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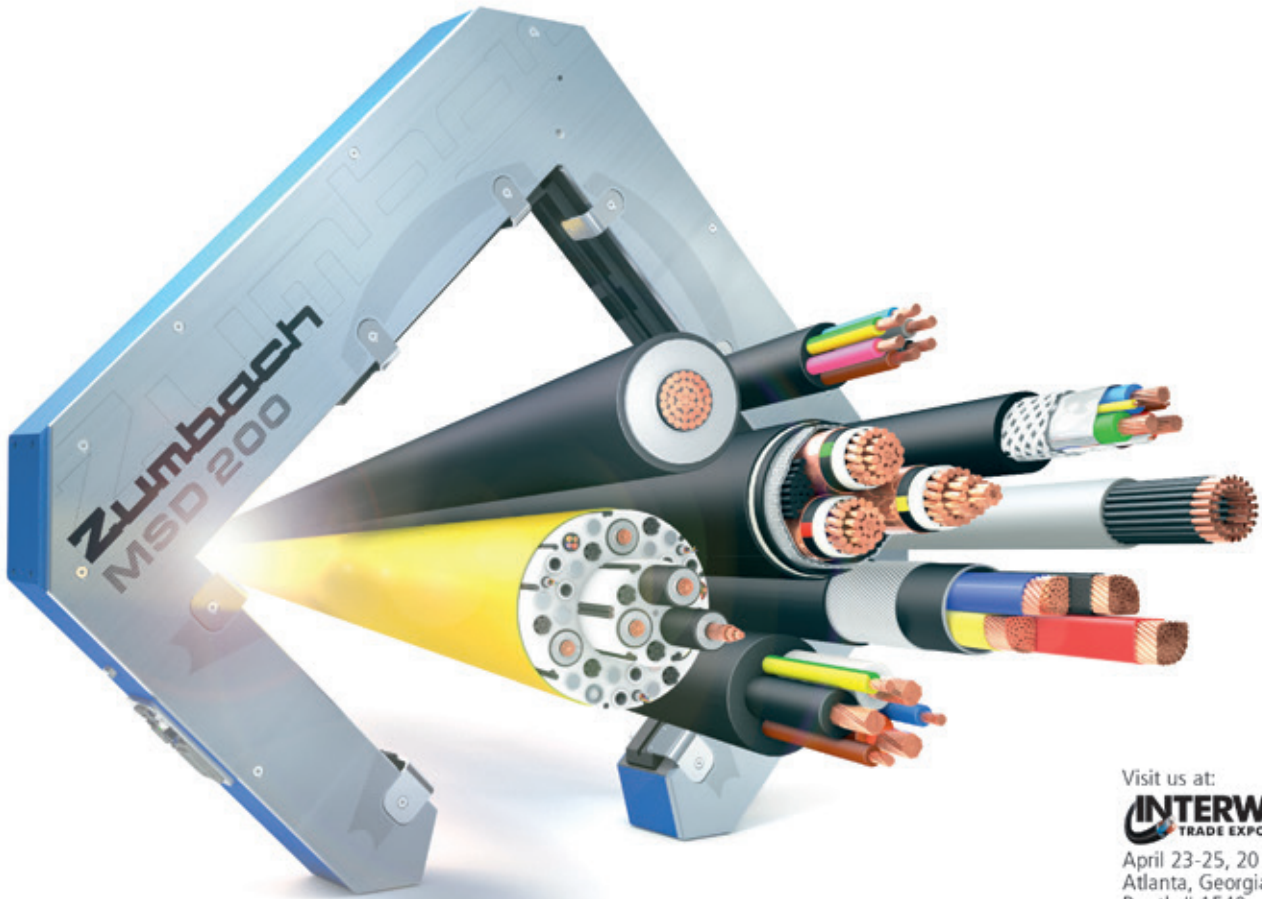
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Stephanie Imöhl, Head of Procurement & Logistics at SIKORA AG



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Modest growth and far fewer risks

The International Monetary Fund foresees modest global economic growth, with fewer risks of major policy mistakes and less financial stress.

The organisation said in January that it expects to see a modest upturn in global growth this year of 3.5 per cent and then 4.1 per cent in 2014, up from 3.2 per cent in 2012.

Still, the IMF — the global economy’s lender of last resort to countries in crisis — noted that financial stresses and the risk of a major policy shock in Europe and the United States have decreased. “Optimism is in the air,” said Olivier Blanchard, the fund’s chief economist. “Some cautious optimism may indeed be justified.”

Mr Blanchard noted that financial markets have become considerably more sanguine over the last year, with the European Central Bank starting a major new bond-buying programme and the US avoiding the worst of the so-called fiscal cliff package of tax increases and budget cuts.

While that could be a sign that financial markets are experiencing some kind of “bubble,” Mr Blanchard also said that investors could be “seeing things which are truly good.” Ultimately, with less financial stress, the real economy should pick up, thus explaining the market optimism, he said.

For Washington, priorities recommended by the IMF would be to avoid excessive fiscal consolidation in the short term and promptly raise the debt ceiling. Christine Lagarde, the fund’s managing director, and other IMF officials have repeatedly warned politicians in Washington not to embark on too stringent an austerity programme, for the good of the world economy as well as that of the United States.

Thomas Helbling, of the fund’s research division, said that the US faces a long-term fiscal problem, with much of the policy challenge resting in bringing down health care spending over time. But he said that the challenge seemed “doable,” and stressed that other countries faced far more wrenching adjustments.



David Bell
 Editor



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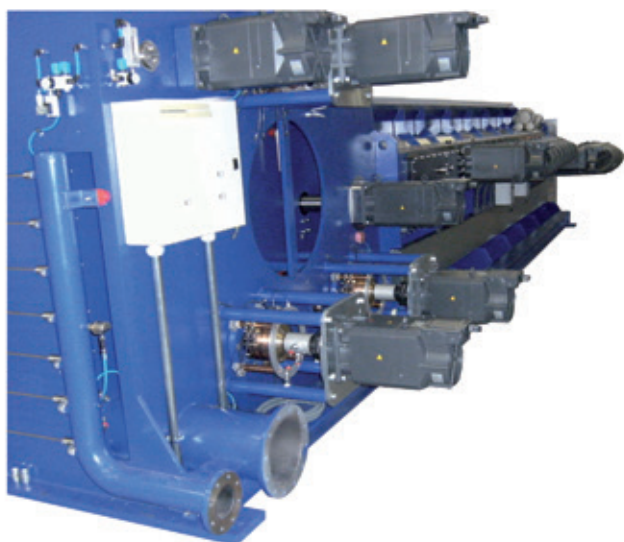
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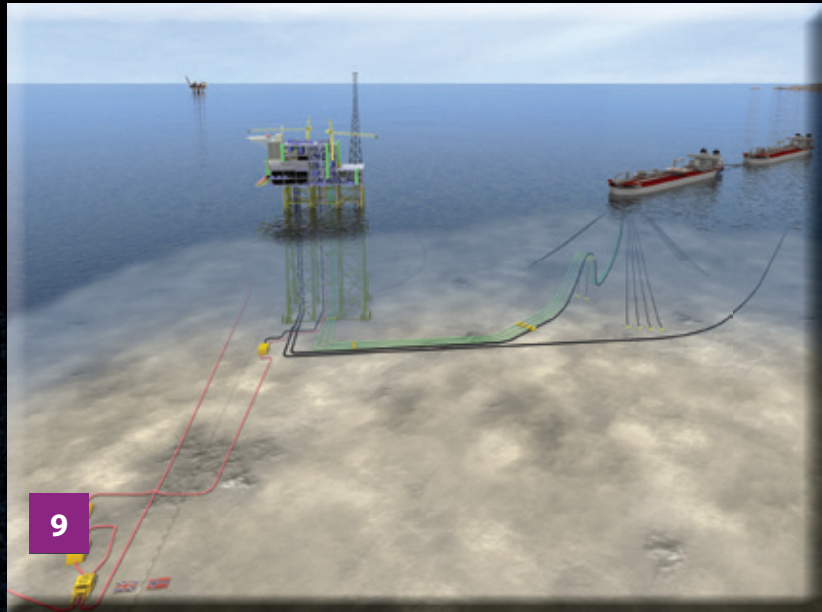
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Getting Technical

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wire Russia 2013

25–28 June: **wire Russia** –
trade exhibition –
Moscow, Russia

Organisers:

Messe Düsseldorf GmbH

Fax: +49 211 4560 7740

Email: info@wire-russia.com

Website: www.wire-russia.com

April 2013

23–25 April: **Interwire** – trade
exhibition – Atlanta, USA

Organisers:

Wire Association International

Fax: +1 203 453 8384

Email: info@wirenet.org

Website: www.wirenet.org

June 2013

16–18 June: **Guangzhou Wire
and Tube** – trade exhibition –
Guangzhou, China

Organisers:

Julang Exhibition Company Ltd

Fax: +86 203 862 0781

Email: meiwen@julang.com.cn

Website: www.julang.com.cn

September 2013

17–19 Sept: **wire/Tube SE Asia** –
trade exhibition – Bangkok, Thailand

Organisers:

Messe Düsseldorf Asia Pte Ltd

Fax: +65 6332 9655

Email: wire@mda.com.sg

Website:

www.wire-southeastasia.com

October 2013

1–3 Oct: **wire South America**
– trade exhibition – Imigrantes
Exposicoes Exhibition Centre,
São Paulo

Organisers:

Messe Düsseldorf/Grupo Cipa

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Email:

infoservice@messe-duesseldorf.de

Website: www.wiresa.com.br

November 2013

4–5 Nov: **CabWire World
Conference** – conference – Milan,
Italy

Organisers:

ACIMAF, CET, IWCEA, IWMA, WAI

Fax: +44 1926 314755

Email: info@iwma.org

Website: www.cabwire.com

10–13 Nov: **IWCS 2013** –
trade exhibition –
Charlotte Convention Center,
Charlotte, NC, USA

Organisers:

IWCS

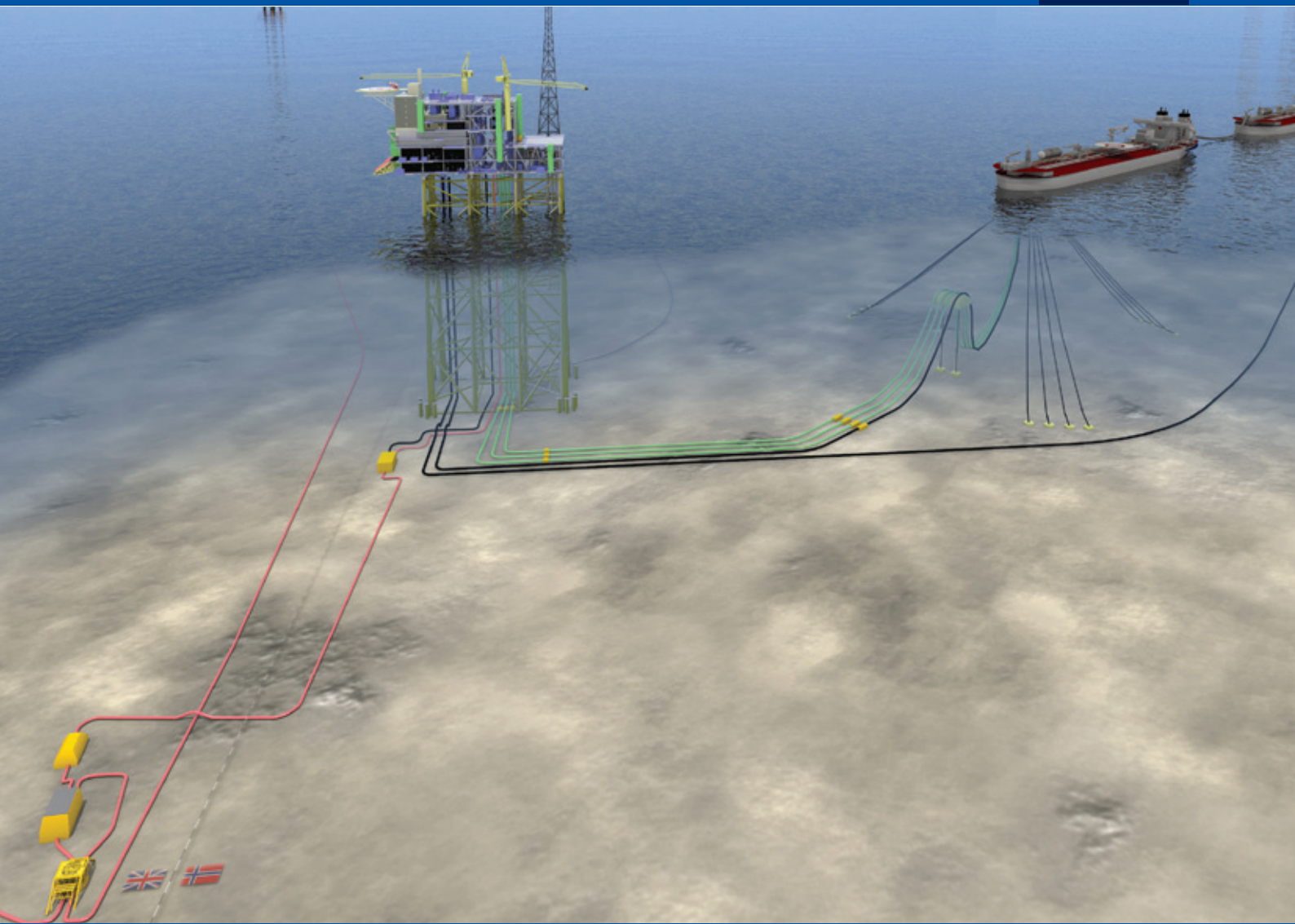
Tel: +1 717 993 9500

Email:

phudak@iwcs.org

Website: www.iwcs.org

Image courtesy of www.bigstockphoto.com 'Monument to Peter the Great in Moscow' Photographer Andrew Boyd



▲ Subsea 7 will lay a 160km power cable from the Martin Linge platform in the North Sea

\$800m North Sea contract

UK-based company Subsea 7 has won a contract worth \$800m from Total E&P Norge, for the development of the Martin Linge gas field located in the North Sea.

The contract includes the establishment of a 160km power cable from the Martin Linge platform, located 180km west of Bergen, to Kollsnes.

Subsea 7 will also provide umbilical and spools for the gas export system, a 55km fibre optic cable and a 3km pipeline and riser system from the Martin Linge platform to the floating storage unit.

Subsea 7 Norway vice president, Stuart Fitzgerald, said the project is the largest subsea, umbilical, riser and flowline (SURF)

contract awarded to the company on the Norwegian continental shelf.

The company has also unveiled the cutting edge Seven Viking vessel, designed for operations in the harshest environments.

The next generation Inspection, Maintenance and Repair (IMR) vessel, the Seven Viking, is co-owned by Subsea 7 and Eidesvik and has been constructed in partnership with Ulstein.

The ICE-C class vessel with a crew capacity of 90 and a top speed of 17 knots, will work for Statoil on a five-year contract.

It has been custom-built according to the operator's specifications to carry out tasks

including inspection, maintenance and repair of subsea installations in addition to scale treatment and RFO work scopes.

Thanks to a clever configuration whereby hull space is maximised and equipment is integrated within a large hangar area, the Seven Viking and its crew have the ability to carry all necessary maintenance equipment on board, ensuring that operational downtime is kept to a minimum.

Safety, efficiency and environmental considerations have been the prime focus for the three partners when developing the Seven Viking.

Subsea 7 – UK
Website: www.subsea7.com

Further expansion plans for Anglia Metal

IN June 2012 Anglia Metal started its activities in copper wire manufacturing for the cable industry and other markets processing copper wire such as can welding and solar ribbon manufacturers.

Formerly trading under Tri-Wire Ltd, the company found a new industrial investor who has a long-term and sustainable strategy in the copper industry.

The new owner has taken on all the management team of Anglia Metal, as well as the experienced staff, and now the company is able to focus on the optimisation and expansion of the business.

The company focus is on supply chain excellence and on the ability to provide a broad range of wire products in plain or tinned varieties.

The product scope ranges from 0.1mm single and multi end wires, various flexible conductors up to a cross section of 10mm² to small braiding bobbins for screening applications.

The production equipment is in line



▲ The Anglia Metal factory in West Yorkshire, UK

with the industrial standard and the factory has gone through continuous improvement exercises over recent years.

Anglia Metal is able to provide very short lead times because of the flexibility and the commitment to customer success by the workforce.

The customer base in the UK is active in data, telecom, building, industrial and automotive cable manufacturing as well

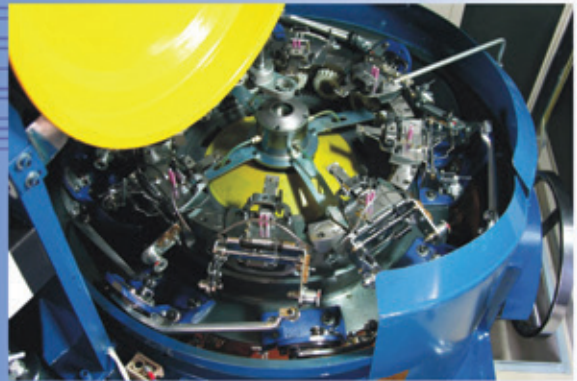
as can production. The company looks forward to further expansion into special wires and other activities in the European market.

Further expansion of the product scope is planned in order to secure local customers an expanded source for their copper wire needs.

Anglia Metal – UK
Website: www.angliametal.com

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Going solo

After more than 25 years working in cooperation, La Farga Group (Spain) and Continuus-Properzi (Italy) have decided to change strategy for approaching the new opportunities offered by the market and proceed independently.

All works and commissioning in progress will be completed to all buyers of CCR copper rod lines and refining furnaces, in combination with La Farga refining technology developed and perfected during the past 25 years.

Marketing director



▲ Terje Moldestad

EFD Induction has appointed Terje Moldestad as new group sales and marketing director. Mr Moldestad takes over from Truls Larsen, who is moving into the company's business development department.

Mr Moldestad took over his new role on 1st January and is based in Skien, Norway.

Building on strong Turkish history

COMBINING business with education seems to be proving fruitful for Deka Surface Technologies.

The fortunes of the Turkish company, formed in 1957 as a simple welding store, has changed since Kemal and Omer Demirkurt, sons of the original owner, took over the business in 1989.

Since their involvement and investment on CNC machines, the company has become partners with many local companies in the areas of automotive, agriculture, printing, steel and iron, defence, marine and aviation.

In 1989 they started their first hot system fusing coating and officially started their coating business.

As they have already gained vast experience on metals in general, combining it with coating has put them in a lucrative position.

Together with their unstoppable desire for innovation, Deka has grown pretty fast. They have always had their hands into the metals, but also, in the theoretical side, they have started working with universities on finding new coating solutions.

In 1998, Deka started producing



▲ Deka has grown quickly thanks to the desire for innovation

and coating parts for the wire drawing sector.

"The power of Deka is not only due to experience but also to the ability to control the whole manufacturing thanks to its in-house machining process," said Kemal.

"Deka has specialised in applying coatings that protect metal components against wear, abrasion and corrosion.

"Many industries have benefited from Deka's know-how and its capability to detect the problem and offer the solution."

Omer, responsible from the technical side of the business, added: "Coating is a sophisticated subject, because many things should be taken into consideration.

"Understanding the reason of wear is very important for the choice of the coating. Tungsten carbide, aluminium oxide, chrome oxide and zirconium oxide are the most popular ones for the wire drawing sector."

Deka Ltd Sti – Turkey
Website: www.deka.com.tr

Tongling orders Contirod® plant

The Tongling Nonferrous Metals Group from Anhui Province has ordered a complete Contirod casting and rolling plant for the production of copper wire rod.

The high-performance line, from SMS Meer, can produce 225,000 tons of copper wire rod per year from cathodes, and is intended to further strengthen Tongling's position in the copper business.

The Contirod line is designed for a capacity of 35 tons per hour, and will be one of the largest integrated copper casting and rolling plants in China.

The line comprises a gas control system on the SMS shaft furnace for melting copper cathodes and a modular Hazelett twin-belt caster.

The casting cross-section is 90mm x 70mm, followed by the rolling line with a 12-stand rolling mill.

The enormous reduction in the cross-sectional area from the cast ingot to the wire rod creates a very fine-grained material microstructure.

"The modern and energy-efficient technology such as the gas control system and the variable-frequency drives make the plant one of the most cost-effective of its kind," claims Thomas Schatz, project manager at SMS Meer.

Commissioning of the line is expected in autumn 2013.

SMS Meer GmbH – Germany
Website: www.sms-meer.com

OUR INTERWIRE 2013 SECTION STARTS ON PAGE 52

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- Semi-conductive non-woven tape
- Semi-conductive cotton tape



2. Water-blocking Tape Series

- Water-blocking tape
- Film laminated water-blocking tape



3. Insulation Binding Tape Series

- Polyester tape
- Non-woven tape
- Strengthened light non-woven fabric

4. Flame Retardant Tape Series

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- Thin flame retardant tape
- Fire resistant mica tape - Phlogopite mica tape
- Synthetic mica tape

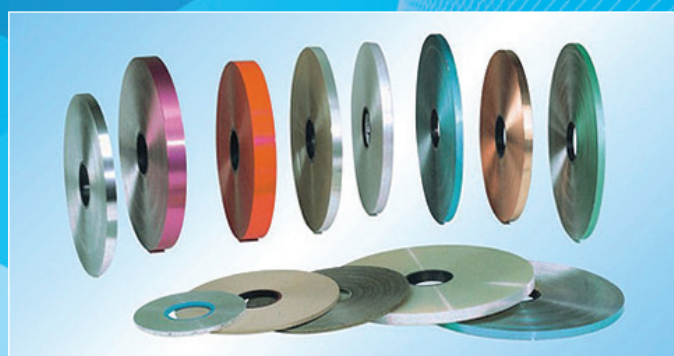


5. Metal Shielding Tape

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6. Filling Rope Series

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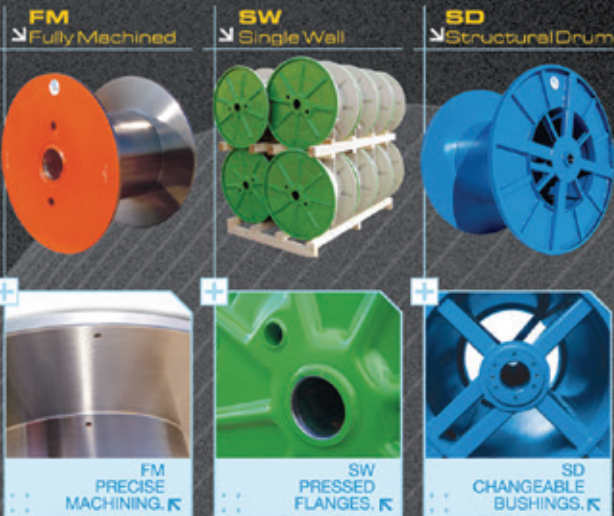
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New general manager

PHILIP Evans has been appointed general manager of Bar Products and Services Ltd.

Mr Evans has many years' experience in the industry and will play a very active role within the business, including having overall control over production planning, order processing, buying and stock control.

He will also play a significant role in implementing the company's development strategy. The appointment comes as Bar Products & Services has received several new export contracts for machinery and equipment into the wire rope industry and has expanded its shaped die capabilities to service the increase in demand from new and established customers worldwide.

The company is also expanding its operations through various projects in India and China.

"The business has grown substantially over the last few years, with additional manufacturing space and a significant investment in new machinery, it is important that we manage the business efficiently. The addition of Philip to the existing team will enable the company to move forward more effectively over the coming years, as we look to expand our markets in these exciting times," said Steven Rika, managing director.

Additional manufacturing staff have also been taken on in the engineering department to keep up with the increased production levels.

As a member of the IWMA (International Wire machinery Association) Bar Products & Services Ltd will be visiting many of the industry exhibitions around the world during 2013 and would be happy to meet new and existing customers.

Bar Products and Services Ltd – UK
Website: www.barproductsandservices.com

SCA and E.ON venture

SCA has signed a joint venture agreement with E.ON, through which the two companies will develop a number of wind power projects.

The joint venture includes the areas operated by SCA Vind until the license application: Hästkullen and Björnlandhöjden in Härnösand, and Kramfors and Timrå municipalities. The agreement also covers wind power projects in southern Ånge and in Ljusdal.

The project is expected to begin operations during 2016 or 2017.

SCA Energy – Sweden Website: www.sca.com



▲ Philip Evans, the new general manager at Bar Products and Services



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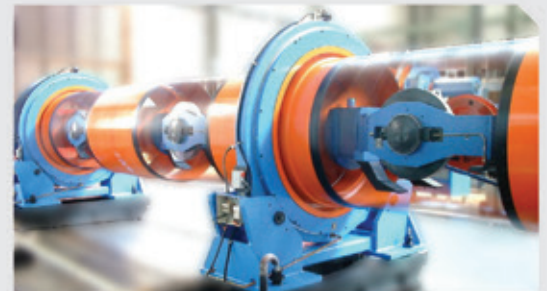
Single Twist Stranders



Bow Skip Stranders



Tubular Stranders



Planetary Stranders



SZ Stranders



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212**

... and Shielding Lines, Taping & Rewinding Lines

New CEO

Alberto Iperti has been appointed chief executive officer of Tenova.

The 48-year-old electrical engineer graduated at Politecnico di Milano, and in 2000 started work for the Techint Group, first as planning director of TenarisDalmine in Italy and then as managing director of Exiros in Argentina, the procurement company of the Techint Group's steel division.



▲ *New Tenova CEO Alberto Iperti*

From 2005 he held the office of Tenaris Global planning director in Argentina as well. In order to join Tenova he has left the role of managing director Tenaris Canada.

During his stay in Canada Mr Iperti was also elected vice-chairman of the Canadian Steel Producers Association, and was an executive member of the board of Canadian Manufacturers & Exporters and the Canadian Council of Chief Executives.

North America takes group stand at wire Russia

WIRE Russia takes place from 25th to 28th June this year at the ZAO Expocentr in Moscow.

A special feature at the event will be the North American group stand, organised by Messe Düsseldorf North America and supported by the Wire and Cable Industry Suppliers Association (WCISA).

This group stand provides a cost-effective means for companies to enter into or to expand their business in the Russian marketplace. Exhibit space on the stand can be reserved now by contacting Messe Düsseldorf North America.

The Russian market has been very strong and continues to provide business opportunities for international companies producing, processing or trading wires and cables.

In addition to the North American group stand, exhibitors from Austria, China, France, Germany and Italy will be represented within official country pavilions. Overall, over 200 exhibitors from more than 30 nations will participate.

The event will again be jointly organised by Messe Düsseldorf

and its subsidiary Messe Düsseldorf Moscow – with the support of leading Russian and international industry associations: All Russian Cable Scientific Research and Development Institute (VNIIKP), the International Wire & Machinery Association (IWMA), the International Wire and Cable Exhibitors Association (IWCEA), the German Wire and Cable Machine Manufacturers Association (VDKM), the Austrian Wire and

Cable Machinery Manufacturers Association (VDKM-AWCMA), the International Wire and Cable Exhibitors Association-France (IWCEA-France) as well as the Italian Wire Machinery Manufacturers Association (ACIMAF) and the Wire and Cable Industry Suppliers Association (WCISA).

Messe Düsseldorf – Germany Website:
www.messe-duesseldorf.com

CabWire call for papers

The leading international wire and cable industry associations are collaborating again to hold the 6th CabWire World Conference at the Palazzo Turati in Milan, Italy on Monday, 4th November 2013.

This year's theme will be "Innovations driving worldwide wire and cable markets" and will feature a panel of both ferrous and non-ferrous expert speakers, presenting papers on the latest technological developments within industry.

The conference will also have table top exhibits on display and there will be the opportunity to attend a gala dinner at the nearby Royal Palace which overlooks the historic Duomo Piazza. There will also be a guided factory visit on Tuesday, 5th November.

To be considered to present a paper or book your place as a delegate, more information is available at www.cabwire.com

The conference is jointly organised by ACIMAF, CET, IWCEA, IWMA and WAI.

Four-year project of using stored electricity to meet demand

KiWi Power and UK Power Networks will work together on a four-year project examining the technical challenges and commercial opportunities of using stored electricity to meet peak energy demands.

The Smarter Network Storage (SNS) project is one of five schemes selected by Ofgem to help secure the UK's electricity supply and develop a new smart grid network.

The five schemes received funding through Ofgem's low carbon networks (LCN) fund, which aims to accelerate the development of a low carbon energy sector, improve efficiency of the electricity distribution network and deliver financial benefits for end users.

One of the aims of the SNS project will be to trial storage technology and investigate the financial benefits of deferring or avoiding network reinforcement and selling flexibility services.

Installation of a large-scale 6MW/10MWh energy storage facility at a trial site in Bedfordshire started in January 2013.

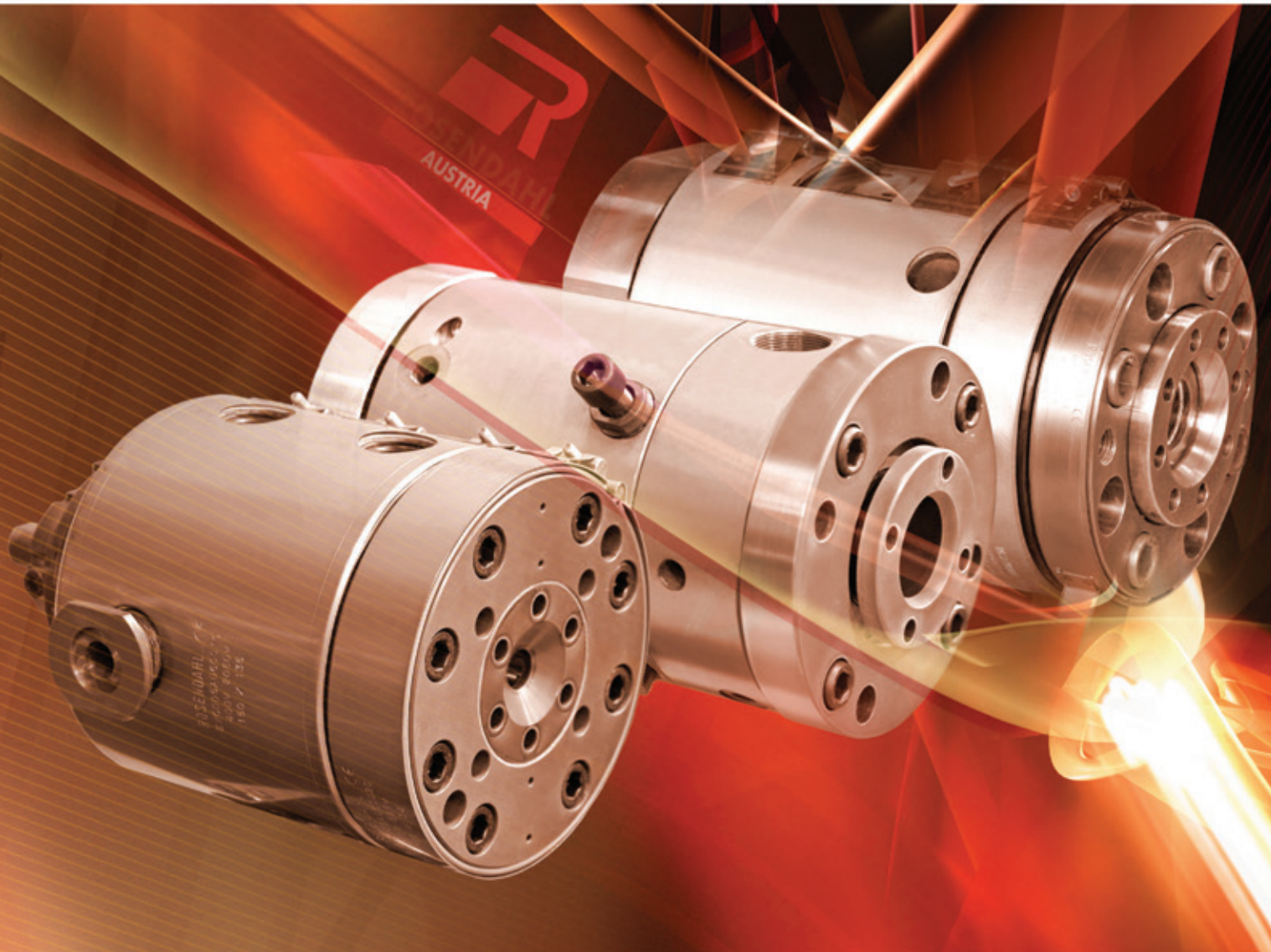
Yoav Zingher, CEO and co-founder of KiWi Power, said: "In order to achieve our renewable energy targets, the UK will need more than 40GW of new low-carbon capacity by 2030.

"Alongside demand-side response measures, energy storage has the flexibility to meet increasing demand peaks and help to manage the supply-side energy provision from intermittent wind and inflexible nuclear energy.

"This trial is an important step towards proving the benefits of energy storage and will provide essential information for understanding the practicalities and economics of energy storage ahead of a smart grid transition."

Kiwi Power – UK Website: www.kiwiPowered.com

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Tratos' North Sea fire resistant cable deal

TRATOS Ltd, UK manufacturer and stockist of electric and fibre optic cables, has won a £5 million order for specialist fire resistant cables from ConocoPhillips for Phase 1 of the Jasmine discovery in the UK, Central North Sea.

Jasmine, one of the UK's largest exploration discoveries since the mid-1990s, was discovered by a ConocoPhillips-operated exploration well in 2006.

First production from Jasmine Phase 1 began in the fourth quarter of 2012 and the core development is expected to produce at an annual gross peak sales rate of more than 88,000 barrels of oil equivalent per day.

Tratos will be supplying medium and low voltage cables for Jasmine Phase 1 designed and manufactured by the company with exceptional fire resistance properties.

Tratos, whose primary market is the oil and gas industry, was the only company able to fully meet ConocoPhillips' rigorous spec for this specialist cable, which was delivered in full last year.




▲ Drum twister from Tratos

All Tratos offshore cables have been tested extensively both in laboratory trials and actual installations and have proven to be exceptionally reliable.

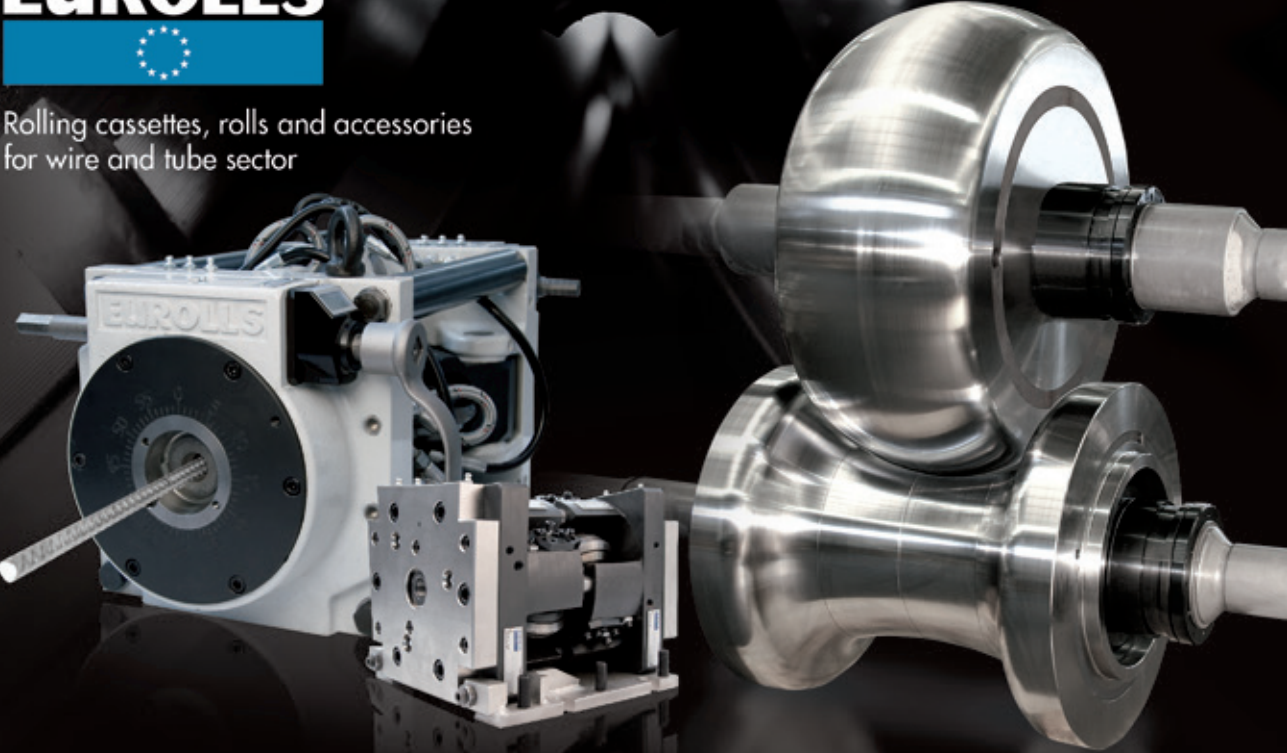
They can be produced to a very wide

range of standards including UK standard BS6883, Norwegian standard NEK 606 and Eni Italian.

Tratos Ltd – UK
Website: www.tratos.co.uk



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UK wave 'hot-spots' in Cornwall and Scotland

NEW research from the Carbon Trust reveals that the Cornish coast and the waters west of Scotland, off Lewis and Uist, are the UK's wave power "hot spots".

These areas, 100km offshore on the edge of the UK's continental shelf, are the most economically suitable locations for developing wave energy, where wave

devices would maximise energy capture from the Atlantic swells.

If exploited, sites in these locations could generate power from waves at around half the cost of current developments. "If we can continue to innovate, to prove the technology at scale and to bring down costs, then there is every reason to believe that wave power can provide a significant contribution to our energy needs," says Stephen Wyatt of the Carbon Trust.

While UK waters offer a potential total resource of 230TWh per year, the Carbon Trust's estimates indicate that wave energy devices could extract a total of up to 95TWh per year. Of that, some 32-42TWh per year – or over 10GW of wave energy capacity – is technically and economically realistic to extract.

If wave farms of 500km in length could be installed to deliver 42TWh per year, it would provide 11 per cent of the UK's current power generation requirements.

Cable cost rise for Western Isles

Scottish Hydro Electric (SHE), a subsidiary of energy company SSE, expects the cost of a planned subsea power cable to increase by 75 per cent. The cable, to link renewable energy projects on the Western Isles with mainland Scotland, is now expected to cost in excess of £700m.

SHE said that completion of the cable and the £75m worth of infrastructure needed on Lewis, originally anticipated for 2015, could be delayed for 12 months or longer.

The Western Isles Council leader has called for an inquiry into the project. Angus Campbell said questions needed to be asked about the costs and timescale of the link.

SHE said it was committed to working towards achieving timely, cost effective investment in the transmission system in the north of Scotland. A spokesperson said: "We will provide a further update on the progress of the Western Isles transmission project, including our supply chain discussions around cost and delivery date, by the end of the year."

Scottish Hydro Electric – UK

Website: www.hydro.co.uk

Carbon Trust – UK

Website: www.carbontrust.com

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It's high voltage!

Pourtier was the chosen supplier for the rotating production lines at ABB's new North American high-voltage and extra high-voltage transmission cable production facility in Huntersville, North Carolina.



▲ The new production line for ABB in Huntersville, North Carolina, USA

French-based Pourtier has a long history of collaboration with ABB.

Pourtier delivered to the Huntersville facility the large capacity rigid strander for conductor, a universal drum twister line for laying-up and one large screening line. Additionally, it also supplied the complete installation and commissioning of these three lines.

To celebrate the launch of this new modern facility, ABB hosted a grand opening celebration with over 100 invited guest including Mr Enrique Santacana, president and CEO for ABB North America.

Keighley dig in for £1m investment

CONSTRUCTION work is now underway on Keighley Laboratories' new heat treatment processes building, at its West Yorkshire, UK, headquarters.

After a detailed topographical survey, site clearance and levelling, the steelwork has now been erected, with the mechanical and electrical (M&E) services scheduled for completion by summer.

The site architects are 2H Architecture of Leeds, the main contractor is Triton Construction of Liversedge and the M&E services are being provided by Dualtec of Keighley.

Representing a total capital investment in excess of £1m, the purpose-built unit will house furnaces, controls and ancillary equipment for new and complementary processes, augmenting Keighley Labs' existing array of heat treatment services.

"We are effectively in the first stage of moving forward again as a company, by making a sizeable investment in new facilities and positioning ourselves with some of the best resources in the industry," said Keighley Labs managing director Debbie Mellor, who took time out from her schedule to take control of a site excavator. "In this new building, we shall have modern furnace equipment and the



▲ Managing director Debbie Mellor takes control during the construction

most sophisticated process controls, enabling us to regulate precisely the parameters to suit clients' exact specifications.

"We shall offer a service that is second-to-none, from a single site at the heart of the engineering and aviation supply industry."

Adjacent to the existing induction hardening department and now sharing a common despatch yard, the new 5,000ft² building is being clad in the same grey-blue coated steel wall and roofing sheets.

Before construction could commence, 2H Architecture supervised the initial enabling contract, which involved demolishing the previous maintenance building.

Full-time positions will be created by the new heat treatment facility, together with several apprenticeship opportunities, adding to an existing headcount of 65 personnel.

Keighley Laboratories Limited – UK
Website: www.keighleylabs.co.uk

Seven-mile Brunei Shell field contract for JDR

JDR has won a contract with Swiber Offshore Construction Pte Ltd for the deployment of ten custom designed umbilicals totalling 13km, to be used at water depths of up to 32m in the Brunei Shell Petroleum Champion Field.

Paul Gahm, VP sales and marketing at JDR, said: "This contract win is the latest in a long-term relationship with Brunei Shell Petroleum, following two previous umbilical contracts for the Champion Field complex.

"It confirms JDR's position as the preferred umbilical vendor for the Asia Pacific region and is testament to the investment we have made over the last two years in our state-of-the art umbilical plant in Hartlepool, UK."

He continued: "Our highly experienced operating

team will now execute this project, which is due for load-out in mid-2013.

"We will provide on-going support through our AIM Services, which enables us to provide 24/7 aftermarket, installation and maintenance through our global network of highly experienced and fully certified technicians."

Mr Joseph Chen, VP Swiber Brunei: "JDR were the only umbilical provider that was prepared to meet the tight deadlines to roll out this project in order to maximise our return from the Champion Field.

"We're delighted with JDR for agreeing to work with us on this complex project with tight delivery deadlines."

JDR – UK **Website:** www.jdr-cables.com

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In detail, the product range comprises:

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- **Die Workshop Ancillary equipment** (cleaning- /measuring devices, microscopes etc.)
- **EDDS-2**
Innovative drawing die marking-, identification, administration equipment (available in standard-or fully automatic execution)
- **Technical Assistance** installation, training, die-reconditioning know-how etc.
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▲ Upgrades to equipment at Bridon International's Doncaster mill

FIB and Bridon – a successful collaboration

BRIDON International, a technology leader in the production of steel wire rope, is upgrading its equipment at the Doncaster Wire Mill in order to increase production and capacity.

Reiterating its confidence in FIB Belgium, Bridon International has called on the supplier of industrial furnaces for the manufacturing and commissioning of a new austenitising open fire furnace. This state-of-the art component, equipped with the latest safety technology, was commissioned at the start of September 2012.

Thanks to the collaboration between FIB Belgium and Bridon International, the assembly and commissioning of the furnace were completed in record time, in order to minimise downtime of the Bridon production line.

- Chinese company Sichuan Ruiyu Photovoltaic Materials (ReneSola Group), a leading producer of solar wafers, is using two patenting lines from FIB Belgium with Ecoquench fluidised bed to produce sawing wires.

The results are expected to lead to an increase in production for the company in the near future.

FIB Belgium is a leading supplier of patenting lines within the framework of sawing wires. New induction solutions are also available for the diffusion process, both in steel cord and in the scope of sawing wires.

FIB Belgium sa – Belgium

Website: www.fib.be

CMI to supply cold rolling mill

CMI FPE Ltd, one of CMI Industry's Indian subsidiaries, has entered into a new agreement with Tezcan Galvaniz AS, Turkey, for the design, manufacture and supply of a 6 Hi reversing cold rolling mill. This is the second 6 Hi mill of CMI FPE in Turkey.

The mill has a total capacity of 350,000 tons per year. It is suitable for 1,350mm wide coils and 1,400mpm process speed.

The mill will be equipped with Level2 automation and automatic flatness control system and will be commissioned within 17 months.

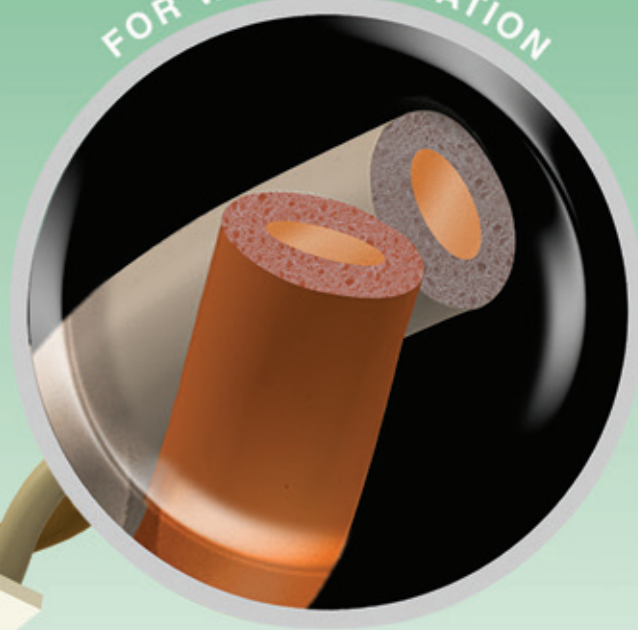
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Subsea cable between Italy and Montenegro

NEXANS has been awarded one of two contracts for the supply and installation of a power cable for the high-voltage direct current (HVDC) link between Italy and Montenegro.

The public tender was called by Terna Rete Italia SpA, a company fully owned by Terna SpA, the operator of Italy's electricity transmission system.

Over the last 20 years, Nexans has manufactured and installed over 3,000km of HVDC submarine cables.

The new link will connect the Italian peninsula with the Balkans

and will contribute to improve the integration of the countries' electricity systems.

The HVDC interconnection between Italy and Montenegro will be approximately 415km in length, comprising 393km of subsea cable and 22km of underground cable for the onshore connections.

It will feature two 500kV HVDC cables in a bipolar configuration (2 x 500MW), with one cable supplied by Nexans.

Nexans – France
Website: www.nexans.com

Cable cleats rush to Russia

Yorkshire cable cleat manufacturer Ellis has won the order to supply extra high voltage (EHV) cable saddles to a unique Hydro Accumulative power plant in the Moscow region.

Ellis' Centaur cable saddles were specified by Russian cable engineering and cable supply company Systec LLC for use in the second phase development of the Zagorskaya pumped storage plant (PSP), located in the administrative district's Sergiev Posad area.

The plant uses two lakes at different altitudes to generate sufficient power to cope with peak demands in Moscow, and when complete will deliver 1,200MW of generated power and 1,320MW of consumable power.

Centaur is a heavy duty extruded aluminium saddle cleat, designed and developed in-house by Ellis in response to a serious safety issue surrounding the restraint of high voltage (HV) and EHV cables up to 160mm in diameter.

Prior to launch, Ellis put its Centaur cable saddles through the most rigorous of testing procedures. The company shipped the saddles to the Netherlands, where they were tested on EHV cable to 163 kA peak and 63 kA RMS for one second, in both 3 phase and phase-to-phase fault scenarios.

Pavel Udovitsky, a senior project manager for Systec, said: "We knew that Ellis had developed a cable cleat for EHV cables and when we spoke to them about the benefits it would bring to this project, the answers they provided left us in absolutely no doubt that its Centaur cable saddle was the ideal specification option."

Ellis Patents – UK
Website: www.ellispatents.co.uk

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▲ Order complete for Sket in Turkey

€10m Turkish delight for Sket

Sket supplied double twist bunching machines, tubular stranding machines and a cage-type stranding machine to Erciyes Celik Halat in Kayseri, Turkey. The supply started in November 2011 and was completed a year later.

The machines are capable of producing a wide range of steel wire ropes for lifts, cranes and mining applications together with ACSR cables. All of the

machines had been commissioned by the end of 2012.

The total value of the Sket stranding machines supplied was approximately €10m. Further projects with this customer are in the planning stage.

Sket Verseilmaschinenbau GmbH – Germany
Website: www.sketvmb.de

Boost to fibre optic network speeds

A TEAM of scientists from Bangor University, Wales, is working with existing fibre optic technology with a view to boosting transfer speeds by combating signal degradation over long distances.

There are several proposed methods to combat the issue, including adding more fibre optic strands to a cable, implementing signal strength boosters and installing extra encoding and decoding lasers at each end. The problem, however, is that all of these steps require a significant financial investment.

The researchers at Bangor are aiming to control costs by manipulating existing technology – optical orthogonal frequency division multiplex (OOFDM) – used by wireless networks and digital broadcasting.

Digital data has been converted to physical electrical waves then translated into pulses of light, as with regular fibre optics.

However, the difference is that these electrical waves can be quickly encoded and decoded,

resulting in extreme speed increases.

To date the team has broken the 20Gbps speed barrier in testing, and expects to eventually surpass 40Gbps. As a comparison, Google is offering fibre network clocked at just 1Gbps to select residents of Kansas.

Researchers say they hope to have a module ready in about two years.

Bangor University – Wales
Website: www.bangor.ac.uk

Rebranding of US business

Pourtier and Setic has re-branded its new machine division in Greensboro, North Carolina, USA.

With over 20 years of continuous presence and after several recent major machine installations in the USA, the Gauder Group subsidiary will now promote the sales of its Pourtier and Setic range under the name "Pourtier & Setic of America".

This product line includes Pourtier's successful rigid stranders and drum twisters for producing low, medium, and high voltage cable and conductor, as well as Setic's large and small double twist bunchers, and complete line of machines for the production of LAN and special cable.

For the used machines market, USA and Canada sales are managed with the subsidiary "Gauder America" which has a joint venture agreement with Lloyd & Bouvier.

Pourtier & Setic of America – USA
Website: www.gaudergroup.com

Cuts at Swedish plant

Componenta is taking measures in Sweden to develop the productivity and profitability of its forging business as part of the group's efficiency programme that started in October 2012.

The measures concern Componenta Wirsbo's operations in Wirsbo, Smedjebacken and Arvika, and aim to boost productivity, operations efficiency and profitability and to cut fixed costs at the forge.

The intention is to downsize the plant in Smedjebacken to a minimum and transfer products mainly to the plant in Arvika, resulting in the loss of 41 jobs in Smedjebacken.

Capacity utilisation rates at Componenta Wirsbo were low during 2012, and its operative result has been weak. The intended restructuring measures will boost the operative result in the forging business by some €2million.

Componenta – Finland
Website: www.componenta.com

Improved services

UK-based RV Rugg has made new investments in the latest wire forming and wire fabrication technologies and now offers improved services for CNC wireforming for wire components, wire fabrication for wire products and assemblies, and a full range of wire finishes. It is intended that the investment will improve service levels and promote the company's development into new industry sectors.

Managing director Steve Rugg said: "Significant investment in several manufacturing areas during 2012 allows us to be well prepared to meet our customers' needs for 2013 onwards. We have purchased new equipment for straightening and cutting, mesh trimming and CNC forming."

RV Rugg works in both mild and stainless steels, and specialises in bespoke wire product manufacture. The current product range includes wire shopfittings, wire guards for lights and heaters, domestic and catering appliance products such as oven shelves, and wire point of sale items.



Transatlantic Cable

The 'Dreamliner'

The latest problems for the Boeing 787 centre on its battery and raise questions about regulators' oversight of new technology.

On 6th February, the US Federal Aviation Administration approved one flight of a 787 Dreamliner, the plane on which Chicago-based Boeing has staked its reputation. The FAA permitted the plane's maker to return it from a painting facility in Fort Worth, Texas, to the company's plant in Seattle. The agency did not approve any other flights, not even to conduct tests on the lithium-ion batteries that are the focus of inquiries in the United States and Japan into recent incidents with the plane.

All 50 787s delivered to airlines worldwide were grounded in mid-January. The single exception, a flight with a crew but no passengers, came one day after the nation's top transportation safety official said that the FAA had, in 2007, accepted test results from Boeing that failed to properly assess the risk of smoke or fire leaking from the batteries of the 787 jet then being built.

Deborah Hersman, the chairwoman of the National Transportation Safety Board (NTSB), told reporters that Boeing had predicted on the basis of its own testing that the batteries on the new planes were likely to emit smoke less than once in every ten million flight hours – and gave no indication that the batteries could erupt in flames.

But when the planes were placed in service, she said, the batteries overheated and smoked twice and caused one fire in January of this year, after fewer than 100,000 hours of commercial flights. "The assumptions used to certify the batteries," Ms Hersman said, "must be reconsidered."

The NTSB has said its experts found evidence of short circuits and uncontrolled overheating inside a fire-ravaged battery from a parked Japan Airlines 787 at Boston's Logan Airport on 7th January. But they have not yet established cause and effect.

In the *New York Times* for 23rd January, Jad Mouawad and Christopher Drew supplied background on the contentious batteries, which in December 2006 the FAA approved for use by Airbus, the European plane maker. The 14-ounce lithium-ion batteries were intended to provide standby power for the emergency lighting system of the Toulouse, France-based company's new A380 jumbo jet. Ten months later, the *Times* reporters wrote, the FAA allowed Boeing to use "the same volatile type of battery" on its new 787 jet. But in Boeing's case the batteries weighed 63 pounds each, were to be used in critical flight systems as well as to provide backup power, and

would be charged and discharged much more often. Yet the agency employed identical language (it could have been "just cut and pasted," according to the *Times*) in laying out the broad safeguards for the batteries.

'Fundamental questions'

In the view of Messrs Mouawad and Drew, the use of lithium-ion batteries in the 787 raises fundamental questions about how US regulators certify new technology and how they balance advances in airplane design and engineering with ensuring safety in commercial flying. These issues will be examined in a federal investigation into what went wrong and at future Senate hearings. ("Boeing's Battery Problems Cast Doubt on Appraisal of New Technologies")

As noted by the *Times*, the FAA said that, when in 2007 it approved Boeing's request to use lithium-ion batteries, the agency had limited experience with their behaviour in commercial aircraft. It did acknowledge that the batteries themselves were more prone to fire than traditional nickel-cadmium or lead-acid batteries.

Experts interviewed by the *Times* said that, regardless of the cause of the 787's problems, the charred remains of the battery that caught fire in the plane in Boston raised the question of whether the safeguards functioned properly. The NTSB said that all eight cells in the battery had sustained "varying degrees of thermal damage." Six of them have been scanned and disassembled for further examination.

► In a contrarian vein, many battery experts told the *Times* reporters that they viewed Boeing's decision to use lithium-ion batteries as a reasonable one and pointed out that lithium-ion batteries had been used in expensive space satellites since around 2000 without serious problems. They said that this track record would have added to the confidence Boeing and federal regulators had about using them in commercial airliners.

Jay F Whitacre, an associate professor of engineering at Carnegie Mellon University, said that GS Yuasa, the Japanese company that built the 787 batteries, told the National Aeronautics and Space Administration (NASA) in a 2008 presentation that it had already supplied batteries for six satellites and had contracts for 50 more. GS Yuasa also said that its satellite batteries had never had a shorting incident in more than ten years of production.

"That's pretty compelling," Professor Whitacre told the *New York Times*. "If I had all that data and saw that they were making batteries for 50 more satellites, I'd say that was a reasonable risk to take. My sense is that Boeing did a fairly decent job of picking the right company."

Transatlantic cable

- But another battery expert, Donald Sadoway, a materials chemistry professor at the Massachusetts Institute of Technology, disagreed. He said that an older type of battery instead of the lighter-weight lithium-ion battery would not have made much of a difference to the 787, adding only about 40 pounds – or the equivalent of an extra suitcase per battery. “So you will risk the plane for something that’s tantamount to one guy’s suitcase?” Mr Sadoway said. “Who’s making the calculation here? It’s absurd. It doesn’t add up.”

One World Trade Center

Thousands, including President Barack Obama, signed their names to a steel beam. Now, ‘Freedom Tower’ awaits only its spire.

On 31st January, a dozen or so workers from a New Jersey steel fabrication and engineering firm were focused on the approximately 50-foot “lighting mast” – the spire segment to be installed last at One World Trade Center in New York City, topping out the skyscraper informally known as Freedom Tower at its planned 1,776 feet. Only a few hundred feet of steel, in 18 separate pieces weighing about 620 tons, remained to be installed before the spire was in place and marking the highest point of any man-made structure in the western hemisphere.

Writing in the *Morristown (New Jersey) Daily Record* 3rd February, Mark Spivey did not have to explain the significance of the building that would be “filling in a gap in the Lower Manhattan skyline that has existed since the twin towers fell 11th September, 2001.” Nor did David Floyd, the president of MRP LLC, need to explain a ritual that had sprung up around the lighting mast taking shape in an immense warehouse near the company’s South Plainfield headquarters.

“A lot of people have touched it just to say ‘I touched it,’” said Mr Floyd. He told the *Record* that the spire receiving finishing touches in January was very different from the 360-foot telecommunications antenna that once topped the World Trade Center’s North Tower. The spire is taller by about 420 feet, and it will contain far fewer communications components. Even so, it will boast weather cameras, satellite equipment, and electric supply lines running all the way to the cylindrical portion at the top, which is only a few inches across.

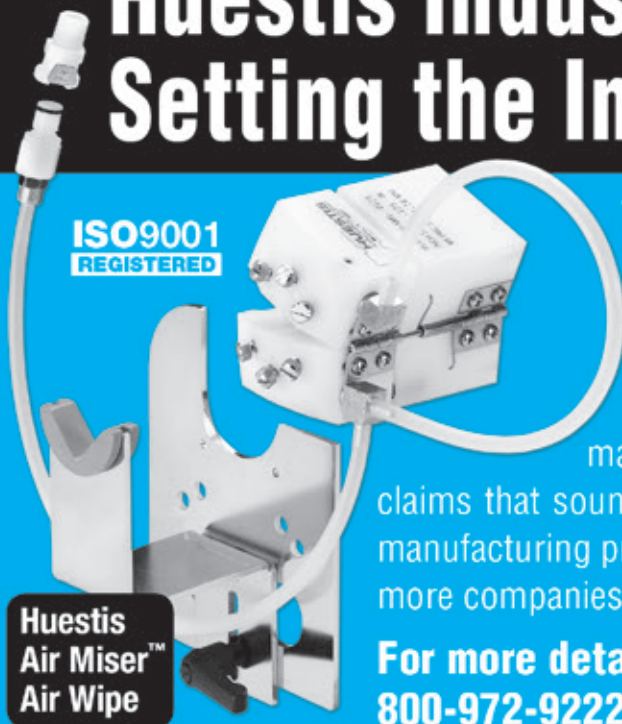
Massive aircraft warning lights will be installed about 10 feet from the pinnacle, with access by way solely of a combination of ladders and struts. Some of these are nothing more than simple steel steps on the exterior of spire sections 1,600 feet off the ground. “I don’t want to be the guy changing this light bulb,” said Mr Floyd. The bulbs, weighing 25 pounds apiece, typically stay lit for about six years each. Shipment via flatbed trailers to the World Trade Center site of the 18 remaining spire segments was expected to take two weeks; hoisting to the top of the skyscraper and installation, another three weeks. But Mr Floyd noted that the process would proceed at the pleasure of Mother Nature. Winds at the top must be below 15 miles per hour for work to go forward.

“One piece a day would be a great day,” said Mr Floyd.

‘Unique redundancy’

The winning bid submitted by MRP in 2008 for a large portion of the steel work at the World Trade Center site included construction work from floors one to 104 at One World Trade Center. One of many Manhattan-based projects for MRP over the last decade, this one meant hundreds of jobs for local construction workers during the worst parts of the economic downturn that started late in 2007. Only about two dozen remain.

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Transatlantic cable

"It's been difficult," said MRP foreman Darren Colgan – a native of Bolton, England – of the recent mass layoffs. "We're slowing down now that the job's coming to an end." The *Daily Record* pointed out that this will also mean the end of some serious headaches. One World Trade Center is in the shape of a square at its base; becomes a series of interconnected triangles several dozen stories up; and is octagonal toward the middle. Not even the segments of the spire are without challenges. "It's a nightmare," Mr Colgan said. "It's as though all the engineers got together in a room and asked who can make the most complicated design."

What is more, the new skyscraper had to adhere to new building parameters requiring strength sufficient to withstand a powerful bomb blast or even moderate seismic activity. Mr Floyd, the company president, explained that in some respects this made construction "uniquely redundant". "No one has ever done anything quite like this," he said of the approximately \$3.8 billion construction project. "When we submitted our bid, I had a terrible sinking feeling that we'd be successful."

- The company's hometown newspaper was reassuring. It will be different, Mr Spivey wrote, when One World Trade Center opens its doors for the first time. According to the Port Authority of New York and New Jersey, owner of the building, the opening is slated for later this year, with some interior fit-out continuing into 2014.

Elsewhere in steel

Are copper-nickel projects drawing meddlesome attention to taconite mining in Minnesota's Mesabi Iron Range?

On the same week of the Clairton announcement, John Surma gave a speech to the Economic Club of Minnesota. The theme was that the company he serves, US Steel Corp, has operated taconite mines a long time in the state and remains a major contributor to the economic vitality of northeastern Minnesota. As reported by business columnist Lee Schafer of the *Minneapolis Star Tribune*, it was a scarcely controversial message, delivered by a genial CEO to a friendly audience. But, Mr Schafer observed, "There was an agenda, of course, if you listened for it. It turns out US Steel is frustrated with regulators." After the speech, when asked about what has changed in the way his industry is regulated in Minnesota, Mr Surma shared some discontents. He has perceived a "lack of clarity" in the regulatory process, and he knows where the blame lies. There seems to be, he said, "a lot more discussion, and a lot more people who seem to want to be in a position to say no." ("US Steel's Subtle Message on Its Frustrations with Regulators," 1st February).

The *Star Tribune's* Mr Schafer pointed out something else that has changed for US Steel in Minnesota: the presence of companies like PolyMet Mining Corp, which is seeking permits to begin production of copper, nickel, and precious metals at its mine and processing facility at the eastern end of the Mesabi Iron Range. And, behind PolyMet, there are other copper-nickel mining projects not as far along. Supplying context, Mr Schafer noted that mining for taconite is hardly a clean industry, but that it has experienced nothing like the kind of problems that have cropped up with copper and nickel mining in other parts of the world. PolyMet, he said, "has been grinding away on its permitting process for years." When asked whether intensified environmental review of mining as a result of copper and nickel projects has changed the dynamic for US Steel in Minnesota, Mr Surma responded that copper and nickel mining is a different business from his. He said he wished those mining firms well.

Mr Schafer was not entirely convinced. Obviously, he wrote, however irritated US Steel may become at greater regulation it cannot move its taconite mines out of Minnesota. Mr Surma himself said that – short of a dramatic, and unlikely, contraction in North American steel demand – there is not much that would cause US Steel to significantly reduce its level of investment in the state. Indeed, about a quarter of the company's \$800 million capital budget this year will go to Minnesota. On the other hand, commented the *Star Tribune*, there are choices that will come up some day, on where to build plants with newer technology or otherwise invest US Steel money. "It was very subtle," wrote Mr Schafer. "But that message was delivered."

New, cleaner coke ovens at the Clairton Works of US Steel are expected to satisfy environmental objections

US Steel has commissioned a battery of coke ovens at its Clairton plant about 20 miles south of the company's Pittsburgh headquarters. Clairton is North America's largest coke plant, producing about 4.5 million tons annually. The new C Battery, which will begin operating later this year, has a rated capacity of 960,000 tons of coke. The \$500 million project was scaled back from a \$1 billion proposal announced by the steel maker in late 2007, before the global recession caused the retrenchment of the industry. As reported by Len Boselovic of the *Pittsburgh Post-Gazette* (1st February), the original intention was to build two new batteries. Under the modified plan, US Steel agreed to make environmental improvements to three existing batteries it had planned to demolish if the second battery had been built. According to Allegheny County Health Department data cited by Mr Boselovic, areas near the Clairton plant and a Neville Island coke plant operated by DTE Energy Services have had some of the dirtiest air in the region in recent years.

At the commissioning ceremony at Clairton on 31st January, US Steel's president and CEO John P Surma said that the new battery uses technology that will enable the plant to significantly reduce emissions and meet certain air quality standards 18 months earlier than the target date set by state officials. Mr Surma also said that US Steel is nearing completion of a coke substitute project at its Gary Works, in Indiana, that will produce 500,000 tons a year. Taken together with Clairton, the two projects will enable the company to supply all of its coke needs internally. According to Mr Surma, buying coke on the open market from sources in China, Ukraine and elsewhere costs the company almost twice as much as making it.

- United Steelworkers union president Leo Gerard was at least as enthusiastic as the US Steel chief about the new C Battery, calling it "the most environmentally sound, emission reducing coke plant probably anywhere in the world." The project secures the jobs of 1,300 Clairton employees as well as 1,400 who work at the company's Edgar Thomson plant in Braddock and the Irvin plant in West Mifflin, both in Pennsylvania.

Telecom

Universities and communities in North Carolina join forces to find providers willing to build them an ultra-high-speed broadband network

"What's not to love about gigabit broadband?" The question, posed by Marguerite Reardon of *CNET News*, has only one answer: nothing.

Transatlantic cable

The news reporter knows that cities and towns across the US want cutting-edge broadband service to give them an edge both domestically and internationally. And policy makers in state houses as well as in Washington DC agree that building next-generation broadband networks would help boost economic development.

Moreover, the effort has friends in high places. President Barack Obama has talked up the importance of improving broadband infrastructure, as has former President Bill Clinton in his appearances before tech audiences. And Ms Reardon noted that, recently, Federal Communications Commission chairman Julius Genachowski stated a goal of getting gigabit-speed broadband services to all 50 states by 2015.

But, according to a report cited by the FCC, so far only 42 communities across 14 states have ultra-high-speed broadband. Google's much publicised Kansas City project, in Missouri, is one. Other initiatives for gigabit broadband services have been led by local municipalities. Cities such as Lafayette, Louisiana, and Chattanooga, Tennessee, are in the van of the municipal fibre movement. In Chattanooga, the FCC says, the fibre network deployed to 170,000 residences helped lure big companies like Volkswagen and Amazon to the community, which has created more than 3,700 new jobs over the past three years.

Now, Ms Reardon reported, the Gig U coalition of universities that helps college towns across the US get wired with super-fast broadband is taking a major step toward bringing gigabit speed broadband networks to a larger constituency.

In February, Gig U announced that it has helped the North Carolina Next Generation Network, a group made up of six communities and four universities – North Carolina State,

University of North Carolina-Chapel Hill, Duke, and Wake Forest – put together a request for proposals (RFP) for a project to bring a next-generation broadband network to a large region of the state. ("First Steps Taken to Build Gigabit Network in North Carolina," 1st February).

➤ Gig U and the NC Next Generation Network are hoping that their RFP will attract both existing and new broadband providers to bid on building and running a network that will offer broadband download speeds of at least 1 Gbps. A 2nd April deadline was set for the proposals, and – presuming all goes well – service under the plan will be offered within 18 months.

Ms Reardon wrote: "The hope is that this regional high-speed network will bring many benefits to the community, including advances in telemedicine, distance learning, and new industries that will create new jobs. Gig U, which was started two years ago, has already helped raise more than \$200 million in private investment for these new networks. So far, Gig U has helped jump-start two major projects with the help of an initiative called Gigabit Squared. In Seattle and Chicago, Gigabit Squared is spearheading projects with the University of Washington and University of Chicago, respectively, to bring super high-speed broadband to parts of these cities.

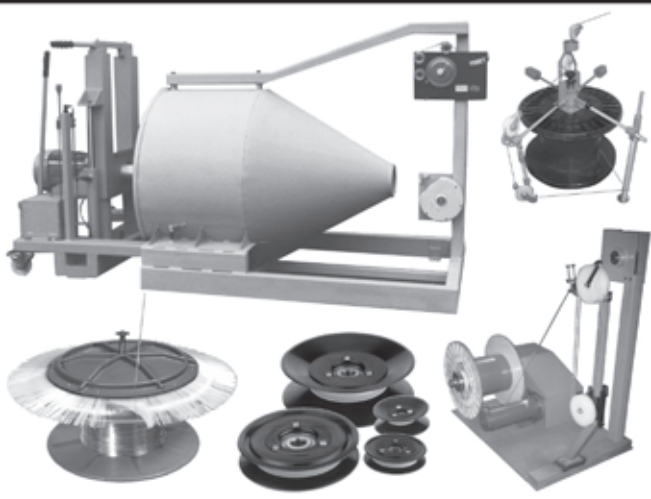
➤ But the effort in North Carolina will be the largest network project facilitated through Gig U to date. It will cover at least four cities in the Triangle Park area of North Carolina including Raleigh, Durham, Chapel Hill, Carrboro and Winston Salem.

Dorothy Fabian – USA Editor

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▲ New cable coating system from Extrudex

All components under control

HIGH-END technology guarantees speed, accuracy and sustainability.

This could be the headline for the order to develop and produce a new cable coating system.

The line was ordered by the cable manufacturer Lapp GmbH, at the end of 2011, designed and built by Extrudex Kunststoff in Mühlacker, Germany, and accepted by the customer at the end of June 2012. The line went into production at Lapp GMBH Kabelwerke in Stuttgart, Germany, during the summer of 2012.

Lapp designs and produces cables and conductors for different industries and markets, such as mechanical and systems engineering, the automotive industry, MSR technology, electrical and installations engineering, and EDC, among many others.

The trial run of the new cable coating line ran just like clockwork. It was quite an achievement to jacket a variety of cables in a variety of polymers (PVC, PUR, TPE and HFFR) during the entire acceptance phase.

The more than pin-point accurate laser measurement system integrated into the line – to an accuracy of 10,000th of a millimetre – monitors even higher accuracy than the permitted tolerance for the cable.

This is entirely due to highly precise Lenze servo control.

The system is extremely accurate with regard to wall thickness control, performance enhancing and economic when it comes to materials as well as energy. The system is easily and quickly changed over, for example

from a yellow-coated single-core 7mm earth cable with two green stripes to multi-core and thicker or thinner cables.

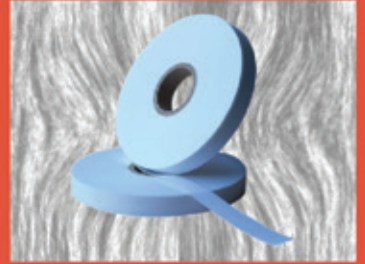
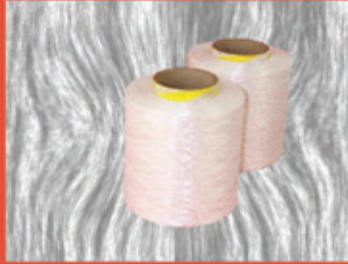
Extrudex can manufacture power lines with a maximum thickness of 55mm. Those, however, will be run straight, ie without dancer or cable accumulator and without diverters. Cables up to 30mm diameter are run with dancer and cable accumulator control.

The entire line has a length of 43 metres, with a process length more than three times that. As a space-saving measure, storage lines are placed above the cooling line, running in the opposite direction. They are indispensable in allowing the change of the cable drum without stoppage.

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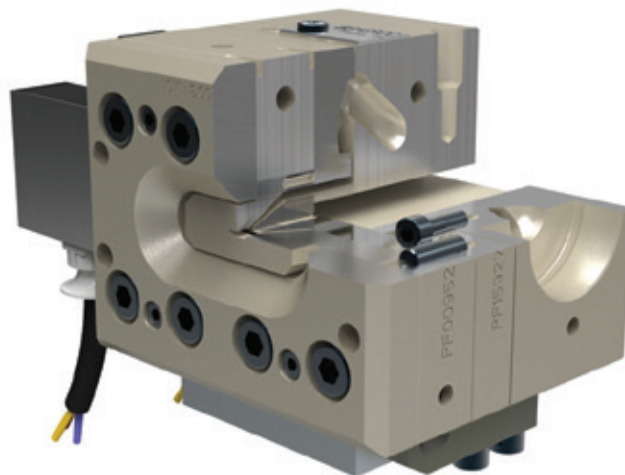
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Erocarb SA – Switzerland
Website: www.erocarb.ch

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Excess of material at the output of a die, during an extrusion process, also called die drool, can significantly reduce the production speed of a cable.

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Erocarb – Switzerland
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**OUR INTERWIRE 2013 SECTION
STARTS ON PAGE 52**

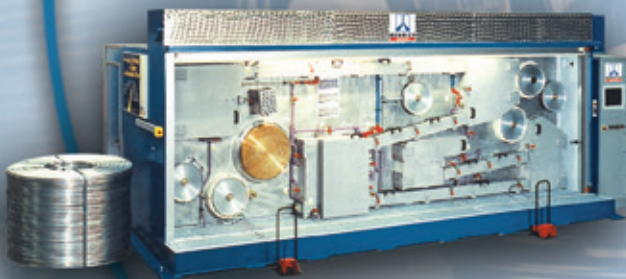


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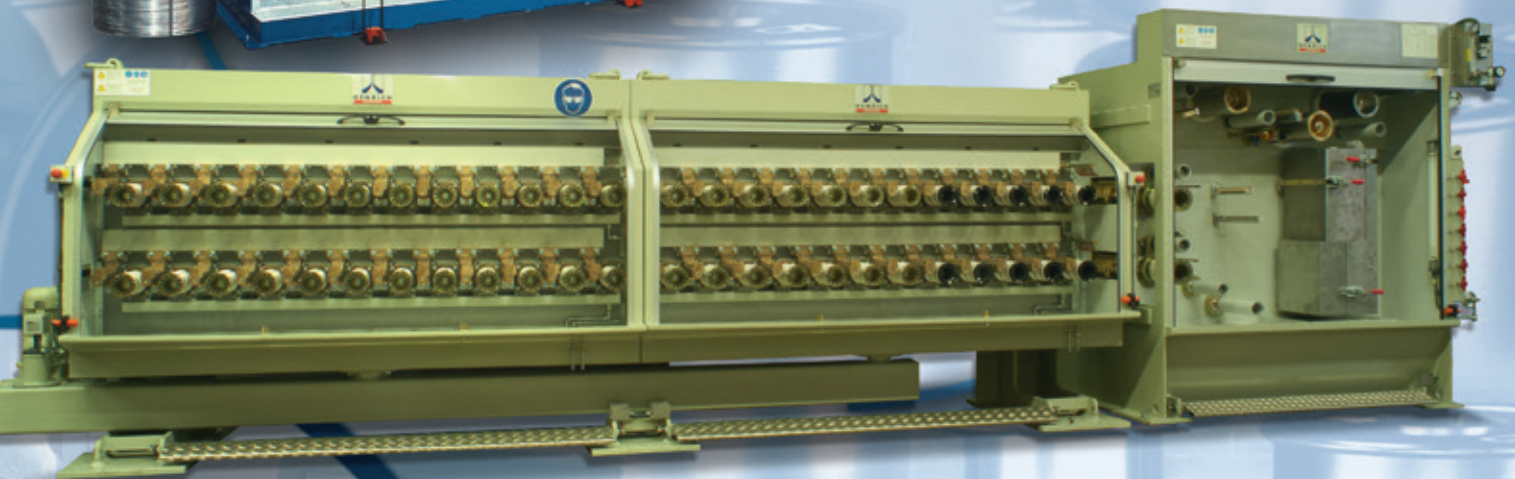
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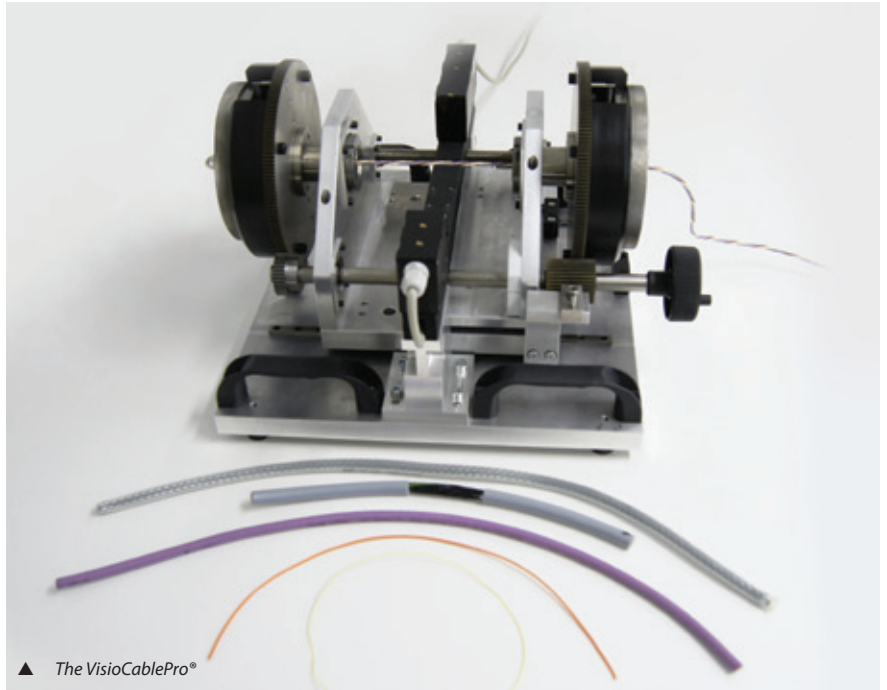
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Present databases can simply be connected simply, and iiM also offers CAQ software, ProCable, as well as many

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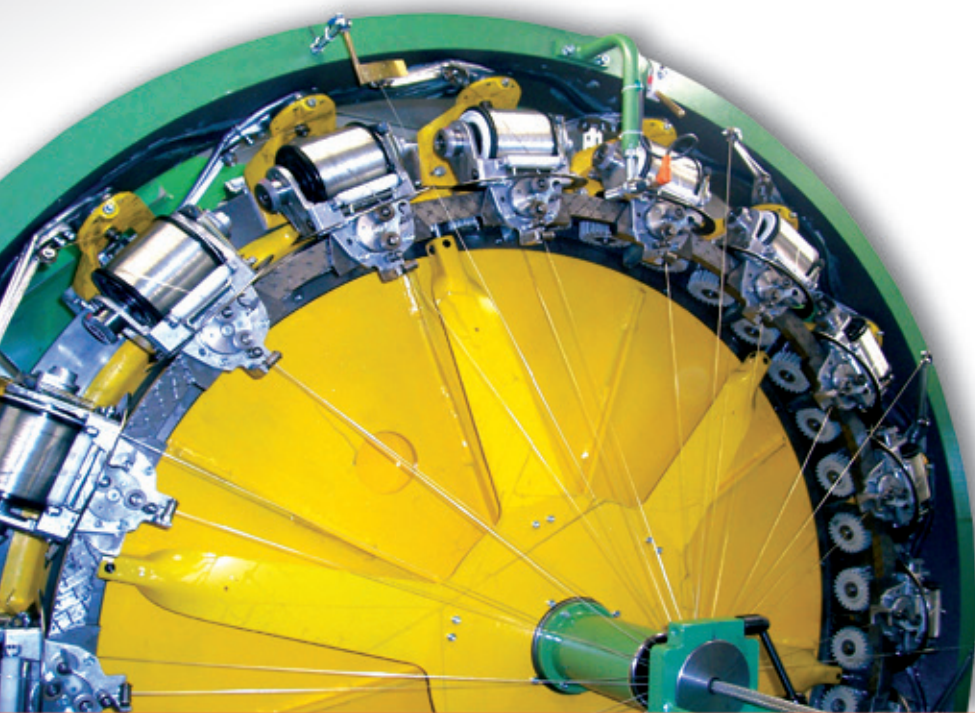
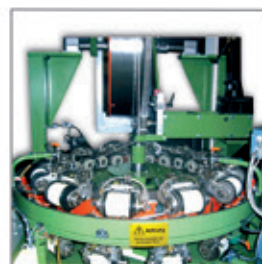
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Sikora AG – Germany

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► *The Preheater 6000 is now available with temperature measurement and control*

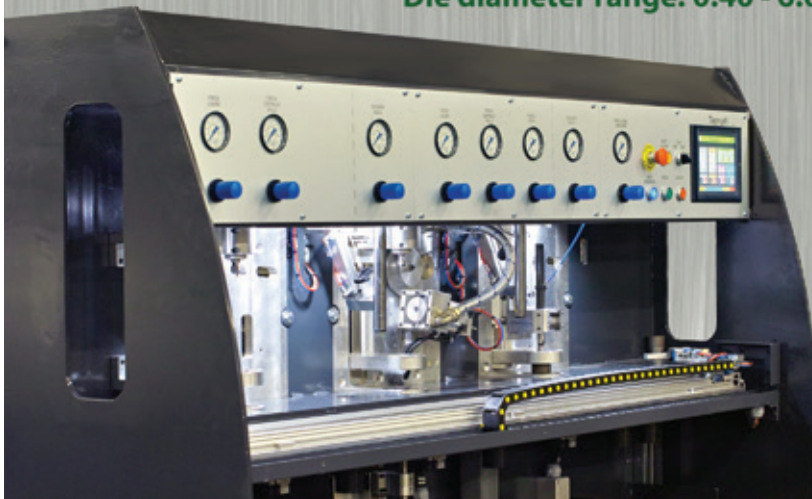


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Strengthening surface preparation role in the wire industry

THE success of Vapormatt's wet blast surface preparation technology in the wire industry is demonstrated by a growing number of installations and, now, the appointment of a sales engineer dedicated to this key sector of manufacturing.

The high levels of process consistency that can be achieved with wet blasting have been proven by Vapormatt in a long list of applications.

These include cleaning, degreasing and descaling as well as etching and satin polishing – across a large number of wire cable and strip products.

Newly appointed sales engineer David Clements mentions manufacturers of rotary extrusions, carding wire, power cables, bandsaw blades, fibre optic cables and high carbon steel wire as being among those gaining from Vapormatt technology.

"As one of the world's leading wet blasting companies, Vapormatt is constantly developing its in-line processing applications for wire manufacturers, not least because wet blasting offers clear-cut advantages over mechanical and chemical methods of wire cleaning, both of which can present performance and environmental issues," he said.

As an example of the company's commitment to application focus, Mr Clements draws attention to the Vapormatt Profelis.

The design can handle wire and cable products of varying geometries and material, while avoiding the use of harsh chemicals and potential contamination risks experienced with alternative methods.



▲ Vapormatt's Profelis wire cleaning unit

Fully self-contained, the Profelis comprises two adjacent units that provide a combination of wet blast, spray rinses and drying, to produce high quality results that meet both cosmetic and performance objectives.

"This is an exciting time to join the company and I look forward to building on its success to date, and helping to fulfil Vapormatt's aim of becoming the wire industry's choice whenever in-line wire cleaning is required," added Mr Clements.

Vapormatt Ltd – UK
Website: www.vapormatt.com

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Cable carriers for reliable protection under dirty operating conditions

No rare occurrence in day-to-day industrial production: sharp or hot chips, flying sparks, aggressive liquids, rough dirt and separated material particles. Certain operating conditions are critical for the cable carriers in automated work and manufacturing processes.

When cables are damaged, the power fails, signals are not received and data is not communicated. There is a danger of costly production losses. Special protection is needed here. For such cases, Tsubaki Kabelschlepp provides the products of the TUBE-series.

In order to meet customer needs or the application specifications, and to always be able to deliver the best solution for any kind of industrial applications, the cable carrier specialist can rely on a great variety of materials in its portfolio.

Whether designs made of plastic, steel, or hybrid variants (plastic chain bands with aluminium stays), or economic versatile standard types, robust, weight-optimised, extremely stable fast or quiet cable carriers for large unsupported lengths, with fixed chain widths, or chain widths accurate to the millimetre, with a large internal height or special design requirements – the portfolio offers the suitable solution for any need.

Accordingly, the covered solutions are also available in various designs. There are, for example, plastic covers which, depending on the application, are mounted on one or on both sides.



▲ Performance, functionality and more: Visual requirements were the deciding factors for this installation of an enclosed cable carrier with plastic chain and aluminium covers

Aluminium covers are particularly light and strong and therefore have a better long-term heat resistance. Sometimes, hot swarf or sparks remain on the covers for a short while until they die down, so aluminium is definitely the best choice compared to special plastics materials.

Steel chains are recommended for areas with extremely high mechanical loads. With steel chains solutions for long-term loads or application-dependent maximum values of up to 600°C may be realised. In a stainless steel design chains

may even be exposed to short-term peak temperatures of up to 1,000°C. In this instance, aluminium covers offer reliable protection without increasing the weight of the chain excessively.

Steel band covers offer a lighter and above all, more economical option. They are available up to a width of 1,000mm for all chain types. The steel band cover is fastened to the chain bands with corresponding holders.

Tsubaki Kabelschlepp – Germany
Website: www.kabelschlepp.de

Cleaning system provides wire glossy finish

Advertorial on behalf of Decalub

THE PWC-S system simultaneously performs drawn wire cleaning and polishing, in-line with wire drawing machine at 6 to 12m/s (1,200 to 2,400ft/min).

Exceptional cleanliness obtained permits wire direct brass coating, copper coating, and wire cleaning prior to heat treatment and coating applications including patenting, annealing, painting, plastic coating, etc.

The PWC-S cleaning system incorporates new technology which enables normal plant cold water to be converted into a unique multi-action high pressure wetting/displace/flush cleaning liquid used to clean drawn wire at high-speed, providing wire smooth glossy finish in plating quality.

The PWC-S system effectively loosens and removes lubricant residue from base material and is particularly



▲ Wire cleaning by PWC-S system

recommended for cleaning applications with wires drawn upon severe conditions resulting in increased heat and burned lubricant tightly bound to the wire surface and embedded in micro-cavities which are further smoothly polished under high pressure separating lubricant residue from base material, washing away dispersed contaminants, enabling wire exiting the unit very clean of white-metal

appearance with reflective finish and completely dry.

For wire decorative applications, the system can be used with emulsion including a new rust preventive additive diluted at 5% concentration. The PWC-S system provides the ultimate combination of simplicity and effectiveness: acid-free, caustic-free, without ultrasonic, without chemicals, hermetically sealed zero-emission system, no fume, no foam.

Economical and environmentally friendly, the system provides significant process savings in production of clean wire. The PWC-S unit is compact and can be easily installed on the finishing/last block of a wire dry drawing machine.

Decalub – France
Fax: + 33 160 2020 21
Email: info@decalub.com
Website: www.decalub.com

Reliable rod welders from PWM

PRECISION engineered to produce strong, reliable permanent welds on non-ferrous materials, PWM cold pressure welders offer manufacturers a fast, economical method of joining large rod sections up to 30mm (1.181") diameter.

Quicker, cleaner, and 'greener' than electrical butt-welding, the cold weld process creates a reliable permanent weld stronger than the parent material without sacrificing electrical integrity.

PWM's range of rod welders includes the P1500, P1000 and EP500 models. Designed and built in PWM's own UK workshops, these robust, heavy-duty machines are energy efficient, low maintenance and easy to operate.

The EP500 electro/pneumatic cold welder is one of PWM's best-selling machines. Dependable and easy to operate, it will weld copper rod 5mm to 12.50mm (0.197" to 0.492") and aluminium rod 5mm to 15mm (0.197" to 0.590").

The compact hydraulic P1000 machine, for copper rod 6mm to 16mm (0.236" to 0.630") and aluminium rod 6mm to 20mm (0.236" to 0.790"), is equipped with quick release dies and an easily adjustable die setting mechanism.

DO4000: Power distribution cable integrity

Improved testing of power distribution equipment during the installation of cables is provided by the Cropico DO4000 range of high performance, digital milliohm meters now available from Seaward.

The portable and rugged instrument features a number of advanced features to test and measure accurately the integrity of switchgear cable joints and other distribution equipment to ensure they are fully maintained and function correctly.

These include forward and reverse current measurement with auto averaging, true current zero, long scale length and a selectable measurement range from 40mΩ to 4kΩ with respective resolutions between 10μΩ and 1Ω.

Within the range, model 4001 also includes temperature compensation, with preset coefficients for copper and



▲ The P1000 hydraulic rod welder

PWM's top of the range model, the P1500 electro-hydraulic rod welder will weld copper rod from 15mm (0.590") up to 25mm (0.984"); aluminium up to 30mm (1.181"). Power consumption is limited to the hydraulic pump motor, making the P1500 very economical to operate. No set up time is required and the weld cycle takes about four to five minutes, with the weld flash removed automatically on completion.

Video demonstrations of the EP500, P1000 and P1500 are available at www.pwmltd.co.uk

Most non-ferrous materials, as well as various alloys can be welded. As a specialist manufacturer of cold welding equipment for nearly 30 years, PWM is always happy to provide advice on cold weld techniques and applications.

PWM Ltd – UK
Website: www.pwmltd.co.uk

aluminium plus user settable coefficients for other materials. Temperature measurement over the range -50 to +800°C is also available.

Protection up to 415V rms is provided at the measurement terminals and push button operation is achieved easily by clearly marked function controls. Direct reading measured values are displayed on a four-digit LCD display.

Over range and low battery indication is also provided and warning LEDs illuminate when an open circuit lead condition is detected.

The 4000 series can be supplied with long leads to allow for accurate measurement of large blades and a rechargeable battery option includes a battery pack, docking station and charger.

Seaward Group – UK
Website: www.seaward.co.uk



▲ The Cropico DO4000 from Seaward



Taping Equipment



Single Twist Lines



Production range:

- Taping, binding, screening machines with concentric heads having dynamic dancer, for spools and pads;
- High performance single twist lines with high speed back-twist feeders;
- Rewinding lines with in-line measuring and quality control systems;
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100 per cent quality inspection, 6,000 times per second

ZUMBACH Electronics has developed a rotation-based laser scanning process that maps round and polygonal shapes up to 6,000 times per second – a first for the industry.

To make production processes as efficient as possible, modern in-line measurement devices are required not only to measure parameters such as diameter, ovality, width and height at very high speed, but also to instantly detect shape deviations and rolling errors.

Some suppliers claim that in steel production, mechanical solutions are more than adequate for these purposes. But not all manufacturers in the industry agree. Zumbach has been an innovation leader on the market since 1957, and its experience has shown that it pays to continually develop new technologies and solutions that deliver more precise measurements and thus contribute to higher productivity.

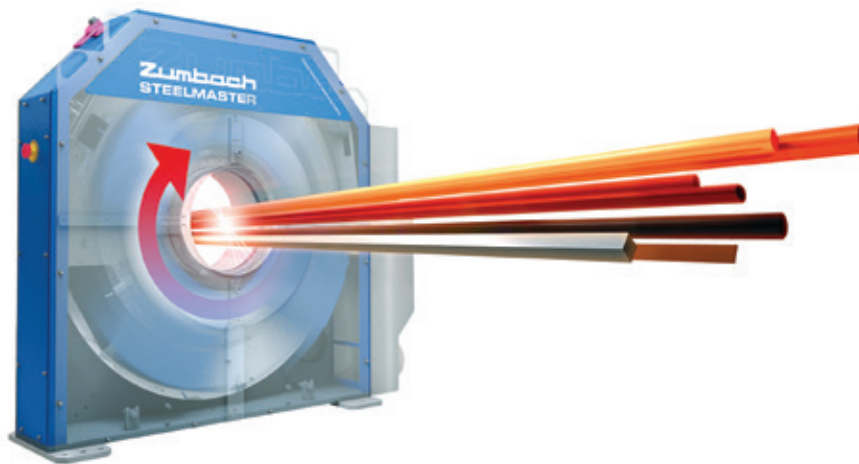
These very standards were applied to the Swiss manufacturer's latest product series, the Steelmaster SMR. Steelmaster units have been used in steel production for many years as a tried-and-tested solution to improve the monitoring of hot rolling and cold processes.

Until now, dimensional measurement and error detection have always been carried out by static or oscillating devices, depending on the application. These devices can measure with great accuracy the outer dimensions and diagonals of both round and non-round products such as squares, hexagons and flat products, regardless of twist and angle of twist.

But until recently the level of precision achievable in manufacturing processes involving high rolling speeds and short lengths left much to be desired. The new Steelmaster SMR product generation comes with sophisticated technology in the shape of an innovative and much faster rotational measurement system.

With its superior performance, Steelmaster SMR opens up a whole new range of applications. The system is based on up to three fully synchronised high-tech laser measuring heads of the ODAC® series, which use an innovative rotational principle to measure outer dimensions, diagonals, diameters and cross-sections with 360° coverage.

Each ODAC® laser measuring head rotates at a speed of 100 rpm and maps the scanned products up to 2,000 times per second to create a precise product profile. In this way up to 600 profiles can be generated every minute. This



▲ The Steelmaster SMR from Zumbach

allows manufacturers to significantly reduce scrap while maintaining stricter tolerances of ½ and ¼ DIN.

There are no longer any restrictions as to the shapes the system can cope with. The Steelmaster SMR models can handle any asymmetrical, polygonal and irregular shapes made of steel and metal up to a diameter of approximately 135mm and temperatures of up to 12,000°C.

The rotary movement isn't the only technical refinement, because there is also the unique, non-contact transmission of power and signals within the measurement unit.

The Steelmaster SMR software is very flexible, allowing data statistics, numerical and graphical displays, logs and so on to be freely configured in line with requirements and working practice in the production environment.

Zumbach developed EPM (Enhanced Profile Measurement, patent pending) for geometries with irregular or asymmetric shape aberrations (eg asymmetric overfill or underfill). In particular, it is also able to capture and calculate polygonal shapes, which can occur in certain rolling processes or after subsequent peeling/grinding operations.

For any shape it will measure at high accuracy not only minimum, maximum and mean diameters but also the true out-of-round deviation RONT as defined by ISO/TS 12181-1, as well as the inscribed circle MICI and the circumscribed circle MCCI.

An optional module named FPS, especially for 3-roll blocks, calculates accurate values corresponding to the diameter values which would be found by manual 3-point micrometer

screws (if both readings are related to room temperature). This FPS module additionally calculates the "Touch" and "Gap" diameters which are essential for the initial roll setting.

The regression analysis included in the software package means that twist and angle of twist no longer influence the measurement result.

This results in lower scrap rates and ensures compliance with strict tolerances. The technology also performs regardless of position, vibration, material temperature and light intensity.

Zumbach AG – Switzerland
Website: www.zumbach.com

Range of machinery from Zica

Bosnian company Zica has a range of used wire processing machinery for sale.

This includes:

- Welded reinforcement mesh production line (cold rolling and ribbing line, straightening and cutting machines, welding machines, turning and stacking device)
- Wire drawing machines (wires for nails, springs, fence etc)
- Sandblasting machine
- Nail production machines
- Polishing nail drum
- Nails machine grinder
- Forklifts
- Different types of bridge cranes
- Straightening and cutting machines
- Hanging scale for crane, five tonnes

Zica dd – Bosnia & Herzegovina
Website: www.zica.ba

Single jacket cable ideal for use in commercial and residential solar projects

AMPHENOL Industrial Global Operations now offers a single jacket photovoltaic (PV) cable used for interconnection wiring in grounded and ungrounded PV systems.

Amphenol's PowerLink solar cable is ideal for use on utility solar farms and in commercial and residential solar projects. Designed with a smaller outer diameter than a standard dual jacket, the single jacket PV cable is more malleable and makes crimping connectors easier.

The new cable, which is available from 6 AWG to 18 AWG, is sunlight resistant and suitable for direct burial. It has a temperature rating of 90°C wet or dry and a cold bend of -40°C. Its voltage ratings range from 600 V to 2,000 V and this new RoHS compliant, UL4703-rated cable has a flammability rating of VW-1.

The PowerLink solar cable is manufactured in a variety of colours including black, white, red, blue, green, yellow and orange.

**Amphenol Industrial Global Operations
– USA**

Website: www.amphenol-industrial.com



▲ The new cable from Amphenol

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Uhing combines rolling ring technology with controller

FOR more than 60 years, Joachim Uhing has been successful with linear drive technology, above all with the RG rolling ring drive invented by the company founder.

In 1983, the RS linear drive nut was added to the product range. Both products operate as non-positive linear drives on plain shafts.

The previously mechanical elements were fitted with in-house, intelligent controls so that customers can purchase turnkey systems from Uhing. At the Hanover Fair in April, the company will showcase two product studies on this topic.

One of the studies focuses on the Uhing RS linear drive nut whose prominent features are the lack of backlash and the excellent sealability. The linear drive nut is equipped with a position sensor system and shown in an underwater application.

On the controller, the user can set the start position, the travelling distance, and the travelling speed. The position sensor system used in this application has a positioning accuracy of $\pm 0.1\text{mm}$, while higher resolutions are possible.



▲ The Rolling Ring drive from Uhing

The second study focuses on the RG rolling ring drive whose linear direction of travel can now be changed individually without interfering with the mechanics while the shaft continues rotating in the same direction.

In addition, a wide range of stroke speeds can be set almost continuously with the shaft rotating at a constant speed. The gear pitch can now be set

with a stepper motor in dependence of data provided by connected sensors, or by direct user input.

The Hanover fair runs from 8th to 12th April and Uhing can be found in Hall 16, Stand G15.

Joachim Uhing KG GmbH & Co – Germany
Website: www.uhing.com

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17-308	CORTINONIS 1250 mm Double Twist Buncher, Year 2010
19-134	WAFIOS Chain Link Fence Machine, Mdle DF-5, 10' Wide
20-187	NIEHOFF Drop Down Coiler, Md. WF-800, W/ T-400 Dancer
21-148	RAUTOMEAD Horizontal scrap 6 wire caster, 60,000 T/week
25-144	MAG Enamelling Oven, model HN4, 44 to 50 Gauge
27-217	DAVIS STANDARD Rubber Extruder, 3.5", 20:1, Water Cooled
27-244	EXTRUSION Line for Steel Wire
28-115	BWE Conform / Conklad Model 550, 12 to 25.4 mm
30-131	BEKAERT NVE Hinge Joint Fence Machine, 2 meters wide
50-253	BARTELL Tubular Strander, Model B64, 10" Diameter, 24 Bays
59-239	NIEHOFF Copper Rod Drawing Line, Model MM85, 2 wire
60-276	SKET Steel Rod Break Down Line, Enter 5.5 mm

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Highly electrifying!

AT the extrusion of cables their insulation is inspected by spark testers (high-voltage spark testers) and possible insulation faults are detected and documented at an early stage. With the new high-frequency spark tester Spark 6030 HF, Sikora opens a new chapter in the spark tester segment: powerful, high reliability in the detection of faults and intelligent multimedia functions.

At the same time the Spark 6030 HF underlines that reliable technology alone is not sufficient to support the operator considerably at work and to ensure safety. That is the reason why Sikora has integrated a 4-step function and safety test according to EN61010-1:2010. Until now this had to be performed by means of external testing devices in the factory.

The Spark 6030 HF is developed for the reliable detection of insulation faults in cables with a diameter from 0.5 to 30mm. The system reliably distinguishes between punctual faults (pin holes) and bare patches.

For testing, the dry cable runs through the sturdy bead chain electrode of the spark tester. Typically the device is installed after the cooling section. Here the cable

insulation is exposed to the specific test voltage and faults in the insulation are reliably detected.

Directly integrated in the device is a display, visualising the selected test voltage, the capacitive load and number of high-voltage break downs. The display is combined with a control panel for entering the test voltage. For production lines without a line computer the Spark 6030 HF is combined with the processor controlled display and control device Remote 2000.

According to European standards, measuring and testing equipment has to be checked regularly. As an innovation in the spark tester segment the Spark 6030 HF optionally integrates a 4-step function and safety test. Accordingly, the spark tester is tested with regard to high-voltage, corona level, short-circuit current and function (sensitivity).

High-voltage test: In this test, the spark tester checks the displayed high-voltage of the device for correctness. The high-voltage has to be within a tolerance of 5%.

Test of the short-circuit current: The spark tester automatically checks the maximum short-circuit current, which for a human body model should not exceed 10 mA

when operating the device (according to EN61010-1:2010).

Function (sensitivity) test: The spark tester automatically performs a function test. By means of an integrated spark gap 20 artificial faults (breakdowns) are initiated in less than 20 seconds. The spark tester automatically checks the correctness of fault detection.

Corona test: The Spark 6030 HF automatically measures and evaluates the corona level. Within the creation of the test certificate the corona level is documented. Up to now, the operator was depending on subjective and visual evaluation of the condition of the insulators in order to fulfil the requirements of EN61010-1:2010. Worldwide the Spark 6030 HF is the only spark tester that carries out this test.

Via Wi-Fi and smart phones, each test is proved by a test certificate which is stored and transmitted to quality management with a single touch of the button. The sparktester conforms to approved test standards (AS, BS, CS, CENELEC, EN, UL, VDE) and safety regulations (as demanded by DIN/VDE 0800, IEC 479-1).

Sikora AG – Germany
Website: www.sikora.com

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Die drawing & lubricants



No maker of wire – a thin strand of metal which must be protected throughout production – requires to be instructed in the importance of lubricants in the correct formulation and amounts, properly applied by mechanisms as precisely calibrated as any in the plant.

Not only must the liquid or dry lubricant solution be adapted to the individual surface finish; it must facilitate feedability, accommodate high line speeds, and avoid contamination-related problems. Circulation, filtering and temperature

control must be responsive to conditions at all times and at every point in the cycle.

The soaps, oils, greases and pastes in the inventory of a state-of-the-art wire mill must also fulfil a second assignment as important as the first: enabling the precious dies through which the wire passes to render the longest possible service life of which they are capable. This dual responsibility – to the tools as well as to the product – is well understood by the suppliers reviewed in this section of EuroWire.

A commitment to the industry

With over 150 years of continuous operation and thanks to international structures and technical know-how, Condat's lubricant range is recognised as a global reference for the wire drawing industry.

The company offers the most extensive and comprehensive range of lubricants for the industry, including:

- Vicafil®: surface coatings, dry lubricants, wet lubricants, oils and pastes
- Steelskin®: speciality wire drawing lubricants
- Galvasmooth®: charcoal wipes for hot dip galvanising
- Condaclean: cleaners

From its inception, Condat's principal philosophy has been to offer products whose chemistries are both durable and environmentally responsible.

Since 2006, with the global evolution of ever more stringent chemical legislations (eg biocides, REACH, GHS), the company

has focused its innovation on providing lubricants as safe as possible for end users and the environment.

As an example, it has reduced its usage of Borax by more than 70 per cent for dry lubricants and has also developed an innovative range of borax-free surface treatments. This commitment helps provide for a healthier work environment for both customers and its own employees, without sacrificing the performance requirements of the products.

With this common philosophy, Condat, through its three production sites and international sales organisation, allows its customers to reduce both their environmental and transportation impact through local storage facilities. With this organisation, it is able to deliver products of a consistent high quality from any location and in a timely manner, thus minimising the risk to customers.

Condat – France

Website: www.condat-lubricants.com

Dies and lubricants – an important choice

The selection of proper dies and lubricants are two of the most important and essential requirements for wire drawing applications. This affects not only the quality, but also helps in reducing cost of drawing in terms of maintenance and the cost of drawing by increasing die life and reducing lubricants consumption.

Kay Pee Dies, established in 1968, produces tungsten carbide dies for wire, bar tube drawing, cold heading extrusion and special applications.

The company serves customers from India, South East Asia, Nepal, the Middle East and Africa. Since 2008 it has worked as an exclusive agent for Pan Chemicals SpA, Italy, for distribution and sale of its wire drawing lubricants.

Kay Pee Dies – India

Website: www.kaypeedies.com



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Offices in Manchester, Mumbai, São Paulo and Shanghai

Cost-effective solutions

Tecnofil has been designing and manufacturing wire-working machinery since 1994, offering cost-effective solutions in the wire industry. The latest developed machine is the ADR-4.

Tecnofil ADR-4 is a machine for fully automatic reworking of tungsten carbide dies, using CNC technology to give the highest productivity, reliability and die geometry precision.

The line is composed of:

- input die magazine holding up to 20 pieces
- electronic control panel with PLC and touch screen to set working parameters
- fully automatic die shifting along the three work stations (cone grinding, cone polishing, cylinder calibration)
- fully automatic identification and selection of input/output dies
- automatic diamond paste feeding.



▲ The ADR-4 from Tecnofil

ADR-4 line works as follows:

1° Station – Cone grinding: The line picks one die from the magazine and inserts in the rotating pliers; the machine automatically sets the contact point and then starts grinding the dies. The control of die diameter is made by adjustable steps to get highest precision level.

2° Station – Cone polishing: The die is picked from grinding station and is delivered to the rotating pliers of the polishing station. Diamond paste is automatically inserted in the die, then the machine sets the contact point and starts polishing the die. The polishing pin can be automatically reground after the desired number of cycles. The control of the die diameter is made by adjustable steps to get the highest precision level.

3° Station – Cylinder calibration: The die is picked from the cone finishing station and delivered to the rotating pliers of the cylinder calibration. The diamond paste is automatically inserted in the die, then the machine sets the contact point and starts polishing the cone by vibration and position control. The re-worked die is placed in the finished die magazine.

Technical features: Die diameter range from 0.4 to 6mm, production speed: 50 dies/hour.

Tecnofil SpA – Italy
Website: www.tecnofil.net

Lab investment for UK firm

As part of its ambitious expansion plan and commitment to quality and service, leading wire drawing lubricant specialist Metalube has acquired almost £60,000 worth of new laboratory equipment.

With a £40,000 investment, the Mettler TGA/DSC is a laboratory highlight. This cutting-edge instrument carries out simultaneous differential scanning calorimetry and thermogravimetric analysis in a single test enabling the evaluation of oxidative stability and evaporation rates under a variety of conditions.

Technical director Chris Nettleship said: "This new Mettler TGA/DSC is particularly good news for wire and tube drawing manufacturers. It allows us to study the ageing of oils and therefore extend the service life. We can also investigate how lubricants behave during the annealing cycle, working alongside customers to optimise product and processes. This all results in enhanced tube quality."

Another recent addition to Metalube's lab is an £18,000 Reichert M2 friction and wear tester. This latest model with variable speed and load allows the company's chemists to study the frictional and wear reduction properties of Metalube's wire drawing products (copper and aluminium).

Mr Nettleship added: "Investment is key to our growth and ensures that Metalube continually provides the class of products that meet our customers' needs. We are 100 per cent committed to quality and innovation. This requires equipment that meets 21st century demands."

Metalube Ltd – UK
Website: www.metalube.co.uk

40 years' experience

Die Tec is an established Mexican company with 40 years' experience in the manufacture of wire drawing dies and special tools for the wire, tube and bar drawing industry.

The company also works with stamping dies and special tooling that requires high quality materials to improve productivity and extend life expectancy.

All tools are manufactured under the worldwide known brand of "Diamex".

Die Tec International – Mexico

Sparkling Nota!

A private company, Nota Precision Engineering has maintained a high position in the market for diamond drawing tools, specialising in the manufacture of tools with superhard materials.

The Polish company has a wealth of experience in diamond dies for drawing wire of carbon steel, stainless steel, stainless steel, copper, bronze, brass, aluminium, nickel and silver, with different geometry, in which the working part may be made of natural diamond, synthetic diamond monocrystalline and polycrystalline synthetic diamond.

Nota can also offer customers diamond and CBN wheels, cutters and other tools with PCD and PCBN, diamond grain and diamond micropowders, diamond pastes, titanium carbide, boron nitride grains, and calibres enamel, inserts for cutting PCD, PDC, PCBN, and diamond dressers.

NOTA Precision Engineering Company – Poland
Website: www.nota.pl

Worldwide reputation

Established in 1950 by Frank Fox, Foxton Die Company has grown from a small, locally based concern into a worldwide manufacturer of tungsten carbide wire drawing dies. The company has flourished during a period that has seen general manufacturing ravaged in the UK. Frank Fox had worked during the 1940s in the die department at Charles Hurst & Son, a renowned wire-drawing factory. He saw the opportunity of setting up a specialist die manufacturing business of his own and so started the company from a small wooden shed in Cleckheaton, Yorkshire, just a few hundred metres away from the current premises.

Engineering excellence and customer service remain the main aims of the company, but managing director Darrell Fox, son of the founder, takes a progressive approach to the future of the business. "We really want to strengthen our message even more. Our customers include manufacturers of wire, bar, cables, jewellery, reinforced concrete, tyres and many more, but new applications are being found all the time. Our experience in industry means that we can find solutions for all types of manufacturing challenges."

Wire drawing dies are a speciality, both round and shaped, but other types of products are manufactured including extrusion, spinner and guide dies. A cleaning and repair service is also offered, along with various ancillary products. Dies are supplied, often from stock, in any quantity and to any schedule to meet the customer's specific requirements.

Foxton Dies Ltd – UK
Website: www.foxtondies.com

New generation lubricant

RichardsApex Europe Ltd is now manufacturing SK-60, its newest generation lubricant for copper rolling mills. SK-60 incorporates state-of-the-art synthetic lubricant design technology.

Throughout ongoing field production trials SK-60 has consistently demonstrated significant comparative advantages with regard to: Extending roll life, rejecting tramp oil, reducing operating concentrations, largely eliminating the need to use tank-side additives and longer emulsion lifetime.

Richards Apex – UK
Website: www.richardsapex.com

www.read-eurowire.com

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Design: CONDAT - 08/08/2013

Invisible strength of dies

Ajex & Turner offers a wide range of wire drawing and compacting dies for any size in PCD, ND, carbide, nano, enamelling and extrusion tooling with Conoptica report, giving accurate geometry of the die.

The company offers in-house die polishing and re-conditioning machines, along with die polishing accessories for PCD/ND/carbide.

Dies can be made in any size as per customers' specifications and offer excellent corrosive wear resistance.



▼ A range of dies from Ajex & Turner

Ajex dies offer following benefits:-

- Allows for high-speed cable production at significantly lower running temperatures and reduces energy costs
- Vastly improves cable surface finish and reduces wire breakage and start-up problems
- Unique design optimises price – performance benefits
- Special locking system in split dies
- Can be made in any size from 1mm to 100mm

Ajex & Turner offers full support in demonstration, applications and service support requirements of its products for customers. It has set up European automatic machines for making dies of all sizes and equipped with all latest quality control system. These automatic machines will produce 300 dies per day with accurate geometry.

Ajex & Turner Wire Dies Co – India

Website: www.ajexturner.com

Range of services

Headquartered in France, Balloffet has been manufacturing dies since 1870 and has three subsidiary companies in the USA, UK and Germany, as well as a worldwide agents network. The company has maintained all its die production in Europe.

The company produces natural diamond dies from 6 μ to 3mm, synthetic mono-crystalline dies from 6 μ to 1mm, poly-crystalline (PCD) dies from 50 μ to 30mm, compacting, stranding and special

shaped dies, enamelling guides, extrusion tooling (guides and dies), special tooling with diamond insert and repolishing machines and equipment.

Balloffet also offers repolishing, training of operators and technicians in its own training centre and showroom or at the customer's plant, and control and technical report of customers' dies.

Balloffet – France

Website: www.balloffetdie.com

Recognised leader

Hangsterfer's Laboratories, Mantua, New Jersey, USA, is recognised as a leader in metal forming compounds.

The Aldraw series of metal forming and fabricating compounds offers outstanding performance across a wide range of applications.

Stamping and blanking of carbon steel, along with drawing of high nickel tubing are accomplished with extended die life, excellent finishes and reduction in scrap material.

The non-hazardous formulation of the Aldraw J2, J1, J4 and J50 provides for a safe work environment and easy waste disposal. Aldraw series metal forming compounds provide customers with complete operational flexibility to handle the toughest jobs and exotic materials with total confidence.



▲ A floating plug from Hangsterfers

Metal spinning and severe forming applications that require maximum adherence and shear resistance are applications where Hangsterfer's Aldraw metal forming compounds provide outstanding results.

Hangsterfer's Aldraw J2, J1, J4 and 50, as well as the full line of Hangsterfer's metal working products, are available globally through a select group of stocking distributors.

Hangsterfer's Laboratories – USA

Website: www.hangsterfers.com

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Interwire 2013



Images of exhibition courtesy WHI and Wire Journal. Main background image courtesy of bigstockphoto.com. Photographer Christophe Holland



INTERWIRE TOUCHDOWN!

MORE than 350 exhibitors will head for Georgia, Atlanta, in April as the wire and cable roadshow heads into town for Interwire.

Organised by the Wire Association International, Interwire is America's premier show for ferrous, non-ferrous and electrical companies from within the sector.

The show, from 23rd to 25th April, is the benchmark trade exhibition for the industry in the USA. This year's show will have a sport theme to it with Hines Ward, wide receiver with the Pittsburgh Steelers, delivering the keynote speech.

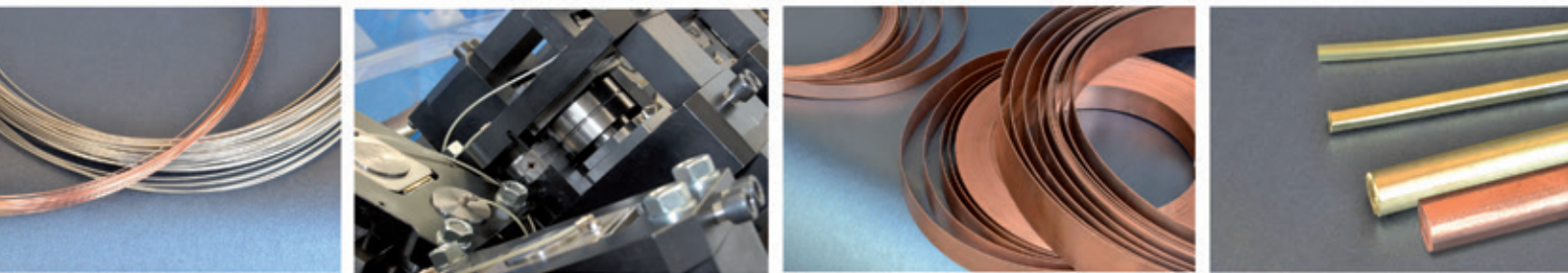
The National Football League great, a Superbowl winner and the only player in NFL Pro Bowl history to score a touchdown on an onside kick, will deliver his speech at the Tuesday luncheon. There is also a golf tournament and charity 5k road race.

The opening reception takes place in the Omni Hotel Atrium from 6.30pm to 8.30pm on Tuesday.

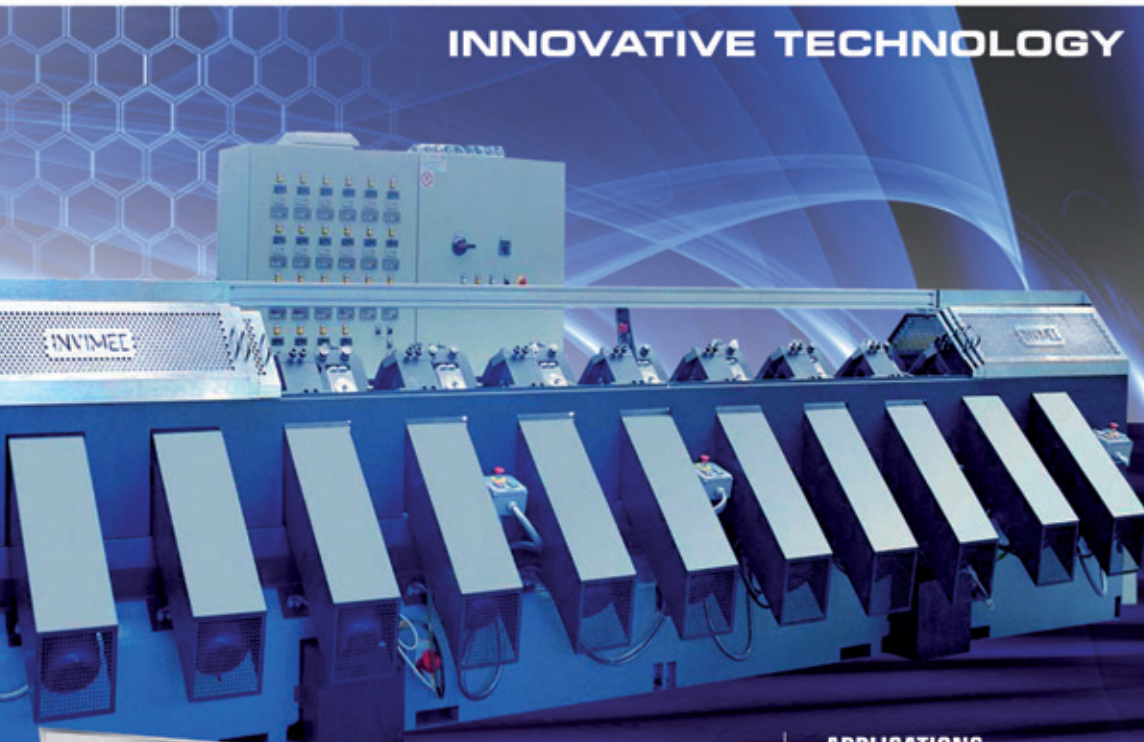
The exhibition runs from 10am to 5pm Tuesday and Wednesday, and 10am to 3pm on Thursday.



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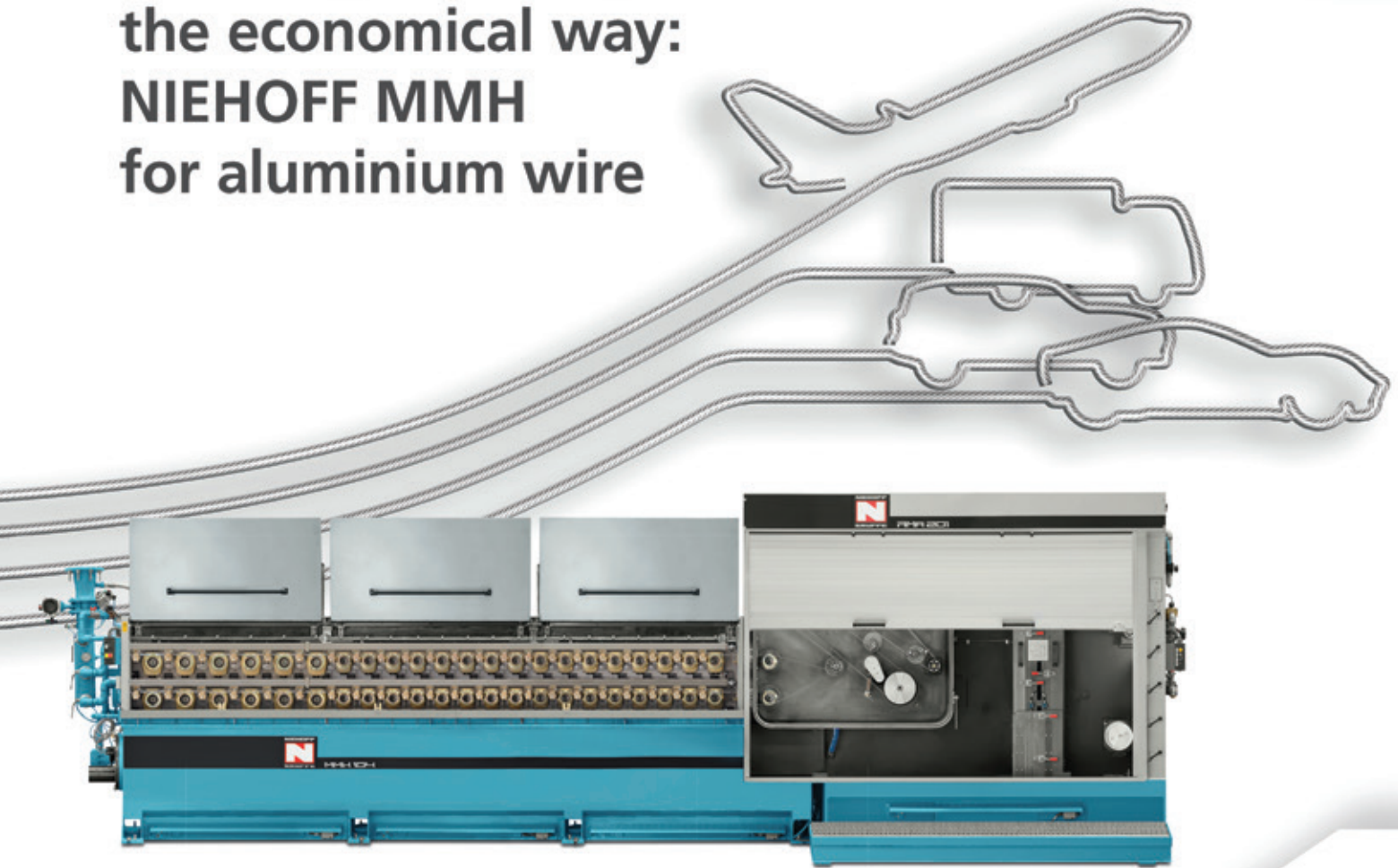





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Advaris GmbH Booth 1070

The Advaris modules for product data management, manufacturing execution and enterprise resource planning (ERP) guarantee smooth integration and the optimisation of processes for companies in the cable industry which are not able to exploit their potential with conventional ERP systems.

Advaris provides optimised industry-specific processes and functions from cable design and the issuing of quotations to manufacturing, quality control, delivery and invoicing.

Advaris GmbH – Germany
Website: www.advaris.com



AEI Compounds Booth 252

Having developed and manufactured wire and cable compounds for over 30 years, AEI Compounds is able to offer a comprehensive range of compounds to meet many of the main wire and cable applications for the European, Asian, Middle Eastern and Far Eastern markets.

The company also works with customers to develop compounds that require compliance to more local and specialised applications such as in the US market.

Products include insulation and sheathing compounds and an extensive range of halogen free grades. Manufacturing both thermoplastic and crosslinkable types, AEI offers the cable designer a wide choice of products to fulfil requirements of most common cable constructions.

AEI Compounds – UK
Website: www.aeicompounds.com



AIM Inc Booth 1014

AIM will be presenting the newest innovation in wire bending: the Synchro bender. This patented bender allows complex forms to be made without sophisticated tool configuration. In addition to the Synchro, AIM will present the new Accuweld line with exclusive features.

The company also specialises in completely automated robotic work cell solutions that take wire from coil, and form, weld and systematically arrange the finished parts. In all instances, wire can be fed directly from a coil, straightened, bent and cut using a software package that provides flexibility and simplicity in programming and is offered in all 'universal languages'.

AIM Inc – USA
Website: www.aimmachines.com



Anbao Wire & Mesh Co, Ltd Booth 331

Anbao is a manufacturer and exporter of steel wire products, galvanised steel wire and strands, Galfan wire and strands, including ACSR wire and strand, overhead ground wire and

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message strand, message/guy/stay/span wire and strand, aluminium-clad steel wire and strand, armouring cable wire and braiding wire.



▲ Wire products from Anbao

The company also supplies stainless steel wire for weaving, braiding, knitting and lashing wire, and is also engaged in various metal wire mesh products. Anbao operates under the ISO 9001 and 14001 quality control system.

Anbao (Qinhuangdao) Wire & Mesh Co, Ltd – China

Website: www.anbao.com



Aztech Lubricants Booth 569

Aztech Lubricants is a global provider of wire drawing and lubrication solutions. With over 125 years of cumulative expertise, the company provides a full line of calcium, sodium and potassium stearate drawing powders, RP oil, drawing oils and precoats.

Key name brands that will be showcased at this year's Interwire include EZDraw, EZClean and EZCoat. The company also offers a complete line of AZWipe spiral brushes, for an easy method to remove excess scale, rust or coatings from wire.

Aztech Lubricants has manufacturing and distribution capabilities in the USA, South America and Asia.

Aztech Lubricants – USA

Website: www.aztechlube.com



B&H Tool Company Booth 1916

B&H Tool Company provides tooling solutions to improve the quality of

extruded products and reduce scrap and set-up. At Interwire, the company will showcase the BH25A MicroCrosshead with Spiral Deflector, claimed to be the industry's lowest area micro crosshead, delivering microextrusion performance for insulated fine wire, fibre optics, and microbore tubing.

Major medical equipment manufacturers have documented significant improvements in micro extrusion process capability and stability using the BH25A MicroCrosshead.

For FEP applications, the BH25A crosshead insulates fine wire with a finished OD of 0.00471" and core OD of 0.00157". Tolerances depend on process and material, but are in the range of +0.0005".

The company will also display its plastic extrusion tooling, including adjustable centre crossheads, fixed centre crossheads, multi-layer crosshead assemblies, tips and dies, and accessories, including extrusion heaters and striping attachments.

B&H produces plastic extrusion tooling for insulated wire, jacketed cable, tubing,

With many years of experience and highly qualified technicians we produce any type of NEW cable plants. TRAFCO is also experienced in supplying SECOND HAND cable plants and in refurbishing Your machineries, grant its functionality and productivity according to all international standards and safety regulations.

Wire drawing lines - Extrusion lines - Double twisters
Stranding lines - Drum twisters - Manual or Automatic Coiling Lines
Rewinding lines - Drawing Dies Laboratory
Complete range of Drawing Dies and Accessories

TRAFCO's highly experienced engineers and technicians are specialized in the cable manufacturing and can deliver a know how and engineering knowledge for all kind of cable production, personnel training, technical and economical feasibility studies, complete turnkey factories.



TRAFCO
WIRE DRAWING MACHINES CABLE MACHINERY

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mail: info@trafcomachinery.com
web site: www.trafcomachinery.com



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hose, pipe and profiles, specialising in practical solutions that minimise life cycle costs, reduce set-up and scrap, and meet specific needs such as lowering temperature profiles and increasing line speeds. The company provides comprehensive engineering, production and technical support to companies who manufacture wire, cable, tubing, hose, pipe and profiles.



▲ BH25A MicroCrosshead with Spiral Deflector

At Interwire, B&H Tool Company will offer four important free tools: a crosshead replacement calculator, tip and die cost calculator, tooling calculator, and DDR/DRB calculator.

The company's Extrusion Process Analysis Package can quickly and efficiently identify the root causes of difficulties related to surging, dimensional variation, crystallisation, knit lines, and other problems not covered by equipment manuals or material spec sheets.

B&H Tool Company – USA
Website: www.bhtool.com

Balloffet **Booth 114**

Headquartered in France, Balloffet has been manufacturing dies since 1870 and has three subsidiary companies in the USA, UK and Germany, as well as a worldwide network of agents. The company has maintained all its die production in Europe.

The company produces natural diamond dies from 6µ to 3mm, synthetic mono-crystalline dies from 6µ to 1mm, poly-crystalline (PCD) dies from 50µ to 30mm, compacting, stranding and special shaped dies, enamelling guides, extrusion tooling (guides and dies), special tooling with diamond insert and repolishing machines and equipment.

Balloffet also offers repolishing, training of operators and technicians in its own training centre and showroom or at

the customer's plant, and control and technical report of customers' dies.

Balloffet – France
Website: www.balloffetdie.com

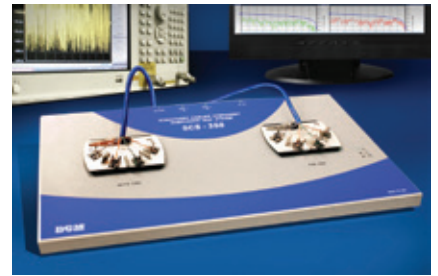
Beta LaserMike **Booth 631**

Beta LaserMike, a provider of precision measurement and control solutions, will exhibit its complete system solution for the in-process measurement and automated quality control testing of communication cable at this year's Interwire.

"In these competitive times, when cable manufacturers are worried about how they can be more profitable, we believe it is more important than ever to educate them about the power of an integrated measurement and controls system," said Bob Stockholm, Beta LaserMike's director of sales for the Americas. "We want to demonstrate that by implementing highly accurate measurement and control solutions along the critical points in the cable extrusion process, manufacturers can significantly increase productivity, reduce waste, and improve product quality to successfully grow their business."

Beta LaserMike plans to display a complete cable extrusion line measurement and control system with gauges in place from the extruder through the puller station. The integrated system solution includes: pre-heater system for uniform, in-process wire heating to eliminate insulation voids in primary cables; AccuScan system for precise on-line measurement of cable diameter and ovality; CapScan system for accurate on-line measurement of cable capacitance; CenterScan system for accurate, reliable monitoring of insulated cable diameter and eccentricity of conductors; lump and neckdown detector system, including the new LN3015 3-axis gauge; and high-frequency spark tester for on-line detection of faults in cable insulation, such as voids and pin holes.

Also included is the LaserSpeed system for non-contact length and speed measurement of moving product with $\pm 0.05\%$ accuracy and $\pm 0.02\%$ repeatability; BenchMike bench-top system for fast, accurate dimensional measurement of cut product samples; DataPro process controller and data management system; LayScan system for accurate, consistent cable lay length measurement of twisted pairs; and SRL Pro on-line structural return loss (SRL) prediction and analysis system.



▲ Beta LaserMike will exhibit the new DCM SCS-350B for testing of high performance LAN cable

Beta LaserMike will also be displaying its line of bench-top DCM testing systems for LAN/data cable, such as the DCM Model ES-2G for quality testing 4-pair category cables up to 2 GHz, and DCM Model SCS-350B for quality testing 4-pair category cables up to 600 MHz. The DCM line of cable testing systems includes bench-top and fully integrated turnkey solutions for accurately and reliably testing LAN/data, telecom, coaxial, and aerospace/defence cables.

Beta LaserMike – USA
Website: www.betalasermike.com

Blachford Corp **Booth 506**

In 2008, a Georgia, USA, sugar mill suffered a devastating explosion due to the presence and subsequent ignition of a combustible dust cloud. The accident resulted in the deaths of 13 people and changed the way industrial manufacturers manage and mitigate dust-related risk.

This accident illustrated the risk associated with combustible dusts and soon thereafter OSHA began an intensive review of workplace safety in dust producing processes.

At the same time, wire manufacturers intensified their search for ways to reduce both the creation and accumulation of dust in their facilities. As part of their search, a number of wire drawers asked Blachford Corporation for technological developments that would reduce dust creation during steel wire drawing.

For over 50 years Blachford has been active as an innovator and a technical solutions provider for the global wire drawing industry.

The company tailors lubricant programmes to the technical specifications of customers' processes. Blachford provides new technology products to wire producers in support of their ever-changing needs. >>>



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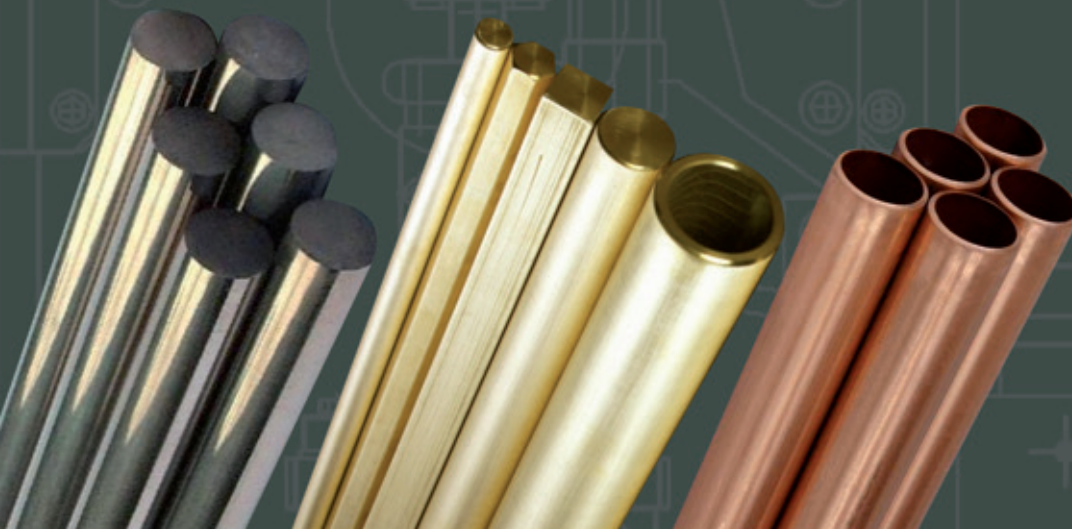


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▲ Blachford past and present

Blachford's efforts led to the development of its newest technology products: Low Dust Drawing Lubricants.

These dry lubricants reduce the creation of observable dust, and in some processes can result in increased drawing speeds, reduced lubricant consumption and extended die life. There is the additional potential of providing improved corrosion resistance.

At Interwire Blachford will present a technical paper on "The Potential for Lubricant Dust Explosions in the Wire Drawing Industry", and will share information with customers at the company's booth.

Blachford Corp – USA

Website: www.blachford.com

Bow Technology Booth 1932

Bow Technology is the answer to cable makers concerned by quality and long-life reliable bows for all brands of double twist machines.

With a comprehensive range of over 500 designs in constant evolution, the division offers a global service from conception to production. The company is the owner of the patented GreenBow, a unique design enabling important energy savings.

Bow Technology – France

Website: www.bowtechnology.com

CM Caballé, SA Booth 212

With over 60 years of experience in the design and manufacture of rotating machinery for the production of power and telecommunication cables and steel ropes, CM Caballé provides the cable industry with a wide array of stranding, twinning, bunching and cabling machinery.



▲ Rigid strander with automatic loading system

The firm is constantly developing new, high quality equipment to meet the ever-changing needs of the wire and cable industry.

The company's portfolio includes equipment for power cables (double twist stranders, rigid stranders, drum twisters, single twist stranders, bow skip stranders, tubular stranders, planetary stranders and SZ stranders); telecom and LAN cables (double twist pairing-quadding machines, single twist cabling lines, group twinner, drum twisters, shielding-jelly filling-sheathing lines and SZ stranders); steel ropes (double twist stranders, tubular stranders, planetary stranders and bow skip stranders); and ancillary equipment (payoffs, take-ups, capstans, caterpillars, taping machines and binders).

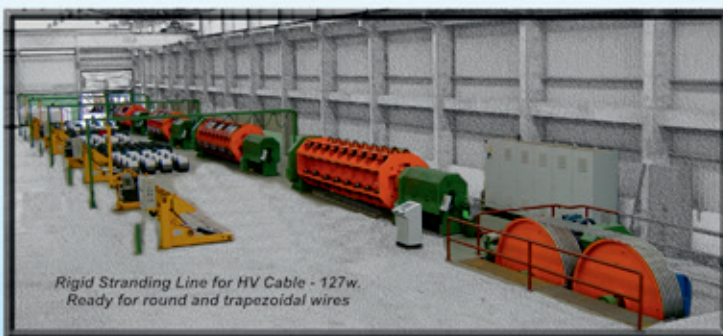


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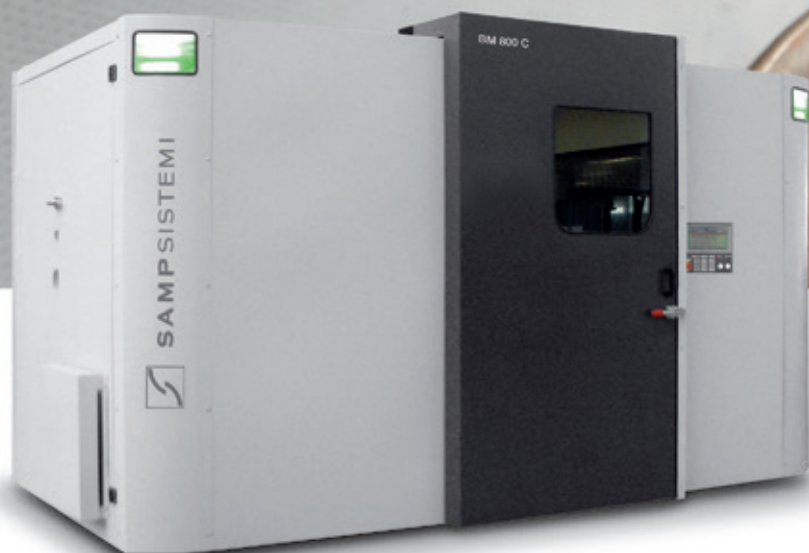
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INTERWIRE STAND 215
TRADE EXPOSITION



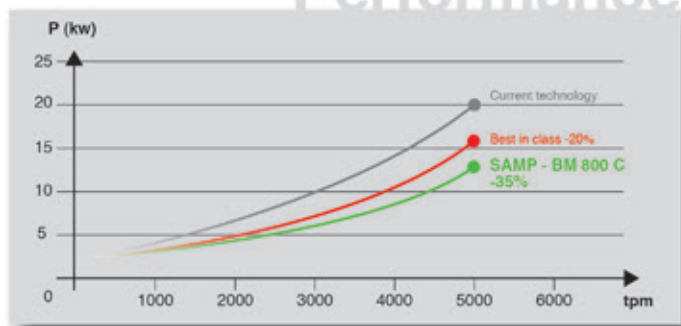
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Performance

The new BM 800 C is a high-performance and innovative double-twist bunching machine. In-depth tests carried out in real working conditions show a decrease of energy costs by up to 35% compared to traditional machines.





At Interwire, the company will show a new range of rigid stranders and drum twisters that have been redesigned and upgraded in collaboration with energy cable producers to manufacture products such as compacted conductors of copper and aluminium for LV, MV, HV and EHV insulated conductors; sector conductors (Milliken) of copper and aluminium for high and extra high voltage insulated conductors; aluminium overhead conductors (AAAC, ACSR) with round or trapezoidal wires; screening with copper wires (single or multi-wire) for MV and HV conductors; and armouring with galvanised steel wires.

CM Caballé, SA – Spain
Website: www.cmcaballe.com



Carris Reels Booth 1524

At Carris Reels, safety and strength are of utmost concern when it comes to products, especially its line of plywood reels and spools. In addition to providing strength and durability with optional hardwood flanges, Carris offers reelply, a hardboard-clad plywood.

For over half a century, Carris Reels has provided its customers with high-quality cable reels and spools including plywood reels, plastic reels and nailed wood reels for the wire and cable industry.

Carris Reels – USA
Website: www.carris.com



Chengdu Centran Booth 970

Centran Industrial is a global supplier of raw materials for the cable and wire industry. It is one of the largest manufacturers of water-blocking tape, water-blocking PET and E-glass yarn, polyester yarn and flame retardant and marking tape in China, and was established in 1997.

The manufacturing facilities located in Chengdu and Wuxi have a total capacity of 5,000 MT for water-blocking tape and yarn.

With emphasis on quality and customer satisfaction, the company is ISO 9002 certified and has become a reliable source of quality products in the international market, exporting to more than 45 countries worldwide.

Centran's tapes and yarn are used for power cable, optical cable, copper

telephone cable, data cable and submarine cable, as binding, bedding, barrier and separating functions.

Chengdu Centran Industrial Co, Ltd – China
Website: www.china-centran.com



Cimteq Ltd Booth 2032

CableBuilder, Cimteq's cable design and quotation software application, helps companies to design wire and cable faster, quote faster and avoid costly mistakes that lead to scrap and re-work.

The application can produce 2D, 3D and profile drawings, and is easy to use and to implement, with features such as fast cable design for all types of cables; easy to use mass-update tools; version control with version comparison; work-flow and approval control; completely customisable configurations; integration to ERP systems; integrated Crystal Reports engine from SAP; and data import/export with spreadsheets.

Other features include fast quotation generation, packaging calculations,



▲ Cimteq's CableBuilder design and quotation software

length-based costing, production of professional datasheets and manufacturing instructions, cable configuration/variant generator, what-if analysis of value engineering, bill-of-material and routing generation, and alternative bill-of-material and routing.

Successfully implementing software is a partnership between the cable maker and the software provider. Cimteq states that it understands the requirements of the industry, and is able to provide companies with the flexibility they require.

Cimteq Ltd – UK
Website: www.cimteq.com

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Clinton Instrument Company Booth 901

Clinton Instrument Company, a leader in spark testers for the wire and cable industry, has expanded its high voltage pinhole detection technology to include new quality control tools for manufacturers of plastic- and dielectric-coated materials.

A Clinton pinhole detection system performs a 100 per cent inspection on the manufacturing line, ensuring product reliability and averting further processing of substandard material. Clinton engineers are available to discuss your pinhole detection application.

Clinton Instrument Company – USA
Website: www.cicsparkers.com



Condat Corp Booth 1650

Condat's lubricant and surface technology range covers all metal forming applications and the company's commercial network services the metal

forming industry worldwide. With over 150 years of expertise in the lubricant business, Condat continuously improves and upgrades its formulations for better value and in order to match the most advanced environmental regulations.

Condat Corporation is the US-based division of Condat SA. With extensive production capabilities, the subsidiary offers the flexibility and reactivity to fully serve the North American market.

A team of experienced sales engineers can help customers with the wide selection of innovative products and services on offer. Condat recommends the best lubricant solutions combining technical and environmental aspects, as well as economic considerations.

At Interwire Condat will present its latest developments in lubricants and products for wire drawing industries, including Vicafil wire drawing lubricants, Steelskin lubricants for demanding applications, Galvasmooth charcoals for hot dip galvanising, and Condaclean cleaners for all metal types.

The show will be an opportunity for Condat to promote several recently developed new products, including Vicafil

TN 1674 T and Vicafil TN 1608 T, two new sodium-based soaps for high speed drawing of carbon steel grades. TN 1674 T is free of lime and calcium compounds.

The company will also be promoting Vicafil TS 4770 W, a non-reactive pre-coating specifically developed to address the demanding application of in-line coating of stainless steels, immediately in front of the drawing bench.

Condat Corporation – USA
Website: www.condatcorp.com



Daloo Booth 1932

Daloo is a supplier of equipment for cable producers wanting simple and reliable machines.

While the design is based on European experience, the manufacturing is performed in China following strict quality criteria.

The company's complete stranding lines and accessories for the production of power and communication cables are

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delivered worldwide, including rigid cage stranders, taping lines, rewinding lines, take-ups and payoffs, and pulling caterpillars.

Daloo – China

Website: www.daloo-machines.com



Die Quip Booth 1003

Many factories take a disposable approach to their dies, looking for a way to reduce cost. This low purchase cost model can have hidden charges that affect the production cost and quality of a mill's efficiency.

High overnight freight and two-way freight fees are regularly absorbed from rush orders when dies are needed quickly or customer requests demand changes to stock.

Large inventories, hidden labour and disposal of good dies from short runs are common areas where production costs are increased but not controlled.

An internal die shop can easily eliminate these expensive problems.



▲ MGF-200 semi-automatic die grinding and polishing machine

With the right training and machinery each die is quickly sized for production and can be adjusted immediately to accommodate production runs. Correct die geometry solves many production problems and good dies pull more wire. Production costs decrease with an efficient internal die shop, and Die Quip has the expertise, training, support and machinery to get you there.

The company's extensive training products include on-site machine training, die making instruction and die design programs for operators and plant management.

Each machine is supplied with Die Quip's exclusive Die Making Handbook

that has reference charts, procedures, formulas and die production instructions.

Die Quip – USA

Website: www.diequip.com



Eder Engineering GmbH Booth 1050

Depending on the quantity of drawn wire and also on the care under which the die tools are being used, all dies are subject to wear.

Their best economy and efficiency is achieved if the dies are taken out of the machine for a fast re-polishing when an onset of wear is visible in the drawing cone, where the incoming wire establishes first contact with the die.

By doing so, the die tools can be used successfully and largely with their initial bore diameter for a long time, prior to having to enlarge them to their next larger usable size.

In today's highly competitive wire drawing industry, and with the growing

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INTERWIRE

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Booth No. 340

<<<

use of multi-wire drawing machines with up to 48 wires drawn on a single machine, a well-equipped and efficiently functioning modern die-workshop is an absolute must, if drawing efficiency and economy is to be maintained at the highest possible level.

Unique concepts, such as Eder's USP-Twin and HGM-21 equipment, have been developed to meet all these demands.



▲ Eder's USP-Twin

Eder-Austria offers a variety of easy to understand and operate state-of-the-art die-reconditioning machines, and its high degree of inherent automation can reduce the number of personnel and the levels of skills formerly required, while at the same time offering longer die life, higher tonnages of drawn wire, and lower operational cost.

Correct refurbishment of dies regularly undertaken in time and with appropriate machines can prolong the service life of costly die tools and as such can contribute to the economic welfare higher net product value in a wire and cable plant.

Eder Engineering GmbH – Austria
Website: www.eder-eng.com



Enkotec A/S Booth 570

At Enkotec's booth, staff will be ready to present news from the area of high-performance machinery for nail production.

The company's product range includes various complementary machines supplied as standalone units or in ENKoline in-line systems.

This year Enkotec will launch an upgrade of the complete ENKOnail+ high-capacity nail machine series.

The upgrade includes many advantages, including: disco variator replaced by robust and maintenance-free servomotor drive; more user-friendly software; improved system for insertion timing with easy and quick adjustment; larger

eight-groove feed rollers with improved lifetime; pedal for manual drive of machine; exhaust air connections allowing efficient evacuation of dust; improved cooling of machine due to powerful extraction of air; electrical cabinet rubber damping supports to reduce vibration; and a box for nibs inside the machine.

Enkotec nail machines are based on a rotary forming principle, allowing wire feeding, wire cutting and head forming to take place in one continuous process of rotating movements, and offering the possibility of unmanned production.

The company claims that the output-per-minute rate of the ENKOnail+ series is the highest in the market, without affecting the production stability. The dimension range is as wide as $\varnothing 1.8-4.2\text{mm}$ (0.071" to 0.165") x nail lengths 32-130mm (1¼" to 5¼").

The machines incorporate a compact, space-saving design and a user-friendly PLC control system with touch screen operator interface, which is easy to navigate and allows quick setup of nail parameters.

Tooling changeovers and maintenance routines are easy to carry out owing to the user-friendly open-door machine design.



▲ Open front of the NX02 machine

At the same time, Enkotec's machine concept allows the implementation of an environment-friendly production with a low noise level, small energy consumption and an oil-free manufacturing process, eliminating the need for subsequent nail tumbling.

Enkotec A/S – Denmark
Website: www.enkotec.com



Esteves Group Booth 806

The Esteves Group is a global company with almost 100 years of expertise in the production of dies, extrusion tools, machines for die reconditioning and refurbishing services. >>>

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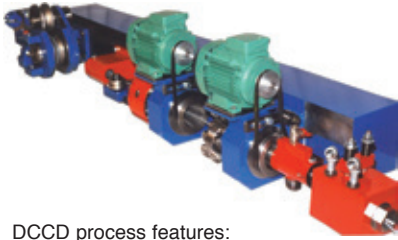
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Esteves Group – USA

Website: www.estevesgroup.com



Eurolls

Booth 1739

Over the past year, Eurolls SpA has been conducting several studies on the use of rolling cassettes versus dies, for special applications.

With the cooperation of several key customers, the company has been able to perform these tests with optimal results.

Consequently, in 2012 Eurolls supplied a large quantity of rolling cassettes to major producers of welding wire and special alloys.

Eurolls can guarantee very precise tolerances, not only for materials made of low, medium and high carbon, but also on wire made by special materials.

The latest Eurolls rolling cassettes are able to achieve final diameters smaller than 1mm.

The Italian company has demonstrated throughout the years its commitment to evolving the rolling cassette technology, since it was first introduced by Eurolls in 1996.

Eurolls completely understands the wire production process, and claims to be the only rolling cassette manufacturer that produces all of its own internal parts, including the cassette body and the rolls. In 2013, Eurolls plans to introduce its latest innovative rolling cassettes to the world market.

The company has recently closed important orders throughout the USA, Mexico and Canadian markets, for different Eurolls products, including machinery and equipment for the wire sector, and roll tooling for the tubing sector.

Thanks to a new working agreement, Eurolls will soon provide regrinding services for tube mill rolls in the USA, and will continue to provide wire and tube mill regrinding services at the Eurolls De Mexico facility, located outside Monterrey, Mexico.

Eurolls SpA – Italy

Website: www.eurolls.com



Flymca and Flyro
Booth 215

For many years Flymca has been producing standard and traditional rotating machines such as rigid, tubular, skip, and planetary stranders as well as drum twisting lines, bow cablers, and double twist bunchers.

The company, which produces payoffs and take-ups for bobbins up to 8,000mm/650 tons, is now also involved in the production of special equipment used for submarine, offshore and umbilical cables production, as well as machinery for steel rope manufacturing.

Flyro is also buying and selling used equipment for the wire and cable, tube and bar industry.

Flymca and Flyro – Spain

Website: www.flymca.com



Gauder America
Booth 1832

The newly created Gauder America will be present on the Lloyd & Bouvier, Inc booth, since the companies entered into a joint venture agreement for better serving the USA and Canada used machines markets.

The Belgium-based supplier has in stock more than 1,000 machines ready to manufacture wires, conductors, cables, ropes and steel products.

A large stock of equipment and any new entries can be viewed in real time at the company's website.

Gauder America – USA

Website: www.gauderamerica.com



Gauder Group, Inc
Booth 1932

With over 20 years of continuous presence and after several recent major machine installations in the USA, the Interwire 2013 show is an opportunity for the Gauder Group, Inc to highlight the

▼ *Bow technology – Gauder Group*



joint rebranding of its Pourtier and SETIC product range as a combined entity, Pourtier & SETIC of America.

Based in France, both are leaders in rotating machines for the non-ferrous wire and cable industry. Gauder Group, Inc develops its support and parts services (including high technology bows) to the North American market from Greensboro, North Carolina.

Gauder Group, Inc – USA
Website: www.gaudergroup.com



Gem Gravure Co Inc
Booth 706

Marking the surface of fluoropolymers is a challenge. Typically a contact wheel has been used to place information such as manufacturer or specification on the surface.

While effective, this technique limits variable information. During 2012, Gem chemists developed two ink jet inks for these materials.

BKG7761 Black and GNG7765 Green are designed for use on fluoropolymers in continuous manufacturing processes. Codes are applied prior to sintering ovens, and heat exposure is required to complete adhesion to the jacket surface. Common industrial fluoropolymers used in industry include PTFE, FEP and ETFE.

The newly formulated inkjet inks show adhesion that is comparable to the traditional gravure inks. After processing, codes survive MIL-W-227598 adhesion testing.

▼ Gem's BKG7761 Black and GNG7765 Green inks



A sewing needle with a diameter of 0.025" is pulled back and forth over the code for 60 cycles.

The length of the stroke is 3/8". A small weight of 500g is attached to the top of the apparatus to hold the needle in place.

125 cycles should be performed; passing codes remain legible after this test.

Results may vary with manufacturing and surface conditions, and customer testing is required to confirm performance.

Gem Gravure Co Inc – USA
Website: www.gemgravure.com



GMP Slovakia
Booth 558

GMP Slovakia produces take-apart reels, including the Easycoil Plus reel. This patented reel can also be used as a coil lifter: with lifting rings in "lifting" position, the barrel expands during the lifting operation and lifts the coil.



▲ GMP's Easycoil Plus take-apart reel

With lifting rings in "free" position, the barrel collapses during the lifting operation and sets the coil free.

Easycoil Plus is completely machined on the parts in contact with the wire, and can be customised according to customers' requirements.

It can be supplied with slots in the flange to fit cardboard barrels, or with changeable flanges to make coils of different widths. >>>



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Easykoil Plus can be balanced, and to prevent wear problems due to the high rotation speed, hardened changeable bushings are recommended.

GMP Slovakia – Slovakia

Website: www.gmp-slovakia.com

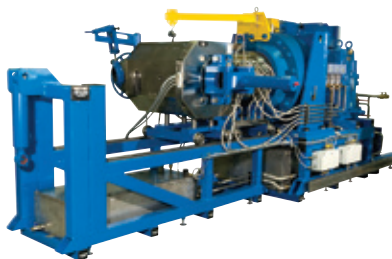


H Folke Sandelin AB Booth 740

H Folke Sandelin AB (HFSAB) from Motala, Sweden, will be a co-exhibitor with Niehoff Endex North America Inc. (HFSAB) has played a leading role globally for over 50 years, supplying

continuous lead extrusion equipment and know-how for trouble free lead sheathing of cables thus providing a perfect moisture barrier.

The latest design extruder is horizontal, floor-standing, easy to install and maintain, fully automatic, extremely reliable with its state-of-the-art control system, enabling continuous operation for weeks with little or no variation in temperatures and wall thickness/concentricity.



▲ The latest extruder from HFSAB

The lead wall thickness can be kept to a minimum with corresponding savings in lead.

A range of die blocks are available to cover an extensive diameter range of 6-225mm (over lead), and a range of Melting Pots are available for 10, 18, 35 and 60 tonne capacities.

Additional equipment includes the cable repair and recovery system, CRRS, which has the possibility of:

Removing individual layers, such as the outer jacket, lead sheath or triple layer XLPE insulation, without causing any damage to the subsequent layer below. Thus enabling the outer jacket, lead sheath or triple layer XLPE to be reapplied and the cable repaired.

Even if the cable is just going to be scrapped, the metal price differences for insulated or un-insulated cables are very large and the equipment would have a very short pay-back period, if the metals are scrapped in their "bright" form.

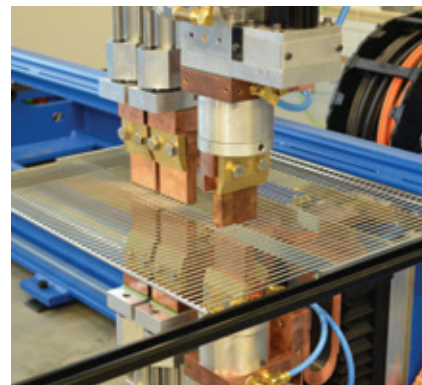
H Folke Sandelin AB – Sweden

Website: www.www.hfsab.com



Ideal Welding Systems Booth 1731

Ideal Welding Systems is a supplier of Ideal and Clifford automated equipment to the sheet metal and wire industry. The company's product offering includes reinforcing and industrial mesh welders, CNC jig welders, butt welders, straightening and cutting machines, wire drawing machines and grating welders.



▲ The CSR102 CNC jig welder features a rotating weld head

The company will be exhibiting the advanced Ideal CSR102 CNC jig welder.

This automated positioning and welding system is suitable for resistance welding both sheet metal and wire components on the same machine.

In line with Ideal's range of 'green' welding equipment, the CSR102 jig welder is equipped with efficient MFDC (medium frequency direct current) welding technology, along with the latest servo motors and drives from Siemens.

The CSR102 also offers the latest in available options and tools to become the most versatile machine the company has built, incorporating horizontal and vertical welding, along with automatic adjustment of welding heights, and a pincer welding tool for welding in the vertical plane, facilitating the welding of 3D sheet metal and wire components.

A rotating weld head is also included, allowing for welding at any angle in the horizontal plane, suitable for the efficient welding of wire products such as fan guards.

The machine on display will also have the largest welding envelope ever displayed by Ideal: 118"(w) x 80"(d) x 15"(h).

Ideal Welding Systems – USA

Website: www.idealweld.com



InnoVites BV Booth 2131

InnoVites highly values interaction with the wire and cable industry, and after attending Interwire 2009 and 2011, the company will be present for a third time in 2013.

The company will showcase its ERP solution for the cable industry: InnoVites for Cable, based on user-friendly Microsoft Dynamics AX technology.

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machines trading

More than 1.200 second-hand machines in stock

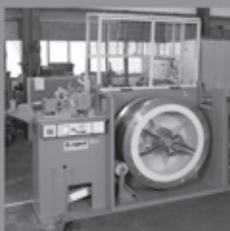


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Based on the long experience of its team, InnoVites, headquartered in The Netherlands, developed software that addresses the specific business issues in the industry, such as length and tolerance management, product data management and copper management.

Benefits of InnoVites for Cable include increased customer satisfaction, via reliable delivery dates with the fully cable length-based logistics management, and length information including length tolerance managed in sales, planning, purchase and production operations.

The system can reduce business risk by managing the impact and risk of metal price volatility (Cu, Al, etc) in quotations, sales and purchase orders, and keeping price lists up to date with the material prices at the commodity exchanges (eg LME and Comex).

Faster response to customer enquiries is provided by the ability to search quickly through the hundreds or even thousands of available items, using the cable design attributes that the customer requires (eg cross section area, number of cores, design standard or armouring type).

Length-based production planning and scheduling result in optimal production lengths and optimal loaded resources.

A personal demonstration during the fair can be arranged via the company's website.

InnoVites BV – The Netherlands
Website: www.innovites.com



Inosym Ltd
Booth 1320

Inosym has been supplying reels to the cable and wire industry for 12 years, and to over 48 countries.

Specialising in steel and plastic reels that are manufactured to European and USA standards, Inosym can offer reels to meet all the varying needs of modern manufacturing plants.

The company's reels were developed to provide cable and wire manufacturers with a product that was realistically priced and of high quality. Several of the company's product ranges are detailed as follows:

- ABS plastic reels from 250 to 1,000mm for insulating, group twinners, stranding, bunching and jacketing
- MF (metal flange) pressed metal process reels in sizes from 100 to 1,250mm, made from high quality steel plate and tube. Applications include universal take-up and payoff reels, bunching, stranding, insulating and jacketing
- SM (semi machined) double-wall high-speed reels are available in sizes from 315 to 1,250mm and are made of high-quality steel plate and tube. Applications include drawing, bunching, stranding and insulating
- FM (fully machined) steel high-speed reels in sizes ranging from 100 to 1,000mm, manufactured from high-quality steel plate and tube. Applications include high-speed single-wire drawing, high-speed multi-wire drawing, bunching and enamelled wire coating
- SD (steel drum reels) are large steel process and shipping drums available in sizes ranging from 800 to 4,500mm. SD steel drum reel options include flat sided flanges, corrugated flange and break-down reels. Applications include drum twisting, stranding, insulating and jacketing >>>



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Mikronix uses a developed **powder coating** technology. By developing new techniques in the field of electrostatic and filter systems. Mikronix machines are simplified for easy use, reducing consumption & costs whilst maintaining **high quality, good references & competitive prices...**

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"Mikronix" **Electrostatic Powder Coating Machines** and plants for the worldwide **Cable, Rubber and Plastic** industry

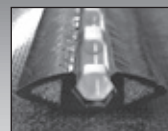
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KEIR - BackBone™ Flyer Bow



Features:

- Improved bow strength (no holes)
- Wire is out of the airstream
- Bow shaped like a wing for improved aerodynamics and low cw factor
- Wear strip eliminated and replaced by wear bushings with windows for easy inspection and dust cleaning
- Wear bushings can be changed while bow is mounted on the rotor

Advantages:

- Lower power (amps) consumption and reduced noise
- Higher TPM – maintaining wire quality
- Reduced bow breakage
- Increased life on wear surfaces reducing down-times and maintenance
- Wire breakds are contained within the bow – extending bow life

US Patent #6,233,513
#5,809,703 and Other Patents Pending



KEIR Manufacturing Inc.

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With more than 350,000ft² of production space, Inosym can provide customers with rapid delivery of both large and small reel orders.

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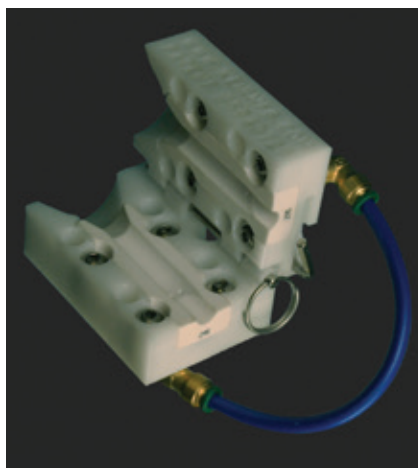


Keir Manufacturing, Inc
Booth 703

Keir Manufacturing, Inc is a US-based manufacturer of high-purity 99.8% alumina ceramic guides, the Frontiersman™ line of air wipes, and composite flyer bows, serving the global wire and cable industry.

The company is dedicated to making products that enable manufacturing processes to run more efficiently and productively through the application of leading edge materials.

Its solutions are focused on continuous process improvement, energy savings and longer operating life.



▲ Keir SplitShot air wipe

Keir's patented SureShot and SplitShot air wipes provide an effective drying method that does not depend on high-volume air consumption.

The efficient design yields effective drying using a very low volume of compressed air and is claimed to last longer than other brands due to the rugged ceramic insert lining the wire path, equating to over 25 per cent

reduction in compressed air usage and an operating life of years versus months.

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

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

Keir Manufacturing, Inc – USA
Website: www.keirmfg.com



LaserLinc Inc
Booth 1850

LaserLinc's accurate and adaptable non-contact laser and ultrasonic systems

The New Wire Drawing Standard

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Universal

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Maximizes die performance, increasing machine utilization and decreasing production costs.

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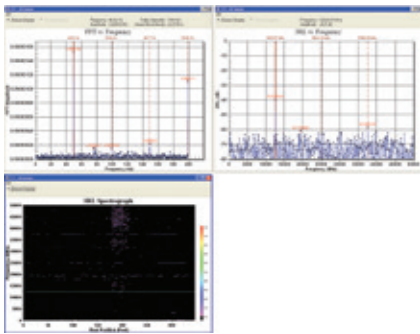


PARAMOUNT DIE
 Drawing Systems for the Wire Industry

measure OD, ID, wall, eccentricity and concentricity for the wire, cable and fibre industries.

High-speed three-axis laser gauging for ovality and flaw detection, plus features such as FFT and SRL prediction, help reduce scrap, increase production efficiency, and improve quality.

The UltraGauge+™ ultrasonic wall thickness measurement system uses hardened stainless steel fixtures designed to withstand harsh wire and cable manufacturing environments, and UltraLock™ Auto Setup provides automatic configuration.



▲ Sample FFT and SRL data

Gauges operate via PC-based Total Vu™ software. Total Vu provides a complete audit trail of the process, including flaw reporting, SPC charts and Excel-based user-designed reports, along with real-time analysis with run and trend charts, graphical cross-section display and measurements in configurable, easy-to-read panels. Other features include in-process tolerance checking, feedback control and recipes.

Laser gauges measure diameters from 0.035 to 120mm (0.0014" to 4.7"), and feature compact models and the highest measurement rates available. With the UltraGauge+, wall thickness can be measured at up to eight positions, with up to 2,000 measurements per second.

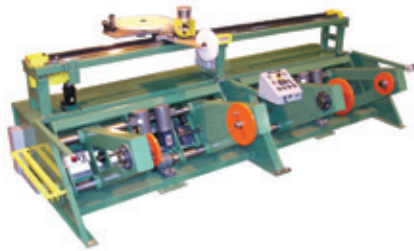
LaserLinc micrometers and the UltraGauge+ digital signal processor have a four-year parts and labour warranty. If a micrometer needs warranty repair, LaserLinc will overnight deliver a temporary replacement.

LaserLinc, Inc – USA
Website: www.laserlinc.com



Lloyd & Bouvier, Inc
Booth 1832

Lloyd & Bouvier now offers a 50" shaftless dual reel take-up, consisting of two



▲ Lloyd & Bouvier's 50" dual reel shaftless take-up

50" welded plate frames bolted together with common traverse mounted on dual linear bearings, with a continuous belt drive activated with a servo motor.

A clamp and pulley system can be incorporated into the traverse system to direct and hold the wire during crossover.

The take-up accepts reel diameters from 24" to 50" and reel widths from 20" to 40".

Reel lifting is accomplished through pneumatically loaded cylinders to lift reels up to 5,000lb. Gate arm positioning for various reel widths is achieved through dual AC gear motors with automatic centring via Acme threaded rod activation. Power is provided by a 10 HP AC motor with in-line reducer to provide maximum torque.

A NEMA panel houses the 10 HP AC Vector main drive and all related electrical components, and operator controls are mounted on gate arms for easy access.

Pintles and drive rotors are provided and customised to individual customer requirements. A 72" version is also available.

The shaftless dual reel design offers a safe and efficient alternative to the older shaft style dual reel take-ups, eliminating operator handling of heavy shafts, and removing the problem of damaged locking collars when loading and unloading reels.

Lloyd & Bouvier supplies new, used, and refurbished wire and cable equipment: extruders, take-ups, wire payoffs, capstans, cabling, Wire preheaters, Tapers, Bunchers including complete processing lines for extrusion, cabling, taping and respooling.

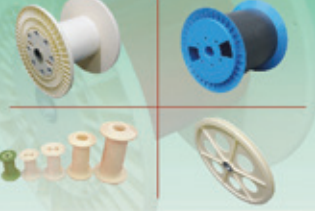
Each new or refurbished machine or system is designed to the customer's specific requirement to satisfy virtually all wire and cable equipment needs.

Lloyd & Bouvier, Inc – USA
Website: www.lloydbouvier.com

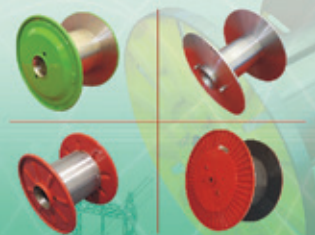
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www.aeimachines.com



Mathiasen Machinery, Inc Booth 333

Mathiasen Machinery Inc (MMI) buys and sells used wire and cable machinery internationally.

Machinery is purchased for inventory or it can be sold on an exclusive basis.

MMI has interest in locating individual machines, complete lines or entire plants. Consignments, warehousing, appraisals and liquidation services are also offered.

MMI has buyers seeking all types of good quality used wire and cable machinery, and serves the domestic and international ferrous and non-ferrous wire machinery markets.

The company's booth will display photos of a wide variety of second hand machinery. Customers are asked to bring their surplus machinery list and photos for evaluation.

Mathiasen Machinery, Inc – USA

Website:

www.mathiasen-machinery.com



Medek & Schörner GmbH Booth 1050

Medek & Schörner will be presenting the following state-of-the-art cable marking machines at Interwire 2013:

Cable marking machines: high quality gravure printers (LAN cables, control cables) for speeds up to 1,200m/min; water misting unit for the application of fine water dust for pre-cooling of hot wire immediately after the extruder; embossing metre markers/hot foil sequential metre markers for high accuracy of length measurement (power cables, telecommunication cables, optical fibre cables); high performance ring markers for marking telephone wires, switchboard wires, automotive cables and LAN cables; video system for monitoring the print quality of fast-running cable printing machines, eg allowing real-time inspection for bad quality and/or missing prints; and laser marking system for cables.

Optical fibre coating systems: top speed optical fibre processing systems; optical fibre colour coding up to 3,000m/min; ring marking of optical fibres; tight buffering up to 1,300m/min; fibre ribbon production with excellent ribbon

planarity, for speeds up to 1,000m/min; CFU production of compact fibre units; copper wire insulation with UV varnishes (enamelled wire); and manufacture of dimension-sensitive precision micro flexible flat cables (FFC) using UV resins.



▲ Optical fibre colour coding up to 3,000m/min from Medek & Schörner

Medek & Schörner covers virtually the entire spectrum of machines for marking cables and coding optical fibres, in particular for power, telecom and data cables.

Medek & Schörner GmbH – Austria

Website: www.medek.at



Nextrom Oy Booth 1050

Nextrom is a supplier of optical fibre glass preform manufacturing equipment. The company produces fibre draw towers and associated machinery for the global fibre market using MCVD, OVD and VAD technologies.

As well as providing optical fibre equipment, Nextrom is a supplier of fibre optic cable production lines.

Rosendahl is a global supplier of high-tech wire and cable manufacturing solutions, offering products and turnkey solutions in the fields of extrusion, corrugation, fibre optic cable and SZ stranding.

Out of these competences, Rosendahl developed the product segments power cable, automotive wire, LAN cable, coaxial cable and fibre optic cables. Rosendahl's most recent completion of its product portfolio is the Crosshead Series.

At Interwire 2013 Nextrom and Rosendahl will present the latest advancements and technology highlights, including recent developments for the production of fibre optic cables, energy, automotive and communication.

On the American market Nextrom and Rosendahl work closely together with their agents, Finoptics Inc for Nextrom products, and Camarena, Inc US and JJ Lowe Associates, Inc for Rosendahl products.



▲ Nextrom SCC 100 clenching capstan

The companies' partners have been involved in the cable and wire business for many years and therefore have long-term experience in this area.

Nextrom Oy – Finland

Website: www.nextrom.com



Niehoff Booth 740

Niehoff Gruppe and its subsidiary Niehoff Endex (NENA) will present equipment including an MMH 121/RM 201.5 multiwire drawing line, a BMV 124 rotary braiding machine, and a D 1001 double twist bunching machine.

The MMH 121 multiwire drawing machine is designed to simultaneously draw 16 wires with a final diameter of up to 0.2mm (32 AWG), which can be processed to intermediate multiwire bundles.

It is possible to directly fill one spool with seven wires to be stranded into a 19-wire construction. Spool handling is simplified, and the lower number of payoff stations can reduce capital investment.

Customer-specific MMH machines adapted to each application and each type of non-ferrous metal can be built.

The 24-carrier lever arm rotary braiding machine BMV 124, a heavier version of the BMV 24 model, has a central passage of 55mm and can carry spools with a weight of up to 5.5kg.

BMV braiders can work for a long time unattended and without operator intervention.



▲ *BMV 124 rotary braiding machine*

The machines are designed to process round or flat wire of bare or coated copper, aluminium and stainless steel with a single-wire diameter ranging from 0.05 to 0.3mm (40-28 AWG) as well as artificial yarn and fibres.

With an integrated central taping device, the braiding and subsequent taping processes are completed in one step.

The D 1001 type single-bow double twist bunching machine is designed for the manufacture of strands of up to 50mm² (1/0) cross section for copper and up to 60mm² (3/0) cross section for aluminium conductors with a lay length of up to 300mm (11.8") and a maximum rotational speed of 3,200 twists/min.

Due to their one-bow design, the D series machines' energy consumption and noise emission are reduced when compared to conventional bunching machines.

Niehoff's 'After Sales Original +' service provides expert know-how, a remote maintenance service, modernisation and upgrading measures, machine operator and maintenance training courses, and fast and reliable supply of wear and spare parts. Specially developed machine components can also be obtained.

Maschinenfabrik Niehoff GmbH & Co KG – Germany
Website: www.niehoff.de

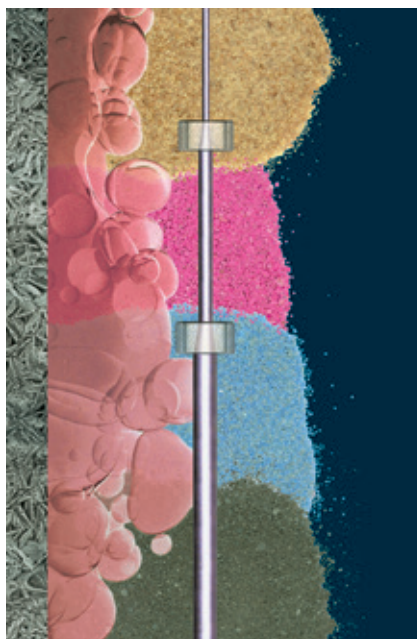
Niehoff Endex North America Inc – USA
Website: www.niehoff-usa.com



Pan Chemicals SpA
Booth 1911

Pan Chemicals is a manufacturer and supplier of high-tech drawing lubricants and coating to the wire industry. The company's production programme includes:

- Dry drawing lubricants (Panlube S series): a full range of calcium, sodium and combined products for low and high carbon steel, non-ferrous and stainless steel
- Wet drawing lubricants (Panlube L series): a complete range of oils, greases and pastes for wet drawing of low and high carbon, welding wire, stainless steel and non-ferrous wire
- Lubricant carriers (Pancover series): phosphates and non-reactive coatings
- Flux for galvanising (Panflux series): developed to improve the efficiency of the galvanising process by a more uniform control of the reaction between the two metals, reducing operation costs and improving the quality of the zinc coating
- Auxiliary products (Panchem series): degreasing agents, pickling inhibitors, protective products, activated charcoal and wiping pads



▲ *Highest quality drawing lubricants and coatings from Pan Chemicals*

Pan Chemicals has a strong emphasis on technical collaboration with its customers, and is focused on the research and development of new products and solutions for specific applications.

Particular attention is dedicated to the development of ecological products according to the new international regulations (borax-free lubricants and coatings).

In addition to chemical and auxiliary products, the engineering department can offer different solutions for mechanical descaling, coating and drying units, rotating die holders and die reconditioning equipment.



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 April 23.-25. 2013 / booth 658

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wire diameter 5.5 - 16 mm
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 Diameter: 6 to 38mm

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 7 x 4
 1x7
 1x19
 Dia: 1.0mm -5.0mm
 Package: Steel spool / Wooden reel / z2



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Tel: (86 23) 67741662 Fax: (86 23) 89119130

Contact person: Mr Jacky chen (Sales Manager)
 Web: <http://www.chonghongmetal.com/>
 email: jackychen8325@gmail.com

Pan Chemicals offers its highest quality drawing lubricants and coatings, state-of-the-art drawing processes and solutions, long experience and specialised technical service.

Pan Chemicals SpA – Italy

Website: www.panchemical.com



Pave Automation Ltd Booth 1612

Pave Automation reports that it has enjoyed success with its new range of CNC bending equipment since the launch around 18 months ago.

The driving force behind the family-owned business, brothers Antonio Perna and Silvio Perna, are dedicated to the innovation and development of these new machines.

The focus has been to supply bending machines to the marketplace that are fast, small and economical.

The experience that the company has gathered over the past 30 years of manufacturing over 1,000 machines, coupled with the latest software and hardware technologies, has created a successful combination.



▲ *Huron fully rotational wire forming machine from Pave Automation*

Pave will be exhibiting its machines at this year's international wire shows, and invites new and old customers to visit its booths with products that they wish to be formed; the company will then program these products to provide accurate on-site cycle times for their manufacture.

The products to be covered will range from 20mm to 3m long, in diameter 3 to 10mm wire.

Pave Automation Ltd – UK

Website: www.pave-wire.com



Phifer Booth 753

Phifer Incorporated, a manufacturer of aluminium round wire, with more than 60 years of experience, will display its range of American-made drawn wire products.



▲ *Phifer drawn wire*

Phifer has diverse capabilities, producing custom wire from numerous alloys in diameters from 0.11 to 11.1mm for a wide variety of applications.

The company's 0.127mm, 0.16mm, 0.254mm and 0.32mm aluminium wire (0.005", 0.0063", 0.01" and 0.0126") is used all over the world as coaxial cable braid shielding, shipboard cable armouring and hose braiding.

Other applications include weaving wire, industrial knitting, tea bag staples, semiconductor bonding, medical devices, stranded power cables and lightning protection cables.

Newer products include copper clad aluminium, low carbon steel and bronze wire 0.127 to 0.5mm (0.005" to 0.02"). Available packages for fine diameter wires include numerous returnable and disposable spools 0.34-14kg (0.75-30lb).

For wire forms, food packaging clips, automotive moulding reinforcement, vacuum metallising and more, Phifer offers aluminium wire in larger diameters 0.81 to 11.1mm (0.032" to 0.4375").

Innovative machinery has expanded and improved Phifer's selection, especially for manufacturers of rivets, staples and other fasteners.

Chemical processing and cleaning is offered for improved appearance and enhanced performance.

Phifer also offers new precision-winding capabilities for aluminium thermal spray and metallising applications.

Packages include coils and stem carriers from 14 to 680kg, fibreboard drums, and more than 40 spools and reels.

The ISO registered company employs a large international sales staff fluent in many languages, and exports to more than 100 countries.

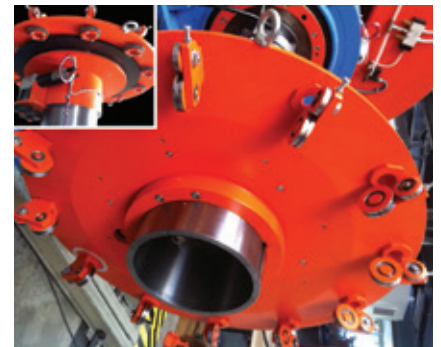
Phifer Inc – USA

Website: www.phifer.com



Pourtier of America Booth 1932

Pourtier of America is the new name chosen by the Gauder Group, Inc to promote the sales of its Pourtier product range.



▲ *Pourtier motorised guiding head for stranding of trapezoidal wires*

The line of equipment includes Pourtier's rigid stranders and drum twisters for producing high quality Milliken conductor for high voltage and extra-high voltage power cable (AC) and conductors for DC cables (round compacted and trapezoidal wires), as well as large equipment required for the production of submarine and umbilical cables.

Pourtier of America – USA

Website: www.gaudergroup.com



PWM Ltd Booth 1066

British manufacturer PWM will be exhibiting its comprehensive range of cold pressure welders, including its best-selling EP500 rod welder, at Interwire 2013. The PWM range will be presented at booth 1066 by Joe Snee Associates, exclusive distributor of PWM cold welding equipment, spares and dies in the USA and Canada.

PWM's powerful electro-pneumatic EP500 cold welder provides a cost-effective method of welding large non-ferrous rod sections. Energy efficient, clean and easy to operate, the EP500 is designed for wire and strip 5 to 12.5mm (0.197" to 0.492") copper, and 5 to 15mm (0.197" to 0.590") aluminium.

The smaller, manually operated M101 cold welder, for copper wire and strip 1 to 3.6mm (0.04" to 0.141") and aluminium 1 to 5mm (0.04" to 0.197"), can be used on a workbench or supplied with a trolley, enabling it to be wheeled quickly to the work area.

Durable and reliable, the heavy duty M101 is simple to maintain due to the low number of component parts.

For joining fine wire in confined spaces, PWM's M10, M25 and M30 hand-held machines are suitable for wire and strip 0.1 to 1.8mm (0.0039" to 0.071").

The BM10 and BM30 models, for use on a workbench or trolley, are suitable for similar wire sizes.

PWM machines and dies, standard or custom made to suit round or profile wire and rod, are designed and precision engineered in the company's own UK workshops, ensuring total quality control and accountability.



▲ PWM's EP500 rod welder will be exhibited at Interwire

All PWM cold welders provide a fast, cost-effective method of welding non-ferrous materials, using the multiple upset process to create a strong permanent weld stronger than the parent material.

Video demonstrations of PWM's cold welders can be viewed on the company's website.

PWM Ltd – UK
Website: www.pwmltd.co.uk

Qunye Booth 1040

Qunye, a leading reel manufacturer in China, has all types of metal and plastic reels for wire and cable.



▲ Reels from Qunye

The company's reels are suitable for use in many areas: high voltage, middle voltage and low voltage XLPE power cables, optical fibre cables, telecommunication cables, steel wires, steel rope, bead wires and cutting wires, as well as in the textile industry.

Qunye – China
Website: www.qunye.com.cn

Rautomead Ltd Booth 234

Rautomead, a specialist in continuous casting technology, processes and machinery, will be exhibiting the latest advances in copper magnesium alloy wire rod production technology, for automotive wiring harness and high speed rail contact wire applications.

DHP copper tube shell 'Castube' production technology will also be on show, which features in the new Compactube process being promoted by SMS Meer GmbH for the small scale manufacture of air conditioning and plumbing tubes.

Rautomead's CuOF wire rod production technology for fine wire, enamelled wire and shaped wire manufacture (by rotary extrusion) will also be available.



▲ RS 3000-5 CuMg machine

Having recently launched its new Advancing Metals Technology division, Rautomead now offers direct access to an extensive network of partnerships at specialist universities, research establishments, key institutions and industry corporations, to develop

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imaginative, innovative and economic processing technologies for new and different alloys and applications.

Rautomead Ltd – UK

Website: www.rautomead.com



Rockford Manufacturing Group Booth 2156

Rockford Manufacturing Group (RMG) Fastener Engineers and Lewis Machine's integrated in-line wire processing solutions are the epitome of lean manufacturing.

RMG's straighten and cut machines have introduced many revolutionary concepts including VF AC drives, 3 die arbors and the patented "clutchless" cutting technology.

On the booth will be the Lewis 1SHVF straighten and cut machine with the 4VPS16 overhead wire payoff.

The 1SHVF has been redesigned to include many updated features including: variable frequency drive technology,

a light weight release and length control system with micro fine adjustment specifically for small diameter material and completely independent control of feed speed – arbor speed – cutter speed, to maximise productivity.

The in-line wire processing equipment is being used by many manufacturing processes, including fastener production, nail making, wire bending, concrete products, steel bar processing, welded wire products, screw machine parts and wire straightening and cutting.

RMG provides integrated systems for the processing of hot-rolled rod into descaled and drawn wire that is regularly used in a variety of production machines and processes to reduce material cost.

Rockford Manufacturing Group – USA

Website: www.rmgfelm.com



Rosendahl Maschinen GmbH Booth 1050

Rosendahl is a global supplier of high-tech wire and cable manufacturing solutions, offering products and turnkey solutions in the fields of extrusion, corrugation, fibre optic cable and SZ stranding.



▲ Machinery from Rosendahl

Out of these competences Rosendahl developed the product segments power cable, automotive wire, LAN cable, coaxial cable and fibre optic cables.

Rosendahl's most recent completion of its product portfolio is the Crosshead Series.

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As well as providing optical fibre equipment, Nextrom is a supplier of fibre optic cable production lines.

At Interwire 2013 Rosendahl and Nextrom will present the latest advancements and

technology highlights, including recent developments for the production of energy, automotive, communication and fibre optic cables.

On the American market Rosendahl and Nextrom work closely together with their agents, Camarena, Inc US and JJ Lowe Associates, Inc for Rosendahl products, and Finoptics Inc for Nextrom products.

The companies' partners have been involved in the cable and wire business for many years and therefore have long-term experience in this area.

Rosendahl Maschinen GmbH – Austria

Website: www.rosendahl-austria.com



SETIC of America Booth 1932

As part of its rebranding activity, the Gauder Group, Inc now markets its SETIC product line as SETIC of America.

This range of equipment offers large and small double twist bunchers for PC and automotive industry, as well as a complete line of machines for the production of LAN and special cable with enhanced performances in one step or two steps according to product mix.

SETIC of America – USA

Website: www.gauder-group.com



T&T Marketing, Inc Booth 305

At Interwire this year, T&T Marketing, Inc will be celebrating its 25th anniversary.

T&T is a single source supplier to the wire and cable industry, distributing everything from bare copper to shielding, filling, insulating and jacketing products.

The company was founded in 1988 and has grown over the years into an international distributor.

T&T will also be introducing new product offerings that were recently added to its portfolio, and will be highlighting Vistamaxx, Irogran A 95 P 5003 DP and PP 4874.

Vistamaxx™ is used as a "blend partner" for polypropylene based compounds. It helps achieve enhanced flexibility, clarity, impact strength and adhesion while reducing or eliminating stress whitening. It is manufactured by ExxonMobil Chemical.

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Irogran® A 95 P 5003 DP, manufactured by Huntsman TPU, is a non-halogen, flame retardant TPU that consistently passes the VW-1 flame test.

The compound has an LOI of 34 per cent for VW-1 applications, a Shore A Hardness of 94, and meets UL1581 requirements.

PP 4874 is a polypropylene compound used for the solid insulation of data cables with superior hardness as desired in CAT 6A and 7A applications.

Manufactured by Borealis, it exhibits high speed extrusion and provides process stability with regard to diameter and geometry as well as good conductor adhesion.

T&T Marketing's booth will be staffed with knowledgeable salespeople who will answer any questions visitors may have regarding the aforementioned products.

Data sheets are available upon request, and samples are available for order.

The T&T booth will also have literature to distribute, showcasing the company's diverse portfolio of wire and cable offerings, which include but are not limited to PVC, polyethylene, nylon and Santoprene™.

T&T Marketing, Inc – USA
Website: www.ttmarketinginc.com



Tensor Machinery Ltd Booth 218

Tensor Machinery is a designer and builder of cabling equipment for the wire and cable industry.

The company provides a wide variety of solutions to manufacture fibre optic or copper cable, including individual pieces of equipment to complete cable manufacturing lines ready to produce cable.

Products include UV colouring lines, loose tube manufacturing, SZ stranding lines, armouring line, yarn serving, payoffs, take-ups and jacketing lines for indoor and outdoor cable products.

Tensor equipment is engineered to withstand the daily demand placed on it by production, and the company uses the latest in mechanical, electrical and electronic technology.

Tensor Machinery Ltd – Canada
Website: www.tensorfiber.com



Troester GmbH & Co KG Booth 340

Troester, a supplier of machines and lines for the cable manufacturing industry, will present a variety of information and new developments in the field of CCV lines and VCV lines for XLPE and rubber cables, one step silane lines for LV and MV cable applications, as well as high speed insulation lines and sheathing lines.

Technical solutions for CV tube components, heavy duty cable jacketing and submarine cable equipment will be introduced.



▲ *Triplex Extrusion*

Troester also represents its subsidiary, X-Compound, which supplies compounding plants for cable compounds such as PVC, HFFR, XLPE, semi-conductive material and special applications.

Troester GmbH & Co KG – Germany
Website: www.troester.de



Tulsa Power Booth 1840

Tulsa Power is the choice for customers seeking the lowest risk, best value solution for spooling, coiling or winding applications. Tulsa Power is the lowest risk because it is the only equipment supplier with demonstrated success over four decades, providing equipment to handle material from 0.4 to 508mm (1/64" to 20") diameter, on spools from two inches through to reels with 30-foot diameters.

Extensive experience and knowledge of Tulsa's engineering team, coupled with the ability to design and deliver solutions based on total benefits for customers, enables the company to find the best balance of cost, safety, reliability, maintainability and performance.

Tulsa Power will build on strengths in design and application engineering, and the wealth of experience, knowledge and data built up over four decades of designing coiling, spooling and winding equipment for flexible materials. These strengths extend to the company's technical sales force's ability to

understand customer application needs and form best solutions.

Tulsa Power – USA
Website: www.tulsapower.com



Windak Inc Booth 1940

Windak specialises in automatic packaging solutions for the wire and cable industry, and has offices in Sweden, USA, Australia and Estonia.

The company will introduce its new automatic reeler AR18-DB line. The Auto Reeler AR18-DB is a fully automatic reeler developed for automatic packaging of cable and wire products on spools or reels between 216 and 460mm (8.5" to 18") in overall diameter. It can be run both in-line (direct connection with extruder) and off-line, and loads and unloads empty reels automatically. The line includes stretch wrapping of the spool to contain the cut end, and output of the machine is two reels per minute.

Windak will combine the AR18-DB reeler with the integrated palletiser GP5, payoff and accumulator, to make a complete automatic spooling line with a short investment payback. It will also show the winding process and palletising of the finished spools and present the latest information about its full range of products, including payoffs, take-ups, rewind lines, coiling and spooling solutions, accumulators and palletisers.

Windak – USA
Website: www.windakusa.com



Zumbach Electronic AG Booth 1540

Zumbach will showcase its broad range of dimensional measurement and inspection systems for rod and bar mills, and wire drawing, wire insulating and cable jacketing processes.

New developments to be introduced include the new modular USYS IPC line of processors and controllers; Steelmater Rotation (SMR) for in-line hot and cold rod and bar mills; Simac® 63 for in-line surface faults and defects; KW 13TRIO for lump and neckdown detection for fine dimension applications; and Profilemaster® PMM 30 for in-line profile measurement of non-round products for fine dimensions.

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

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Atlanta, USA - April 23rd - 25th, Booth 1655

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Via Aldo Moro

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Foam fluoropolymer solutions and processing for insulating high performance cables

By Gary G Thuot and Robert T Young, of DuPont Chemicals and Fluoroproducts, Wilmington, Delaware, USA

Abstract

With the number of high performing dielectric materials available today, selecting the ideal insulating materials for high demand cables is a balance of performance, processability and cost. This paper will present electrical performance and selection criteria for foam fluoropolymer dielectrics. Establishing viable processing ranges and key processing considerations, which will provide a stable, repeatable process, will also be investigated.

Foam fluoropolymers offer excellent electrical characteristics, low smoke and high temperature resistance. Typically fluoropolymers are used in applications where low smoke is required such as plenum cables, high temperature applications such as military specified cables and applications requiring resistance to soldering.

Selecting the right polymer as it relates to product size and the electrical properties is important in obtaining a robust process and desired cable performance. Processing and monitoring equipment selection and their operation are important to producing quality product at high yields. The intent of this paper is to explain some of these key product and process characteristics and their effects on the process and performance.

Selecting the right material

Considerations for selecting a foaming fluoropolymer resin for high performance cables include electrical/physical performance needs, product conductor size

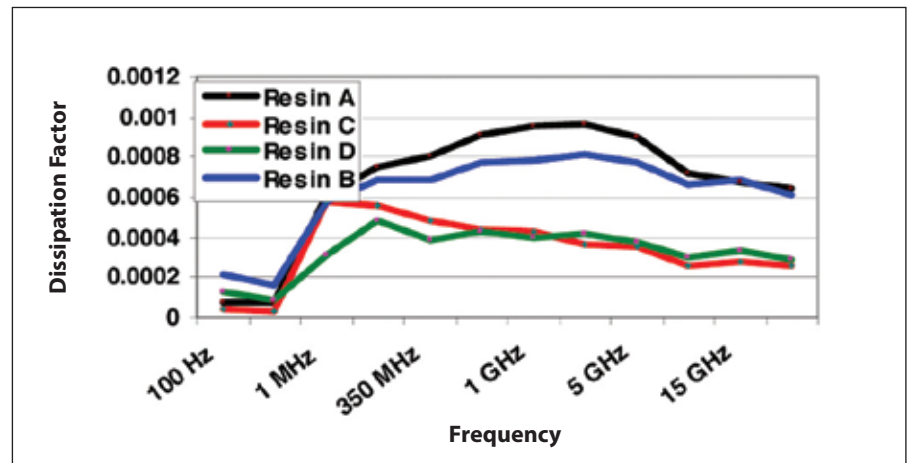
and dielectric wall thickness. Electrical performance, as the graph below indicates, can vary with resin composition.

The dissipation factor data (Figure 1) illustrates differences measured on solid plaques of various grades of DuPont™ Airquick FFR foam resins in their solid state (un-foamed).

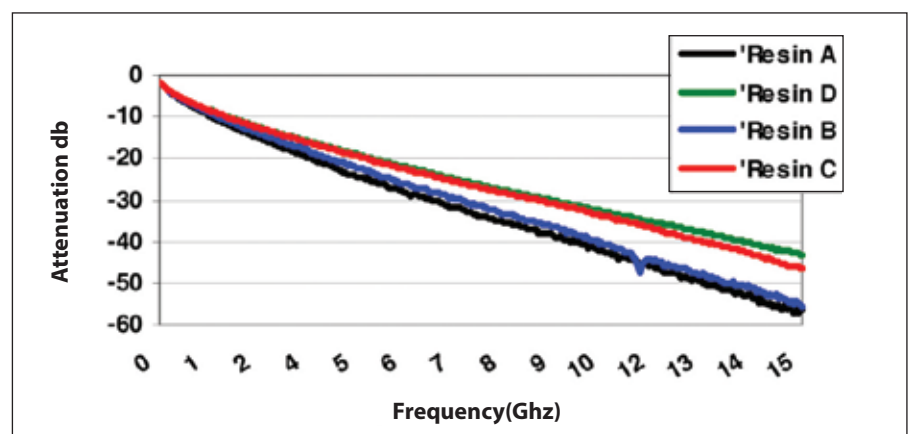
The attenuation results (Figure 2) are based upon actual 50-ohm cable samples produced using identical design and processing conditions but varying resin grades.

As illustrated in Figure 2, there can be a significant difference in the cable loss based on grade selection.

▼ Figure 1: Dissipation factor



▼ Figure 2: Attenuation



The electrical power loss in a cable is typically measured in decibels (db) and is equal to ten times the log of the ratio of the power input of one end of the cable to the power output at the other end.

As greater demands are placed on cables to operate at higher frequencies, these material differences play a large role in the overall cable performance.

For example, a fluoropolymer cable foamed to approximately 82 per cent velocity of propagation produced with the resins referenced in *Figures 1* and *2* and tested at 2.5 Ghz would yield significant differences in signal loss.

A 100-foot cable produced with Resin B would display approximately a 20 per cent loss in power as compared to the equivalent cable made with Resins C or D.

Resin A would lead to almost a 30 per cent loss in power as compared to Resins C or D.

These differences in performance would be accentuated as the cables are utilised at higher operating frequencies.

DuPont has developed a portfolio of resins using the DuPont Airquick Technology, such as FFR 330, FFR 550, FFR 750, and FFR 770 foam resins, which offers the customer a wide range of electrical performance and cable design options.

▼ **Figure 3:** Cell structure comparison



▼ **Table 2:** Resin selection by cable design

Resin	Conductor range	Wall range	Void range
Resin A (7 MRF)	24 and up	.015 and up	10-58%
Resin B (14 MRF)	24 and up	.015 and up	10-55%
Resin C (12 MRF)	26 and up	.015 and up	10-58%
Resin D (30 MRF)	24 and smaller	.005- .02	10-50%
Resin E (42 MRF)	24 and smaller	.003- .02	10-55%

Nucleant	Average capacitance	Capacitance variation	Sparks/ 1,000ft
Concentrate	27.6 pf/ft	.9 pf/ft	10
Fully compounded	26.9 pf/ft	.4 pf/ft	0

▲ **Table 1:** Performance summary

Nucleant technology and cell formation

To provide sites for the foam cell nucleation to occur, inorganic materials such as boron nitride have been typically added to the resin to aid in foaming. The addition of other proprietary materials to the boron nitride markedly improves the foaming process.

The method of introduction can vary from fully compounded ready-to-use resins to concentrates, which are added during the extrusion process. To help demonstrate this, a side-by-side process comparison of a fully compounded resin (DuPont™ FFR 770 foam resin) was made to an equivalent product with a commercially available foam concentrate.

For the purpose of this comparison, the nucleant compositions were varied but the per cent loading and base resin utilised were held constant.

The cable construction used for this experiment was a 23 AWG single wire with a 19-mil wall, typical of a 100-ohm shielded twisted pair construction.

The target expansion rate was 40 per cent. The fully compounded DuPont™ FFR 770 performed well achieving the desired capacitance with low variation, easily holding spark voltage of 2.5 kV.

The equivalent product with the commercially available concentrate was unable to achieve the desired expansion rate, displayed greater capacitance variation and would not hold the spark test voltage. *Table 1* provides a summary of the results.

The significant performance difference between the two materials is a result of foam cell structure differences caused by nucleating package selection. *Figure 3* illustrates the differences in cell size and structure between the two materials.

As can be seen in *Figure 3*, the fully compounded material provides a small uniform cell structure, whereas the sample made with the concentrate results in large, non-uniform cells.

The inability to foam the concentrate-based material to the higher extent would have other cable design consequences. To achieve equivalent electrical performance, the wall thickness would have to be increased to compensate for the lower void content, thereby consuming more fluoropolymer material.

For example in the singles for the aforementioned sample, the inability to foam to the higher extent would result in an increase of approximately 20 per cent in the required lb/1,000ft for each single to achieve equivalent impedance.

Selecting the resin grade for the application

Once the desired electrical performance is determined, resin selection moves to determining the resin based on conductor, insulation wall size and burn performance,

as applicable. Typically the lower the melt flow rate, the better the burn performance (i.e. less smoke generation).

The higher the melt flow rate, the more suitable the resin is for thinner insulation walls and smaller cable designs. Table 2 provides some general guidelines for resin selection.

Process parameter and effects – foam expansion rates

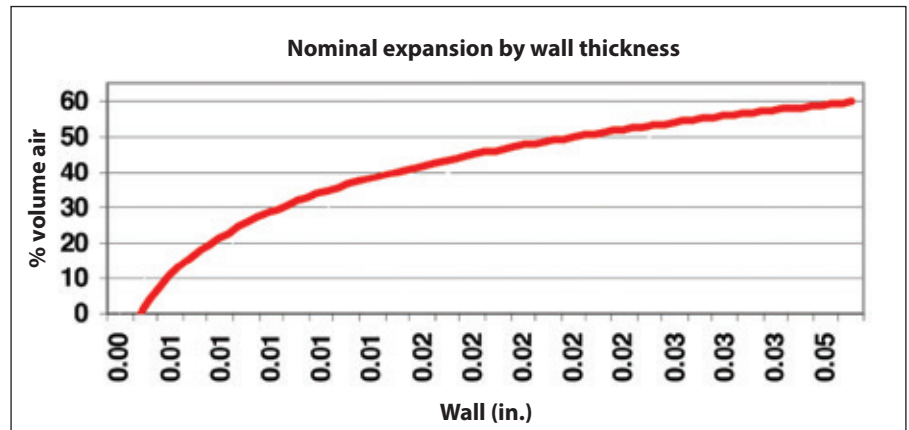
It is common for cable engineers to design cables using calculated expansion rates yielding the lowest theoretical cost. However, there are other important factors that impact cost, such as process ability, overall electrical performance and cable damage and compression from subsequent operations after extrusion. Neglecting these design factors could mistakenly result in higher cost and significant scrap generation. Consider a typical video coax cable designed using a 59 per cent expansion rate versus the same cable designed with a 54 per cent expansion rate.

The cable with 59 per cent expansion may push the process to its limits, subsequently increasing start-up scrap and causing greater process variation. From an electrical standpoint, higher void content typically results in larger cells and higher formation of cells around the centre conductor, which can have a major impact on cable return loss.

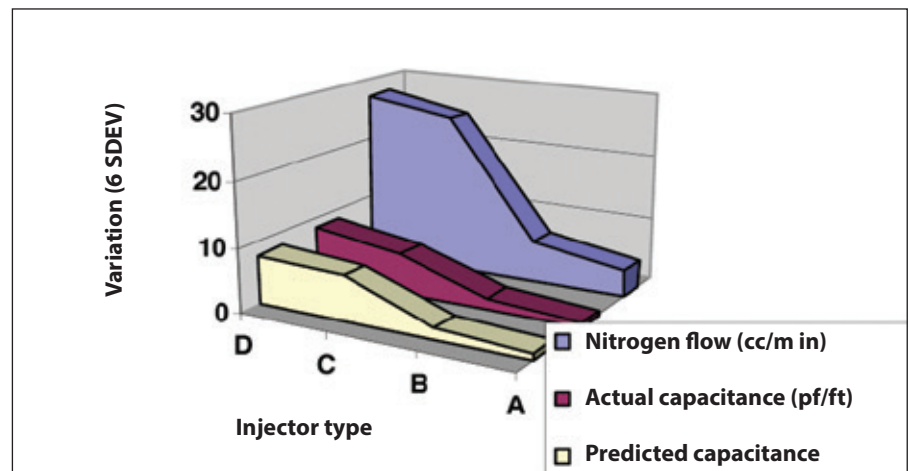
Alternatively, the same cable can be made at a 54 per cent expansion rate with a weight increase of only 0.28lb/1,000ft. This small change will provide a robust, repeatable product with improved cable return loss, less scrap and higher productivity with the same cable impedance. Figure 4 provides general guidelines for foam expansion rates based on the dielectric wall thickness. Actual maximum expansion rates will vary based on resin selection and processing methods.

High-pressure nitrogen gas injection

Foaming is achieved by injecting high-pressure nitrogen gas into the molten polymer during the extrusion process. The rate of foaming is determined by the flow rate of the gas in proportion to the resin output at the operating RPMs of the extruder. The higher the gas flow to the resin output, the higher the expansion rate.



▲ Figure 4: Nominal expansion rates



▲ Figure 5: Gas flow and capacitance variation

The consistency of this gas flow is critical to maintaining a uniform expansion rate, which is needed to maintain low variations in cable capacitance and signal time delay for the cable.

Measuring gas flow

Ensuring that a constant, correct gas flow is injected into the melt is one of the most important foaming process variables. Undetected variation of gas flow will result in capacitance variation, leading to process instability and significant scrap. Off-line injector flow measurements (such as water displacement) will determine the average injector flow rate at room temperature. However, it will not determine the actual process flow rate or flow variation as injector flows can change radically once heated to processing temperatures.

Consequently, an in-line flow meter is recommended when utilising the gas injection foaming process. With a flow meter, the gas pressure can accurately be set to obtain the calculated flow rate required for the desired nominal capacitance. In addition, variations in flow rate can be monitored.

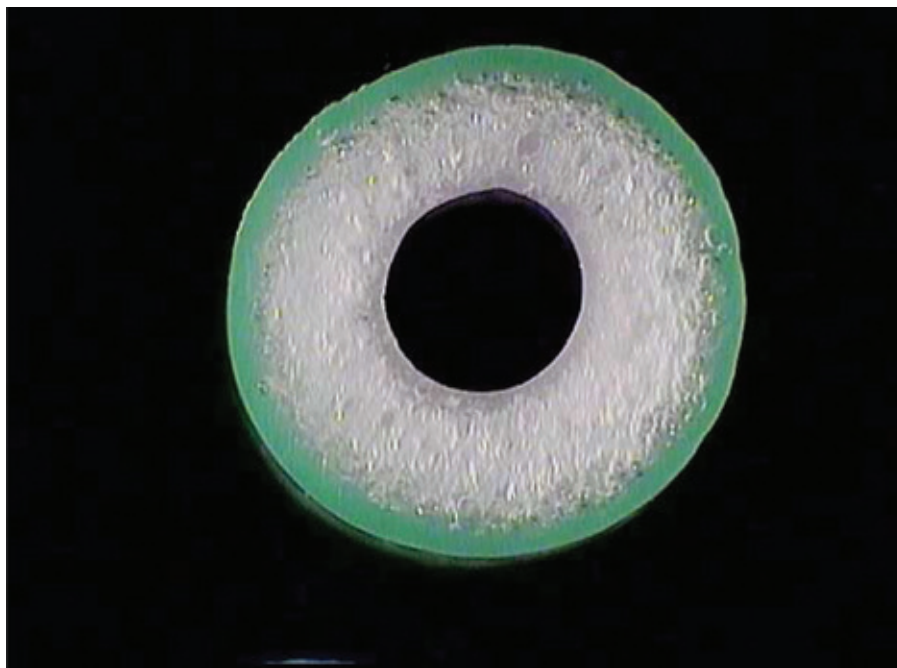
Selecting the gas injector for the product

When sizing an injector, the extruder barrel pressure and the nitrogen flow rate for the desired expansion rate versus the product run speed need to be considered.

The flow rate of the gas is controlled by the injector orifice size and the nitrogen gas pressure. The orifice needs to be sized so that the gas pressure is higher than the barrel pressure for the desired gas flow. Suppose a given cable construction requires a flow rate of 50cc/minute of nitrogen for a line speed of 600 feet per minute and creates an extruder barrel pressure of 1,000psig.

The selected injector for this process needs to have the orifice sized no larger than to deliver a gas flow rate of 50cc/minute at pressure greater than the barrel pressure.

With a flow rate greater than 50cc/minute @1,000psig, the gas pressure would need to be adjusted lower than the barrel pressure and doing so would result in the injector plugging leading to the product going solid.



▲ **Figure 6:** Cross section of foam core with solid skin outer layer

Increasing the gas pressure higher than 1,000 psig will cause too high of a gas flow resulting in over foaming. This over foaming condition is often misunderstood as to be a material or processing problem.

Conversely, if the injector orifice is too small there may not be enough available gas pressure to obtain the gas flow needed. This will result in an inability to achieve the desired expansion rate and product capacitance. For this reason it is typical to have several injectors with different flow rates available over a wide range of pressures.

The number of different sizes needed varies with the product mix and available gas pressure. Utilising a high-pressure nitrogen pump increases the gas pressure range over that produced from a high-pressure cylinder.

The use of a pump can then help reduce the number of injector sizes needed for an operation leading to lower overall costs.

The injector design can also impact performance. *Figure 5* shows the result of trials comparing four commercially available injector styles as quantified by the gas flow variation and the resultant capacitance variation.

A 50-ohm core with a 23-gauge conductor foamed to approximately 50 per cent was used for these trials. The gas flow rate six sigma variation (± 3 standard deviations) ranged from 4cc/min to 27cc/min with a resultant capacitance variation of 0.3 to 3.8pf/ft. These results demonstrate that performance issues often attributed to the fluoropolymer material are typically a

processing issue related to the equipment. Use of the wrong-sized injector or an unstable design can mask the true performance benefit of certain materials.

Product cooling

The cooling medium for the extruded core is usually a combination of ambient air and water. The distance required for each of these is dependent on product size and line speed. Having the correct distances is critical for cooling prior to wire take-up to avoid flattening of the insulation on the reel and impacting the electrical performance.

By keeping the water quench point distance as far from the crosshead as possible will yield the best product. This is because a long air-cooling distance gives time for the resin to shrink down onto the conductor providing a consistent, tight interface with the conductor without the use of excessive preheat.

This consistent conductor interface provides a uniform insulation strip force even after the initial bond is broken.

The advantage is improved structural return loss and resistance to stresses of subsequent processing operations. Sometimes a long air-cooling distance is not an option because of total available cooling distance.

If this is the case cold water should be avoided in the first cooling section as excessive ovality of the insulation and low conductor adhesion can result.

Tempered cooling is recommended as it reduces the initial shock on the insulation improving insulation ovality and conductor adhesion.

Skinning

Extruding an outer layer of solid material or skinning provides additional benefits, such as:

- An easy and efficient way of colouring the insulation
- Improved dielectric strength, which is useful on thinner wall cable designs
- Higher foam expansion rates
- Greater resistance to insulation damage during subsequent processing such as twinning or braiding

Applying a solid skin coat requires an initial equipment investment (an auxiliary extruder and special crosshead) but provides payback in reduced scrap and product cost. Both the foam and solid layer are achieved at the same time through a single cross-head using standard processing methods. *Figure 6* illustrates a foam core with a coloured solid outer layer.

Conclusions

There are various foamable fluoropolymer resin options available, each having unique capabilities and limitations. Selecting the correct resin for the application is important for cost, ease of processing and desired electrical performance.

Designing and processing cables within the materials' capabilities will produce quality products with high yields. Processing equipment selection and process conditions are critical to ensure a stable process, maintain minimum product variation and achieve the lowest cost operation.

Special techniques, such as the addition of solid skin layer(s) to foam constructions, can provide additional improvements to processing and performance. ■

This paper was presented at the IWCS symposium November 2011.

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Nordamerika organisiert einen Gemeinschaftsstand in Russland

DIE Messe *wire Russia* findet dieses Jahr vom 25. bis 28. Juni im ZAO Expocentre in Moskau statt.

Eine Besonderheit der diesjährigen Veranstaltung wird der Gemeinschaftsstand von Nordamerika sein, der von der Messe Düsseldorf North America organisiert und von der Wire and Cable Industry Suppliers Association (WCISA) mitfinanziert wurde.

Dieser Gemeinschaftsstand bietet eine kostengünstige Möglichkeit für die Unternehmen, die in den russischen Markt eintreten bzw. expandieren möchten. Die Standfläche auf der Messe kann jetzt schon reserviert werden, indem man sich mit der Messe Düsseldorf North America in Verbindung setzt.

Der russische Markt war sehr leistungsfähig und bietet weiterhin Geschäftsmöglichkeiten für internationale Unternehmen, die Draht und Kabel herstellen, bearbeiten oder damit Handel treiben.

Neben dem Gemeinschaftsstand aus Nordamerika, sind Aussteller aus Österreich, China, Frankreich, Deutschland und Italien in offiziellen Länderpavillons vertreten. Alles in allem werden über 200 Aussteller aus über 30 Ländern daran teilnehmen.

Die Veranstaltung wird wieder in Zusammenarbeit mit der Messe Düsseldorf und deren Tochtergesellschaft Messe Düsseldorf Moscow organisiert – mit der Unterstützung führender

russischer und internationaler Industrieverbände: All Russian Cable Scientific Research and Development Institute (VNIKP), der internationale Draht- und Maschinenverband (IWMA), die International Wire and Cable Exhibitors Association (IWCEA), der deutsche Verband der Draht- und Kabelmaschinen-Hersteller (VDKM), der Verband österreichischer Draht- und Kabelmaschinen-Hersteller (VÖDKM-AWCMA), der Internationale Verband der Draht- und Kabelmaschinenhersteller, Frankreich (IWCEA-France) sowie der italienische Verband der Draht- und Kabelmaschinen-Hersteller (ACIMAF) und die Wire & Cable Industry Suppliers Association (WCISA)

Messe Düsseldorf – Deutschland

Website: www.messe-duesseldorf.com

Zuverlässige Walzdrahtschweißer von PWM

Mit Präzision errichtet um starke, zuverlässige, dauerhafte Schweißungen an NE-Materialien herzustellen, bieten die Kaltschweißer von PWM den Herstellern eine schnelle und preisgünstige Methode um große Walzdrahtquerschnitte mit einem Durchmesser bis zu 30mm (1,181") zu vereinen.

Schneller, sauberer und umweltbewusster als das elektrische Stumpfschweißen, erzeugt das Kaltschweißverfahren eine zuverlässige dauerhafte Schweißung, die solider ist als Muttermetall ohne die elektrische Unversehrtheit zu beeinträchtigen.

Die Produktpalette der Drahtschweißer von PWM schließt die Modelle P1500, P1000 und EP500 ein. In den eigenen Werkstätten von PWM in der UK entworfen und gebaut, sind diese robuste, hochbelastbare Maschinen energieeffizient, wartungsarm und bedienerfreundlich.

Der elektronisch-pneumatische Kaltschweißer EP500 ist eine der sich am besten verkaufenden Maschinen von PWM. Zuverlässig und bedienerfreundlich kann diese Maschine Kupferwalzdraht von 5mm bis 12,50mm (0,197" bis 0,492") und



▲ Der hydraulische Walzdrahtschweißer P1000 von PWM

Aluminiumwalzdraht von 5mm bis 15mm (0,197" bis 0,590") schweißen.

Die kompakte hydraulische P1000-Maschine für Kupferwalzdraht von 6mm bis 16mm (0,236" bis 0,630") und Aluminiumwalzdraht von 6mm bis 20mm (0,236" bis 0,790"), ist mit Schnellauskoppelung-Ziehsteinen und einem leicht einstellbaren Ziehstein-Einstellmechanismus ausgestattet.

Das Spitzenmodell aus der Produktpalette von PWM, der P1500 elektrisch-hydraulischer Walzdrahtschweißer wird Kupferwalzdraht von 15mm (0,590") bis 25mm (0,984") schweißen - Aluminium bis zu 30mm (1,181").

Der Stromverbrauch beschränkt sich auf den Hydraulikpumpenmotor, wodurch die Bedienung der P1500 sehr preisgünstig ist. Keine Einrichtungszeit wird benötigt und das Schweißspiel nimmt zirka vier bis fünf Minuten in Anspruch, mit automatisch beseitigter Schweißabschmelzung bei der Fertigstellung.

Videovorführungen der EP500, P1000 und P1500 stehen unter www.pwmltd.co.uk zur Verfügung.

Die meisten NE-Materialien sowie verschiedene Legierungen können geschweißt werden. Seit fast 30 Jahren als Hersteller von Ausrüstungen für das Kaltschweißen spezialisiert, freut sich PWM immer Ratschläge zu Kaltschweißtechnik und -anwendungen geben zu können.

Das weltweite Netzwerk erfahrener Vertreter des Unternehmens, gemeinsam mit der sich in der UK befindenden Mannschaft, bieten der internationalen Draht- und Kabelindustrie einen raschen und effizienten Service.

PWM Ltd – UK

Website: www.pwmltd.co.uk

Weitere Expansionspläne

Im Juni 2012 startete das Unternehmen Anglia Metal seine Aktivitäten im Bereich Kupferdrahtherstellung für die Kabelindustrie und andere Märkte, die in der Bearbeitung von Kupferdraht spezialisiert sind, wie z. B. jene im Bereich der Schweißung von Behältern und Herstellung von Solarbänder.

Früher unter Tri-Wire Ltd firmiert, fand das Unternehmen einen neuen Industrieminvestor, der eine langfristige und nachhaltige Strategie in der Kupferindustrie vorsieht. Der neue Besitzer hat das gesamte Managementteam sowie die erfahrenen Mitarbeiter von Anglia Metal übernommen, und damit kann sich das Unternehmen auf die Optimierung und Expansion der Geschäfte konzentrieren.

Der Firmenfokus liegt im Supply-Chain-Excellence und im Angebot einer großen Auswahl von Drahtprodukten in blanken oder verzinneten Sorten. Der Lieferumfang umfasst Produkte von 0,10mm Drähten mit einem und mehreren Enden, verschiedene flexible Leitern mit einem maximalen Querschnitt von 10mm² bis hin zu kleinen Flechtspulen für Abschirmungsanwendungen.



▲ Das Werk von Anglia Metal in West Yorkshire, UK

Die Produktionsausrüstung stimmt mit dem industriellen Standard überein und das Werk hat in den letzten Jahren von kontinuierlichen Verbesserungen profitiert. Ebenso kann Anglia Metal sehr kurze Lieferzeiten bieten, dank der Flexibilität und des Engagements der Belegschaft, um somit den Kundenerfolg zu sichern.

Der Kundenkreis im UK ist in der Herstellung von Datenübertragungs-, Telekommunikations-, Gebäude- und Industriekabel sowie Fahrzeugleitungen und in der

Dosenproduktion tätig. Das Unternehmen erwartet eine zusätzliche Expansion im Bereich Spezialdrähte und in anderen Bereichen des europäischen Markts.

Eine weitere Expansion des Produktumfangs wird geplant, damit für die Kunden vor Ort die Lieferung einer umfangreicheren Produktauswahl an Kupferdraht sichergestellt werden kann.

Anglia Metal – UK
Website: www.angliametal.com

Stärkung der Rolle der Oberflächenvorbereitung in der Drahtindustrie

Der Erfolg der Technologie der Nassstrahl-Oberflächenvorbereitung von Vapormatt in der Drahtindustrie wird durch eine wachsende Zahl von Einrichtungen gesichert, und auch durch die Ernennung eines Vertriebsingenieurs, der sich diesem Schlüsselsektor der Herstellung widmet.

Das hohe Niveau der Prozessbeständigkeit, das mit der Nassstrahlung erzielt werden kann, wurde von Vapormatt durch eine große Auswahl von Anwendungen bewiesen, darunter Reinigung, Entfettung und Entzunderung sowie Abätzung und Satinpolierung – und zwar durch zahlreiche Draht-, Kabel- und Bandprodukte.

Der kürzlich zum Vertriebsingenieur ernannte David Clements zählt die Hersteller von drehenden Extrusionen, kardierendem Draht, Starkstromkabeln, Bandsägeblättern, Lichtwellenleiterkabeln und hochgekohltem Stahldraht zu denen, die durch die Technologie von Vapormatt Vorteile genießen.

Als Beispiel für die Verpflichtung des Unternehmens im Schwerpunkt Anwendung, weist Clements auf Profelis von Vapormatt hin.

Mit diesem Maschinenaufbau können Draht- und Kabelprodukte

verschiedener Geometrien und Werkstoffe bedient werden, während der Einsatz von rauen Chemikalien vermieden wird sowie die potentielle Verunreinigungsgefahr, die mit alternativen Methoden getestet wird.

Völlig autonom, umfasst Profelis zwei anliegende Einheiten, die eine Kombination von Nassstrahlung, Sprayspülungen und Trocknung bieten, um hochwertige Ergebnisse herzustellen, die die ästhetischen Ansätze sowie die Leistungsziele erfüllen.

Vapormatt Ltd – UK
Website: www.vapormatt.com

Lösungen zu und Verarbeitung von Schaum-Fluorpolymer für die Isolierung von Hochleistungskabeln

Von Gary G Thuot und Robert T Young, von DuPont Chemicals & Fluoroproducts, Wilmington, Delaware, USA

Übersicht

Mit einer Vielzahl heute zur Verfügung stehender dielektrischer Hochleistungsmaterialien, ist die Auswahl des idealen Isolierwerkstoffs für Hochleistungskabel ein ausgewogenes Verhältnis von Leistung, Verarbeitbarkeit und Kosten.

In diesem Artikel werden die elektrischen Leistungen und das Auswahlkriterium für dielektrisches Schaum-Fluorpolymer-Material vorgestellt. Das Erstellen durchführbarer Verarbeitungsbereiche und die Überlegungen zu Schlüsselverarbeitungen, die ein stabiles und wiederholbares Verfahren bieten, werden ebenfalls erforscht.

Schaum-Fluorpolymere bieten hervorragende elektrische Eigenschaften, eine geringe Rauchbildung und eine hohe Temperaturbeständigkeit. In der Regel werden Fluorpolymere in Anwendungen eingesetzt, die eine geringe Rauchbildung fordern, wie z. B. bei Plenum-Kabeln, bei Hochtemperaturanwendungen wie z. B. bei spezifizierten Militärkabeln und bei Anwendungen, bei denen eine Lötbeständigkeit erforderlich ist.

Die Auswahl des auf die Produktgröße bezogenen richtigen Polymers und der elektrischen Eigenschaften ist wichtig, um ein robustes Verfahren und die gewünschten Kabelleistungen zu erzielen.

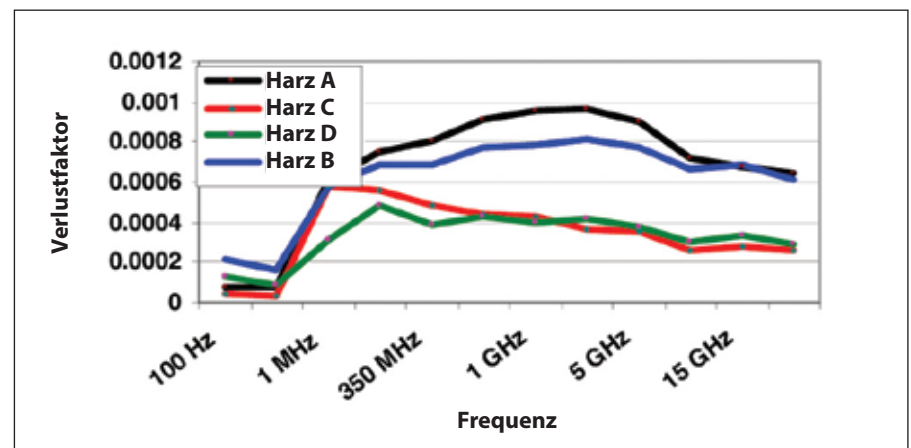
Die Auswahl der Verarbeitungsausrüstungen und der Überwachungsausrüstungen sowie deren Betrieb sind von Bedeutung um Qualitätsprodukte mit hohen

Erträgen herzustellen. Beabsichtigt wird mit diesem Artikel einige dieser Schlüsseleigenschaften der Produkte und Verfahren sowie deren Auswirkungen auf das Verfahren und die Leistungen zu erklären.

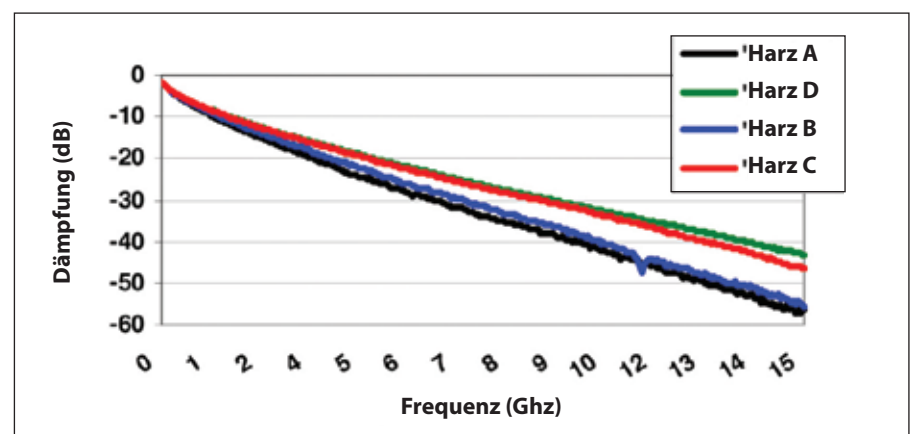
Die Auswahl des richtigen Materials

Die Erwägungen zur Auswahl eines Schaum-Fluorpolymerharzes für

▼ Bild 1: Verlustfaktor



▼ Bild 2: Dämpfung



Hochleistungskabel schließen die Anforderungen elektrischer/physikalischer Leistungen, die Produktleitergröße und die dielektrische Wanddicke ein.

Die elektrischen Leistungen, wie im nachfolgenden Diagramm dargestellt, können entsprechend der Harzzusammensetzung variieren. Die Angabe des Verlustfaktors (*Bild 1*) verdeutlicht die Unterschiede, die auf festen Platten verschiedener Sorten von DuPont™ Airquick FFR Schaumharze in deren festen Zustand (ungeschäumt) gemessen werden.

Die Dämpfungsergebnisse (*Bild 2*) basieren auf tatsächlichen 50-Ohm Kabelproben, die mit Einsatz eines identischen Aufbaus und Verfahrensbedingungen, aber mit unterschiedlichen Harzsorten, hergestellt wurden. Wie in *Bild 2* dargestellt, kann sich beim Kabelverlust ein wesentlicher Unterschied ergeben, der auf der Sortenauswahl basiert. Der Stromausfall in einem Kabel wird in der Regel in Dezibel (db) gemessen und entspricht dem 10fachen Logarithmus des Verhältnisses der Eingangsleistung eines Kabelendes gegenüber der Ausgangsleistung am anderen Ende.

Da gesteigerte Anforderungen an Kabeln gestellt werden um bei höheren Frequenzen zu funktionieren, spielen diese Materialunterschiede eine wichtige Rolle bei der gesamten Kabelleistung.

Nukleierungsmittel	Durchschnittliche Kapazitätanz	Kapazitätanzänderung	Funken/1.000 Fuß
Konzentrat	27.6 pf/ft	.9 pf/ft	10
Völlig vermischt	26.9 pf/ft	.4 pf/ft	0

▲ **Tabelle 1:** Zusammenfassung der Leistungen

Zum Beispiel würde ein Fluorpolymer-Kabel auf zirka 82 Prozent Ausbreitungsgeschwindigkeit geschäumt, das mit auf *Bild 1* und *2* dargestellte Harze hergestellt und bei 2,5 Ghz geprüft wird, wesentliche Unterschiede beim Signalverlust ergeben. Ein 100 Fuß langes, mit Harz B hergestelltes Kabel würde einen Stromausfall von zirka 20 Prozent aufweisen im Vergleich zum gleichwertigen mit Harz C oder D hergestelltem Kabel. Harz A würde zu zirka 30 Prozent Stromausfall im Vergleich zum Harz C oder D führen. Diese Unterschiede bei den Leistungen würden hervorgehoben werden, wenn die Kabel bei höheren Betriebsfrequenzen eingesetzt werden.

DuPont hat ein Portfolio von Harzen mit Einsatz der DuPont Airquick-Technik erweitert, wie z. B. FFR 330, FFR 550, FFR 750 und FFR 770 Schaumharze, die den Kunden eine große Auswahl an elektrischen Leistungen und Kabelaufbauoptionen bieten.

Nukleierungstechnik und Zellenbildung

Um Plätze zu bieten, in denen die Schaumzellen-Nukleierung entstehen kann, werden in der Regel anorganische Materialien, wie z. B. Bornitrid, dem Harz hinzugefügt, um das Schäumen zu erleichtern.

Der Zusatz anderer Markenmaterialien im Bornitrid verbessert deutlich das Schaumverfahren. Die Methode der Additivierung kann variieren von vollständig vermischten einsatzbereiten Harzen zu Konzentraten, die während des Extrusionsverfahrens hinzugefügt werden.

Um als Beweis zu dienen, fand ein parallel durchgeführter Verfahrensvergleich zwischen einem völlig vermischtem Harz (DuPont™ FFR 770 Schaumharz) und einem gleichwertigen Produkt mit einem handelsüblichen Schaumkonzentrat statt.

Für diesen Vergleich wurden die Zusammensetzungen des Nukleierungsmittels variiert, aber die Teillast des Harzes und das eingesetzte Grundharz wurden konstant gehalten. Der für diesen Versuch benutzte Kabelaufbau war ein 23 AWG-Einzeldraht mit einer 19 Mil Wand, typisch bei einem 100-Ohm abgeschirmten paarverseilten Aufbau. Das Ziel der Dehnrate entsprach 40 Prozent.

Der vollständig vermischte DuPont™ FFR 770 erreichte gute Ergebnisse der gewünschten Kapazitätanz mit einer 2,5 kV Spannung mit niedriger Abweichung und leicht haltenden Funken. Das gleichwertige Produkt mit dem handelsüblichen Konzentrat konnte nicht die gewünschte Dehnrate erzielen, zeigte eine höhere Kapazitätanzänderung an und würde nicht die Spannung der Durchlaufprüfung halten. *Tabelle 1* stellt eine Zusammenstellung der Ergebnisse dar.

Der wesentliche Leistungsunterschied zwischen den beiden Materialien ist ein Ergebnis der Unterschiede in der Schaumzellenstruktur, welche durch die kernhaltige Paketauswahl entstehen. *Bild 3* verdeutlicht die Unterschiede der Zellengröße und der -struktur zwischen den beiden Materialien.

▼ **Bild 3:** Vergleich zwischen Zellstrukturen



▼ **Tabelle 2:** Harzauswahl entsprechend des Kabelaufbaus

Harz	Leiterauswahl	Wandbereich	Porenbereich
Harz A (7 MRF)	24 und darüber hinaus	.015 und darüber hinaus	10-58%
Harz B (14 MRF)	24 und darüber hinaus	.015 und darüber hinaus	10-55%
Harz C (12 MRF)	26 und darüber hinaus	.015 und darüber hinaus	10-58%
Harz D (30 MRF)	24 und geringer	.005- .02	10-50%
Harz E (42 MRF)	24 und geringer	.003- .02	10-55%

Wie aus Bild 3 ersichtlich, bietet das völlig vermischte Material eine kleine gleichmäßige Zellenstruktur, während die Probe, die mit dem Konzentrat hergestellt wird, große uneinheitliche Zellen zur Folge hat. Die Unfähigkeit das Konzentrat-basierte Material bis zum höheren Maß zu schäumen würde andere Folgen für den Kabelaufbau haben.

Um gleichwertige elektrische Leistungen zu erzielen, sollte die Wanddicke erhöht werden um den niedrigeren Porengehalt auszugleichen, dabei wird mehr Fluorpolymermaterial verbraucht.

Zum Beispiel in den Einzeldrähten für die obengenannte Probe, würde die Unfähigkeit bis zum höheren Maß zu schäumen eine Erhöhung von zirka 20 Prozent im geforderten Wert von Pfund/1.000 Fuß je Einzeldraht ergeben, um eine gleichwertige Impedanz zu erzielen.

Auswahl der Harzsorte für die Anwendung

Wenn die gewünschte elektrische Leistung bestimmt wird, ist das Harz entsprechend des Leiters, der Isolierungswanddicke und der Brennleistung zu bestimmen, soweit sie anwendbar sind. Die Regel ist, je niedriger der Schmelzrate, desto höher ist die Brennleistung (d.h. weniger Rauchbildung).

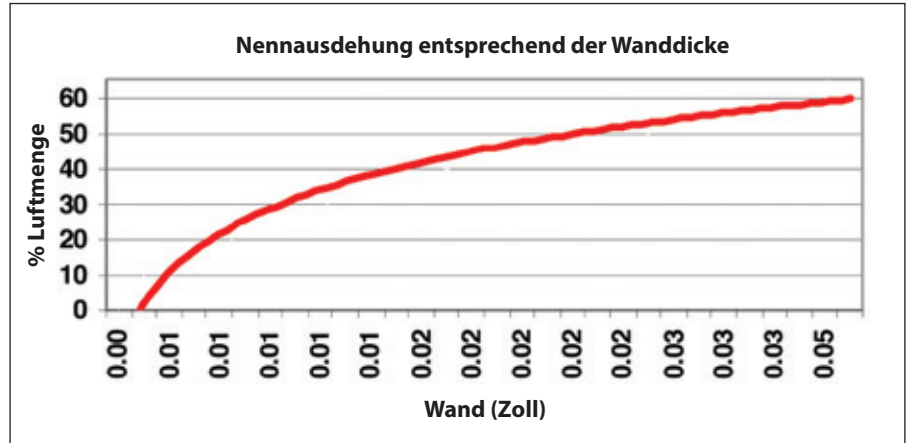
Je höher die Schmelzrate ist, desto geeigneter ist das Harz für dünnere Isolierungswände und kleinere Kabelaufbauten. Tabelle 2 bietet einige allgemeine Richtlinien für die Harzauswahl.

Verfahrenparameter und Wirkungen – Schaumausdehnungsraten

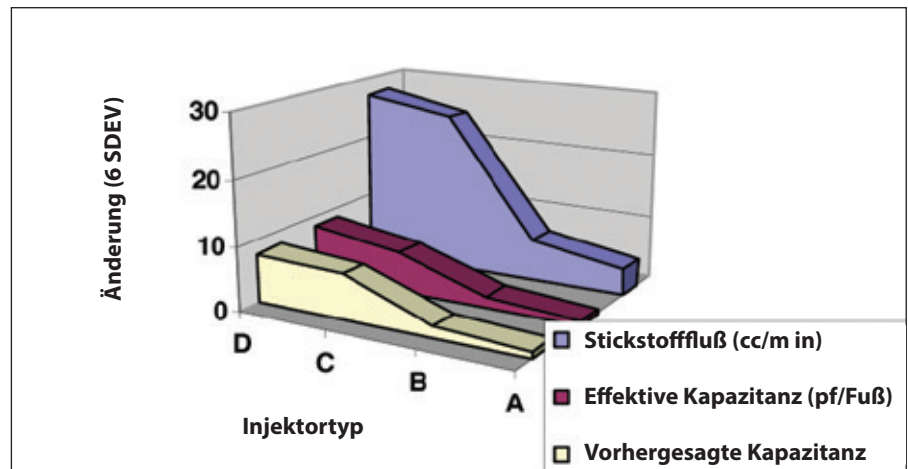
Für Kabel-Ingenieure ist es gängig beim Entwurf der Kabel berechnete Ausdehnungsraten einzusetzen, die die niedrigsten theoretischen Kosten liefern.

Jedoch gibt es weitere wichtige Faktoren, die sich auf die Kosten auswirken, wie z. B. Verfahrensfähigkeit, gesamte elektrische Leistung sowie Kabelschaden und -stauchung, aus den nach der Extrusion folgenden Verfahren.

Aus einer Vernachlässigung dieser Aufbauaktoren könnten irrtümlicherweise höhere Kosten und erhebliche Schrotterzeugungen



▲ Bild 4: Nominale Expansionsraten



▲ Bild 5: Gasfluß und Kapazitätzänderung

entstehen. Berücksichtigt wird ein typisches Video-Koaxialkabel, das mit einer Ausdehnungsrate von 59 Prozent entworfen wurde - im Vergleich zu einem gleichen Kabel, das mit einer Ausdehnungsrate von 54 Prozent entworfen wurde.

Das Kabel mit der Ausdehnung von 59 Prozent könnte das Verfahren an seinen Grenzen drängen, was nachträglich den Anfahrtschrott erhöhen und größere Verfahrensänderungen verursachen würde. Vom elektrischen Standpunkt betrachtet, resultiert ein höherer Porengehalt in der Regel aus größeren Zellen und einer höheren Bildung von Zellen um den Mittelleiter, was wiederum eine höhere Auswirkung auf die Kabelrückflusdämpfung haben könnte.

Anderenfalls kann dasselbe Kabel mit einer Ausdehnungsrate von 54 Prozent, mit einer Gewichtszunahme von nur 0,28 Pfund/1.000 Fuß, gefertigt werden.

Diese geringe Änderung wird ein robustes, reproduzierbares Produkt mit einer verbesserten Kabelrückflusdämpfung bieten, weniger Schrott und eine höhere Produktivität mit derselben Kabelimpedanz.

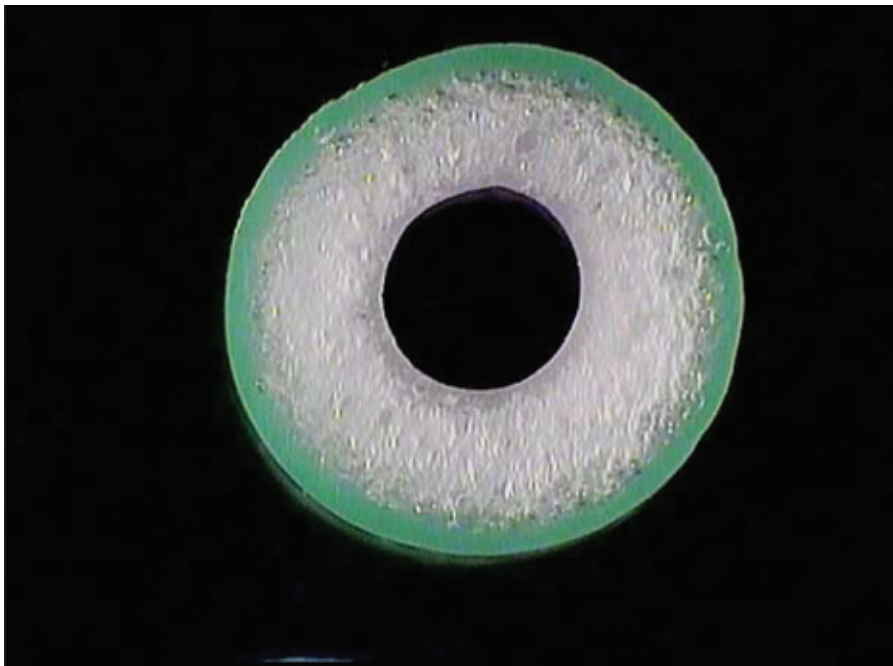
Bild 4 bietet die allgemeinen Richtlinien für die Schaumausdehnungsraten basierend auf der dielektrische Wanddicke. Die effektiven höchsten Ausdehnungsraten werden basierend auf der Harzauswahl und Verfahrensmethoden variieren.

Hochdruck-Stickstoffgasinjektion

Das Schäumen wird durch das Einspritzen von Hochdruck-Stickstoffgas im geschmolzenen Polymer während des Extrusionsverfahrens erzielt.

Die Schaumrate wird durch den Durchsatz des Gases bestimmt, im Verhältnis zur Harzleistung bei den Betriebsdrehzahlen des Extruders. Je höher der Gasfluß gegenüber der Harzleistung, desto höher ist die Ausdehnungsrate.

Die Beständigkeit dieses Gasflusses ist grundlegend um eine gleichmäßige Ausdehnungsrate einzuhalten, die erforderlich ist um niedrige Änderungen bei der Kabelkapazitätz sowie Signalverzögerungszeiten für die Kabel aufrechtzuhalten.



▲ Bild 6: Querschnitt des Schaumkerns mit fester Hautaußenschicht

Messung des Gasflusses

Sicherzustellen, dass ein konstanter, richtiger Gasfluß in die Schmelze eingespritzt wird, ist eine der wichtigsten Variablen des Schaumverfahrens. Nicht erfasste Änderungen des Gasflusses werden in Kapazitätsänderungen resultieren, die zu einer Verfahrensstabilität und erheblichem Schrott führen. Die Messungen des Offline-Injektorsflusses (wie z. B. die Wasserverdrängung) werden den durchschnittlichen Injektordurchsatz bei Raumtemperatur bestimmen. Sie werden aber nicht den tatsächlichen Verfahrensdurchsatz oder die Flussänderung bestimmen, da sich die Injektorflüsse radikal ändern können, wenn sie bis zu den Verarbeitungstemperaturen erwärmt werden. Demzufolge empfiehlt sich ein Inline-Flussmesser wenn das Gasinjektion-Schaumverfahren benutzt wird. Mit einem Flussmesser kann der Gasdruck genau eingestellt werden, um den berechneten Durchsatz zu erzielen, der für die gewünschte Nennkapazität erforderlich ist. Darüber hinaus können die Änderungen des Durchsatzes überwacht werden.

Auswahl des Gasinjektors für das Produkt

Bei der Dimensionierung eines Injektors ist der Druck der Extrudertrommel zu berücksichtigen sowie der

Stickstoffdurchsatz für die gewünschte Ausdehnungsrate im Vergleich zur Betriebsgeschwindigkeit des Produkts. Der Durchsatz des Gases hängt von den Abmessungen der Injektoröffnung und des Stickstoffgasdrucks ab.

Die Öffnung ist derart zu dimensionieren, dass der Gasdruck höher als der Trommeldruck für den gewünschten Gasfluß ist. Vorausgesetzt wird, dass ein bestimmter Kabelaufbau einen Durchsatz von 50cc/min Stickstoff für eine Liniengeschwindigkeit von 600 Fuß pro Minute fordert und einen Druck der Extrudertrommel von 1.000psig erzeugt.

Der ausgewählte Injektor für dieses Verfahren bedarf einer Öffnung, die nicht größer dimensioniert sein darf als jene zur Förderung eines Gasdurchsatzes von 50cc/min bei einem Druck höher als jener der Trommel.

Mit einem Durchsatz über 50cc/min bei 1.000psig würde eine Einstellung des Gasdrucks erforderlich sein, die niedriger ist als der Trommeldruck und daraus würde resultieren, dass das Injektorverschließen zur Erstarrung des Produkts führen würde.

Eine Erhöhung des Gasdrucks über 1000 psig würde einen zu hohen Gasfluß verursachen, was wiederum zum Übersäumen führt. Diese Übersäumbedingung wird oft missverstanden, und als Material- oder Verarbeitungsproblem betrachtet.

Ist dagegen die Injektoröffnung zu klein, ist es möglich, dass nicht genügend Gasdruck vorhanden ist um

den geforderten Gasfluß zu erzielen. Das resultiert in einer Unfähigkeit die gewünschte Ausdehnungsrate und Produktkapazität zu erzielen.

Aus diesem Grund stehen in der Regel verschiedene Injektoren mit unterschiedlichen Durchsätzen über eine große Druckauswahl zur Verfügung.

Die Anzahl unterschiedlicher geforderter Abmessungen variiert abhängig vom Produktmix und dem verfügbaren Gasdruck. Der Einsatz einer Hochdruck-Stickstoffpumpe erhöht die Gasdruckauswahl im Vergleich zum Einsatz eines Hochdruckzylinders.

Die Anwendung einer Pumpe kann eine Reduzierung der Anzahl an Abmessungen der Injektoren beitragen, die für einen Betrieb gefordert werden, und damit zu einer Senkung der Gesamtkosten führen.

Der Injektoraufbau kann auch Einfluss auf die Leistungen haben. Bild 5 zeigt das Ergebnis der Versuche, die vier handelsübliche Injektorausführungen vergleichen, wie durch die Gasflußänderung und der sich ergebenden Kapazitätsänderung quantifiziert.

Für diese Versuche wurde ein 50-Ohm Kern und ein Leiter mit einem Durchmesser von 23 Gauge eingesetzt, der zirka um 50 Prozent geschäumt ist. Die Six-Sigma-Abweichung des Gasdurchsatzes (± 3 Standardabweichungen) liegt zwischen 4 und 27cc/min mit einer sich ergebenden Kapazitätsänderung von 0,3 bis 3,8pf/Fuß.

Diese Ergebnisse zeigen, dass Leistungsaspekte, die oft dem Fluorpolymermaterial zugeschrieben werden, in der Regel ein Verarbeitungsaspekt sind, der sich auf die Ausrüstung bezieht.

Der Einsatz eines falsch ausgemessenen Injektors oder ein instabiler Entwurf kann den echten Leistungsvorteil bestimmter Materialien verbergen.

Produktkühlung

Das Kühlmittel für den extrudierten Kern ist üblicherweise eine Kombination von Umgebungsluft und Wasser. Der geforderte Abstand hängt jeweils von der Produktgröße und der Liniengeschwindigkeit ab.

Die richtigen Abstände sind grundlegend für das Kühlen vor dem Drahtaufwickler, um das Abflachen der Isolierung an der Spule zu vermeiden sowie Auswirkungen auf die elektrische Leistung. Indem der Abstand der Wasserabschreckungsstelle soweit wie möglich vom Kreuzkopf

entfernt gehalten wird, wird das beste Produkt erbracht. Das ist darauf zurückzuführen, dass ein langer Abstand von der Luftkühlungsstelle dem Harz die Zeit gibt auf dem Leiter einzuschumpfen und dabei eine beständige, enge Schnittstelle mit dem Leiter bietet, ohne den Einsatz einer übermäßigen Vorwärmung.

Diese beständige Leiterschnittstelle bietet eine gleichmäßige Kraft des Isolierbands, auch nachdem die anfängliche Haftung gebrochen ist. Der Vorteil liegt in einer gesteigerten Rückflussdämpfung und Widerstand gegen Beanspruchungen der darauf folgenden Verarbeitungsverfahren.

Manchmal ist ein langer Abstand von der Luftkühlungsstelle keine Option wegen des gesamten verfügbaren Kühlungsabstands.

Falls das der Fall ist, sollte Kaltwasser in der ersten Kühlstrecke vermieden werden weil eine übermäßige Ovalität der Isolierung und eine niedrige Leiterhaftung resultieren könnten. Die gehärtete Kühlung empfiehlt sich, weil sie den anfänglichen Schock auf die Isolierung reduziert, und die Isolierungsovalität und die Leiterhaftung erhöht.

Skinning

Das Extrudieren einer Außenschicht von festem Material oder das Skinning bieten zusätzliche Vorteile, wie z. B.:

- Eine leichte und effiziente Weise die Isolierung einzufärben
- Erhöhte dielektrische Festigkeit, die bei Kabelaufbauten mit dünneren Wänden nützlich sind
- Gesteigerte Schaumausdehnungsraten
- Höhere Beständigkeit gegenüber Isolierschäden während der darauf folgenden Verarbeitung wie z. B. Paarverseilung oder Beflechtung

Die Anwendung einer festen Hautbeschichtung fordert eine anfängliche Ausrüstungsinvestition (einen Nebenextruder und Sonderkreuzkopf) aber bietet Vorteile durch weniger Ausfall und Produktionskosten.

Der Schaum und die feste Schicht werden gleichzeitig durch einen Einzelkreuzkopf mit Anwendung von Standard-Verarbeitungsmethoden erzielt. *Bild 6* verdeutlicht ein Schaumkern mit einer eingefärbten festen Außenschicht.

Schlußfolgerungen

Zur Verfügung stehen verschiedene Optionen für Schaum-Fluoropolymerharze,

die jeweils besondere Möglichkeiten und Einschränkungen aufweisen. Die Auswahl des richtigen Harzes für die jeweilige Anwendung ist für die Kosten, die einfache Verarbeitung und die gewünschten elektrischen Leistungen von Bedeutung.

Der Aufbau und die Verarbeitung von Kabeln innerhalb der Materialmerkmale werden hochwertige Produkte mit hohen Erträgen erzielen. Die Auswahl der Verarbeitungs-ausstattung und der Verfahrensbedingungen sind grundlegend um ein stabiles Verfahren zu sichern, eine minimale Produktabweichung zu erhalten und die niedrigsten Kosten des Verfahrens zu erzielen.

Sondertechniken, wie z. B. die Aufnahme einer festen Hautschicht, bzw. fester Hautschichten, bis zu den Schaumentwicklungen, können zusätzliche Verbesserungen gegenüber Verarbeitung und Leistung bieten. ■

Северная Америка будет представлена коллективным стендом в России

Выставка «wire Russia» пройдет с 25 до 28 июня 2013 в ЗАО «Экспоцентр» в Москве

У участников выставки будет уникальная возможность посетить коллективный стенд Северной Америки, организованный «Messe Düsseldorf North America» при поддержке «Wire and Cable Industry Suppliers Association» (ассоциация поставщиков проволоки и кабеля) (WCISA).

Данный коллективный стенд продемонстрирует компаниям эффективные способы вхождения на российский рынок или расширения их деятельности. Выставочное место можно забронировать сейчас, связавшись с «Messe Düsseldorf

North America». Российский рынок всегда был сильным, и сегодня он открывает большие возможности для международных компаний, занимающихся производством, обработкой или продажей проволоки и кабелей.

Помимо коллективного стенда Северной Америки на выставке будут представлены павильоны таких стран, как Австрия, Китай, Франция, Германия и Италия. Всего в выставке примут участие более 30 стран..

Выставка будет вновь организована «Messe Düsseldorf» и дочерней компанией «Messe Düsseldorf Moscow» при поддержке ведущих российских и международных промышленных

ассоциаций: Всероссийский научно-исследовательский, проектно-конструкторский и технологический институт кабельной промышленности (ВНИИКП), Международная ассоциация производителей проволоки и оборудования, Международная ассоциация производителей проволоки и кабеля, Немецкая ассоциация производителей проволоки и кабельного оборудования, Международная ассоциация производителей проволоки и кабеля во Франции, Ассоциация производителей кабельного оборудования в Италии и Ассоциация поставщиков проволоки и кабеля.

«Messe Düsseldorf» – Германия
Вебсайт: www.messe-duesseldorf.com

Надежные сварные стержневые электроды «PWM»

Точность проектировки, применяемая для производства прочных, надежных сварных швов на нежелезных материалах, сварные стержневые электроды холодной сварки «PWM» предлагают производителям быстрый, экономичный метод соединения больших секций диаметром до 30 мм (1,181"). Более быстрая, чистая и экологичная в отличие от электрической стыковой сварки холодная сварка создает надежное постоянное сварное соединение прочнее, чем исходный материал, не уменьшая электрической целостности.

Ассортимент сварных электродов «PWM» включает модели P1500, P1000 и EP500. Разработанные и созданные в собственных мастерских «PWM», данное надежное, сверхпрочное оборудование является энергосберегающим, низкочастотным и легким для управления. Электрический/пневматический стержневой электрод холодной сварки EP500 – один из самых популярных среди оборудования «PWM». Надежный и простой в управлении, он сваривает медные прутья от 5 мм



▲ P1000 гидравлический сварной электрод «PWM»

до 12,50 мм (от 197 дюймов до 492 дюймов) и алюминиевые прутья от 5 мм до 15 мм (от 197 дюймов до 590 дюймов). Компактное гидравлическое оборудование P1000 предназначено для медных прутьев от 6 мм до 16 мм (от 236 дюймов до 630 дюймов) и алюминиевых прутьев от 6 мм до 20 мм (от 236 дюймов до 790 дюймов) и оборудовано механизмом быстрого разъединения и легко настраиваемым механизмом формирующего элемента

Самая популярная модель из всего ассортимента «PWM» – P1500 электрогидравлический сварной стержневой электрод применяется

для медных прутьев от 15 мм (590 дюймов) до 25 мм (984 дюйма); алюминиевых - до 30 мм (1,181 дюйм). Потребление энергии ограничивается гидравлическим двигателем мотора, который делает P1500 экономичным в управлении. Время для установки не требуется, и сварной цикл занимает от четырех до пяти минут, после чего сварочный грат удаляется автоматически. Видео демонстрации по применению EP500, P1000 и P1500 можно увидеть на www.pwmltd.co.uk

Нежелезные материалы, а также материалы из сплавов материалы можно сваривать. Будучи экспертом оборудования холодной сварки на протяжении более 30 лет, «PWM» всегда рада предоставить совет по технологиям холодной сварки и ее применению. Всемирная сеть компании, в которую входят опытные специалисты совместно с командой персонала Британии предлагают быстрый и эффективный сервис в международной сфере проволоки и кабеля.

«PWM Ltd» – Великобритания
Вебсайт: www.pwmltd.co.uk

Планы по дальнейшему расширению

В июне 2012 «Anglia Metal» начала свою деятельность в сфере производства проволоки для кабельной промышленности и других рынков обработки медной проволоки, таких как: жестяная сварка и производство ленточного солнечного элемента.

Ранее известная под названием «Tri-Wire Ltd», компания привлекла нового промышленного инвестора с продолжительной и надежной стратегией в медной промышленности. Новый владелец взял весь управляющий персонал из «Anglia Metal», а также высококвалифицированные кадры, и в настоящее время компания имеет возможность сконцентрироваться на оптимизации и расширении своей деятельности.

Внимание компании сосредоточено на формировании великолепной логистической цепи и на способности предоставить широкий выбор упакованной и неупакованной продукции. Ассортимент продукции включает в себя одноконцевую и многоконцевую проволоку от 0,10 мм, различные гибкие шнуры с поперечным разрезом вплоть до 10 мм², а также небольшие коклюшечные катушки для экранирования.



▲ Завод металлопродукции «Anglia» в западном Йоркшире, Великобритания

Технологическое оборудование соответствует промышленным стандартам и за последние годы подверглось многочисленным заводским модификациям. «Anglia Metal» способна выполнять заказ в максимально короткие сроки благодаря гибкости и заинтересованности сотрудников в успехе заказчика.

Компания располагает активной клиентской базой в Великобритании в информационной сфере, сфере телекоммуникаций, строительства, промышленного и автомобильного

производства кабелей, а также производства металлической тары.

Компания надеется на дальнейшее расширение своей деятельности в сфере специального применения проволоки и на выход на европейский рынок.

Планируется расширение объема продукции для обеспечения местных клиентов необходимым количеством медной проволоки.

«Anglia Metal» – Великобритания
Вебсайт: www.angliametal.com

Увеличение роли подготовки поверхности в проволочной промышленности

Успех технологии «Vapormatt» подготовки поверхности паровоздушным дутьем в сфере проволоки доказан растущим количеством установок и инженеров по сбыту, работающих в основном производственном секторе.

«Vapormatt» доказала, что высокий уровень технологической прочности можно достичь за счет применения паровоздушного дутья в многочисленных сферах. Способы применения включают очистку, обезжиривание и удаление накипи, а также гравировку и полирование лентой с абразивным материалом средней зернистости, которые

используются для большого числа стальных кабелей и продукции для снятия покрытия.

Дэвид Клементс, недавно занявший должность инженера по продажам, среди производителей, получивших преимущества от технологии «Vapormatt» называет производителей в сферах ротационного прессования, растяжки кабеля, силовых кабелей, ленточных пил, оптиковолоконного кабеля и проволоки из высокоуглеродистой стали. В качестве примера нацеленности компании на применение господин Клементс обращает внимание на «Vapormatt Profelis». Данный

профиль может применяться для кабельной и проволочной продукции различных размеров и материалов без применения жестких химикатов и потенциальных рисков загрязнения, вызванных альтернативными методами. Полностью автономный «Profelis» состоит из двух смежных установок, которые осуществляют паровоздушное дутье, струйную промывку и осушку, что приводит к высоким результатам, соответствующим как косметическим, так и функциональным характеристикам.

«Vapormatt Ltd» – Великобритания
Вебсайт: www.vapormatt.com

Решения для пенных фторполимеров и обработка кабелей высокой производительности

Гари Туот и Роберт Янг, «DuPont Chemicals and Fluoroproducts», Уилмингтон, Делавер, США

Краткое содержание

С большим количеством высокопроизводительных диэлектрических материалов, доступных сегодня, выбор идеальных изоляционных материалов для кабелей, пользующихся большим спросом, должен представлять сочетание производительности, технологичности и стоимости.

Данная статья представит электрические характеристики и критерии отбора для пенных фторполимерных диэлектриков. Кроме того, будет рассмотрен вопрос установления возможного диапазона обработки и основные принципы обработки, которые обеспечат надежную, точную технологию.

Пенные фторполимеры обладают превосходными электрическими характеристиками, являются малодымящими и выдерживают высокую температуру. Обычно фторполимеры применяются для малодымящих сред, таких как: огнестойкий кабель, в высокотемпературных средах, таких как: кабели, используемые в военных технических условиях, а также в средах, устойчивых к спайке.

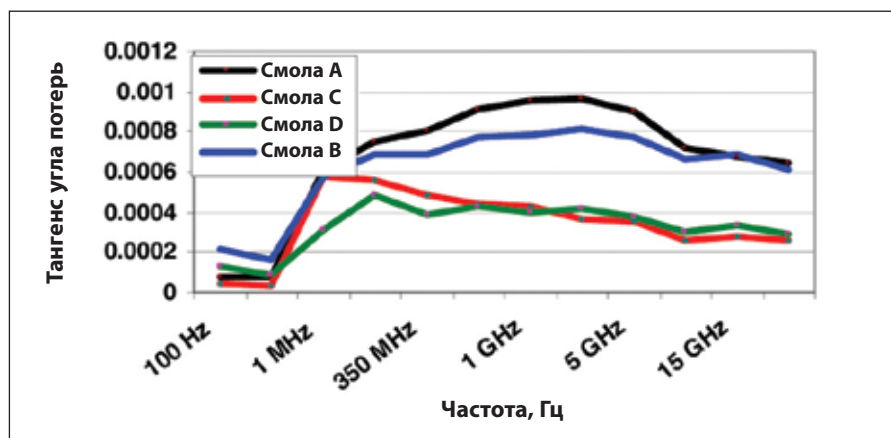
Выбор правильного полимера, а также то, как он соотносится с размером продукции и электрическими свойствами, играет важную роль в достижении надежного функционирования и желаемой производительности кабеля. Обработка и контроль выбора оборудования и их эксплуатация важны для производства качественной продукции с большой мощностью. Данная работа преследует цель объяснить некоторые из этих ключевых характеристик и их влияние на технологию и производительность.

Выбор правильного материала

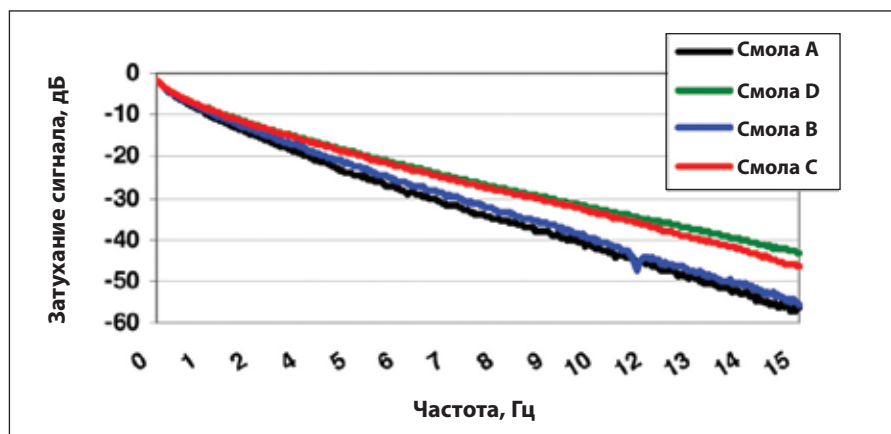
Выбор в пользу пенной смолы фторполимера для кабелей высокой производительности основывается на электрических/физических эксплуатационных характеристиках,

размере проводника продукции и толщины стенки диэлектрика. Электрические характеристики, как показано на графике ниже, могут меняться в зависимости от состава смолы. Тангенс угла диэлектрических потерь данных (Рис. 1) иллюстрирует различия показателей, измеренных на твердых частицах различных профилей

▼ Рисунок 1. Коэффициент потерь



▼ Рисунок 2. Затухание сигнала



пенной смолы в твердом состоянии «DuPont™ Airquick FFR» (невспененная).

Результаты затухания (Рис. 2) основаны на фактических образцах кабелей 50 Ом, изготовленных по универсальному проектированию и одинаковым технологическим условиям, но из различных профилей смолы. Как показано на рисунке 2, в зависимости от выбора профиля смолы, возникает значительная разница в потере кабеля. Электрическая мощность потерь в кабеле измеряется, как правило, в децибелах (дБ), и равна отношению каротажной мощности одного конца кабеля, умноженного в 10 раз, к выходной мощности на другом конце кабеля. Так как к кабелям с более высокими частотами предъявляются более высокие требования, данные различия материала играют большую роль в общей производительности кабеля.

К примеру, фторполимерный кабель, вспененный примерно до скорости прохождения 82%, изготовленный из смолы как на рисунках 1 и 2 и испытанный на частоте 2,5 Гц, значительно повлияет на потерю сигнала. 100-футовый кабель, произведенный из смолы В, продемонстрирует около 20% потерь мощности по сравнению с таким же кабелем, произведенным из смолы С или

Центрообразователь	Среднее емкостное сопротивление	Колебание емкостного сопротивления	Искры 1000 футов
Концентрат	27.6 pf/ft	.9 pf/ft	10
Полностью комбинированный	26.9 pf/ft	.4 pf/ft	0

▲ Таблица 1. Сводка показателей

D. Смола А может привести к 30% потери мощности по сравнению со смолами С или D. Данные различия могли бы быть более выраженными, так как кабели применяются на более высоких частотах. «DuPont» разработала ряд смол при использовании технологии «DuPont Airquick», таких как: пенные смолы FFR330, FFR 550, FFR 750 и FFR 770, благодаря чему клиентам предоставляется широкий спектр электрических характеристик и параметров проектирования кабеля.

Технология центрообразователя и образование пор

Для обеспечения места образования пор пены, обычно в смолу добавляются

неорганические вещества, такие как нитрид бора, которые способствуют пенообразованию. Добавление других фирменных материалов к нитриду бора также в значительной мере увеличивает процесс пенообразования. Метод внедрения может различаться от полностью комбинированных готовых к эксплуатации смол до концентратов, которые будут добавлены в процессе формовки. Чтобы продемонстрировать это, было проведено параллельное сравнение полностью комбинированной смолы (пенной смолы «DuPont™ FFR 770») и эквивалентной продукции пенного концентрата, имеющегося в продаже.

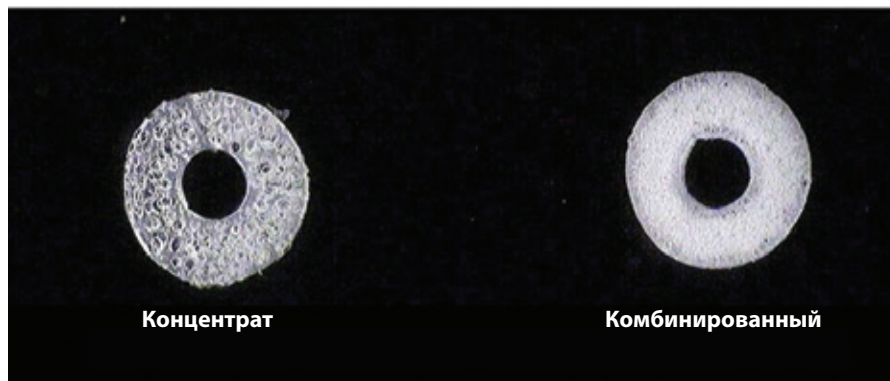
Для проведения данного сравнения центрообразователи композиции были разнообразны, а процент загрузки и используемой основной смолы поддержаны в постоянстве. Кабельной конструкцией, используемой для данного эксперимента, стал одножильный провод с калибром 23 и 19-и мл стенкой, обычно применяемый в конструкции экранированного кабеля «витая пара» с сопротивлением 100 Ом. Необходимый коэффициент расширения составлял 40%.

Полностью комбинированная «DuPont™ FFR 770» показала хорошие результаты, достигнув необходимой емкости с низкой вариацией, легко сохраняя напряжение искры в 2,5 кВ. Аналогичная продукция, имеющаяся в продаже, не смогла достичь желаемого темпа расширения, показав большее колебание емкости, и не выдержала испытание искры напряжения. В таблице 1 содержится сводка результатов.

Значительная разница в производительности между данными двумя материалами является результатом различия структуры пенных клеток, вызванного выбором центрообразователя. На рисунке 3 показаны различия в размерах клеток и структуре двух материалов.

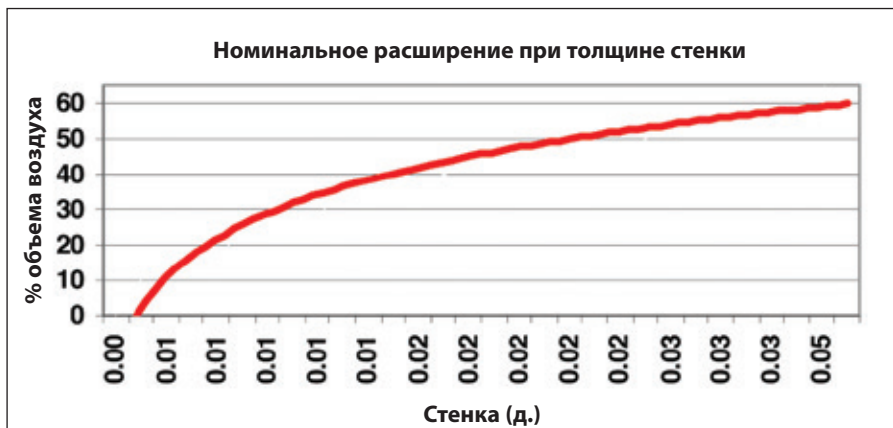
Как видно на рисунке 3, полностью комбинированный материал обеспечивает единую структуру клетки, в то время как образцы, полученные из концентрата, являются большими неоднородными клетками.

▼ Рисунок 3. Сравнение структуры клеток

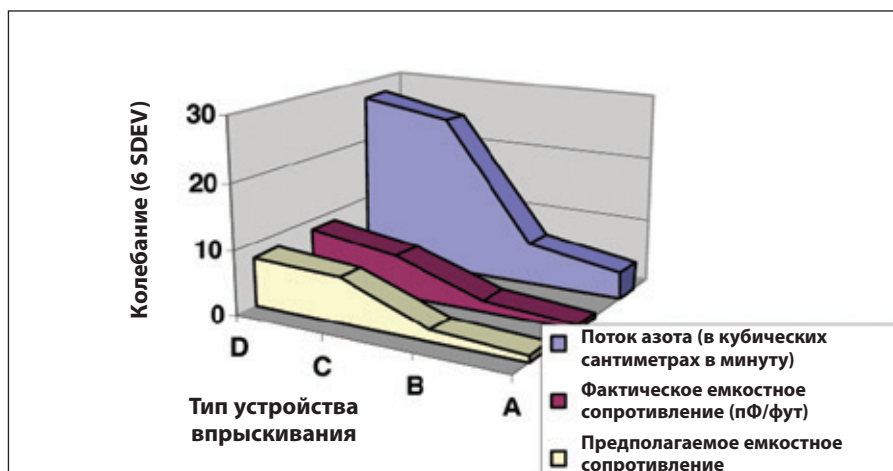


▼ Таблица 2. Выбор смолы для различных профилей кабеля

Смола	Диапазон проводника	Диапазон стенки	Диапазон пустот
Смола А (7 MRF)	24 и выше	.015 и выше	10-58%
Смола В (14 MRF)	24 и выше	.015 и выше	10-55%
Смола С (12 MRF)	26 и выше	.015 и выше	10-58%
Смола D (30 MRF)	24 и меньше	.005- .02	10-50%
Смола E (42 MRF)	24 и меньше	.003- .02	10-55%



▲ Рисунок 4. Номинальные коэффициенты расширения



▲ Рисунок 5. Расход газа и колебание емкостного сопротивления

Неспособность вспенить материал, основанный на концентрате в большей степени будет иметь негативные последствия при других конструкциях кабеля.

Для получения аналогичных электрических характеристик толщина стенки должна быть увеличена, чтобы компенсировать более низкое содержание пустот, тем самым потребляя больше фторполимерного материала.

Например, для вышеупомянутого одножильного образца неспособность вспенивания до нужной степени приведет к увеличению расхода материала для достижения эквивалентного сопротивления примерно на 20% при необходимых 1000 футах на каждый одножильный кабель.

Выбор профиля смолы

Как только необходимые электрические характеристики определены, выбор смолы заключается в отборе смолы на основе необходимого

проводника, размере стенки изоляции и производительности при горении. Как правило, чем ниже показатель текучести расплава, тем лучше производительность при горении (то есть меньше образование дыма).

Чем выше скорость текучести расплава, тем больше подходит смола для более тонких изоляционных стенок и небольших кабельных конструкций. В таблице 2 приводятся некоторые общие рекомендации по выбору смол.

Технологические параметры и эффекты – коэффициент вспенивания

Нередко кабельные инженеры производят расчет скорости расширения для получения низкой теоретической стоимости. Тем не менее, существуют и другие важные факторы, влияющие на стоимость, такие как: техническая способность, общие электрические характеристики, а также повреждение

и сжатие кабеля после процесса экструзии. Пренебрежение этими факторами проектирования может привести к ошибочно увеличенной цене и к образованию большого количества металлоотходов. Рассмотрим стандартный видеокоаксиальный кабель, спроектированный при использовании 59% коэффициента расширения, и сравним его с аналогичным кабелем, с 54% расширения.

Кабель с 59% коэффициентом расширения может довести процесс до предела, в дальнейшем увеличивая первоначальный объем металлоотходов и приводя к большим технологическим изменениям.

Из электрических соображений большое содержание пустот, как правило, приводит к клеткам большего размера и к формированию большего количества клеток вокруг центрального проводника, что может оказать существенное влияние на оптические потери в кабеле на отражение.

При другом подходе, тот же самый кабель может иметь коэффициент расширения 54% с увеличением массы всего лишь на 0,28 фунтов/1000 футов. Это небольшое изменение обеспечит продукции надежные, устойчивые характеристики, меньшие оптические потери на отражение и более высокую производительность с тем же самым сопротивлением.

На рисунке 4 приводятся общие рекомендации по увеличению пенного коэффициента в зависимости от толщины стенки диэлектрика. Фактическое максимальное значение скорости расширения будет меняться в зависимости от выбора смолы и методов обработки.

Закачка азота под высоким давлением

Вспенивание достигается путем подачи газообразного азота под высоким давлением в расплавленный полимер в процессе экструзии. Скорость вспенивания определяется соотношением расхода газа к формированию смолы при функционирующем вращении экструдера.

Чем больше соотношение расхода газа к формированию смолы, тем выше скорость расширения.

Постоянство потока газа имеет решающее значение для поддержания равномерной скорости расширения,

которая необходима для поддержания минимального колебания емкости кабеля и времени задержки сигнала в кабеле.

Измерение расхода газа

Одним из самых важных процессов вспенивания является обеспечение впрыска постоянного потока газа в расплав. Необнаруженные изменения потока газа приведут к изменениям емкости, что приведет к неустойчивости технологического процесса и большому количеству отходов.

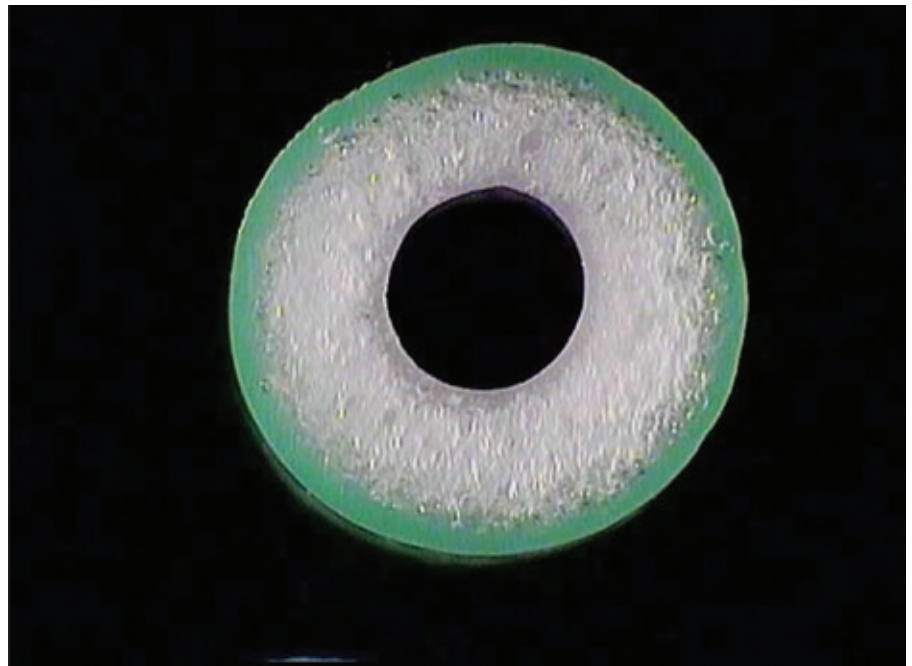
Автономное устройство измерения расхода газа (например, при помощи воды) будет определять среднюю скорость потока при комнатной температуре. Тем не менее, оно не сможет определить фактического технологического расхода газа или изменения расхода, так как поток устройства впрыскивания может радикально измениться при нагревании до температуры обработки. Таким образом, рекомендуется использовать встроенный расходомер при применении впрыска газа для процесса вспенивания.

С расходомером давление газа может быть достаточно четко установлено для получения расчетной скорости потока, необходимой при заданной номинальной емкости. Кроме того, можно контролировать изменение скорости потока.

Выбор устройства впрыскивания газа для продукции

При определении размера устройства для впрыскивания необходимо учитывать соотношение давления в цилиндре экструдера и скорость функционирования продукции, чтобы получить желаемую скорость расширения.

Расход газа регулируется размером форсуночного отверстия устройства впрыскивания. Отверстие должно быть такого размера, чтобы давление газа было выше давления в цилиндре для требуемого потока газа. Предположим, что для конструкции данного кабеля необходим объем газа азота 50 кубических сантиметров в минуту для производительности технологической линии 600 футов в минуту, при которой создаваемое давление цилиндра



▲ Рисунок 6. Профиль пенозаполнителя с наружным слоем цельной оболочки

экструдера достигает 1000 фунтов на квадратный дюйм.

Выбранное устройство впрыска для данного процесса должно иметь отверстие размером не больше, чем доставляемый объем газа 50 кубических сантиметров в минуту с давлением выше давления цилиндра.

С расходом газа больше 50 кубических сантиметров в минуту и давлением 1000 фунтов на квадратный дюйм давление газа должно быть установлено ниже, чем давление цилиндра, что, в свою очередь, приведет к подключению устройства впрыскивания и производству твердой продукции.

Увеличение давления выше 1000 фунтов на квадратный дюйм вызовет увеличение расхода газа и чрезмерное вспенивание.

Данное чрезмерное вспенивание очень часто ошибочно принимают за проблемы обработки или проблемы с материалом.

И наоборот, если отверстие устройства для впрыскивания слишком мало, давления газа может быть недостаточно для достижения необходимого потока газа. Это приведет к невозможности получения желаемой скорости расширения и емкости продукции.

По этой причине в распоряжении необходимо иметь несколько форсунок с разным диапазоном давления. Число необходимых различных размеров зависит от ассортимента продукции

и имеющегося давления газа. Использование насоса с азотом высокого давления увеличивает диапазон давления газа после прохождения его через цилиндр высокого давления.

Таким образом, применение насоса может помочь уменьшить число необходимых размеров устройства впрыскивания, что приведет к снижению общих затрат.

Конструкция устройства для впрыскивания также может повлиять на производительность. На рисунке 5 показаны результаты испытаний, сравнивающих четыре типа устройств для впрыскивания с различным расходом газа и емкостным сопротивлением, имеющихся на рынке.

Для данных испытаний было использовано ядро 50 Ом с проводником 23 калибра со вспениванием примерно до 50%. Расход газа 6 сигма вариации (± 3 стандартных отклонения) был в диапазоне от 4 кубических сантиметра в минуту до 27 кубических сантиметра в минуту с результирующим колебанием емкости от 0,3 до 3,8 пФ/фут.

Данные результаты свидетельствуют о том, что проблемы производительности, связанные с фторполимерными материалами, связаны на самом деле с проблемами обработки, что относится к оборудованию. Использование форсунок неправильного размера или неустойчивые конструкции могут скрывать истинные преимущества определенных материалов.

Охлаждение продукции

Охлаждающей средой для сжатого ядра служит обычно сочетание атмосферного воздуха и воды.

Расстояние, необходимое для каждого из них зависит от размера продукции и длины линии. Правильное расстояние является критическим для охлаждения приемного устройства до проводов, чтобы избежать уплотнения изоляции на катушке и влияния на электрические характеристики.

Соблюдение расстояния точки водяного охлаждения как можно дальше от траверсы обеспечит изготовление продукции наилучшего качества. Причиной этому является большое расстояние воздушного охлаждения, предоставляющее время для стягивания смолы на проводнике, что обеспечит последовательную, четкую границу с проводником без использования чрезмерного подогрева.

Такая последовательная граница проводника обеспечивает равномерное распределение полосы изоляции, даже если первоначальная связь нарушена. Преимуществом является уменьшение структурных возвратных потерь и устойчивость к нагрузкам при последующих процедурах обработки. Иногда большое расстояние воздушного охлаждения невозможно из-за общего имеющегося расстояния охлаждения.

В таких случаях необходимо избегать применения холодной воды в первой фазе охлаждения, так как это может привести к чрезмерной овальности изоляции и низкой адгезии проводника. Умеренное охлаждение необходимо, поскольку оно снижает первоначальное поражающее воздействие на изоляцию и улучшает овальность изоляции, а также адгезию проводника.

Снятие поверхностного слоя

Снятие поверхностного слоя или зачистка обладает следующими преимуществами:

- Является легким и эффективным методом окраски изоляции
- Увеличивает прочность диэлектрика, что используется для профилей кабеля с более тонкими стенками
- Увеличивает вспенивание
- Повышает устойчивость изоляции к разрушению в процессе последующей обработки, такой как скрутка пар или обмотка

Применение обшивки из цельной оболочки требует первоначальных инвестиций в оборудование (вспомогательного экструдера и специальной траверсы), но обеспечивает окупаемость благодаря уменьшению образования лома и стоимости продукции. В то же время и пена, и сплошное покрытие получают за счет одной траверсы и стандартных методов обработки. Рисунок 6 иллюстрирует пенозаполнитель с цветной цельной наружной оболочкой.

Заключение

В настоящее время в продаже имеются различные варианты вспененных фторполимеров смол, каждый из которых имеет уникальные характеристики и ограничения в применении. Выбор правильной смолы влияет на стоимость, простоту обработки и необходимые электрические характеристики. Проектирование и производство кабелей с опциями материалов позволят изготавливать высококачественную продукцию высокой производительности. Выбор оборудования для обработки и условий обработки имеют решающее значение для поддержания стабильного технологического процесса, минимального колебания показателей продукции и достижения низкой стоимости эксплуатации.

Специальные методы, такие как добавление цельной оболочки к пенным конструкциям могут обеспечить дополнительные усовершенствования обработки и производительности. ■

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L'Amérique du Nord organise un stand collectif en Russie

LA foire wire Russia aura lieu du 25 au 28 juin prochain auprès du Centre d'Expositions de Moscou.

Une particularité de l'événement de cette année sera le stand du groupe nord-américain, organisé par Messe Düsseldorf North America et financé par WCISA (Wire and Cable Industry Suppliers Association).

Ce stand collectif représente un moyen rentable pour les entreprises d'accéder ou de développer leurs activités sur le marché russe.

L'espace d'exposition du stand peut être réservé dès maintenant en contactant Messe Düsseldorf North America.

Jusqu'à présent, le marché russe s'est

démontré très fort et continue à offrir des occasions d'affaires aux sociétés internationales spécialisées dans la production, dans la transformation ou dans la commercialisation des fils et des câbles.

En plus du stand du groupe nord-américain, les exposants provenant de l'Autriche, de la Chine, de la France, de l'Allemagne et de l'Italie seront représentés au sein de pavillons nationaux officiels. Dans l'ensemble, plus de 200 exposants provenant de plus de 30 nations y participeront.

L'événement sera de nouveau organisé conjointement par Messe Düsseldorf et sa filiale Messe Düsseldorf Moscou, avec le soutien des principales associations de l'industrie russe et

internationale telles que: l'institut VNIIPK (All Russian Cable Scientific Research and Development Institute), l'association IWMA (International Wire & Machinery Association), l'association IWCEA (International Wire and Cable Exhibitors Association), l'association VDKM (German Wire and Cable Machine Manufacturers Association), l'association VÖDKM-AWCMA (Austrian Wire and Cable Machinery Manufacturers Association), l'association IWCEA-France (International Wire and Cable Exhibitors Association-France), l'association italienne ACIMAF et l'association WCISA (Wire and Cable Industry Suppliers Association).

Messe Düsseldorf – Allemagne

Website: www.messe-duesseldorf.com

Soudeuses de fil fiabiles réalisées par PWM

Conçues avec précision pour produire des soudures solides, fiabiles et permanentes sur des matériaux non ferreux, les soudeuses à pression à froid de PWM offrent aux fabricants une méthode rapide et économique de joindre d'amples sections de fil jusqu'à 30mm (1,181") de diamètre.

Plus rapide, plus propre et plus écologique par rapport au soudage bout à bout électrique, le processus de soudage à froid offre un soudage permanent et fiable plus robuste que le matériau de départ sans compromettre l'intégrité électrique.

La gamme de soudeuses pour fil de PWM comprend les modèles P1500, P1000 et EP500.

Conçues et réalisées dans les ateliers de PWM au Royaume-Uni, ces machines robustes, haute performance représentent une solution économique d'un point de vue énergétique, exigent un entretien réduit et sont conviviales.

La soudeuse à froid électropneumatique EP500 est l'une des machines les plus vendues de PWM. La machine, fiable et d'utilisation simple, est conçue pour souder le fil de cuivre de 5mm à



▲ Soudeuse hydraulique P1000 de PWM

12,50mm (de 0,197" à 0,492") et le fil d'aluminium de 5mm à 15mm (de 0,197" à 0,590").

La soudeuse hydraulique compacte P1000 pour fil de cuivre de 6mm à 16mm (de 0,236" à 0,630") et fil d'aluminium de 6mm à 20mm (de 0,236" à 0,790") est équipée de filières à extraction rapide et d'un mécanisme de réglage de la filière aisé.

Le modèle haut de gamme de PWM, la soudeuse de fil électro-hydraulique P1500 est conçue pour souder fil de cuivre de 15mm (0,590") à 25mm (0,984") et aluminium jusqu'à 30mm (1,181").

La consommation d'énergie est limitée au moteur de la pompe hydraulique, ce qui rend le modèle P1500 très économique à exploiter.

Aucune configuration n'est nécessaire et le temps du cycle de soudage dure environ de quatre à cinq minutes; l'étincelage est automatiquement éliminé à la fin de l'opération.

Des démonstrations vidéo des soudeuses EP500, P1000 et P1500 sont disponibles à la page www.pwmltd.co.uk

Les machines sont conçues pour souder la plupart des matériaux non ferreux, ainsi que plusieurs types d'alliages. En tant que fabricant spécialiste de l'équipement de soudage à froid pendant près de 30 ans, la société PWM est toujours heureuse de donner des conseils concernant les techniques et les applications du soudage à froid.

Le réseau mondial d'agents expérimentés de la société, en collaboration avec l'équipe du Royaume-Uni, offre un service rapide et efficace à l'industrie internationale du fil et du câble.

PWM Ltd – Royaume-Uni

Website: www.pwmltd.co.uk

D'autres projets d'expansion

En juin 2012, Anglia Metal a démarré son activité dans la fabrication de fil de cuivre pour l'industrie du câble et d'autres marchés spécialisés dans le traitement du fil de cuivre, par exemple le soudage de boîtes et la fabrication de bandes métalliques pour les panneaux solaires.

La société qu'autrefois commercialisait sous le nom Tri-Wire Ltd, a trouvé un nouvel investisseur industriel qui a une stratégie à long terme et soutenable dans l'industrie du cuivre. Le nouveau propriétaire a embauché toute l'équipe de gestion de Metal Anglia, ainsi que le personnel expérimenté, et maintenant la société est en mesure de se concentrer sur l'optimisation et sur l'expansion de l'entreprise.

La focalisation de l'entreprise est sur l'excellence de la chaîne d'approvisionnement et sur la capacité de fournir une large gamme de produits à base de fil en version simple ou étamée. La gamme de produits comprend des fils individuels ou multiples de 0.10 mm, différents conducteurs souples jusqu'à une section maximale de 10mm² ainsi que des bobines de tressage de petites dimensions pour des applications de blindage.



▲ Usine de Anglia Metal en West Yorkshire (Royaume-Uni)

L'équipement de production est conforme aux normes industrielles et l'usine a expérimenté des améliorations continues pendant ces dernières années. En outre, Anglia métal est en mesure d'offrir des délais de livraison très courts grâce à la flexibilité et à l'engagement de la part de son personnel pour garantir la réussite de ses clients.

La base des clients au Royaume-Uni comprend des entreprises dans le secteur de la transmission des données, des télécommunications, de la construction, de la fabrication de câbles

pour l'industrie et pour le secteur de l'automobile ainsi que la production de boîtes. Anglia Metal s'attend à une nouvelle expansion dans le secteur des fils pour applications spécifiques et dans d'autres secteurs du marché européen.

La société envisage également d'étendre sa gamme de produits afin de garantir à ses clients locaux l'approvisionnement d'une majeure variété de produits pouvant satisfaire leurs besoins en fil de cuivre.

Anglia Metal – Royaume-Uni
Website: www.angliametal.com

Amélioration de la méthode de traitement de la surface dans l'industrie du fil

Le succès de la technologie de traitement de la surface par décapage par voie humide de Vapormatt dans l'industrie du câble est démontré par un nombre croissant d'installations et, aujourd'hui, par la nomination d'un ingénieur commercial dédié à ce secteur clé de l'industrie manufacturière.

L'uniformité élevée des processus pouvant être obtenue grâce au décapage par voie humide a été éprouvée par Vapormatt dans une vaste gamme d'applications comprenant le nettoyage, le dégraissage et le décalaminage ainsi que la gravure et

le polissage satin d'un grand nombre de produits pour câbles, fils et bandes. Nouvellement nommé ingénieur commercial, David Clements mentionne les fabricants de machines d'extrusion rotatives, de fils cardés, de câbles de puissance, de lames à ruban, de câbles à fibres optiques et de fils en acier à haute teneur en carbone étant parmi ceux qui profitent de la technologie Vapormatt.

À titre d'exemple de l'engagement de l'entreprise en ce qui concerne le développement d'applications, M. Clements attire l'attention sur la machine Profelis de Vapormatt. La conception de la machine permet de gérer les produits

de fils et de câbles de différentes géométries et matériaux, tout en évitant l'utilisation de produits chimiques et les risques potentiels de contamination rencontrés avec d'autres méthodes.

Entièrement autonome, Profelis comprend deux unités adjacentes qui offrent une combinaison de décapage humide, de rinçage par arrosage et de séchage. L'ensemble permet d'obtenir des résultats de haute qualité qui répondent aux objectifs du point de vue esthétique et de performance.

Vapormatt Ltd – Royaume-Uni
Website: www.vapormatt.com

Solutions et traitement des fluoropolymères expansés pour l'isolement des câbles hautes performances

Par Gary G Thuot et Robert T Young, de DuPont Chemicals & Fluoroproducts, Wilmington, Delaware, États-Unis

Résumé

Avec le grand nombre de matériaux diélectriques hautes performances actuellement disponibles, la sélection de matériaux isolants idéals pour les câbles haut rendement est une question d'équilibre entre les performances, l'ouvrabilité et les coûts.

Le présent article illustre les performances électriques et les critères de sélection pour les matériaux diélectriques à base de fluoropolymères expansés. Cet article analyse également comment établir des valeurs d'élaboration faisables et présente des considérations importantes afin de définir un processus stable et répétable.

Les fluoropolymères expansés offrent d'excellentes caractéristiques électriques, une basse émission de fumées et une haute résistance à la température. Normalement, les fluoropolymères sont utilisés dans des applications exigeant une basse émission de fumées telles que les câbles plénum, dans des applications à hautes températures comme les câbles destinés à un usage militaire et dans des applications exigeant une résistance au soudage.

La sélection adéquate du polymère en fonction des dimensions du produit et des propriétés électriques est importante pour obtenir un processus efficace et les performances désirées du câble.

La sélection des équipements de processus et de monitoring et le fonctionnement relatif sont importants pour réaliser un produit de qualité avec des rendements élevés. Le but de cet article consiste en la description de certaines caractéristiques clés du produit et du processus et des effets correspondants sur le processus même ainsi que sur les performances.

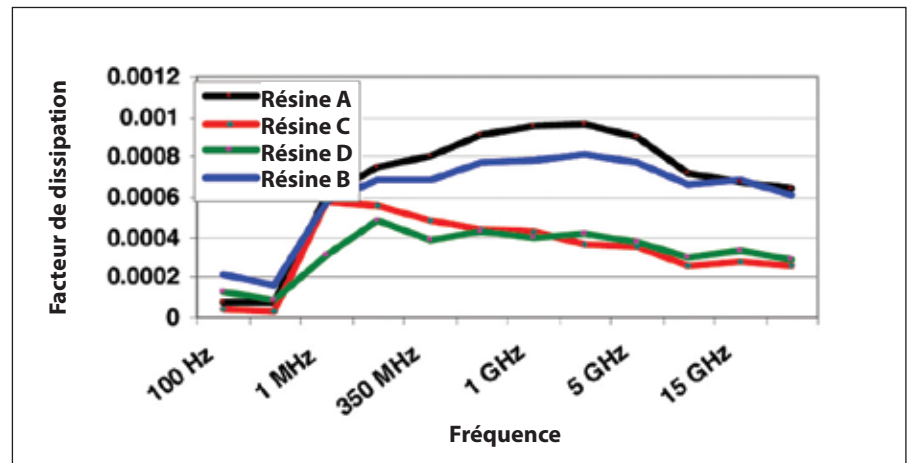
Choix du matériau adéquat

Les considérations concernant la sélection d'une résine de fluoropolymère expansible pour les câbles hautes performances doivent inclure également les exigences de performances électriques/physiques, les dimensions du conducteur du produit et l'épaisseur de la paroi diélectrique.

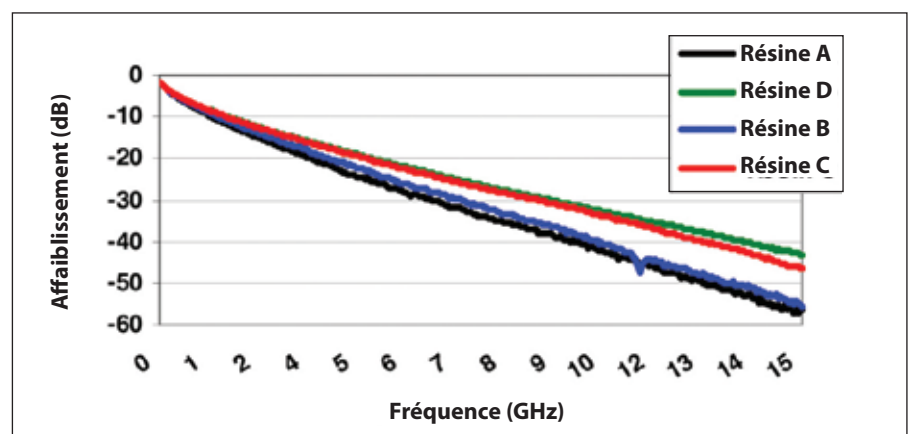
Les performances électriques, comme indiqué sur le diagramme fourni ci-dessous, peuvent varier en fonction de la composition de la résine.

Les données du facteur de dissipation (*Figure 1*) illustrent la différence moyenne mesurée sur des plaques solides de différentes qualités des résines expansibles FFR Airquick DuPont™ à l'état solide (non expansées).

▼ Figure 1: Facteur de dissipation



▼ Figure 2: Atténuation



Les résultats concernant l'atténuation (Figure 2) sont basés sur des échantillons de câble de 500hms réels produits utilisant une structure et des conditions de processus identiques, mais en variant la qualité de la résine. Comme représenté à la Figure 2, il y a une différence significative de perte de câble en fonction de la qualité sélectionnée.

Généralement, la perte de puissance électrique dans un câble est mesurée en (dB) et est égale à 10 fois le logarithme du rapport entre la puissance d'entrée à une extrémité du câble et la puissance de sortie de l'autre extrémité. Avec la demande croissante de fonctionnement des câbles à des fréquences supérieures, ces différences de matériau jouent un rôle décisif dans le rendement global du câble.

Par exemple, un câble réalisé avec un fluoropolymère expansé d'environ 82 pour cent de la vitesse de propagation produit avec les résines indiquées aux Figures 1 et 2 et essayé à 2,5Ghz, présentera des différences significatives dans la perte de signal.

Un câble de 100 pieds réalisé avec la Résine B, présentera environ 20 pour cent de la perte de puissance par rapport à un câble équivalent produit avec les Résines C ou D.

La Résine A entraînerait une perte de puissance égale à environ 30 pour cent

Agent de nucléation	Capacitance moyenne	Variation de capacitance	Étincelles/1 000ft
Concentré	27.6 pf/ft	.9 pf/ft	10
Complètement mélangé	26.9 pf/ft	.4 pf/ft	0

▲ **Tableau 1:** Résumé des performances

par rapport aux Résines C ou D. Ces différences de performances s'accroissent en utilisant des câbles à des fréquences de fonctionnement supérieures.

DuPont a développé une gamme de résines en utilisant la technologie "DuPont Airquick Technology", telles que les résines expansées FFR 330, FFR 550, FFR 750 et FFR 770, offrant au client une large gamme de performances électriques et d'options de structures de câbles.

Technologie de nucléation et formation cellulaire

Pour fournir des sites pour la réalisation de la nucléation cellulaire de la mousse, des matériaux inorganiques comme le nitrure de bore sont généralement ajoutés à la résine pour contribuer à la formation de la mousse.

L'addition d'autres matériaux brevetés à base de nitrure de bore améliore considérablement le processus d'expansion. La méthode d'addition peut varier de résines déjà mélangées et prêtes à l'emploi aux concentrés qui sont ajoutés durant le processus d'extrusion.

Comme démonstration, une comparaison du processus en parallèle a été effectuée entre une résine déjà mélangée (résine expansée DuPont™ FFR 770) et un produit équivalent avec un concentré de mousse disponible sur le marché.

Pour cette comparaison, les compositions de l'agent nucléant ont été modifiées, alors que les pourcentages de résine de charge et de base utilisés ont été maintenus constants. Pour cette expérience on a utilisé un câble formé par un fil individuel de 23Awg avec une paroi de 19-mil, typique d'une structure à paires torsadées de 100hms. Le taux d'expansion cible était égal à 40 pour cent.

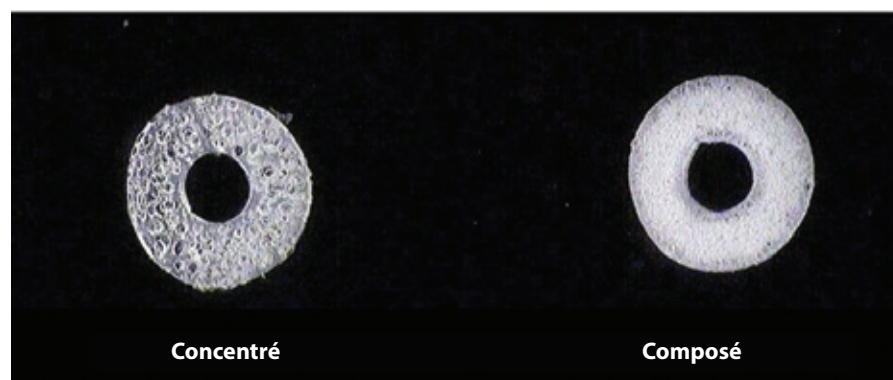
La résine déjà mélangée FFR 770 DuPont™ a donné des résultats satisfaisants en atteignant la capacitance souhaitée avec une variation réduite et une tension d'arc contenue de 2,5KV.

Le produit équivalent avec le concentré disponible sur le marché n'a pas atteint le taux d'expansion désiré, il a montré une variation de capacitance majeure et n'a pas soutenu la tension de l'essai aux étincelles. Le Tableau 1 fournit un résumé des résultats.

La différence significative des performances entre les deux matériaux est le résultat des différences de structure cellulaire de la mousse due au paquet de nucléation sélectionné. La Figure 3 illustre les différences de dimension et de structure des cellules entre les deux matériaux.

Comme l'on peut remarquer à la Figure 3, le matériau déjà mélangé présente une structure cellulaire uniforme et de petites dimensions, alors que l'échantillon réalisé avec le concentré présente des cellules de grandes dimensions et non uniformes. L'impossibilité de former la mousse en partant du matériau à base de concentré en mesure majeure entraîne d'autres conséquences dans la structure du câble.

▼ **Figure 3:** Comparaison entre structures cellulaires



▼ **Tableau 2:** Sélection de la résine en fonction de la structure du câble

Résine	Gamme de conducteurs	Gamme de parois	Gamme de pores d'air
Résine A (7 MRF)	24 et outre	.015 et outre	10-58%
Résine B (14 MRF)	24 et outre	.015 et outre	10-55%
Résine C (12 MRF)	26 et outre	.015 et outre	10-58%
Résine D (30 MRF)	24 et plus petits	.005 - .02	10-50%
Résine E (42 MRF)	24 et plus petits	.003 - .02	10-55%

Pour obtenir des performances électriques équivalentes, l'on devrait augmenter l'épaisseur de la paroi pour compenser la teneur en air inférieure, en consommant ainsi une quantité majeure de fluoropolymère.

Par exemple, dans les fils individuels de l'échantillon susmentionné, l'impossibilité d'étendre davantage le matériau entraîne une augmentation de 20% du poids en livres requis pour chaque longueur de 1000 pieds de chaque fil pour obtenir l'impédance équivalente.

Sélection de la qualité de résine pour l'application

Une fois les performances électriques désirées déterminées, il faut sélectionner la résine en fonction du conducteur, des dimensions de la paroi d'isolement et des performances ignifuges selon les nécessités. Généralement, plus l'indice de fluidité est bas, plus les performances ignifuges seront élevées (c'est-à-dire une quantité de fumée inférieure).

Plus l'indice de fluidité est élevé, plus la résine est adéquate pour les parois d'isolement plus minces et pour les structures de câbles plus petites. Le *Tableau 2* offre quelques indications concernant la sélection de la résine.

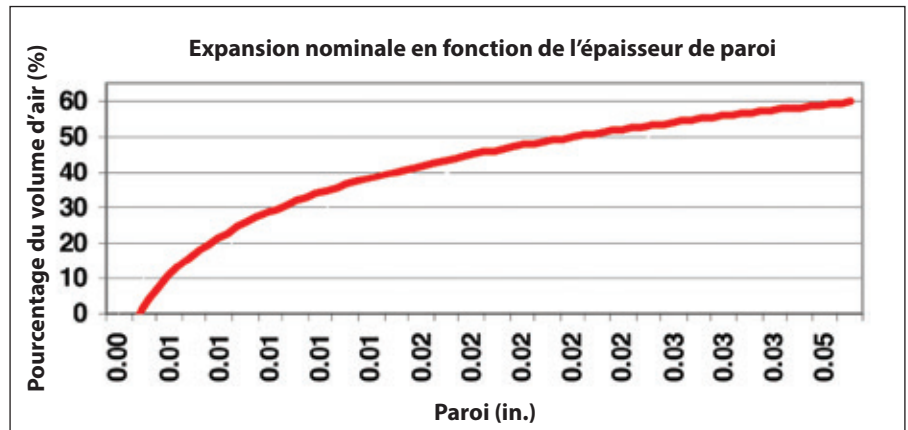
Paramètres de processus et effets – taux d'expansion de la mousse

La conception de câbles en utilisant des taux d'expansion calculés pour obtenir le coût théorique le plus réduit est désormais une pratique commune parmi les ingénieurs spécialisés en câbles.

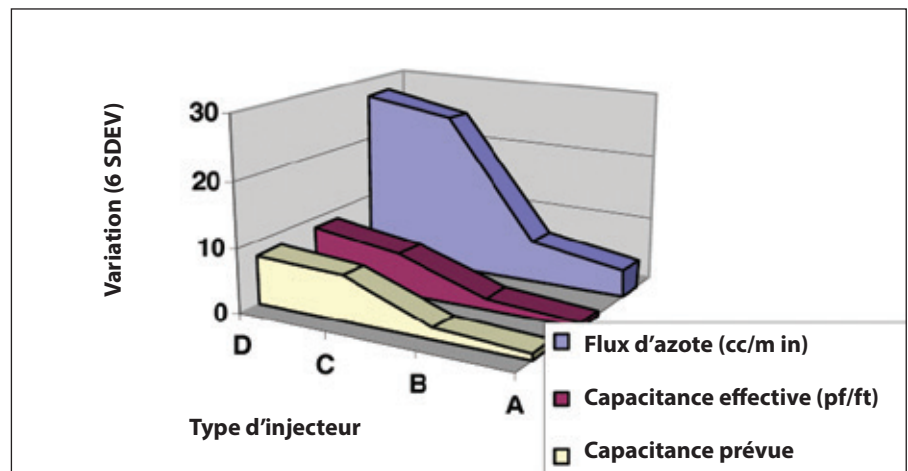
Toutefois, il y a d'autres facteurs importants qui influencent les coûts tels que la capacité d'élaboration, les performances électriques globales et la compression du câble résultant des opérations successives à l'extrusion.

Le fait de négliger ces facteurs de conception pourrait causer par erreur des coûts plus élevés et générer une grande quantité de rebuts.

Considérons maintenant un câble vidéo coaxial typique en utilisant un taux d'expansion de 59 pour cent par rapport au même câble conçu avec un taux d'expansion de 54 pour cent.



▲ Figure 4: Taux d'expansion nominaux



▲ Figure 5: Flux du gaz et variation de la capacitance

Le câble avec l'expansion de 59 pour cent peut pousser le processus à la limite, en augmentant par la suite les rebuts de départ et en entraînant une majeure variation du processus.

Généralement, du point de vue électrique une teneur en air supérieure entraîne des cellules plus grandes et une formation de cellules supérieure autour du conducteur central, et par conséquent un impact important sur l'affaiblissement d'adaptation du câble.

En alternative, le même câble peut être réalisé avec un taux d'expansion de 54 pour cent avec une augmentation de poids de seulement 0,28lbs/1 000ft.

Cette variation minimale offre un produit robuste et répétable avec un meilleur affaiblissement d'adaptation, une mineure quantité de rebuts et une majeure productivité avec la même impédance du câble.

La *Figure 4* fournit des indications générales concernant les taux d'expansion de la mousse en fonction de l'épaisseur de la paroi diélectrique. Les taux d'expansion maximaux effectifs vont varier en fonction de la résine sélectionnée et des méthodes de processus adoptées.

Injection d'azote à haute pression

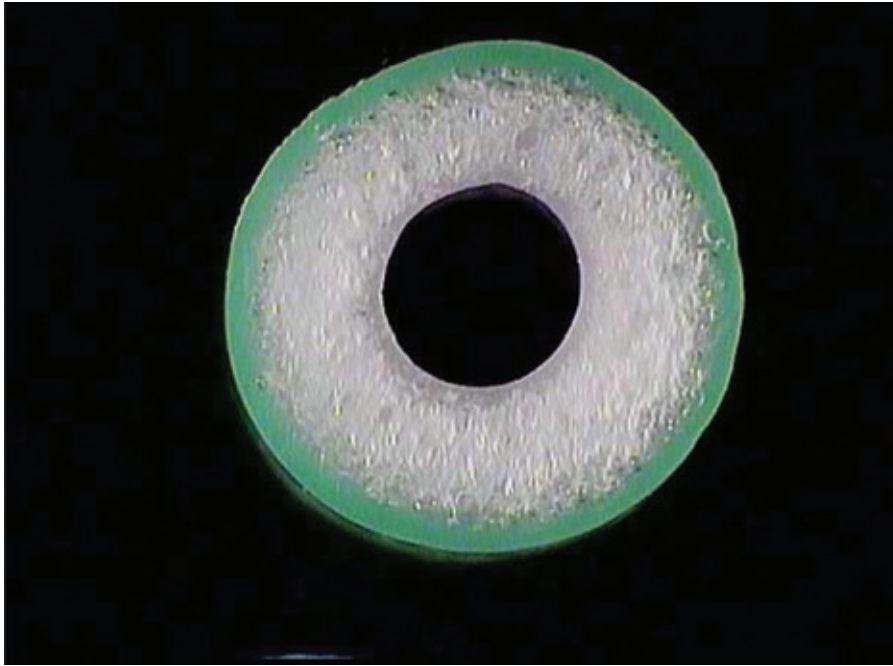
La formation de mousse est obtenue en injectant de l'azote à haute pression dans le polymère fondu durant le processus d'extrusion.

Le taux de formation de mousse est déterminé par le débit de gaz par rapport à la sortie de la résine aux tours par minute de fonctionnement de l'extrudeuse. Plus le flux du gaz est élevé par rapport à la sortie de la résine, plus le taux d'expansion sera élevé.

L'uniformité de ce flux de gaz est fondamentale pour maintenir un taux d'expansion uniforme, nécessaire pour maintenir des valeurs minimales de variation de la capacitance et de retard des signaux du câble.

Mesurage du flux de gaz

L'assurance d'injecter un flux constant et correct dans le matériau fondu représente l'une des variables les plus importantes du processus de formation de mousse.



▲ **Figure 6:** Section transversale d'un noyau de

Les variations du flux du gaz non détectées entraîneront des variations de capacitance et, par conséquent, une instabilité du processus avec de grandes quantités de rebuts.

Les mesurages du flux de l'injecteur hors ligne (tels que le déplacement de l'eau) permettent de déterminer le débit moyen de l'injecteur à la température ambiante.

Toutefois, il ne sera pas possible de déterminer le débit effectif du processus ni la variation du débit étant donné que le débit de l'injecteur peut varier radicalement après le réchauffage jusqu'à atteindre les températures de processus.

Il est donc recommandé d'employer un mesureur de flux en ligne lorsque l'on obtient l'expansion au moyen d'injection de gaz.

Avec un mesureur de flux, la pression du gaz peut être affichée avec précision pour obtenir le débit calculé requis pour la capacitance nominale désirée. En outre, il est possible de contrôler les variations de débit.

Sélection de l'injecteur de gaz pour le produit

Lorsqu'un injecteur est dimensionné, il faut considérer la pression du cylindre d'extrusion et le débit de l'azote pour obtenir le taux d'expansion désiré par rapport à la vitesse d'avancement du produit. Le flux de gaz dépend des dimensions de l'orifice de l'injecteur et de la pression de l'azote.

L'orifice doit être dimensionné de manière à ce que la pression du gaz soit supérieure à la pression du cylindre pour obtenir le flux de gaz désiré.

Supposons qu'une structure de câble donnée exige un flux de 50cc/minute d'azote pour une vitesse de ligne de 600 pieds par minute et qu'une pression du cylindre d'extrusion de 1 000psig soit générée.

L'injecteur sélectionné pour ce processus exige que l'orifice ait des dimensions adéquates pour obtenir un débit de gaz de 50cc/minute à une pression supérieure à la pression du cylindre.

Avec un flux supérieur à 50cc/minute à 1 000psig, la pression du gaz devrait être réglée à une valeur inférieure à la pression du cylindre; toutefois cela produirait une obstruction qui à son tour causerait la solidification du produit.

En augmentant la pression du gaz à des valeurs supérieures à 1 000psig, le flux de gaz serait trop élevé et causerait une expansion excessive. Cette formation de mousse excessive est souvent mal comprise et considérée comme étant un problème dû au matériau ou au processus.

Au contraire, si l'orifice de l'injecteur est trop petit, la pression du gaz disponible pourrait ne pas être suffisante pour obtenir le flux de gaz requis.

Cela empêchera d'obtenir le taux d'expansion et la capacitance du produit désirés. Généralement, pour cette raison on utilise plusieurs injecteurs avec différents flux disponibles pour une

large gamme de pressions. Le nombre de dimensions différentes nécessaires varie selon la gamme de produits et la pression du gaz disponible. L'utilisation d'une pompe d'azote à haute pression augmente la gamme de pressions de gaz disponibles par rapport à l'utilisation d'un cylindre à haute pression.

L'utilisation d'une pompe peut donc contribuer à réduire le nombre de dimensions des injecteurs requis pour une opération ainsi que les coûts totaux.

Les performances peuvent être influencées également par la conception de l'injecteur.

La Figure 5 illustre les résultats des essais basés sur la comparaison de quatre types d'injecteurs disponibles sur le marché obtenus en mesurant la variation de flux du gaz et la variation de la capacitance en résultant. Pour ces essais on a utilisé un noyau de 50Ohm avec un conducteur de diamètre 23G expansé jusqu'à environ 50 pour cent.

La variation Six Sigma du flux de gaz (± 3 déviations standard) allait de 4cc/min à 27cc/min avec une variation de capacitance résultante allant de 0,3 à 3,8pf/ft. Ces résultats démontrent que les problèmes de performance, souvent attribués au fluoropolymère, sont typiquement des problèmes de processus liés aux équipements.

L'utilisation d'un injecteur mal dimensionné ou d'une structure instable peut cacher le bénéfice réel des performances de certains matériaux.

Refroidissement du produit

Généralement, le moyen de refroidissement pour le noyau extrudé consiste en une combinaison d'air ambiante et eau.

La distance requise pour chacune de ces dernières dépend des dimensions du produit et de la vitesse de la ligne. Les distances correctes sont fondamentales pour le refroidissement avant l'enroulement du fil pour éviter l'aplatissage de l'isolement sur le dévidoir et un impact sur les performances électriques.

En maintenant la distance du point de refroidissement de l'eau le plus loin possible de la tête d'injection, on peut obtenir un produit meilleur. Et ce, parce qu'une distance suffisante du point de refroidissement au moyen d'air permet la contraction de la résine au-dessus du

conducteur en fournissant une interface uniforme et adhérente au conducteur sans exiger un préchauffage excessif.

Cette interface du conducteur uniforme fournit une force de la bande d'isolement même après la rupture du lien initial. Les avantages consistent en un meilleur affaiblissement de réduction structurel et en une résistance aux sollicitations des opérations de processus successives.

Parfois il n'est pas possible d'appliquer une distance suffisante du point de vue du refroidissement au moyen d'air, puisque la distance totale disponible n'est pas suffisante.

Dans ce cas, il faut éviter d'utiliser de l'eau froide dans la première section de refroidissement parce que cela pourrait entraîner une excessive ovalité de l'isolement et une adhésion au conducteur plus limitée.

Il est recommandé d'adopter un refroidissement trempé puisqu'il réduit le choc initial dans l'isolement en améliorant son ovalité et son adhésion au conducteur.

Skinning

L'extrusion d'une couche externe de matériau solide, autrement définie comme «skinning» offre des avantages supplémentaires tels que:

- une façon facile et efficace de colorer l'isolement
- une résistance diélectrique améliorée, qui est utile dans les structures de câbles avec des parois plus minces
- des taux d'expansion de la mousse supérieurs
- une résistance majeure aux dommages de l'isolement durant le processus successif comme le pairage ou le tressage

L'application d'un revêtement solide exige un investissement initial en équipements (une extrudeuse auxiliaire et une tête d'injecteur spécifique), mais offre des avantages en termes de réduction de rebuts et des coûts de produit.

La mousse et la couche solide sont obtenues en même temps au moyen d'une tête d'injection individuelle en utilisant des méthodes de processus standard. La *Figure 6* illustre un noyau de mousse avec une couche extérieure solide colorée.

Conclusions

Il existe différentes options de résine de fluoropolymère expansible disponible,

et chacune présente des possibilités et des limitations spécifiques. Le choix de la résine correcte pour l'application est important pour les coûts, pour faciliter le processus et pour obtenir les performances désirées.

La conception et le traitement des câbles en considérant les caractéristiques des matériaux permettent d'obtenir des produits avec des rendements élevés.

La sélection des équipements de processus et les conditions de processus sont cruciales pour garantir un processus stable, pour maintenir une variation du produit minimale et pour réduire au maximum les coûts de l'opération.

Des techniques spécifiques telles que l'ajout d'une couche ou de plusieurs couches de revêtements solides aux structures expansées peuvent améliorer davantage le processus et les performances. ■

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Il Nord America organizza uno stand di gruppo in Russia

LA fiera wire Russia si terrà quest'anno dal 25 al 28 giugno presso il Centro Esposizioni ZAO di Mosca.

Una particolarità della manifestazione di quest'anno è la presenza dello stand del gruppo Nordamericano, organizzato da Messe Düsseldorf North America e finanziato dalla WCISA (Wire and Cable Industry Suppliers Association).

Questo stand di gruppo costituisce per le società un mezzo economico per entrare o per espandere le proprie attività nel mercato russo. Lo spazio espositivo dello stand può essere riservato già ora contattando Messe Düsseldorf North America.

Il mercato russo si è dimostrato sinora

molto forte e continua ad offrire opportunità commerciali alle società internazionali specializzate nella produzione, nella lavorazione o nella commercializzazione di fili e cavi.

Oltre allo stand del gruppo nordamericano, gli espositori provenienti da Austria, Cina, Francia, Germania e Italia saranno rappresentati nei padiglioni ufficiali nazionali. In totale, parteciperanno oltre 200 espositori provenienti da più di 30 nazioni.

La fiera sarà organizzata ancora in collaborazione con Messe Düsseldorf e la filiale Messe Düsseldorf Moscow, con il supporto delle principali associazioni industriali russe e internazionali come:

l'istituto VNIKP (All Russian Cable Scientific Research and Development Institute), l'associazione IWMA (International Wire & Machinery Association), l'associazione IWCEA (International Wire and Cable Exhibitors Association), l'associazione VDKM (German Wire and Cable Machine Manufacturers Association), l'associazione VÖDKM-AWCMA (Austrian Wire and Cable Machinery Manufacturers Association), l'associazione IWCEA-France (International Wire and Cable Exhibitors Association-France), l'associazione italiana ACIMAF e l'associazione WCISA (Wire and Cable Industry Suppliers Association).

Messe Düsseldorf – Germania

Website: www.messe-duesseldorf.com

Saldatrici di filo PWM affidabili

Le saldatrici a freddo di PWM di alta precisione, progettate per realizzare saldature permanenti, robuste e affidabili in materiali non ferrosi, offrono ai fabbricanti un modo rapido ed economico di unire ampie sezioni di filo fino a 30mm (1,181") di diametro.

Più rapido, pulito ed ecologico della saldatura di testa elettrica, il processo di saldatura a freddo da come risultato una saldatura permanente e affidabile, più resistente rispetto al materiale matrice e senza compromettere l'integrità elettrica.

La gamma di saldatrici di filo di PWM comprende i modelli P1500, P1000 e EP500. Progettata e fabbricata nelle officine di PWM nel Regno Unito, queste macchine robuste ad alto rendimento rappresentano una soluzione economica da un punto di vista energetico, richiedono una scarsa manutenzione e sono di facile utilizzo.

La saldatrice a freddo elettro-pneumatica EP500 è una delle macchine più vendute di PWM. La macchina, affidabile e facile da usare, è progettata per saldare filo di rame da



▲ Saldatrice di filo idraulica P1000 di PWM

5mm a 12,50mm (da 0,197" a 0,492") e filo di alluminio da 5mm a 15mm (da 0,197" a 0,590").

La saldatrice idraulica compatta P1000 per filo di rame da 6mm a 16mm (da 0,236" a 0,630") e filo di alluminio da 6mm a 20mm (da 0,236" a 0,790") è equipaggiata con filiere a disinserimento veloce e con un meccanismo di regolazione della filiera facilmente regolabile.

La saldatrice di filo elettro-pneumatica P1500, che è il miglior modello della gamma di PWM, è progettata per saldare filo di rame da 15mm (0,590") a 25mm (0,984") e di alluminio

fino a 30mm (1,181"). Il consumo della macchina si limita all'energia utilizzata per il motore della pompa idraulica, che rende il modello P1500 un modello di funzionamento molto economico. Non richiede tempo di preparazione e il ciclo di saldatura dura da 4 a 5 minuti circa, e inoltre lo scintillio della saldatura viene eliminato automaticamente al termine dell'operazione.

Nella pagina www.pwmltd.co.uk si possono vedere dimostrazioni video delle saldatrici EP500, P1000 e P1500.

Le macchine consentono di saldare la maggior parte dei materiali non ferrosi e vari tipi di leghe. Per PWM, specializzata nella fabbricazione di saldatrici a freddo per circa 30 anni, è sempre un piacere fornire un consiglio sulle tecniche e sulle applicazioni di saldatura a freddo. La rete mondiale di agenti specializzati della società, unitamente all'équipe del Regno Unito, offre un servizio rapido ed efficiente per il settore internazionale del cavo e del filo.

PWM Ltd – Regno Unito

Website: www.pwmltd.co.uk

Ulteriori programmi di espansione

Nel giugno 2012 la società Anglia Metal avviò la propria attività di produzione di filo di rame per il settore del cavo e altri mercati specializzati nella lavorazione del filo di rame, come quelli della saldatura di lattine e della fabbricazione di nastri metallici per pannelli solari.

La società che precedentemente operava sotto il nome di Tri-Wire Ltd, ha incontrato un nuovo investitore industriale che vanta una strategia sostenibile a lungo termine nel settore del rame. Il nuovo proprietario, ha rilevato tutto il team dirigenziale di Anglia Metal unitamente al personale specializzato, e ora la società è in grado di concentrarsi sull'ottimizzazione e sull'espansione delle proprie attività commerciali.

L'obiettivo principale della società è l'eccellenza della catena di fornitura e la capacità di offrire un'ampia gamma di prodotti di filo normale o stagnato. La gamma di prodotti comprende fili singoli o multipli da 0,10mm, vari conduttori flessibili con una sezione massima di 10mm² fino a bobine di trecciatura di piccole dimensioni per applicazioni di schermatura.

L'equipaggiamento di produzione è in linea con gli standard industriali e la fabbrica ha beneficiato di continui



▲ Stabilimento di Anglia Metal nel West Yorkshire (Regno Unito)

miglioramenti nel corso degli ultimi anni. Inoltre Anglia Metal è in grado di offrire tempi di consegna molto brevi grazie alla flessibilità e all'impegno da parte del suo personale per garantire il successo del cliente.

Il portafoglio clienti in Gran Bretagna comprende aziende operanti nel settore della trasmissione di dati, delle telecomunicazioni, della costruzione, della fabbricazione di cavi per l'industria e per il settore automobilistico, nonché la produzione

di lattine. Anglia Metal si aspetta un'ulteriore espansione nel settore dei fili per applicazioni speciali e in altri settori del mercato europeo.

Inoltre, la società ha in programma di ampliare la propria gamma di prodotti per assicurare ai propri clienti locali la fornitura di una maggiore varietà di prodotti che soddisfino le loro richieste di filo di rame.

Anglia Metal – Regno Unito
Website: www.angliametal.com

Miglioramento del metodo di trattamento della superficie nel settore del filo

IL successo della tecnologia per il trattamento di superfici con granigliatura a umido di Vapormatt nell'industria del cavo è attestato dal crescente numero di impianti e dall'attuale nomina di un responsabile tecnico-commerciale per questo settore di produzione chiave della fabbricazione.

L'elevata uniformità di processo che si può raggiungere con la granigliatura a umido è stata collaudata da Vapormatt in una vasta gamma di applicazioni che comprendono la pulitura, lo sgrassaggio e la discagliatura, l'incisione e la satinatura di una gran varietà di prodotti

per cavi, fili e nastri. David Clements, il responsabile tecnico-commerciale recentemente nominato, cita i fabbricanti di macchine di estrusione rotative, fili cardati, cavi di potenza, lame a nastro, cavi di fibra ottica e filo di acciaio ad alto tenore di carbonio fra coloro che traggono beneficio dalla tecnologia Vapormatt.

Come esempio dell'impegno della società nello sviluppo di applicazioni, il Sig. Clements porta l'attenzione sulla macchina Profelis di Vapormatt. La progettazione della macchina consente di gestire prodotti di filo e cavo di

diverse forme e materiali e di evitare l'utilizzo di sostanze chimiche aggressive e potenziali rischi di contaminazione sperimentati con metodi alternativi.

La macchina Profelis totalmente autonoma dispone di due unità adiacenti che combinano la granigliatura a umido, il risciacquo a spruzzo e l'asciugatura. L'insieme consente di ottenere risultati di alta qualità che soddisfano gli obiettivi dal punto di vista estetico e del rendimento.

Vapormatt Ltd – Regno Unito
Website: www.vapormatt.com

Soluzioni e trattamento dei fluoropolimeri espansi per l'isolamento di cavi ad alte prestazioni

A cura di Gary G Thuot e Robert T Young, di DuPont Chemicals & Fluoroproducts, Wilmington, Delaware, USA

Riassunto

Con il gran numero di materiali dielettrici ad alte prestazioni attualmente disponibili, la selezione di materiali isolanti ideali per cavi ad alto rendimento è una questione di equilibrio fra prestazioni, lavorabilità e costi. Il presente articolo illustra le prestazioni elettriche e i criteri di selezione per materiali dielettrici a base di fluoropolimeri espandibili. In questo articolo inoltre si esamina come stabilire dei valori di elaborazione fattibili e si presentano importanti considerazioni ai fini di definire un processo stabile e ripetibile.

I fluoropolimeri espansi offrono eccellenti caratteristiche elettriche, una ridotta emissione di fumo e un'elevata resistenza alla temperatura. Normalmente, i fluoropolimeri sono utilizzati in applicazioni che richiedono una bassa emissione di fumo come i cavi plenum, in applicazioni ad alte temperature come i cavi indicati per impieghi militari e applicazioni che richiedono resistenza alla saldatura.

La selezione del polimero adeguato in relazione alle dimensioni del prodotto e alle proprietà elettriche è importante per ottenere un processo efficace e le prestazioni desiderate per il cavo. La selezione degli equipaggiamenti di processo e di monitoraggio e il relativo funzionamento sono importanti per realizzare prodotti di qualità con rendimenti elevati. L'obiettivo del presente articolo è di descrivere alcune delle caratteristiche chiave del prodotto e del processo e i relativi effetti sul processo stesso e sulle prestazioni.

Scelta del materiale adeguato

Fra le considerazioni che riguardano la selezione di una resina di fluoropolimero

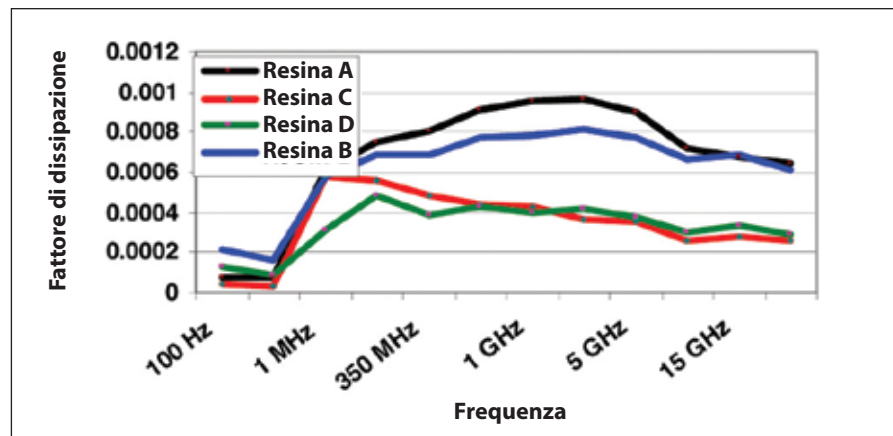
espandibile per cavi ad alte prestazioni vanno inclusi anche i requisiti di prestazioni elettriche/fisiche, le dimensioni del conduttore del prodotto e lo spessore della parete dielettrica.

Le prestazioni elettriche, come indicato sul grafico riportato qui di seguito, possono variare a seconda della composizione della resina. I dati del fattore di dissipazione (Figura 1) illustrano la differenza media misurata su placche solide di varie qualità di resine espandibili FFR Airquick DuPont™ allo stato solido (non espanso).

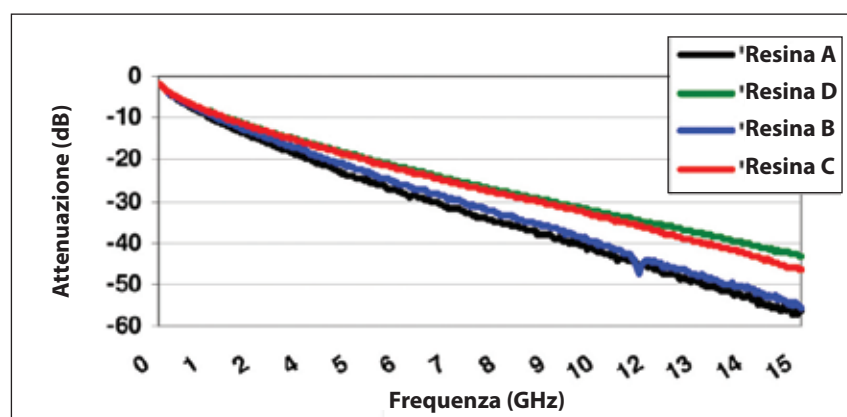
I risultati relativi all'attenuazione (Figura 2) si basano su campioni di cavo da 500hm reali prodotti utilizzando struttura e condizioni di processo identiche, ma variando la qualità della resina. Come illustrato sulla Figura 2, vi è una differenza significativa di perdita del cavo in base alla qualità selezionata.

Generalmente, la perdita di potenza elettrica in un cavo si misura in decibel (dB) ed è pari a 10 volte il logaritmo del rapporto fra la potenza d'ingresso ad una estremità del cavo e la potenza di uscita dell'altra estremità.

▼ Figura 1: Fattore di dissipazione



▼ Figura 2: Attenuazione



Con la crescente domanda di funzionamento dei cavi a frequenze più elevate, queste differenze di materiali giocano un ruolo importante nel rendimento complessivo del cavo.

Ad esempio, un cavo realizzato con un fluoropolimero espanso a circa l'82 per cento della velocità di propagazione prodotto con le resine indicate nelle *Figure 1 e 2* e provato a 2,5Ghz, presenterà delle differenze significative nella perdita di segnale. Un cavo di 100 piedi prodotto con la Resina B, presenterà circa un 20 per cento della perdita di potenza rispetto ad un cavo equivalente prodotto con le Resine C o D. La Resina A comporterebbe una perdita di potenza pari a quasi il 30 per cento rispetto alle Resine C o D. Queste differenze di prestazioni si accentueranno utilizzando cavi a frequenze di funzionamento più elevate. DuPont ha sviluppato una gamma di resine utilizzando la tecnologia "DuPont Airquick Technology", quali le resine espandibili FFR 330, FFR 550, FFR 750 e FFR 770, che offrono al cliente un'ampia gamma di prestazioni elettriche e opzioni di strutture di cavi.

Tecnologia di nucleazione e formazione cellulare

Per fornire siti in cui si verifichi la nucleazione cellulare della schiuma,

Agente di nucleazione	Capacitanza media	Variazione di capacitanza	Scintille/1.000ft
Concentrato	27.6 pf/ft	.9 pf/ft	10
Completamente miscelati	26.9 pf/ft	.4 pf/ft	0

▲ **Tabella 1:** Sommario prestazioni

si aggiungono di norma materiali inorganici come il nitrato di boro alla resina per contribuire alla formazione della schiuma. L'aggiunta di altri materiali brevettati a base di nitrato di boro migliora notevolmente il processo di espansione. Il metodo di additivazione può variare da resine già miscelate e pronte per l'utilizzo a concentrati che vengono addizionati durante il processo di estrusione. Come dimostrazione, è stata realizzata una comparazione del processo in parallelo fra una resina già miscelata (resina espandibile DuPont™ FFR 770) e un prodotto equivalente con un concentrato di schiuma disponibile sul mercato.

Per questa comparazione sono state variate le composizioni dell'agente nucleante, mentre le percentuali di resina di carico e di base utilizzate sono state mantenute costanti.

Per questo esperimento è stato utilizzato un cavo formato da un filo singolo di 23Awg con una parete di 19-mil, tipico della struttura di doppioli intrecciati da 100Ohms. Il tasso di espansione prefissato era pari al 40 per cento.

La resina già miscelata FFR 770 DuPont™ ha dato buoni risultati raggiungendo la capacitanza desiderata con tensione a bassa variazione e scintillamento contenuto di 2,5KV. Il prodotto equivalente con il concentrato disponibile sul mercato non ha raggiunto il tasso di espansione desiderato, ha mostrato una variazione di capacitanza maggiore, e non è riuscito a sostenere il voltaggio della prova di scintillamento. La *Tabella 1* fornisce un riassunto dei risultati.

La differenza significativa delle prestazioni fra i due materiali è data dalle differenze della struttura cellulare della schiuma dovuta al pacchetto di nucleazione selezionato. La *Figura 3* illustra le differenze di dimensione e struttura delle cellule fra i due materiali.

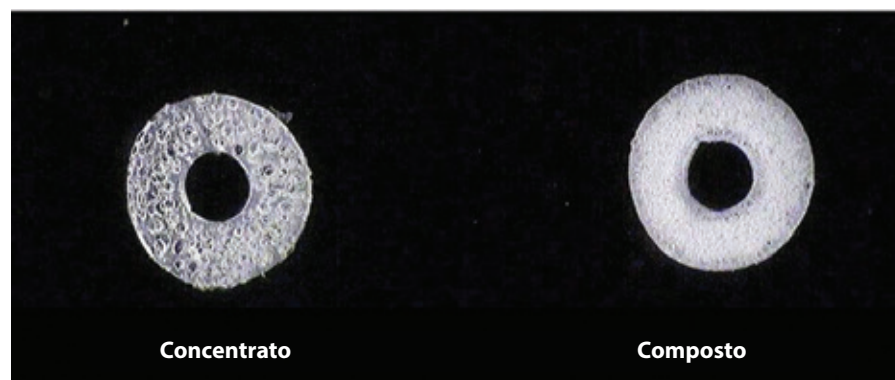
Come si può vedere sulla *Figura 3*, il materiale già miscelato presenta una struttura cellulare uniforme e di piccole dimensioni, mentre il campione realizzato con il concentrato presenta cellule di grandi dimensioni e non uniformi. L'impossibilità di formare schiuma a partire dal materiale a base di concentrato in misura maggiore implica altre conseguenze nella struttura del cavo. Per ottenere prestazioni elettriche equivalenti, si dovrebbe aumentare lo spessore della parete per compensare il minore contenuto d'aria consumando così una quantità maggiore di fluoropolimero.

Ad esempio, nei fili singoli del campione sopra citato, l'impossibilità di espandere maggiormente il materiale comporta un aumento di circa il 20% del peso in libbre richiesto per ogni 1000 piedi di ciascun filo per ottenere l'impedenza equivalente.

Selezione della qualità di resina per l'applicazione

Una volta determinate le prestazioni elettriche desiderate, si deve selezionare la resina in base al conduttore, alle dimensioni della parete di isolamento e alle prestazioni ignifughe secondo le necessità. Normalmente, minore è l'indice di fusione, migliori saranno le prestazioni ignifughe (vale a dire minore generazione di fumo). Maggiore è l'indice di fusione, più adeguata sarà la resina per le pareti di isolamento più sottili e per le strutture di cavo più piccole. La *Tabella 2* offre alcune indicazioni sulla selezione della resina.

▼ **Figura 3:** Comparazione fra strutture cellulari



▼ **Tabella 2:** Selezione della resina in funzione della struttura del cavo

Resina	Gamma di conduttori	Gamma di pareti	Gamma di pori d'aria
Resina A (7 MRF)	24 e oltre	.015 e oltre	10-58%
Resina B (14 MRF)	24 e oltre	.015 e oltre	10-55%
Resina C (12 MRF)	26 e oltre	.015 e oltre	10-58%
Resina D (30 MRF)	24 e più piccoli	.005- .02	10-50%
Resina E (42 MRF)	24 e più piccoli	.003- .02	10-55%

Parametri di processo ed effetti – tassi di espansione della schiuma

È pratica diffusa per gli ingegneri specializzati in cavi progettare cavi utilizzando tassi di espansione calcolati per ottenere il costo teorico più basso. Tuttavia, vi sono altri fattori importanti che influenzano i costi, come la capacità di elaborazione, le prestazioni elettriche globali e i danni e la compressione del cavo dovuti alle operazioni successive all'estrusione.

Trascurare questi fattori di progettazione potrebbe erroneamente causare costi più elevati e generare un'elevata quantità di scarti. Consideriamo un tipico cavo coassiale da video utilizzando il 59 per cento di tasso di espansione rispetto allo stesso cavo progettato con il 54 per cento di tasso di espansione.

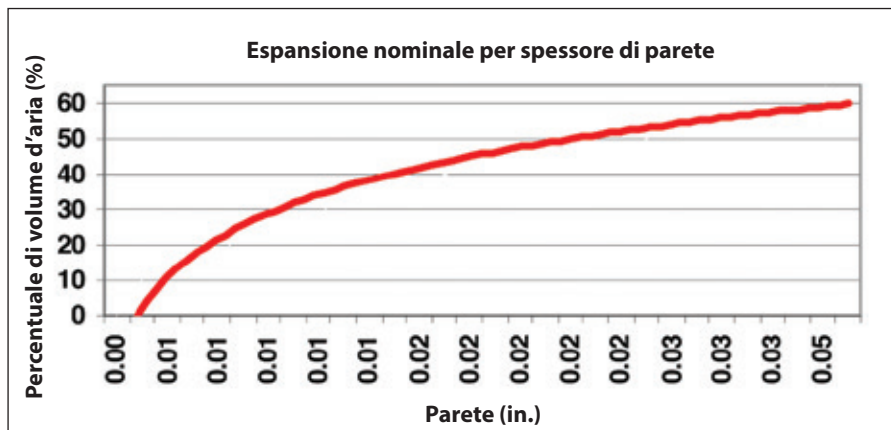
Il cavo con il 59 per cento di espansione può spingere il processo al limite, aumentando successivamente gli scarti iniziali e causando una maggiore variazione del processo. Dal punto di vista elettrico, generalmente un maggiore contenuto d'aria determina cellule più grandi e una maggiore formazione di cellule attorno al conduttore centrale, che potrebbero avere un impatto importante sull'attenuazione di riflessione del cavo. In alternativa, lo stesso cavo può essere realizzato con il 54 per cento di tasso di espansione con un aumento di peso di solo 0,28lbs/1.000ft.

Questa minima variazione offre un prodotto robusto e ripetibile con una migliore attenuazione di riflessione, una minore quantità di scarti e una maggiore produttività con la stessa impedenza del cavo.

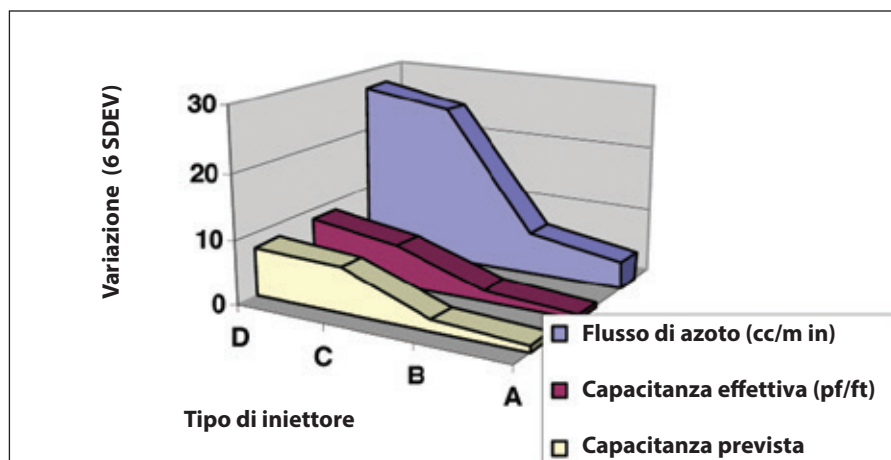
La *Figura 4* fornisce delle indicazioni generali sui tassi di espansione della schiuma in funzione dello spessore della parete dielettrica. Gli effettivi tassi di espansione massimali varieranno in funzione della selezione della resina e dei metodi di processo adottati.

Iniezione di azoto ad alta pressione

La formazione della schiuma si ottiene iniettando azoto ad alta pressione nel polimero fuso durante il processo di estrusione. Il tasso di formazione di schiuma è determinato dalla portata del gas in base all'uscita della resina ai giri al minuto di funzionamento dell'estrusore.



▲ **Figura 4:** Tassi di espansione nominali



▲ **Figura 5:** Flusso del gas e variazione della capacitance

Maggiore è il flusso del gas rispetto all'uscita della resina, maggiore sarà il tasso di espansione. L'uniformità di questo flusso di gas è fondamentale per mantenere un tasso di espansione uniforme, necessario per mantenere valori minimi di variazione della capacitance e di ritardo del segnale del cavo.

Misurazione del flusso di gas

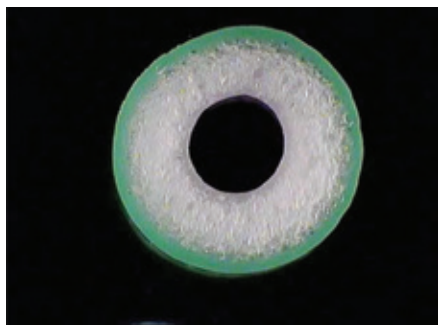
Assicurare che venga iniettato un flusso costante e corretto nel materiale fuso costituisce una delle variabili più importanti del processo di formazione della schiuma. Le variazioni di flusso del gas non rilevate risulteranno in variazioni di capacitance e conseguentemente in una instabilità di processo con grandi quantità di scarti. Le misurazioni del flusso dell'iniettore fuori linea (come lo spostamento dell'acqua) consentono di determinare la portata media dell'iniettore alla temperatura ambiente. Tuttavia, non sarà possibile determinare la portata di processo effettiva né la variazione del flusso dato che la portata dell'iniettore può variare radicalmente dopo essersi riscaldato fino a raggiungere le temperature di processo.

Si raccomanda pertanto l'impiego di un misuratore di flusso in linea quando si ottiene l'espansione mediante iniezione di gas. Con un misuratore di flusso, la pressione del gas può essere configurata con precisione per ottenere la portata calcolata richiesta per la capacitance nominale desiderata. Inoltre, è possibile controllare le variazioni di portata.

Selezione dell'iniettore di gas per il prodotto

Quando viene dimensionato un iniettore, bisogna considerare la pressione del tamburo estrusore e la portata dell'azoto per ottenere il tasso di espansione desiderato rispetto alla velocità di avanzamento del prodotto. La portata di gas dipende dalle dimensioni dell'orifizio dell'iniettore e dalla pressione dell'azoto.

L'orifizio deve essere dimensionato in modo tale che la pressione del gas sia più alta della pressione del tamburo per ottenere il flusso di gas desiderato. Supponiamo che una data struttura di cavo richieda un flusso di 50cc/minuto di azoto per una velocità di linea di 600 piedi al minuto e crei una pressione del tamburo estrusore di 1.000psig.



▲ **Figura 6:** Sezione trasversale di un nucleo di schiuma con strato solido esterno

L'iniettore selezionato per questo processo richiede che l'orifizio abbia dimensioni adeguate per ottenere una portata di gas di 50cc/minuto ad una pressione superiore alla pressione del tamburo. Con un flusso superiore a 50cc/minuto a 1.000psig, la pressione del gas dovrebbe essere regolata ad un valore inferiore alla pressione del tamburo; ma in questo modo si produrrebbe l'ostruzione dell'iniettore con conseguente solidificazione del prodotto. Aumentando la pressione del gas a valori superiori a 1.000psig, il flusso del gas sarebbe troppo elevato e l'espansione sarebbe eccessiva. Questa eccessiva formazione di schiuma viene spesso fraintesa e considerata un problema dovuto al materiale o al processo.

Al contrario, se l'orifizio dell'iniettore è troppo piccolo, la pressione del gas disponibile potrebbe non essere sufficiente per ottenere il flusso di gas richiesto. Ciò comporterà l'impossibilità di ottenere il tasso di espansione e la capacità del prodotto desiderati. Generalmente, per questa ragione si utilizzano diversi iniettori con vari flussi disponibili per un'ampia gamma di pressioni. Il numero di diverse dimensioni necessarie varia secondo la gamma di prodotti e la pressione del gas disponibile. L'utilizzo di una pompa di azoto ad alta pressione aumenta la gamma di pressioni di gas disponibili rispetto all'utilizzo di un cilindro ad alta pressione. L'utilizzo di una pompa può pertanto ridurre il numero di dimensioni degli iniettori richiesti per una operazione con conseguente riduzione dei costi complessivi.

Anche la struttura dell'iniettore può influenzare le prestazioni. La *Figura 5* illustra i risultati delle prove basate sulla comparazione di quattro tipi di iniettori disponibili sul mercato ottenuti misurando la variazione del flusso del gas e la variazione della capacità risultante. Per queste prove è stato utilizzato un nucleo di 50Ohm con un conduttore di diametro 23G espanso fino a circa il 50 per cento. La variazione Sei Sigma del flusso di gas (± 3 deviazioni standard) variava da 4cc/min a 27cc/min con una variazione di capacità risultante da 0,3

a 3,8pf/ft. Questi risultati dimostrano che i problemi di prestazione, spesso attribuiti al fluoropolimero, sono tipicamente problemi di processo legati agli equipaggiamenti. L'utilizzo di un iniettore mal dimensionato o di una struttura instabile può mascherare il reale beneficio delle prestazioni di alcuni materiali.

Raffreddamento del prodotto

Il mezzo di raffreddamento per il nucleo estruso è generalmente costituito da una combinazione di aria ambiente e acqua. La distanza richiesta per ciascuna di queste dipende dalle dimensioni del prodotto e della velocità della linea. Le distanze corrette sono fondamentali per il raffreddamento prima dell'avvolgimento del filo per evitare l'appiattimento dell'isolamento sull'aspo e di influenzare le prestazioni elettriche.

Mantenendo la distanza del punto di raffreddamento dell'acqua il più possibile lontano dalla testa di iniezione si otterrà il prodotto migliore. Questo perché una sufficiente distanza dal punto di raffreddamento mediante aria consente la contrazione della resina sopra il conduttore fornendo un'interfaccia uniforme e aderente al conduttore senza necessità di eccessivo preriscaldamento.

Con tale interfaccia del conduttore uniforme si ottiene una forza uniforme del nastro di isolamento persino dopo la rottura del legame iniziale. I vantaggi consistono in una migliore attenuazione di riflessione strutturale e resistenza alle sollecitazioni delle operazioni di processo successive. A volte non si può applicare una sufficiente distanza dal punto di raffreddamento mediante ARIA in quanto la distanza di raffreddamento complessiva disponibile non è sufficiente. In questo caso, si deve evitare l'utilizzo di acqua fredda nella prima sezione di raffreddamento poiché ne potrebbe conseguire un'eccessiva ovalità dell'isolamento e una ridotta adesione al conduttore. Si raccomanda un raffreddamento temprato poiché riduce lo shock iniziale nell'isolamento migliorando la sua ovalità e adesione al conduttore.

Skinning

L'estrusione di uno strato esterno di materiale solido o skinning offre dei benefici aggiuntivi quali:

- un modo facile ed efficiente di colorare l'isolamento
- una resistenza dielettrica migliorata, che è utile nelle strutture di cavi con pareti più sottili

- tassi di espansione della schiuma più alti
- maggiore resistenza ai danni dell'isolamento durante il processo successivo come cordatura o trecciatura

L'applicazione di un rivestimento solido richiede un investimento iniziale in equipaggiamenti (un estrusore ausiliario e una testa di iniettore speciale), ma offre benefici mediante una riduzione degli scarti e dei costi di prodotto. La schiuma e lo strato solido si ottengono allo stesso tempo mediante una testa di iniettore singola utilizzando metodi di processo standard. La *Figura 6* illustra un nucleo di schiuma con uno strato esterno solido colorato.

Conclusioni

Vi sono diverse opzioni di resine di fluoropolimero espandibile disponibili, e ciascuna presenta possibilità e limitazioni specifiche. La scelta della resina corretta per l'applicazione specifica è importante per i costi, per facilitare il processo e per ottenere le prestazioni elettriche desiderate.

La progettazione e la lavorazione dei cavi considerando le caratteristiche dei materiali consente di ottenere prodotti con alti rendimenti.

La selezione degli equipaggiamenti di processo e le condizioni di processo sono fondamentali per garantire un processo stabile, mantenere una minima variazione del prodotto e ridurre il più possibile i costi dell'operazione. Tecniche speciali quali l'aggiunta di uno strato o più strati di rivestimenti solidi alle strutture espanse possono migliorare ulteriormente il processo e le prestazioni. ■

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Norteamérica organiza un stand de grupo en Rusia

LA feria wire Russia será celebrada este año del 25 al 28 de junio en el Centro de Exposiciones ZAO de Moscú.

Una peculiaridad de la feria de este año será el stand grupal norteamericano, organizado por Messe Düsseldorf North America y financiado por la Asociación de Proveedores del Sector del Cable y Alambre (WCISA).

El stand de grupo representa para las empresas un modo rentable de entrar y expandir sus negocios en el mercado ruso. El espacio de exposición del stand puede ser reservado ya contactando con Messe Düsseldorf North America.

El mercado ruso se ha mostrado hasta

ahora muy fuerte y sigue ofreciendo oportunidades de negocios a las empresas internacionales que producen, procesan o comercializan alambre y cable.

Además del stand grupal norteamericano, los expositores de Austria, China, Francia, Alemania e Italia aparecerán representados en los pabellones oficiales de dichos países. En total, el evento contará con más de 200 expositores procedentes de más de 30 países.

La feria será organizada una vez más entre Messe Düsseldorf y su sucursal Messe Düsseldorf Moscú, con el apoyo de asociaciones industriales líderes rusas e internacionales como el Instituto de

Investigación Científica y de Desarrollo del Cable Íntegramente Ruso (VNIKIP), la Asociación Internacional del Alambre y Máquinas (IWMA), la Asociación Internacional de Expositores de Cable y Alambre (IWCEA), la Asociación Alemana de Fabricantes de Maquinaria para Cable y Alambre (VDKM), la Asociación Austriaca de Fabricantes de Maquinaria para Cable y Alambre (VÖKM-AWCMA), la Asociación Internacional de Expositores de Cable y Alambre en Francia (IWCEA-Francia), la Asociación Italiana de Fabricantes de Maquinaria para Alambre (ACIMAF) y la Asociación de Proveedores del Sector del Cable y Alambre (WCISA).

Messe Düsseldorf – Alemania

Website: www.messe-duesseldorf.com

Soldadoras de alambión PWM fiables

Las soldadoras a presión en frío de PWM de alta precisión, pensadas para realizar soldaduras permanentes, fuertes y fiables en materiales no ferrosos, ofrecen a los fabricantes una manera rápida y económica de unir secciones de alambre grandes de hasta 30mm (1,181") de diámetro.

La soldadura en frío, más rápida, limpia y ecológica que la soldadura a tope eléctrica, da como resultado una soldadura permanente y fiable más resistente que el material matriz y sin afectar a la integridad eléctrica.

La gama de soldadoras de alambión de PWM comprende los modelos P1500, P1000 y EP500. Diseñadas y fabricadas en los talleres de PWM en el Reino Unido, estas robustas máquinas industriales representan una solución rentable desde el punto de vista energético, requieren poco mantenimiento y son fáciles de usar.

La soldadora en frío electro-neumática EP500 es una de las máquinas más vendidas de PWM. La máquina, segura y fácil de usar, está diseñada para soldar alambión de cobre de 5mm a 12,50mm



▲ Soldadora de alambión hidráulica P1000 de la casa PWM

(de 0,197" a 0,492") y de aluminio de 5mm a 15mm (de 0,197" a 0,590").

La soldadora hidráulica compacta P1000 para alambión de cobre de 6mm a 16mm (de 0,236" a 0,630") y de aluminio de 6mm a 20mm (de 0,236" a 0,790") está equipada con hileras de desenganche rápido y mecanismo regulador de hilera.

La soldadora de alambión electro-neumática P1500, que es el mejor modelo de la gama de PWM, está diseñada para soldar alambión de cobre de 15mm (0,590") a 25mm (0,984") y de aluminio de hasta 30mm (1,181").

El único consumo de la máquina es la

energía consumida por el motor de la bomba hidráulica, lo que hace de la P1500 un modelo de funcionamiento muy rentable.

No requiere tiempo de preparación y el ciclo de soldadura dura de 4 a 5 minutos, además el calor eléctrico de la soldadura es eliminado automáticamente cuando se termina la operación.

En la página www.pwmltd.co.uk se pueden ver vídeos de demostración de las soldadoras EP500, P1000 y P1500.

Las máquinas permiten soldar materiales no ferrosos, además de distintos tipos de aleaciones. Para PWM, especializada en la fabricación de soldadoras en frío desde hace casi 30 años, siempre es un placer asesorar sobre las técnicas y aplicaciones de soldado en frío.

La red mundial de agentes expertos de la empresa, junto con el equipo del Reino Unido, ofrece un servicio rápido y eficiente para el sector internacional del cable y alambre.

PWM Ltd – Reino Unido

Website: www.pwmltd.co.uk

Mayores planes de expansión

En junio de 2012 Anglia Metal empezó a fabricar hilo de cobre para el sector del cable y otros mercados dedicados al procesado de hilo de cobre como la soldadura de latas y la fabricación de cintas de interconexión para paneles solares fotovoltaicos.

La empresa, que antes operaba como Tri-Wire Ltd, ha encontrado un nuevo y válido inversor respaldado por una estrategia sostenible y a largo plazo en el sector del cobre. El nuevo propietario ha incorporado todo el equipo directivo de Anglia Metal, además de su experta plantilla, con lo que la empresa puede dedicarse ahora a la optimización y expansión de sus actividades comerciales.

El objetivo principal de la empresa es la excelencia en la cadena de suministro y la disponibilidad de una amplia gama de productos de alambre ordinario o estañado. La gama de productos abarca desde carretes con uno o varios hilos de 0,10mm, varios conductores flexibles con una sección máx. de 10mm² hasta carretes de trenzado pequeños para aplicaciones de apantallado.

El equipo de producción se mueve conforme a los estándares industriales



▲ Fábrica de Anglia Metal en West Yorkshire (Reino Unido)

y la fábrica ha efectuado continuas mejoras en los últimos años. Anglia Metal es capaz de ofrecer tiempos de entrega muy cortos gracias a la flexibilidad y al esfuerzo de sus trabajadores para garantizar el éxito del cliente.

La base de clientes británicos comprende empresas del sector de la transmisión de datos, telecomunicaciones, construcción, fabricación de cables para la industria y el sector automovilístico, además de

la producción de latas. Anglia Metal espera expandirse aún más en el sector de los alambres para uso especial y otros sectores del mercado europeo.

Además, la empresa ha planeado ampliar aún más su gama de productos para respaldar mejor a sus clientes locales con una mayor variedad de productos que cubra sus necesidades de hilo de cobre.

Anglia Metal – Reino Unido
Website: www.angliametal.com

Mejorando el sistema de limpieza superficial de alambres

El creciente número de instalaciones y el actual nombramiento de un ingeniero de ventas dedicado a este sector de fabricación clave como es el del alambre corroboran el éxito del sistema de limpieza superficial por chorreado húmedo de Vapormatt.

La alta uniformidad de proceso que se puede alcanzar con el chorreado húmedo ha sido probada por Vapormatt en una extensa lista de aplicaciones que incluye limpieza, desengrase y descascarillado, además de grabado químico y pulido satinado de una gran variedad de productos para cables, alambres y flejes.

El recién nombrado ingeniero de ventas David Clements cita a los fabricantes de extrusiones giratorias, alambre de carda, cables de suministro eléctrico, cuchillas de sierra de cinta, cables de fibra óptica y

alambre de acero de alto carbono como los beneficiados con la tecnología Vapormatt.

“Vapormatt, una de las empresas más importantes a nivel mundial en el campo del chorreado húmedo, desarrolla continuamente sus aplicaciones de procesado en línea para fabricantes de alambres, entre otras razones porque el chorreado húmedo ofrece ventajas evidentes frente a los sistemas mecánicos y químicos para la limpieza del alambre, métodos estos que pueden dar problemas de rendimiento y ambientales”, comentó.

Como ejemplo de la dedicación de la empresa al desarrollo de aplicaciones de procesado, el Sr. Clements citó el equipo Profelis de Vapormatt.

El diseño del equipo permite manejar productos de alambre y cable de

distintas formas y materiales, y evita el uso de sustancias químicas agresivas y el potencial riesgo de contaminación observado en otros métodos.

El equipo totalmente autónomo Profelis dispone de dos unidades adyacentes que combinan chorreado húmedo, enjuague por rociado y secado. Todo ello permite obtener resultados de alta calidad que cumplen con los objetivos de estética y rendimiento.

“Es el momento más propicio para unirse a la compañía. Espero contribuir a su éxito en adelante y ayudar a Vapormatt a cumplir su objetivo de convertirse en la empresa de referencia para el sector del alambre cuando se trate de limpiar alambre en línea”, añadió Clements.

Vapormatt Ltd – Reino Unido
Website: www.vapormatt.com

Soluciones y procesado de fluoropolímeros expandidos para el aislamiento de cables de altas prestaciones

Por Gary G Thuot y Robert T Young, de DuPont Chemicals & Fluoroproducts, Wilmington, Delaware, EE.UU.

Resumen

Con el gran número de materiales dieléctricos de alto rendimiento disponibles en el día de hoy, seleccionar los materiales aislantes ideales para cables de altas prestaciones significa buscar el equilibrio entre prestaciones, procesabilidad y coste.

Este artículo presenta las prestaciones eléctricas y los criterios para la selección de dieléctricos a base de fluoropolímeros expandidos. Además, en este artículo se examina cómo establecer valores de elaboración viables y se presentan importantes consideraciones sobre el procesado, con el fin de determinar un proceso estable y repetible que también será estudiado.

Los fluoropolímeros expandidos ofrecen excelentes propiedades eléctricas, baja producción de humo y resistencia a las altas temperaturas. Normalmente, los fluoropolímeros se usan en aplicaciones donde se requiere baja emisión de humo, como los cables plenum, en aplicaciones a alta temperatura, como los cables incluidos en las especificaciones militares, y en aplicaciones que requieren resistencia a la soldadura.

Seleccionar el polímero adecuado de acuerdo con las dimensiones del producto y las propiedades eléctricas es importante para obtener un proceso correcto y las prestaciones deseadas para el cable.

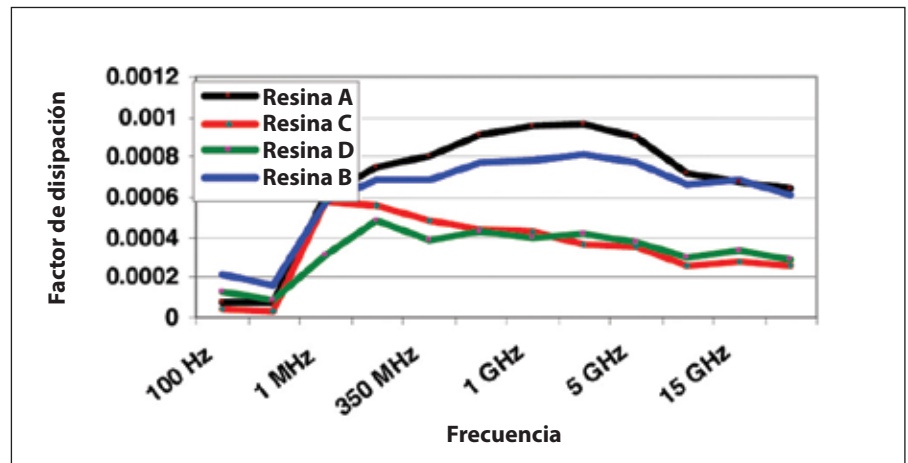
La selección del equipo de procesamiento y monitorización y su funcionamiento son importantes para realizar productos de calidad con rendimientos elevados. El objetivo de este artículo es describir algunas de estas características clave del producto y del proceso y sus efectos en el proceso mismo y en las prestaciones.

Selección del material adecuado

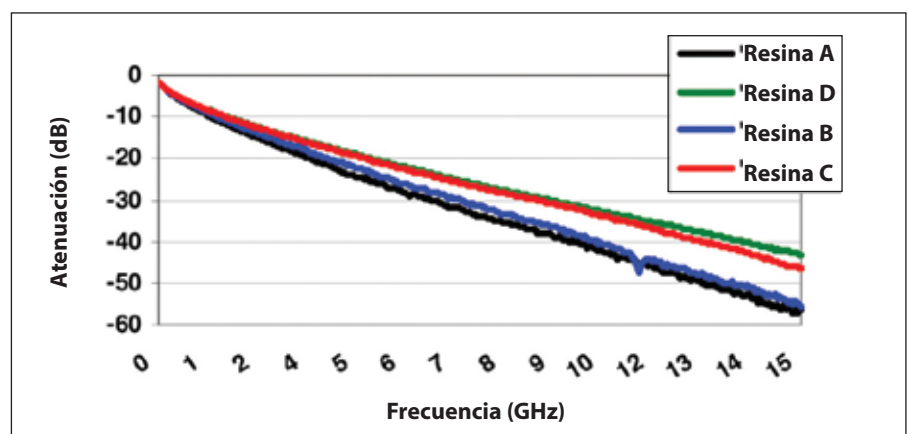
Las consideraciones para seleccionar una resina de fluoropolímero expandible para cables de altas prestaciones incluyen las prestaciones eléctricas/físicas requeridas, las dimensiones del conductor del producto

y el espesor de la pared dieléctrica. Las prestaciones eléctricas, como se indica en el gráfico de abajo, pueden variar dependiendo de la composición de la resina. Los datos del factor de disipación (Figura 1) ilustran la diferencia medida en placas sólidas de varias calidades de resinas expandibles FFR Airquick DuPont™ en su estado sólido (no expandido).

▼ Figura 1: Factor de disipación



▼ Figura 2: Atenuación



Los resultados de atenuación (*Figura 2*) se basan en muestras reales de cable de 50 Ohmios producidas usando diseños de cables y condiciones de procesamiento idénticos pero variando la calidad de la resina. Como se puede ver en la *Figura 2*, hay una diferencia significativa de pérdida de potencia del cable según la calidad de resina seleccionada. La pérdida de potencia eléctrica de un cable se mide normalmente en decibelios (dB) y corresponde a 10 veces el logaritmo de la relación entre la potencia de entrada en un extremo del cable y la potencia de salida en el otro extremo. A medida que se requiere que los cables funcionen a mayor frecuencia, estas diferencias de material juegan un papel importante en las prestaciones globales del cable.

Por ejemplo, un cable realizado con fluoropolímero expandido a aproximadamente un 82% de velocidad de propagación producido con las resinas indicadas en las *Figuras 1 y 2* y probado a 2,5Ghz presenta diferencias significativas por lo que se refiere a la pérdida de señal. Un cable de 100 pies producido con la Resina B presenta aproximadamente un 20% de pérdida de potencia respecto a un cable equivalente producido con resinas C o D.

La resina A produce una pérdida de potencia de casi un 30 por ciento respecto a las resinas C o D. Estas diferencias de prestaciones se intensifican usando cables a frecuencias de funcionamiento más altas.

Agente de nucleación	Capacitancia media	Variación de capacitancia	Chispas/1.000ft
Concentrado	27.6 pf/ft	.9 pf/ft	10
Compuesto listo para usar	26.9 pf/ft	.4 pf/ft	0

▲ **Tabla 1:** Sumario de las prestaciones

DuPont ha desarrollado una gama de resinas usando la tecnología "DuPont Airquick Technology", tales como las resinas expandibles FFR 330, FFR 550, FFR 750 y FFR 770, que ofrecen al cliente una amplia gama de prestaciones eléctricas y opciones de diseño de cables.

Tecnología de nucleación y formación celular

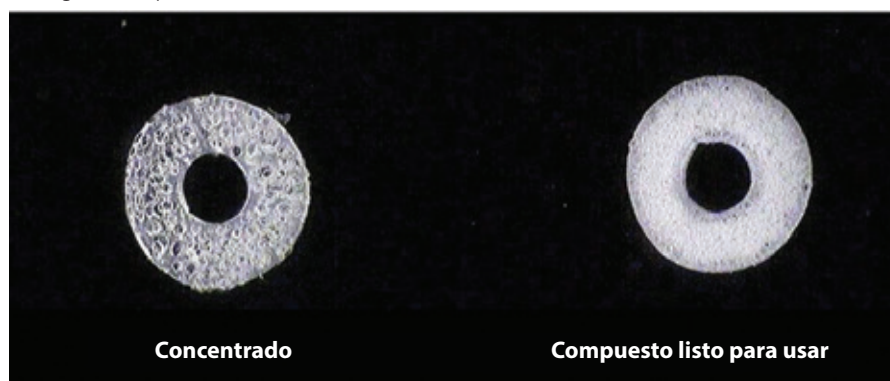
Para disponer de sitios donde ocurra la nucleación celular de la espuma normalmente se agregan a la resina materiales inorgánicos como el nitrato de boro que favorece el esponjado. Agregando otros materiales patentados a base de nitrato de boro, se mejora notablemente el proceso de esponjado. El método de añadido puede comprender desde resinas ya compuestas, listas para usar, hasta concentrados, que se añaden durante el

proceso de extrusión. Como demostración, se ha realizado una comparación paralela entre un proceso con resina lista para usar (resina expandible FFR 770 DuPont™) y un producto equivalente con un concentrado expandible disponible en el comercio.

Para esta comparación se variaron las composiciones del agente de nucleación, pero se mantuvieron constantes los porcentajes de resina de carga y de base utilizados. Para este experimento se utilizó un cable formado por un alambre individual de 23Awg con una pared de 19-mil, típico de un par trenzado apantallado de 100 Ohmios. La tasa de expansión buscada era un 40%.

La resina lista para usar FFR 770 DuPont™ dio buenos resultados y alcanzó la capacitancia deseada con voltaje de baja variación de 2,5KV sin chispas. El producto equivalente con el concentrado disponible en el comercio no alcanzó la tasa de expansión deseada, mostró mayor variación de capacitancia y producción de chispas. La *Tabla 1* muestra un sumario de los resultados.

▼ **Figura 3:** Comparación entre estructuras celulares



▼ **Tabla 2:** Selección de la resina según el diseño de cable

Resina	Gama de conductores	Gama de paredes	Gama de huecos
Resina A (7 MRF)	24 y superiores	.015 y superiores	10-58%
Resina B (14 MRF)	24 y superiores	.015 y superiores	10-55%
Resin C (12 MRaF)	26 y superiores	.015 y superiores	10-58%
Resina D (30 MRF)	24 e inferiores	.005- .02	10-50%
Resina E (42 MRF)	24 e inferiores	.003- .02	10-55%

La diferencia de prestaciones más importante entre los dos materiales es debida a las diferencias de la estructura celular de la espuma determinada por el paquete de nucleación seleccionado. La *Figura 3* ilustra las diferencias de dimensiones y estructura de las celdas entre los dos materiales.

Como se puede ver en la *Figura 3*, el material listo para usar ofrece una estructura celular uniforme y pequeña, mientras que la muestra realizada con el concentrado presenta celdas grandes y no uniformes.

La imposibilidad de expandir más el material a base de concentrado implica otras consecuencias en el diseño del cable. Para alcanzar prestaciones eléctricas equivalentes, se debería aumentar el espesor de la pared para compensar el menor contenido de huecos, utilizando así más fluoropolímero.

Por ejemplo, en los alambres de la muestra citada antes, debido a la imposibilidad de obtener una mayor expansión, se debería aumentar de un 20% el peso en libras requerido por cada 1.000 pies de cada alambre para poder obtener la impedancia equivalente.

Selección de la calidad de resina para la aplicación

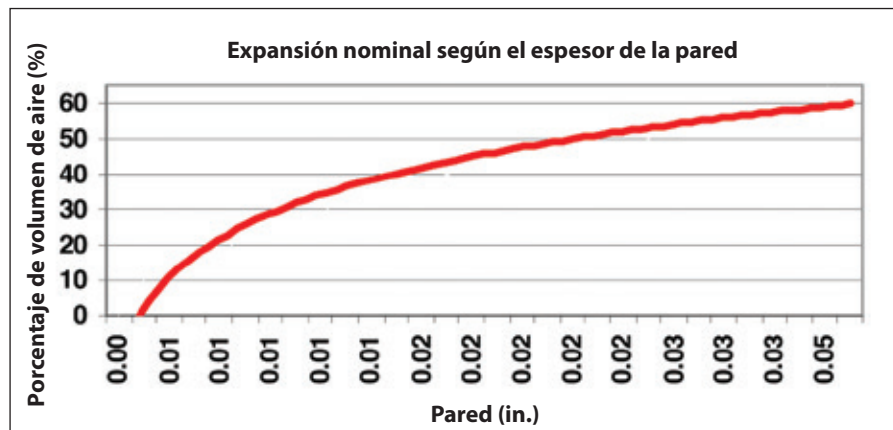
Después de determinar las prestaciones eléctricas deseadas, se debe seleccionar la resina en función del conductor, de las dimensiones de la pared de aislamiento y de las prestaciones frente al fuego, según las necesidades. Normalmente, cuanto más bajo sea el caudal del material fundido, mejores serán las prestaciones frente al fuego (es decir, menos humo generará). Cuanto más alto sea el caudal del material fundido, más adecuada será la resina para paredes de aislamiento más finas y diseños de cables más pequeños. La *Tabla 2* ofrece algunas indicaciones sobre la selección de la resina.

Parámetros de proceso y efectos – tasas de expansión de la espuma

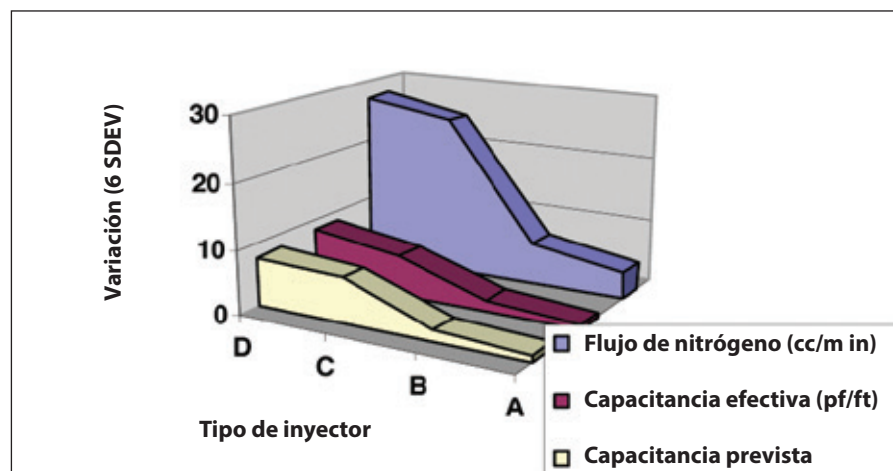
Es corriente entre los ingenieros especializados en cables diseñar cables usando tasas de expansión calculadas para obtener el coste teórico más bajo. Sin embargo, hay otros factores importantes que afectan al coste, como la capacidad de procesado, las prestaciones eléctricas globales, y los daños y compresión del cable debidos a las operaciones sucesivas después de la extrusión. Si no se consideran estos factores de proyecto, los resultados podrían dar erróneamente costes más altos y una considerable cantidad de desechos. Consideremos un típico cable coaxial de vídeo diseñado con un 59% de tasa de expansión respecto al mismo cable diseñado con un 54% de tasa de expansión.

El cable con el 59 por ciento de expansión puede llevar el proceso hasta sus límites, aumentando sucesivamente los desechos iniciales y causando mayor variación del proceso. Desde el punto de vista eléctrico, un contenido de huecos más alto suele dar como resultado celdas más grandes y mayor formación de celdas alrededor del conductor central, lo cual puede tener un impacto importante sobre la pérdida de retorno del cable. Como alternativa, el mismo cable puede ser realizado con un 54 por ciento de tasa de expansión con un aumento de peso de sólo 0,28lbs/1.000ft. Esta pequeña variación ofrece un producto robusto y repetible con una pérdida de retorno mejorada, menor cantidad de desechos y mayor productividad con la misma impedancia del cable.

La *Figura 4* ofrece indicaciones generales sobre las tasas de expansión de la espuma en función del espesor de la pared dieléctrica. Las tasas de expansión máximas efectivas



▲ **Figura 4:** Tasas de expansión nominales



▲ **Figura 5:** Flujo del gas y variación de la capacitancia

variarán según la resina que se seleccione y los métodos de procesamiento que se adopten.

Inyección de gas nitrógeno a alta presión

El esponjado se obtiene inyectando nitrógeno gaseoso a alta presión en el polímero fundido durante el proceso de extrusión. La tasa de esponjado es determinada por el caudal del gas respecto a la salida de la resina a las RPMs de funcionamiento del extrusor. Cuanto más alto sea el caudal del gas a la salida de la resina, más alta será la tasa de expansión. La uniformidad de este flujo de gas es crítica para mantener una tasa de expansión uniforme, necesaria para mantener valores mínimos de variación de la capacitancia y de retraso de la señal del cable.

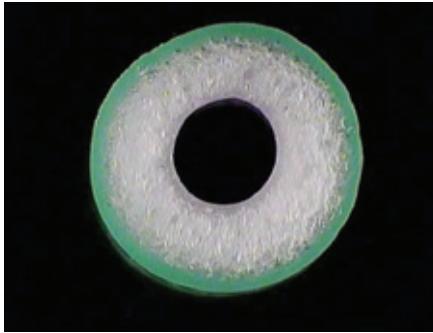
Medición del flujo de gas

La inyección de gas en el material fundido con un flujo correcto y constante es una de las variables más importantes del proceso

de esponjado. Las variaciones de flujo del gas no detectadas producen variaciones de capacitancia, dando lugar a un proceso inestable y a gran cantidad de desechos. Las mediciones del flujo del inyector fuera de línea (como el desplazamiento del agua) permiten determinar el caudal medio del inyector a temperatura ambiente. Sin embargo, no permiten determinar el caudal del proceso real o la variación de flujo, dado que el flujo del inyector puede cambiar radicalmente después de calentarse a las temperaturas de procesado. Por consiguiente, se recomienda usar un medidor de flujo en línea cuando el esponjado es realizado mediante inyección de gas. Con un medidor de flujo, la presión del gas puede ser configurada con precisión para obtener el caudal calculado requerido y obtener la capacitancia nominal deseada. Además, las variaciones de caudal pueden ser controladas.

Selección del inyector de gas para el producto

Cuando se dimensiona un inyector, se deben considerar la presión del tambor del extrusor y el caudal del nitrógeno para obtener la tasa de expansión deseada



▲ **Figura 6:** Sección de un núcleo esponjado con capa externa sólida

respecto a la velocidad de avance del producto. El caudal del gas depende de las dimensiones del orificio del inyector y de la presión del nitrógeno gaseoso. El orificio debe ser dimensionado de manera que la presión del gas sea más alta que la del tambor para obtener el flujo de gas deseado. Supongamos que una determinada construcción de cable requiere un caudal de 50cc/min. de nitrógeno para una velocidad de línea de 600 pies/min. y genera una presión en el tambor del extrusor de 1.000psig.

El inyector seleccionado para este proceso necesita que el orificio tenga las dimensiones adecuadas para entregar un caudal de gas de 50cc/minuto a una presión mayor que la del tambor. Con un caudal mayor de 50cc/minuto a 1.000psig, la presión del gas debe ser ajustada para que sea más baja que la presión del tambor; pero de esta manera se produciría la obstrucción del inyector llevando a la solidificación del producto. Aumentando la presión del gas a valores superiores a 1.000psig, el flujo de gas sería demasiado alto y el esponjado sería excesivo. Este esponjado excesivo a menudo no es aceptado bien porque es considerado un problema debido al material o al procesado.

Por el contrario, si el orificio del inyector es demasiado pequeño, la presión de gas disponible puede ser insuficiente para obtener el flujo de gas necesario, y como resultado no sería posible conseguir la tasa de expansión y la capacitancia del producto deseadas.

Por esta razón, normalmente se tienen varios inyectores de distintos caudales disponibles para una amplia gama de presiones. La variedad de tamaños requerida depende de la gama de productos y la presión del gas disponible. El uso de una bomba de nitrógeno a alta presión aumenta el campo de presiones disponibles respecto al uso de un cilindro a alta presión.

Por tanto, el uso de una bomba puede reducir la cantidad de inyectores de distinto tamaño requerida para una operación reduciendo de esta manera los costes totales.

El diseño del inyector puede afectar también a las prestaciones. La *Figura 5* muestra los resultados de pruebas en las que se comparan cuatro tipos de inyectores comercialmente disponibles obtenidos midiendo la variación del flujo del gas y la variación de la capacitancia resultante. Para estas pruebas se usó un núcleo de 50Ohm con un conductor de diámetro 23 expandido aproximadamente a un 50%.

La variación Seis Sigma del caudal del gas (± 3 desviaciones estándares) iba de 4cc/min. a 27cc/min. con una variación de capacitancia resultante de 0,3 a 3,8pf/ft. Estos resultados demuestran que los problemas de prestaciones a menudo atribuidos al fluoropolímero normalmente son debidos a problemas de procesado relacionados con los equipos. El uso de un inyector mal dimensionado o un diseño inestable puede ocultar las prestaciones reales de ciertos materiales.

Enfriamiento del producto

Normalmente, el núcleo extruido es enfriado mediante aire ambiente mezclado con agua. La distancia requerida para cada uno de estos medios depende de las dimensiones del producto y de la velocidad de línea. La aplicación de la distancia correcta es un factor fundamental para el enfriamiento anterior al enrollado del alambre a fin de evitar que el aislamiento se aplaste en el carril y se afecte al rendimiento eléctrico. Manteniendo la distancia del punto de enfriamiento del agua lo más lejos posible del cabezal inyector se obtiene un producto mejor.

El motivo de esto es que una distancia del punto de enfriamiento con aire grande le da tiempo a la resina a contraerse sobre el conductor formando una interfaz uniforme y pegada al conductor sin necesidad de un precalentamiento excesivo.

Con una interfaz del conductor uniforme se obtiene una fuerza uniforme de la banda de aislamiento incluso después de la rotura del enlace inicial. Las ventajas que se obtienen son una pérdida de retorno estructural mejorada y resistencia a las tensiones de las operaciones de procesado siguientes.

A veces, no es posible aplicar una distancia del punto enfriamiento con aire suficiente debido a la distancia de enfriamiento total disponible. En este caso no se debe usar agua fría en la primera sección de enfriamiento, porque se puede causar una ovalidad del aislamiento excesiva y poca adhesión al conductor. Se recomienda un enfriamiento templado porque reduce el choque inicial en el aislamiento y se mejora su ovalidad y adhesión al conductor.

Capa sólida externa (skinning)

La extrusión de una capa externa de material sólido o *skinning* proporciona beneficios adicionales como:

- coloreado del aislamiento facilitado y eficiente
- resistencia dieléctrica mejorada, que es útil en diseños de cables con paredes más finas
- tasas de expansión de la espuma más altas
- mayor resistencia del aislamiento contra daños durante el procesado sucesivo como el pareado o el trenzado

La aplicación de un revestimiento sólido requiere una inversión inicial en equipos (una extrusora auxiliar y un cabezal inyector especial) pero aporta beneficios como la reducción de desechos y coste del producto. La espuma y la capa sólida se obtienen al mismo tiempo a través de un solo cabezal inyector usando métodos de procesado estándares. La *Figura 6* ilustra un núcleo de espuma con una capa externa sólida de color.

Conclusiones

Hay varias opciones de resinas de fluoropolímero expandible disponibles, y cada una presenta capacidades y limitaciones específicas. Seleccionar la resina adecuada para la aplicación es importante para los costes, para facilitar el procesamiento y obtener las prestaciones eléctricas deseadas. El diseño y procesado de cables considerando las características de los materiales permite obtener productos de alto rendimiento.

La selección de los equipos de procesado y las condiciones del proceso son críticos para asegurar un proceso estable, mantener la variación de producto mínima y reducir los costes de operación.

Técnicas especiales como el añadido de de capas sólidas a estructuras expandidas pueden aportar otras mejoras al procesado y a las prestaciones. ■

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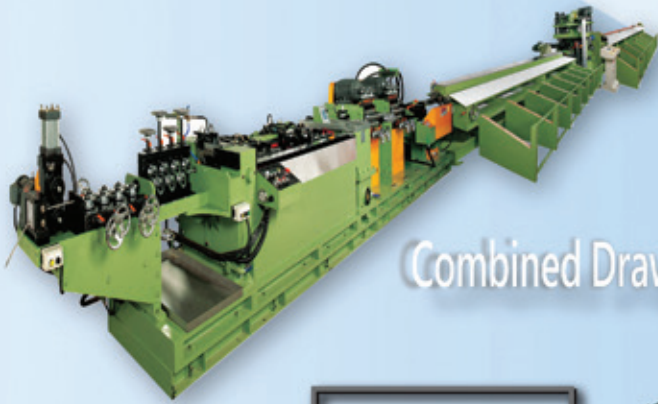


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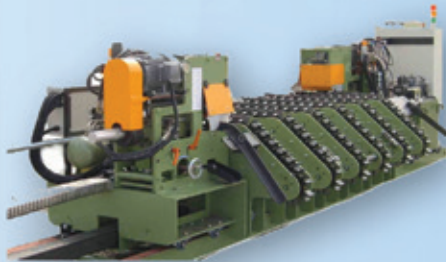
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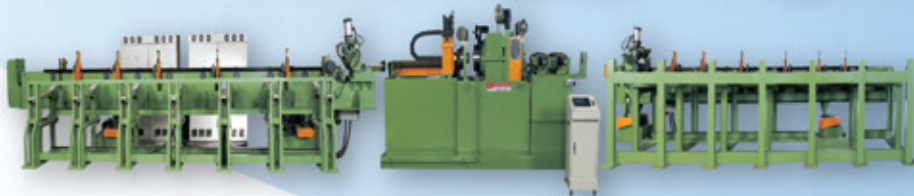
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