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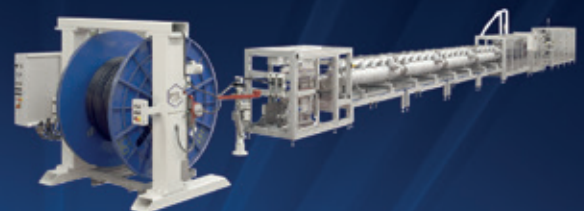
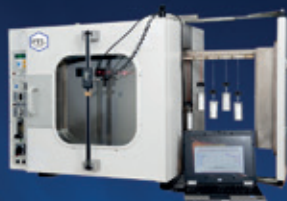
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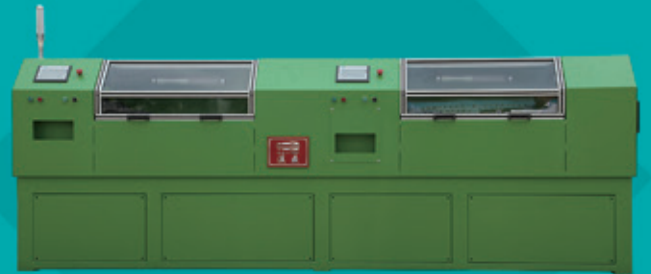
HANDING
CABLE MACHINERY

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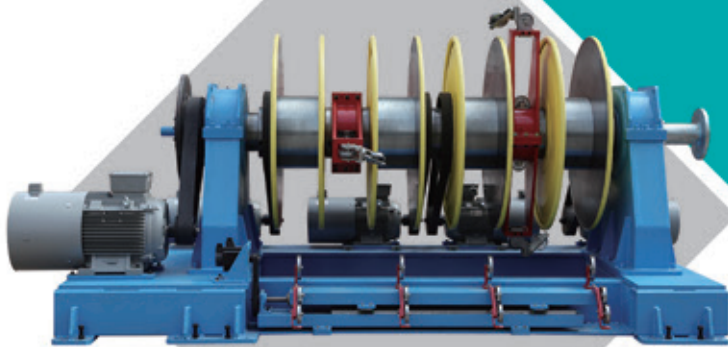
EXT $\Phi 30$ - $\Phi 200$ High efficiency extrusion line

High efficiency extruder normal extrusion capacity
• PVC 1200kg/hr • PE 1000kg/hr • HFFR 900kg/hr

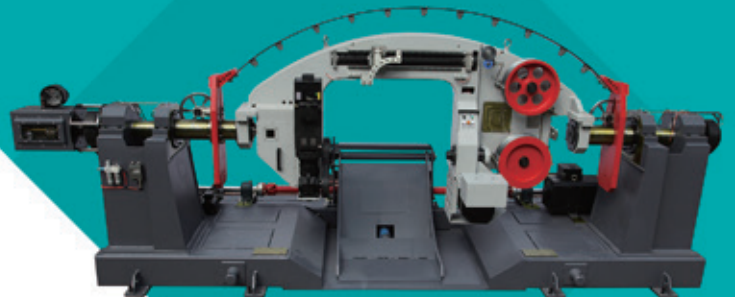
Horizontal taping machine



CS $\Phi 1200$
Concentric stranding machine



DT $\Phi 1000$ - $\Phi 2500$
Double twist stranding machine





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Email: export@hdxljx.com



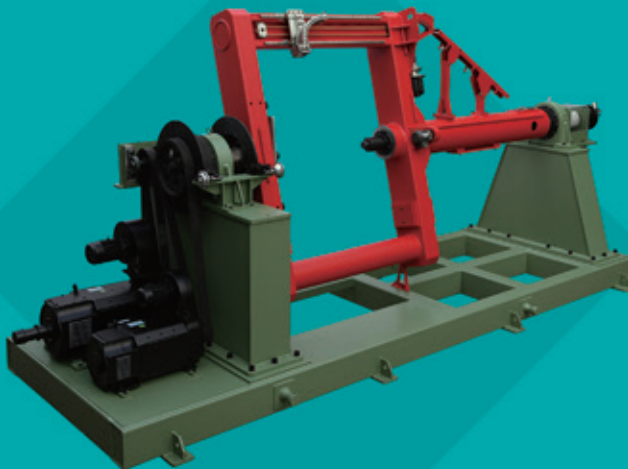
STΦ500-Φ2500
Catilever type single twisting machine



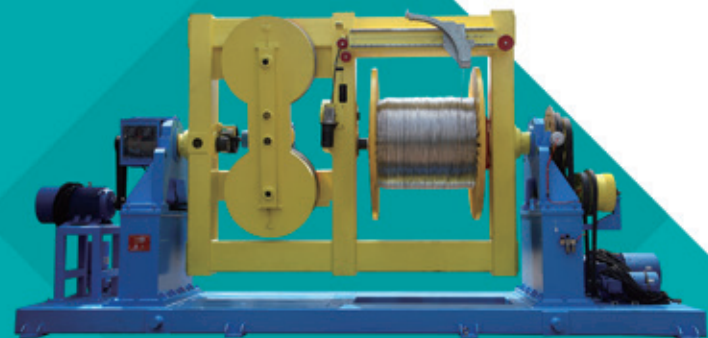
Auto coiling and
stacking line



STΦ1250-Φ2000
Single twist armouring machine



STΦ1000-Φ2000
Single twist stranding machine





*** US\$33 purchase only**
Front cover: Sikora AG
See page 80 for further details

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Investment leads to a brighter future

Investment plays a large and ever-increasing role within the wire and cable industry. Month after month we get stories of companies strategically planning their own futures and spending money on plant, machinery, additional employees and buildings, all with one eye on the future.

In that respect this issue of *EuroWire* is no different with Ugitech (page 11) and Mario Frigerio (page 15) investing wisely in readiness for further expansion in the future.

This investment can also be seen as Messe Düsseldorf Asia prepares to stage wire Southeast Asia (page 16). The show is being held on the back of a massive infrastructure boost to the region with the ASEAN infrastructure needs by 2020 reaching some US\$524 billion in Thailand, Malaysia, Indonesia and the Philippines alone.

Messe Düsseldorf is also increasing its reach in the exhibition market with the staging of Iran Wire in Tehran, Iran, in December this year (page 22).

Iran Wire is seen as an attractive entry point into the emerging Iranian market.

Around 200 exhibitors are expected at the four-day show organised by the Iranian Aria Group Conference and Exhibition Development Company. Messe Düsseldorf is the exclusive overseas associate and will be responsible for the canvassing and handling of all international exhibitors.

Whilst looking to the future is an important role for any company, one business firmly taking a look back in this issue is Zumbach, which is celebrating its 60th year in business.

You can read about the company's humble beginnings and how it grew from a small office in Biel, Switzerland, on pages 24 and 25.



David Bell
 Editor

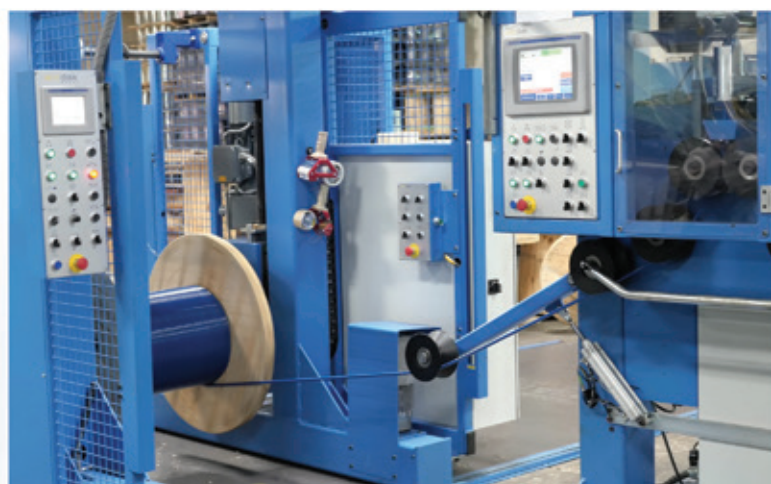
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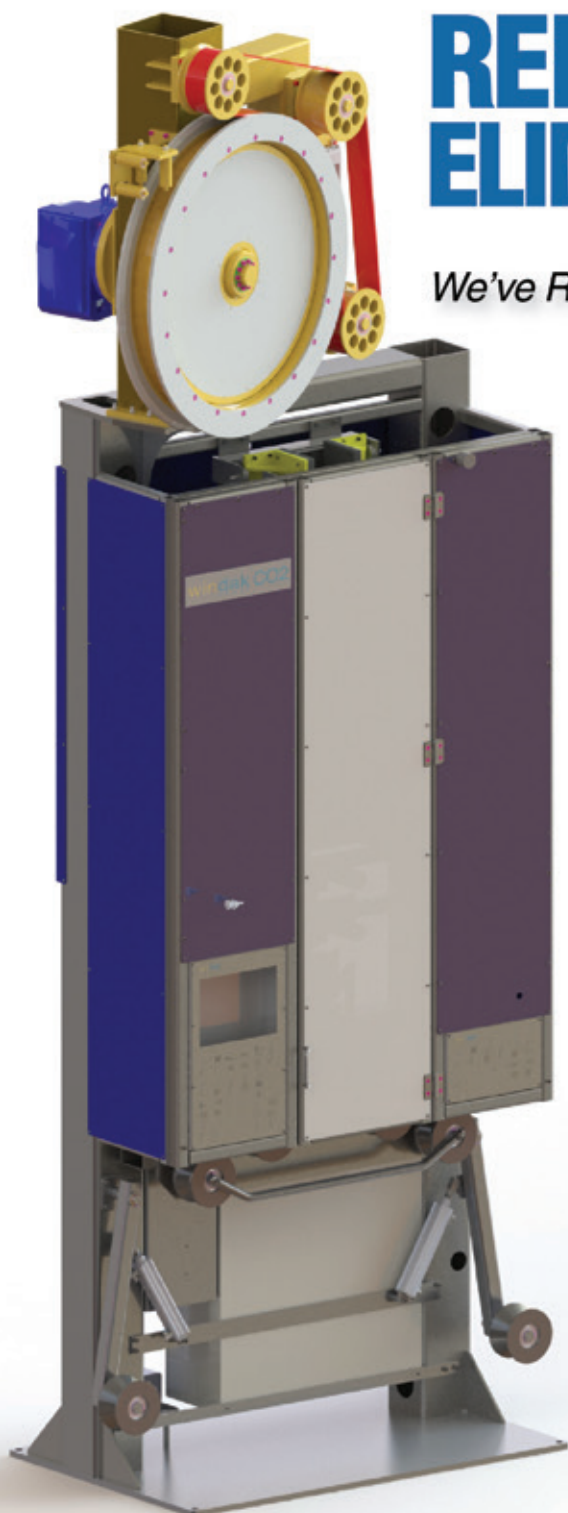
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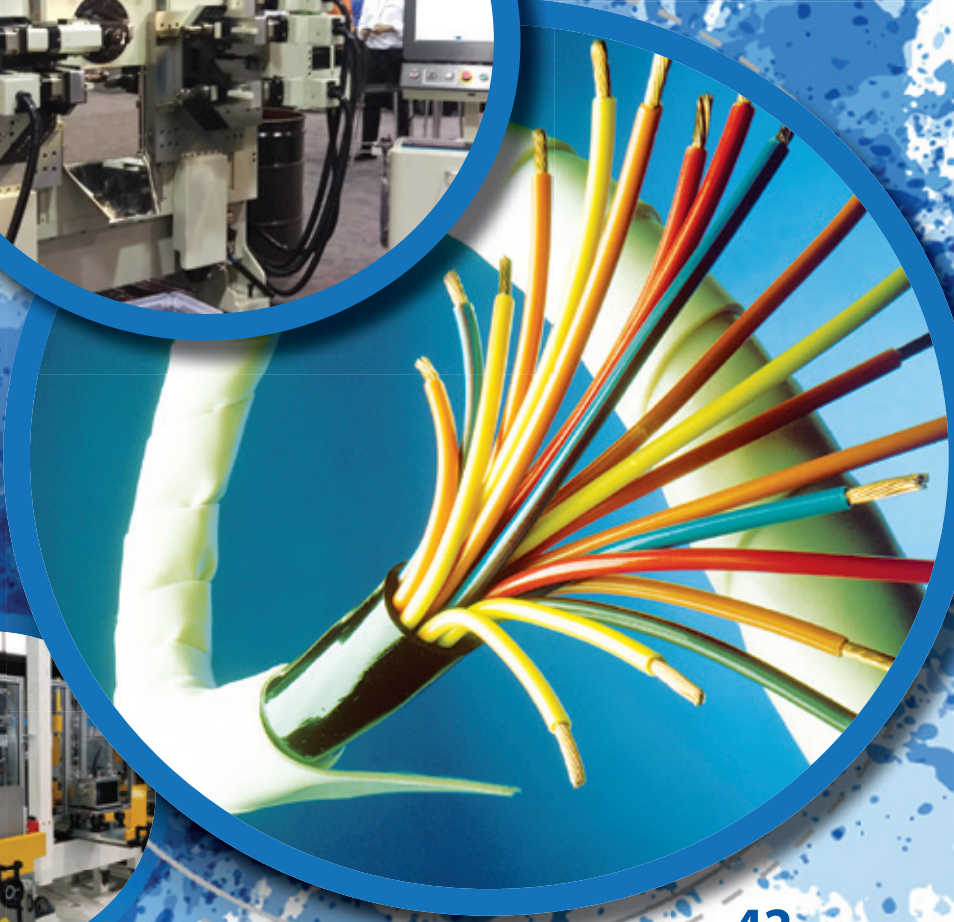
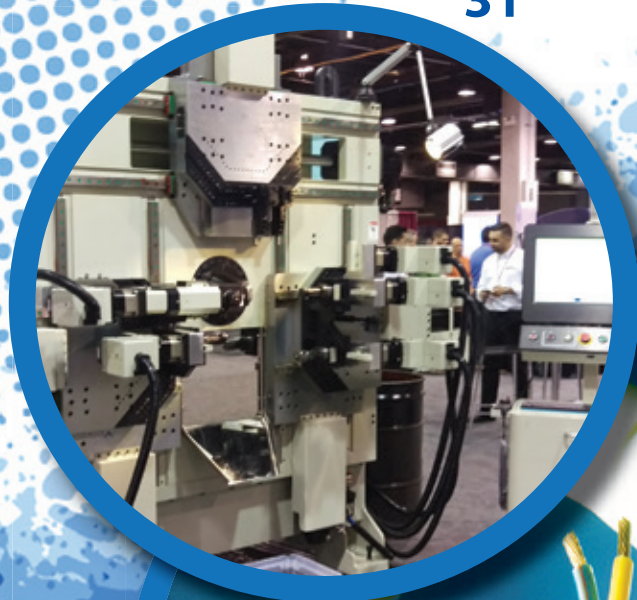
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Getting Technical:
TPV-based Insulation
for Medium Voltage
Applications

Feature

Cable sheathing, armouring,
printing and marking

Interwire 2017 – review

wire Russia 2017 – review

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International Metal and Metallurgy Exhibition

28-30 June:

International Metal and Metallurgy Exhibition –

trade exhibition – Guangzhou, China

Organisers: Julang Exhibition Co Ltd

Fax: +86 203 862 0781

Email: julang@julang.com.cn

Website: www.julang.com.cn

dates for your diary ...

2017

September

19–21 September:
wire Southeast Asia –
trade exhibition –
Bangkok, Thailand

Organisers:

Messe Düsseldorf Asia Pte Ltd

Fax: + 65 6337 4633

Email: wire@mda.com.sg

Website: www.wire-southeastasia.com

October

3–5 October:
wire South America –
trade exhibition –
São Paulo, Brazil

Organisers:

Messe Düsseldorf GmbH

Fax: +49 211 4560 668

Email: info@wire-south-america.com

Website: www.wire-south-america.com

8–11 October:
IWCS Technical Symposium –
conference and exhibition –
Orlando, Florida, USA

Organisers:

IWCS

Tel: +1 717 993 9500

Email: phudak@iwcs.org

Website: www.iwcs.org

November

7 November:
CabWire 2017 – conference –
Düsseldorf, Germany

Organisers: IWMA

Fax: +44 121 781 7404

Email: info@iwma.org

Website: www.iwma.org

December

5–8 December:
Iran Wire – exhibition –
Tehran, Iran

Organisers:

Messe Düsseldorf GmbH

Fax: +49 211 4560 668

Email: info@iranwire.ir

Website: www.iranwire.ir

bigphoto.com "Guangzhou International Finance Centre, Guangzhou, China", Photographed by Erid



▲ Ugitech has invested almost €2m in a new ultrasonic test unit at its production site in Ugine and has thereby increased its capacity in quality assurance for steel bar

€2m testing investment at Ugitech

WHETHER brake system, fuel injector or airbag pressure sensor – the principle of zero defects has long been the standard in the automotive industry for steel products for safety-critical components.

To meet the rising demand for flawless stainless steel, French company Ugitech – part of the Schmolz + Bickenbach Group – has invested almost €2m in a new ultrasonic testing unit. This step has allowed the company to increase capacity in quality assurance.

Ugitech now tests almost 35,000t annually of steel rod intended for the automotive industry, for internal and surface defects.

Thereby the company contributes to the production of high-quality automotive components.

The automotive industry is an important sales market for the stainless steel producer. In a demonstration of its commitment to this market, the company has installed a new ultrasonic testing unit at its Ugine site in France.

With the new system technology, the steel producer has around 50 per cent more capacity in quality assurance. The non-destructive testing is used for quality control and assurance of steel bar in accordance with the highest technical standards.

For steel in which material inclusions or surface defects would constitute functional risks for the use of the component, this type of testing is vital.

This is also an effective way of ensuring that steel bar with material defects is rejected from further processing.

Following machining of the steel bar, the part's thickness in some cases is less than 0.5mm depending on the specific part. Consistently flawless quality of the bar steel core and surface is essential for reliable component stability.

Ugitech SA – France
Website: www.ugitech.com



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09-11.05.2017

Campaign delivers substandard cable message



▲ Substandard cable highlighted by the ACI

THE Approved Cables Initiative (ACI) has developed an online video campaign to highlight the dangers and problems contractors and installers can face with substandard cable. The campaign, which was launched in January to the cable supply industry, has been developed around three themes and will grow into a collection of animated videos as part of the ACI's further involvement in content marketing.

The campaign is launching with three messages – 'dressed to impress' tells the viewer that some cables are deliberately under-specified when produced; 'speak the right language' highlights the fact that what is written on the cable may not be what you buy; and 'better behaved cable' spells out that if the purchase doesn't feel right then it probably isn't.

Peter Smeeth, of the Approved Cables Initiative, said: "We understand that our target audience is embracing social media more and more to find answers and now looks to a range of channels for information.

"More often this will involve social media and online videos continue to grow in popularity. With a picture worth 1,000 words as they say, and one in three in the UK viewing at least one online video a week, a video campaign done well can spread the messages we want to share in a simple and clear format to new and existing audiences."

The videos will be hosted on the ACI's website and its YouTube channel, and it is hoped that all cable industry associations will share the content with members and followers. The videos can be watched at www.aci.org.uk

The ACI launched in 2010 to address the issues of unsafe, non-approved and substandard cables entering the UK marketplace. The ACI gives guidance to the cable supply chain and where it identifies suspect cable, contact is made with relevant importers, distributors and manufacturers, and results are published.

Approved Cables Initiative – UK
Website: www.aci.org.uk

Meeting requirements

Ajex & Turner, India, produces high quality trapezoidal wire drawing dies and sector shaped conductor dies.

The company is able to serve its customers with any special tooling, such as shape drawing dies (trolley, oval, trapezoidal, rectangular, square, triangle, sector, etc) and sector shaped compacting dies for bunching and stranding lines. Fundamentally this kind is used in the wire design and cable manufacture industries.

Trapezoidal/shaped wire drawing dies apply to rod break down machines and drawing machines, and are used in wire drawing.

Sector shaped compacting dies (D shape sector dies) are used on rigid stranding machines and are suitable for use in the production of low voltage underground power cables or similar.

Ajex & Turner Wire Dies Co – India
Website: www.ajexturner.com



▲ Black Box's pre-terminated fibre assemblies can be configured and ordered online in seconds

Black Box launches pre-terminated fibre cables for sale online

BLACK Box is introducing a line of made-to-order pre-terminated fibre cables which can be configured and ordered online in seconds at black-box.eu/pretermfibre

With just a few clicks, the configurator walks users through cable types, cores, connectors, and other options, including breakouts and pulling eyes.

The configurator builds a custom SKU and provides end-users with a price for instant ordering.

Pre-terminated fibre cable saves IT professionals, resellers, integrators and infrastructure contractors time and money on enterprise fibre deployments.

Lead times are greatly reduced. The company can build and ship the cables in as little as two days.

Black Box fully tests and labels cables before shipment so they arrive plug-and-play ready. Installation time can be reduced by as much as 70 per cent by eliminating long field termination times and errors.

Pre-terminated cables are also economical. Black Box estimates that users will save money with pre-terminated fibre cable compared to buying the bulk cable and terminating it themselves. Users will eliminate costly fibre waste, consumables, expensive termination equipment and the labour needed to terminate the cable.

"The new pre-terminated fibre offering is in response to customer demand for faster, easier data centre deployments," said Ryan Hopkins, cable product manager at Black Box.

"Pre-terminated fibre gives users a no-hassle, error-free way to install and change enterprise fibre without worrying about the cost, time or reliability of field terminations."

Pre-terminated fibre cable options include:

- Five cores: OM1, OM2, OM3, OM4 and OS2
- Five cable types: indoor (tight-buffered), indoor/outdoor (loose-tube and armoured loose-tube), and zipcord
- One jacket: LSZH
- Six connectors: LC and SC in both APC and UPC polishes, ST in UPC polish, and E2000
- Multiple strand counts from two to 24. Other counts are available on request

Black Box Network Services– UK
Website: www.blackbox.co.uk

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MFL investing in the future



▲ High-speed precision layer re-spooling lines

RENOVATIONS and improvements are continuing at Mario Frigerio's new facility near the City of Lecco, on Lake Como, Italy.

The company's management, administration, sales, engineering automation, production and customer service are all housed under one roof.

3D design technology has now been transferred to the assembly teams on the production floor, and will be used in a new portal to help customers retrieve all the necessary information for the installation of equipment and maintenance.

New investment has also been made in the customer service team with the goal of tracking all incoming requests and accelerating the response to customer queries. New software allows the team

Rosen's role at Ulbrich

Wire and Cable Consulting LLC has named Thomas J Rosen as senior advisor, RF cable products, for Ulbrich Specialty Wire Products Division, Westminster, South Carolina, USA, a part of Ulbrich Stainless Steels and Special Metals.

This new position expands an agreement reached in mid-2016 between Ulbrich and Wire & Cable Consulting, LLC that named Mr Rosen as a provider of marketing and business development activities. In this new position, he will now add focus on product development and new account development.

Ulbrich's speciality wire products division manufactures precision-made conductors with tight tolerances in flat, strip, ribbon and ultra-fine round wire, available in various

to interact with customers. MFL USA and Frigeco USA are also included in the programme to cover wider support due to the time difference between Italy and North America.

In the equipment range Mario Frigerio has recently included three new units for packaging the finished products for welding wire:

- The high-speed precision layer re-spooling lines, both fully automatic and semi-automatic, can work both with plastic spools and wire baskets; only the tooling must be replaced
- The newly designed drum packing lines, suitable for all types of drums, both round and square

Mario Frigerio – Italy
Website: www.mflgroup.com

copper and copper alloys, RoHs-compliant alloys, stainless steel and pure nickel, and also performs custom plating in nickel, silver and tin for high performance applications in harsh environments.

The company is also developing silver-plated copper clad aluminium products for centre conductors and flat wire applications to offer weight reduction in aerospace, military, medical, satellite and GPS applications.

Wire and Cable Consulting was formed in 2015 to provide services including market and business development, strategic advising and sales representation to wire and cable companies.

Wire and Cable Consulting LLC – USA

DECALUB GREEN CLEANING TECHNOLOGIES FOCUS ON:

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(for plating and high glossy finish)



Wire Rod Lubrication
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(with no speed limit)



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MANUFACTURING
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Fax: +86 21 5169 3758
Email: sales@comsuctech.com
Web: www.comsuctech.com

Thriving infrastructure boost for exhibition

WIRE Southeast Asia returns to the Bangkok Trade & Exhibition Centre (BITEC), Bangkok, Thailand, from 19th to 21st September. This opportune and strategic staging of the two specialist trade fairs comes amidst encouraging prospects expected for the wire and cable industries, especially due to the thriving infrastructure and manufacturing sectors in Southeast Asia.

Online exhibitor registration is open now at www.wire-southeastasia.com

According to the Asian Development Bank (ADB), the energy and transport sectors will account for 62.6 per cent of the total ASEAN infrastructure investment needs by 2020. This is confirmed by Goldman Sachs' projection about infrastructure spending in power and transport in four ASEAN countries (Thailand, Malaysia, Indonesia and the Philippines) which will amount to US\$524 billion by 2020.

A major ASEAN infrastructure initiative is the ASEAN Power Grid (APG) with investment requirement of US\$5.9 billion, as well as the Singapore-Kuala Lumpur high-speed rail which will span 217 miles and is expected to start operations in 2026.

On the manufacturing front, should ASEAN fully implement the ASEAN Economic Community's integration strategy and capture a larger share of global manufacturing, the region could gain US\$280-US\$625 billion in annual GDP by 2030 as stated in a recent report by the McKinsey Global Institute.

This infrastructure growth, alongside the expansion of the automotive, new energy, high-speed rail, urban transport,



▲ Exhibitors and visitors at a previous wire Southeast Asia

aerospace, petrochemical, infrastructure construction and other application industries, has brought new opportunities for the fastener industry.

Reflecting such global trends, a special zone on fastener technology will make its debut at wire Southeast Asia 2017. The Fastener Pavilion will be a dedicated showcase of the complete upstream and downstream industry chain on fastener technology.

The exhibit profile will range from standard and non-standard fasteners as well as fasteners' application in various industries to manufacturing skills and supporting facilities of fasteners.

The dynamic line-up at wire Southeast Asia will feature an all-encompassing range of innovative machinery for wire and cable manufacturing, processing and finishing, fastener technology, new processes in measuring, control and test engineering and specialist areas as well as new and upgraded tools and auxiliary materials. A series of conferences and seminars will complement the exhibits.

When last held in 2015, 411 exhibitors from 33 countries showcased their products at wire and Tube Southeast Asia to 7,144 trade visitors from 56 nations. Almost 33 per cent of these visitors came from outside Thailand, especially from Bangladesh, India, Malaysia, Singapore, Taiwan, Indonesia, Myanmar and Pakistan as well as visiting delegations from China, Japan, Korea and Vietnam. The shows featured seven national pavilions and country groups from Austria, China, Germany, Italy, Taiwan, the UK and the USA.

Messe Düsseldorf Asia Pte Ltd – Singapore
Website: www.wire-southeastasia.com

Single brand name for exhibitions

The brand name "Join the best – worldwide" will in future include all international events organised by Messe Düsseldorf within its wire and cable portfolio.

Trade fairs for metal production, processing and finishing, for wires, cables and tubes, iron and steel have a long tradition in Düsseldorf, Germany. In addition to the number one trade fairs wire and Tube in Düsseldorf, "Join the best – worldwide" unites ten international trade fairs organised around the globe – wire and Tube China in Shanghai, wire and Tube India in Mumbai, wire and Tube Russia in Moscow, wire and Tube Southeast Asia in Bangkok, as well as wire South America and TUBOTECH in São Paulo, Brazil.

Messe Düsseldorf GmbH & Co KG – Germany
Website: www.messe-duesseldorf.com

An advertisement for ANBAO Hair Pin Wire. It features the ANBAO logo (a stylized 'A' with 'AB' inside) and the text "ANBAO Hair Pin Wire". Below the text, technical specifications are listed: "Dia.: 0.99mm", "T/S: 1400-1670N/mm²", "Tolerance: +/-0.02mm", and "Packing: in coils or on reels". The image shows several large coils of grey wire and a few individual hair pin wires. At the bottom, the company name "ANBAO CORP." is displayed along with contact information: "Add: No.33 Qinhuangxi Street, Qinhuangdao, P.R.China, 066000", "Tel: +86-335-3893600", "Fax: +86-335-3870760", "Email: anbao@anbao.net", and "Website: www.anbao.net".

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UPCAST® is the leading supplier of upward continuous casting technology for a wide range of non-ferrous applications.



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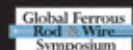
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Issued to Mario Frigerio S.p.A.



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Global success for BAR

BAR Products and Services Ltd – supporting the wire, tube and rod industry worldwide – is celebrating its increasing global success.

Following on from its effective attendance at the wire 2016 exhibition, securing multiple worldwide contracts, Bar Products and Services has expanded into China, Mexico and Europe.

Six wire rope/strand compaction units plus compaction rollers have been supplied this year to India and Mexico, for strand sizes from 2mm to 40mm.

A further five machines for the wire rope industry will be shipped to China and an additional one into Europe. Sales of the wire strand compaction units are supported by BAR's associate company, which has many years' experience and expertise in the manufacture of wire and wire rope.

Bar Products and Services' impressive wire strand compaction unit boasts a quick roller change, rapid set up, reduced friction and more even wire distribution.

Bar Products and Services is a major

Broad skills

Involved in the fields of tungsten carbide tools since 1870 and machinery for decades, French company Agir Technologies takes advantage of its broad skills to provide the best to all customers. Agir is able to provide solutions and competent advice to a variety of requests.

The investments made in the company, such as a wire cutting EDM with two-wire spool of 0.03mm, a five-axle CNC machine to cut the electrodes, and new CAD/CAM software allow Agir to widen its range of high precision and quality tools.

The company specialises in the production of tungsten carbide tools for wire and cable manufacturing and other wire transformation, including wire drawing dies (round, shaped, pressure), drawing dies and plugs, cable extrusion tools, straightening tools, wire-guides, tools for welding rods and plated wires. Agir is able, thanks to its software, to calculate any drawing station for round wire just like for any shaped wire.

The company exports its tungsten carbide tools, machines and know-how on five continents and to more than 60 countries.

Agir Technologies – France

Website: www.agir-technologies.com

supplier in the field of wire rope compaction.

Along with the supply of compaction units and rollers to cover a range of strand diameters from 2mm to 40mm it also supplies numerous other high quality tooling and offers a rapid service on a worldwide basis.

BAR Products and Services Ltd – UK

Website:

www.barproductsandservices.com

▼ Wire compaction unit from BAR Products



Measurement Full in line quality certification

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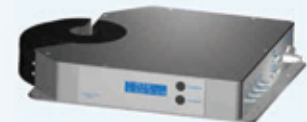


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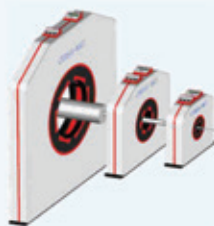
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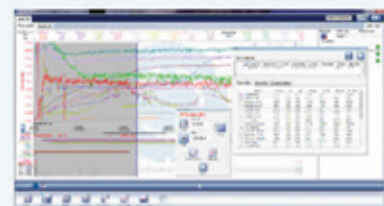


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Four ships commission cable laying software

IN the last few months, the submarine cable industry's cable installation software, MakaiLay, has been commissioned on four cable laying vessels around the world.

KT Submarine (KTS, Korea) recently completed a challenging installation with one of its cable laying vessels, *Segero*. It also commissioned the software on its other vessel, the *Responder*, and is currently using it to manage a cable installation in the Pacific.

"To provide more accurate cable installation services to our client, we started using MakaiLay in our most recent cable lays, and we are impressed with its capabilities," said Mr Moon, engineer-in-charge, KT Submarine.

"Especially useful is the look-ahead feature that allows us to keep the cable on the desired route and to maintain the correct bottom slack by issuing appropriate instructions to the cable engine and the DP operators."

MakaiLay is currently being commissioned on NTT World Engineering Marine Corporation's (NTTWEM, Japan) newly constructed cable laying vessel, *Kizuna*.

MakaiLay is advanced subsea cable installation software that enables users to lay submarine cables with the highest level of accuracy, speed, safety and reliability possible, reducing the risk of cable failures.

The software has been rigorously tested and validated and is used by over 80 per cent of the global fleet of cable ships on countless commercial lays and military installations to successfully install well over 400,000km of cable worldwide.

Makai Ocean Engineering Inc – USA
Website: www.makai.com

Business development engineer

Doug Druce has been appointed to to Sikora's office in Boston, Massachusetts, USA, which opened in 2015.

The office serves customers of the wire and cable, optical fibre, hose and tube and plastic industries with measuring, control, inspection, analysis and sorting technologies. Mr Druce's role is providing sales and technical support.

Mr Druce has an educational background in mechanical engineering from Auckland University of New Zealand. He has many years of experience in plastic injection moulding and extrusion.

He has been working at the Sikora International base in Peachtree, Georgia, USA, since September 2016 and has completed a training programme at the company's headquarters in Bremen, Germany, where he gained in-depth knowledge of the variety of Sikora products.

Sikora International Corp – USA
Website: www.sikora.net



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Messe Düsseldorf organises participation of exhibitors at Iran Wire 2017

IRAN Wire will be held in Tehran from 5th to 8th December as the only exhibition in Iran mapping the entire spectrum of wires, cables, tubes, pipes, profiles and related industries.

All international companies from the respective industries that want to showcase and sell their products will find a unique platform at Iran Wire as an attractive entry point into the emerging Iranian market.

Around 200 exhibitors are expected to present their innovative technical products in the areas of wires, cables, tubes, pipes and profiles. The four-day trade fair is organised by the Iranian Aria Group Conference and Exhibition Development Company in Tehran.

Messe Düsseldorf is the exclusive overseas associate and will be responsible for the canvassing and handling of international exhibitors. Furthermore, Messe Düsseldorf serves in a wide range of organisational areas, including international exhibitor registration, stand design and a smooth on-site operation



▲ Tehran – host city of Iran Wire being staged in December

at the Tehran International Permanent Fairground.

Companies from the wire and tube industry wanting to exhibit at Iran Wire should contact Daniel Ryfisch (+49 211

4560 7793, ryfischd@messe-duesseldorf.de) and Cem Bağcı (+49 211 4560 478, bagcic@messe-duesseldorf.de).

Messe Düsseldorf – Germany
Website: www.iranwire.ir

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Pioneering Zumbach – a glance back at the last

IT was in Biel (the centre of the Swiss and worldwide watch industry), Switzerland, on 1st May 1957. Bruno Zumbach, a young electrical engineer, not even 30, had come up with the idea of starting his own electronics company because he wanted to build something independently.

Electronics were still in their infancy: relay and vacuum tubes were still the main elements. The transistor was something almost unbelievable; all integrated circuits and microprocessors, the stuff of the future. However, economic development in Switzerland at that time was good and there were many thriving machine factories in Biel.

Customised drives – the first manufactured products

The first orders, individually or in small quantities, were received for drive systems in any kind of machine. They concerned machines for watches, optics, sterilisation and instruments of all kinds.

Probably the biggest and ‘most daring’ order at the initial stage was automating the butter centre in Gossau near St Gallen (Switzerland). The whole butter production and distribution system was automated with a completely non-contact drive – at that time still a brand new technology. It was the first such drive in Switzerland.

For cost reasons, all control elements, the so-called logic blocks, were developed and mass-produced at the company’s own factory. Even drives, light barriers and other items were manufactured in-house in Biel.

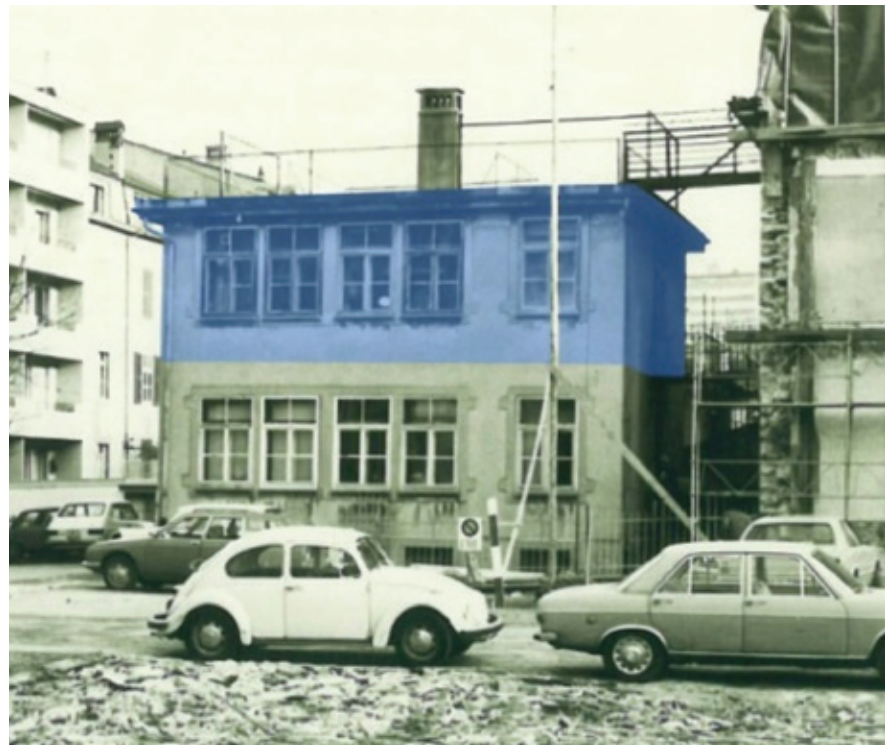
The vision of a new kind of DC motor drive

At the time, there were many manufacturers of cylindrical grinding machines in Biel and Switzerland who required low-vibration and finely adjustable drives. Bruno Zumbach quickly realised that this was a major market. The problem was that a satisfactory solution was not possible with the thyatron technology of the time.

Zumbach’s vision involved developing and building a small and affordable “Ward Leonard” drive with a monoblock inverter and a matching DC motor and controller. This technology was only practicable and affordable for far higher drive outputs at the time. The “Ward Leonard vision” would soon become the basis of Zumbach technology for many years.

A pioneer of on-line measurement, Zumbach manufactures a comprehensive range of non-contact, on-line measuring and control instruments. Its technology is in use worldwide and this year the company celebrates its 60th anniversary.

Whether for the cable industry, plastics, rubber or steel and metal industry, Zumbach technology is used by customers who rely on the quality and reliability of its instruments and systems.



▲ The first home of the company was a small, rented studio and office in an old factory building in the centre of Biel

The first production articles and growing success

The first production orders soon arrived. The new kind of drive proved its worth and became established. Leading grinding machine companies such as Tripet, Charmilles, Kellenberger, Tschudin, Studer and others became regular customers. As a result, hundreds if not thousands of Zumbach drives found their way to market; many of them are still in operation today.

From the basics

The workforce had grown to around 20 by 1964 and new premises were required. A small factory was built in a few months and today (with new cladding) still forms the heart of the company’s main building in Orpund.

Changing times and new visions

In the early 1960s, Zumbach realised that its business with drives could not guarantee a viable future for the

company. The field was marked by new technical possibilities and thus growing numbers of competitors, who began to force down prices and margins. The machine tool industry would also soon begin its process of decline.

Around 1972, a plan was developed to produce an eccentricity tester for electrical cables. In 1974, Zumbach was granted a patent for the new inductive Ex-Test 7 device, which became the first major success in what was then the new field of in-line measuring equipment.

The product range – and the company – continues to grow

The optical diameter measuring devices became Zumbach’s most successful products. The analogue Odc types were created around 1975, and the absolute measuring Odac® gauges from 1977.

The Odac 24 was the first gauge with absolute measurement to be sold in large quantities. “Odac®” became a registered trademark; and more than 80,000 Odacs

60 years of Swiss reliability and quality...

of all types and for a huge range of applications have been sold since then.

In 1994, Bruno Zumbach handed the management of the group over to his son Rainer. In the following years the group expanded and founded further subsidiaries, amongst others in Asia.

Besides these own Zumbach companies, additional representatives have since been contracted.

Consequently, one of the objectives of Zumbach, the proximity to customers, could be strengthened to a maximum and local services have consistently been expanded over the last 20 years.

Numerous market-driven and innovative developments have been realised, eg non-contact profile and shape measuring systems or rotating measuring units with the revolutionary, non-contact transmission of both signals and energy, as well as the use of modern technologies (eg linear sensor technology and many others). Thus, a further aim of the Zumbach group could be met: always offering the customer the best solution with the most ideal price-performance ratio.

It was necessary to serve all the markets at the same time, so work began to find representative offices for the most important countries. Specialist knowledge and local service are essential for successful sales of these products, and only very few trading companies could offer this expertise.

As a result, sales and service offices and later registered companies were established from 1970 in many different countries.



▲ Zumbach Electronic AG today

The first was in the USA in 1979, followed by the UK, Germany, France, Spain, Italy, India, Taiwan and, in 2001, China. Over 20 sales engineers in Orpund and the foreign companies now ensure the success of the products on the global market.

Expansion into the plastics industry

The plastics industry is a large, growing market. Tubes and hoses of all types need to be tested for their diameters and wall thicknesses, giving rise to special devices using other technologies such as ultrasound etc. Profiles also became a relevant market segment and can be measured and monitored in real-time today with devices equipped with light-slit method and image processing capabilities.

Expansion into the steel industry

In the late 1980s, Zumbach also ventured into a completely new field: the steel industry. This concerned the measurement of huge, red-hot steel pipes for the oil and gas industry. They were later joined by rods and wire rod that must be measured at speeds of up to 400km per hour.

Although the established Odac measuring heads could be used, complex systems for cooling and mechanical protection needed to be developed. The first systems were sold in Italy, France and Spain.

These steel systems were subjected to ongoing development and upgrades, and today are responsible for a good proportion of overall sales.

Produce more, better, and at lower cost

Zumbach systems, integrated into the manufacturing process, enable customers to increase output with lower material costs. They also reduce downtime, allow for safer operation of equipment and provide for flawless quality control.

In addition, they allow for an immediate quality improvement in cable manufacture through tighter tolerances, better transmission capabilities, easier subsequent manufacture, and simple pairing of conductors, as typical examples.



▲ Automated butter distribution

Zumbach AG – Switzerland

Website: www.zumbach.com



Transatlantic Cable

The air travel market

▶ A small but strategic Chinese investment could help American Airlines to a lucrative trans-Pacific future

Growth in air traffic between China and the USA is likely to be approximately zero for some time. But according to Sydney, Australia-based *Bloomberg* contributor David Fickling, "wise airline executives tend to think in decades, rather than years." As forecast by Boeing Co (Chicago), trans-Pacific will be almost as large a market as north Atlantic in 2035.

There will also, by that time, be more domestic air traffic in China than in the USA, a prospect which dominates US airline executives' thinking and leads them to this question: how do you get a foot in the world's soon-to-be-biggest aviation market in the face of official intransigence from its government?

Mr Fickling reported that American Airlines Group thinks it has found a way. People familiar with the matter told *Bloomberg News* that the world's biggest airline company is in talks to take a stake of about \$200 million in China Southern Airlines Co via a private placement. ("American's Southern Comfort in China," 22nd March)

Barely enough to cover the cost of a single Boeing 787, that sum is trifling to a carrier that posted more than \$40 billion in revenue over the previous year. With China Southern worth about \$10 billion, \$200 million would barely net American a two per cent stake. It is "in the high-stakes diplomacy of international aviation" that *Bloomberg* sees the logic of the purchase.

▶ 'Virtual' capacity/real tickets

As a loosening of visa restrictions between China and the USA spurs travel demand, American has been trying to catch up to Delta and Continental on trans-Pacific routes.

But airlines in both the USA and China are already stymied by hard caps on flight frequency. There just are not enough slots available under a 2007 air transport agreement between the two countries to enable the companies to meet the forecast demand.

Mr Fickling bluntly stated the generally acknowledged view that the difficulties USA carriers experience in navigating China's allocation system for airport slots place them at a substantial disadvantage to their Chinese counterparts. It holds that the frequent inability of USA carriers to obtain commercially

viable slots in China in a timely manner deprives them of their bilaterally conferred rights, and harms the interests of the USA and the travelling public.

Teaming up with China Southern would be "an alternative way to skin this cat" for American, wrote Mr Fickling. The Texas-based airline – which has petitioned the USA Department of Transport for extra time to start services on one of the last available routes from Los Angeles to Beijing – cannot increase its penetration of China by way of its own equipment.

But a code-share agreement with a Chinese carrier would allow it to buy seats on a partner's plane and offer "virtual" capacity instead.

▶ The investment in China Southern could also be a first step to bigger things for American. According to *Bloomberg*, CEO Doug Parker thus raises the odds of getting the Guangzhou-based carrier to join American in Oneworld, the third-largest global airline alliance in terms of passengers. This would mean access to "the real prize" of coordinating code-shares, frequent-flyer programmes and airport schedules.

China Southern and its Shanghai-based rival China Eastern Airlines are both partners of Delta in the Sky Team alliance, the world's largest. But Delta has favoured Shanghai as its hub for connections to the rest of China. So, noted Mr Fickling, with its Guangzhou connection "American [is apparently] pushing on an open door in attempting to make itself China Southern's new best friend."

▶ Bans, detentions, vetting and restrictions on electronic devices imperil the \$250 billion USA travel industry

In a 24th March interview with *Bloomberg's* Justin Bachman, the CEO of the US Travel Association (USTA) commented that "travel is a very fragile thing, and perception is a factor."

To Roger Dow, a former Marriott International Inc executive, actions taken during the young presidency of Donald J Trump have already exacerbated that fragility and altered perceptions of America as an attractive and hospitable destination for the visitor. ("US Travel Industry Fears a 'Lost Decade' Under Trump," 27th March)

Mr Dow does not expect arrivals to decline as much as after the terrorist attacks of 2001 in New York City – at least not yet. For now, he does expect a dip of as much as four per cent. "We haven't seen the big damage yet," he told Mr Bachman. "What we're getting is the noise level."

Transatlantic cable

Keeping that level high is what *Bloomberg* describes as “a steady drumbeat of news and policy proclamations” seeming likely to damage the \$250 billion American travel industry and its roughly 15 million USA employees. For example:

- Unpleasant initial contacts between the USA president and leaders of Australia, Germany, Mexico and China, resulting in negative publicity “in countries that send lots of travellers to America”;
- Two majority-Muslim-nation travel bans, with protests and news coverage “that made for a global public relations disaster.” The first ban, suspended by the courts, resulted in the detention of foreign travellers and airport chaos. The second, somewhat altered, ban was frozen before it could take effect;
- An airline cabin restriction on electronic devices for people flying from airports in eight nations;
- Following a 6th March order from the White House to enhance visa screening, the announcement of a State Department policy mandating extra vetting of visa applicants in nations that review US-bound travellers. Noted Mr Bachman, “This includes inspection of social media accounts for some.”

The new policy covers nations – among them Brazil, Mexico, China, Argentina, Colombia and South Africa – that generate substantial business and tourist traffic. The USTA estimates that 15 million travellers a year will be affected.

- Market strategy firm Tourism Economics LLC, a unit of Britain's Oxford Economics, told *Bloomberg* that Mr Trump's rhetoric and unpopularity abroad will likely reduce visitor arrivals in the USA by 4.3 million this year.

The popular destinations New York, Los Angeles and Miami are especially susceptible to any declines.

According to the Washington-based US Travel Association, during the administration of President Barack Obama the USA saw an increase in international arrivals from 51 million in 2006 to nearly 78 million in 2015. These statistics prompted a coda to Mr Bachman's article: “Some of that may be attributable to Brand USA, a marketing organisation formed by Obama's Commerce Department to help sell America as an international travel destination.”

Notes on steel

- Nucor Corp (Charlotte, North Carolina), announced on 22nd March that it will be investing \$85 million to upgrade the rolling mill at its steel bar mill in Marion, Ohio. Nucor Steel Marion Inc is Ohio's largest producer of rebar and signpost, capable of producing over 400,000 tons annually. The mill recently marked its 100th year of steelmaking.
- As reported on 27th March on *manufacturing.net* by Michael Luciano, Arkansas-based Big River Steel announced its collaboration with the artificial intelligence company Noodle.ai on what they believe will be the first “smart” steel mill in the United States.

Big River and its San Francisco-based partner define a smart factory as one in which AI and Internet of Things (IoT) connectivity play an integral role in the majority



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Transatlantic cable

of operations. The concept will be demonstrated at the projected \$1.3 billion, 1300-acre steel mill in Osceola, Arkansas.

Dave Stickler, CEO of Big River Steel, seemed to acknowledge that scrap metal recycling and steel production at a smart facility will involve a learning curve.

The mill is analogous to a driverless car, he told Mr Luciano: "The first day, the car doesn't know how to drive itself; but the more it drives, the more it learns. The AI algorithms will allow the mill to react to production challenges automatically."

For his part, Stephen Pratt, Noodle.ai's CEO, expressed confidence that his company's platform – the BEAST – will be able to leverage Big River's "rich trove of sensor data" to effect improvements in such areas as maintenance planning, production line scheduling, logistics operations and environmental protection.

- ▶ Acting on a petition from Globe Specialty Metals (Miami, Florida), the US Department of Commerce on 29th March initiated investigations into certain silicon metal imports. The subsidiary of London-based Ferroglobe alleged that unfairly subsidised silicon, a deoxidiser in steelmaking, was being dumped in the USA market.

Commerce initiated anti-dumping duty investigations on silicon from Australia, Brazil and Norway; and countervailing duty investigations on silicon from Australia, Brazil and Kazakhstan.

The alleged dumping margins for Australia range from 28.58 per cent to 52.81 per cent; for Brazil, from 15.41 per cent to 134.92 per cent; and for Norway, from 32.25 per cent to 45.66 per cent.

In *Platts*, Sarah Baltic Hilliar reported that the scope of the investigation covers all forms and sizes of silicon metal, including silicon powder.

According to Commerce, 2016 imports into the USA of silicon metal from Australia, Brazil, Kazakhstan and Norway had an estimated value of \$33.9 million, \$60 million, \$17.5 million and \$26.1 million, respectively.

At the Geneva Motor Show

Daimler's Dieter Zetsche shared his views on auto markets, import barriers, and the future of the internal combustion engine.

The 2006 "Ask Dr Z" ad campaign for Chrysler cars left Americans with the indelible impression of Dieter Zetsche as a natural comedian. But the chairman of the board of directors of Germany's Daimler AG and head of Mercedes-Benz Cars, whose term was recently extended to 2019, is better known as a perceptive commentator on the global automotive industry.

During the 2017 Geneva Motor Show, held 9th to 19th March, Mr Zetsche participated in a wide-ranging roundtable with American journalists. Here, paraphrased and much condensed, are highlights from associate editor Christian Seabaugh's report on the interview in *Motor Trend* ("Mercedes-Benz's Zetsche in Geneva," 17th March):

Motor Trend: There's some talk in Washington, DC about reducing carbon dioxide (CO₂) and fuel economy requirements for auto manufacturers. Would Daimler welcome that?

Mr Zetsche: I don't think it would be a different world for us if that were to happen. I'm watching what the final outcome will be.

MT: Could we ever reach the point of having completely different Mercedes products for the US market and the rest of the globe?

Z: Today there are two sources for regulation in the USA, (California Air Resources Board [CARB] states and non-CARB states), and they affect our sales about 50/50 volume-wise. But we do not plan to have different vehicles in the States versus globally.

Electric mobility is a development we will drive forward because we're convinced that it's what the future will ask from us, independent of government regulation at this point in time.

MT: Are you concerned about trade issues in the USA such as a rise in taxes, tariffs or import barriers?

Z: In general terms, we are certainly convinced that free trade is something positive and creates wealth around the globe for all participants. Wherever in the world we are, we have to accept that governments define regulation, and we adjust accordingly. We have a strong position in the USA with 22,000 people working there, at multiple locations. So I'm relatively relaxed on that issue as long as I don't get worse news.

MT: Do you see Mercedes expanding its manufacturing footprint in the USA?

Z: We do that all the time. Right now, we are developing a manufacturing site for vans in the USA. We are always investing in Alabama, for new products, for new capacity. There's nothing reactive to a new situation there but rather an ongoing process.

MT: How much life does the internal combustion engine have left in it? What's the situation for diesel globally?

Z: The progress in combustion engines is amazing. Emissions reductions are continuing, and in that area the difference between a modern diesel and a gas engine is very small.

In the USA, diesel has never played a significant role in passenger cars and light trucks. In Europe, contrariwise, it provides us, not just as companies but as a society, with an opportunity for 15 to 20 per cent lower CO₂ versus gas, and more and more without a downside thanks to the modern emission systems of diesel engines.

We do believe that a modern diesel is a good thing. We therefore will continue to invest in diesel. In the case of heavy-duty trucks, it seems unlikely that they will be driven by energy stored in batteries in the foreseeable future. Gas might provide an alternative, but it will power a combustion engine.

I think that combustion engines still have a pretty long life ahead, and will figure importantly in the very diverse world of 30, 40 or 50 years from now.

MT: The USA has seen two years of record traffic fatalities. Is that something that you take into account as you're developing autonomous cars?

Z: We have had two overriding visions for almost decades. One is emissions-free driving, and we are getting closer to that one. The other one is accident-free driving. We are definitely getting closer to that, too. The benefits of passive systems, which do not prevent accidents from happening but reduce impact, are now far exceeded by the benefits of active safety technology,

Transatlantic cable

and these assistance systems are key to achieving our goal. We do believe that accident-free driving is a realistic vision. And that is why we're very supportive of perfecting these assistance systems, which ultimately will lead to Stage 5 autonomous driving as well.

I would say that, by the beginning of the next decade, it [will become] more and more difficult to have an accident with a Mercedes.

- As defined in *Wired* (26th August, 2016), a Stage 5 car can handle all driving tasks and go anywhere: "No human, no steering wheel, no pedals. Climb in, tell it where you want to go (if it doesn't already know from reading your calendar), and get back to looking at your phone."

Energy

One of the greatest potential sources of renewable energy, the Sun, inspires an electrically powered German rival

"Our parent star is a very finicky worker. It refuses to work at night, dislikes cloudy days, doesn't do as well at higher latitudes, and in some parts of the world it disappears entirely for months at a time."

Writing from Monroe, Washington, in *New Atlas*, David Szondy reviewed the public debut of the brainchild of scientists and engineers at the German Space Center (DLR) who, needing a

more reliable and controllable Sun for laboratory work, built one of their own. Their three-storey "Synlight" in Jülich, North Rhine-Westphalia, will support such research projects as the development of processes for producing hydrogen fuel from sunlight. ("World's Largest Artificial Sun Rises in Germany," 23rd March)

Essentially a sunlamp powered by electricity, the huge device works like a backwards parabolic reflector. As explained by Mr Szondy, where a more conventional spotlamp uses a single powerful light source focused by reflection from a parabolic mirror, Synlight is itself a giant parabola made up of 149 xenon short-arc lamps.

These can be adjusted to focus on a single spot measuring 8 inches square and exposed to solar radiant power of disparate strengths.

At maximum setting, the device reportedly can deliver 320 kilowatts (kW), or 10,000 times the normal solar radiation experienced on Earth's surface, and temperatures up to 3,000°C (5,400°F).

According to DLR, these extremely high temperatures are necessary to carry out research on processes that use the Sun to produce solar fuels.

As noted in *New Atlas*, although hydrogen is seen by some as the "green" fuel of the future because it leaves behind only water when it burns, producing it requires large amounts of energy – usually from the burning of fossil fuels. Synlight may provide the solution. In addition to solar-generated hydrogen, DLR envisions it proving useful in the study of how materials age under extreme UV rays.

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Transatlantic cable

- ▶ The artificial Sun at Jülich cost a total of \$3.77 million, most of which was provided by the state of North Rhine-Westphalia. Germany's Federal Ministry for Economic Affairs and Energy (BMWi) contributed \$1.2 million.

World economics

Stronger performances from key economies bode well for global trade flows, but protectionism is a looming threat

Based in Barcelona, Spain, *FocusEconomics* provides analysis and forecasts for 127 countries as well as price forecasts for 33 key commodities. Its monthly Consensus Forecast Report for Major Economies, informed by a global network of analysts, contains macroeconomic projections developed from over 250 sources.

The 1st March edition, written by senior economist Angela Bouzanis, presented data for first-quarter (Q1) 2017 indicating that "faster global growth could be here to stay." The most recent Consensus showed an upward revision to growth prospects for major economies such as the Eurozone and the United Kingdom. But it also took note of a gathering threat to that momentum: a rise in the protectionist sentiment rippling through the global economy.

Here, condensed and edited, are Ms Bouzanis's appraisals of significant economic areas:

UNITED STATES: Upbeat economic data continues to emerge from the USA economy despite a turbulent political atmosphere. After gross domestic product (GDP) growth slipped in the final quarter of last year, leading indicators suggest a firming-up in Q1 2017. In January, employers added jobs at the quickest pace in four months and the manufacturing index of the Institute for Supply Management (ISM) rose to an over-two-year high.

Solid consumer spending and stronger energy-related investments should drive an acceleration in growth this year. The *FocusEconomics* panel sees US GDP expanding 2.3 per cent, topping its 1.6 per cent for 2016. For 2018, the panel sees growth picking up slightly to 2.4 per cent.

EUROZONE: Recovery in the Euro area remains on track, building on the healthy economy of Q4 2016. The unemployment rate fell to a multi-year low in December and economic sentiment held fast at a high level into the New Year. The manufacturing purchasing managers index (PMI) hit a 70-month high in February and the respondents' confidence was high. This positive economic data is lifting the Eurozone's outlook for 2017. An improving labour market and a stronger global economy are seen fuelling a healthy 1.6 per cent expansion this year, up from the Consensus February forecast. For 2018, growth is expected to be broadly steady at 1.5 per cent.

UNITED KINGDOM: The economy of the UK started the year on a positive note and continues to confound the pessimists, with the manufacturing sector expanding strongly in January. This came on the back of revised GDP figures for Q4 2016 which showed better growth than previously forecast. Exports also rose sharply, likely due in part to a weaker pound sterling.

On the political front, the government's Brexit Bill passed the House of Commons intact, after an overwhelming majority of MPs backed the bill and all amendments were defeated. At press time it was being debated in the House of Lords. Consensus forecasts 1.4 per cent growth this year, up 0.2 percentage

points from its February forecast. For 2018, growth in the UK is projected to dip only very slightly.

JAPAN: USA President Donald J Trump's anti-trade policies threaten Japan's nascent recovery as – despite an unemployment rate at multi-year lows – timid gains in wage growth continue to weigh on economic activity. Even so, the Japanese economy managed to expand for the fourth consecutive quarter in Q4 2016 as a weak yen and strong global demand propelled export growth. But Japan is walking a tightrope in terms of its economic recovery, with protectionism shadowing its economic outlook. Consensus analysts in March saw the Japanese economy growing one per cent this year, unchanged from their February projection. For 2018, they see growth at 0.8 per cent.

- ▶ Addressing the protectionist threat to the broad rebound in global trade flows, Ms Bouzanis called attention to a border adjustment tax (BAT) being hotly debated in the USA, the world's largest economy and the current epicentre of protectionist sentiment. This measure, a favourite of President Trump, would tax all imports into the USA, the aim being to generate enough revenue to offset a large corporate tax cut. The plan has been criticised by analysts and would likely negatively impact key trading partners such as China and Germany, which might take retaliatory action. Mr Trump's setback with the American Health Care Act has clouded his prospects for achieving the BAT. But his protectionist stance – along with his disregard for international organisations such as the WTO (World Trade Organization) – could, in the extreme scenario, spark a global trade war.

Dorothy Fabian – USA Editor



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▲ The new NX-500F on display at an exhibition

New NX-500F for spring machinery

THE future in spring manufacturing is here with the new NX-500F spring machine from AIM, an exciting new product created to solve difficult manufacturing challenges in larger size springs.

AIM Inc, an active machinery exporter via its two facilities in North America and Europe, is proud to announce its partnership with Plusprings Co, a Taiwan-based manufacturer.

AIM product offerings will include new spring machines, complementing its existing lines and extending the solutions available under one roof.

The new spring machines are manufactured with top shelf components at the Plusprings facility with the cooperation of AIM experts, in most cases, common with the existing AIM machine components.

AIM will be stocking replacement parts and providing prompt support to all of its customers' needs from its North America and Europe facilities.

The new spring machines have nine to 25 axes and are capable of using spring wire from 0.5mm to 5mm, with higher capacities coming soon. Options include a servo cutter, double spinner, servo

stamping, external feeding device and Easydur Camera inspection system (max 14 axis feedback at the same time), can be customised depending on customer requirements.

AIM has headquarters in the USA with a second location in Europe.

Committed to innovation, quality and rapid response tech support, it manufactures a broad line of wire bending machines, from below 1mm to over 25mm wire diameters.

AIM Inc – USA
Website: www.aimmachines.com

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AEI Machines – synonymous with rigid stranders



▲ Rigid stranding machine from AEI Machines

AEI Machines was established in 1971 by Mr L S Jain, chairman, and has been manufacturing various types of rotating cable machines for the stranding, screening, armouring and laying-up of power cables and overhead conductors since its inception.

Over the years the company has become totally focused on the development and perfection of each aspect of the rigid strander, producing machines that epitomise the process of cable making and uplift the productivity benchmarks and working standards in the cable factory.

AEI's strength lies in the total understanding of customer requirements and offering suitable products ranging from the largest stranders (128 bobbins rigid stranding machine for 500kV cables) to the highest productivity ones.

These machines are suitable for the production of up to 127 wires stranded conductor (70mm² to 3,000mm² in round/Milliken construction) for low, medium and extra high voltage (EHV) power cables:

- Highly compacted round conductor (by dies/rolls)
- Pre-spiralled/straight sector/Milliken conductor
- ACSR/AAAC/AAC overhead conductor
- Pre-shaped wire (TW) and HTLS overhead conductor
- Laying-up of control cables
- Copper screening of power cables
- Steel wire/strip armouring

AEI Machines undergoes continuous evaluation resulting in machines that are powerful and updated with the latest technological features such as higher speeds, fully automatic floor/trolley loading devices, electronic shaft synchronisation (including during power failure), individual wire break detectors, auto regulated pneumatic bobbin brakes, motorised pintles and remote diagnostics over telecom link.

Moreover, AEI's use of perfectly balanced fork type cage rotor construction ensures energy efficiency. The company states that users of AEI Machines can expect smart machines that require minimal maintenance and deliver decades of trouble-free operation.

"As the market for quality cables has grown, so too has the demand for high performance machines," said Alok Jain, director.

"Our main focus has been the development of rigid stranders incorporating the latest technologies to overcome manufacturing challenges and improving process efficiencies. Our approach has been fruitful given the reputation and the demand we enjoy today from cable manufacturers all over the world."

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The benefits of vibration on drawing dies

THE traditional method of drawing wires and tubes can be quite restrictive due to the friction created at the point of draw. Ultraswage International has developed technology that uses a computerised vibration management system to vibrate the drawing die.

The resulting virtual elimination of friction against the die leads to a range of production and product benefits over current drawing methods.

Greater reductions per pass: Without friction, the strain on the tag is reduced, allowing greater reduction per pass. In general, the softer the material, the larger the ratio between force used traditionally to overcome friction and that used to deform the material through the die. Often this can be achieved in one pass rather than the traditional two.

Improved surface finish: The resulting surface finish is excellent.

Improved lubrication: There is a wider choice of lubricants, which can mean a cleaner product and in some cases avoid the need for cleaning after annealing.

Simple die changes: Dies simply screw

into the base of the transducer unit making for uncomplicated changes.

Greatly enhanced die life: Due to the virtual elimination of friction the life of the die is massively increased.

Energy savings: The elimination of friction in the die saves more power than is used by the ultrasonic equipment. The reduced capstan power consumption gives the financial benefit of reduced energy costs and often the productivity benefit of increased draw speeds.

Reduced stock inventory: The greater reductions per pass possible by using ultrasonic technology can lead to fewer stock sizes having to be kept, reducing stock and therefore cost.

Operator control: Though advanced technology, it has been designed to make for uncomplicated control and does not need extra operator involvement.

Increased output: In cases where older machinery is not producing efficiently, output can be increased where the force needed to draw traditionally is reduced when using ultrasonics.

The Ultraswage 2000 Power Source is stand-alone while the transducer/die assembly replaces the existing die, usually by fitting a simple, custom-made mounting frame. The system can accept both wet and dry lubricants, enabling a wider choice of lubricant to be considered. The drawing die is a standard tungsten carbide die inserted into a ring of stainless steel. This enables the die to



▲ Transducer/die assembly fitted to a Schumag drawing machine

vibrate because tungsten alone is a very difficult metal to vibrate.

The Ultraswage 2000 system allows for the drawing of rounds to shapes and is suitable for both ferrous and non-ferrous metals. As a unit it is also versatile in the sense that it can be retro-fitted to existing drawing equipment, can be designed into new equipment and can, with the addition of pay-off and take-up reels, capstan, etc, form a dedicated drawing line.

Ultraswage International Ltd – UK
Website: www.ultraswage-int.co.uk

Rod rust removal – dry, green and clean

Wire rod rust is no longer an alarming phenomenon, since the introduction of the Smooth-Brush (SB) wire rod green and dry cleaning system.

Installed in-line after a simple rod reverse bending descaler, the SB system removes excess rod scale and rust, converting over 95 per cent of rod scale into useful micro-abrading pads, providing efficiency and simplicity in rod dry cleaning applications, H/C and L/C, including 0.98 per cent C.

Continuously liberated rod scale provides, in-line, a reactive about 5-micron size texture enabling powder lubricant to be chemically and mechanically interlocked to the rod surface, forming a hard and consistent anti-wear and anti-friction conversion coating that is found to perform comparably to or better than zinc phosphate.

This achieves in-line direct drawing from mechanically descaled uncoated bare rod, at virtually zero energy consumption and zero maintenance cost, in a totally green and dry application.

The SB rod cleaning is used in the most demanding wire drawing applications, including spring wire, plating wire, galvanised wire, PC strand wire, Al clad wire, cold-heading wire, CO₂ welding wire, etc.

The SB dry cleaning system replaces the most costly operations in wire rod cleaning processes (including acid and other aggressive wet chemicals), generating substantial cost savings, environmental benefits and improvement of productivity.

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New for Rosendahl

EXTRUSION technology is not only the line's core, but Rosendahl's business core, as well.

This is where the company does most of its R&D activities and where it gets the results for its customers. Now it is not only cables that Rosendahl extrudes. The Austrian cable machine maker has extended its know-how for steel rope extrusion.

Such jacketed steel ropes are commonly applied for stay cables or mono-strands. Stay cables are primarily used for cable-stayed bridges. Unbounded mono-strands are used in civil engineering in pre-stressed concrete structures (PT systems).

Often, several single cables (mono-strand) are combined into a bundle (multi-strand), as well. A single strand usually has a diameter of 1/4" to 1 1/8". Other dimensions are also available.

Before jacketing, these strands are coated with a special anti-corrosion material. Rosendahl applies a permanent elastic corrosion protection, grease or wax, to those strands. This coating provides corrosion protection and length watertightness, and it reduces internal friction.

The tricky part is to coat the individual steel wires with grease or wax. Specifically for this type of rope preservation, Rosendahl has developed new rope conservation machine which is used immediately prior to the application of the PE jacket.

The company has introduced a new on-line monitoring system for the grease/wax coating application. This ensures high quality and performance control during the entire conservation process.

RosendahlNextrom – Austria
Website: www.rosendahlnextrom.com

High-speed taping at 1,000rpm



▲ Rosendahl's helical tape applicator Rota 500

Rosendahl's new solution for helical taping works at high speeds – both inline and offline.

Cable production at high speeds with long production lengths has become a common requirement for manufacturers. Not only does it support continuous production, but it also raises the return on investment.

For those cables that require helical taping, Rosendahl has introduced the Rota 500 helical tape applicator. It is designed for polymer tape materials and supports high-speed taping of up to 1,000rpm. Products from 20 to 60mm in diameter can be taped on the Rota 500.

It is a concentric tape applicator that is

used for both inline and offline solutions. Very long tape lengths can be applied by using large tape spool sizes (500mm in diameter and 500mm in length) on a carton core.

Different cable applications require different taping materials. Some examples are as a separator material between the cable core and the jacket, or a water swellable tape or powder taping, etc.

The Rota 500 not only provides for flexibility, but also for a high degree of productivity.

RosendahlNextrom – Austria
Website: www.rosendahlnextrom.com

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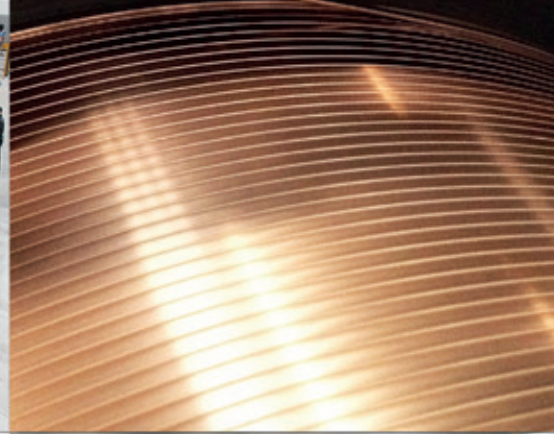


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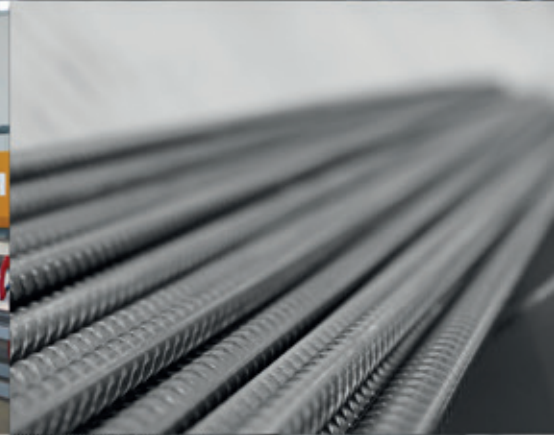
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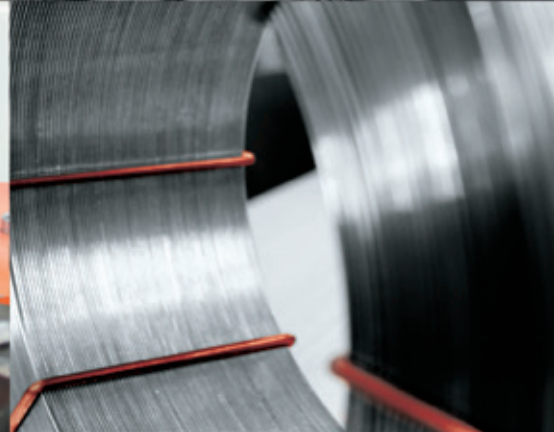
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New lightweight line of fibre optic reels

HANNAY Reels recently introduced a new package of specialised fibre optic reels to address the unique needs of the communications industry.

The reel packages are designed specifically for use with tactical and hybrid fibre optic cable types, including Broadcast SMPTE, TAC and/or opticalCON. A lightweight metal construction includes external and/or internal drum storage with a protective grommet for easy access to cable, while also providing protection from dirt and debris.

Featuring a non-reflective black matte finish to resist harsh outdoor elements, the new Series AVF-14 and AVF-18 are well-suited for live events, mobile broadcast units, mining operations, and military communication.



▲ The AVF-14 series from Hannay Reels

High voltage measuring

Haefely Hipotronics, a developer and provider of high voltage test systems and measuring devices, has launched the new high precision $\tan \delta$ /power factor measuring instrument 2823-REF.

The 2823 is, claims the company, the highest precision $\tan \delta$ /power factor measuring instrument on the market. It uniquely combines more than 50 years of experience in high voltage testing together with the latest technology.

The IP50 protection and the electrically decoupled communications hardware increase operator safety as no electrical signal is transmitted to the laboratory control room.

Haefely Hipotronics Inc – USA
Website: www.haefely-hipotronics.com

The new package includes:

Series AVF-14: A lightweight aluminium reel under ten pounds designed for easy transport and handling.

Featuring a modular frame style, the handle and leg can be easily replaced in the event of damage. Reel capacity ranges from 350 feet of SMPTE cable up to 3,500 feet of fibre optic cable.

Series AVF-18: A durable aluminium/

steel reel weighing less than 25 pounds. Featuring a unique frame style, the reel allows multiple reels to be stacked on top of it for space saving.

A strong 4" optional caster enables easy transport with large capacities of camera cable. Reel capacity ranges from 1,000 feet of SMPTE cable up to 9,250 feet of fibre optic cable.

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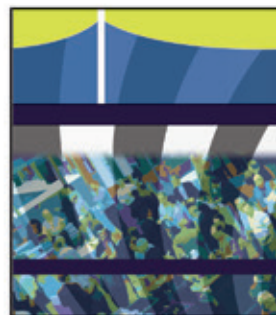
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Inspection and analysis of plastic pellets

THE purity of the material is an important criterion in plastic production and processing. Sikora's programme of innovative inspection, analysis and sorting devices inspects raw plastic material and detects impurities inside the pellets as well as on their surface.

The Sikora Purity Scanner for the on-line inspection and sorting of plastic pellets has been successfully integrated into production lines worldwide.

Plastic manufacturers, processors and end users use this innovative device that uniquely combines X-ray and optical technologies to check their plastic material on-line for contamination. Contaminated material is automatically sorted out.

In the segment of cable production, specifically those companies producing medium, high and extra-high voltage cables as well as subsea cables are focusing on this technology.

For smaller throughputs as well as production lines where sample testing is sufficient, or for the control of incoming goods, Sikora developed the purity concept systems.

The analysis devices offer an inspection by X-ray technology (X), optics (V) or infrared technology (IR). They detect contamination in pellets, flakes and films/tapes.

The Purity Concept X inspects up to 3,000 pellets (200ml) that are placed on a tray. Within seconds, these pellets are inspected for contamination.

Subsequently, contaminated pellets are optically highlighted, which makes the extraction of the individual contamination significantly easier.

Sikora recommends the combination of the Purity Scanner and Purity Concept X for a comprehensive process optimisation.

After the Purity Scanner has successfully detected and sorted



▲ Purity Concept X with tray from Sikora

contaminated pellets, these pellets are then again checked and optically marked by the Purity Concept X. This interaction of on-line and off-line inspection and analysis enables the absolute control of the material purity as well as knowledge to prevent future contamination.

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The “Bullet II” extrusion head from Guill



▲ The Bullet II, showing the absence of hardware, ie nuts and bolts, so disassembly, cleaning and restart are made easier

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 any conventional head on the market currently, according to company sources. The company has announced the next generation of this 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. Additionally, the new patent pending CAM Lock® deflector retaining system offers these additional benefits to extruders and machine builders:

- It only takes a half turn of the Cam Lock® to remove and install the deflector and tip
- No fastening hardware required
- Fast tool changes, threaded retaining ring for the die and threaded tip retainer
- Dies are removed from the front and tips from the rear
- Tooling retainers also provide gum space adjustment
- Hassle-free air/vacuum connections
- Simplified cleaning
- Reduces downtime and lowers operating costs

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. Optional keyed tooling capability offers machine designers and end users quick orientation, so the overall unit design enables faster disassembly, proper cleaning and restart, allowing the line to become more profitable, more quickly.

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Compounds, masterbatches & additives

If an article or paper on masterbatches is accompanied by photos, one of them is sure to picture open containers of pigments in vivid candy colours, making for the most attractive illustrations in wiremaking.

To the eye of an expert, this will not blunt the

vital importance of these concentrated mixtures of additives which – together with compounds – call for the most exquisitely precise transmission and distribution of extrusion and pelletising power.

A leading provider of thermoplastic elastomers

describes a masterbatch as a “package” for colouring plastics. It is a package that has been perfected over many decades for wire-makers who have come to rely on its contents for some very exacting attributes, not even excluding electrical conductivity and UV resistance.

Low-smoke HFFR wire and cable compounds get halogen-free assessment from UL

UL has recognised seven Halguard® low-smoke, halogen-free flame retardant (LS-HFFR) compounds for wire and cable as “halogen-free” in accordance with a new assessment programme, it has been announced by the vinyl division of Teknor Apex.

Also listed as in compliance are 14 halogen-free colour concentrates from the company’s colour division.

Inaugurated last year, the UL programme certifies cable components as halogen-free in accordance with combustion tests to determine acid gas content, acidity and conductivity. Compliance is listed in UL AATJ2.

The seven Halguard LS-HFFR products listed include:

- Five high-performance 58000-58300 Series compounds. Halguard LS-HFFR compounds in these series exhibit a higher level of flame retardance than other high-performance HFFR materials without compromising physical or electrical properties. They are recommended for data centre cables, control cables, energy cables, and other demanding applications where low smoke generation and minimal flame spread are key. The grades certified as halogen-free by UL include Halguard 58100, 58205, 58210, 58215 and 58350. The last two exhibit low post-extrusion shrinkage for fibre optic applications.
- Two low-cost 58600 Series compounds. Designed for general-purpose jacketing applications, Halguard LS-HFFR compounds in this series are more economical than premium compounds while incurring little compromise in performance properties. The series includes grades with enhanced flame retardance as well as lower post-extrusion shrinkage. Halguard 58600 Series compounds are suitable for cables used in subway, mass transit, cell tower, data centre and infrastructure applications, as well as internal wiring in electrical and electronic equipment. The grades certified as halogen-free by UL include Halguard 58600 and 58610.

The UL certification for Teknor Color applies to 14 concentrates supplied in pellet form, using ethylene-vinyl acetate (EVA) and polyethylene (PE) polymers as carrier resins. These new concentrates can be used with the EVA or polyolefin-based halogen-free flame retardant (HFFR) compounds currently available.

“The Halguard LS-HFFR product line addresses a wide range of application requirements, including physical properties, flexibility, processability, flame retardance, post-extrusion shrinkage and cost,” said Mike Patel, director of marketing and business development for the vinyl division.

“The addition of halogen-free assessments by UL further expands options for customers and is particularly advantageous for those seeking to supply installations in confined spaces or public infrastructure such as mass transit.”

Teknor Apex – USA
Website: www.teknorapex.com



▲ Cable with an HFFR jacket

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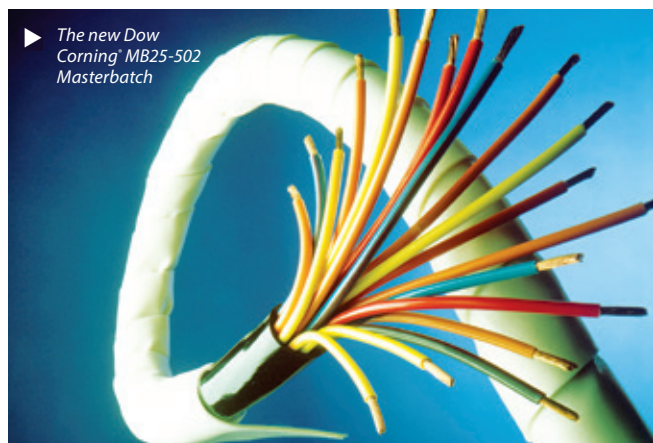
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New masterbatch from Dow Corning

Dow Corning has launched Dow Corning® MB25-502 Masterbatch, an advanced new silicone technology specifically designed to optimise processability of highly mineral-filled polyethylene (PE) compounds for wire and cable applications.

This new masterbatch is claimed to be the first in the industry to combine best-in-class processing with an affordable cost. By reducing screw torque, die build-up and die pressure, the material can improve extrusion throughput by up to 110 per cent compared to PE compounds without a processing additive.

"The wire and cable industry is moving toward the use of halogen-free flame retardants, but these mineral additives can



▶ The new Dow Corning® MB25-502 Masterbatch

cause major processing issues due to the high loadings that are required for effectiveness," said Christophe Paulo, global segment leader, plastics and composites for Dow Corning.

"Until now, customers were forced to choose between expensive, over-engineered additives with higher performance, or low-cost but underperforming products. New Dow Corning MB25-502 Masterbatch enables wire and cable customers to maximise productivity without paying a premium for unneeded functionality."

Dow Corning MB25-502 Masterbatch raises throughput of PE compounds with high mineral loadings (up to 70 per cent by weight) by reducing screw torque by as much as 30 per cent. Lower torque, in turn, accelerates production and cuts energy costs. This silicone masterbatch also avoids die build-up and die pressure that require frequent interruptions for cleaning.

By narrowly targeting processability issues instead of including extra functionality, the new masterbatch achieves outstanding results at a competitive price. Adding to its cost-effectiveness, the Dow Corning product is highly efficient at lower loadings (0.5 to one per cent) than competitive silicone-based additives.

Dow Corning MB25-502 Masterbatch is compatible with low-density PE (LDPE), linear low-density PE (LLDPE) and cross-linked PE (XLPE). It is supplied globally as free-flowing pellets.

Dow Corning – USA

Website: www.dowcorning.com

New engineer role at Cable Components

Cable Components Group (CCG) has appointed Lyle Topa to the position of polymer compounding engineer.

In his new position, he will be an integral part of a product development team for new compounds for wire and cable insulation, jacketing, cable fillers, fibre-optic blown tubing and non-wovens. Compounds will be developed from polyolefins, fluoropolymers and engineered resins, with the addition of fire retardants, nano particles, foaming agents and other value-adding ingredients.

Mr Topa joined CCG after graduating last spring from the University of Rhode Island with a bachelor's degree in mechanical engineering. Since then, he has been participating in a six-month training programme in compound engineering at CCG.

"Working closely with the manufacturer, Lyle has played an integral role in commissioning and troubleshooting our new compounding equipment," president Charles Glew said. "In addition, he has already assisted in developing compounding processes that will create the foundation for future business at CCG."

Mr Topa has developed compounding work instructions (CWIs) that are helping to advance CCG's compounding operation into the production stage. Last year, CCG invested \$3m to develop two Buss Kneader lines that provide the ability to compound materials at below-standard temperatures, enabling foaming agents and high levels of flame retardants to be incorporated into products without degradation. CCG also has a high-temperature, twin-screw line that serves as a workhorse for compounding its flagship FluoroFoam® product.

With its compounding lines ready to operate, CCG has begun adding staff with compounding expertise and marketing its expanded capabilities.

Cable Components Group – USA

Website: www.cablecomponents.com

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Inspection and analysis of XLPE and HPTE material at medium- and high-voltage cable production

By Harry Prunk, Sikora AG, Bremen, Germany

Abstract

Plastics that are used for the insulation of medium- high- and extra-high- voltage cables have to comply with the highest purity standards.

Most commonly XLPE (cross-linkable polyethylene) material is used for the insulation of cable. For cross-linking of the XLPE the cable passes through a CV tube (continuous vulcanisation tube) where it is exposed to high temperatures for the cross-linking.

Typically at the manufacturing of these types of cables the CV tube is filled with nitrogen and operated at a pressure of 10 bars. Before the cable can be further processed, such as the application of a screen as well as the outer sheaths, a degassing is necessary, which may take up to ten days. Commonly, the line is built as a CCV or VCV line (Catenary Continuous Vulcanisation or Vertical Continuous Vulcanisation).

The technology is well proven as it has been used for decades, but it involves high costs for the building and the production line. In addition, there is another method on the advance where high performance thermoplastic elastomer (HPTE), based on polypropylene, is used as insulation material.

This new technology has been further invented by Prysmian and is published as the so called 'P-Laser' technology.^[1] The material shows good electrical and thermo-mechanical properties, comparable and in some aspects even superior to those of XLPE.

The HPTE does not require a cross-linking section and no degassing treatments. That means that the complete cable can be manufactured in an in-line production process, where even the screening and the outer sheath could be applied in one production step.

No matter which approach is applied, the demands for dielectric strength of XLPE and HPTE remains on the same high level and needs to be assured.

Important in this regard is the cleanliness of the insulating material. This is the point where the advanced purity inspection and sorting system comes into focus.

This paper will introduce an online inspection and sorting system that detects contamination inside and on the pellets such as metallic or organic contamination, colour variations, agglomerates, cross-contamination and foreign pellets.

The system presented includes the unique combination of X-ray technology and an optical camera technology for highest detection probability for all sorts of contamination.

Thus, the quality of XLPE or HPTE material and accordingly the production process are optimised and costs reduced.

Furthermore, the paper will briefly refer to an innovative offline system, which inspects and analyses small batches of pellets.

This is further of importance to check pellets that have been sorted out by the online inspection and sorting system.

XLPE and HPTE insulated medium- and high-voltage cable

Today, insulation material that is mainly in use for MV and HV cables is cross-linked polyethylene (XLPE).

Cross-linked polyethylene is produced from polyethylene under high pressure with organic peroxides as additives. Under heat and pressure the cross-linking takes place. The individual molecular chains are linked with one another, and this results in a material change from a thermoplastic to an elastic material.

An advantage of XLPE as insulation for medium- and high-voltage cables is their low dielectric loss and their excellent electrical and physical properties for power transmission.

As XLPE is resistant to thermal deformation and to ageing, an XLPE cable allows the carrying of large currents. Another feature is the easy installation of XLPE cable. It withstands small radius bending and is light in weight.^[2]

Some years ago the company Prysmian invented a new type of cable where instead of XLPE an HPTE (high performance elastomer) is used. This material has equivalent characteristics to XLPE.

The difference is that there is no cross-linking and accordingly no by-products. HPTE is re-usable, allows shorter production time and reduced facility area, and is compatible with the existing network components.

Both materials XLPE and HPTE are used for medium- and high-voltage cable production.

Necessity of clean plastic material for MV and EHV cables

The purity of the plastic material that is used for the insulation of HV and EHV cables is highly important. The purer the compound (Figure 1), the lower the risk of a breakdown.

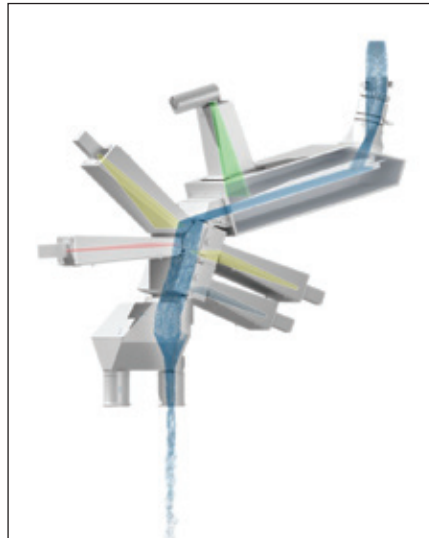
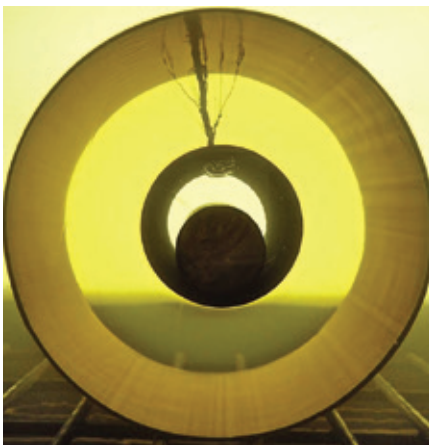
Metal impurities of 50µm may already cause damage to the end product with high follow-up costs. The repair of a defective subsea cable, for example, which has been damaged by contamination, can lead to weeks of downtime.

Furthermore, contaminated insulation compound and respective defective cables and consequential breakdowns at the discharge test affect the industry at the manufacturing process. As part of the production of EHV cables, they are tested in plant with a test voltage 2.5 times the nominal voltage.

▼ **Figure 1:** High quality insulation compound



▼ **Figure 2:** Cross section of an EHV cable with breakdown



▲ **Figure 3:** Inspection and sorting system with X-ray camera (green), optical (yellow), infrared (red), and colour (blue) cameras



▲ **Figure 5:** Offline inspection and analysis system

Approximately, five to six breakdowns (Figure 2) a year are commonly registered by each production site causing tremendous losses.

One breakdown causes costs of up to €150,000 even before the cable is delivered to its dedicated position. In addition, valuable time is lost, making permitted delivery dates unachievable.

Often, non-agreed joints have to be used, damaging the quality image of the manufacturer, and this may lead to contractual penalties.

It is for these reasons that some standards for high-voltage cables demand the exclusion of contamination from 75µm in the processed materials.^[3]

Moreover, there are guidelines from the AEIC (Association of Edison Illuminating Companies), which state that cables have to be designed in such a way that they are usable for at least 40 years.

Accordingly, it is necessary to inspect the material for purity to 100 per cent before it enters the end product. Sample tests are not sufficient to exclude all contamination reliably.

Today, cable manufacturers use screens to catch impurities in the XLPE and HPTE melt before they get into the cable. The screens are positioned directly in the melt flow after the extruder, before the crosshead. However, these screens can get clogged by scorches, or excessive amounts of contaminants after certain run time. Then the melt pressure in the extruder may increase significantly.

Finally, the production has to be stopped in order to change the screens, which in

turn means that later a joint is required at that position.

Joints where the cables are welded together are manually made and always critical, in particular with regard to subsea cables for offshore applications.

That is why cable manufacturers aim at delivering large cable lengths with only a minimum number of joints, as they contain a potential risk for breakdowns.

As clogged screens reduce the productivity of the line, reliable methods to detect and sort out contamination in the polyethylene material have to be implemented.

XLPE and HPTE purity assurance before material processing: inspection and sorting

Today, for pellet inspection, systems are used either in laboratories or for online monitoring during the production process of the granules.

The majority of the systems are based on optical technology to detect contamination on the pellet. Contamination inside the pellets cannot be detected by these systems. The inspection and sorting system described in the following pages allows for 100 per cent online quality assurance by using X-ray technology and an optical technique.

Contaminations that are detected are identified by image processing software,

characterised as contamination and automatically separated. The technology allows for the detection of impurities down to a size of 50µm.

X-ray technology

The basic detection principle of the X-ray technology uses the different attenuation of the material. XLPE mainly comprises carbon.

The carbon atom has six protons in its core. A typical contamination would be steel particles from the extruder or granulator, which is mainly iron (FE). Iron has 26 protons in its core.

These 26 protons have a much higher X-ray attenuation than the six protons from the carbon and this results in a perfect contrast between the two materials in the X-ray image.

Optical technology

Regarding the optical inspection, the illumination plays an essential role. In order to allow precise recordings of material flows at industrial speed, modern camera technologies (optical, infrared and colour cameras) are used.

Powerful image processing software similar to the one used for the X-ray inspection is used to detect contamination with the optical system.

Therefore, by setting a certain threshold, all contaminated pellets which are above the threshold in the mathematical algorithm are sorted out.

Typical contamination detected by X-ray and optical technology

The combination of both X-ray and optical technologies enables the detection of contamination in the pellet itself and on its surface (Figure 4).

The X-ray system inspects transparent and coloured (eg black) pellets as well as semi-conductive XLPE material for impurities.

Typical impurities detected with X-ray are metallic as well as organic contamination and inhomogeneities (TiO₂) inside the pellet. In addition, the optical system detects, for example, black specks on the pellet, foreign objects and foreign pellets as well as other organic or metallic contamination.

Integration of the system in the production line

The system is typically installed between the hopper that is fed from the XLPE and

HPTe supply (octabin, bag or silo) and the hopper of the extruder, whereas the compound is fed by gravity.

On- and offline inspection and analysis of pellets, flakes and tapes/films

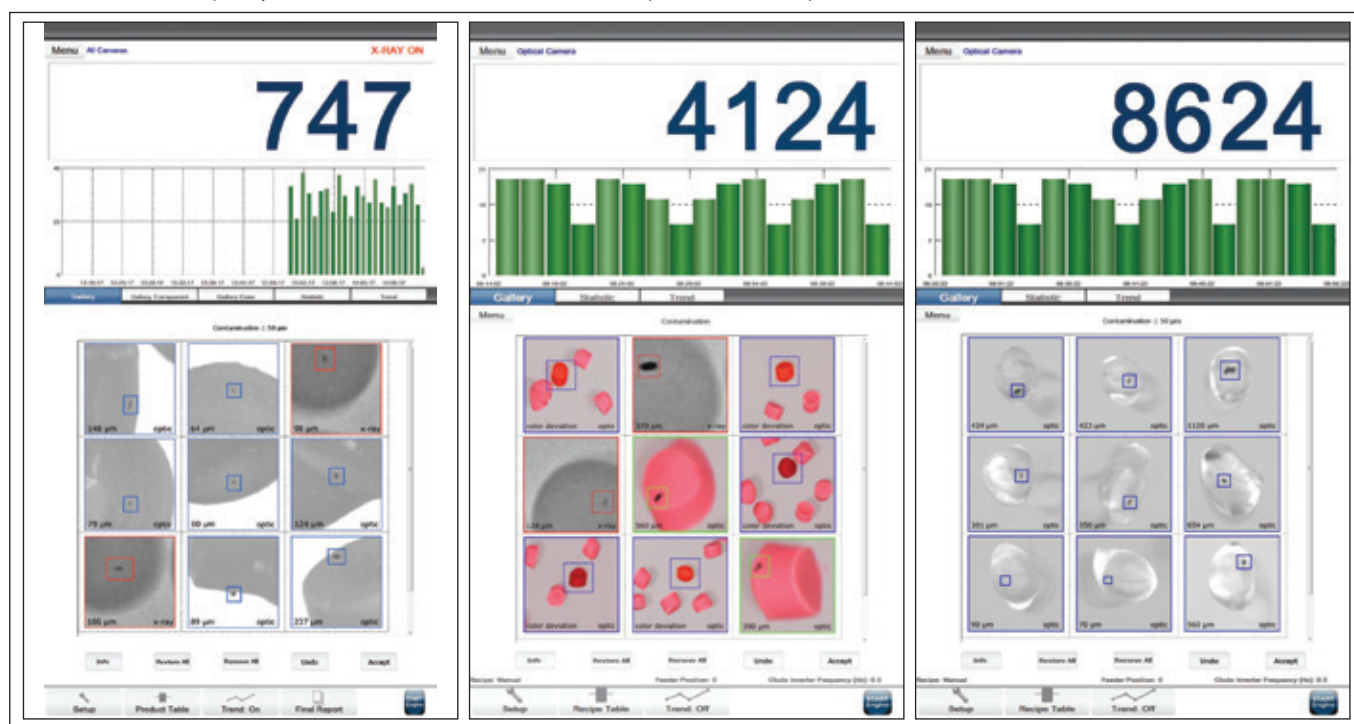
In addition to online inspection and sorting devices there are modular designed systems available for on- and offline inspection and analysis of pellets, flakes and tapes/films. These are used for smaller throughputs as well as production lines where sample testing is sufficient, or for the control of incoming goods.

Depending on application, the systems are equipped with X-ray technology (X), infrared technology (IR) or optical sensors (V) to be used during the production or for sample testing and detect contamination from 50µm.

For example, a laboratory inspection and analysis device with X-ray technology (Figure 5) inspects up to 3,000 pellets (200ml) that are placed on a tray.

Within seconds, these pellets are inspected for contamination. Subsequently, contaminated pellets are optically highlighted, which makes the extraction of the individual contamination significantly easier.

▼ **Figure 4:** By means of X-ray technology and an optical inspection the system detects contamination inside the plastic pellet and on its surface. The system detects metal contamination, black specks, yellow discolourations and colour variations in transparent and non-transparent material



For comprehensive process optimisation cable manufacturers combine an online inspection and sorting system with an offline inspection and analysis device.

Once contaminated pellets have been detected and sorted out, the laboratory system inspects these pellets again and marks contamination optically for an easy separation of all rejects.

This interaction of online and offline inspection and analysis enables control of the material purity and allows the creation of a database to prevent future contamination.

Conclusion

In summary, this paper outlined the reasons for the need of a high purity degree of XLPE and HPTE material used for the insulation of MV and EHV cables.

Furthermore, the paper introduced systems for on- and offline quality control of XLPE and HPTE that inspect the material before processing.

The presented inspection and sorting system detects contaminated pellets and separates them before they get into the extrusion process.

The contamination may be in the raw material, but may have also been added at the handling and transport stage.

Accordingly, even if cable manufacturers keep on using screens, this technology assures that screens are not getting clogged with impurities from contaminated pellets and allows, therefore, a longer and safe production run.

By using X-ray and optical technologies contaminants inside and on the pellet surface are detected, which guarantees 100 per cent quality control.

With the use of an offline inspection and analysis system for contaminated pellets that had been separated by the online inspection system, production processes can even be improved.

The material purity is controlled and the analysis gives information to prevent future contamination.

Taking these advantages together, the use of the introduced technologies for quality control of XLPE and HPTE material is essential to assure high-quality MV and EHV cables.

Simultaneously, by ensuring a high purity degree of XLPE and HPTE material, cost for re-manufacturing cables that failed

the discharge tests can be saved and the efficiency of the cable production line is improved to a great extent. ■

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Förderung einer prosperierenden Infrastruktur auf der Messe

WIRE Southeast Asia kommt dieses Jahr wieder in das Bangkok Trade & Exhibition Centre (BITEC), Bangkok, Thailand, vom 19. bis 21. September. Diese angebrachte und strategische Inszenierung von zwei Messe-Spezialisten wird von positiven Aussichten begleitet, die für die Draht- und Kabelbranche erwartet werden, insbesondere aufgrund der prosperierenden Infrastruktur- und Produktionssektoren in Südostasien.

Die Online-Ausstelleranmeldung ist bereits jetzt unter www.wire-southeastasia.com möglich.

Nach der asiatischen Entwicklungsbank (ADB) werden bis 2020 die Bereiche Energie und Transport 62,6% des gesamten Investitionsbedarfs im Infrastruktursektor des Verbandes Südostasiatischer Nationen (ASEAN) erwirtschaften. Bestätigt wird dies durch die Prognose von Goldman Sachs über die Infrastrukturausgaben für Energie und Transport in vier ASEAN-Staaten (Thailand, Malaysia, Indonesien und Philippinen), die 524 Milliarden USD bis 2020 betragen sollen.

Eine wichtige ASEAN-Initiative im Bereich der Infrastrukturen ist das ASEAN Power Grid (APG) mit einem Investitionsbedarf von 5,9 Milliarden USD sowie die Singapur-Kuala Lumpur Hochgeschwindigkeitsbahn, die sich über 217 Meilen erstreckt und voraussichtlich 2026 in Betrieb gehen wird.



▲ Aussteller und Besucher an einem vorherigen Draht Southeast Asien

Bezogen auf die Fertigung, sollten die ASEAN-Staaten die Integrationsstrategie der ASEAN-Wirtschaftsgemeinschaft vollständig umsetzen und einen größeren Anteil der weltweiten Fertigung an sich ziehen, so könnte das BIP dieser Region von 280 bis 625 Milliarden USD bis 2030 jährlich erreichen, wie in einem kürzlich veröffentlichten Bericht des McKinsey Global Instituts festgestellt.

Dieser Infrastrukturwachstum - parallel zur Erweiterung der Industrie im Bereich Automobil, neue Energie,

Hochgeschwindigkeitsbahn, Stadtverkehr, Raumfahrt, Petrochemie, Infrastrukturbau und anderen Anwendungen - hat der Befestigungsindustrie neue Möglichkeiten eröffnet.

Diese weltweiten Tendenzen widerspiegelnd, wird ein Sonderbereich der Befestigungstechnologie bei der wire Southeast Asia 2017 debütieren. Der Fastener-Pavillon wird eine der vollständigen vor- und nachgelagerten Industriekette der Befestigungstechnologie gewidmete Präsentation zeigen.

Das Ausstellungsprofil wird Standardbefestigungen und nicht dem Standard entsprechende Befestigungen sowie Befestigungsanwendungen in unterschiedlichen Branchen abdecken, bis hin zur Fertigungskompetenz und Hilfseinrichtungen für Befestigungen.

Die dynamische Aufstellung bei der wire Southeast Asia wird eine umfassende Auswahl an innovativen Maschinen für die Herstellung, Verarbeitung und Fertigung von Draht und Kabel, für die Befestigungstechnologie, für neue Verfahren in der Mess-, Regel- und Prüftechnik und Fachgebiete sowie neue und aufgerüstete Werkzeuge und Hilfsmittel darstellen.

Die Ausstellungen werden von einer Reihe von Konferenzen und Seminaren ergänzt.

Messe Düsseldorf organisiert Ausstellerbeteiligungen bei der Iran Wire 2017

Vom 5. bis 8. Dezember findet in Teheran die Iran Wire als einzige Fachmesse im Iran statt, die das gesamte Spektrum der Bereiche Draht, Kabel, Rohre, Pipelines, Profile und entsprechenden Industrien abbildet.

Alle internationale Unternehmen aus den jeweiligen Branchen, die ihre Produkte präsentieren und verkaufen möchten, werden bei der Iran Wire eine einzigartige Plattform als attraktiven Einstiegspunkt im iranischen Schwellenmarkt finden.

Rund 200 Aussteller werden erwartet, die ihre innovativen technologischen Produkte in den Bereichen Draht, Kabel, Rohre, Pipelines und Profile präsentieren. Organisiert wird die viertägige Fachmesse in Teheran von der iranischen Aria Group Conference and Exhibition Development Company.

Die Messe Düsseldorf tritt als einziger internationaler Teilnehmer auf und wird für die Werbung und das Handling von internationalen Ausstellern verantwortlich sein. Darüber hinaus deckt die Messe Düsseldorf eine große Auswahl an Organisationsbereichen, darunter die internationale Ausstelleranmeldung, das Standkonzept und einen reibungslosen Ablauf vor Ort auf dem Messegelände Tehran International Permanent Fairground ab.

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Richtungsweisend: 60 Jahre Zumbach!

ALS Pionier der Online-Messung, produziert Zumbach eine umfassende Palette von berührungslosen, Online Mess- und Regelinstrumenten. Seine Technologie ist weltweit im Einsatz und dieses Jahr feiert das Unternehmen sein 60-jähriges Jubiläum.

Ob für die Kabel-, Kunststoff- oder Gummiindustrie sowie Stahl- und Metallindustrie, wird die Technologie von Zumbach von Kunden eingesetzt, die auf Qualität und Zuverlässigkeit seiner Geräte und Systeme angewiesen sind.

Es war in Biel/Schweiz (das Zentrum der schweizerischen und weltweiten Uhrenindustrie), am 1. Mai 1957. Bruno Zumbach, ein junger Elektroingenieur, nicht einmal 30 Jahre alt, kam auf die Idee eine eigene Elektronikfirma zu gründen, weil er eigenständig etwas herstellen wollte.

Die Elektronik steckte noch in ihren Anfängen, Relais und Vakuumrohre waren immer noch die wichtigsten Elemente. Der Transistor war etwas fast unvorstellbares; alle integrierten Schaltungen und Mikroprozessoren, Sachen der Zukunft. Zu dieser Zeit war die wirtschaftliche Entwicklung in der Schweiz jedenfalls positiv und es gab viele erfolgreiche Maschinenfabriken in Biel.

Die ersten Aufträge, einzeln oder in kleinen Mengen, wurden für Antriebssysteme erhalten, die in Maschinen jeder Art eingesetzt wurden. Sie betrafen Maschinen für Uhren, Optik, Sterilisation und Instrumente jeglicher Art. Wahrscheinlich war der größte und „gewagteste“ Auftrag im Anfangsstadium die Automatisierung der Butterzentrale in Gossau, in der Nähe von St. Gallen (Schweiz). Das ganze Butterproduktions- und -vertriebssystem wurde mit einem völlig berührungslosen Antrieb automatisiert – zu jener Zeit eine brandneue Technik. Es war der erste Antrieb dieser Art in der Schweiz.

Aus Kostengründen wurden alle Schaltelemente, die sogenannten Logikblöcke entwickelt und im eigenen Werk des Unternehmens serienmäßig hergestellt. Auch Antriebe, Lichtschranken und andere Bestandteile wurde betriebsintern in Biel hergestellt.

Zu dieser Zeit gab es in Biel und im restlichen Teil der Schweiz viele Hersteller von Rundschleifmaschinen, die schwingungsarme und fein justierbare Antriebe benötigten. Bruno Zumbach erkannte schnell, dass es sich um einen



▲ Die erste Heimat der Firma als kleines, gemietetes Studio und Büro in einem alten Fabrikgebäude im Zentrum von Biel

wichtigen Markt handelte. Das Problem war, dass eine zufriedenstellende Lösung mit der damals gängigen Thyatron-Technik nicht möglich war.

Zumbachs Vision sah die Entwicklung und den Bau eines kleinen und erschwinglichen „Ward Leonard“-Antriebs mit einem Monoblock-Umformer und einem passenden GS-Motor und -Regler vor. Damals war diese Technologie nur für Antriebsleistungen umsetzbar und erschwinglich, die um ein vielfaches höher lagen. Die „Ward Leonard-Vision“ würde bald für viele Jahre die grundlegende Zumbach-Technologie werden.

Anfang der 60iger Jahre erkannte Zumbach, dass sein Geschäft mit Antrieben keine lebensfähige Zukunft für das Unternehmen garantieren konnte. Der Sektor wurde durch neue technische Möglichkeiten und somit durch eine steigende Zahl von Wettbewerbern geprägt, die anfangen eine Senkung der Preise und Margen aufzuerlegen. Dann würde in Kürze für die Werkzeugmaschinenindustrie ein Prozess des Rückgangs beginnen.

Um 1972 wurde ein Projekt entwickelt, um einen Exzentrizitäts-Tester für elektrische Kabel herzustellen. 1974 wurde Zumbach ein Patent für das neue induktive Gerät Ex-Test 7 erteilt, das der erste große Erfolg wurde, in dem neuen Bereich der Inline-Messgeräte.

Die optischen Durchmesser-Messgeräte

wurden Zumbachs erfolgreichste Produkte. Die analogen Odc-Typen wurden um 1975, die Absolutmessgeräte Odac® ab 1977 entworfen. Odac 24 war das erste Messgerät zur absoluten Messung, das massenhaft verkauft wurde. „Odac“ wurde ein eingetragenes Warenzeichen; und seitdem wurden über 80.000 Odac-Messgeräte jeglicher Art und für eine große Auswahl an Anwendungen verkauft.

Bruno Zumbach übergab 1994 die Geschäftsführung der Gruppe an seinen Sohn Rainer. In den Folgejahren vergrößerte sich die Gruppe und gründete weitere Tochtergesellschaften, unter anderem in Asien. Neben diesen eigenen Unternehmen von Zumbach, wurden seitdem zusätzlich Vertreter unter Vertrag genommen. Demzufolge konnte eines der Ziele von Zumbach - die Kundennähe – maximal gefestigt werden und lokale Dienstleistungen wurden in den letzten 20 Jahren konsequent ausgebaut.

Infolgedessen wurden ab 1970 Verkaufs- und Serviceniederlassungen und später eingetragene Unternehmen in zahlreichen Ländern gegründet. Das erste lag 1979 in den USA, gefolgt von den UK, Deutschland, Frankreich, Spanien, Italien, Indien, Taiwan und 2001 China. Über 20 Vertriebsingenieure in Orpund und die ausländischen Unternehmen sichern nun den Produkterfolg auf dem Weltmarkt.

Zumbach AG – Schweiz
Website: www.zumbach.com

Inspektion und Analyse von XLPE- und HPTE-Material bei der Herstellung von Mittel- und Hochspannungskabeln

von Harry Prunk, Sikora AG, Bremen, Deutschland

Übersicht

Kunststoffe, die für die Isolierung von Mittel-, Hoch und Höchstspannungskabeln eingesetzt werden, müssen die höchsten Reinheitsstandards erfüllen. In den meisten Fällen wird XLPE (vernetzbares Polyethylen) -Material für die Isolierung des Kabels eingesetzt. Für die Vernetzung des XLPE läuft das Kabel durch ein CV-Rohr (kontinuierliche Vulkanisation), wo es hohen Temperaturen für die Vernetzung ausgesetzt ist.

In der Regel wird bei der Herstellung dieser Kabeltypen das CV-Rohr mit Stickstoff gefüllt und bei einem Druck von 10 Bar betrieben. Bevor das Kabel weiterverarbeitet werden kann, wie z. B. das Anbringen einer Abschirmung wie auch Außenummantelungen, ist eine Entgasung nötig, die bis zu 10 Tagen in Anspruch nehmen kann. Im Allgemeinen wird die Linie als eine CCV- oder VCV-Linie gebaut (bzw. Kettenlinien kontinuierliche Vulkanisation oder Vertikale kontinuierliche Vulkanisation).

Diese Technologie ist bewährt, da sie seit Jahrzehnten eingesetzt wird, ist aber jedoch mit hohen Kosten für den Bau und die Produktionslinie verbunden. Darüber hinaus ist eine andere Methode auf dem Vormarsch, bei der Hochleistungsthermoplastisches Elastomer (*High Performance Thermoplastic Elastomer* bzw. HPTE), basierend auf Polypropylen, als Isolationsmaterial eingesetzt wird. Diese neue Technologie wurde von Prysmian erarbeitet und ist als sogenannte „P-Laser“-Technologie verbreitet.^[1] Das Material zeigt gute elektrische und thermo-mechanische Eigenschaften auf, die mit XLPE

vergleichbar und in einigen Aspekten XLPE sogar überlegen sind. HPTE fordert kein Vernetzungsabschnitt und keine Entgasungsbehandlung. Das bedeutet, dass das komplette Kabel in einem Inline-Produktionsverfahren hergestellt werden kann, wo auch die Abschirmung und die Außenummantelung in einem Produktionsschnitt angebracht werden können.

Egal welcher Ansatz zur Anwendung kommt, bleibt der Bedarf an dielektrischer Festigkeit von XLPE und HPTE auf dem gleichen hohen Niveau und muss gesichert werden. Wichtig ist in diesem Zusammenhang die Sauberkeit des Isoliermaterials. Das ist der Punkt, in dem das fortschrittliche Reinheitsinspektions- und Sortierungsgerät in den Fokus rückt.

In diesem Artikel wird ein Online-Inspektions- und Sortierungsgerät vorgestellt, das Kontaminationen in und auf Pellets erkennt wie z. B. metallische- oder organische Verunreinigungen, Farbvariationen, Agglomerate, Kreuzkontaminationen und Fremd pellets. Das vorgestellte Gerät schließt die einzigartige Kombination von Röntgentechnologie und einer optische Kameratechnik für höchste Detektionswahrscheinlichkeit für alle Arten von Kontaminationen ein. Demzufolge werden die Qualität des XLPE- oder HPTE-Materials entsprechend dem Produktionsverfahren optimiert und die Kosten reduziert.

Darüber hinaus behandelt dieser Artikel kurz ein innovatives Offline-Gerät, das Kleinserien von Pellets inspiziert und analysiert. Das ist außerdem von

Bedeutung um die Pellets zu prüfen, die über das Online-Inspektions- und Sortierungsgerät aussortiert wurden.

Mit XLPE und HPTE isolierte Mittel- und Hochspannungskabel

Heute ist das Isolationsmaterial, das hauptsächlich für Mittelspannungs- (MV) und Hochspannungskabel (HV) eingesetzt wird, vernetztes Polyethylen (XLPE). Vernetztes Polyethylen wird von Polyethylen unter hohem Druck mit organischen Peroxiden als Additive hergestellt. Unter Wärme und Druck findet die Vernetzung statt. Die individuellen Molekularketten werden miteinander vernetzt, und ergeben eine Materialveränderung von einem thermoplastischen zu einem elastischen Material. Ein Vorteil des XLPE als Isolierung für Mittel- und Hochspannungskabel liegt in deren niedrigem dielektrischen Verlust und deren hervorragenden elektrischen und physikalischen Eigenschaften für die Stromübertragung.

Da XLPE widerstandsfähig gegen thermische Verformung und Alterung ist, kann ein XLPE-Kabel hohe Stromstärken übertragen. Ein weiteres Merkmal ist die leichte Installation des XLPE-Kabels. Es widersteht kleinen Biegeradien und ist leicht.^[2]

Vor einigen Jahren hat das Unternehmen Prysmian einen neuen Kabeltyp erfunden, in dem statt XLPE, HPTE (Hochleistungs-Elastomer) eingesetzt wird.

Dieses Material weist gleichwertige Merkmale wie XLPE auf. Der Unterschied liegt darin, dass keine Vernetzung besteht und demzufolge keine Nebenprodukte, HPTE ist wiederverwendbar, ermöglicht eine kürzere Produktionszeit, reduziert den Anlagenbereich und ist kompatibel mit den bestehenden Netzwerkkomponenten.

Beide Materialien XLPE und HPTE werden für die Herstellung von Mittel- und Hochspannungskabeln eingesetzt.

Saubere Kunststoffmaterialien - Voraussetzung für MV- und EHV-Kabel

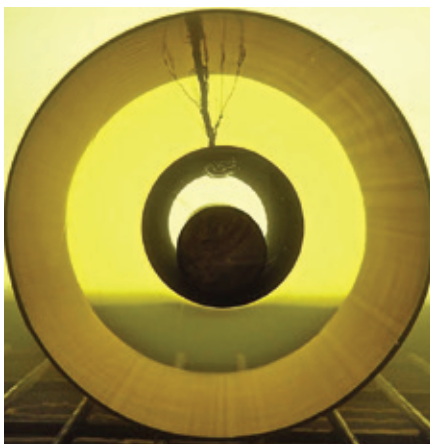
Die Reinheit des Kunststoffmaterials, das für die Isolierung von Hochspannungs- und Höchstspannungs- (EHV) Kabeln eingesetzt wird, spielt eine sehr wichtige Rolle. Je reiner das Compound (Abb. 1), desto geringer ist das Risiko eines Durchschlags.

Metallische Verunreinigungen von 50µm können bereits Schäden am Endprodukt mit hohen Folgekosten verursachen.

▼ **Abb. 1:** Hochwertige Isolierungsmischung



▼ **Abb. 2:** Querschnitt eines EHV-Kabels mit Durchschlag



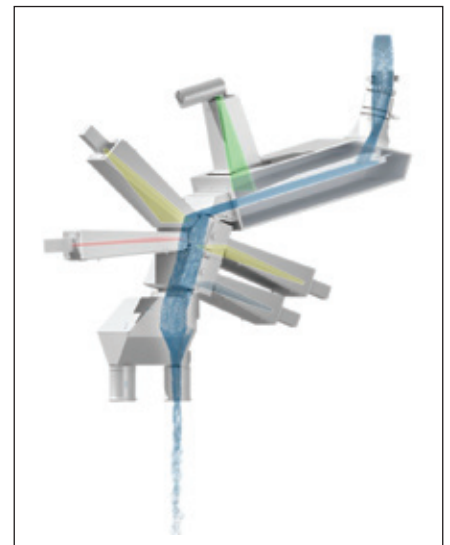
Die Reparatur eines defekten Unterseekabels beispielsweise, das durch Kontamination beschädigt wurde, kann zu wochenlangem Ausfall führen. Darüber hinaus kann die kontaminierte Isolierungsmischung mangelhafte Kabel bzw. sich daraus ergebene Durchschläge während des dielektrischen Entladungstests verursachen, mit negativen Auswirkungen auf die Industrieebene während des Herstellungsverfahrens. Im Rahmen der Produktion der EHV-Kabel, werden diese im Werk mit einer Prüfspannung geprüft, die 2,5 Mal der Nennspannung entspricht.

Etwa fünf bis sechs Durchschläge (Abb. 2) werden üblicherweise pro Jahr an jedem Produktionsstandort registriert, was immense Verluste zur Folge hat. Bereits ein einziger Durchschlag verursacht Kosten von bis zu 150.000 Euro, sogar bevor das Kabel in seine vorgesehene Position verlegt wird. Außerdem geht wertvolle Zeit verloren und somit können vereinbarte Lieferzeiten nicht eingehalten werden. Häufig müssen auch nicht vereinbarte Joints eingesetzt werden, welche das Qualitätsimage des Herstellers beschädigen und Vertragsstrafen zur Folge haben können. Daher ist es gemäß einigen Normen für Hochspannungskabel erforderlich, dass Kontaminationen ab 75µm in weiterverarbeitenden Materialien ausgeschlossen sind.^[3] Außerdem müssen Kabel laut den Richtlinien AEIC (Association of Edison Illuminating Companies) auf eine Lebensdauer von mindestens 40 Jahren ausgelegt sein.

Dementsprechend ist es notwendig, das Material zu 100% auf Reinheit zu überprüfen bevor es in das Endprodukt einfließt. Stichproben sind nicht ausreichend, um alle Kontaminationen zuverlässig auszuschließen. Heutzutage nutzen Kabelhersteller Siebe um Verunreinigungen in der XLPE- und HPTE-Schmelze aufzufangen bevor diese in das Kabel gelangen. Die Siebe sind direkt im Schmelzfluss positioniert, nach dem Extruder und vor dem Spritzkopf. Diese Siebe können jedoch nach einer gewissen Laufzeit durch Scorches oder extrem hohe Verunreinigung verstopfen.

Woraufhin der Schmelzdruck im Extruder sich bedeutend erhöhen kann. Schließlich muss die Produktion zum Austausch der Siebe gestoppt werden, was wiederum bedeutet, dass später an diese Stelle ein Joint zu setzen ist.

Joints, das heißt wo die Kabel zusammengeschweißt werden, werden per Hand gefertigt und sind immer kritisch, insbesondere in Bezug auf Unterseekabel bei Offshore-Anwendungen. Aus diesem Grund ist es das Ziel von Kabelherstellern, möglichst



▲ **Abb. 3:** Inspektions- und Sortiergerät mit Röntgenkamera (grün), optischer (gelb), infraroter (rot) und Farb- (blau) kamera

große Kabellängen mit nur einem Minimum an Joints herzustellen, da Joints ein potentielles Risiko für Kabelbruch beinhalten. Da verstopfte Siebe die Produktivität der Linie reduzieren, werden zuverlässige Methoden benötigt, um Kontaminationen im Polyethylen-Material zu detektieren und auszusortieren.

Sicherung der XLPE- und HPTE-Reinheit steht vor der Materialverarbeitung: Inspektion und Sortierung

Heutzutage wird die Überprüfung von Pellets durch Systeme durchgeführt, die entweder in Laboren oder zur Online-Kontrolle während der Produktion der Granulate eingesetzt sind.

Die Mehrheit dieser Geräte basiert auf optischer Technologie, um Verunreinigungen auf dem Pellet zu detektieren. Dennoch können Kontaminationen im Inneren der Pellets durch diese Systeme nicht erkannt werden.

Das Inspektions- und Sortiergerät, das im Folgenden beschrieben wird, erlaubt eine Online-Qualitätssicherung zu 100% durch den Einsatz von Röntgentechnologie und optischer Technik. Detektierte Kontaminationen werden durch eine Bildverarbeitungssoftware identifiziert, als Kontamination charakterisiert und automatisch aussortiert. Die Technologie erlaubt die Detektion von Verunreinigungen ab einer Größe von 50µm.

Röntgentechnologie

Das Grundprinzip der Erfassung der Röntgentechnologie setzt die unterschiedliche Dämpfung des Materials ein. XLPE besteht überwiegend aus Kohlenstoff. Das Kohlenstoffatom besitzt sechs Protonen in seinem Kern. Eine typische Kontamination wäre Stahlpartikeln vom Extruder oder Granulator, das vorwiegend Eisen (FE) ist. Eisen besitzt 26 Protonen in seinem Kern. Diese 26 Protonen weisen eine viel höhere Röntgendämpfung als die sechs Protonen vom Kohlenstoff auf und daraus resultiert ein perfekter Kontrast zwischen den zwei Werkstoffen im Röntgenbild.

Optische Technologie

In Bezug auf die optische Inspektion, spielt die Beleuchtung eine wesentliche Rolle. Um genaue Erfassungen des Materialflusses bei der Industriegeschwindigkeit zu ermöglichen, werden moderne Kameratechnologien (optische, infrarote, Farbkameras) eingesetzt. Eine leistungsstarke Bildverarbeitungssoftware, die jener ähnlich ist, die für die Röntgeninspektion eingesetzt wird, wird genutzt um Verunreinigung mit dem optischen System zu detektieren. Demzufolge sind, durch die Sortierung eines bestimmten Schwellenwerts, alle verunreinigten Pellets, die sich über den Schwellenwert im mathematischen Algorithmus befinden, aussortiert.

Typische Kontaminationen detektiert durch Röntgen- und optische Technologie

Die Kombination von Röntgen- und optischer Technologie ermöglicht die Detektion von Verunreinigungen im Pellet und auf dessen Oberfläche (Abb. 4). Das Röntgensystem inspiziert transparente und farbige (z.B. schwarze) Pellets sowie Halbleiter-XLPE-Material auf Verunreinigungen. Typische Verunreinigungen die mit Röntgentechnologie erkannt werden sind metallische und organische Kontaminationen und Inhomogenitäten (TiO₂) im Inneren des Pellets. Darüber hinaus detektiert das optische System beispielsweise schwarze Specs auf dem Pellet, Fremdkörper und Fremd pellets sowie andere organische oder metallische Kontaminationen.

Systemintegration in die Produktionslinie

Das System wird üblicherweise zwischen dem Trichter der mit dem XLPE und HPTe gespeist wird (Oktabin, Sack oder Silo) und dem Trichter des Extruders installiert, wobei das Material mit Hilfe der Schwerkraft zugeführt wird.

On- und Offline-Inspektion und -Analyse von Pellets, Flakes und Folien/Tapes

Neben den Online-Inspektions- und -Sortiergeräten, stehen modulare Baukastensysteme für die On- und Offline-Inspektion- und -Analyse von Pellets, Flakes und Folien/Tapes zur Verfügung.

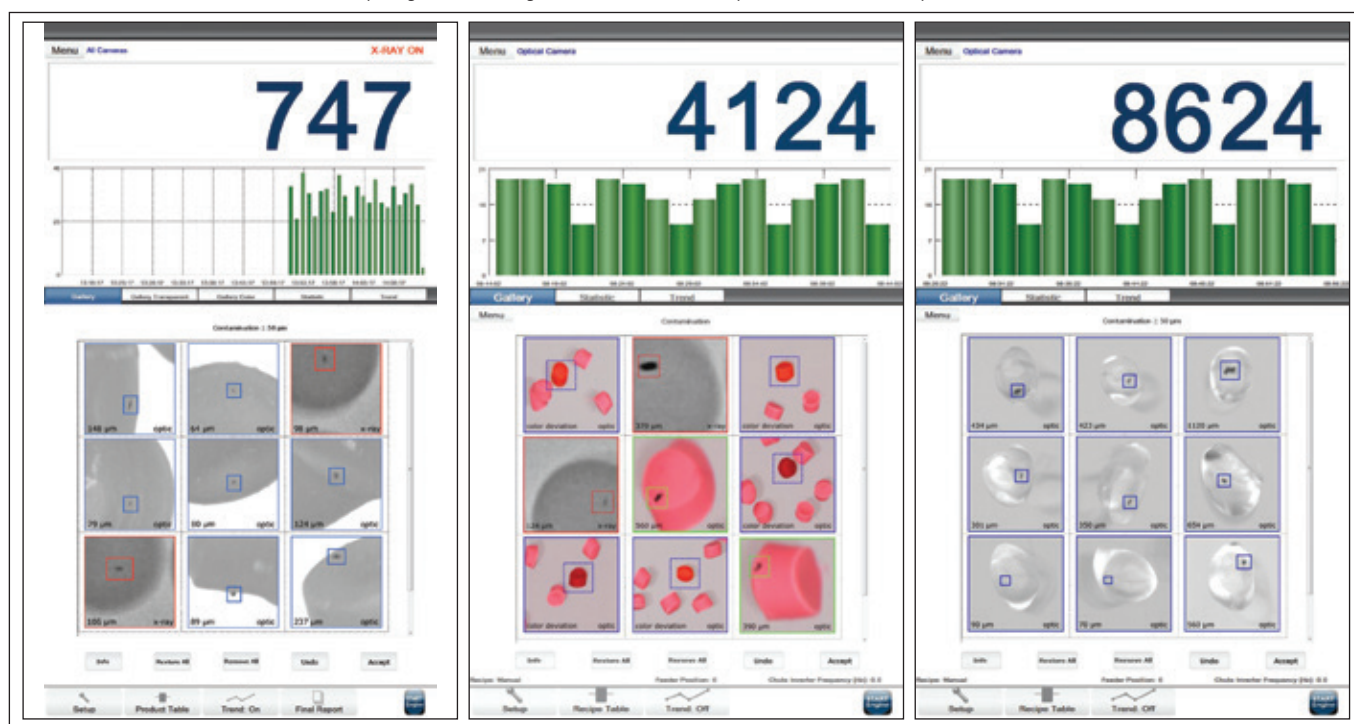
Eingesetzt werden sie für kleinere Produktionsvolumen sowie Produktionslinien, wo Stichproben ausreichend sind, oder für die Wareneingangsprüfung.

Je nach Anwendung werden die Geräte mit Röntgentechnologie (X), Infrarot-Technologie (IR) oder optischen Sensoren (V) ausgestattet, die während der Produktion oder für Stichproben einzusetzen sind und um Kontaminationen ab 50µm zu detektieren. Zum Beispiel inspiziert ein Laborinspektions- und -analysengerät mit einer Röntgentechnologie (Abb. 5) bis zu 3.000 Pellets (200ml), die auf einem Träger platziert sind.

Innerhalb weniger Sekunden werden diese Pellets auf Verunreinigung untersucht.

Kontaminierte Pellets werden anschließend optisch markiert, was die Entnahme der einzelnen Verunreinigung deutlich erleichtert.

▼ **Abb. 4:** Mittels der Röntgentechnologie und einer optischen Inspektion, detektiert das Gerät Kontaminationen im Inneren des Pellets und auf dessen Oberfläche. Das Gerät detektiert Metallkontamination, schwarze Specs, gelbe Verfärbung und Farbvarianten in transparenten und nicht transparenten Materialien





▲ **Abb. 5:** Offline-Inspektions- und Analysengerät

Zur umfassenden Prozessoptimierung kombinieren Kabelhersteller ein Online-Inspektions- und -Sortierungsgerät mit einem Offline-Inspektions- und -Analysegerät.

Nachdem die kontaminierten Pellets detektiert und aussortiert werden, inspiziert das Laborsystem diese Pellets nochmals und markiert optisch die Kontamination zur leichten Trennung aller Ausschüsse.

Dieses Zusammenspiel von On- und Offline-Inspektion und -Analyse ermöglicht eine Kontrolle der Materialreinheit sowie die Schaffung einer Datenbank zur Vermeidung zukünftiger Kontaminationen.

Schlussfolgerung

Zusammenfassend werden in diesem Artikel die Gründe für die Notwendigkeit eines hohen Reinheitsgrads des XLPE- und HPTE-Materials dargestellt, welches für die Isolation von MV- und EHV-Kabeln eingesetzt werden. Weiterhin werden Systeme für die On- und Offline-Qualitätskontrolle des XLPE- und HPTE-Materials vorgestellt, die das Material vor der Verarbeitung, überprüfen.

Das vorgestellte Inspektions- und Sortierungsgerät erkennt verunreinigte Pellets und sortiert diese aus, bevor sie in den Extrusionsprozess gelangen. Die Kontamination könnte sich im Rohmaterial befinden, könnte aber auch während der Handhabung und des Transport hinzugefügt werden. Auch wenn Kabelhersteller weiterhin Siebe einsetzen, gewährleistet diese Technologie, dass die Siebe nicht von Kontaminationen der verunreinigten Pellets verstopfen und ermöglicht dadurch eine längere und sichere Produktionszeit.

Durch den Einsatz von Röntgen- und optischer Technologie werden Verunreinigungen im Inneren und auf der Pelletoberfläche detektiert. Somit wird eine 100% Qualitätskontrolle sichergestellt. Mit Einsatz des Offline-Inspektions- und -Analysegerät für verunreinigte Pellets, die durch das Online-Inspektionsgerät getrennt wurden, können die Produktionsverfahren sogar erhöht werden.

Die Materialreinheit wird kontrolliert und durch die Analysen werden die Informationen gegeben, um zukünftige Kontaminationen zu vermeiden.

Werden diese Vorteile gemeinsam wahrgenommen, ist der Einsatz der vorgestellten Technologien für Qualitätskontrolle des XLPE- und HPTE-Materials von wesentlicher Bedeutung, um hochwertige MV- und EHV-Kabel zu sichern.

Gleichzeitig, indem ein hoher Reinheitsgrad von XLPE und HPTE gewährleistet wird, können Materialkosten für die Neuherstellung von Kabeln, die den dielektrischen Entladungstest nicht bestanden haben, eingespart werden und die Effizienz der Kabelproduktionslinie wird in hohem Maße verbessert. ■

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Процветающая инфраструктура как стимул проведения выставки

Выставка Wire Southeast Asia возвращается в Бангкокский международный торговый и выставочный центр в Тайланде с 19 по 21 сентября. Данная удобная и стратегическая организация двух отраслевых выставок как раз соответствует вселяющим надежды ожиданиям в кабельной и проволочной промышленности, особенно в связи с процветающей инфраструктурой и производственными сферами в юго-восточной Азии.

Онлайн регистрация участников уже открыта на сайте www.wire-southeastasia.com

По информации Asian Development Bank (ADB), энергетическая и транспортная отрасли составят 62,6% всех инфраструктурных инвестиций АСЕАН к 2020. Данные подтверждаются и прогнозом Goldman Sachs по затратам на инфраструктуру в энергетике и транспортной промышленности в четырех странах АСЕАН (Тайланд, Малайзия, Индонезия и Филиппины), которые достигнут 524 миллиардов долларов США к 2020.

Основной инициативой АСЕАН является энергосистема АСЕАН (ASEAN Power Grid (APG)), для которой необходимо 5,9 миллиарда долларов США инвестиций, а также высокоскоростная железная дорога Сингапур – Куала-Лумпур, протяженность которой составит 217 миль, с ожидаемым



▲ Участники и посетители предыдущей выставки по проволоке в Юго-восточной Азии

вводом в эксплуатацию в 2026 году. В производственной сфере в случае полного выполнения АСЕАН стратегии интеграции экономического сообщества АСЕАН и увеличения доли в глобальном производственном секторе, регион может увеличить ежегодный ВВП на 280-625 миллиардов долларов США к 2030, как указано в недавнем отчете McKinsey Global Institute.

Данный рост инфраструктуры, наряду с расширением строительства объектов инфраструктуры автомобильной, энергетической, авиакосмической, нефтехимической отраслей,

высокоскоростных железных дорог, городского транспорта, а также иных сфер применения, принес новые возможности предприятиям, выпускающим детали крепления.

Отражая такие глобальные тенденции, особая зона технологий крепежных деталей будет впервые представлена на выставке wire Southeast Asia 2017. В павильоне крепежных деталей будет отдельный демонстрационный стенд со всей цепочкой промышленного производства и обработки в технологии деталей крепления.

Выставочное портфолио будет варьироваться от стандартных до нестандартных деталей крепления, а также деталей крепления в различных отраслях и сферах производства, а также вспомогательного оборудования для деталей крепления.

Динамичная подборка на выставке wire Southeast Asia продемонстрирует всеобъемлющий диапазон инновационного машинного оборудования для производства кабеля и проволоки, обработки и отделки, технологии крепления, новые технологии в измерении, управлении и технике испытаний и специализированные отрасли, а также усовершенствованные инструменты и вспомогательные материалы. Ряд конференций и семинаров дополнит выставочные образцы.

Messe Düsseldorf организует участие экспонентов в выставке Iran Wire 2017

Iran Wire будет проводиться в Тегеране с 5 по 8 декабря в качестве единственной выставки в Иране, где будут продемонстрированы провода, кабели, трубки, трубы, профили и соответствующие отрасли. У всех международных компаний из соответствующих отраслей, желающих продемонстрировать и продать свою продукцию, будет возможность использовать уникальную платформу на выставке Iran Wire в качестве привлекательного способа выхода на иранский рынок. Ожидается, что около 200 участников представят свою инновационную техническую продукцию в таких отраслях, как провода, кабели, трубки, трубы и профили. Четырехдневная отраслевая выставка организована иранской компанией Aria Group Conference и компанией Exhibition Development Company в Тегеране.

Messe Düsseldorf является эксклюзивным зарубежным помощником и будет отвечать за агитацию и работу с международными участниками. Кроме того, Messe Düsseldorf предоставляет услуги в большом ряде организационных вопросов, включая регистрацию международных участников, дизайн стендов и организованную работу самой выставки на постоянной территории проведения международных выставок в Тегеране.

Messe Düsseldorf GmbH & Co KG – Германия

Вебсайт: www.iranwire.ir

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Новатор Zumbach – 60 лет истории

Новатор в измерении в режиме реального времени, компания Zumbach производит всеобъемлющую линейку неконтактных приборов для контроля и измерения в режиме реального времени. Ее технология используется по всему миру, а в этом году компания отмечает 60-летнюю годовщину. Будь то кабельная промышленность, пластик, резина или сталь и металлургия, технологии Zumbach используются клиентами, которые полагаются на качество и надежность данных инструментов и систем. 1 мая 1957 года в Биле (центре швейцарского и мирового производства часов) Бруно Зумбах, молодому инженеру-электрику, которому еще не было и 30, пришла в голову идея создания своей собственной компании по производству электроники, так как он хотел создать что-то самостоятельно.

Сфера электронных приборов была еще на заре, реле и вакуумные трубки были все еще основными компонентами. Транзистор был чем-то почти невероятным; все встроенные контуры и микропроцессоры казались чем-то из будущего. Однако, в то время экономическое развитие Швейцарии было хорошим, и в Биле было много процветающих заводов по производству машинного оборудования.

Первые заказы, индивидуальные и в небольших количествах, были получены на системы привода для любого вида машинного оборудования. Это было машинное оборудование для производства часов, оптики, стерилизации и всех типов приборов. Вероятно, самым большим и самым ценным заказом на начальной стадии был автоматизированный центр по производству сливочного масла в Госсау около Сент-Галлен (Швейцария). Все производство масла и система распределения были автоматизированы при помощи полностью неконтактного привода – что в то время считалось новинкой в технологии. Это был первый привод такого рода в Швейцарии.

По экономическим соображениям все элементы управления, так называемые логические блоки, были разработаны и пущены в массовое производство на собственном заводе компании. Даже приводы, фотобарьеры и иные части были изготовлены на заводе в Биле. В то время в Биле и Швейцарии было много производителей круглошлифовальных станков, которым требовались приводы с низким уровнем вибрации



▲ Первый офис компании – небольшая арендованная для офиса студия в здании старой фабрики в центре Били

и легкой настройкой. Бруно Зумбах быстро понял, что это его основной рынок. Проблемой было лишь то, что удовлетворительное решение было недоступно с тиратроновой технологией.

Видение Зумбаха включало разработку и создание небольшого доступного привода "Ward Leonard" с моноблочным инвертором и соответствующим постоянным током двигателя и контроллера. Данная технология была выполнима и доступна только для более высокой производительности привода в то время. "Ward Leonard vision" скоро стал основой технологии компании Zumbach на долгие годы.

В начале 1960-х Зумбах понял, что его бизнес с приводами не может гарантировать стабильное будущее для компании. Отрасль была полна новых технологических возможностей, а следовательно, растущим числом конкурентов, которые начали снижать цены и маржу. Сфера производства инструментов для машинного оборудования вскоре пришла в упадок.

Около 1972 года был разработан план по производству прибора для испытания эксцентриситета у электрических кабелей. А в 1974 году Зумбах получил патент на новый индуктивный прибор Ex-Test 7, который одним из первых добился успеха в том, что сегодня называют оборудованием для измерения в режиме реального времени. Оптические приборы для измерения диаметра стали самой успешной продукцией Zumbach.

Аналоговый тип Odc был создан около 1975 года, прибор абсолютного измерения types Odc 24 стал первым прибором с абсолютным измерением, проданным в больших количествах. "Odc" стал зарегистрированным товарным знаком, более 80 000 приборов Odc всех типов и для большого диапазона применений были проданы с тех пор.

В 1994 году Бруно Зумбах передал руководство группой компаний своему сыну Райнеру. В последующие годы группа расширялась, и создавались новые филиалы, помимо прочего в Азии. Помимо данных компаний, которыми владеет Zumbach, были открыты дополнительные представительства. Впоследствии, одна из целей компании Zumbach, близость к клиентам, была максимально увеличена, а местное обслуживание постоянно расширялось на протяжении 20 лет.

В результате продажи и офисы обслуживания, а также зарегистрированные позже компании, образовались во многих странах, начиная с 1970 года. Первой компанией была компания в США в 1979 году, за которой последовала компания в Великобритании, Германии, Франции, Испании, Италии, Индии, Тайване и в 2001 году в Китае. Более 20 инженеров по продажам в Орпунде и иностранных компаний сейчас обеспечивают успех продукции на мировом рынке.

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Инспекция и анализ материала ПЭ-С и высокоэффективного термопластового эластомера при производстве кабелей среднего и высокого напряжения

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Аннотация

Пластмасса, которая используется для изоляции кабелей среднего, высокого и сверхвысокого напряжения, должна соответствовать самым высоким стандартам чистоты.

Наиболее часто для изоляции кабеля используется ПЭ-С (сшитый полиэтилен). Для сшивки полиэтилена кабель проходит через трубу непрерывной вулканизации, где он подвергается воздействию высоких температур для сшивки. Обычно при производстве кабелей данных типов труба непрерывной вулканизации заполнена азотом и функционирует под давлением 10 бар.

До дальнейшей обработки кабеля, такой как применение экрана, а также наружных оболочек, необходима дегазация, которая может занять до 10 дней.

Обычно линия построена как наклонная линия непрерывной вулканизации или вертикальная линия непрерывной вулканизации. Технология является проверенной, так как она используется десятилетиями, однако она подразумевает большие затраты на строительство и линию производства.

Кроме того, есть еще один современный метод, где в качестве изоляционного материала используется высокоэффективный термопластовый эластомер на основе полипропилена. Данная новая технология была впоследствии изобретена компанией Prysmian и опубликована как называемая Р-лазер технология.^[1] Материал демонстрирует хорошие

электрические и термо-механические характеристики, сравнимые в некоторых аспектах с характеристиками ПЭ-С. Высокоэффективный термопластовый эластомер не требует секции сшивки и очистки дегазацией.

Это означает, что весь кабель может быть изготовлен в процессе поточного производства, где даже экранирование и внешняя оболочка могут применяться за один производственный шаг.

Независимо от того, какой подход применяется, требования к прочности ПЭ-С и высокоэффективного термопластового эластомера остаются на одинаково высоком уровне и должны быть соблюдены. В данном отношении важна чистота изоляционного материала. И именно в этот момент в центре внимания оказывается усовершенствованная система инспекции чистоты и сортировки.

В данной работе будет представлена система инспекции в режиме реального времени и сортировки, которая обнаруживает загрязнения внутри и на заготовках, такое как металлическое или органическое загрязнение, изменения цвета, взаимное загрязнение и инородные заготовки.

Представленная система включает уникальную комбинацию технологии рентгеновского луча и технологию оптической камеры для обеспечения самой высокой вероятности обнаружения всех видов загрязнений. Таким образом, качество материала ПЭ-С или высокоэффективного термопластового эластомера и соответственно производственный процесс оптимизированы, и цены снижены.

Кроме того, в данной работе кратко представлена инновационная автономная система, которая проводит инспекцию и анализ небольших партий заготовок.

Также важно проверять заготовки, которые были отсортированы системой инспекции в режиме реального времени и сортировки.

Средневольтные и высоковольтные кабели с изоляцией из ПЭ-С и высокоэффективного термопластового эластомера

Сегодня основным материалом, который используется для изоляции средневольтных и высоковольтных кабелей, является сшитый полиэтилен (ПЭ-С).

Сшитый полиэтилен изготавливается из полиэтилена под высоким давлением с органическими пероксидами в качестве добавки. Сшивка происходит под давлением и высокой температурой. Отдельные молекулярные цепочки связываются одна с другой, что приводит к изменению материала с термопластичного на эластичный.

Преимуществом ПЭ-С в качестве изоляции для средневольтных и высоковольтных кабелей является его низкая диэлектрическая потеря и отличные электрические и физические

характеристики для передачи электроэнергии. Так как ПЭ-С является устойчивым к термической деформации и старению, кабель из ПЭ-С позволяет передавать токи большой силы. Еще одной характеристикой является легкость установки кабеля из ПЭ-С. Он выдерживает изгибы маленького радиуса и является легким.^[2]

Несколько лет назад компания Prysmian изобрела новый тип кабеля, где вместо ПЭ-С используется высокоэффективный термопластовый эластомер.

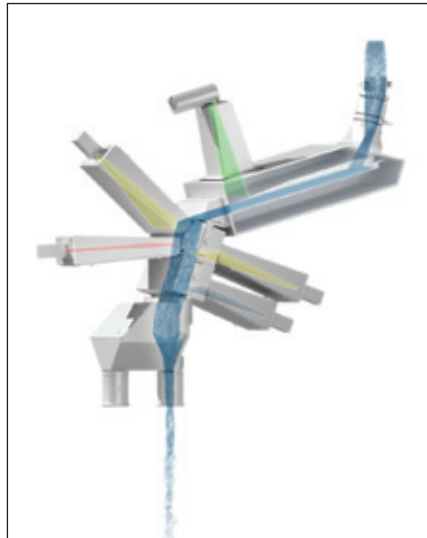
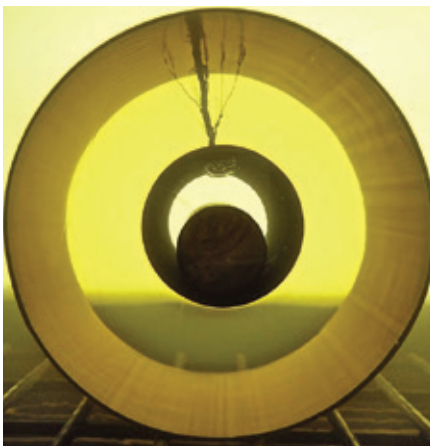
Данный материал обладает схожими с ПЭ-С характеристиками. Отличием является отсутствие сшивки и, соответственно, отсутствие побочной продукции, высокоэффективный термопластовый эластомер допускает повторное применение, позволяет сократить время изготовления, уменьшает площадь установки и является совместимым с существующими компонентами сети.

Оба материала - ПЭ-С и высокоэффективный термопластовый эластомер - используются для производства средневольтных и высоковольтных кабелей.

▼ Рисунок 1. Изоляционный компаунд высокого качества



▼ Рисунок 2. Разрез кабеля сверхвысокого напряжения с обрывом



▲ Рисунок 3. Система инспекции и сортировки с рентгеновской камерой (зеленой), оптической (желтой), инфракрасная (красная) и цветной (голубой) камерами



▲ Рисунок 5. Автономная система инспекции и анализа

Необходимость в чистых пластических материалах для высоковольтных кабелей и кабелей сверхвысокого напряжения

Чистота пластического материала, который используется для изоляции высоковольтных кабелей и кабелей сверхвысокого напряжения, очень важна. Чем чище компаунд (Рисунок 1), тем меньше риск поломки. Металлические примеси размером всего 50 мкм могут повредить окончательную продукцию, что приведет в последствии к увеличению затрат.

К примеру, ремонт дефектного подводного кабеля, который был поврежден из-за загрязнения, может привести к неделям простоя. Кроме того, загрязненный изоляционный компаунд, соответственно, поврежденные кабели и последующие выходы из строя при испытании на разряд оказывают негативное влияние на отрасль в процессе производства. Как часть производства кабелей сверхвысокого напряжения проводится испытание на установке с испытательным напряжением в 2,5 раза выше номинального напряжения.

Приблизительно от пяти до шести выходов из строя в год (Рисунок 2) обычно фиксируются на каждой производственной площадке, что приводит к огромным потерям. Только

один выход из строя приводит к затратам в размере 150 000 евро еще до доставки кабеля в предназначенное место. Кроме того, потеряно ценное время, что делает недостижимым поставку в ранее согласованные сроки.

Очень часто приходится использовать несогласованные соединения, что впоследствии наносит урон репутации высокого качества производителя и может привести к контрактным неустойкам.

Именно по данным причинам некоторые стандарты к высоковольтным кабелям требуют исключения загрязнений размером от 75 мкм в обработанных материалах.^[3] Помимо этого, существуют руководства AEIC (Association of Edison Illuminating Companies), в которых указано, что кабели должны быть рассчитаны таким образом, чтобы их срок службы составлял минимум 40 лет. Соответственно, необходимо проводить инспекцию 100% материала в части его чистоты до того, как он попадает в конечную продукцию. Испытания образцов не достаточны для полного надежного исключения всех загрязнений.

Сегодня производители кабелей используют экраны для улавливания загрязнений в расплавах ПЭ-С и высокоэффективного термопластового эластомера до того, как они попадут в кабель. Экраны помещаются непосредственно на поток расплава после экструдера перед сшивкой. Однако, данные экраны засоряются при ожогах или излишнем количестве загрязнений после определенного времени использования. Затем

давление расплава в экструдере может значительно увеличиться. И, наконец, необходимо останавливать производство для замены экранов, что в свою очередь означает необходимость применения соединений в данном расположении. Соединения, там кабели сварены, выполняются вручную и всегда являются критически важными, особенно для подводных кабелей, применяемых на шельфе. Вот почему производители кабелей стремятся поставить кабели большой длины с минимальным количеством соединений, так как они не предполагают наличие потенциального риска выхода из строя. Так как засоренные экраны снижают производительность линии, необходимо введение надежных методов для обнаружения загрязнения в полиэтиленовом материале.

Обеспечение чистоты ПЭ-С и высокоэффективного термопластового эластомера до переработки материала: инспекция и сортировка

Сегодня для инспекции заготовок используются системы либо в

лабораториях, либо для контроля в режиме реального времени во время процесса образования гранул.

Большинство систем основано на оптической технологии для обнаружения загрязнения на заготовке. Загрязнение внутри заготовок не может быть выявлено данными системами.

Система инспекции и сортировки, описанная ниже, позволяет обеспечить 100% качество в режиме реального времени при использовании технологии рентгеновских лучей и оптической технологии.

Загрязнения, которые обнаруживаются и определяются программным обеспечением, обрабатывающим изображения, характеризуются как загрязнения и автоматически отделяются.

Технология позволяет выявлять загрязнения размеров до 50 мкм.

Рентгеновская технология

Основной принцип обнаружения в рентгеновской технологии использует различное затухание материала.

ПЭ-С, в основном, содержит углерод. Атом углерода содержит шесть протонов в ядре.

Стандартным загрязнением являются металлические частицы из экструдера или гранулятора, что в основном состоит из железа (FE). У железа 26 протонов в ядре.

Данные 26 протонов имеют более высокое рентгеновское затухание, чем шесть протонов и у углерода, что в результате предоставляет яркое отличие между двумя материалами на рентгеновском изображении.

Оптическая технология

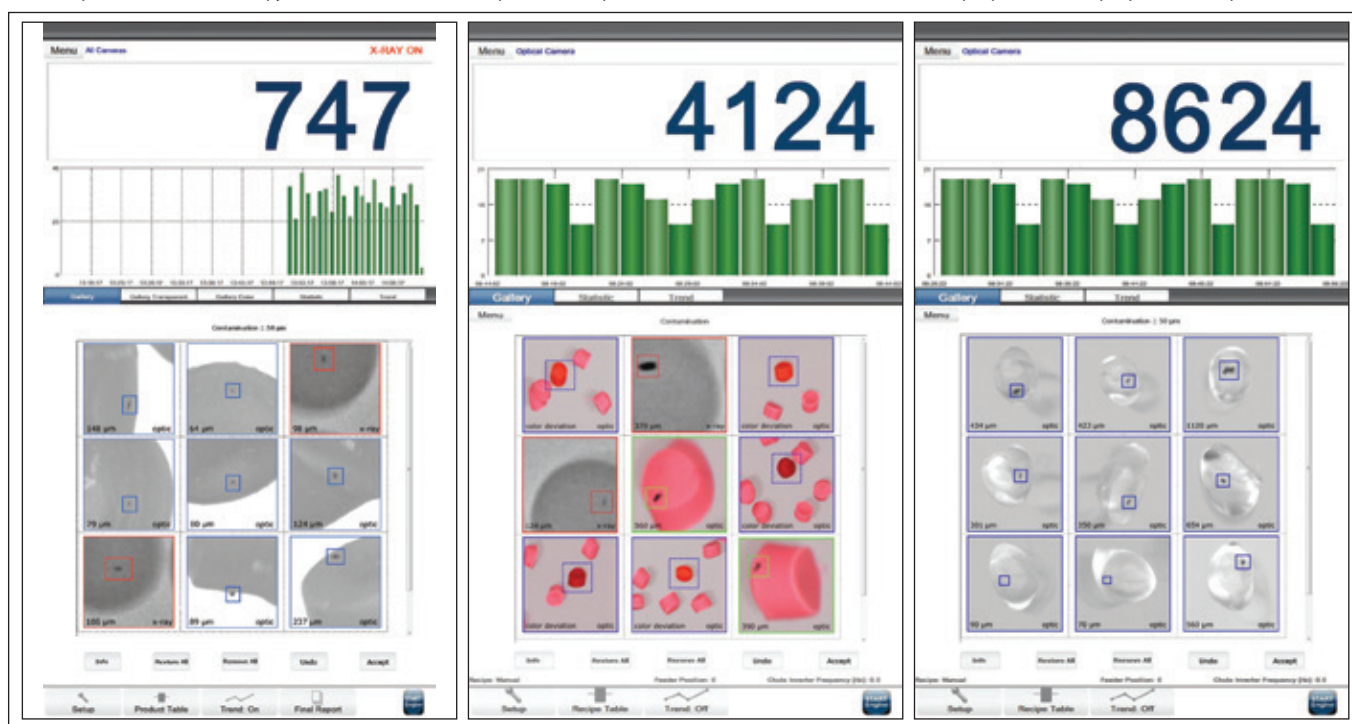
Что касается оптической инспекции, освещение играет существенную роль.

Для точной регистрации потоков материала при скорости производства используются современные технологические камеры (оптические, инфракрасные, цветные камеры).

Мощное программное обеспечение по обработке изображения схоже с тем, которое используется для рентгеновской инспекции для обнаружения загрязнения оптической системы.

Таким образом, при установлении определенного порога все загрязненные заготовки, которые превышают порог в математическом алгоритме, отсортировываются.

▼ **Рисунок 4.** Посредством рентгеновской технологии и оптической инспекции система обнаруживает загрязнение внутри металлической заготовки и на ее поверхности. Система обнаруживает металлическое загрязнение, черные точки, пожелтения и отличия цвета в прозрачных и непрозрачных материалах



Стандартное загрязнение, обнаруживаемое рентгеновской и оптической технологией

Комбинация как рентгеновской, так и оптической технологии позволяет обнаружить загрязнение в самой заготовке и на ее поверхности (Рисунок 4). Рентгеновская система проводит инспекцию прозрачных и окрашенных заготовок (например, черных), а также полупроводниковых материалов ПЭ-С на наличие загрязнений.

Стандартные загрязнения, обнаруживаемые рентгеном, являются металлические, а также органические загрязнения и неоднородности (TiO₂) внутри заготовки. Кроме того, оптическая система обнаруживает, к примеру, черные пятна на заготовках, инородные объекты и инородные заготовки, а также органическое или металлическое загрязнение.

Интеграция системы в линию производства

Система обычно устанавливается между приемником, на который поступает материал после подачи ПЭ-С и высокоэффективного термопластового эластомера (октабин, мешок или емкость) и приемников экструдера, куда компаунд подается самотеком.

Системы инспекции и анализа заготовок, зерен и лент/ пленок в режиме реального времени и автономные

Помимо устройств инспекции и сортировки в режиме реального времени, есть модульные разработанные системы для инспекций в режиме реального времени и автономных инспекций и анализа заготовок, зерен и лент/пленок.

Они используются для меньшего объема производства, а также для производственных линий, где достаточно выборочное испытание, или для входного контроля продукции.

В зависимости от применения системы оборудованы рентгеновской технологией, инфракрасной технологией или оптическими сенсорами, которые должны применяться во время проведения выборочных испытаний и обнаруживать загрязнения размером от 50 мкм. К примеру, устройство лабораторной инспекции и анализа с рентгеновской технологией (Рисунок 5) проводит инспекцию до 3 000 заготовок, которые размещены на подносе.

За несколько секунд данные заготовки проходят инспекцию на наличие загрязнений. Впоследствии загрязненные заготовки оптически выделяются, что делает извлечение отдельного загрязнения значительно легче.

Для полного процесса оптимизации технологии производители кабеля соединили инспекцию в режиме реального времени и систему сортировки с устройством автономной инспекции и анализа.

После обнаружения и отсортировки загрязненных заготовок лабораторная система инспекции повторно и оптически отмечает загрязнение для легкого отделения весь брак. Данное сочетание автономной инспекции и инспекции в режиме реального времени позволяет контролировать чистоту материала и позволяет создавать базу данных для предотвращения будущего загрязнения.

Заключение

Таким образом, в данной работе указаны причины, по которым необходима высокая степень чистоты для ПЭ-С и высокоэффективного термопластового эластомера, используемых в качестве изоляции высоковольтных кабелей и кабелей сверхвысокого напряжения.

Кроме того, в работе представлена система для автономного контроля качества и контроля качества в реальном времени ПЭ-С и высокоэффективного термопластового эластомера, которые проводят инспекцию материала до его обработки.

Представленная система инспекции и сортировки обнаруживает загрязненные заготовки и отделяет их до того, как они попадают в процесс экструзии. Загрязнение может быть в материале сырья, но также может появиться на стадии обработки и транспортировки. Соответственно, даже если производители кабелей используют экраны, данная технология предотвращает засорение экранов

загрязнениями от заготовок и, таким образом, обеспечивает более долгий срок службы и надежность.

При использовании рентгеновской и оптической технологий обнаруживаются загрязняющие вещества внутри и на поверхности заготовок, что гарантирует 100% контроль качества.

С использованием системы автономной инспекции и анализа загрязненных заготовок, которые были отделены при помощи системы инспекции в режиме реального времени, можно улучшить производственные процессы. Чистота материала контролируется, а анализ дает информация для предотвращения загрязнения в будущем.

При одновременном использовании данных преимуществ использование представленных технологий для контроля качества материала ПЭ-С и высокоэффективного термопластового эластомера является существенным для обеспечения высокого качества кабелей высокого и сверхвысокого напряжения.

В то же время, при обеспечении высокой степени чистоты материала ПЭ-С и высокоэффективного термопластового эластомера стоимость повторного производства кабелей, которые не прошли испытание на разряд, может быть уменьшена, а эффективность линии производства кабеля значительно увеличена. ■

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Essor d'une infrastructure florissante pour l'exposition

WIRE Southeast Asia fera retour cette année au Bangkok Trade & Exhibition Centre (BITEC), Bangkok, Thaïlande, du 19 au 21 Septembre. L'aménagement rapide et stratégique des deux foires commerciales spécialisées se situe dans le cadre des perspectives encourageantes attendues pour les industries du fil et du câble, notamment en raison de l'essor dans le domaine des infrastructures et de la production en Asie du Sud-Est.

L'inscription en ligne des exposants est ouverte maintenant sur le site web www.wire-southeastasia.com

Selon la Banque asiatique de développement (BAD), les secteurs de l'énergie et des transports représenteront 62,6% du total des besoins d'investissement dans le secteur des infrastructures de l'ANASE (Association des nations de l'Asie du Sud-Est) d'ici 2020. Cela est confirmé par la projection de Goldman Sachs en ce qui concerne les dépenses en infrastructures dans les secteurs de l'électricité et des transports dans quatre pays de l'ANASE (Thaïlande, Malaisie, Indonésie et Philippines) qui s'élèvera à 524 milliards de dollars d'ici 2020.

Une initiative majeure de l'ASEAN dans le secteur des infrastructures est représentée par l'ASEAN Power Grid (APG) avec des besoins d'investissement de 5,9 milliards de dollars américains, ainsi



▲ Exposants et visiteurs à un fil précédent Southeast Asia

que par le train à grande vitesse reliant Singapour à Kuala Lumpur, qui s'étendra sur 217 milles et sera vraisemblablement opérationnel en 2026.

En ce qui concerne le côté manufacturier, au cas où les pays de l'ANASE activerait totalement la stratégie d'intégration de la Communauté économique de l'ANASE et obtiendrait une part plus importante de la fabrication globale, la région pourrait réaliser un PIB annuel de 280 à 625 milliards de dollars d'ici 2030, comme l'indique un récent rapport du McKinsey Global Institute.

Cette croissance de l'infrastructure, parallèlement à l'expansion du secteur de l'automobile, des énergies nouvelles, des trains à grande vitesse, du transport urbain, de l'aérospatiale, de la pétrochimie, de l'infrastructure et d'autres applications, a apporté de nouvelles opportunités à l'industrie des dispositifs de fixation.

En réfléchissant à de telles tendances globales, un secteur spécifique au sein de la technologie des dispositifs de fixation fera ses débuts à la foire wire Southeast Asia 2017. Le Pavillon Fastener réservé aux dispositifs de fixation sera la vitrine dédiée de la chaîne industrielle complète en amont et en aval pour la technologie de fixation.

Messe Düsseldorf organise la participation des exposants à Iran Wire 2017

Iran Wire se tiendra à Téhéran du 5 au 8 décembre en tant que seule exposition en Iran qui sera dédiée à la totalité de la gamme des fils, des câbles, des tubes, des tuyaux, des profils et des industries connexes.

Toutes les entreprises internationales des secteurs respectifs qui souhaitent présenter et vendre leurs produits, trouveront une plate-forme unique à Iran Wire comme point d'accès attractif sur le marché iranien émergent.

Environ 200 exposants devraient présenter leurs produits techniques innovants dans les domaines des fils, des câbles, des tubes, des tuyaux et des profils. La foire commerciale se déroulant pendant quatre jours est organisée par la société iranienne Aria Group Conference and Exhibition Development Company à Téhéran.

Messe Düsseldorf est le partenaire exclusif d'outre-mer et sera responsable de la publicité et de la gestion des exposants internationaux. En outre, Messe Düsseldorf opère sur un large éventail de domaines organisationnels, y compris l'enregistrement international des exposants, la conception des stands et le déroulement régulier sur place au Salon International Permanent de Téhéran.

Messe Düsseldorf GmbH & Co KG – Allemagne
Website: www.iranwire.ir

Le profil de l'exposition couvrira les pièces de fixation standard et non standard, leur application dans différents secteurs ainsi que les compétences et savoir-faire de fabrication et les supports des pièces de fixation.

Le programme dynamique à wire Southeast Asia comportera une gamme complète de machines innovantes pour la fabrication, pour le traitement et pour la finition des fils et des câbles, la technologie des pièces de fixation, de nouveaux procédés de mesure, de contrôle et d'ingénierie des essais et des domaines spécifiques ainsi que des outils et des matériaux auxiliaires nouveaux et modernisés. Une série de conférences et de séminaires complètera les expositions.

Messe Düsseldorf Asia Pte Ltd – Singapour
Website: www.wire-southeastasia.com

Zumbach à l'avant-garde – depuis 60 ans

PIONNIER de la mesure en ligne, Zumbach fabrique une gamme complète d'instruments de mesure et de contrôle en ligne sans contact. Sa technologie est utilisée dans le monde entier et cette année la société va célébrer son 60ème anniversaire.

Que ce soit pour l'industrie des câbles, des plastiques, du caoutchouc ou de l'acier et de l'industrie métallurgique, la technologie Zumbach est utilisée par les clients qui comptent sur la qualité et la fiabilité de ses instruments et de ses systèmes.

C'était le 1er mai 1957 lorsque dans la petite ville suisse de Bienne (centre de l'industrie horlogère suisse et mondiale), Bruno Zumbach, qu'un jeune ingénieur électricien, de même pas 30 ans, eu l'idée de créer sa propre entreprise en électronique parce qu'il souhaitait réaliser quelque chose de manière indépendante.

L'électronique était encore à ses débuts, les tubes à relais et à vide étaient encore les éléments principaux. Le transistor était quelque chose d'impensable; les circuits intégrés et les microprocesseurs, des choses qui semblaient appartenir à un avenir lointain.

Cependant, à cette époque le développement économique en Suisse était positif et il y avait de nombreuses usines de machines florissantes à Bienne.

Les premières commandes, passées individuellement ou pour de petites quantités, concernaient les systèmes d'entraînement installés dans tout type de machine. Il s'agissait de mécanismes pour les montres, pour le secteur optique, pour la stérilisation et pour les instruments de toutes sortes.

Probablement la commande la plus importante et la plus "audacieuse" dans la phase initiale fut celle pour l'automatisation du centre pour la production de beurre à Gossau près de Saint-Gall (Suisse). L'ensemble du système de production et de distribution de beurre fut automatisé avec un actionnement entièrement sans contact - alors encore une toute nouvelle technologie. Ce fut le premier actionnement de ce genre en Suisse.

Pour des raisons de coût, tous les éléments de contrôle, les soi-disant blocs logiques, furent développés et fabriqués en série dans l'usine de l'entreprise. Même les actionnements, les barrières optiques et d'autres composants furent fabriqués en interne à Bienne.



▲ La première maison de l'entreprise en tant que petit studio loué et un bureau dans un ancien bâtiment d'usine au centre de Biel

À l'époque, il y avait de nombreux fabricants de machine de rectification cylindriques à Bienne et en Suisse qui exigeaient des actionnements à faible vibration et à réglage fin. Bruno Zumbach se rendit vite compte qu'il s'agissait d'un marché très important. Le problème était qu'aucune solution satisfaisante n'était possible avec la technologie Thyatron de l'époque.

Le projet de Zumbach impliquait le développement et la construction d'un actionnement compact et économique, le "Ward Leonard", équipé d'un onduleur monobloc avec un moteur adapté et d'un régulateur. À l'époque, cette technologie n'était praticable et abordable que pour des performances d'actionnements considérablement supérieures. Le "Ward Leonard vision" serait bientôt devenu la technologie Zumbach de base pendant de nombreuses années.

Au début des années 60, Zumbach se rendit compte que ses activités dans le secteur des actionnements ne pouvaient garantir un avenir durable à l'entreprise. Le champ fut marqué par de nouvelles possibilités techniques et donc par un nombre croissant de concurrents, qui commencèrent à imposer une réduction des prix et des marges. L'industrie des machines-outils aurait bientôt commencé son processus de déclin.

Vers 1972, un plan fut développé pour produire un testeur d'excentricité pour les câbles électriques. En 1974, Zumbach obtint un brevet pour le nouvel appareil inductif 7 Ex-Test qui devint le premier succès important dans ce qui était alors le nouveau domaine des équipements de mesure en ligne.

Les appareils de mesure du diamètre optiques devinrent les produits les plus réussis de Zumbach. Les types analogiques Odc furent créés vers 1975, les jauges Odac® de mesure absolue à partir de 1977. L'Odac 24 fut la première jauge avec une mesure absolue à être vendue en grandes quantités. "Odac®" devint une marque déposée et plus de 80 000 Odacs de tous types et pour une vaste gamme d'applications ont été vendus depuis lors.

En 1994, Bruno Zumbach confia la direction du groupe à son fils Rainer. Au cours des années suivantes, le groupe élargit son activité et fonda d'autres filiales, entre autres en Asie. Outre ces filiales de propriété de Zumbach, des représentants supplémentaires furent contractés depuis.

Zumbach fut ainsi en mesure de renforcer au maximum l'un des ses objectifs, la proximité des clients, en étendant constamment les services locaux pour ses clients au cours des 20 dernières années.

En conséquence, des bureaux de vente et de service furent créés et ensuite des sociétés enregistrées furent établies depuis 1970 dans de nombreux pays. La première société fut établie aux États-Unis en 1979, suivis par le Royaume-Uni, l'Allemagne, la France, l'Espagne, l'Italie, l'Inde, Taiwan et en 2001 la Chine. Plus de 20 ingénieurs commerciaux à Orpund et dans les entreprises étrangères assurent actuellement le succès des produits sur le marché mondial.

Zumbach Electronic AG – Suisse
Website: www.zumbach.com

Inspection et analyse des matériaux XLPE et HPTE pour la production de câbles à moyenne et haute tension

Par Harry Prunk, Sikora AG, Brême, Allemagne

Résumé

Les matières plastiques utilisées pour l'isolation des câbles de moyenne, haute et très haute tension doivent être conformes aux normes de pureté les plus strictes. Généralement, on utilise le matériau XLPE (polyéthylène réticulable) pour l'isolation du câble.

Pour la réticulation du XLPE, le câble passe par un tube CV (tube à vulcanisation continue) où il est exposé à des températures élevées pour le processus de réticulation.

En général, lors de la fabrication de ces types de câbles, le tube CV est rempli d'azote et actionné à une pression de 10 bars. Avant que le câble puisse être soumis à un autre traitement, tel que l'application d'un écran et de gaines extérieures, il est nécessaire d'effectuer un dégazage, pouvant exiger jusqu'à 10 jours. Généralement, la ligne est réalisée comme une ligne CCV ou VCV (vulcanisation continue en caténaire ou vulcanisation continue verticale).

La technologie est bien éprouvée car elle est utilisée depuis des décennies, mais elle implique des coûts élevés pour la réalisation et pour la ligne de production. En outre, il existe une autre méthode avancée utilisant l'élastomère thermoplastique haute performance (*High Performance Thermoplastic Elastomer* ou *HPTE*), à base de polypropylène en tant que matériau isolant.

De plus, cette nouvelle technologie a été inventée par Prysmian et est connue sous le nom de "Technologie Laser-P"^[1]

Le matériau présente de bonnes propriétés électriques et thermo-mécaniques, comparables, voire même, pour certains aspects, supérieures à celles du XLPE. Le HPTE n'exige pas de section de réticulation ni de traitement de dégazage. Cela signifie que le câble complet peut être fabriqué dans le cadre d'un processus de production en ligne, comprenant également l'application du blindage et de la gaine extérieure pendant une seule phase de production.

Quelle que soit l'approche adoptée, les exigences de résistance diélectrique des matériaux XLPE et HPTE restent toujours à un niveau élevé et doivent être assurées. La propreté du matériau isolant est importante à cet égard. C'est à ce point que le système avancé d'inspection de la pureté et le système de tri entrent en scène.

Cet article présente un système d'inspection et de tri en ligne qui détecte la contamination à l'intérieur et sur la surface des granules tels que la contamination métallique ou organique, les variations de couleur, les agglomérats, la contamination croisée et les granules étrangers. Le système présenté comprend la combinaison unique de la technologie à rayons X et une technologie de caméra optique pour réaliser la probabilité de détection maximale pour tout type de contamination. Ainsi, la qualité du matériau XLPE ou HPTE et donc le processus de production sont optimisés et les coûts sont réduits.

En outre, dans cet article nous ferons une brève allusion à un nouveau système hors ligne, qui inspecte et analyse de petits lots

de granules. Cela est également important pour vérifier les granules qui ont été triés par le système d'inspection et de tri en ligne.

Câble moyenne et haute tension isolé avec les matériaux XLPE et HPTE

Aujourd'hui, le matériau isolant le plus utilisé pour les câbles moyenne tension (MT) et haute tension (HT) est le polyéthylène réticulé (XLPE). Ce matériau est obtenu à partir de polyéthylène sous haute pression avec l'addition de peroxydes organiques comme additifs.

La réticulation a lieu en présence de chaleur et de pression. Les chaînes moléculaires individuelles sont liées les unes aux autres avec pour résultat une transformation du matériau thermoplastique en un matériau élastique. Un avantage du XLPE comme isolant pour les câbles moyenne et haute tension est leur faible perte diélectrique et leurs excellentes propriétés électriques et physiques pour la transmission de puissance.

Du fait que le XLPE résiste à la déformation thermique et au vieillissement, un câble XLPE est en mesure de transporter de grandes puissances. Une autre caractéristique est représentée par la facilité de pose du câble XLPE. Ce matériau peut supporter des rayons de courbure étroit, de plus il est léger.^[2]

Il y a quelques années, la société Prysmian a inventé un nouveau type de câble utilisant le matériau HPTE (*High Performance Elastomer* ou élastomère haute performance) à la place du XLPE. Ce matériau présente des caractéristiques équivalentes au XLPE.

La différence consiste dans le fait qu'il n'y a pas de réticulation et donc aucun sous-produit, le HPTE est réutilisable, il permet des temps de production plus courts, une surface d'installation réduite et il est compatible avec les composants de réseau existant déjà. Les deux matériaux XLPE et HPTE sont utilisés pour la production de câbles à moyenne et haute tension.

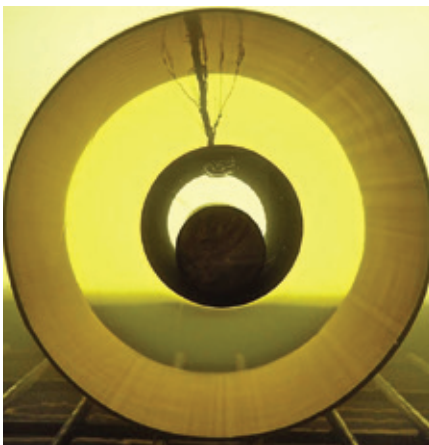
Nécessité d'une matière plastique propre pour les câbles MT et THT

La pureté de la matière plastique utilisée pour l'isolation des câbles HT et THT (très haute tension) est extrêmement importante. Plus le composé est pur (Figure 1), plus le risque de panne est réduit.

▼ Figure 1: Composé isolant haute qualité



▼ Figure 2: Section transversale d'un câble THT avec panne



Des impuretés métalliques de 50µm peuvent déjà elles-mêmes endommager le produit final et entraîner ainsi une forte augmentation des coûts.

La réparation d'un câble sous-marin défectueux, par exemple, qui a été endommagé par des matières contaminantes, peut entraîner des semaines d'arrêt. En outre, le composant de l'isolement contaminé peut causer des défauts dans le câble ainsi que des pannes consécutives au cours de l'essai de décharge se répercutant sur l'industrie lors du processus de fabrication.

Dans le cadre de la production des câbles THT, ces derniers sont testés en usine avec une tension d'essai de 2,5 fois la tension nominale.

Généralement chaque site de production enregistre environ de cinq à six pannes par an (Figure 2), ce qui entraîne d'énormes pertes. Une seule panne entraîne déjà des coûts jusqu'à 150 000 euros, avant même que le câble ne soit posé dans la position prévue. De plus, on perd un temps précieux, en compromettant ainsi le respect des dates de livraison prévues.

Souvent, il faut utiliser des joints non choisis d'un commun accord, en endommageant ainsi l'image de qualité du fabricant, ce qui peut entraîner des pénalités contractuelles.

C'est pourquoi certaines normes concernant les câbles haute tension exigent l'exclusion de la contamination à partir de 75µm dans les matériaux traités.^[3]

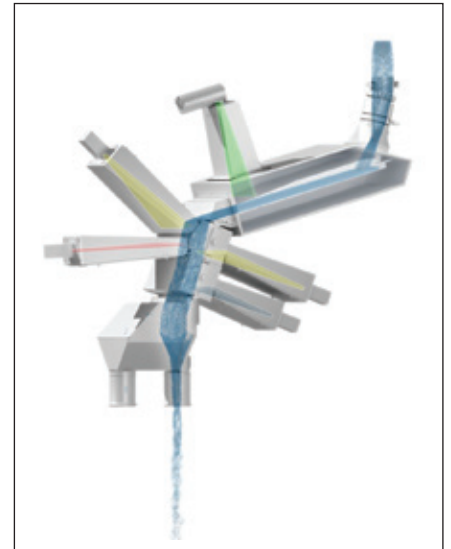
En outre, les câbles doivent être conçus conformément aux lignes directrices de l'AEIC (*Association of Edison Illuminating Companies*) selon lesquelles ils doivent être utilisables pendant une durée de vie d'au moins 40 ans.

En conséquence, il est nécessaire de s'assurer que le matériau a une pureté de 100% avant qu'il ne soit introduit dans le produit final.

Les essais par échantillonnage ne suffisent pas à exclure toute contamination de manière fiable.

Aujourd'hui, les fabricants de câbles utilisent des tamis pour capter les impuretés dans les matériaux XLPE et HPTE avant leur introduction dans le câble. Les tamis sont positionnés directement dans le fluide après l'extrudeuse, avant la tête transversale.

Cependant, ces tamis peuvent s'obstruer à cause de matériel carbonisé ou d'une quantité excessive de contaminants après un certain temps d'exploitation.



▲ Figure 3: Système d'inspection et de tri au moyen d'une caméra à rayons X (vert), optique (jaune), infrarouge (rouge) et couleur (bleu)

Ensuite, la pression de fusion dans l'extrudeuse peut augmenter de manière significative jusqu'à exiger l'arrêt de la production pour remplacer les tamis, ce qui signifie qu'enfin un joint sera nécessaire dans cette position. Les joints, c'est à dire les points où les câbles sont soudés ensemble, sont fabriqués manuellement et sont toujours critiques, notamment en ce qui concerne les câbles sous-marins pour les applications en mer.

C'est pourquoi les fabricants de câbles visent à fournir de grandes longueurs de câble avec un nombre minimum de joints car ces derniers présentent un risque potentiel de pannes.

Étant donné que les tamis obstrués réduisent la productivité de la ligne, des méthodes fiables pour détecter et trier la contamination dans le matériau en polyéthylène sont requises.

Garantie de pureté dans les matériaux XLPE et HPTE avant le traitement du matériau: inspection et tri

Aujourd'hui, l'inspection des granules se fait à l'aide de systèmes aussi bien dans des laboratoires que pour la surveillance en ligne pendant le processus de production des granules.

La plupart des systèmes est basée sur la technologie optique pour détecter les contaminations sur les granules. Toutefois, ces systèmes ne permettent pas de détecter la contamination à l'intérieur des granules.

Le système d'inspection et de tri décrit ci-dessous permet une assurance qualité en ligne à 100% en utilisant la technologie à rayons X et une technique optique. Les contaminations détectées sont identifiées par un logiciel de traitement d'images, caractérisé en tant que contamination et sélectionnées automatiquement. La technologie permet d'effectuer la détection d'impuretés à partir d'une dimension de 50µm.

Technologie à rayons X

Le principe de détection de base de la technologie à rayons X utilise l'atténuation différente du matériau. Le matériau XLPE est essentiellement constitué de carbone. L'atome de carbone a six protons dans son noyau. Une contamination typique pourrait être constituée de particules d'acier provenant de l'extrudeuse ou du granulateur, qui est principalement du fer (FE).

Le fer a 26 protons dans son noyau. Ces 26 protons sont caractérisés par une atténuation supérieure aux rayons X par rapport aux six protons du carbone et se traduit par un contraste parfait entre les deux matériaux dans l'image à rayons X.

Technologie optique

En ce qui concerne l'inspection optique, l'éclairage joue un rôle essentiel.

Afin de permettre des enregistrements précis des flux de matériaux à des vitesses industrielles, l'on utilise des technologies de caméra modernes (caméras optiques, infrarouge, couleur).

Un logiciel de traitement d'image puissant similaire à celui utilisé pour l'inspection par rayons X est utilisé pour détecter la contamination avec le système optique. Par conséquent, en affichant un certain seuil, tous les granules contaminés, qui sont au-dessus du seuil dans l'algorithme mathématique, sont triés.

Contamination typique détectée par les rayons X et la technologie optique

La combinaison des deux technologies à rayons X et optique permet de détecter la contamination dans les granules et sur sa surface (Figure 4).

Le système à rayons X inspecte les granules transparents et colorés (ex. noirs) ainsi que le matériau semi-conducteur XLPE pour détecter d'éventuelles impuretés.

Des impuretés typiques détectées au moyen des rayons X sont constituées par des contaminations métalliques et organiques et des hétérogénéités (TiO₂) à l'intérieur du granule.

De plus, le système optique détecte, par exemple, des impuretés noires (*specs*) sur le granule, des corps étrangers et des granules étrangers ainsi que d'autres contaminants organiques ou métalliques.

Intégration du système dans la chaîne de production

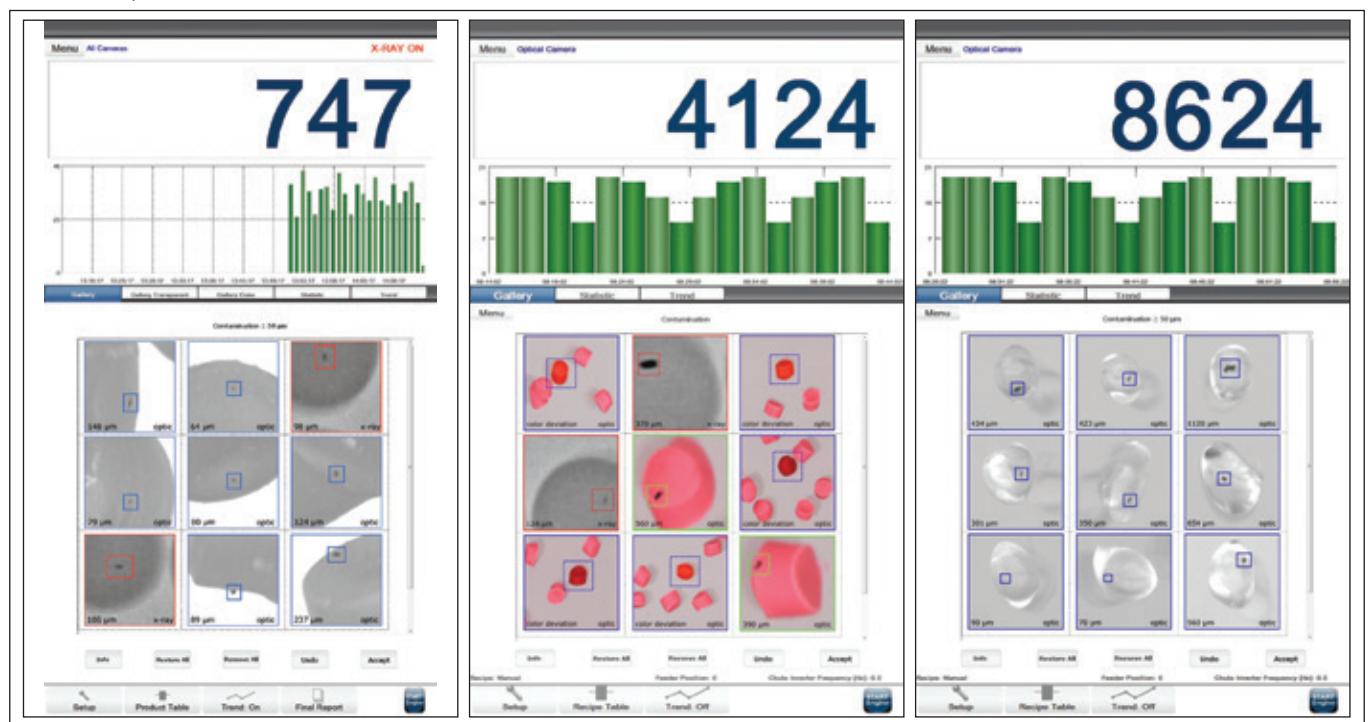
Le système est essentiellement installé entre la trémie qui est alimentée avec les matériaux XLPE et HPTE (octabine, sac ou silo) et la trémie de l'extrudeuse, alors que le composé est alimenté par gravité.

Inspection et analyse en ligne et hors ligne de granules, flocons et bandes/films

En plus des systèmes d'inspection et de tri en ligne, il existe des systèmes modulaires conçus pour l'inspection et l'analyse en ligne et hors ligne de granules, flocons et bandes/films.

Ces systèmes sont utilisés pour des débits plus limités, et pour les lignes de production pour lesquelles les analyses des échantillons pris au hasard sont suffisantes ou pour le contrôle des marchandises entrantes.

▼ **Figure 4:** Grâce à la technologie à rayons X et à une inspection optique, le système détecte la présence de contaminants à l'intérieur de la matière plastique et sur la surface du granule. Le système détecte la contamination par des métaux, des impuretés noires (*specs*), des décolorations jaunes et des variations de couleur dans les matériaux transparents et non transparents





▲ **Figure 5:** Système d'inspection et d'analyse hors ligne.

Selon l'application, les systèmes sont équipés de la technologie à rayons X (X), de la technologie infrarouge (IR) ou de capteurs optiques (V) à utiliser pendant la production ou pour l'analyse des échantillons et la détection de la contamination à partir de 50µm.

Par exemple, un dispositif d'inspection et d'analyse en laboratoire avec la technologie à rayons X (Figure 5) inspecte jusqu'à 3 000 granules (200ml) placés sur un plateau.

En quelques secondes, ces granules sont inspectés pour détecter la présence d'éventuels contaminants. Par la suite, les granules contaminés sont mis en évidence au moyen du système optique, ce qui rend l'extraction de chaque contaminant nettement plus facile.

Pour l'optimisation globale du processus, les fabricants de câbles associent un système d'inspection et de tri en ligne à un dispositif d'inspection et d'analyse hors ligne.

Une fois la détection et le triage des granules contaminés effectués, le système de laboratoire inspecte de nouveau ces granules et marque les contaminants au moyen du système optique pour permettre de séparer aisément la totalité des rejets.

Cette interaction entre l'inspection et l'analyse en ligne et hors ligne permet de contrôler la pureté du matériau et de créer une base de données pour prévenir la contamination future.

Conclusions

En résumé, cet article expose les raisons pour lesquelles il est nécessaire que

les matériaux XLPE et HPE utilisés pour l'isolation des câbles MT et EHT offrent un degré de pureté élevé. Il présente en outre les systèmes de contrôle de qualité en ligne et hors ligne des matériaux XLPE et HPE qui inspectent le matériau avant le traitement.

Le système d'inspection et de tri présenté détecte les granules contaminés et les sépare avant leur entrée dans le processus d'extrusion.

La contamination peut être déjà présente dans la matière première, mais pourrait également s'ajouter lors de la manipulation et du transport.

Par conséquent, même si les fabricants de câbles continuent à utiliser des tamis, cette technologie garantit que ces derniers ne sont pas obstrués par des impuretés provenant des granules contaminés et permet donc un cycle de production plus long et sûr.

En utilisant les rayons X et les technologies optiques, il est possible de détecter les contaminants présents à l'intérieur et sur la surface des granules, ce qui garantit un contrôle total de la qualité.

Grâce à l'utilisation d'un système d'inspection et d'analyse hors ligne des granules contaminés qui ont été précédemment séparés par le système d'inspection en ligne, il est même possible d'améliorer les processus de production.

La pureté du matériau est contrôlée et l'analyse fournit des informations pour prévenir toutes éventuelles contaminations futures.

En tenant compte de cet ensemble d'avantages, l'utilisation des technologies présentées concernant le contrôle de la qualité des matériaux XLPE et HPE est essentielle pour assurer des câbles MT et EHT haute qualité.

En même temps, tout en garantissant un degré de pureté élevé des matériaux XLPE et HPE, il est possible de réduire les coûts des matériaux nécessaires pour fabriquer de nouveau les câbles qui ont échoué lors des essais de décharge diélectrique et d'améliorer considérablement l'efficacité de la ligne de production du câble. ■

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Impulso ad un'infrastruttura fiorente per l'esposizione

WIRE Southeast Asia ritorna quest'anno in Thailandia al Bangkok Trade & Exhibition Center (BITEC) a Bangkok dal 19 al 21 settembre. Il tempestivo e strategico allestimento delle due fiere specialistiche si colloca nell'ambito delle incoraggianti prospettive attese per il settore del filo e del cavo, dovute soprattutto ai fiorenti settori delle infrastrutture e della produzione nel Sud-Est asiatico.

La registrazione online per gli espositori è ora aperta sul sito www.wire-southeastasia.com

Secondo la Banca asiatica di sviluppo (ADB), i settori dell'energia e dei trasporti rappresenteranno il 62,6 per cento del fabbisogno complessivo di investimenti nel settore delle infrastrutture dell'Associazione delle Nazioni del Sud-est asiatico (ASEAN) entro il 2020. Ciò è confermato dalla proiezione di Goldman Sachs circa la spesa in infrastrutture nel settore dell'elettricità e dei trasporti in quattro paesi dell'ASEAN (Thailandia, Malesia, Indonesia e Filippine) che ammonterà a 524 miliardi USD entro il 2020.

Un'importante iniziativa dell'ASEAN nel settore delle infrastrutture è rappresentata dall'ASEAN Power Grid (APG) con un fabbisogno d'investimento di 5,9 miliardi USD, così come il collegamento ferroviario ad alta velocità Singapore-Kuala Lumpur, che si estenderà per 217 miglia e sarà presumibilmente operativo nel 2026.

Messe Düsseldorf organizza la partecipazione di espositori a Iran Wire 2017

Iran Wire si terrà a Teheran dal 5 all'8 dicembre come unica fiera in Iran che sarà dedicata all'intera gamma di fili, cavi, tubi, condotti, profili e relative industrie.

Tutte le aziende internazionali dei rispettivi settori che desiderano esporre e vendere i propri prodotti potranno trovare una piattaforma unica a Iran Wire come interessante punto di ingresso nel mercato iraniano emergente.

Si prevede che saranno circa 200 gli espositori che presenteranno i loro prodotti tecnici innovativi nei settori del filo, dei cavi, dei tubi e dei profili. La fiera di quattro giorni è organizzata dall'iraniana Aria Group Conference and Exhibition Development Company a Teheran.

Messe Düsseldorf è il partner d'oltreoceano esclusivo e sarà responsabile della pubblicità e della gestione degli espositori internazionali. Inoltre, Messe Düsseldorf opera in una vasta gamma di settori organizzativi, compresa la registrazione degli espositori internazionali, la progettazione dell'allestimento e il regolare svolgimento in loco presso il Tehran International Permanent Fairground.

Messe Düsseldorf GmbH & Co KG – Germania
Website: www.iranwire.ir



▲ Espositori e visitatori di un filo precedente Southeast Asia

Sul fronte della produzione, qualora gli stati dell'ASEAN attuassero pienamente la strategia di integrazione della Comunità economica ASEAN e conquistassero una quota maggiore della produzione globale, la regione potrebbe guadagnare da 280 a 625 miliardi USD nel PIL annuale entro il 2030, come emerge da un recente rapporto del McKinsey Global Institute.

Questa crescita delle infrastrutture, a fianco dell'espansione del settore automobilistico, della nuova energia, dei treni ad alta velocità, del trasporto

urbano, dei settori aerospaziale e petrolchimico, della costruzione di infrastrutture e altri settori di applicazione, ha offerto nuove opportunità all'industria del fissaggio.

Riflettendo tali tendenze globali, farà il suo esordio a wire Southeast Asia 2017 un settore particolare nell'ambito della tecnologia degli elementi di fissaggio. Il padiglione Fastener riservato agli elementi di fissaggio sarà una vetrina dedicata dell'intera filiera industriale a monte e a valle sulla tecnologia di fissaggio.

Il profilo dell'esposizione spazierà dagli elementi di fissaggio standard e non standard alla loro applicazione in vari settori nonché le competenze e le abilità produttive e le strutture di supporto degli elementi di fissaggio.

Il programma dinamico presso wire Southeast Asia sarà caratterizzato da una gamma completa di macchine innovative per la produzione, la lavorazione e la finitura di fili e cavi, la tecnologia degli elementi di fissaggio, nuovi processi nella tecnologia di misurazione, di comando e di controllo e aree specialistiche nonché strumenti e materiali ausiliari nuovi e migliorati. Le esposizioni saranno completate da una serie di conferenze e seminari.

Messe Düsseldorf Asia Pte Ltd – Singapore
Website: www.wire-southeastasia.com

Zumbach all'avanguardia da 60 anni

PRECURSORE nel settore della misurazione on-line, la società Zumbach produce una gamma completa di strumenti di misura e controllo on-line senza contatto. La sua tecnologia è utilizzata in tutto il mondo e quest'anno la società festeggia il suo 60° anniversario.

Che sia per il settore dei cavi, della plastica, della gomma o per il settore dell'acciaio e dei metalli, la tecnologia Zumbach è utilizzata da clienti che contano sulla qualità e sull'affidabilità dei suoi strumenti e sistemi.

Era il 1° maggio 1957 quando nella cittadina svizzera di Biel (centro dell'industria orologiera svizzera e mondiale) Bruno Zumbach, allora giovane ingegnere elettrico non ancora trentenne, ebbe l'idea di avviare la propria azienda di elettronica poiché desiderava realizzare qualcosa autonomamente.

L'elettronica era ancora agli albori: i relè e le valvole erano ancora i componenti principali. Il transistor era qualcosa d'impensabile e i circuiti integrati e microprocessori sembravano appartenere ad un futuro lontano. A quel tempo in Svizzera lo sviluppo economico era comunque positivo e a Biel c'erano numerose e fiorenti fabbriche di macchine.

I primi ordini, emessi singolarmente o per piccole quantità, furono ricevuti per i sistemi di azionamento inseriti in qualsiasi tipo di macchina. Si trattava di macchine per orologi, per il settore ottico, per la sterilizzazione e per strumenti di ogni genere. Probabilmente l'ordine più consistente e "ardito" nella fase iniziale fu quello per l'automazione della centrale per la produzione del burro a Gossau nei pressi di St. Gallen (Svizzera). L'intero sistema di produzione e distribuzione di burro fu automatizzato con un azionamento completamente privo di contatto, a quel tempo considerato ancora una tecnologia del tutto inedita. Si trattò del primo azionamento di questo tipo in Svizzera.

Per motivi di costo, tutti gli elementi di controllo, i cosiddetti blocchi logici, furono sviluppati e prodotti in massa nella fabbrica della società. Persino gli azionamenti, le barriere fotoelettriche e altri componenti furono prodotti internamente a Biel.

A quel tempo a Biel e nel resto della Svizzera vi erano numerosi produttori di rettificatrici cilindriche che richiedevano



▲ La prima sede della società come un piccolo studio affittato un ufficio in una vecchia fabbrica, nel centro di Biel

azionamenti a basse vibrazioni e a regolazione fine. Bruno Zumbach comprese immediatamente che si trattava di un mercato importante. Il problema consisteva nel fatto che non esisteva una soluzione soddisfacente con la tecnologia dei tiratroni del tempo.

Il progetto di Zumbach prevedeva lo sviluppo e la costruzione di un azionamento conveniente e di piccole dimensioni, il "Ward Leonard", dotato di un inverter monoblocco e di un motore e di un regolatore a corrente continua adeguati. A quel tempo, questa tecnologia era praticabile e conveniente solo per prestazioni di azionamenti di gran lunga superiori. La "Ward Leonard vision" sarebbe presto diventata la tecnologia Zumbach di base per molti anni.

Nei primi anni 60, Zumbach si rese conto che la propria attività nel settore degli azionamenti non poteva garantire un futuro sostenibile per l'azienda. Il settore fu contraddistinto da nuove possibilità tecniche e quindi da un numero crescente di concorrenti che iniziarono a imporre una riduzione dei prezzi e dei margini. L'industria delle macchine utensili avrebbe presto iniziato il suo processo di declino.

Intorno al 1972, fu sviluppato un progetto per produrre un tester per l'eccentricità nei cavi elettrici. Nel 1974, Zumbach ottenne un brevetto per il nuovo dispositivo induttivo 7 Ex-Test, che divenne il primo grande successo in quello che era allora il nuovo settore degli strumenti di misura in linea.

I dispositivi ottici di misurazione del diametro divennero i prodotti di maggiore successo di Zumbach. I tipi Odc analogici furono creati intorno al 1975, i misuratori assoluti Odac® furono creati a partire dal 1977. L'Odac 24 fu il primo apparecchio con misurazione assoluta ad essere venduto in grandi quantità. "Odac®" divenne un marchio registrato e da allora furono venduti oltre 80.000 misuratori Odac di tutti i tipi e per una vasta gamma di applicazioni.

Nel 1994 Bruno Zumbach affidò la gestione del gruppo al figlio Rainer. Negli anni successivi il gruppo ampliò la propria attività e creò ulteriori filiali, tra cui in Asia. Oltre a queste filiali di proprietà di Zumbach, da allora la società ingaggiò ulteriori rappresentanti. Zumbach poté così rafforzare al massimo uno dei propri obiettivi, la vicinanza ai clienti, ampliando costantemente i servizi locali per il cliente nel corso degli ultimi 20 anni.

Furono conseguentemente creati uffici vendita e di assistenza e successivamente furono costituite delle società a partire dal 1970 in numerosi paesi diversi. La prima di queste società ebbe nel 1979 la propria sede negli Stati Uniti, seguiti da Regno Unito, Germania, Francia, Spagna, Italia, India, Taiwan e nel 2001 Cina. Oltre 20 tecnici commerciali a Orpund e le società estere garantiscono oggi il successo dei prodotti sul mercato globale.

Zumbach Electronic AG – Svizzera
Website: www.zumbach.com

Controllo e analisi del materiale XLPE e HPTE nella produzione di cavi a media e alta tensione

A cura di Harry Prunk, Sikora AG, Brema, Germania

Riassunto

Le materie plastiche utilizzate per l'isolamento dei cavi a media, alta e altissima tensione devono rispettare rigorosissimi standard di purezza. In genere, viene utilizzato il materiale XLPE (polietilene reticolato) per l'isolamento dei cavi.

Per la reticolazione dello XLPE, il cavo passa attraverso un tubo CV (vulcanizzazione continua) dove viene esposto ad elevate temperature per il processo di reticolazione.

Generalmente, nella produzione di questi tipi di cavi, il tubo CV viene riempito di azoto e fatto funzionare a una pressione di 10 bar. Prima che il cavo possa essere sottoposto a ulteriore trattamento, come ad es. l'applicazione di una schermatura e di guaine esterne, è necessario effettuare un degasaggio che può richiedere fino a 10 giorni.

Comunemente, la linea è costruita come una linea CCV o VCV (vulcanizzazione continua catenaria o vulcanizzazione continua verticale). La tecnologia è ben collaudata in quanto è utilizzata da decenni, ma comporta costi elevati per la costruzione e la linea di produzione.

Inoltre, esiste un altro metodo avanzato, che utilizza l'elastomero termoplastico ad alto rendimento (*High Performance Thermoplastic Elastomer* o HPTE) a base di polipropilene come materiale isolante.

Questa nuova tecnologia è stata messa a punto da Prysmian e viene presentata come la cosiddetta tecnologia "P-Laser".^[1]

Il materiale presenta buone proprietà elettriche e termo-meccaniche, paragonabili e per alcuni aspetti persino superiori a quelle del materiale XLPE. Il materiale HPTE non richiede una sezione reticolabile né alcun trattamento di degassificazione.

Ciò significa che il cavo completo può essere fabbricato nell'ambito di un processo di produzione in linea, in cui potrebbero essere applicate anche la schermatura e la guaina esterna in un'unica fase di produzione.

Indipendentemente dall'approccio adottato, i requisiti di rigidità dielettrica dei materiali XLPE e HPTE restano elevati e devono essere assicurati. Importante a tale riguardo è la pulizia del materiale isolante. È a questo punto che vengono messi a fuoco il sistema avanzato di controllo della purezza e di selezione.

Il presente articolo illustrerà un sistema di controllo in linea e di selezione che rileva la contaminazione all'interno e sulla superficie dei pellet come ad es. contaminanti metallici od organici, variazioni di colore, agglomerati, contaminazioni incrociate e pellet estranei.

Il sistema presentato comprende la combinazione unica della tecnologia a raggi X e un sistema ottico per ottenere la massima capacità di rilevamento per qualsiasi tipo di contaminazione. Pertanto, la qualità del materiale XLPE o HPTE e di conseguenza il processo di produzione risultano ottimizzati e i costi ridotti.

Nell'articolo si farà inoltre un breve cenno su un sistema fuori linea innovativo, che

ispeziona e analizza piccoli lotti di pellet. Ciò è anche importante per verificare pellet che sono stati selezionati mediante il sistema di controllo e di selezione in linea.

Cavo a media e alta tensione isolato con materiale XLPE e HPTE

Oggi il materiale isolante più utilizzato per i cavi a media tensione (MV) e alta tensione (HV) è il polietilene reticolato (XLPE).

Questo materiale viene prodotto da polietilene ad alta pressione con l'aggiunta di perossidi organici come additivi. La reticolazione avviene in presenza di calore e pressione.

Le singole catene molecolari vengono collegate tra loro, ottenendo così una trasformazione del materiale termoplastico in un materiale elastico.

Un vantaggio che presenta il materiale XLPE come isolante per cavi a media e alta tensione è la loro bassa perdita dielettrica e le loro eccellenti proprietà elettriche e fisiche per la trasmissione dell'elettricità. Siccome il materiale XLPE è resistente alla deformazione termica e all'invecchiamento, un cavo XLPE permette di trasportare correnti di alta intensità. Un'altra caratteristica è rappresentata dalla facilità d'installazione dei cavi XLPE.

Questo materiale sopporta raggi di curvatura stretti ed è inoltre leggero.^[2]

Alcuni anni fa la società Prysmian ideò un nuovo tipo di cavo in cui si utilizza il materiale HPTE (Elastomero ad alte prestazioni) anziché lo XLPE. Questo materiale presenta caratteristiche equivalenti allo XLPE. La differenza consiste nel fatto che non vi è reticolazione e pertanto alcun sottoprodotto, il HPTE è riutilizzabile, consente tempi di produzione più brevi, una zona d'installazione ridotta ed è compatibile con i componenti di rete esistenti. Entrambi i materiali XLPE e HPTE sono utilizzati per la produzione di media e alta tensione del cavo.

Necessità di materiale plastico pulito per cavi MV e EHV

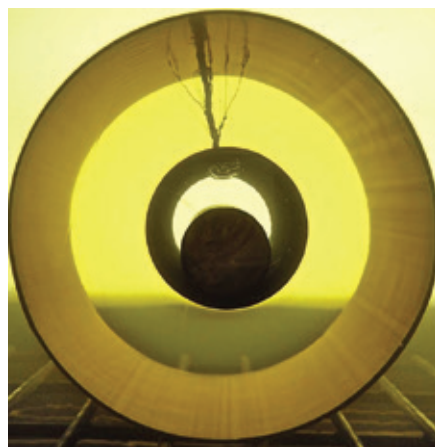
La purezza del materiale plastico che viene utilizzato per l'isolamento di cavi HV ed EHV (altissima tensione) è estremamente importante. Quanto più puro è il composto (Figura 1), tanto minore è il rischio di un guasto.

Impurità metalliche di 50µm possono di per sé danneggiare il prodotto finale e quindi determinare un notevole aumento dei costi.

▼ **Figura 1:** Composto isolante di alta qualità



▼ **Figura 2:** Sezione trasversale di un cavo EHV con guasto



Ad esempio, la riparazione di un cavo sottomarino difettoso che è stato danneggiato da materiali contaminanti, può comportare settimane di inattività. Inoltre, il composto contaminato dell'isolamento può causare sia difetti nel cavo, sia guasti conseguenti durante il test di scarica dielettrica con effetti che si ripercuotono a livello industriale durante il processo produttivo.

Nell'ambito della produzione di cavi EHV, essi sono testati presso lo stabilimento con una tensione di prova pari a 2,5 volte la tensione nominale.

Generalmente, ciascun sito di produzione registra approssimativamente da cinque a sei guasti l'anno (Figura 2) che causano perdite enormi. Già un solo guasto provoca costi fino a 150.000 euro prima ancora che il cavo sia posato nella posizione prevista.

Inoltre, si perde del tempo prezioso, non permettendo di rispettare le date di consegna previste. Spesso, devono essere utilizzati dei giunti non concordati, danneggiando così l'immagine di qualità del produttore con potenziali sanzioni contrattuali. È per queste ragioni che alcune norme per cavi ad alta tensione richiedono che siano escluse contaminazioni a partire da 75µm nei materiali lavorati.^[3]

Inoltre, i cavi devono essere progettati secondo le linee guida dell'associazione AEIC (Association of Edison Illuminating Companies), in modo tale da essere utilizzabili per una vita utile di almeno 40 anni. Di conseguenza, è necessario verificare che il materiale abbia una purezza del 100% prima che venga inserito nel prodotto finale.

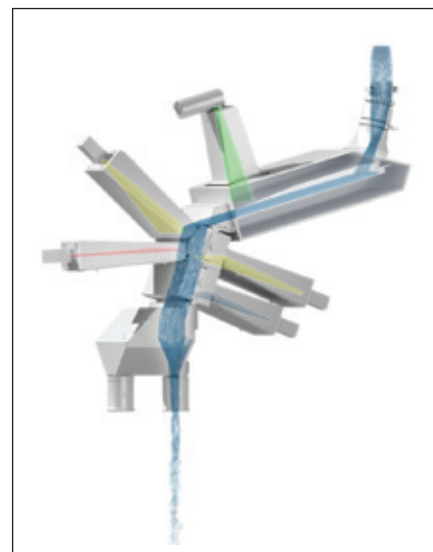
Le prove a campione non sono sufficienti per escludere in modo affidabile qualsiasi tipo di contaminazione.

Oggi i produttori di cavi utilizzano dei filtri per catturare le impurità nella fusione dei materiali XLPE e HPTE prima del loro inserimento nel cavo.

I filtri vengono posizionati direttamente nel fluido dopo l'estrusore, prima della testa trasversale.

Tuttavia, questi filtri possono intasarsi a causa di materiale carbonizzato, o dell'eccessiva quantità di contaminanti dopo un certo periodo di funzionamento.

Quindi la pressione del materiale fuso nell'estrusore può aumentare in modo significativo fino a richiedere l'arresto della produzione per sostituire i filtri, il che significa che successivamente sarà necessario un giunto in quella posizione.



▲ **Figura 3:** Sistema di controllo e di selezione mediante macchina fotografica a raggi X (verde), ottica (giallo), a infrarossi (rosso) e a colori (blu)

I giunti, ovvero i punti in cui i cavi sono saldati insieme sono realizzate manualmente e sono sempre critiche, in particolare per quanto riguarda i cavi sottomarini per le applicazioni offshore.

È per questa ragione che i produttori di cavi puntano a fornire lunghezze di cavi consistenti che presentino solo un minimo numero di giunti poiché questi presentano un potenziale rischio di guasto.

Siccome i filtri ostruiti riducono la produttività della linea, vengono richiesti dei metodi affidabili che consentano di rilevare e selezionare le contaminazioni nel materiale di polietilene.

La garanzia di purezza nei materiali XLPE e HPTE prima della lavorazione del materiale: controllo e selezione

Oggi, per il controllo dei pellet, vengono utilizzati dei sistemi sia nei laboratori sia per il monitoraggio in linea durante il processo di produzione dei granuli.

La maggior parte di tali sistemi si basa sulla tecnologia ottica per rilevare le contaminazioni sul pellet.

Tuttavia, questi sistemi non consentono di rilevare la contaminazione all'interno dei pellet.

Il sistema di controllo e selezione descritto di seguito consente una garanzia di qualità in linea del 100% utilizzando la

tecnologia a raggi X e una tecnica ottica. Le contaminazioni rilevate vengono identificate mediante un software di elaborazione di immagini, caratterizzate come contaminazione e selezionate automaticamente.

La tecnologia consente di effettuare il rilevamento delle impurità a partire da una dimensione di 50µm.

Tecnologia a raggi X

Il principio di rilevamento di base della tecnologia a raggi X utilizza la diversa attenuazione del materiale.

Il materiale XLPE è composto principalmente da carbonio. L'atomo di carbonio possiede sei protoni nel suo nucleo. Una contaminazione tipica potrebbe essere costituita da particelle di acciaio provenienti dall'estrusore o dal granulatore, che è prevalentemente ferro (FE).

Il ferro possiede 26 protoni nel suo nucleo. Questi 26 protoni sono caratterizzati da una maggiore attenuazione ai raggi X rispetto ai sei protoni dal carbonio e si traduce in un perfetto contrasto tra i due materiali nell'immagine a raggi X.

Tecnologia ottica

Per quanto riguarda il controllo ottico, l'illuminazione gioca un ruolo essenziale.

Al fine di consentire registrazioni precise dei flussi di materiali a velocità industriali, vengono utilizzate delle moderne tecnologie delle telecamere (telecamere ottiche, a infrarossi, a colori).

Un potente software di elaborazione delle immagini simile a quello utilizzato per il controllo a raggi X viene utilizzato per rilevare la contaminazione con il sistema ottico.

Pertanto, impostando una certa soglia, tutti i pellet contaminati che sono al di sopra della soglia nell'algoritmo matematico, sono selezionati.

Contaminanti tipici rilevati mediante raggi X e tecnologia ottica

La combinazione della tecnologia a raggi X e della tecnologia ottica consente il rilevamento di contaminanti nel pellet e sulla sua superficie (Figura 4).

Il sistema a raggi X ispeziona pellet trasparenti e colorati (ad esempio di colore nero) nonché materiale XLPE semi-conduttivo per individuare eventuali impurità.

Impurità tipiche rilevate mediante i raggi X sono costituite da contaminazioni metalliche e organiche e disomogeneità (TiO₂) all'interno del pellet. Inoltre, il sistema ottico rileva, ad esempio, impurità

nere (specs) sul pellet, corpi estranei e pellet estranei nonché altri contaminanti organici o metallici.

Integrazione del sistema nella linea di produzione

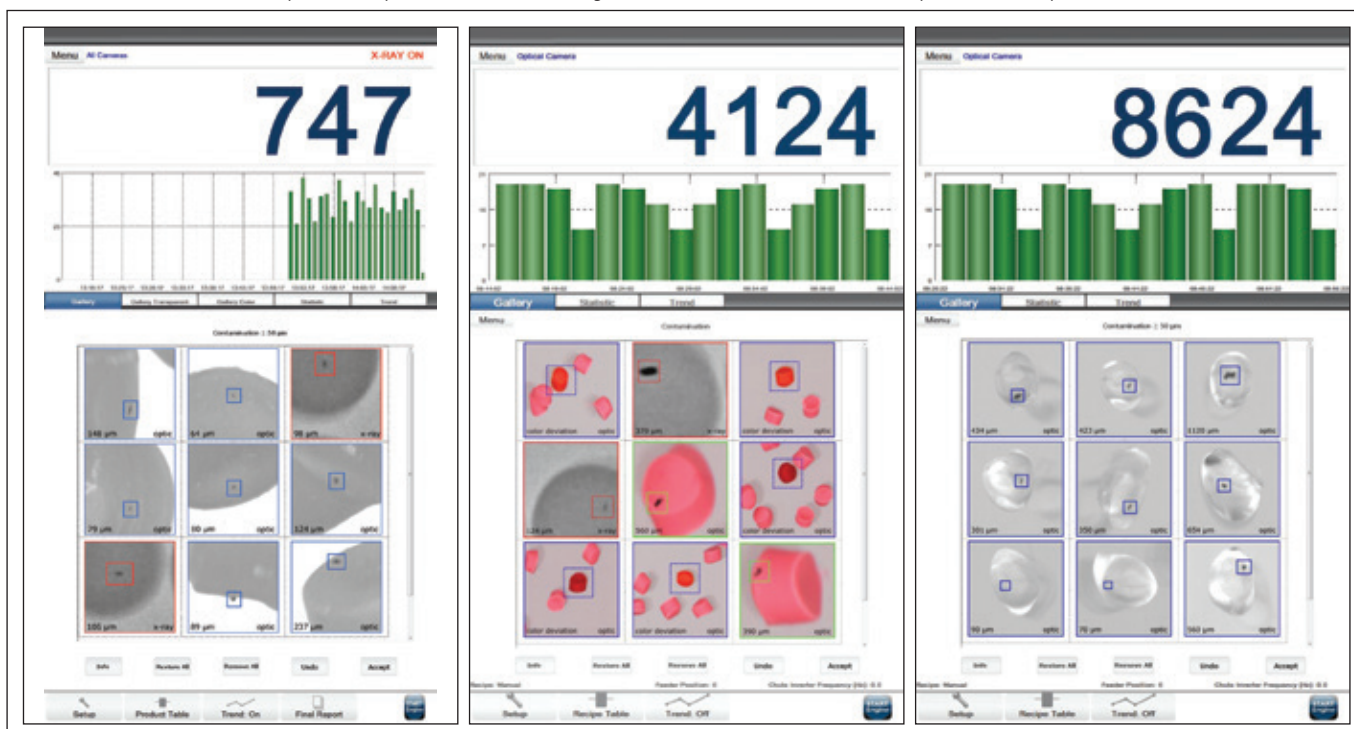
Il sistema è tipicamente installato tra la tramoggia che è alimentata con il materiale XLPE e HPTE (octabin, sacco o silos) e la tramoggia dell'estrusore, laddove il composto viene alimentato per gravità.

Controllo e analisi online e offline di pellet, scaglie e nastri/film

Oltre ai sistemi di ispezioni e di selezione online sono disponibili dei sistemi modulari per il controllo e l'analisi online e offline di pellet, scaglie e nastri/film. Questi sistemi vengono utilizzati per volumi di produzione più limitati e per le linee di produzione in cui sono sufficienti le prove a campione, o per il controllo delle merci in entrata.

A seconda dell'applicazione, i sistemi sono dotati di tecnologia a raggi X (X), tecnologia a infrarossi (IR) o sensori ottici (V) da utilizzare durante la produzione o per le prove a campione e per rilevare contaminazioni da 50µm.

▼ **Figura 4:** Grazie alla tecnologia a raggi X e a un controllo ottico, il sistema rileva la presenza di contaminanti all'interno del pellet di plastica e sulla sua superficie. Il sistema rileva la contaminazione da metalli, impurità nere (specs), scolorimenti di colore giallo e variazioni di colore nei materiali trasparenti e non trasparenti.





▲ **Figura 5:** Sistema di controllo e analisi fuori linea

Ad esempio, uno strumento di controllo e di analisi di laboratorio con tecnologia a raggi X (Figura 5) ispeziona fino a 3.000 pellet (200ml) posti su un vassoio.

In pochi secondi, questi pellet vengono ispezionati per rilevare la presenza di eventuali contaminanti. Successivamente, i pellet contaminati sono evidenziati mediante il sistema ottico che rende molto più facile l'estrazione di ciascun contaminante.

Per un'ottimizzazione globale del processo, i produttori di cavi abbinano un sistema di controllo e di selezione in linea ad un sistema di controllo e di analisi offline. Una volta effettuati il rilevamento e la selezione dei pellet contaminati, il sistema di laboratorio ispeziona nuovamente questi pellet e marca i contaminanti mediante il sistema ottico per consentire una facile separazione di tutti gli scarti.

Questa interazione tra controllo e analisi online e offline permette di controllare la purezza del materiale e di creare una banca dati per evitare contaminazioni future.

Conclusioni

In sintesi, il presente documento ha illustrato le ragioni della necessità di un elevato grado di purezza dei materiali XLPE e HPTE utilizzati per l'isolamento dei cavi a media tensione e ad elevatissima tensione.

Inoltre, sono stati presentati i sistemi per il controllo qualità online e offline dei materiali XLPE e HPTE che ispezionano il materiale prima della lavorazione.

Il sistema d'controllo e selezione presentato rileva i pellet contaminati e li separa

prima che entrino a far parte del processo di estrusione. La contaminazione può essere già presente nella materia prima, ma potrebbe anche aggiungersi durante la manipolazione e il trasporto.

Di conseguenza, anche se i produttori di cavi continuano a utilizzare filtri, questa tecnologia assicura che questi non siano intasati da impurità provenienti da pellet contaminati e consente quindi un ciclo di produzione più lungo e sicuro.

L'utilizzo dei raggi X e delle tecnologie ottiche consente di rilevare le sostanze contaminanti presenti all'interno e sulla superficie dei pellet, garantendo un controllo totale della qualità.

Grazie all'utilizzo di un sistema di controllo e analisi offline dei pellet contaminati che sono stati prima separati dal sistema di controllo in linea, è persino possibile migliorare i processi di produzione.

Viene controllata la purezza del materiale e l'analisi fornisce informazioni per prevenire future contaminazioni.

Considerando complessivamente questi vantaggi, l'utilizzo delle tecnologie presentate per il controllo di qualità dei materiali XLPE e HPTE è indispensabile per garantire dei cavi MV e EHV di alta qualità.

Contemporaneamente, garantendo un elevato grado di purezza dei materiali XLPE e HPTE, è possibile ridurre i costi dei materiali necessari per fabbricare nuovamente i cavi che non hanno superato la prova di scarica dielettrica e migliorare notevolmente l'efficienza della linea di produzione del cavo. ■

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Impulso a la floreciente infraestructura para la feria

WIRE Southeast Asia regresa al Trade & Exhibition Centre (BITEC) de Bangkok, en Tailandia, donde se celebrará del 19 al 21 de septiembre. La estratégica celebración de las dos ferias especializadas llega en un momento propicio y con perspectivas alentadoras para los sectores del cable y alambre, especialmente gracias a los prósperos sectores de las infraestructuras y de la manufactura en el sureste asiático.

El plazo para el registro online de los expositores ya está abierto en www.wire-southeastasia.com

Según el Banco de Desarrollo Europeo (ADB), los sectores de la energía y del transporte supondrán el 62,6% de las necesidades totales de inversión en infraestructura para la ASEAN (Asociación de Naciones del Sureste Asiático) para el año 2020. Así lo ha confirmado la previsión de Goldman Sachs acerca del gasto en infraestructura para energía y transporte en cuatro países de la ASEAN (Tailandia, Malasia, Indonesia y Filipinas), que ascenderá a 524.000 millones de dólares americanos de aquí a 2020.

Una importante iniciativa de la ASEAN en el campo de las infraestructuras es la red de suministro eléctrico ASEAN (APG), que requiere una inversión de 5.900 millones de dólares americanos, además de la línea de alta velocidad Singapur-Kuala Lumpur, que atravesará 350 kilómetros y cuyas obras están previstas que inicien en 2026.

Messe Düsseldorf organiza la participación de expositores en Iran Wire 2017

Iran Wire se celebrará este año en Teherán del 5 al 8 de diciembre y es la única feria de Irán dedicada a la industria del alambre, cable, tubo, perfiles e industrias afines.

Todas las empresas internacionales de estos sectores que deseen exponer y vender sus productos dispondrán de una plataforma única en Iran Wire, que servirá de punto de entrada atractivo en el emergente mercado iraní.

Se espera que unos 200 expositores presenten sus productos técnicos innovadores en los sectores del alambre, cable, tubo y perfiles. La feria, que durará cuatro días, está organizada por la empresa de desarrollo de conferencias y ferias de Aria Group en Teherán.

Messe Düsseldorf es el socio extranjero exclusivo y estará encargado de la gestión y promoción de los expositores internacionales. Asimismo, Messe Düsseldorf colabora en una amplia gama de áreas organizativas, que incluyen el registro de expositores internacionales, el diseño de los stands y el correcto desarrollo del evento directamente en el recinto ferial permanente internacional de Teherán.

Messe Düsseldorf GmbH & Co KG – Alemania
Website: www.iranwire.ir



▲ Expositores y visitantes en un cable anterior Southeast Asia

En el sector de la manufactura, si la ASEAN implementa toda la estrategia de integración de la comunidad económica ASEAN y se hace con una porción de manufactura global mayor, la zona podría aumentar su PIB anual entre 280.000-625.000 millones de dólares americanos para el año 2030, como decía un informe reciente redactado por el instituto de investigación global McKinsey.

El desarrollo de la infraestructura, junto con la expansión del sector automotriz, nuevas energías, línea ferroviaria de alta velocidad, transporte urbano,

aeroespacial, petroquímico, construcción de infraestructuras y otros sectores de aplicación, ha brindado nuevas oportunidades a la industria de los elementos de sujeción.

Esas tendencias globales han determinado la creación de una zona ferial dedicada exclusivamente a la tecnología de sujeción, que hará su debut en wire Southeast Asia 2017. El pabellón Fasteners dedicado a los elementos de sujeción servirá de escaparate para toda la cadena industrial que interviene antes y después en el proceso de producción industrial de la tecnología de sujeción.

La feria abarcará desde elementos de sujeción estándares y no estándares, además de la aplicación de dichos elementos en varios sectores industriales, hasta competencias de fabricación y medios auxiliares de los elementos de sujeción.

El dinámico programa de wire Southeast Asia incluirá una completa gama de maquinaria innovadora para la fabricación, procesado y acabado de cable y alambre, tecnología de sujeción, nuevos procesos de medida, ingeniería de control y ensayo y sectores especializados, además de herramientas nuevas y actualizadas y materiales auxiliares. Una serie de conferencias y seminarios completarán el programa de la feria.

Messe Düsseldorf Asia Pte Ltd – Singapur
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La pionera Zumbach celebra su 60º aniversario

ZUMBACH, pionera en la fabricación de sistemas de medida en línea, produce una amplia gama de instrumentos de medida y control en línea sin contacto. Su tecnología es utilizada en todo el mundo y este año la empresa celebra su 60º aniversario.

Tanto si se trata del sector del cable, de los plásticos, de la goma como del acero o los metales, la tecnología Zumbach es utilizada por clientes que confían en la calidad y fiabilidad de sus instrumentos y sistemas.

Todo empezó en Biel (centro neurálgico de la industria suiza y del sector de los relojes a nivel mundial), en Suiza, el 1 de mayo de 1957. A Bruno Zumbach, un joven ingeniero eléctrico, de ni siquiera 30 años, se le ocurrió abrir su propia empresa de electrónica porque quería hacer algo por su cuenta.

Tubos de vacío y relés en su estadio elemental constituían los principales elementos de la electrónica en aquella época. El transistor era algo casi inconcebible; los circuitos integrados y los microprocesadores eran cosa del futuro. Sin embargo, Suiza estaba viviendo un buen desarrollo económico en aquella época y había muchas fábricas de maquinaria prósperas en Biel.

Los primeros pedidos que se recibieron, por separado o en grandes lotes, fueron de sistemas de accionamiento para cualquier tipo de máquina. Eran sistemas para máquinas de relojes, ópticas, de esterilización e instrumentos de todo tipo. Probablemente, el mayor y «más osado» pedido en la fase inicial de la empresa fue automatizar el centro de producción de mantequilla de Gossau, cerca de St Gallen (Suiza). Toda la producción de mantequilla y el sistema de distribución fueron automatizados con un accionamiento totalmente sin contacto, que en aquel tiempo era tecnología innovadora. Era el primer accionamiento de ese tipo que se hacía en Suiza.

Por razones de precio, todos los elementos de control, los llamados bloques lógicos, fueron desarrollados y producidos en masa en la propia fábrica de la empresa. Incluso los accionamientos, las barreras luminosas y otros elementos se fabricaron internamente en Biel.

En aquel tiempo, había muchos fabricantes de amoladoras cilíndricas en Biel y en Suiza que necesitaban accionamientos regulables de precisión y con pocas vibraciones. Bruno Zumbach se dio cuenta inmediatamente de que



▲ La primera casa de la empresa como un pequeño estudio alquilado una oficina en un antiguo edificio de la fábrica en el centro de Biel

se hallaba ante un mercado importante. El problema era la imposibilidad de encontrar una solución satisfactoria con la tecnología de tiratrón de entonces.

La visión de Zumbach comprendía el desarrollo y la construcción de un accionamiento 'Ward Leonard' pequeño y asequible con un invertidor mono bloque y un motor de c.c. y controlador. Esta tecnología solo era practicable y asequible para accionamientos de altísimo rendimiento en aquel tiempo. El sistema «Ward Leonard» se convertiría pronto en la base de la tecnología Zumbach durante años.

A principios de los '60, Zumbach se dio cuenta de que su negocio de accionamientos no podía garantizar un futuro viable para la empresa. El sector ofrecía grandes posibilidades técnicas, lo que llevó a un aumento del número de competidores, quienes empezaron a forzar la bajada de precios y los márgenes de ganancia. El sector de las máquinas-herramienta también inició pronto su fase de declino.

Alrededor de 1972, se desarrolló un plan para producir un probador de excentricidad para cables eléctricos. En 1974, a Zumbach se le concedió una patente para el nuevo dispositivo inductor Ex-Test 7, que se convirtió en el primer éxito importante en lo que era entonces el nuevo campo de los equipos de medida en línea.

Los medidores de diámetro ópticos

pasaron a ser los productos de mayor éxito de Zumbach. Los tipos ODC analógicos se crearon alrededor de 1975 y los medidores absolutos ODAC® a partir de 1977. El ODAC 24 fue el primer medidor absoluto que se vendió en grandes cantidades. "ODAC®" pasó a ser una marca comercial registrada. Desde entonces, se han vendido más de 80.000 ODACs de todo tipo y para una extensísima gama de aplicaciones.

En 1994 Bruno Zumbach dejó la dirección del grupo en manos de su hijo Rainer. En los años siguientes el grupo se expandió y abrió otras subsidiarias, entre otros lugares en Asia.

Además de estas empresas de propiedad de Zumbach, desde entonces se han contratado servicios de representación. De esta manera, uno de los objetivos de Zumbach, la proximidad a los clientes, podría consolidarse al máximo. Y en los últimos 20 años los servicios locales se han ampliado constantemente.

Para ello, en numerosos países se abrieron oficinas de venta y atención al cliente y a partir de 1970 empezaron a crearse empresas registradas. La primera fue en Estados Unidos en 1979, seguida de otras en el Reino Unido, Alemania, Francia, España, Italia, La India, Taiwán y en 2001 en China. Ahora, más de 20 ingenieros de venta en Orpund y en las empresas extranjeras garantizan el éxito de los productos en el mercado global.

Zumbach AG – Suiza
Website: www.zumbach.com

Inspección y análisis de material XLPE y HPTE en la producción de cable de media y alta tensión

Por Harry Prunk, Sikora AG, Bremen, Alemania

Resumen

Los plásticos utilizados para el aislamiento de cables de media, alta y extra alta tensión deben cumplir los niveles de pureza más altos. El material más usado para el aislamiento de cables es el polietileno reticulado (XLPE).

Para reticular el XLPE, el cable pasa a través de un tubo CV (tubo de vulcanización continua) donde queda expuesto a altas temperaturas para el proceso de reticulación.

Generalmente, cuando se fabrican estos tipos de cables, se llena el tubo CV con nitrógeno y se trabaja a una presión de 10 bares. Antes de que se puedan efectuar los procesamientos siguientes en el cable, como la aplicación de una pantalla o cubiertas externas, es necesario efectuar la desgasificación, que puede tardar hasta 10 días. Normalmente, la línea está construida como línea CCV o VCV (vulcanización continua catenaria o vulcanización continua vertical).

Esta tecnología está más que probada porque ha sido usada durante décadas, pero conlleva costes altos para su construcción y para la línea de producción. Además, hay otro método avanzado que utiliza como material de aislamiento el HPTE, un elastómero termoplástico de alto rendimiento a base de polipropileno. Esta nueva tecnología ha sido desarrollada aún más por Prysmian y presentada como tecnología "P-Laser".^[1]

El material presenta buenas propiedades eléctricas y termo-mecánicas, comparables a las del XLPE y, a veces, incluso superiores.

El HPTE no requiere una sección de reticulación ni desgasificación. Esto significa que todo el cable puede ser fabricado en un proceso de producción en línea, durante el cual se pueden aplicar la pantalla y la cubierta externa también, en una única fase de producción.

Sea cual sea el método aplicado, los niveles de rigidez dieléctrica requeridos del XLPE y HPTE son altos y deben ser garantizados. Por este motivo, la limpieza del material aislante es muy importante y aquí es donde entra en juego el sistema avanzado de inspección de pureza y separación.

Este artículo presenta un sistema de inspección y separación en línea que permite detectar la contaminación dentro y en la superficie de los pellets tales como contaminantes metálicos u orgánicos, variaciones de color, aglomerados, contaminación cruzada y pellets extraños.

El sistema que se va a presentar incluye la combinación única de la tecnología de rayos X y un sistema óptico para ofrecer la máxima capacidad de detección de todo tipo de contaminación. Esto permite optimizar la calidad del material XLPE o HPTE y el proceso productivo y, por consiguiente, reducir los costes.

Además, en este artículo se hablará brevemente de un sistema innovador fuera de línea que permite inspeccionar y analizar pequeños lotes de pellets.

Asimismo, esto es importante para controlar los pellets que se han separado por medio del sistema de inspección y separación en línea.

Cable de media y alta tensión aislado con XLPE y HPTE

El material de aislamiento más usado hoy en día para cables de media y alta tensión es el polietileno reticulado (XLPE). El polietileno reticulado se produce sometiendo el polietileno a alta presión con aditivos como los peróxidos orgánicos.

La reticulación se realiza a base de calor y presión. Las cadenas moleculares individuales se enlazan unas con otras dando lugar a una modificación del material que pasa de termoplástico a elástico. Una ventaja del XLPE como aislante de cables de media y alta tensión es su baja pérdida dieléctrica y excelentes propiedades eléctricas y físicas para la transmisión de la energía.

Dado que el XLPE es resistente a la deformación térmica y al envejecimiento, un cable XLPE permite transmitir corrientes elevadas. Otra característica del cable XLPE es su facilidad de instalación. Puede soportar radios de curvatura pequeños y es ligero.^[2]

Algunos años atrás, la compañía Prysmian inventó un nuevo tipo de cable donde se usa el HPTE (elastómero de altas prestaciones) en lugar del XLPE. Este material tiene las mismas características que el XLPE.

La diferencia es que con el HPTE no tiene lugar ninguna reticulación y, por lo tanto, no hay ningún subproducto, el HPTE puede ser reutilizado, permite tiempos

de producción más breves, un área de producción reducida y es compatible con los componentes de red existentes. Ambos materiales, el XLPE y el HPTE, se usan para la producción de cables de media y alta tensión.

La necesidad de material plástico limpio para cables de media, alta y extra alta tensión

La pureza del material plástico que se usa para el aislamiento de cables de alta y extra alta tensión es extremadamente importante. Cuanto más puro es el compuesto (Figura 1), más bajo es el riesgo de rotura.

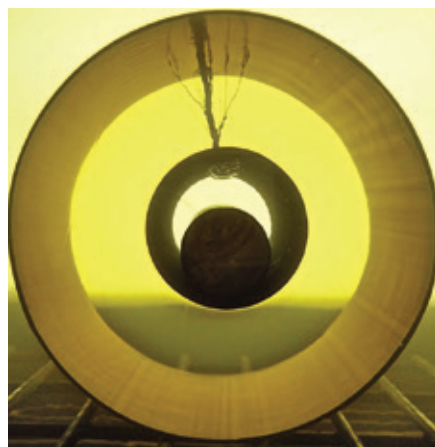
La presencia de impurezas de metal de 50µm puede ya causar daños al producto final con consiguientes costes elevados.

La reparación de un cable submarino defectuoso que, por ejemplo, se ha dañado debido a la contaminación, puede suponer una parada de semanas.

▼ **Figura 1:** Compuesto de aislamiento de alta calidad



▼ **Figura 2:** Sección (transversal) de un cable de extra alta tensión con rotura



Además, el compuesto contaminado del aislamiento puede causar defectos en el cable y fallos consiguientes durante la prueba de descarga dieléctrica con efectos negativos a nivel industrial durante el proceso productivo. Como parte de su proceso productivo, los cables de extra alta tensión (EHV) son probados en la planta de producción con una tensión de prueba 2,5 veces más alta que la tensión nominal.

Normalmente, se registran aproximadamente de cinco a seis roturas (Figura 2) al año en cada sitio de producción, que causan pérdidas enormes.

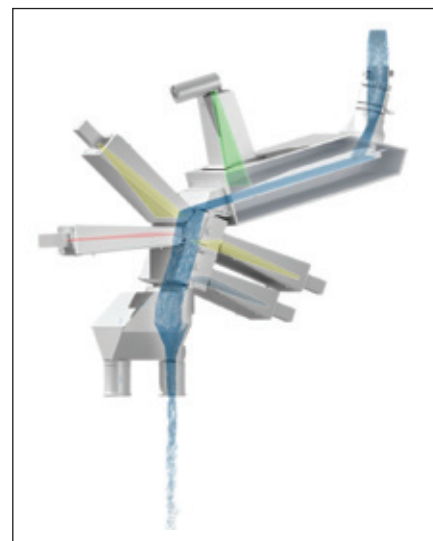
Una sola rotura puede causar un gasto de hasta €150.000 ya antes de que el cable sea instalado en su posición dedicada. Además, se pierde tiempo muy valioso, al no poderse respetar las fechas de entrega. A menudo, se deben usar juntas no pactadas, dañando la imagen de calidad del productor, y llevando a penalidades contractuales. Por esta razón, algunas normas para cables de alta tensión establecen la eliminación de contaminantes de más de 75µm de los materiales procesados.^[3]

Además, existen recomendaciones de la AEIC (Association of Edison Illuminating Companies), que establecen que los cables sean diseñados para durar por lo menos 40 años. Por consiguiente, es necesario inspeccionar el material para que tenga una pureza del 100 por cien antes de que quede integrado en el producto final. Las tomas de muestras no son suficientes para excluir de manera fiable cualquier tipo de contaminación.

En el día de hoy, los fabricantes de cables usan filtros para separar las impurezas del compuesto de XLPE y HPTE antes de que contaminen el cable. Los filtros se colocan directamente en el flujo de material fundido, después de la extrusora y antes del cabezal inyector. Sin embargo, estos filtros pueden quedar obstruidos después de un tiempo de funcionamiento debido a la presencia de material quemado o a un exceso de contaminantes.

En este caso, la presión del material fundido en la extrusora puede aumentar significativamente hasta tener que parar la producción para cambiar los filtros. Esto significa que luego habrá que hacer una unión en ese punto.

Las juntas, es decir los puntos donde los cables están soldados, se hacen manualmente y siempre son puntos delicados, en particular en el caso de cables submarinos para instalaciones en alta mar. Por esto, los fabricantes de cables tratan de entregar cables largos con el mínimo número de juntas por donde los



▲ **Figura 3:** Sistema de inspección y separación con cámara de rayos X (verde), cámara óptica (amarillo), de infrarrojos (rojo) y de colores (azul)

cables podrían romperse. Dado que los filtros atascados reducen la productividad de la línea, se deben implementar métodos fiables para detectar y apartar los contaminantes en el material de polietileno.

Control de la pureza de XPLE y HPTE antes del procesamiento del material: inspección y separación

Hoy en día, para inspeccionar los pellets existen sistemas que se usan tanto en los laboratorios o como en el control fuera de línea durante el proceso de producción de los gránulos. La mayor parte de los sistemas se basa en la tecnología óptica para detectar la contaminación en la superficie de los pellets. Pero la contaminación dentro de los pellets no puede ser detectada por estos sistemas.

El sistema de inspección y separación descrito a continuación permite efectuar el control de calidad total en línea usando la tecnología de rayos X y una técnica óptica.

Los contaminantes son identificados por un software de procesamiento de imágenes, clasificados como contaminación y separados automáticamente. Esta tecnología permite detectar impurezas de hasta 50µm.

Tecnología de rayos X

El principio de base de la detección con tecnología de rayos X se basa en la

diferente atenuación del material. El XLPE incluye principalmente carbono. El átomo de carbono tiene seis protones en su núcleo.

Un contaminante muy corriente podrían ser las partículas de acero procedentes de la extrusora o la granuladora, que están constituidas principalmente por hierro (FE).

El hierro tiene 26 protones en su núcleo. Dado que estos 26 protones presentan una atenuación mucho más alta a los rayos X que los seis protones del carbono, es posible generar un contraste perfecto entre los dos materiales en la imagen radiográfica.

Tecnología óptica

Por lo que se refiere a la inspección óptica, la iluminación es esencial. Para grabar de manera precisa los flujos de materiales a velocidad industrial, se usan tecnologías de cámara modernas (cámaras ópticas, de infrarrojos, de colores).

Junto con el sistema óptico, se usa un potente software de procesamiento de imágenes similar al usado para la inspección con rayos X para detectar la contaminación.

Por lo tanto, configurando un cierto umbral, todos los pellets contaminados que superan el umbral en el algoritmo matemático, son separados.

Contaminación típica detectada por las tecnologías de rayos X y óptica

La combinación de ambas tecnologías de rayos X y óptica permite detectar la contaminación en el pellet y en su superficie (Figura 4).

La tecnología de rayos X permite inspeccionar pellets transparentes y de color (ej. negros) y material de XLPE semiconductor para detectar las impurezas.

Los rayos X permiten detectar impurezas típicas, como los contaminantes metálicos y orgánicos, y falta de homogeneidad (TiO_2) dentro del pellet. Además, está el sistema óptico, que detecta por ejemplo impurezas negras en el pellet, objetos o pellets extraños, u otra contaminación orgánica o metálica.

Integración del sistema en la línea de producción

El sistema se instala normalmente entre la tolva alimentada con material de XLPE y HPTe (ej. octabín, bolsa o silo) y la tolva de la extrusora, donde el compuesto es alimentado por gravedad.

Inspección y análisis de pellets, cascarilla y cintas/películas en línea y fuera de línea

Además de los dispositivos de inspección y separación en línea, existen sistemas modulares para la inspección y el análisis en línea y fuera de línea de pellets, cascarilla, cintas/películas.

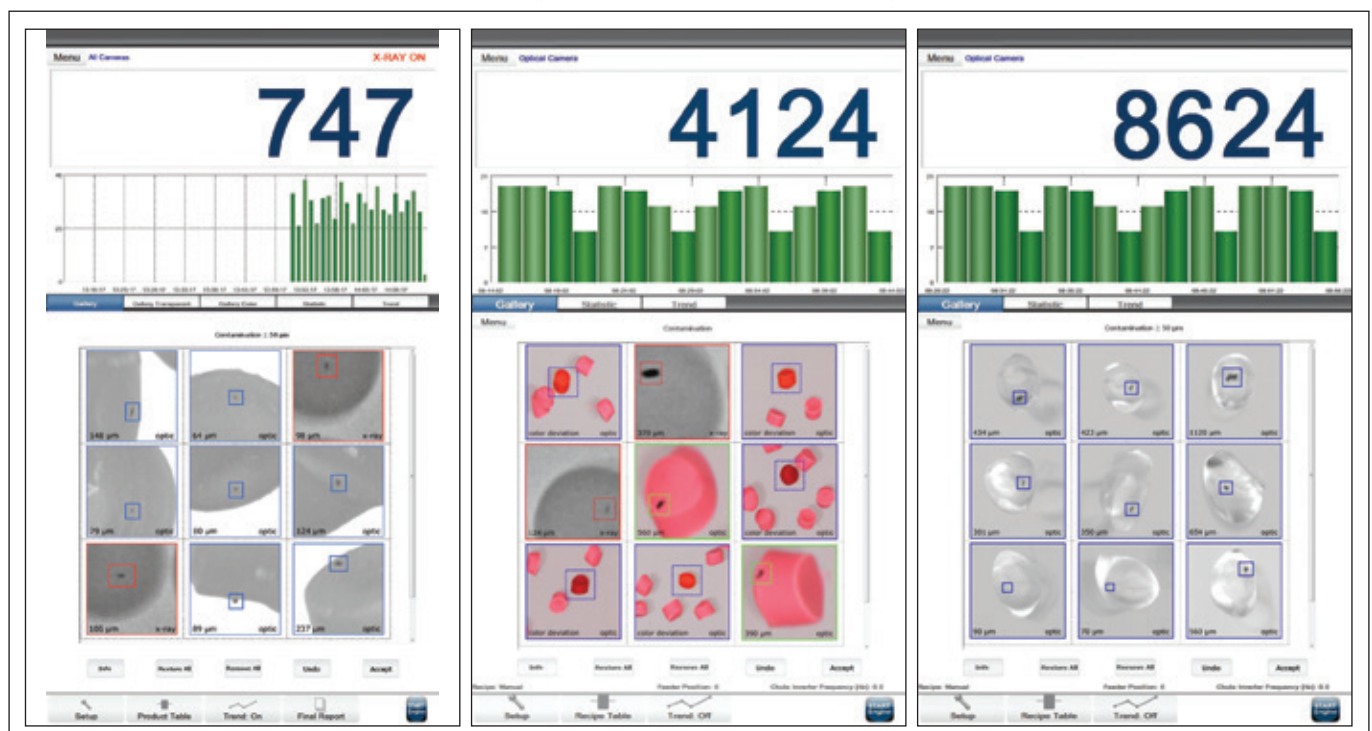
Estos se usan para volúmenes de producción reducidos y en líneas de producción donde es suficiente la prueba de muestras o el control de la mercancía entrante.

Según la aplicación, los sistemas están equipados con tecnología de rayos X (X), tecnología de infrarrojos (IR) o sensores ópticos (V) que se usan durante la producción o para la prueba de muestras, y permiten detectar contaminantes a partir de $50\mu\text{m}$.

Por ejemplo, un dispositivo de inspección y análisis de laboratorio con tecnología de rayos X (Figura 5) inspecciona hasta 3.000 pellets (200ml) puestas en una bandeja. En pocos segundos, estos pellets son inspeccionados para buscar posibles contaminantes.

Luego, los pellets contaminados son destacados ópticamente, lo que facilita enormemente la extracción de los elementos contaminantes.

▼ **Figura 4:** Mediante la tecnología de rayos X y una inspección óptica el sistema detecta la contaminación dentro y en la superficie del pellet de plástico. El sistema detecta contaminación metálica, impurezas negras, decoloración amarilla y variaciones de color en material transparente y no transparente





▲ **Figura 5:** Inspección fuera de línea y sistema de análisis

Para una optimización completa del proceso, los fabricantes de cables combinan un sistema de inspección y separación en línea con un dispositivo de inspección y análisis fuera de línea.

Tras detectar y separar los pellets contaminados, el sistema de laboratorio inspecciona estos pellets de nuevo y marca ópticamente la contaminación para facilitar la separación de todo el material rechazado.

Esta interacción de inspección y análisis en línea y fuera de línea permite controlar la pureza del material y crear una base de datos para evitar contaminación futura.

Conclusión

En resumen, podemos decir que en este artículo se han analizado las razones por las cuales es necesario tener un alto grado de pureza del material XLPE y HPTE usado para el aislamiento de cables de media y extra alta tensión.

Además, el artículo ha presentado los sistemas de control de calidad del XLPE y del HPTE en línea y fuera de línea que permiten inspeccionar el material antes de su procesamiento.

El sistema de inspección y separación presentado permite detectar pellets contaminados y separarlos antes de usarlos en el proceso de extrusión.

Los contaminantes pueden encontrarse ya en el material bruto, pero pueden añadirse también durante las fases de manejo y transporte. Por lo tanto, incluso si los fabricantes de cable continúan usando filtros, esta tecnología garantiza que los filtros no se atasquen con las impurezas de

pellets contaminados y, por consiguiente, asegura una producción más larga y segura.

Usando las tecnologías de rayos X y óptica, se pueden detectar los contaminantes dentro y en la superficie de los pellets, garantizando así un control de calidad total. Con el uso de un sistema de inspección y análisis fuera de línea de los pellets contaminados que han sido separados por el sistema de inspección en línea, se pueden mejorar incluso más los procesos de producción.

De esta manera, se controla la pureza del material y, además, el análisis provee información útil para evitar la contaminación futura.

Considerando todas estas ventajas, el uso de las tecnologías presentadas para el control de calidad del material de XLPE y HPTE es esencial para asegurar cables de media y extra alta tensión de alta calidad.

Al mismo tiempo, asegurando un alto grado de pureza del material de XLPE y HPTE, se evita el coste de los materiales necesarios para volver a fabricar los cables que no han pasado la prueba de descarga dieléctrica y se mejora en gran medida la eficiencia de la línea de producción del cable. ■

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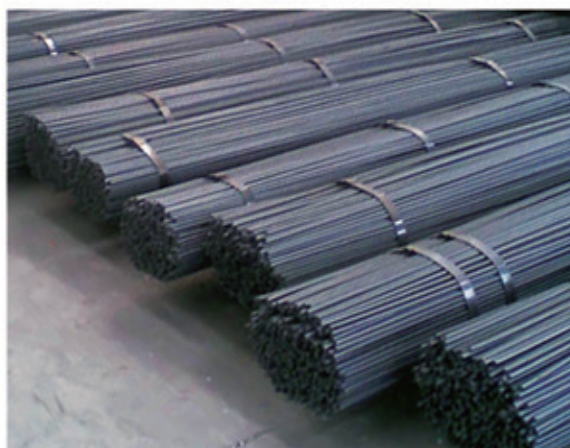
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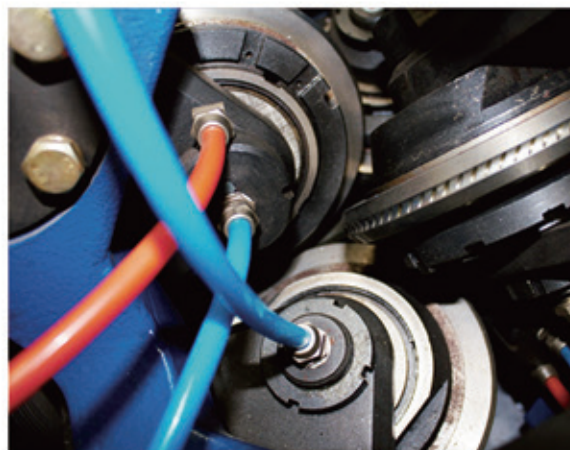
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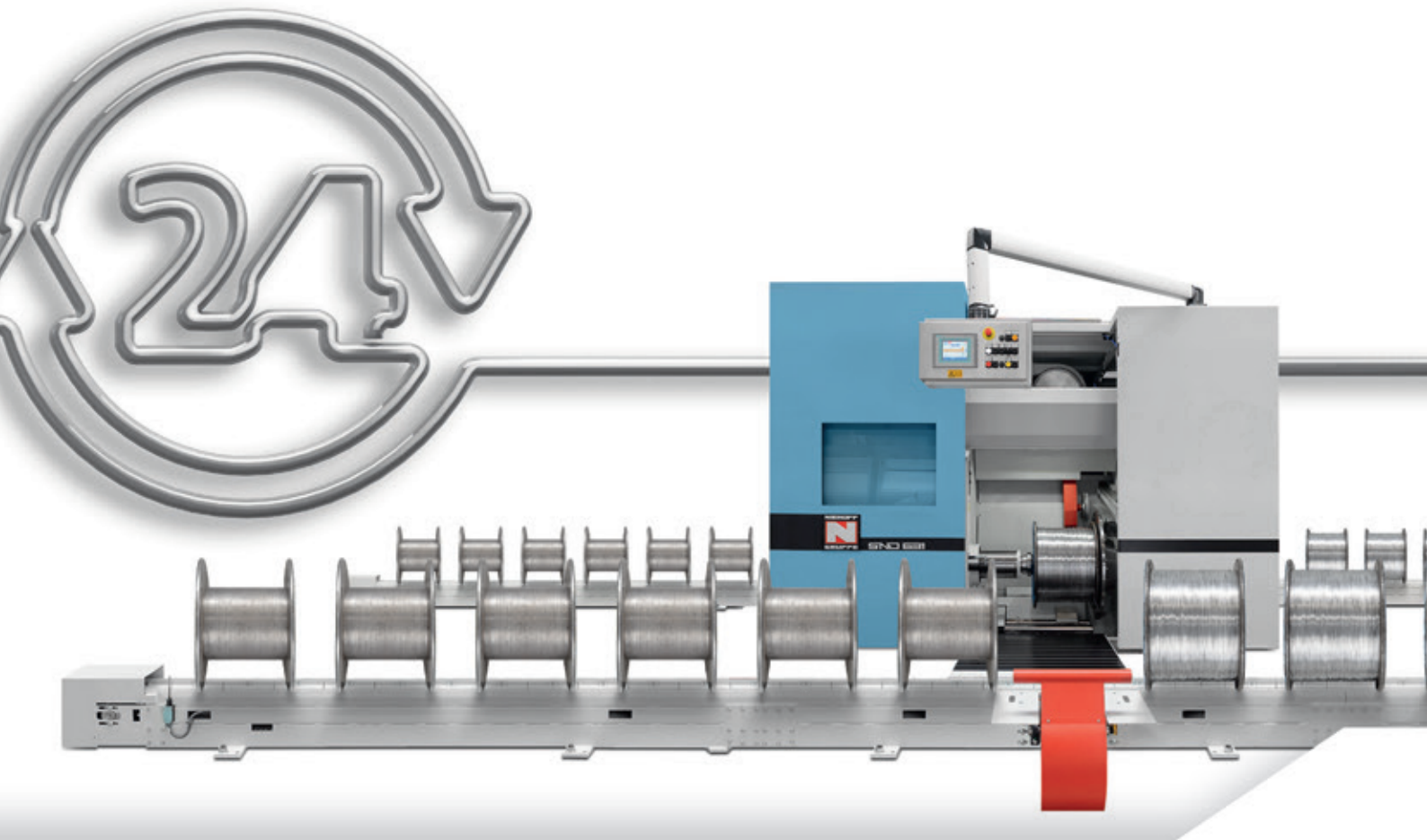
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