaptation à la configuration optique ou des modifications du logiciel
- Étant donné que la caméra est orientée vers la surface, les gouttes d'eau, la graisse et les particules de poudre seront détectées par le système en tant que défauts. En général, ce problème peut être résolu en installant un système de nettoyage à jets d'air bien placé. En alternative, la sensibilité du système peut être réduite, ce qui peut donner lieu à des défauts mineurs qui passent à travers le filtre

### 3.4 Résultats des essais

Le système de détection de défauts d'enroulement est une version modifiée du système d'inspection de la surface qui est utilisé dans de nombreuses lignes de production dans le monde afin de détecter des défauts de surface dans les fils et dans les câbles. Les *Figures* de 1 à 6 illustrent quelques exemples d'images de défauts et de mesures d'enroulement.

## 4 Conclusions

Un système de contrôle de défauts d'enroulement, permet de détecter les imperfections sur la surface d'un câble enveloppé et d'enrouler le câble correctement en montrant la distance et l'angle de chevauchement. Le système présente plusieurs avantages:

- Indiqué pour tous types de fil/câble enroulé et armure ondulée
- Garantie pour le client de ne pas recevoir de produits défectueux en améliorant ainsi les relations et la confiance des clients
- Réduit la nécessité de modifier les câbles et élimine les déchets de câbles entraînant des coûts de matériaux et de main d'œuvre
- Contribue à améliorer le processus de production interne pour réduire les défauts
- Assure le chevauchement de câbles ■

*Cet article a été présenté avec l'autorisation du 64<sup>ème</sup> International Wire and Cable Symposium, Atlanta, Georgia, États-Unis, novembre 2015.*



# Compatibilità con una vasta gamma di dispositivi

Sjogren Industries ha introdotto un estrattore per filo di nuova concezione che è compatibile con una gamma di diversi dispositivi di trazione del filo.

Il design è degno di nota per l'impugnatura ergonomica la quale, associata ad una funzione di bloccaggio che mantiene le ganasce dell'estrattore aperte, consente all'operatore di tenere facilmente il dispositivo in una mano e di inserire contemporaneamente il filo con l'altra.

Le ganasce sono bloccate in posizione aperta mediante una piastra scorrevole che ritrae la ganascia superiore. Sempre tenendo il filo in posizione con una mano, l'operatore può chiudere le ganasce con l'altra mediante il meccanismo di sgancio, situato immediatamente sopra la maniglia, grazie ad una semplice pressione del pollice. Questo processo di inserimento consente all'operatore di impiegare meno tempo per la configurazione.

Un'altra caratteristica progettuale del nuovo estrattore di Sjogren è la testa rotante che consente di effettuare la trazione in linea retta dalla trafila e tangenzialmente sul cabestano. Questa funzione integrata elimina la necessità di aggiungere una forcilla separata al gruppo estrattore, ed è particolarmente utile nel caso di trafilatura di materiale fragile.



▲ Estrattore di filo di nuova concezione

Sjogren ha inoltre migliorato la convenienza delle ganasce dell'estrattore progettandole con due superfici di lavoro, di cui una viene utilizzata quando la ganascia si trova nella posizione superiore, e l'altra quando si trova nella posizione inferiore. Questa struttura a doppio uso raddoppia efficacemente la durata prima della sostituzione, essendo facile scambiare la posizione delle ganasce superiori e quelle inferiori. L'estrattore di Sjogren è compatibile con una molteplicità di dispositivi per estrattori, ed è indicato per cabestani con un diametro che varia da 16" a 30" (406mm-762mm), (con rotazione in senso antiorario) e che lavorano con diametri di filo da 0,06" a 0,25" (1,5mm-6,3mm).

**Sjogren Industries – Stati Uniti**

**Website:** [www.sjogren.com](http://www.sjogren.com)

## Potenziamento del team manageriale

Craig Rika si è unito al team manageriale del produttore di trafilature e attrezzature di trafilatura Bar Products & Services Ltd con sede nel Regno Unito.

Craig è figlio dell'attuale presidente e amministratore delegato Steven Rika ed è rientrato in azienda dopo aver trascorso i suoi anni di formazione come sportivo professionista, ossia come giocatore di cricket, giocatore nel rugby union e nel rugby league, sempre a livello professionale.

Ha lavorato per l'azienda con un contratto part-time dividendo il suo tempo fra lavoro e impegni sportivi.

Ha poi soddisfatto la sua ambizione adolescenziale di diventare un agente di polizia, un ruolo che ha ricoperto per 15 anni prima di fare ritorno nell'azienda di famiglia a lavorare con il cognato, Glenn Rika-Rayne.

La sua nomina consentirà a Steven Rika di concentrarsi sugli sviluppi futuri.

**BAR Products and Services – Regno Unito**

**Website:** [www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Craig Rika

## Risultato di successo con l'ultimo sistema di rotazione RS20

Dopo il lancio del nuovo sensore RS20 (sistemi di prova a correnti parassite con la meccanica di rotazione) è stato installato un certo numero di macchine presso diversi clienti principali e con buoni risultati in varie applicazioni.

▼ Il nuovo sensore RS20



Il sistema è principalmente utilizzato dai produttori di barre di acciaio o in applicazioni delle linee di trafilatura.

Il vantaggio del sistema risiede nei dischi sensore di dimensioni variabili che possono essere specificamente adattati alle esigenze dei clienti per ogni applicazione e ogni diametro.

La relativa apparecchiatura di prova è disponibile in diverse varianti, dalla versione semplice a un canale alla versione complessa a dieci canali. Ciò consente di effettuare le prove dei materiali per ricercare difetti orientati in modo trasversale, difetti orientati in modo longitudinale o la combinazione di entrambi i tipi di difetti.

**Prüftechnik Dieter Busch AG – Germania**  
**Website:** [www.pruftechnik.com](http://www.pruftechnik.com)

## Migliore precisione e alta velocità

Jouhsen-bündgens ha lanciato nuove soluzioni per la produzione ad alta precisione di sezioni di filo. La PrecisionCut UD2 equipaggiata con un sistema modulare flessibile e la PrecisionCut MJC9 per effettuare tagli corti di precisione consentono una produzione più economica per gli utenti di filo grazie a velocità di elaborazione elevate e a tempi di cambio brevi.

La macchina per la raddrizzatura e il taglio PrecisionCut UD2 è progettata come un sistema modulare flessibile. La possibilità di utilizzare diverse dimensioni di raddrizzatrici su un unico impianto, garantisce tempi di cambio brevi per una vasta gamma di applicazioni. Di conseguenza, i fabbricanti possono produrre materiali con diverse resistenze e diametri in modo molto economico.

La UD2 è indicata per produrre barre corte e lunghe da 5 a 4.000mm nonché per gestire diametri di filo nella gamma da 0,05 a 4mm. La concezione robusta della macchina raggiunge delle prestazioni di rendimento fino ad un massimo di 500 pezzi al minuto. Con la PrecisionCut MJC9, Jouhsen-bündgens offre all'industria del filo una concezione di macchina ottimizzata per la produzione di sezioni di filo precise, rettangolari e corte ad alta velocità: fino a 600 pezzi al minuto con una lunghezza di 1,5 x d fino a 70mm. Il sistema di taglio nella macchina MJC funziona attualmente con un sistema denominato "bush-bush", che realizza in combinazione con l'alimentazione precisa di sezioni di filo rettangolari e senza sbavature. Gli utenti possono trattare cavi con diametri compresi tra 3,5 e 9,3mm.



▲ PrecisionCut MJC9 di Jouhsen-bündgens

Che si tratti di raddrizzatura, taglio, processo termico di separazione, lavorazione delle estremità, formatura a freddo o di fare la punta, le macchine di Jouhsen-bündgens trattano fili con le tolleranze più ridotte ad alta velocità di tutto il mondo. La domanda di tecnologia Jouhsen-bündgens è anche aumentata in seguito alla crescente miniaturizzazione dei componenti. L'impianto produce componenti per l'elettronica o per l'industria automobilistica; catene di trazione e catene a camme, cuscinetti o perni. Infine, per le applicazioni mediche, i bisturi, le cannule e gli aghi chirurgici sono spesso tagliati, molati e immagazzinati ad alta velocità a centinaia di pezzi al minuto.

**Jouhsen-bündgens – Germania**

**Website:** [www.jouhsen.de](http://www.jouhsen.de)



# Ispezione ottica dei difetti nell'avvolgimento dei cavi

A cura di Craig Girdwood e Andrew McCloskey, Taymer International

## Riassunto

Il sistema di ispezione ottica dei difetti dell'avvolgimento migliora significativamente il controllo qualità nel caso di cavi avvolti. La struttura superficiale e di avvolgimento del cavo è costantemente monitorata da un sistema di visione artificiale alla velocità della linea di produzione.

La superficie di avvolgimento può essere visualizzata direttamente e/o registrata per il 100 per cento della lunghezza del cavo.

Vengono identificati difetti superficiali e di avvolgimento, e le immagini dei difetti vengono registrate insieme alle informazioni sulla posizione. Le informazioni sull'avvolgimento, tra cui l'angolo di avvolgimento e la percentuale di sovrapposizione, possono essere monitorate per eventuali modifiche. Questa tecnologia migliora la qualità del cavo prodotto ed evita che vengano consegnati al cliente prodotti difettosi.

## 1 Introduzione

Un problema critico di qualità che si crea durante la produzione di cavi avvolti è rappresentato dai difetti superficiali e di avvolgimento. Difetti superficiali potenziali comprendono graffi o fori, ed eventuali difetti di avvolgimento possono includere un avvolgimento irregolare, un angolo di avvolgimento scorretto, la sbucciatura e la lacerazione del nastro.

Questi difetti non costituiscono solo un problema esteriore, ma possono portare all'esposizione del nucleo del cavo all'ambiente circostante, causando cortocircuiti e guasti delle apparecchiature.

L'identificazione e il rilevamento di tali difetti durante il processo di produzione consentono di adottare un'immediata azione correttiva e di riparare o scartare le sezioni difettose del prodotto. Utilizzando il feedback costante e immediato dalla

macchina, gli operatori e i tecnici di processo sono in grado di individuare la causa principale dei difetti.

Il sistema di ispezione dei difetti dell'avvolgimento utilizza una o più telecamere ad alta velocità che catturano immagini in tempo reale delle superfici dei cavi avvolti. Il software di ispezione dell'avvolgimento è in grado di misurare con precisione la distanza e l'angolo di avvolgimento, nonché determinare il tipo e le dimensioni di una vasta gamma di difetti superficiali e difetti di avvolgimento.

È possibile rilevare tali difetti fino a 0,1mm di dimensione e generare un allarme. Quando viene rilevato un difetto, un'immagine digitale viene migliorata, ingrandita e visualizzata su un monitor remoto, permettendo all'operatore di verificare i difetti.

Ciò consente agli operatori di determinare il tipo di difetto, di identificare i falsi positivi (come una goccia d'acqua per esempio), o anche di rilevare imperfezioni superficiali (come scolorimento della superficie, graffi).

Le misure dell'angolo di avvolgimento e della distanza per l'intero cavo vengono salvate in un database assieme ad un registro contenente qualsiasi informazione relativa ad eventuali difetti di superficie o di avvolgimento.

Le informazioni sui difetti comprendono il tipo di difetto, le dimensioni e la posizione del cavo espresse in metri o piedi. Ciò consente agli operatori di isolare rapidamente i difetti una volta completata la produzione.

Il sistema di ispezione dell'avvolgimento può essere facilmente integrato nelle linee di produzione esistenti e presenta delle buone prestazioni con vari tipi di cavi avvolti e armature corrugate. Il sistema di ispezione dell'avvolgimento assicura che eventuali problemi vengano scoperti prima che eventuali prodotti difettosi siano inviati ai clienti.

Le luci possono avere una vita media di oltre 50.000 ore di funzionamento e costituiscono l'unica parte di consumo dell'intero sistema.

## 2 Limitazioni dell'attuale tecnica di rilevamento dei difetti

### 2.1 Misuratori di diametro a laser

Un misuratore di diametro a laser viene utilizzato per rilevare rigonfiamenti o strozzature. La macchina utilizza una tecnologia laser e ombra per misurare il diametro del cavo. La misurazione del diametro è estremamente precisa e può essere utilizzata per classificare rigonfiamenti o strozzature.

Tuttavia, non vi è alcun modo di sapere veramente se il difetto rilevato è un difetto reale. Ad esempio, una particella di polvere o una goccia d'acqua sul cavo aumenterebbe la misurazione del diametro, causando un falso positivo.

### 2.2 Spark Tester

Uno spark tester è un'apparecchiatura che può essere utilizzata per rilevare difetti di tipo poroso.

La macchina crea una scintilla quando vi è un poro che espone il nucleo del cavo, che è un metallo conduttivo. Tuttavia, se un poro non espone il nucleo, non viene creata la scintilla. Ma il poro, che non è un foro passante, è comunque un difetto poiché nel tempo potrebbe espandersi ed esporre il nucleo del cavo.

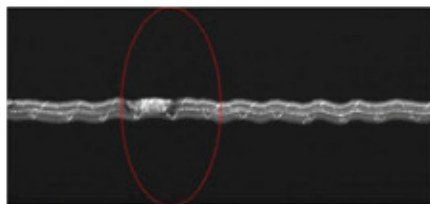
Inoltre, per i prodotti senza un nucleo (tubi saldati, tubi e flessibili) o prodotti senza un nucleo conduttore (cavo in fibra ottica), gli spark tester non sono applicabili.

### 2.3 Sistemi di visione

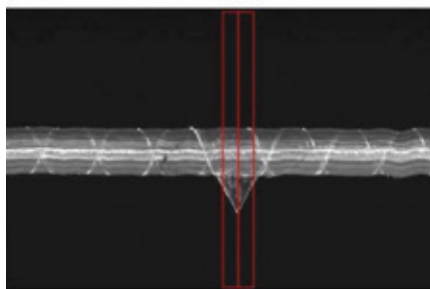
I sistemi di ispezione dei difetti di superficie di vecchia generazione non



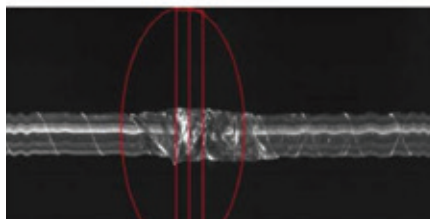
▲ **Figura 1:** Avvolgimento irregolare



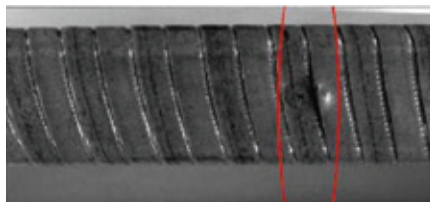
▲ **Figura 2:** Difetti superficiali



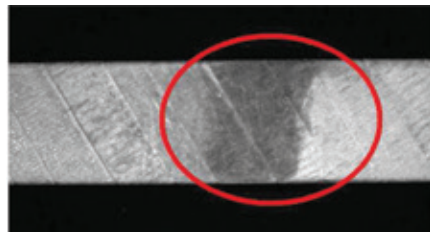
▲ **Figura 3:** Spellatura del nastro



▲ **Figura 4:** Raggrinzimento del nastro



▲ **Figura 5:** Increspatura dell'armatura



▲ **Figura 6:** Scolorimento

erano in grado di identificare né misurare le spirali del prodotto. Questi sistemi si limitavano a ignorare le spirali per individuare difetti significativi, come pori, rigonfiamenti evidenti o cambiamenti di forma.

Il sistema di controllo dell'avvolgimento è stato migliorato con l'aggiunta di un software di elaborazione delle immagini e delle configurazioni di telecamera alternative che identificano il profilo del cavo avvolto e può misurare parametri e rilevare variazioni nell'avvolgimento che sono considerati difetti.

## 3 Sistema di ispezione mediante visione artificiale

### 3.1 Progettazione optomeccanica

Il sistema di rilevazione dei difetti di avvolgimento è costituito da una o più telecamere ad alta risoluzione e da un'illuminazione adeguata per catturare immagini di cavi in movimento a velocità superiori a 1.200 piedi (400 metri) al minuto.

L'utilizzo di più telecamere a 360 gradi consente la completa copertura della superficie del cavo. Il sistema produce immagini di alta qualità a queste velocità, con una frequenza di fotogrammi al secondo molto elevata. Tale frequenza è sincronizzata con un algoritmo encoder e di velocità.

L'illuminazione varia a seconda dell'applicazione. I fattori considerati sono la riflettanza del materiale, il profilo della superficie, il colore, la velocità della linea e il tipo di telecamera.

Al fine di assicurare la coerenza delle immagini, l'apparecchio è dotato di una protezione per evitare che l'illuminazione dell'ambiente, particelle esterne o altri fattori possano influenzare i risultati.

Inoltre, la vibrazione del cavo è minimizzata grazie all'utilizzo di guide che evitano immagini sfocate.

Per l'elaborazione delle immagini per l'ispezione dell'avvolgimento dei cavi viene utilizzato un algoritmo avanzato. Un tipico algoritmo è in grado di rilevare difetti di superficie e di avvolgimento quali graffi, buchi, avvolgimento irregolare, un angolo di avvolgimento errato, la sbucciatura e la lacerazione del nastro.

L'algoritmo richiede un'analisi dei pixel dell'immagine e che questi vengano raggruppati per un'ulteriore interpretazione. In caso di rilevamento di un difetto, l'operatore viene avvertito da un allarme e viene salvato un rapporto di errore nel registro dei dati corrente.

Per una maggiore chiarezza, il difetto viene inoltre visualizzato sullo schermo dell'operatore.

### 3.2 Miglioramento della garanzia di qualità

Indicato per qualsiasi tipo di prodotto: dato che il sistema di rilevamento dei difetti di superficie con un'accurata misurazione del diametro utilizza il sistema di visione artificiale, può essere utilizzato per controllare la superficie di molti tipi di prodotti con avvolgimento

o profili corrugati. Si tratta del metodo disponibile più accurato per rilevare difetti di avvolgimento e superficiali e conseguentemente l'algoritmo avanzato può aiutare a classificare il tipo di difetti.

**Riduzione di difetti:** il sistema può fornire all'operatore una visione delle immagini di superficie correnti nonché i difetti più recenti unitamente alle dimensioni del difetto e al diametro del cavo corrente.

Questo flusso continuo di informazioni in tempo reale, in particolare i dati relativi ai difetti, permette all'operatore di isolare le cause delle imperfezioni dell'avvolgimento. Identificare quando e come un difetto si verifica permetterà al personale tecnico di conoscere la causa principale dei difetti e ridurre la loro frequenza.

**Garanzia di qualità:** il sistema continuerà a monitorare l'avvolgimento del cavo costantemente sia per quanto riguarda la distanza di sovrapposizione, sia per quanto riguarda l'angolo di avvolgimento. Le misurazioni possono essere registrate per una successiva analisi.

Le immagini di difetti superficiali e di avvolgimento vengono catturate e salvate su un disco rigido per l'utilizzo in relazioni sulla qualità. Lo schermo del sistema di ispezione dell'avvolgimento permette ai supervisori dell'ingegneria e della produzione di esaminare con maggiore facilità i difetti senza la necessità di osservare direttamente il difetto sul cavo.

Le immagini dei difetti vengono salvate assieme ad informazioni riguardanti la posizione che consentono agli operatori di individuare ed eliminare velocemente i difetti prima che raggiungano i clienti o si verifichi un difetto sul campo.

### 3.3 Limitazioni

Il sistema di ispezione dei difetti di avvolgimento presenta alcune limitazioni:

- A volte tipi di avvolgimento molto diversi richiederanno l'adeguamento alla configurazione ottica o modifiche del software
- Dal momento che la telecamera è rivolta verso la superficie, le gocce d'acqua, il grasso e le particelle di polvere verranno rilevate dal sistema come difetti. In generale, questo problema può essere risolto installando un sistema di pulizia con soffi d'aria ben collocato. In alternativa, la sensibilità del sistema può essere diminuita, il che può sfociare in alcuni difetti minori che passano attraverso il filtro

### 3.4 Risultati delle prove

Il sistema di ispezione dei difetti di avvolgimento è una versione modificata



del sistema di ispezione superficiale che viene utilizzato in numerose linee di produzione in tutto il mondo per rilevare i difetti superficiali nei fili e nei cavi.

Le Figure da 1 a 6 illustrano alcune immagini campione di difetti e misurazioni dell'avvolgimento.

## 4 Conclusioni

Un sistema di ispezione dei difetti di avvolgimento, consente di rilevare le imperfezioni sulla superficie di un cavo avvolto e di avvolgere il cavo correttamente mostrando la distanza e l'angolo di sovrapposizione.

Il sistema presenta diversi vantaggi:

- Adatto ad ogni tipo di filo/cavo avvolto e armatura corrugata
- Garanzia per il cliente di non ricevere prodotti difettosi, migliorando le relazioni e la fiducia del cliente
- Riduce la necessità di elaborare nuovamente i cavi ed elimina gli scarti di cavi che comportano costi di materiale e di manodopera
- Contribuisce a migliorare il processo di produzione interno per ridurre i difetti.
- Garantisce la sovrapposizione del cavo ■

*Documento presentato con l'autorizzazione del 64° Simposio Tecnico IWCS, Atlanta, Georgia, Stati Uniti, novembre 2015.*

**Craig Girdwood and  
Andrew McCloskey  
Taymer International Inc**  
Markham, Ontario  
Canada  
**Tel:** +1 905 479 2614  
**Email:** [craig.girdwood@taymer.com](mailto:craig.girdwood@taymer.com)  
**Website:** [www.taymer.com](http://www.taymer.com)

## Compatible con una gama de equipos

Sjogren Industries ha presentado un tirador de alambre de nuevo diseño, compatible con una serie de equipos de tiro de alambre.

Es de destacar el diseño por su mango ergonómico que, junto con el mecanismo que bloquea la mordaza de tiro en posición abierta, le permite al operador agarrar el tirador con una mano fácilmente mientras mete el alambre con la otra.

Incluye una placa corredera que retrae la mandíbula superior para mantener la mordaza abierta. Justo encima del mango hay un mecanismo de desencanche que permite cerrar la mordaza con una mano con un simple toque de pulgar, mientras se sujeta el cable con la otra. Enhebrando el alambre de este modo se ahorra tiempo durante la preparación.

Otra característica del diseño del nuevo tirador de Sjogren es su cabeza giratoria, que permite tirar del cable en línea recta desde la caja de la hilera o tangencialmente en el cabrestante.

Este elemento integrado evitar tener que ponerle al tirador de alambre una unión con abrazadera, y es de gran utilidad sobre todo cuando se estira material quebradizo.

Sjogren también ha mejorado la rentabilidad de las mandíbulas del tirador diseñándolas con dos superficies de trabajo: una utilizada cuando la mandíbula está arriba y la otra cuando está abajo.

Este diseño de doble uso duplica efectivamente la vida operativa de las mandíbulas, ya que la mandíbula de arriba y la de abajo pueden intercambiarse.



▲ Tirador de alambre de nuevo diseño

El tirador de Sjogren es compatible con una serie de equipos de tiro, y su uso es indicado en cabrestantes de 406mm (16") a 762mm (30") de diámetro (giro antihorario) y que trabajan con alambres de 1,5mm (0,06") a 6,3mm (0,25") de diámetro.

**Sjogren Industries – Estados Unidos**

**Website:** [www.sjogren.com](http://www.sjogren.com)

## Reforzando el equipo directivo

Craig Rika ha entrado a formar parte del equipo directivo del fabricante británico de hileras y herramientas de estirado Bar Products & Services Ltd.

Craig es hijo del actual presidente y director general Steven Rika.

Vuelve a la empresa después de pasar sus años de formación como deportista profesional jugando a cricket, a rugby y en la liga de rugby a nivel profesional en todos ellos.

En la empresa trabajaba media jornada, compaginando la vida laboral con sus compromisos deportivos. Más tarde, cumplió su sueño de adolescente de ser oficial de policía, trabajo al que se dedicó durante 15 años antes de volver al negocio familiar para trabajar con su cuñado Glenn Rika-Rayne.

Con la entrada de su hijo en el equipo directivo, Steven Rika podrá dedicarse a negocios futuros.

**BAR Products and Services – Reino Unido**

**Website:** [www.barproductsandservices.com](http://www.barproductsandservices.com)



▲ Craig Rika



## Éxito del nuevo sistema giratorio RS20

Tras el lanzamiento del nuevo sensor RS20, utilizado en sistemas de prueba de corrientes parásitas con componentes giratorios, se han instalado una serie de máquinas en las instalaciones de distintos clientes clave con las que se han obtenido buenos resultados en diversas aplicaciones.



▲ El nuevo sensor RS20

El sistema está siendo utilizado principalmente en las instalaciones de fabricantes de barras de acero o en líneas de estirado de alambre.

La ventaja del sistema radica en las sondas de disco de regulación rápida que pueden ser adaptadas a las exigencias específicas de los clientes para cada aplicación y cada diámetro.

El equipo de ensayo está disponible en distintas versiones, desde una versión simple de un solo canal hasta una versión compleja de diez canales. Esto permite detectar en los materiales defectos transversales, longitudinales o una combinación de ambos.

**Prüftechnik Dieter Busch AG – Alemania**

**Website:** [www.pruftechnik.com](http://www.pruftechnik.com)

## Mejor precisión y alta velocidad

Jouhsen-bündgens ha presentado sus nuevas soluciones para cortar trozos de alambón con alta precisión. La cortadora de precisión PrecisionCut UD2 con sistema modular flexible y la PrecisionCut MJC9 para trozos cortos les permiten a los usuarios de alambón producir a menor precio gracias a sus altas velocidades de procesamiento y a los breves tiempos de cambio.

La enderezadora-cortadora PrecisionCut UD2 ha sido diseñada como sistema modular flexible. El hecho de poder usar distintos tamaños de enderezadoras en una misma máquina, permite efectuar cambios de producción rápidamente para una amplia gama de aplicaciones. Por consiguiente, los fabricantes pueden producir materiales de dureza y diámetros variables a precio realmente conveniente.

La UD2 es indicada para producir barras cortas y largas de 5 a 4.000mm y para trabajar con diámetros de alambón de 0,05 a 4mm. El sólido diseño de la máquina permite obtener un rendimiento máximo de 500 piezas por minuto.

La cortadora PrecisionCut MJC9 de Jouhsen-bündgens representa para el sector del alambre un concepto de máquina optimizado para cortar trozos rectangulares con precisión y a altas velocidades: de hasta 600 piezas por minuto de longitudes de 1,5 x d a 70mm. El sistema de corte de la máquina MJC funciona con un sistema de "casquillo-casquillo" que, con la exacta calibración, efectúa cortes rectangulares y sin rebabas. Los usuarios pueden trabajar con alambones de diámetro comprendido entre 3,5 y 9,3mm.



▲ La cortadora de precisión PrecisionCut MJC9 de Jouhsen-bündgens

Además de enderezar y cortar, cortar por electrofisión, mecanizar extremos, conformar en frío o afilar puntas, las máquinas de Jouhsen-bündgens procesan alambón con tolerancias mínimas a altas velocidades en todo el mundo. La demanda de tecnología Jouhsen-bündgens también ha aumentado debido a la continua tendencia de miniaturizar los componentes. El equipo produce piezas para la electrónica o el sector automotriz: cadenas de transmisión y de levas, rodamientos o clavijas. Para aplicaciones médicas, a menudo se cortan y afilan lancetas, cánulas y agujas para cirugía, que luego son cargadas en almacenes a alta velocidad de centenares de unidades por minuto.

**Jouhsen-bündgens – Alemania**

**Website:** [www.jouhsen.de](http://www.jouhsen.de)

# Inspección óptica de defectos de envoltura para cables

Por Craig Girdwood y Andrew McCloskey, Taymer International

## Resumen

El sistema de inspección óptica de defectos de envoltura mejora significativamente el control de calidad del cable envuelto.

La estructura de la superficie y de la envoltura del cable es monitorizada constantemente por un sistema de visión artificial a la velocidad de la línea de producción. La superficie de la envoltura puede ser visualizada en directo o registrada a lo largo de todo el cable. Los defectos superficiales y de la envoltura son localizados, y las imágenes de los defectos son registradas junto con la información sobre su posición.

La información sobre la envoltura, incluidos el ángulo de envoltura y el porcentaje de superposición, pueden ser monitorizados para ver si hay variaciones. Esta tecnología mejora la calidad del cable producido y evita que se entreguen al cliente productos defectuosos.

## 1 Introducción

Un problema de calidad crítico que se presenta durante la producción de cable envuelto es el de los defectos superficiales y de la envoltura.

Los defectos superficiales potenciales incluyen arañazos y agujeros, mientras que los defectos de la envoltura incluyen envoltura irregular, ángulo de envoltura incorrecto, pelado o roturas de la cinta.

Estos defectos no son solamente problemas superficiales, sino que pueden también causar la exposición del núcleo al ambiente externo, con consiguientes cortocircuitos y fallo del equipo.

Localizando y detectando estos defectos durante el proceso de producción, se pueden efectuar las correcciones necesarias y se pueden reparar o eliminar las secciones defectuosas del producto.

Gracias a las señales realimentación constantes e inmediatas de la máquina, los operadores y los ingenieros de proceso pueden determinar la causa que origina el defecto.

El sistema de inspección de la envoltura usa una o más cámaras de alta velocidad para capturar las imágenes en tiempo real de la superficie del cable envuelto.

El software de inspección de la envoltura puede medir cuidadosamente la distancia y el ángulo de envoltura, y puede determinar el tipo y las dimensiones de una amplia gama de defectos superficiales y de la envoltura.

Se pueden detectar defectos superficiales y de la envoltura de hasta 0,1mm y generar alarmas. Cuando se detecta un defecto, su imagen digital es mejorada, ampliada y visualizada en un monitor remoto, permitiendo al operador verificar los defectos.

Esto permite a los operadores determinar el tipo de defecto, localizar los falsos positivos (como una gota de agua por ejemplo), o incluso detectar imperfecciones superficiales (como cambios de color, arañazos).

Las mediciones del ángulo de envoltura y de la distancia de todo el cable son guardadas en una base de datos con un registro de la información sobre cualquier defecto superficial o de la envoltura.

La información sobre el defecto incluye el tipo, el tamaño y la posición del defecto en el cable en metros o pies.

Esto permite a los operadores apartar los defectos rápidamente después de completar la producción.

El sistema de inspección de la envoltura puede ser integrado fácilmente en líneas de producción existentes y es adecuado para varios tipos de cables envueltos y blindajes corrugados. El sistema de inspección de la envoltura permite detectar cualquier problema antes de enviar a los clientes los productos defectuosos. Las luces pueden tener una duración de más de 50.000 horas de funcionamiento y son la única parte desechable de todo el sistema.

## 2 Límites de las técnicas de detección de defectos corrientes

### 2.1 Medidores de diámetro láseres

Se usa un medidor de diámetro láser para detectar bultos y estrechamientos. La máquina usa una tecnología basada en láser y sombra para medir el diámetro del cable.

La medición del diámetro es extremadamente precisa y se puede usar para clasificar bultos o estrechamientos.

Sin embargo, no hay manera de saber verdaderamente si el defecto detectado es real. Por ejemplo, una partícula de polvo o una gota de agua en el cable aumentarían la medida del diámetro dando como resultado un falso positivo.

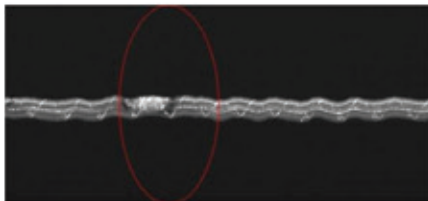
### 2.2 Probador de chispa

Un probador de chispa es un instrumento que se puede usar para detectar defectos tipo porosidad.

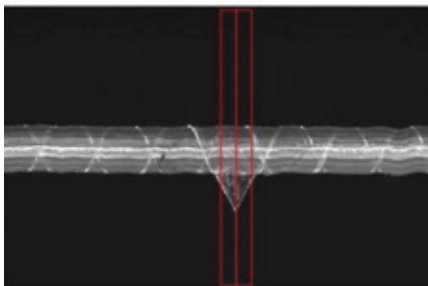




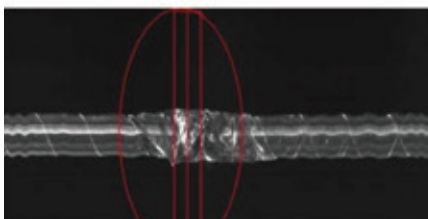
▲ Figura 1: Envoltura irregular



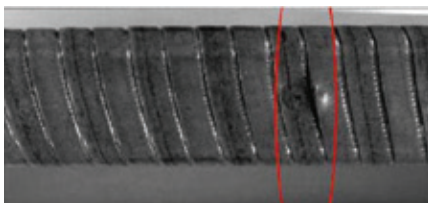
▲ Figura 2: Imperfecciones superficiales



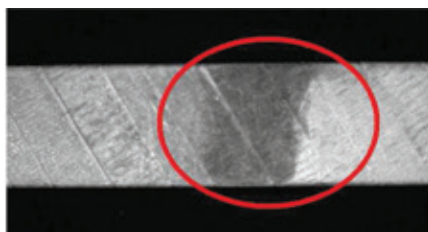
▲ Figura 3: Pelado de la cinta



▲ Figura 4: Arruga de la cinta



▲ Figura 5: Fruncido de la armadura



▲ Figura 6: Decoloración

La máquina genera una chispa cuando hay un poro donde queda expuesto el núcleo del cable, que es un metal conductor. Sin embargo, si el poro no deja expuesto el núcleo, no se genera ninguna chispa. Pero el poro, que no es un agujero pasante, sigue siendo un defecto, dado que con el tiempo puede expandirse y dejar expuesto el núcleo del cable.

Asimismo, para productos sin núcleo (tubos soldados, tubos y mangueras) o productos con núcleo no conductor (cable de fibra óptica), los probadores de chispa no se pueden usar.

## 2.3 Sistemas de visión

Los sistemas de detección de defectos de generación anterior no podían localizar y medir las espiras del producto.

Estos sistemas tenían sus limitaciones y no podían analizar las espiras sino sólo localizar defectos significativos como poros, bultos evidentes o cambios de forma.

El sistema de inspección de la envoltura ha sido mejorado con un software de procesamiento de imágenes adicional y con configuraciones de cámaras alternativas que pueden localizar el perfil del cable envuelto, medir los parámetros y detectar las variaciones de la envoltura, que se consideran defectos.

## 3 Sistema de inspección mediante visión artificial

### 3.1 Diseño opto-mecánico

El sistema de inspección de defectos de la envoltura consiste en una o más cámaras de alta resolución y una iluminación adecuada para capturar imágenes del cable en movimiento a velocidades de más de 1.200 pies (400 metros) por minuto.

Usando varias cámaras, se puede alcanzar una cobertura de 360 grados de la superficie del cable. El sistema produce imágenes de alta calidad a estas velocidades con una frecuencia de fotogramas por segundo muy alta.

La frecuencia de fotogramas por segundo es sincronizada con un codificador y un algoritmo de velocidad.

La iluminación puede variar de acuerdo con la aplicación. Los factores a considerar son la reflectividad del material, el perfil de la superficie, el color, la velocidad de la línea y el tipo de cámara.

Para asegurar la coherencia de las imágenes, el equipo está dotado de una protección para evitar que la iluminación del ambiente, partículas externas u otros factores afecten a los resultados. La vibración del cable es minimizada gracias al uso de guías para evitar imágenes desenfocadas.

Se usa un algoritmo avanzado para procesar las imágenes para la inspección de la envoltura del cable.

Un algoritmo típico puede detectar defectos superficiales y de la envoltura como araños, agujeros, envoltura irregular, ángulo de envoltura incorrecto, pelado y roturas de la cinta.

El algoritmo requiere el análisis de los píxeles de la imagen para agruparlos para una sucesiva interpretación.

Si se detecta un defecto, el sistema genera una alarma para avisar al operador y guarda un informe del error en el registro de datos corriente. El defecto es visualizado también en la pantalla del operador para mayor claridad.

### 3.2 Mejora del control de calidad

*Adecuado para todo tipo de productos:* dado que el sistema de detección de defectos superficiales con medición precisa del diámetro usa la visión artificial, puede ser usado para inspeccionar la superficie de muchos tipos de productos envueltos o de perfiles corrugados.

Es el método más preciso para detectar defectos superficiales y de la envoltura disponible y el algoritmo avanzado puede ayudar a clasificar el tipo de defectos según el caso.

*Menos defectos:* el sistema puede presentar al operador las imágenes corrientes de la superficie junto con los defectos más recientes, las dimensiones de los defectos y el diámetro corriente del cable.

Esta fuente de información continua en tiempo real, principalmente datos sobre fallos, permite al operador eliminar las causas de las imperfecciones de la envoltura.

Determinando cuándo y cómo ha ocurrido un defecto permite al equipo técnico llegar a conocer la causa originaria de los defectos y reducir su frecuencia de aparición.

*Control de calidad:* el sistema monitoriza constantemente la envoltura del cable para detectar la distancia y el ángulo de superposición.

Las mediciones pueden ser registradas para un análisis posterior. Las imágenes de los defectos superficiales y de la envoltura son capturadas y guardadas en un disco duro para usarlas en los informes de calidad.

La pantalla del sistema de inspección de la envoltura permite a los supervisores de ingeniería y producción examinar fácilmente el defecto potencial sin tener que observar el defecto directamente en el cable.

Las imágenes del defecto son guardadas junto con la información sobre su posición permitiendo a los operadores buscar y eliminar rápidamente los defectos antes de que lleguen a sus clientes o haya un fallo en campo.

### 3.3 Limitaciones

El sistema de inspección de la envoltura tiene pocas limitaciones:

- A veces hay tipos de envoltura muy distintos que requieren ajustes en la configuración óptica o cambios del software.
- Dado que la cámara enfoca a la superficie, las gotas de agua, la grasa y las partículas de polvo pueden ser detectadas como defectos por el sistema.

Generalmente, esto se puede resolver con un sistema de limpieza con chorro de aire bien colocado. Como alternativa, se puede reducir la sensibilidad del sistema, pero en este caso los defectos más pequeños pueden pasar a través del filtro.

### 3.4 Resultados de las pruebas

El sistema de inspección de los defectos de la envoltura es una versión modificada del sistema de inspección superficial utilizado en numerosas líneas de producción en todo el mundo para detectar defectos superficiales en alambres y cables.

Algunas imágenes de muestra de los defectos y de las mediciones de la envoltura se pueden ver en las Figuras de 1 a 6.

## 4 Conclusiones

Con un sistema de inspección de los defectos de la envoltura, se detectarán las imperfecciones de la superficie del cable envuelto y envolver el cable correctamente con la posibilidad de controlar la distancia y el ángulo de superposición.

El sistema presenta varias ventajas:

- Es adecuado para cualquier tipo de alambre/cable envuelto y blindajes corrugados.
- Asegura que el cliente no reciba productos defectuosos, mejorando la relación y confianza del cliente.
- Reduce la necesidad de procesar de nuevo los cables y evita los derroches de cable que suponen costes de material y mano de obra.
- Ayuda a mejorar el proceso de producción interno para reducir los defectos.
- Asegura la superposición del cable. ■

*Este documento es presentado por cortesía del 64º Simposio Técnico IWCS, Atlanta, Georgia, EE.UU., noviembre de 2015*

**Craig Girdwood and  
Andrew McCloskey  
Taymer International Inc**  
Markham, Ontario  
Canada

**Tel:** +1 905 479 2614

**Email:** [craig.girdwood@taymer.com](mailto:craig.girdwood@taymer.com)

**Website:** [www.taymer.com](http://www.taymer.com)



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\* Front cover courtesy of Sikora AG, showing their X-RAY 6000 PRO.

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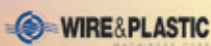
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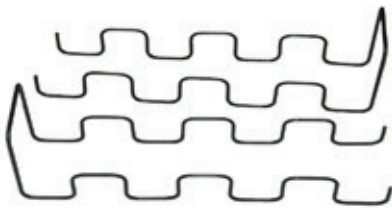
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### CONTACT INFORMATION

AUTOLINK (SHENZHEN) TECHNOLOGY CO., LTD

Tel: +86 755 2715 5685 | Mob: +86 136 9229 5712

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