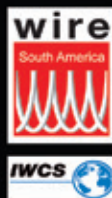




eurowire

September 2015 • US\$33\*  
www.read-eurowire.com

# wire



The International Magazine for the Wire & Cable Industries

The World's First,  
really contact-less,  
hand held optical  
micrometer to check  
wires and cables

**HWS.1**  
*Handy Wire Scanner*

AEROEL

See us at:

Wire Southeast Asia  
16-18 September,  
Bangkok, Thailand  
ACIMAF Pavillon



Wire South America  
6-8 October  
Sao Paulo, Brasil  
ICE Pavillon



ISSN 1463-2438



SPARK TESTER: ENSURE THE QUALITY OF CABLE JACKETS AND INSULATIONS

# Powered To Perform



The new Spark Tester generation accurately maintains test voltage under any condition including highest capacitive loads.



- Shortest recovery time after disruptive breakdown
- Pin hole and bare patch detection
- Controlled, adjustable test voltage of up to 28kVDC / 15kVAC
- Complete range of electrodes
- Compliance with several standards including IEC 62230, UL 1581, UL 2556



Learn more about the  
Spark Tester Family

**Zumbach**  
SWISS PRIME MEASURING SINCE 1957

**ZUMBACH Electronics**  
sales@zumbach.ch | www.zumbach.com



# SANFENG

# 50 years



11<sup>th</sup> International Wire & Cable Trade Fair For Southeast Asia

16-18 SEP 2015  
Booth No. E29

ITEC  
Bangkok • Thailand

[www.wire-southeastasia.com](http://www.wire-southeastasia.com)



WIRE SOUTH AMERICA  
Brazil. São Paulo

2015.10.06-10.08  
Booth No. 711



INDIVIDUAL DRIVE MOTOR  
TYPE OF ROD BREAK  
DOWN M/C



STD-630HTS  
DOUBLE TWISTER



INTERMEDIATE WIRE  
DRAWING M/C



FINE WIRE DRAWING M/C  
WITH CONTINUOUS  
ANNEALING M/C



ROD BREAK  
DOWN M/C



TANDEM TYPE  
SINGLE TWIST STRANDER



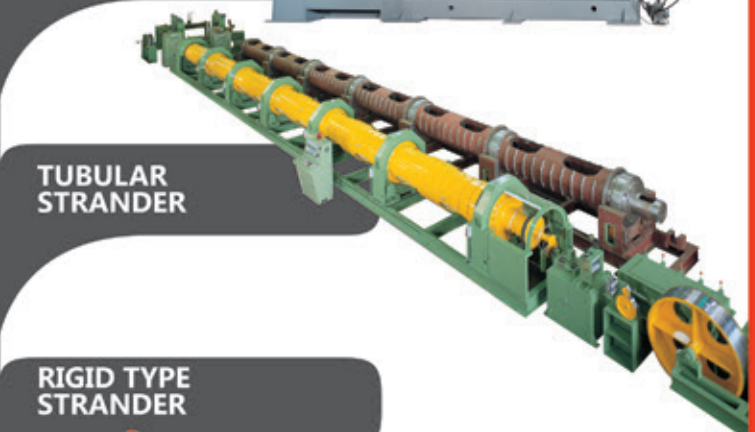
DOUBLE TWIST



EXTRUDER



TUBULAR  
STRANDER



RIGID TYPE  
STRANDER

# mobac High Quality Products for Wire and Cable Applications

**Payoff with dancer accumulator  
and double pivot to pre-load**



tension adjustment  
by magnetic particle brake or hysteresis brake  
for spools Ø 560 - 800 mm

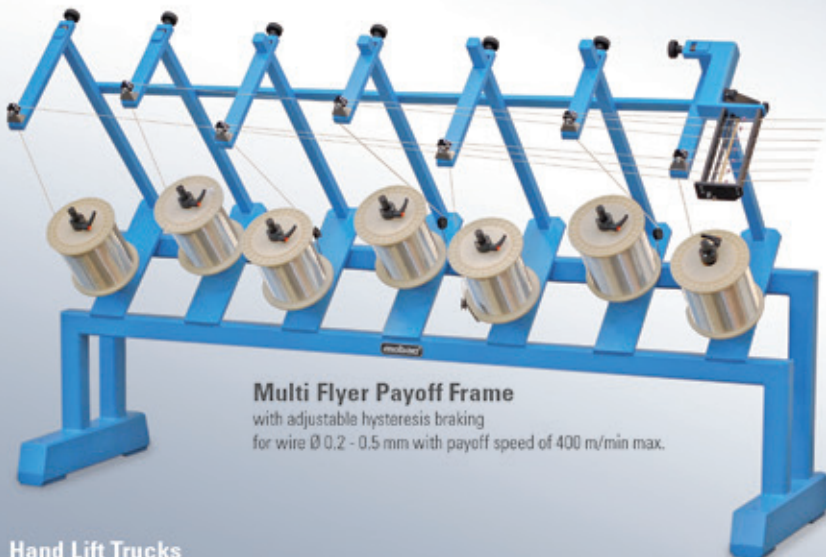
**Flyer Payoff  
with dancer accumulator**

for spools Ø 630 - 800 mm,  
for single- and multiwire,  
wire speed up to 400 m/min



**Driven  
Tangential Payoff**

with tension and rpm control  
for spools Ø 710- 780 mm,  
for single- and multiwire,  
wire speed up to 250 m/min

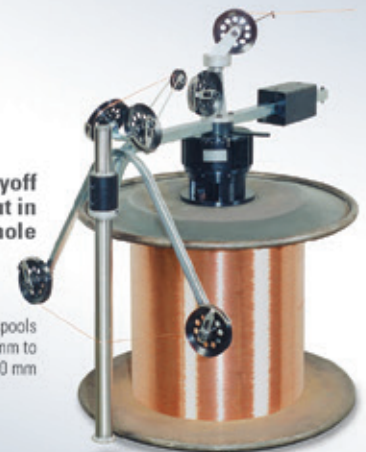


**Multi Flyer Payoff Frame**

with adjustable hysteresis braking  
for wire Ø 0.2 - 0.5 mm with payoff speed of 400 m/min max.

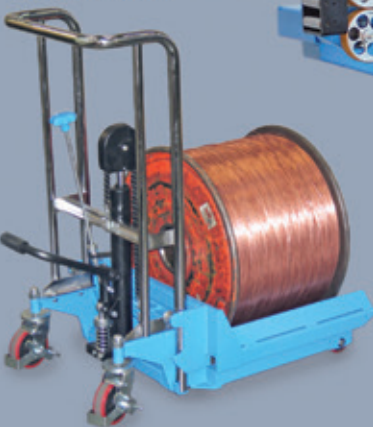
**Flyer Payoff  
to put in  
bobbin hole**

for spools  
Ø 500 mm to  
Ø 1250 mm



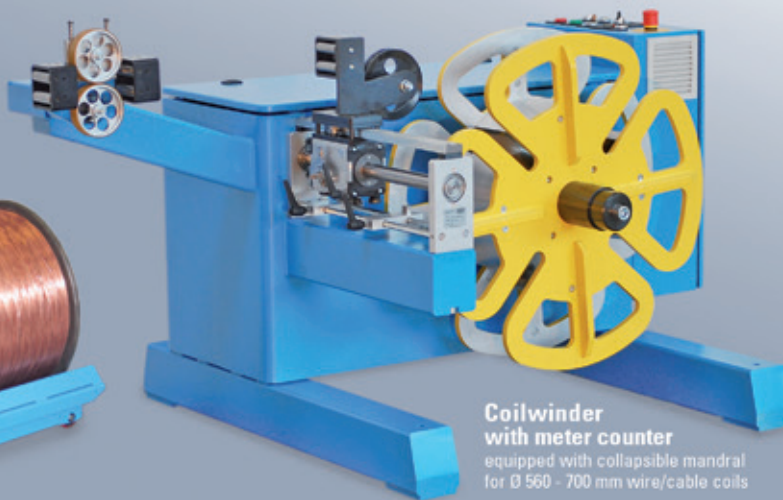
**Hand Lift Trucks**

for handling of spools up to  
Ø 630 mm and 800 kg of weight,  
different types available,  
to lift up bobbins  
directly from the floor



**Coilwinder  
with meter counter**

equipped with collapsible mandral  
for Ø 560 - 700 mm wire/cable coils



**Spooler** for spools Ø 60 - 200 mm,

available with one or two spool seats,  
with revolution counter to preset  
and automatic stop,  
with spool take up via adjustable pintle  
and follower tip  
available with mechanical or laser sensor  
controlled traverse unit



mobac GmbH  
Bunsenstr. 1 • 24145 Kiel • Germany  
Phone +49 (0)431-65 0277  
Fax +49 (0)431-65 05 11  
mobac@t-online.de

[www.mobac.de](http://www.mobac.de)

See our complete and  
extensive program range!

**mobac**<sup>®</sup>  
**GMBH-KIEL**

# »First class cables are the benchmark!«

Holger Lieder  
Sales Director SIKORA AG



## Online quality assurance of cables

The X-RAY 6000 PRO from SIKORA is a sophisticated system for continuous process control and online quality supervision in jacketing and insulating lines.

### Your benefits:

- Reduced start-up times by an online measurement of wall thickness, eccentricity, diameter and ovality of single and multi-layer cables
- Optimum wall thickness and material consumption
- Increased productivity and cost saving
- No start-up scrap
- Process stability
- Reliability with no need for calibration



**SIKORA**  
Technology To Perfection

See us at wire/tube Southeast Asia, September 16-18, Bangkok, Booth J25



\*US\$33 purchase only  
 Front cover: Aeroel  
 See page 103 for further details

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

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

**INTRAS OFFICES**

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

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

**US copies only:**  
 EUROWIRE (ISSN No: 1463-2483, USPS No: 022-738)  
 is published bi-monthly  
 by Intras Ltd and distributed in the USA by  
 Asendia USA, 17B S Middlesex Ave, Monroe NJ 08831.  
 Periodicals postage paid at New Brunswick, NJ and additional mailing offices.  
 POSTMASTER: send address changes to  
 Eurowire, 17B S Middlesex Ave, Monroe NJ 08831

**www.read-eurowire.com**

© 2015 Intras Ltd, UK  
 ISSN 1463-2438



When you have finished with this magazine please recycle it recycle

# Hectic exhibition schedule ahead

Exhibitions and conferences seem to come thick and fast this time of year.

On the Orient there is wire Southeast Asia in September in Bangkok, Thailand, while there is a Transatlantic shift a month later with wire South America and IWCS, both of which feature in this new issue.

Our coverage of IWCS, which this year is in Atlanta, Georgia, USA, gets underway on page 54. Another notable change with this conference and exhibition is that it is being staged in October – the first time in its 64-year history that it hasn't been held in November.

Events in São Paulo, Brazil, receive our attention from page 56 onwards. Run along with Tubotech and attracting some 15,000 visitors two years ago, wire South America is expected to grow rapidly, seemingly in tandem with the economic fortunes of the country.

Details of wire Southeast Asia can be found in the September issue of our sister publication, *Wire & Cable ASIA*.

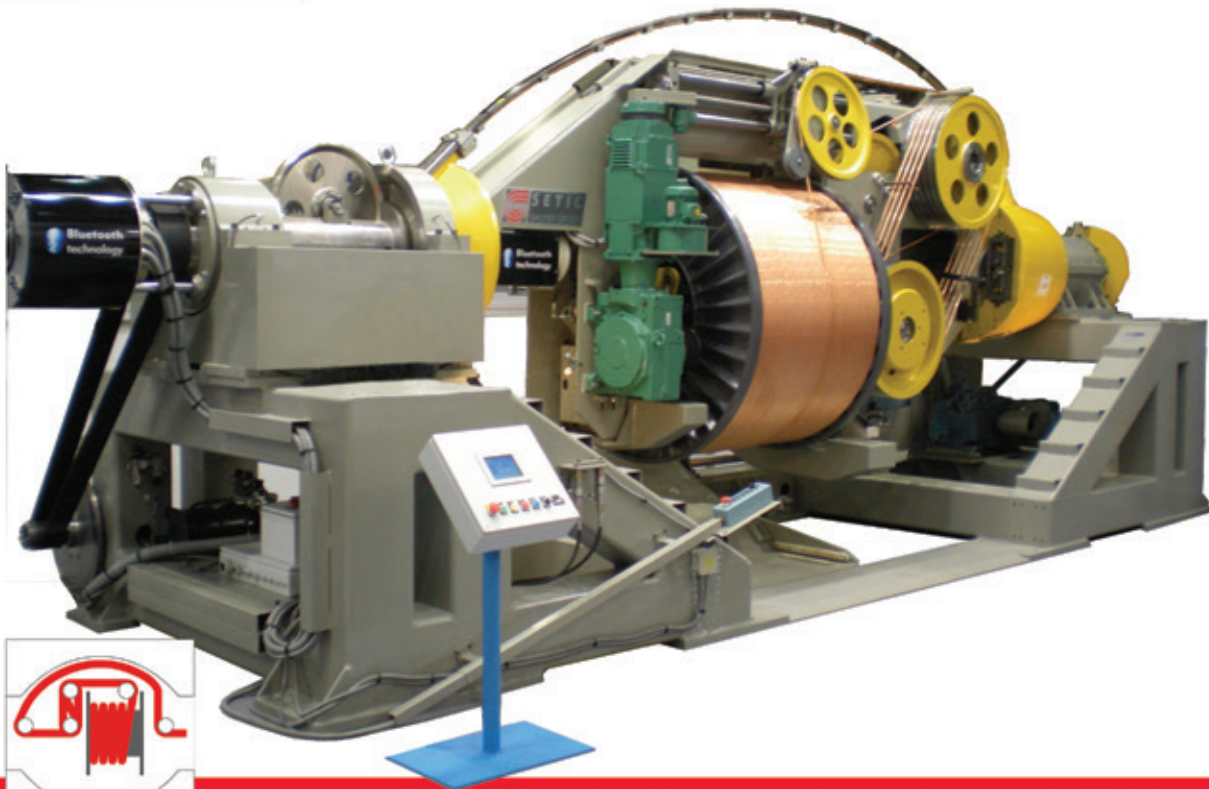
There is also news from wire Russia. Staged in Moscow in June, and defying an unfavourable economic climate in the country, the exhibition drew more than 200 exhibitors and a good sprinkling of visitors ensured another success at the Expocentre. Full details can be found on page 25.

There is also good news for cable quality standards worldwide with BASEC (British Approvals Service for Cables) now providing low and medium voltage cable testing to all International Electrotechnical Commission standards.

BASEC also recently received accreditation for its testing facility at one of the highest levels of recognised quality for any testing or calibration laboratory. The full story is on page 15.



David Bell  
 Editor

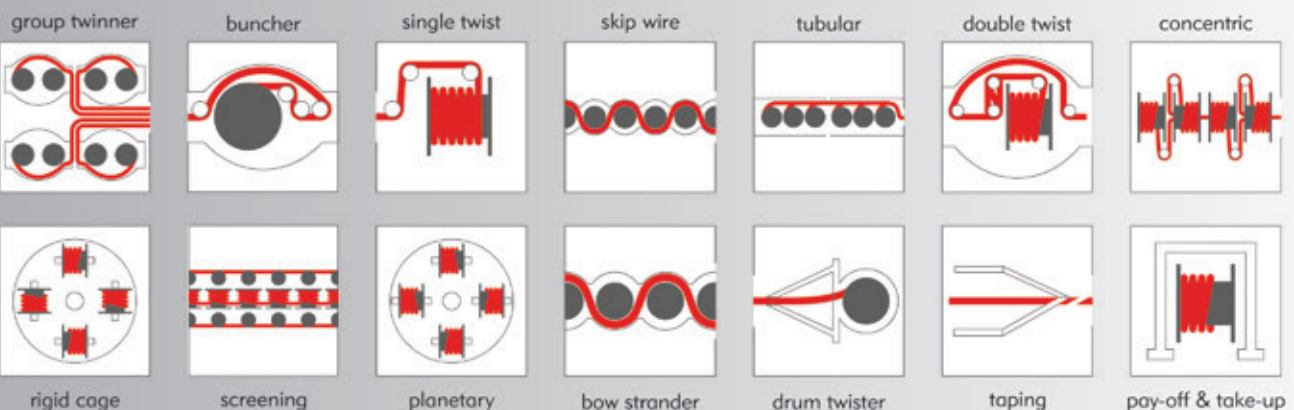


## SETIC Large Double Twist Stranders



Feel safe, go for Quality

All the machinery You need is here :



Visit us at :

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

Meet us at :

H36  
Bangkok  
Sep. 16-18



1006  
São Paulo  
Oct. 6-8



POURTIER France  
Tel. : +33 1 64 21 84 00  
pourtier@gaudergroup.com

SETIC France  
Tel. : +33 4 77 23 25 55  
setic@gaudergroup.com

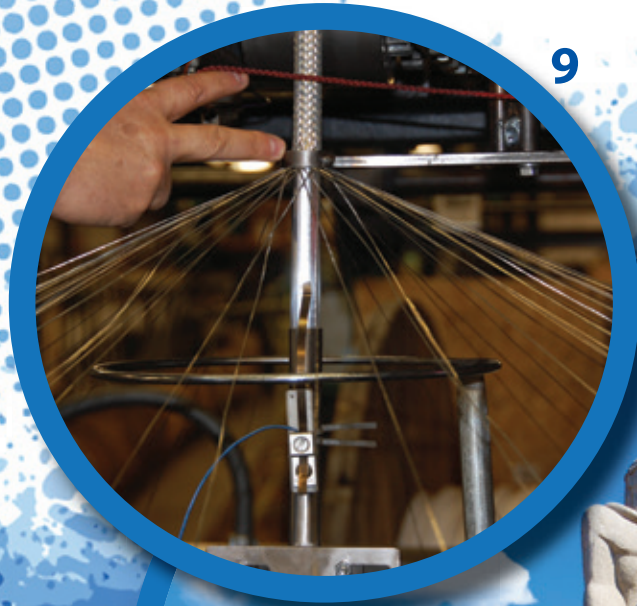
POURTIER & SETIC of America  
Tel. : +1 336 856 8176  
pourtier.setic.america@gaudergroup.com

# Contents

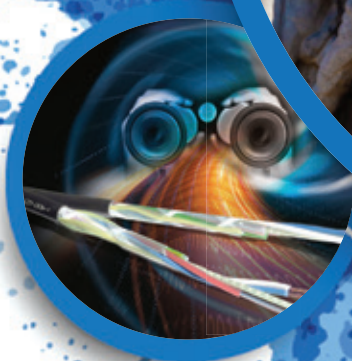
September 2015

## Regulars

- 8** Diary of events
- 9** Corporate News
- 30** Transatlantic Cable
- 34** Technology News
- 54** IWCS
- 56** wire South America 2015
- 103** Editorial Index
- 103** Advertisers' Index



9



34



56



### Deutsch Inhalt

- 76** Neuigkeiten
- 103** Inserentenverzeichnis

### Содержание на русском языке

- 81** Новости рынка
- 103** Перечень рекламодателей



## Technical Articles

### **73** Standardisation of PV wires and cables 2001-2014

By Faruk Yeginsoy, Leoni Struder AG

### **78** Standardisierung von PV-Leitungen und -Kabeln 2001-2014

von Faruk Yeginsoy, Leoni Struder AG

### **83** Стандартизация фотоэлектрических проводов и кабелей 2001-2014

Faruk Yeginsoy, Leoni Struder AG

### **89** Standardisation des fils et des câbles photovoltaïques 2001-2014

Par Faruk Yeginsoy, Leoni Struder AG

### **95** Standardizzazione dei fili e dei cavi fotovoltaici 2001-2014

A cura di Faruk Yeginsoy, Leoni Struder AG

### **100** Normalización de alambres y cables fotovoltaicos 2001-2014

Por Faruk Yeginsoy, Leoni Struder AG

## Next Issue

### Getting Technical:

Fire Risk and Safety  
Philosophy in Indoor  
Cabling

## Subscribe Now!



Visit us online at:

[www.read-eurowire.com](http://www.read-eurowire.com)



## Sommaire Français

**87** Nouvelles du Marché

**103** Index des Annonceurs

## Indice Italiano

**93** Notizie del Mercato

**103** Indice degli Inserzionisti

## Indice Español

**98** Noticias de Mercado

**103** Índice de Anunciadores

5-8 October:

**IWCS Technical Symposium –  
conference and exhibition –  
Atlanta, Georgia, USA**

**Organisers:** IWCS

**Tel:** +1 717 993 9500

**Email:** phudak@iwcs.org

**Website:** www.iwcs.org

### 2015

#### October

5-10 October:

**EMO** – trade exhibition – Milan, Italy

**Organisers:**

EFIM-ENTE Fiere Italiane Macchine

**Fax:** +39 226 255 882

**Email:** info@emo-milano.com

**Website:** www.emo-milano.com

6-8 October:

**wire South America** – trade exhibition – São Paulo, Brazil

**Organisers:**

Messe Düsseldorf GmbH

**Fax:** +49 211 4560 668

**Email:** info@wire-south-america.com

**Website:**

www.wire-south-america.com

#### November

3 November:

**Cabwire Conference** – conference – Düsseldorf, Germany

**Organisers:**

IWMA, WAI, ACIMAF, CET IWCEA

**Fax:** +44 121 781 7404

**Email:** info@iwma.org

**Website:** www.cabwire.com

### 2016

#### April

4-8 April:

**wire/Tube Düsseldorf** – trade exhibition – Düsseldorf, Germany

**Organisers:** Messe Düsseldorf GmbH

**Fax:** +49 211 45 60668

**Email:** wire@messe-duesseldorf.de

**Website:** www.wire.de

#### May

11-14 May:

**Lamiera** – trade exhibition – Bologna, Italy

**Organisers:** Ucimu-Systems

**Fax:** +39 0226 255 894

**Email:** lamiera.esp@ucimu.it

**Website:** www.lamiera.net

#### June

8-9 June:

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

**Organisers:** Wire Association International

**Fax:** +1 203 453 8384

**Email:** sales@wirenet.org

**Website:** www.wirenet.org

#### September

26-29 September:

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

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

**Fax:** +86 216 169 8301

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

**Website:** www.wirechina.net



**SUPERMAC INDUSTRIES (INDIA) LTD**  
AN ISO 9001 CERTIFIED COMPANY

## OUR PRODUCT RANGE

- Insulation Line and Sheathing Line for House Wiring & Control Cables
- Insulation Line and Sheathing Line for Power Cables
- Triple Extrusion Line for SIOPLAS (XLPE) Cable
- CCV Line for LV/MV Power Cables upto 132 KVA
- Extruders
- Cross- Head
- Haul-Off Caterpillar
- Capstan
- Take-up and Pay-Off



**PIONEERING INNOVATIVE TECHNOLOGIES AND SYSTEMS  
FOR CABLE INDUSTRIES.**



A NAME THAT'S SYNONYMOUS WITH

**CABLES**  
THE WORLD OVER

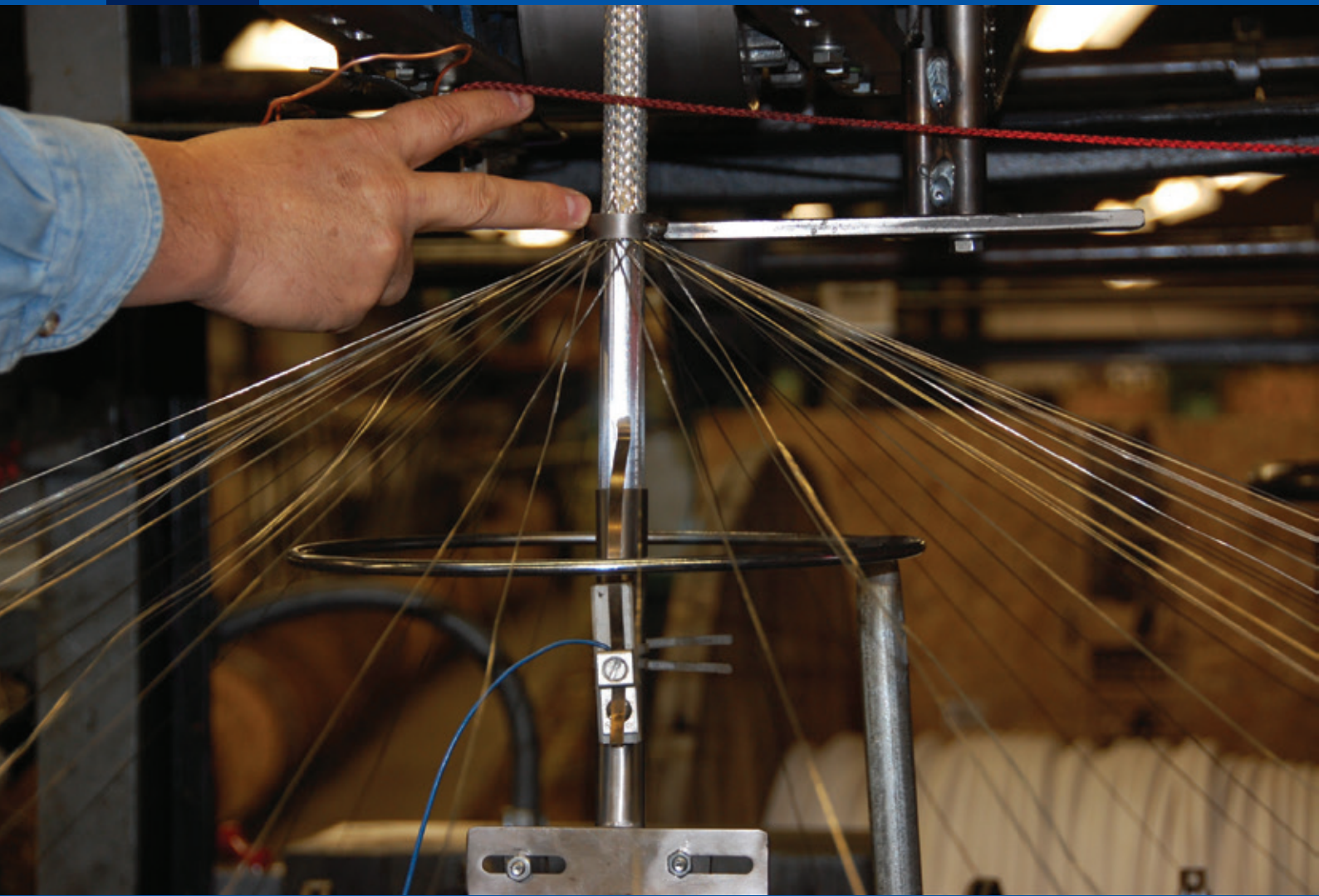
### Head Office

A-29, Naraina Industrial Area, Phase-1, New Delhi-110028, India  
Phone.: +91-11-25896041, 25896042, Fax No.: +91-11-25798674  
E-mail.: office@supermacindia.com

### Works

Plot No 2 Sector 6, IMT Manesar, Gurgaon Haryana, India  
Tel.No.: +91-124-4690500, Fax No.: +91-124-4690501  
E-mail.: jasvinder@supermacindia.com

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



▲ *Increased capacity and faster turnaround*

## Gladding acquires Eaton braiding assets

GLADDING Braided Products, a New York state wire braid manufacturer and braided shielding provider, has acquired the braiding equipment assets of Eaton Filtration LLC's Belgium braiding operations.

This acquisition expands Gladding's capabilities for shielding wire over larger cables.

Its expanding technology is now used on cables servicing oil, natural gas, electric utility, and submersible oceanic installations.

Besides its own products, the Belgium equipment will expand Gladding's capacity for overbraid shielding (of wire and textile fibres) via its sub-contact braided shielding operations, doing the work for other cable companies.

As more companies choose to "out-source" their braided shielding (copper, steel, bronze) to Gladding's New York state

factory, the company's added capacity will assure faster turn-around times and added capacity.

"With this acquisition," explained Gladding's president, D H Sparky Christakos, "Gladding is prepared to further sub-contract for others in the cable industry.

"Cable manufacturers are recognising that outsourcing their braid work to Gladding saves labour, time, space and manpower. Turn-around time is critical, and this additional equipment from Belgium gives us capacity to offer a one-week turnaround, if needed."

The Eaton machinery has been installed in Gladding's main plant, a 100,000ft<sup>2</sup> braiding facility in Chenango County, near Syracuse, New York.

**Gladding Braided Products – USA**  
**Website:** [www.gladdingbraid.com](http://www.gladdingbraid.com)

## Customised solutions for all

FLYMCA is offering its customers all types of customised solutions to their stranding and cabling requirements.

The company combines the expertise and experience of its staff, along with 3D designs and finite elements analysis, as well as modern machinery for parts fabrication and testing equipment. Investment is increased each year in order to deliver higher quality at competitive prices.

Many things have happened in the three years since the inauguration of Flymca's new manufacturing facilities, including:

- The growth of Flymca's production capacity and turnover increased by an additional 30 per cent every year
- The company has been able to manage the 90 per cent of its own production by itself, investing in new machinery, designing through new procedures as well as educating its own specialists in new and modern techniques
- There has been a 15 per cent growth in the traditional cabling and stranding machines that the company manufactures, as well as a growth of over 55 per cent in special machines
- The power field accounts for more than 70 per cent of the company's production
- 2015 shows a strong increase in the manufacturing of machinery for steel ropes

Sister company Flyro deals with all types of used machinery for the production of electric wires and cables, as well as steel wires and ropes, giving customers additional solutions to requirements or projects.



▲ Flymca has seen an increase in production capacity and turnover

Machines can be sold 'as is', checked or reconditioned.

Combinations of used and new machines can be achieved.

**Flymca and Flyro – Spain**

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

**Website:** [www.flyro.es](http://www.flyro.es)



### Aluminium Foil Laminated PET Film

Material: AL/PET, APL/PE ,Foil Free Edge Tape

Color: silver/ blue / gold Width: 5mm-1000mm

Packing: around 2.5kg/reel Type: Insulation Film



**ANBAO QINHUANGDAO INTERNATIONAL CORP.**

Add: No.33 Qinhuangxi Street, Qinhuangdao, P.R.China, 066000

Tel: +86-335-3893600

Fax: +86-335-3870760

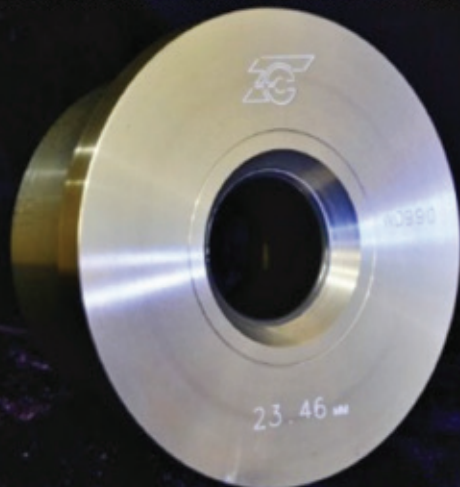
Email: [anbao@anbao.net](mailto:anbao@anbao.net)

Website: [www.anbao.net](http://www.anbao.net)

**GEEIGNET  
UM ALLE METALLDRÄHTE**

Wir verstehen alle Ihre Bedürfnisse

Wir erfüllen alle Ihre Anforderungen



**TEN CHEN DIAMOND  
INDUSTRY CO., LTD.**

Website: [www.tienchen.com.tw](http://www.tienchen.com.tw)

E-mail: [diamonddie@tienchen.com.tw](mailto:diamonddie@tienchen.com.tw) (English)

[tcdiamonddie@tienchen.com.tw](mailto:tcdiamonddie@tienchen.com.tw) (Deutsch)

Tel: +886 3 4853838 Fax: +886 3 4785333

## Developing and refining

Since 1969 Clifford Welding Systems has been developing and refining its range of mesh welding machines for the production of welded wire reinforcing mesh, welded wire fine mesh, welded wire mine mesh, welded wire fencing mesh and other welded wire mesh products.

Successfully manufacturing a machine that can produce these products efficiently and reliably is the result of many years of development and world-class engineering expertise.

An example of Clifford's capability and one of the most successful mesh welders is the quick-setup Engineering mesh welder. This machine can accommodate a wide range mesh spacings, commonly multiples of 2" and 3", without having to move any of the linewire or welding elements, resulting in no setup time for this portion of the machine, and a radically reduced change over time when switching products.

Businesses are now able to efficiently and cost effectively produce an order for a customer of a single panel of mesh, and some customers have reported being able to do up to 20 mesh style changeovers in a single shift.

Clifford has also been successful in the production of efficient and highly productive mine mesh welders. The most critical requirements of high quality mine mesh are a consistent and high strength weld and a dimensionally accurate piece of mesh in length width and squareness.

Achieving these high quality requirements on a consistent basis thousands of times a day is no small feat, and requires very precise and finely tuned machines. Clifford's mine mesh welders use an absolute positioning system and a double pullout system to ensure consistent accuracy and high levels of production efficiency.

In order to ensure the best quality weld with the highest weld strength Clifford uses a single point welding element narrow enough to include a single weldpress and transformer for each weld intersection; each element is controlled by a separate weld controller that utilises positive current feedback to accurately measure and adjust the current in each weld intersection. This ensures it can reliably produce a consistent weld quality, dramatically reducing costly re-work and product returns from customers.

Clifford's mesh welders are modular in design and can be equipped with many accessories, including manual and automated feeders for introducing the linewires into the welding portal, semi-automatic and fully automatic turning and stacking systems to remove the welded panels from the welder, mesh stack tying stations, bundle stacking systems, automated weighing stations, conveyor systems and tagging stations.

The company has, this year, opened new dedicated sales and service offices in the USA and Dubai, and appointed new distributors throughout Asia. The company is also in the final stages of development of some new revolutionary products.

**Clifford Welding Systems (Pty) Ltd – South Africa** Website: [www.cliffeng.com](http://www.cliffeng.com)

## New president and CEO for Davis-Standard

Davis-Standard LLC has appointed James Murphy as president and chief executive officer. Mr Murphy has been an integral part of Davis-Standard for more than 25 years, progressing through various leadership roles in sales and engineering management.

He is also one of the most respected and active leaders in the plastics industry, most recently serving as chairman of NPE 2015.

Prior to this promotion, Mr Murphy was a member of Davis-Standard's office of the president and responsible for leading the company's sales and marketing efforts.

In his new role, he will be supported by a strong leadership team in the United States, Europe and Asia.

"I am honoured by the opportunity to lead Davis-Standard and excited about our future," said Mr Murphy. "The Davis-Standard family is almost 900 strong and working around the clock to serve customers worldwide. We are a market leader with outstanding employees and industry partners. We will continue to work together to build stronger customer relationships, cutting edge technology, and superior service and support."

## Equipment still installed



▲ Northampton 1.8m double twist buncher, made in 1995

WIRE and Plastic Machinery has recently acquired wire and cable manufacturing equipment, which is still installed in the western USA. The equipment is being offered for immediate sale.

Highlights include:

- Northampton 1.8m (1995) and 1.25m (1994) double twist bunchers
- MGS 1.25m double twist buncher (1995)
- Syncro FX-13 rod breakdown machine 400HP DC, F annealer, 30" (760mm) dual spooler
- CWF rod breakdown 8mm–1.6mm, 13 die, F annealer, Bongard 1,050mm drop coiler (1999)
- 560mm (22") Watson 37-wire 6+12+18 rigid strander. AC vector motors and drives
- 560mm (22") Watson 61-wire, 6+12+18+24 rigid strander. AC vector motors and drives
- Two 4½" (114mm) Davis Standard 24L/D sheathing lines
- Two Skaltek MP-360 coiling lines
- 600mm Merritt Davis dual spooler

Others include 1.2m Edmands and 760/630mm Lesmo DT bunchers, 1.5m/1.8m MGS rewind line.

**Wire & Plastic Machinery Corp – USA**  
Website: [www.wireandplastic.com](http://www.wireandplastic.com)

Robert Geckle, a current member of Davis-Standard's board, will support the leadership team as chairman. Mr Geckle has been part of the board of directors for over a year and has significant executive experience with industrial companies and private equity. His most recent corporate position was as president of the Textron Fluid and Power Systems Group. Prior to that, he was president of Branson Ultrasonics, the market leader in plastic joining technology.

**Davis-Standard LLC – USA**  
Website: [www.davis-standard.com](http://www.davis-standard.com)

# Death of Roger Guillemette

ROGER Guillemette, until recently the chief executive of Guill Tool and Engineering Company, has died at the age of 81.

Mr Guillemette, of Narragansett, Rhode Island, USA, graduated from Coventry High School and served as a machinist in the US Army, 600<sup>th</sup> Engineering Aviation Maintenance Co. He was stationed in Korea and Mineral Wells, Texas.

He and his wife Claudette raised their four children in the village of Phenix, Rhode Island.

An entrepreneur, he established several businesses throughout his lifetime, creating long-term steady employment opportunities for many people. Guill Tool & Engineering Company was established in 1962 and remains in operation today.

Mr Guillemette was always an inspiration to his employees and his passion for engineering quality products and customer solutions never waned.

He had been a fierce advocate for USA manufacturing on local and national levels, participating in many organisations as well as advocating for STEM education in the state of Rhode Island.



▲ Roger Guillemette

Professionally, he was SE MA Chapter past President of NTMA-RI and a long-time member of the Wire Association and Society of Plastic Engineers.

Guill Tool, as a result of Mr Guillemette's leadership and drive, remains active in the Rhode Island Manufacturers Association, National Association of Manufacturers, National Institute of Manufacturing Skills, the Rhode Island STEM Center and other local endeavours

for the betterment of the industry and community.

Memorial contributions may be made to The Johnny Cake Center of Peace Dale, 1231 Kingstown Road, Peace Dale, Rhode Island, USA 02879.

Visit [www.nardolillo.com](http://www.nardolillo.com) for online condolences.

**Guill Tool & Engineering – USA**  
**Website:** [www.guill.com](http://www.guill.com)

**EUROBEND**

**Innovation & History**

CORPORATE VIDEO

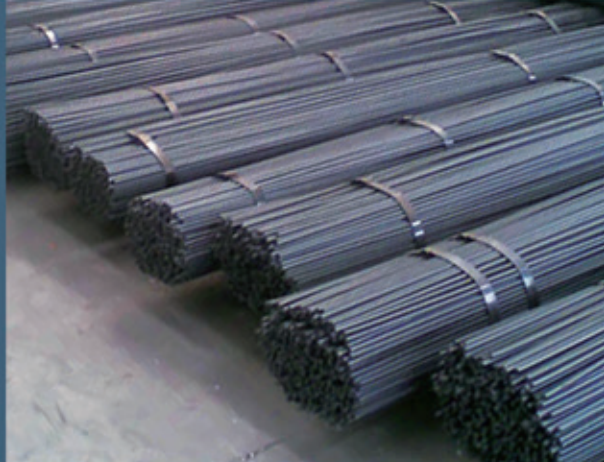
**The MELC Series of Single Line & Multi Line Straightening and Cutting machines:**

- Using our 4th generation Straightening Rotor with hyperbolic straightening rollers
- Rotation of the rotor results in spiral rotation of the rollers around the wire, thus achieving straightening and feeding simultaneously.
- Hyperbolic roller profile ensures full line and not point contact between roller and wire, minimizing wire marking and maximizing roller life.
- No frequent straightening adjustments required as in conventional straightening machines equipped with dies and regular rollers
- Flying shear cutter ensures uninterrupted operation
- Anti-twist twin-roller system (patented) guaranteeing the torsion-free production of wires during the straightening process
- Machines ranges: Up to 50mm (SINGLE LINE MACHINE VERSIONS)  
Up to 12mm (MULTI LINE MACHINE VERSIONS)
- Constant straightening quality of 1/1000, regardless of material type (smooth, deformed, recessed, re-bar) and quality (high tensile, stainless steel, etc)
- Exceptional linear accuracies (±0.1mm)
- On multi line machines, each rotor operates independently from the others, processing the same or different wire diameter

**EUROBEND GmbH**  
Allersberger Str. 185, Geb. G-3, D-90461, Nürnberg, Germany  
Tel.: +49 911 9498980,  
e-mail: [sales@eurobend.com](mailto:sales@eurobend.com), [www.eurobend.com](http://www.eurobend.com)



**STIRRUP BENDER**



**New Factory 270,000 m<sup>2</sup>**



**TJK MACHINERY (Tianjin) CO., LTD.**

South Side of Huashi Rd., Beichen Dist.,  
Tianjin, China, 300409

Tel: +86-22-26993766

Fax: +86-22-86996265

Website: [www.tjkmachinery.com](http://www.tjkmachinery.com)

E-mail: [tjk@tjkmachinery.com](mailto:tjk@tjkmachinery.com)



## Testing to all international cable standards

THE British Approvals Service for Cables (BASEC) has announced it will now provide low and medium voltage cable testing to all International Electrotechnical Commission (IEC) cable standards.

It was a common misconception that BASEC only tested cable to British or European cable standards, however the testing and certification body serves reputable cable manufacturers and standards authorities across the world.

When selling cable product worldwide, cable manufacturers need to ensure the product is in accordance with the cable standards set by that country's regulator, which could be British, European or international standard requirements, and even private or sector standards.

Dr Jeremy Hodge, chief executive at BASEC, said: "As our service has become recognised in more territories, we have experienced an increase in the demand for testing to IEC cable standards and therefore we have expanded our cable testing scope to include all low and medium voltage IEC cable standards where previously this was limited to a few key types.

"The benefit to cable manufacturers is where they require multiple testing to cover British and European (BS EN) standards and IEC standards, we can test to both standards at the same time where this is permitted. We can then provide a double test report for one cable, and potentially award two certificates."

One of the most common IEC cable standards BASEC tests to is IEC 60502, which is cable intended for fixed installation indoors, outdoors, underground or in the presence of water.

When a certificate has been issued, a cable manufacturer can list the standards it has been awarded against the cable product it is selling.

In this instance, a cable manufacturer may describe its cable product to potential customers together with the equivalent British Standards it has achieved, for example: Low voltage power cables with XLPE insulation and PVC sheathing to IEC 60502-1, BS 5476, and BS 7889 or medium voltage power cables to IEC 60502-2 up to 18/30 (36) kV and to BS 6622 up to 19/33 (36) kV

"Our message to cable buyers is always



▲ Low and medium voltage cable testing at BASEC

specify a recognised standard and an independently approved cable, check the cable markings on delivery and before installation to ensure it meets the criteria for its intended use. If suspicious cable is found, contact BASEC or your local regulatory authority for advice," added Dr Hodge.

BASEC was recently awarded ISO/IEC 17025:2005 accreditation for its world-class cable testing laboratory based in the UK. This is one of the highest levels of recognised quality any testing or calibration laboratory can attain.

**BASEC – UK**  
**Website:** [www.basec.org.uk](http://www.basec.org.uk)



We focus on two things.

The other one is you.



**WE KNOW WIRE**

[www.metalwire.com](http://www.metalwire.com)  
Tel: +31 (0)77 398 5300

### DECALUB GREEN CLEANING TECHNOLOGIES FOCUS ON:

**Wire Cleaning**  
( for plating and high glossy finish )



**Wire Rod Lubrication**  
( for frictionless drawing )



**Rod Dry Preparation**  
( with no speed limit )



**DECALUB**

31, avenue de Condé  
77500 CHELLES, FRANCE  
E-mail: [info@decalub.com](mailto:info@decalub.com)  
Website: [www.decalub.com](http://www.decalub.com)

## Huber snaps up technology

HUBER Engineered Materials (HEM), a division of J M Huber Corporation, has acquired the Safire™ nitrogen and phosphorus halogen-free fire retardant technology from Floridienne Group and Catena Additives (a 100 per cent subsidiary of Floridienne).

Huber's goal is to take the patented Safire™ technology, integrate it within its existing halogen-free portfolio of flame-retardants and smoke suppressants, and rapidly develop a line of commercial products.

"The addition of the Safire technology is another exciting step in the on-going growth of Huber's Fire Retardant Additive business, as we continue to strengthen our array of halogen-free flame retardant offerings," said Jerry Bertram, vice president and general manager of Huber's Fire Retardant Additives business unit.

"This acquisition gives Huber the opportunity to work in a new category with nitrogen and phosphorus flame retardants, and we believe the synergistic benefits and value between Safire and many of our current products will be advantageous for customers."

The Safire™ technology addition marks the third acquisition over the past five years for Huber's growing Fire Retardant Additives business, following the 2012 purchase of the speciality hydrate flame retardant business from Almatris and the 2010 acquisition of the Kemgard® flame retardant and smoke suppressant business from Sherwin-Williams.

"We look forward to working with companies who've expressed

an interest in the Safire technology along with introducing it to those who aren't as familiar with it," added Mr Bertram. "Our plan is to develop a full complement of halogen-free products that meet the most demanding fire retardant requirements our customers are facing."

HEM has been a trusted supplier of non-halogen flame retardants and smoke suppressants for more than 30 years. It produces value-added alumina trihydrate (ATH), magnesium hydroxide (MDH) and engineered molybdate-based compounds, and provides technical expertise for a variety of thermoplastic, thermoset plastic and rubber end-use applications, including fibre-reinforced plastics, roofing, silicone rubber, wire and cable, coatings and carpet backing.

**Huber Engineered Materials – USA**  
**Website:** [www.hubermaterials.com](http://www.hubermaterials.com)

## Satisfaction guaranteed

In the first quarter of 2015 Madem Brazil conducted a customer satisfaction survey with 86 wire and cable manufacturing customers in 21 countries.

The company received 56 (65%) responses from customers polled in four categories: bad, regular, good and very good. 99.4% of responses fell into good and very good categories.

**Madem Reels – Brazil**  
**Website:** [www.madem.com.br](http://www.madem.com.br)

## PTFE Coaxial taping machine

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

*10% up of speed for the braiding machine*  
GSB-1A: 165r.p.m.  
GSB-2: 110r.p.m.



*Please contact us for more details about our machines:*

- GSB series high speed braider*
- GSB-Z series heavy braider*
- WGSB series horizontal heavy braider*
- LRBJ series vertical taping machine*
- WRBJ series horizontal taping machine line*
- Extruding line*
- Pay-off and take-up*



**上海南洋电器器材有限公司**  
SHANGHAI NANYANG ELECTRICAL EQUIPMENT CO., LTD.

Address : No.110, Luda Road, Pudong New Area, Shanghai, China  
Tel : 0086-21-33896307, 0086-21-33896308 Fax : 0086-21-33896305  
E-mail : [sales@shanghai-nanyang.com](mailto:sales@shanghai-nanyang.com) [sales@shanghai-nanyang.sina.net](mailto:sales@shanghai-nanyang.sina.net)  
Contact person : Stephen Chen



## FAST AND RELIABLE, YET SIMPLE



Meet us there!

Rosendahl's new, enhanced RL-R Secondary Coating Line is outstandingly reliable.

Manufacture at high speeds and with high reproducibility. Benefit from flexible product manufacture, easy operation handling, robust line configuration and a small footprint - day after day.

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



## Double quality accreditation success

ONE of the UK's leading manufacturers of round and profile wires has been awarded two quality accreditations to reinforce its commitment to health and safety and environmental best practice.

Alloy Wire, which employs 25 people across its factories in the West Midlands and Yorkshire, took just six months to work towards and secure OHSAS 18001 and ISO 14001 and now plans to use the approvals to win new work across the nuclear, aerospace, spring, defence and oil and gas sectors.

The firm is already enjoying a host of operational benefits as a result of its two commitments, including minimising risk of production delays and downtime through accidents and gaining significant cost savings in waste, recycling and energy consumption.

Mark Venables, managing director, said: "These quality accreditations epitomise our desire for continuous improvement, efficient risk assessment and extensive training for all of our staff.

"The fact we were awarded so quickly shows that most of our internal processes were already working and we hope that this news will provide further assurances to our global client base that they work with a company that cares about safety and wire production that is as environmentally friendly as it can be."

He added: "It's also been a commercial



▲ The Alloy Wire team celebrates receiving the quality accreditations

decision to make us even more competitive and, increasingly, some customers are demanding you meet environmental targets in order to be just included in a tender."

Alloy Wire is a manufacturer of precision drawn round wire, flat wire and shaped wire in a comprehensive range of high performance and exotic nickel alloys.

The company supplies wire from 0.025mm

(0.001") to 21mm (0.827") and currently works with 4,000 customers in 15 sectors.

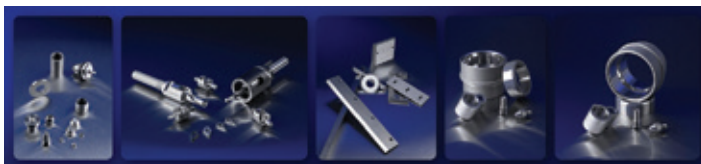
Its extensive stockholding of materials, ability to provide small batch quantities and three-week lead times has helped it establish a global reputation that sees Alloy Wire products sent to more than 45 countries across the world.

**Alloy Wire Ltd – UK**  
**Website:** [www.alloywire.com](http://www.alloywire.com)

## Crafts' unique ability

Many of the world's largest wire and cable producers trust Crafts Technology because of its ability to provide innovative solutions to severe wear and corrosion problems.

For more than 20 years, the company has produced precision wire annealer rings, made from tungsten carbide, and users of these specialised rings have experience greatly extended wear life in comparison to other hardened materials.



▲ The range of products on offer from Crafts Technology

The unique material characteristics of solid tungsten carbide wire annealer rings not only provide for exceptional wear life but also contribute to the production of a higher quality wire with exceptional signal characteristics.

Crafts Technology understands how to create an ultra-hard material solution that can help users increase part quality and reduce production equipment downtime, giving the company a competitive advantage. It is not uncommon for users of tungsten carbide wear parts to increase service life by a factor of ten to 100 times that of hardened steel, which provides users with maximum equipment up-time and productivity.

**Crafts Technology – USA**

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

## Helping cut costs

CILS prints barcodes, serial numbers and batch numbers, providing immediate, custom-printed durable labels for all industrial applications.

The company manufactures high performance 'ready-to-apply' barcode and 'variable data' labels with a range of over 3,500 application-specific durable label material/adhesive combinations, resistant to the harshest industrial conditions including extreme temperatures (+388°C), chemicals/solvents, abrasion, oil/fuels, etc. Labels are constructed to any size, shape and colour, and can be pre-printed with corporate designs.

**CILS – UK**  
**Website:** [www.cils-international.com](http://www.cils-international.com)

## Prakab uses CableERP and CableBuilder

PRAKAB Průzká Kabelovna (Prakab) has selected InnoVites CableERP and CableBuilder as its business solution.

CableERP is InnoVites' comprehensive ERP solution for the wire and cable industry on Microsoft Dynamics AX. CableBuilder is the leading cable design solution of Cimteq that fully integrates with CableERP.

For more than a year, the Prakab team evaluated available solutions in the market. They selected InnoVites, based on their industry expertise and the industry-focused solutions.

Based in the Czech Republic, Prakab is a member of the SKB Group and a leading cable manufacturer in the region.

Mr Krňák, CFO at Prakab, said: "The cable industry has unique requirements for its business solutions. These requirements are not covered by standard ERP systems. That's why our old system has been heavily customised to support our processes. We were excited when we learned more about InnoVites CableERP. It addresses the key issues of our industry in sales, logistics, planning, production and scheduling. The full integration with CableBuilder minimises product data maintenance. With InnoVites CableERP we have a complete and sustainable solution for the future."

InnoVites CableERP is based on Microsoft Dynamics AX, the innovative ERP solution with rich functionality that helps enterprises benefit from modern technology. InnoVites complements AX with functionality that is focused on the wire and cable industry.



▲ Cable solutions from InnoVites

The InnoVites solution helps customers to:

- Improve customer satisfaction by meeting their cable requirements better and faster
- Reduce working capital and material losses by optimising for length in logistics and production
- Become more agile with reliable product data available online throughout the company
- Become smarter with a best-of-breed IT solution that understands the cable industry
- Reduce risk of price volatility with a comprehensive non-ferrous metals module

**InnoVites BV – Netherlands** Website: [www.innovites.com](http://www.innovites.com)

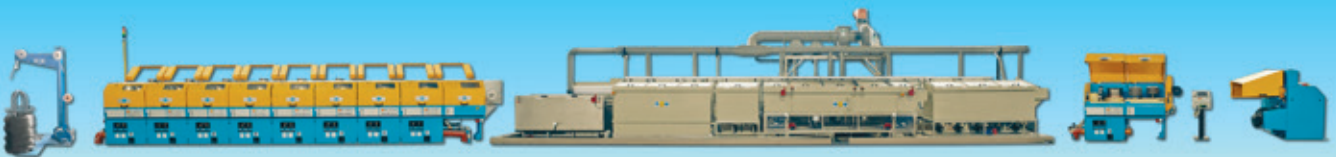


**Lämneå Bruk AB**  
A passion for service.

[www.lamnea.se](http://www.lamnea.se)

### Welding Wire Production Line

High Productivity, Most Profitable and Superior Quality



The complete solution for welding wire made by the Swedish Experts



Learn more and visit us: Booth F17  
16 - 18 September 2015

# JCDOFAMA

## 杰创·东方



- ◆ Copper & Copper Scrap CCR Line
- ◆ Aluminium Alloy Rod CCR Line
- ◆ Copper Rod Upward Casting Line
- ◆ Copper & Alloy Rod Cold Rolling Mill

- ◆ Continuous Lead Sheathing Extruder
- ◆ Continuous Extrusion Machinery
- ◆ Copper Rod Breakdown Machine
- ◆ Aluminium & Alloy Rod Breakdown Machine

- ◆ Resistance Annealer
- ◆ Dual Spooler
- ◆ Medium Wire drawing Machine
- ◆ Multiwire Drawing Machine



**德阳杰创线缆机械有限责任公司**  
**Deyang Jiechuang Wire & Cable Machinery Co., Ltd.**  
 No.6 South Helanshan Road, Tianyuan, Deyang, Sichuan 618019, China  
 Tel: +86-838-2802628, 2823685 Fax: +86-838-2800877  
 website: www.jcdofama.com e-mail: jcdofama@163.com

## 'Fantastic' start for Cimteq

THE first part of 2015 has seen cable and design manufacturing company Cimteq get off to a fantastic start.

With multiple new business wins under its belt it is easy to see why this rapidly growing company is quickly becoming a leading producer of cable manufacturing technology around the globe.

With large companies such as Datwyler, Northwire and Habia adopting the products during the first quarter of 2015, the company is enabling cable manufacturing to become a much more efficient and profitable industry to operate in.

The benefits that Cimteq's products deliver in terms of streamlining the pricing and costing process are excellent, and that is just one of the strings to the extremely comprehensive bow that is the Cimteq offering.

Amongst its activities this year the company has provided a bespoke solution for EIS Wire and Cable. The Massachusetts, USA-based company went to Cimteq looking to replace an existing, out-of-date system with a platform that would allow them more functionality whilst streamlining their existing systems into a single operating entity. Cimteq's CableBuilder software offered the perfect solution allowing EIS to service its customers more efficiently whilst still delivering its exacting standards of quality.

"Selecting CableBuilder was an excellent decision. Cimteq's knowledge and ability to adapt the software to our own processes, systems and methods of working was impressive; they supported us throughout the whole implementation period and did an excellent job. We are more than satisfied with the results so far and are looking forward to experiencing the effect CableBuilder will have on



▲ This year's Interwire has helped Cimteq to a busy start to 2015

our company in the months and years to come," said Richard M Goyette, engineering and quality manager, EIS.

In addition the speciality wire and cable manufacturer Nuhas Oman has recently started using CableBuilder to aid it in product design and manufacturing, particularly in relation to power cables.

The Middle Eastern-based company was attracted to CableBuilder for its ability to automate many steps of its design and costing procedure. The platform can be seamlessly integrated with existing systems, ensuring minimum disruption to production.

Further deals with Habia, located in Sweden and across Datwyler's Chinese, Swiss and Czech Republic plants, have also been agreed. Both projects will allow Cimteq to transform the productivity, efficiency and, as a direct result, profitability of both businesses.

Habia will see a complete change in the way it works in terms of design and quotations with several outdated systems being replaced by two streamlined, completely compatible and integrated

systems. Cimteq is extremely enthusiastic about this new installation and looks forward to assisting Habia during the year.

It can be argued that Cimteq is one of the players to watch in the industry, a conclusion that Simon Gainey, business development manager at Cimteq, will not be refuting.

"The start to 2015 has been a fantastic one. With the versatility offered by CableBuilder and CableMES we have aided a great many companies to revolutionise their systems. It truly is very satisfying to help a company to reduce their costs and increase profitability whilst also ensuring that quality and accuracy of product are maximised.

"We are already beginning to see how powerful word of mouth is with several enquiries coming about as a result of referrals. Our products speak for themselves and we are very excited to see what the rest of the year brings. The cable industry is certainly an interesting environment to be operating in right now."

**Cimteq Ltd – UK**  
**Website:** [www.cimteq.com](http://www.cimteq.com)



## Strengthening its position

NUMALLIANCE has purchased EMS (Electro Mécanique Saverne).

EMS specialises in the design and production of machines for chipless end-forming and rotary and blade cutting machines for tubes.

With this new acquisition Numalliance extends its offering in tube processing for various industries. The solutions offered by the company are used for automotive (seating frames, exhaust), point of purchase (supermarket carts, display shelves), furniture, agriculture applications and more.

Numalliance was formed by a merger of three companies: Mascoft, Latour and Satime, of which the oldest boasts over 140 years of experience. The strength of the company mainly lies in its expertise in mechatronic: the hybridisation of mechanics and the in-house development of its user-friendly software, which enabled it to develop internationally recognised CNC machines.

In October 2013, Numalliance successfully integrated Silfax, an expert for tube

bending with a strong foothold in the aeronautics industry.

Established in 1949 near Strasbourg, France, EMS will benefit from the support of Numalliance's subsidiaries based in China, Germany, India, Mexico, USA and more recently Slovakia, and also by its international network of sales agents and sales engineers. With a global direct workforce of 225 and sales in excess of €45m, the company generates more than 92 per cent of its sales outside of France and 50 per cent outside Europe.

"With this acquisition, we keep extending our competences to offer our customers a global and fully integrated answer to their needs with complementary and compatible products," said Joël Etienne, chief executive.

"The addition of EMS perfectly fits our company's dynamic motion and constant evolution. We set our business internal and external growth target high for the year to come," he added.

**Numalliance – France**  
**Website:** [www.numalliance.com](http://www.numalliance.com)

## Rebuilding and upgrading of wire and cable making machines

Queins Machines, Germany, uses its many years experience to rebuild and upgrade a wide range of wire and cable making machines.

Wearing parts such as bearings, belts, brakes, pneumatic- and/or hydraulic components are renewed, new electrical wiring and 'a must', completely new electrical controls, using the newest technology by adding energy efficient digital drives and modern PLC controls.

Further services comprise upgrading of machine performance, such as modification of stranding lines composition as well as a mixture of lines with new and pre-owned components, in order to guarantee highest output at reasonable costs.

**Queins Machines GmbH – Germany**  
**Website:** [www.queins.com](http://www.queins.com)



# YHM



## YUANCUT





**Copper Alloy Wire & Rods Manufacturer**

- Copper Alloy Wire
- Brass Wire
- Nickel Silver Wire
- Phosphor Bronze Wire
- Silicon Bronze Wire
- Free Cutting Brass Rod & Wire
- RoHS Brass Rod
- EDM Wire
- Copper Anode

**銅合金線棒  
專業製造廠**

- 銅合金線
- 黃銅線
- 洋白銅線
- 磷青銅線
- 矽青銅線
- 快削黃銅線棒
- 環保黃銅棒
- 放電加工用電極線
- 陽極銅球









**元祥金屬工業股份有限公司**  
**YUANG HSIAN METAL INDUSTRIAL CORP.**

台灣彰化市彰水路 175 號  
No. 175, Chang Shui Rd., Changhua City, Taiwan  
TEL: +886-4-761 3688 E-mail: [info@yhm.com.tw](mailto:info@yhm.com.tw)  
FAX: +886-4-761 2289 <http://www.yhm.com.tw>  
Skype: yhm7613688



# Borlink™ Technology: the energy to enable global industry



## Borlink™ LS4258DCE

Energy is the heartbeat of industry – it keeps lights shining, plants running and wheels turning. Borealis and Borouge, the world's leading providers of innovative, value creating plastics solutions for the wire and cable industry, help make sure that your facilities get the energy they need with our diverse cable applications spanning all voltage levels.

Our Borlink™ technology creates the innovation links that secure world-class, step-changing solutions that benefit the whole wire and cable value chain from energy generation to your factory. Borlink™ LS4258DCE and Borlink™ LS4201EHV, our latest HVDC and EHV innovations enabling more efficient electricity transmission at higher voltage levels, will help to build more interconnections and support further integration of renewable energies into the grid, bringing power to industry around the world.

**Borealis and Borouge – Bringing energy all around.**

## REELS AND DRUMS

Metal reels for wire and cable. Process and transport.



REEL FOR DRAWING AND STRANDING



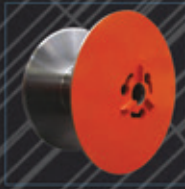
CABLE AND ROPE PROCESS REEL



CABLE AND ROPE PROCESS REEL



STRUCTURAL DRUM IN TUBULAR VERSION



MASSIVE REEL



REINFORCED DOUBLE FLANGE REEL

## HANDLING EQUIPMENT

All the necessary accessories for reels and coils handling.



ROLLING SYSTEM FOR DRUMS



TAKE APART REEL FOR COIL'S PRODUCTION



TILTING UNIT FOR REELS AND COILS



TILTING DEVICE FOR REELS



AUTOMATIC LIFTER FOR REELS



AUTOMATIC LIFTER FOR COILS



Sao Paulo / Brazil  
October 06-08, 2015  
Stand nr. 708

Headquarter & Production plant:  
GMP Slovakia s.r.o.,  
Pribenik - Slovakia

Companies of the group:  
GMP do Brasil Imp. Exp. Ltda,  
Jandira/SP - Brasil  
GMP Reels India Private Ltd,  
Nashik - India

sales@gmp-slovakia.com  
www.gmp-slovakia.com



▲ Top of Europe: Jungfrauoch, Switzerland

## Strong network on the Jungfrauoch

THE Jungfrauoch has been completely digitalised. It is one of the first tourist destinations to operate its entire information and communication technology over the Internet Protocol (All over IP), and this was made possible by a modern local data network.

For the networking of more than 5,000 connections, Jungfraubahnen chose an installation solution from Swiss cabling specialist R&M.

Part of the modernisation of the mountain station included the installation of a LAN at 3,454 metres above sea level. It integrates 100 telephone connections, 200 network access points for computers, live webcams and WLAN antennas as well as interfaces to the infrastructure of the trains, tunnels, ski lifts, chair lifts, restaurants and adventure worlds.

A new two-storey engineering room is used as HQ for the communication infrastructure. The individual buildings were connected with 20 network cabinets and Cat 6A copper cabling from the modular R&M freenet range. FO cabling from R&M serves as the backbone and link to the external telecommunication network.

Jungfraubahnen was looking for an ultra-efficient network to be able to further optimise the attraction of the destination in the age of digitalisation. The company wants to increase the number of visitors from 866,000 in 2014 to one million by 2022.

Tourists benefit from numerous multimedia presentations and full-coverage, stable cellular phone connections to three leading Swiss providers. A connection is even guaranteed in the railway tunnel.

This means guests can spontaneously send their impressions of the Alpine sensation to friends and family using their smartphone.

The data network gives the mountain station management the chance to organise control and manage tasks more efficiently.

**R & M – Switzerland**  
Website: [www.rdm.com](http://www.rdm.com)

## wire Russia defies economic climate

MAY saw the staging of wire Russia 2015 as the leading Russian trade fair for wire, cable and wire-processing industries at the Moscow exhibition centre Expocentre.

Defying the unfavourable economic climate in Russia, the organisers – Messe Düsseldorf and Messe Düsseldorf Moskau as well as their partner VNIIEP JSC (All Russian Cable Research and Development Institute) – continued to register high numbers of both national and international exhibitors at the trade fair.

To the tune of 200 exhibitors presented their product and service innovations for four days. This underscores how important this industry platform is for the Russian Federation. 2,500 experts from the wire, cable and wire-processing industries came to wire Russia, the all-encompassing B2B event in Moscow.

Werner M Dornscheidt, president and CEO of Messe Düsseldorf, assesses market opportunities with cautious optimism despite the tight political and economic situation: "Although the current situation is

anything but easy I am convinced the outlook for the wire and cable industries on the Russian market are positive in the long run. We have already overcome many global economic challenges.

"This has shown us that those standing their ground on the market even in difficult times are among the winners when business picks up again."

He added: "The fact that visiting trade fairs abroad has become more difficult for Russian experts benefits local events. We are satisfied with the number of visitors."

Exhibitors from 25 nations took part in wire Russia 2015 – including big names on the manufacturing side, small specialists, long-standing participants as well as first-time exhibitors.

Particularly well represented were suppliers from Germany, Italy and Austria. Joint corporate participations came from Germany, Austria, China and Italy.

Numerous international and national trade associations supported wire Russia: IWMA (International Wire & Machinery Association), IWCEA (International Wire and Cable Exhibitors Association), VDKM eV (German Wire and Cable Machine Manufacturers Association), VÖDKM (Austrian Wire and Cable Machine Manufacturers Association), IWCEA France (International Wire and Cable Exhibitors Association), WCISA (Wire and Cable Industry Suppliers Association), ACIMAF (Italian Wire Machinery Manufacturers Association) and SECRI (Shanghai Electric Cable Research Institute).



▲ Visitors to this year's wire Russia

Messe Düsseldorf GmbH – Germany

Website: [www.wire-russia.com](http://www.wire-russia.com)







WORLD LEADER IN TC TOOLS & MACHINES



MIG 100A



TCLD-GP

Our know-how for your efficiency since 1870

WIRE AND CABLE

[www.agir-technologies.com](http://www.agir-technologies.com)

FRANCE [contact@agir-technologies.com](mailto:contact@agir-technologies.com) Tel. +33 3 80 51 81 31

## Meeting the increasing pressure

AS the wire industry continues to globalise, there is increasing pressure on wire producers to remain profitable through process optimisation and product differentiation. Blachford is working to assist in this effort by offering wire drawers a unique and sustainable competitive advantage by leveraging its core competency – designing customer-specific lubricants and lubricant programmes – to achieve customers' goals.

Blachford has been supplying the world's top wire producers since the 1950s with cost-effective, meticulously researched, and innovative wire drawing lubricant programmes. These programmes are designed to meet the requirements of customers' processes and end product goals. Blachford does this by working closely with its customers to understand their processes and their goals.

It then develops new products and/or lubricant programmes that are tailored to each customer's specific requirements. Blachford's approach of working collaboratively with its customers, its in-field engineers and its R&D team requires higher focus, but also offers greater overall value.

Its processes, quality standards and R&D laboratories are fully ISO 9001 certified. Dr John Blachford, its owner, is well known throughout the chemical industry for his promotion of Responsible Care®, ensuring that his companies act as responsible corporate citizens. Blachford's people are committed to working with its customers to ensure both optimum product performance and responsible application.



▲ A proud history from Blachford

Whether working to develop products that impart specific finished wire characteristics, or to enable customers to produce more quality tons faster and less expensively, Blachford's combination of technically advanced products and customer-focused approach offers customers a competitive edge.

**Blachford Inc – USA**  
**Website:** [www.blachford.com](http://www.blachford.com)

## New dog, new tricks



## First Metalube lubrication academy

MANCHESTER, UK-based lubricants specialist Metalube welcomed guests from Europe, China, Turkey, Egypt and the UAE to its first ever lubrication academy recently.

The academy was designed to keep both distributors and agents abreast of new and existing product ranges as well as provide them with essential sales tools.

Douglas Hunt, commercial director, said: "We had a great couple of days and it's been really productive to have so many of our international team together.

"Product knowledge is an essential sales skill and fully understanding our products' features allows our representatives to present the benefits accurately and persuasively.

"We know that customers respond to enthusiastic sales staff who are passionate about their products and eager to share the benefits with them."

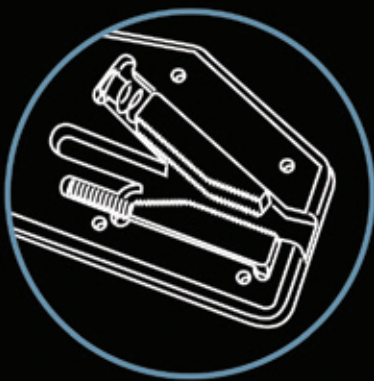
Metalube manufactures a range of industrial wire rope lubricants and many other high performance industrial lubricants. The exporter employs 34 people and has offices in China, India and Brazil.



▲ Staff and guests at the first ever Metalube academy

**Metalube Ltd – UK**

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



## Safety that works harder

The new Sjögren wire puller does more than look different: it makes a difference in the safety and productivity of your operation. No other puller does so much to improve spindle uptime.

**Design innovation built on shop floor insight: Sjögren builds productivity.**

[SJOGREN.COM](http://SJOGREN.COM)

**Sjögren®**

## Technology plays a vital role at Whitelegg

WHITELEGG Machines' CFM wire bending technology is playing a vital role in improved productivity for Multimesh, one of the UK's leading fabricators of stainless steel, welded wire mesh products.

Established in 1982, Multimesh (UK), a division of Harpscreen Manufacturing, has made its reputation through a creative and flexible response to its customers' needs with the capability to produce either short-run, tailor-made specials or lengthy production runs.

With its motto of 'Making Wire Work for You', the company's 30,000ft<sup>2</sup> St Helens facility with over 50 employees serves growing home and overseas markets.

Output includes medical decontamination baskets and containers where the qualities of stainless steel enable them to stand up to repeated autoclaving. For the catering industry, products include trolleys, frying baskets, racks and cooling trays – items that have to withstand high temperatures and intensive hygienic cleaning.

The aerospace industry market is served by Multimesh's wide range of ultrasonic decontamination baskets, used where vital components in 'clean room' conditions are treated prior to assembly. Agricultural, veterinary and equestrian are other important markets; the company makes threshing screen replacements for harvesters for home and export, pet transport cages and a variety of special tailor-made racks and grilles typically for equine transporters.

A considerable part of Multimesh's formed component output is from its



▲ Typical finished products

new Whitelegg CFM 850 2D wire bender with automatic butt-welding. Whitelegg has specialised in the development and manufacture of forming machines for over 50 years with sales worldwide. The latest CFM 50 series incorporates advanced software, new bend head operation and intuitive operator control.

This machine has specific additional features for processing stainless steel.

In-line chamfering combined with an argon gas application system produces a very strong butt weld with no flash, thus negating secondary operations. An additional bend head is supplied for very intricate or tight forming operations.

Prior to the installation of the machine, general manager Steve Watson had known of the CFM as he had been outsourcing pre-formed components from several suppliers who had their own machines.

Determined to have an in-house CFM, he contacted Whitelegg Machines who suggested a visit to an existing client to view an operational machine. This proved the clincher, and a CFM with automatic butt-welding was supplied.

The CFM brought immediate benefits to Multimesh's output, not least being the simplicity of operation, allowing staff to set the machine through easy-to-follow on-screen graphics.

The stainless coil feed wire passes through a three-roller feed to straighten the wire in both horizontal and vertical planes. This ensures consistent forming by the bend head and accurate butt-welding.

The CFM currently handles 304 and 316 grade stainless wire in 4mm and 6mm diameters. Typical output of a rectangular formed and welded component is 700 per hour.

The introduction of automation processes often results in manpower reduction, but not only has the CFM brought Multimesh substantially greater production but sales have also increased, as well as extra staff employed.

**Whitelegg Machines Ltd – UK**  
Website: [www.whitelegg.com](http://www.whitelegg.com)





▲ A wide range of springs from Leeco Spring International

### Springing into action


Leeco Spring International is a full service spring manufacturer that stocks a wide range of both compression springs and extension springs, but also has the capability to custom-make springs for almost any industry or application. The company has an experienced design and engineering staff that can assist with any custom application, and can also offer secondary services and load testing capabilities.

General products include compression springs, clock springs, conical springs, extension springs, flat springs, garter springs, instrument springs, leaf springs, motor springs, precision springs, torsion springs, variable rate springs, Belleville washers, cantilever beams, rings, stampings and wire forms. The company has more than 8,000 different designs of compression springs on the shelf, ready to ship.

**Leeco Spring International – USA**  
Website: [www.leecospring.com](http://www.leecospring.com)

Revolutionizing CNC Technology for Wire, Tube and Strip Forming Machinery



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






*Garantit la plus haute qualité  
First class quality*



1. Diamond and PCD dies
2. TC dies
3. Shaped dies
4. Guide tooling
5. Straighteners and straightening rolls
6. Enameling dies and Extrusion dies
7. Machinery
8. Consumables
9. Services

**Tel. +33 329360808**  
**mail@adc-sarl.fr** France




### Last Generation of SUPERSOL® Steelcord Drawing Lubricants


**SUPERSOL® TS 4000**

- Adapted to ST/UT Steelcord Drawability
- High and Robust Adhesion Performance

**Contact us:**  
produit.info@solvay.com  
www.solvay.com



Sawing wire



Steel cord for tire reinforcement



### NDT solutions for flaw detection

*Complete tube  
and bar inspection  
by Eddy Current/  
Ultrasonic*



**RotoUTscan:**  
RotoUTscan are ultrasonic rotating heads designed for tubes and bars flaws detection at high speeds for:

- longitudinal defect detection
- transversal defect detection
- thickness and diameter measurement of the product, OD, ID and ovalization

**General composition:**

- mechanical bench
- water circulation system
- ultrasonic head
- centering devices for guiding the product
- ultrasonic electronic multi-channel
- supervisor with report software

All the systems (on-line and/or off-line) meet quality standards such as API, ASME, ASTM, DIN. Thanks to its range of products and its remote assistance, CMS provides worldwide quality and productivity solutions for industrial applications.

**Contrôle Mesure Systèmes SA**  
Contact our commercial team:  
Email address: [contactcms@cmseddyscan.com](mailto:contactcms@cmseddyscan.com)

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



# Transatlantic Cable

## Two steel bridges

▶ Despite intensive and inventive testing, the failed anchor rods on the new San Francisco-Oakland Bay Bridge resist explanation

"The arm is the business end of a Charpy impact tester: it swings into a thing and, on impact, measures how much energy it took to break that thing. In this case, the 'thing' is steel from a new bridge connecting two cities in one of the most seismically active places on the planet. And the steel broke."

Nick Stockton of *Wired* went on to state the conclusion drawn from the flat, glittery inner surfaces of the test piece. To a metallurgist they showed that, in its short time holding together the new east span of the San Francisco-Oakland Bay Bridge, the steel corroded. ("The Mystery of the Brand-New Bay Bridge's Corroded Steel," 10<sup>th</sup> June)

The significance of this corrosion can scarcely be overstated. The Bay Bridge does not just span a bay but essentially connects two active fault lines. To the west is the infamous San Andreas, source of the "bridge-busting, building-buckling, World Series-stopping 1989 Loma Prieta temblor," as Mr Stockton puts it.

To the east lies the Hayward, relatively quiet since 1868. But seismologists give it a one in three chance of producing a 6.8 magnitude earthquake by 2036.

The fairly low-tech Charpy V-notch method of gauging toughness is only one of the tests that materials scientists are using to determine why several anchor rods securing the newest portion of the Bay Bridge, the busiest in the Northern California region, failed their earthquake inspections.

In 2013, seismic tests found that 32 rods had been affected by water corrosion. Several were pried out of the concrete for testing, and a broader investigation turned up four more compromised rods.

Wrote Mr Stockton: "The bridge's engineers want to pry them out and ship them to labs in Illinois and Alabama that will bang, pull, beat, and twist out the cause of their failure." The urgency derives from the necessity for the bridge to not only survive the next quake but also to function immediately afterward.

"The city is going to need this bridge after a big event because a big event will bring San Francisco to its knees," Brian Maroney, the Bay Bridge's chief engineer, told *Wired*. The bridge is intended to roll with the rumbling ground and the anchor rods are a critical element of its design.

A detailed description of that design, published on *wired.com*, illustrates the situation confronting Mr Maroney and his team of investigators as 13<sup>th</sup> September 2013 – opening day of the new span – approached. The opening took place, in fact ahead of schedule. But with an explanation for its corroded rods as elusive as ever, the testing continues.

## ▶ 'Massive, threaded steel shafts'

Most of the bridge's eastern span is a long, low ramp rising out of Oakland to meet Yerba Buena Island. Two side-by-side lanes are supported from below by huge, T-topped piles. As the bridge approaches the island it switches to suspension – anchored by an eastern and western pile – to enable huge container ships to move through the channel below and into the Oakland docks.

Below the roads each pile is capped with seismic safety features called shear keys and bearings. When an earthquake hits, these let the bridge sway with the rolling earth, while anchor rods – massive, threaded steel shafts up to 24 feet long and two to three inches thick – keep it from bucking off completely.

The rods in the eastern suspension pile were the ones that corroded, snapping in half during pre-opening-day tests. Mr Maroney and the bridge's governing council decided to proceed with the opening and continue testing to pinpoint the precise circumstances for the failure of the rods.

As noted by Mr Stockton: "Even with the faulty bolts, the new bridge was more seismically safe than the old."

He reported that the first tests took place on the bridge itself, with earthquake-level loads applied by a huge hydraulic jack to 406 suspect rods. Only two came up short, but Mr Maroney decided that safety concerns dictated removal of the rods for further testing.

Of course, sharp impact is not the only threat to a rod's integrity. More specific to the failed Bay Bridge rods is the Townsend test, which checks what happens to a water-soaked bolt over time. Here, each end of the rod is attached to a massive jack.

"Using these huge hydraulic jacks we stretch to increase the load, then let the rod sit in a bath for 48 hours," explained Mr Maroney. He chose this test because many of the original 32 failed rods did not break when tested in situ but from one day to two weeks later.

Mr Stockton of *Wired* observed that both tests using jacks are "hugely expensive" because they require pulling whole rods from the bridge's concrete. A local materials tester helped Mr Maroney to develop the Raymond test, which mimics



# Transatlantic cable

the pressures of the Townsend but on a much smaller scale and using completely different mechanics. Mathematical calculations confirm that they essentially test the same types of strain.

Mr Maroney's materials advisors will be taking other measures, both mechanical and modelled, to tease out the cause of the failures.

At the same time, the anchor rods are not the sole problem with the Bay Bridge. Rods under the main tower are threatened by water corrosion. There are misaligned deck sections. And inspections have turned up substandard welds in the tower and roads.

But right now, Mr Stockton wrote, the main focus is on the 32 anchor rods in the eastern suspension pile "and what caused them to corrode where others did not."

▶ Famous for its canals, Amsterdam is set to welcome a related attraction: the first-ever 3D-printed steel bridge

Another highly advanced bridge – the world's first to be constructed by means of 3D-printing methods – is attracting attention in the city of Amsterdam.

In the first large-scale test of the technology, a Dutch start-up plans to employ robotic printers to weld the structure even as it inches across a canal.

This bridge has none of the problems currently experienced in San Francisco. But then, it was still in pre-production in advance of a September demonstration when the engineering company MX3D issued this statement: using robotic printers "that can 'draw' steel structures in 3D, we will print a pedestrian bridge over water in the centre of Amsterdam."

In a first large-scale deployment of the technology, robotic-arm printers will "walk" across the canal, essentially printing their own support structure as they progress. The robotic arms will heat the steel to a searing 2,700° Fahrenheit to weld the bridge – a sophisticated computer-generated design – drop-by-drop.

"The underlying principle is very simple," the bridge's designer Joris Laarman told Agence France-Presse (16<sup>th</sup> June). "We have connected an advanced welding machine to an industrial robot arm."

The technique could, the company said, become standard on construction sites, especially those involving dangerous tasks on high buildings. It also obviates the need for scaffolding as the robot arms will support themselves with the very structure they print.

It is obviously not a rapid-fire method; nor can the permissions process be rushed. While Amsterdam City Council spokeswoman Charlene Verweij said the Dutch capital was supporting the project, in June there was still uncertainty about a specific site for the bridge, which the designers hope will be completed by mid-2017.

"I strongly believe in the future of digital manufacturing and local production," said Mr Laarman, taking the long view. "This bridge can show how 3D-printing has finally entered the world of large-scale functional objects and sustainable materials." (The Guardian, 16<sup>th</sup> June)

He added: "It's a new form of craftsmanship."

A concern about 3D-printing – or additive manufacturing, as it is also known – is whether the properties of 3D-printed materials are equal to those of conventional manufacture.

Iain Todd of the Australian news service *The Conversation* reported that, generally speaking, 3D-printed components can be comparable to their traditionally produced equivalents.

Beginning with the prototyping of objects through the various stages of development, the method has in fact been in use since the 1980s.

Today, 3D-printed surgical devices – hip implants, for example – are not uncommon. And 3D-printed parts have been a feature of Formula One racing cars and military aircraft for years, performing very well.

In reference to the canal bridge in Amsterdam, Mr Todd wrote (19<sup>th</sup> June): "What we are seeing now is that the technology is becoming more mainstream – and that change is helping drive a huge explosion of creative thought about how, and where, we make things."

## Automotive

▶ In the wake of fatalities tied to General Motors cars, 'a seminal shift' in how US regulators will deal with automakers

"From Day One I said, isn't NHTSA just as guilty as General Motors is? It's terrific they are finally owning up to their mistakes."

The stepfather of a victim of one of the 109 fatal accidents linked to a defective ignition switch in General Motors cars was referring to the National Highway Traffic Safety Administration.

In June, after more than a year of castigating the automaker, the NHTSA, a unit of the US Department of Transportation (DOT), had acknowledged its own role in the gravest safety crisis in GM's history.

Two internal DOT reports identified a series of failings by the NHTSA that allowed millions of faulty GM cars to go unrepaired for more than a decade. The ignition switches could suddenly turn off, stalling the engine and disabling the airbags.

As noted by *New York Times* reporters Bill Vlasic and Rebecca R Ruizjune, while the reports still fixed blame for the crashes squarely on GM, the nation's largest automaker, they also included an unusually blunt catalogue of mistakes made by its regulators. ("Safety Agency Admits Missing Clues to GM Ignition Defects," 5<sup>th</sup> June)

The agency admitted having ignored signs of the defect, and failing to bring its full authority to bear on GM. In a conference call with reporters, transportation secretary Anthony Foxx said NHTSA is now revising its investigative procedures, stepping up efforts to obtain safety data from automakers, and creating an oversight team of outside experts to help put the changes into effect.

For his part, the NHTSA administrator, Mark R Rosekind, in the job only since December, had already adopted a more aggressive stance toward the auto industry, pushing in particular for quicker responses on continuing safety issues at Fiat Chrysler Automobiles and the Japanese airbag manufacturer Takata.

# Transatlantic cable

Of course, the automotive industry has long been required by law to supply data on crashes, accident victims, and internal defect investigations. Mr Rosekind said: "The GM experience changed the culture here. What that means is, challenge the information you're getting and challenge the assumptions you are pursuing."

In response to the new NHTSA chief's avowal to "trust, but verify" any safety data provided hereafter by the car companies, the *Times* reporters wrote, "That [will be] a seminal shift in how government regulators have long dealt with automakers."

## ▶ The simultaneous upswing in car-sharing and auto sales allays fears in Detroit that American millennials reject car ownership

Now the largest demographic block in the USA, millennials – those who reached young adulthood around the year 2000 – figure prominently among the 1.3 million Americans belonging to some type of car-sharing network at the end of 2014. According to the University of California-Berkeley's Transportation Sustainability Research Center this represents a 34 per cent increase from 2013.

At the same time, Greg Gardner of the *Detroit Free Press* reported, a parallel trend confutes the forecasts of futurists that millennials are not that interested in owning cars and trucks. New vehicle sales in the US are running at levels not seen since the housing bubble of a decade ago. ("Car Sharing Thrives Despite Torrid New Vehicle Sales," 13<sup>th</sup> June)

Yet a third expanding element was noted by Mr Gardner. Clients of a "newish segment of the car-share industry" rent out their personal vehicles to strangers in much the same way that tenants or owners in the Airbnb.com programme rent out their residences to other travellers. This San Francisco-based vehicle-share programme, which launched in 2009, is called Getaround and has expanded this year to Washington DC; Portland, Oregon; and Chicago.

Data from JD Power and Associates confirms that, despite their rental activity, millennials are not abandoning car ownership. The auto sales site found that those born after 1980 accounted for 27 per cent of new vehicle purchases in the USA last year, up from just 18 per cent in 2010.

A dubious assumption about two other sets of American drivers was remarked, and controverted, in the *Free Press*. It is that Generation Xers (born 1960-1980) and Baby Boomers (1946-1964) "will be ensconced forever in suburbia, desperately dependent on their cars."

In May, Zipcar, which is owned by the Avis Budget Group, released a study that more Americans between 50 and 69 are moving to urban cores. Nearly 15 per cent of Zipcar renters are over 50, according to company president Kaye Ceille.

For now, at least, wrote Mr Gardner, the modest US economic recovery is strong enough to spur both new vehicle sales and car sharing, especially in urban areas "where residents of all ages are looking for ways to reduce the cost of owning multiple vehicles."

## ▶ Ford launches car-share pilot in London and six US cities

Detroit's Ford Motor Co picked up quickly on a new willingness of millennials to share rides with others – and

also to supplement their incomes by renting out their cars. Cristina Maza of the *Christian Science Monitor* reported that, applying the findings of its own recent research, the automaker announced 23<sup>rd</sup> June that Ford Credit is launching a pilot peer-to-peer car-sharing programme with two partners: the San Francisco-based start-up Getaround, in the USA; and easyCar Club, a sister company of the low-cost airline easyJet, in London, UK.

The programme will allow Ford owners to rent their vehicles to pre-screened drivers. It will begin in six American cities: Berkeley, Oakland, and San Francisco in California; Portland, Oregon; Chicago, and Washington DC.

In the United Kingdom the programme will launch in London. Getaround will be responsible for managing the app that customers in the USA use to arrange a ride share.

Initially, the programme will include 14,000 Ford Motor Credit customers in the USA and 12,000 in Britain. This initial experiment will last until November.

While Ford already offered its customers in the UK the opportunity to rent a car on a pay-as-you-go basis, now the company will permit customers to offset the expenses of their car payments by renting out their vehicles.

"A study released in February by the business advisory firm AlixPartners found that 4.9 million people worldwide now use car-share memberships," Ms Maza wrote. "That number is expected to jump to 26 million by 2020."

## ▶ Technology and environmental concerns have doomed a venerable American institution: the automobile salvage yard

"Separating themselves from their predecessors, they computerise inventory, adhere to increasingly strict environmental standards, maintain precise records, and choose not to keep snarling Doberman pinschers at the entrance gate."

These enlightened successors to traditional junkyard operators are automotive recyclers – the preferred term in an industry whose trade group, the Automotive Recyclers Association (ARA), has more than 3,000 members.

The transition came to the attention of Mike Tierney of the *New York Times* when he was researching an article on Old Car City USA, a tourist attraction in Georgia, about an hour's drive north of Atlanta.

Not too long ago, he noted, this repository of thousands of abandoned autos was a salvage yard for do-it-yourselfers, like so many others that dotted, or blighted, the American landscape.

Now, "lovingly neglected" and open to paying visitors – \$15 to browse, \$25 to take pictures – it is a relic of an auto industry that is no more. ("Nature Helps Squeeze Out a Little More Mileage, 14<sup>th</sup> June)

Mr Tierney could find no clear statistics on how many old-time junkyards remain in the USA. "There are junkyards still out there," Michael Wilson, executive vice president of the ARA, told him. "We just don't represent them."

The used-parts places were compelled to adapt, wrote Mr Tierney, in response to tougher environmental and land-use restrictions and the increasing complexity of vehicles.

# Transatlantic cable

The days when many items were interchangeable among autos of different models and years are gone.

Some parts must be electronically reprogrammed; and technology-intensive hybrid vehicles, in particular, dictate the presence of specialists on the staffs of recycling centres.

"It's not as easy to take a vehicle right into your facility and dismantle it," said Mr Wilson of the ARA, adding that his group has grown since the recession of 2007-2009, even as the industry has consolidated.

## Energy

### Foreseen over the next quarter-century: profound changes in how the world gets its electricity

According to a new forecast by Bloomberg New Energy Finance (BNEF) that plots out global power markets to 2040, six massive shifts are "coming soon to power markets near you."

The shifts that are seen as transforming markets over the next 25 years rest on a belief that the renewable-energy boom is already here.

Proceeding from there, BNEF asserts that the trillions of dollars that will be invested in energy generation over the next 25 years will drive some of the most profound changes yet in how electricity is produced and delivered.

Here, abbreviated and lightly edited, are highlights from the BNEF forecast, as reported by Tom Randall of BloombergBusiness ("The Way Humans Get Electricity Is About to Change Forever," 23<sup>rd</sup> June)

### Solar prices keep crashing

The price of solar power will continue to fall, until solar becomes the cheapest form of power in a rapidly expanding number of national markets. By 2026, utility-scale solar will be competitive for the major part of the world.

The lifetime cost of a photovoltaic solar-power plant will drop by almost half over the next 25 years, even as the price of fossil fuels creeps higher.

Solar power will eventually become so cheap that it "outcompetes" new fossil-fuel plants and even starts to supplant some existing coal and gas plants, potentially stranding billions in fossil-fuel infrastructure.

"The industrial age was built on coal," wrote Mr Randall. "The next 25 years will be the end of its dominance."

Solar billions become solar trillions: With solar power so cheap, investment will surge. Expect \$3.7 trillion in solar investments between now and 2040. Solar alone will account for more than a third of new power capacity worldwide.

The revolution will be decentralised: The biggest solar revolution will take place on rooftops. High electricity prices and cheap residential battery storage will make small-scale rooftop solar ever more attractive, driving a 17-fold increase in installations. By 2040, rooftop solar will be cheaper than electricity from the grid in every major economy, and almost 13 per cent of

electricity worldwide will be generated from small-scale solar systems. Global demand for electricity slows: Even as the world is inundated with mobile phones, flat screen TVs, and air conditioners, growth in demand for electricity is slowing.

The reason: efficiency. To cram huge amounts of processing power into pocket-sized gadgets, engineers have had to focus on how to keep those gadgets from overheating.

That has meant huge advances in energy efficiency. Switching to an LED light bulb, for example, can reduce electricity consumption by more than 80 per cent.

Thus, even as people rise from poverty into the middle class faster than ever, global electricity consumption will remain relatively flat.

Over the next 25 years global demand will grow about 1.8 per cent a year, compared with three per cent a year from 1990 to 2012. In wealthy OECD [Organisation for Economic Co-operation and Development] countries, power demand will actually decline.

Natural gas burns briefly: Natural gas will not become the "oft-idealised bridge fuel" that transitions the world from coal to renewable energy.

The USA fracking boom will help bring global prices down somewhat, but few countries outside the US will replace coal plants with natural gas. Instead, developing countries will often opt for some combination of coal, gas and renewables.

Even in the fracking-rich US, installing wind power will be cheaper than building new gas plants by 2023, and utility-scale solar will be cheaper than gas by 2036.

Fossil fuels are not going to suddenly disappear. They will retain a 44 per cent share of total electricity generation in 2040 (down from two-thirds today), much of which will come from legacy plants that are cheaper to run than to shut down.

Developing countries will be responsible for 99 per cent of new coal plants and 86 per cent of new gas-fired plants between now and 2040.

Coal is clearly on its way out, but in developing countries that need to add capacity quickly, coal-power additions will be roughly equivalent to utility-scale solar.

The climate will still suffer: The shift to renewables is happening stunningly fast but not fast enough to prevent perilous levels of global warming.

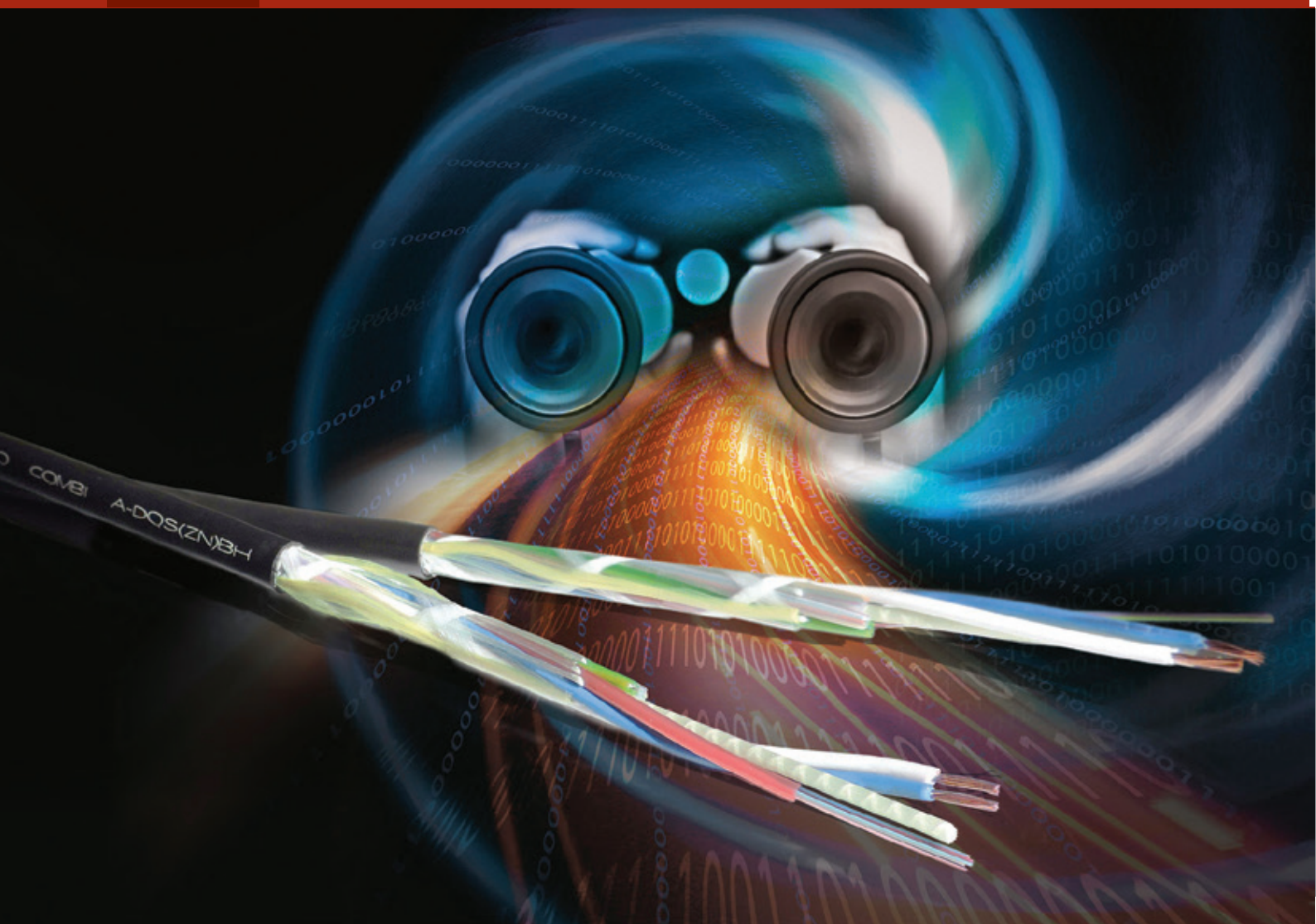
About \$8 trillion, or two-thirds of the world's spending on new power capacity over the next 25 years, will go toward renewables.

Still, without additional policy action by governments, global carbon dioxide emissions from the power sector will continue to rise until 2029 and will remain 13 per cent higher than today's pollution levels in 2040.

"That's not enough to prevent the surface of the Earth from heating more than two degrees Celsius, according to BNEF," Mr Randall wrote, in conclusion.

"That's considered the point of no return for some worst consequences of climate change."

**Dorothy Fabian**  
USA Editor



▲ The new FO Outdoor wbKT Micro Combi from Datwyler

## Mini hybrid cable

DATWYLER has launched the FO Outdoor wbKT Micro Combi, the world's first mini hybrid cable for NGN and NGA networks (Next Generation Networks, Next Generation Access).

It combines four 12-fibre stranded loose tubes, available in either single-mode or multi-mode fibre, with two stranded copper wires.

Thanks to a small external diameter of only 6.5 mm the cable can be retrofitted into existing empty duct systems as well as blown into long sections of microduct system.

The mini hybrid cable with its additional stranded copper wires (0.50mm<sup>2</sup>) is particularly suitable for use in security-sensitive areas.

In FTTx networks it is a cost-effective

alternative to installing two different types of cable and can provide an option for house connections, eg for an emergency supply to fire service telephones in the event of a power failure.

It enables power to be supplied to active remote technology such as street cabinets, emergency telephones, smart grids or data centres, and allows the remote monitoring of connection technology such as cable couplers, distribution frames and access control systems. Once installed it is also easy to locate from ground level.

Two coloured, easily identifiable ripcords mean that the cable sheath can be safely opened, and installation is simplified by dry core interstices, which facilitates easy assembly and removal.

The FO Outdoor wbKT Micro Combi

complies with all the requirements of IEC 60794-1-2 in respect of lateral pressure, impact, repeated bending and torsion.

Datwyler developed the new cable with reference to the "Catalogue of Safety Requirements for the Operation of Telecommunications and Data Processing Systems and for the Processing of Personal Data in accordance with §109 of the German Telecommunications Act (TKG)".

The catalogue, effective since May 2013, was drawn up by the German Federal Network Agency in consultation with the Federal Office for Information Security (BSI) and the Federal Commissioner for Data Protection and Freedom of Information.

The new cable is available from September.

**Datwyler – Switzerland**

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

## Frigeo engineers redesign extruders

WHILE the extruder is the melt supply device in most extrusion processes, the basic design has not evolved much over the last few years. Its purpose is to supply molten material at a constant melt temperature and at a constant volumetric rate.

The typical extruder is made up of three geometric sections: The feed section or solids conveying, the transition or melting section, and the metering or pumping section. Frigeo has redesigned a number of areas on the Frigeo extruder:

- Feeding zone
- Extruder barrel and screw profile
- Thermoregulation
- Stable and reactive electronics
- Increased output and lower energy consumption

The actual melting takes place in the feeding zone. Most plastics are poor conductors of heat and are melted by shearing the material against the barrel rather than by heat conduction. Consistent flow of material into the extruder barrel is obtained by controlling the temperature of the feed throat.

However, you cannot rely on plant water supply which can vary from 38°F (3°C) in the winter to 75°F (24°C) in the summer. These fluctuations in temperature will affect melt temperature and cause product variations.

Therefore, controlling the temperature of the feed throat is essential to constant solids conveying. The Frigeo grooved feed throat, integral cooling jacket and closed loop water temperature control circuit provide a constant feeding zone



▲ Redesign work has been extensive from Frigeo

temperature. The next section is the transition zone, where a large amount of heat will be generated.

Much of the heat necessary to plasticise the material comes from the rotation of the screw. The faster the screw rotates, the higher the surface speed of the screw, the greater amount of shear in the material and therefore an increase in melt temperature.

The combination of rotational speed, adequate cooling and accurate temperature control will keep the shear rate down and prevent localised overheating.

It is in this area that Frigeo engineers have done the most extensive research and redesign.

**Frigeo - Italy**  
**Website:** [www.frigeo.com](http://www.frigeo.com)



### It's Seamless and It's SheathEx™



#### The New Process for High Voltage Cable Sheathing

**Main Features Include:**

- Seamless aluminium sheath with no weld or bead
- Continuous extrusion (no stop marks) for very long cable lengths
- Standard CCR rod with no pre-heat requirement
- Suitable for Power Cables up to 170mm Ø
- In-line Corrugation

**Other Benefits Include:**

- Low capital cost
- Low running costs
- Low energy requirement
- Low manpower
- Low maintenance
- High reliability





### Conform™ - Conklad™ Original Machines at Affordable Prices

**Continuous Extrusion from Copper or Aluminium Rod**

**Applications Include:**

- Copper Bus Bar, Rectangular (Magnet) Wire, Commutators & Other Shaped Conductors
- Solid Aluminium Conductor (SAC)
- Aluminium 'Seamless' Sheathing of OPGW, CATV and HV Cables
- Aluminium Round & Multivoid Tubes

**New 'S' Range Built in China:**

- Low capital cost
- Low running costs
- Low energy requirement
- Low manpower
- Low maintenance
- High reliability



Visit BWE at wire South America 2015 – Stand No. 710



For more information visit: [www.bwe.co.uk](http://www.bwe.co.uk)  
Contact: +44 1233 627736 or [kevinbennett@bwe.co.uk](mailto:kevinbennett@bwe.co.uk)

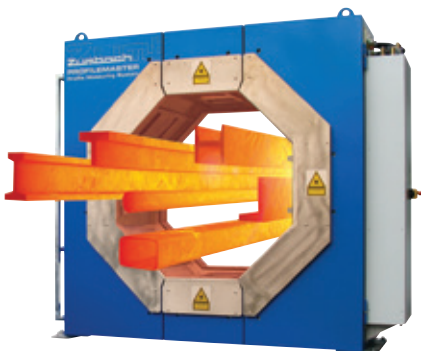
## New addition from Zumbach

ZUMBACH Electronic has introduced three new additions to its line of profile gauges for steel and metal profiles. The gauges are based on the laser light section technique and by camera vision, often also called "light cut" principle.

Up to eight line lasers 'mark' the contour of the product, and the respective cameras each capture a large number of pixels on the product contour.

Highly developed software adds the four pictures to the true, orthogonal section of the profile. All critical dimensions, angles and radii can be programmed, together with their tolerances.

Operators and supervisors can not only monitor the true profile as a 1:1 section online, but also see irregular faults such as seams, concave or convex shapes, etc.



▲ The new line of profile gauges from Zumbach

All standard profiles such as H, I, U, L beams, hexagons, squares, flats and any special shapes are measurable.

Depending on the maximum product dimensions, the three new models cover measuring fields up to 200, 400 or 800mm.

Thanks to a unique concept, the Profilemaster® delivers highly accurate and stable readings (which is not 'natural' by this principle, used in many gauges).

A high reliability is guaranteed thanks to a sophisticated, multi-stage protection and purging/cooling system.

Key advantages include:

- With up to eight cameras, modular camera setting, any shape can be captured
- Up to 16,000 points/contour (2,048/camera) = 5,734,400 points/second (with eight cameras)
- High sampling rate of 350 to 500/second (full profiles/second)
- Four different colours of laser at an eight camera system with no interference
- Shape fault detection (SFD)
- Compilation of a 3D model thanks to the high sampling rate
- Trouble-free maintenance with quick and easy access to the maintenance points

Essential facts include:

- Maximum product dimensions: Up to ø600mm for rounds; up to 500 x 500mm for squares
- Number of camera modules: One to eight
- Repeatability of measurement: Better than 0.01mm

**Zumbach Electronic AG – Switzerland**

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

## Various Mesh Welding Machines

*Made in Taiwan*



**GSA-125C**



**GSA-80L**

**Application:**

**BRC/358mesh/Fence/V Forming/Cages/Shelves/Bird spikes/etc...**



**Golden Spot Industry Inc.**

[www.goldspot.com.tw](http://www.goldspot.com.tw)

[welding@goldspot.com.tw](mailto:welding@goldspot.com.tw)

**TEL:+886-4-23334589**

**FAX:+886-4-23331788**

# HIGH PRODUCTIVITY LRPC STRAND LINE

@ferstudio

A COMBINATION OF THE LATEST  
TECHNOLOGICAL DEVELOPMENTS  
AND PROVEN EXPERIENCE  
HAS GIVEN RISE TO A RANGE  
OF HIGH PRODUCTION & EFFICIENT  
LRPC STRAND LINES



STRAND FORMATION



TENSIONING  
CAPSTANS



STRAND  
TAKE UP/PAY OFF



RESPooling &  
PACKAGING



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

WIRE MACHINERY DIVISION



# Water soluble machining and grinding fluids

Q8OILS has launched Q8 Brunel, its latest revolution in water-soluble machining and grinding fluids.

The Q8 Brunel range has been developed to out-perform all other fluids and has already been successfully tried and tested with manufacturers across Europe.

It is formulated to be fully compliant with the latest European industry legislation, providing a range of products that are free from boron, boric acid, chlorinated paraffin, secondary amine, formaldehyde releasing biocides and nitrites.

Introducing the new Q8 Brunel range, Q8Oils product line manager Stuart Duff said: "Following extensive research and both laboratory and field-trial testing, we have reinvented the way in which the industry approaches soluble metal working fluid chemistry by developing a completely new approach that focuses on three key customer requirements – product performance, environmental protection and operator health."

He insists that, subject to customer requirements, significant improvements to tool life and surface finish are

achievable, and claims that: "Q8 Brunel is so advanced that it has the potential to reduce the operating costs for every customer."

The result is a revolution in high performance, water-soluble machining and grinding fluids with advanced safety features. Thousands of hours have been invested in laboratory testing and field trials to ensure Q8 Brunel is a revolution in soluble metal working fluid technology, and it is fully compliant with European environmental and chemical legislation.

All Q8 Brunel grades comply with TRGS 611 and are suitable for use in hard and soft water where they display low foaming properties.

They are suitable for high speed machining applications and the demanding fluid delivery pressures found on modern machine tools; it is here where significant tool life improvements are achievable.

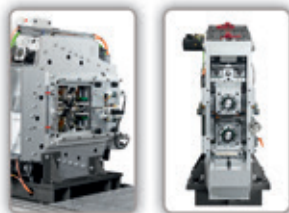
**Q8Oils – Belgium**  
**Website:** [www.q8oils.com](http://www.q8oils.com)



▲ The Q8 Brunel range from Q8Oils



**WORLD-CLASS WIRE ROLLING MACHINES**  
**MADE IN GERMANY**



FUHR GmbH & Co.KG  
P.O. Box 1230  
D-32834 Steinheim | Germany  
Email: [office@fuhr-wire.com](mailto:office@fuhr-wire.com)  
[www.fuhr-wire.com](http://www.fuhr-wire.com)



Visit us at Wire Southeast Asia 2015 / Booth K19 and Wire South America / Booth 706A





▲ The plasma machine allows for an accurate distribution of heat/temperature throughout the cross-section of the stranded construction

## Degreasing of stranded wires and ropes

ROPE and strand making often requires the individual wires to be properly lubricated before stranding. During stranding the individual wires also work-harden, which makes the strand lose its straightness and causes individual wires to “flower” when the strand is cut.

Often the strands and ropes have to be cleaned and/or stress relieved before they are suitable for further processing or packing. This is common in many applications, for example in strands and ropes for the medical, jewellery, architectural and decorative sectors.

Plasmait has been working with wire manufacturers in these sectors to design an effective solution for heat treatment of stranded products and ropes. The plasma machine allows for an accurate distribution of heat/temperature throughout the cross-section of the stranded construction.

Individual wires are annealed or stress relieved to equal temper/softness, which straightens the strands and prevents the “flowering” of strand ends. Accurate control of heat transfer and thereby resulting mechanical properties can be achieved on

a wide range of stranded constructions and materials such as copper, aluminium, stainless steel, plated wire wires and many other materials and their alloys.

The annealing/stress relieving process is conducted in a controlled inert atmosphere in low vacuum, which facilitates effective degreasing inside the stranded construction during the annealing process. This is a result of a distinct feature of plasma discharge that is the strongest in the small cavities between the individual wires in the stranded construction. Surface activation can be achieved if extra coating adhesion is necessary in-line with subsequent polymer coating.

Plasma machines can be used on a wide range of diameters and materials. They are compact machines that use little floor space. Plasma machines can cold start in a few minutes and can be stopped immediately. This avoids the lengthy heating-up and cooling-down times and associated energy costs that are symptomatic of a conventional tube furnace.

**Plasmait GmbH – Austria**  
**Website:** [www.plasmait.com](http://www.plasmait.com)

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



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

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

Global specialists in high-performance lubricants



**METALUBE®**

**Metalube Brazil**  
Tel: + 55 11 6188-7088  
[ventas@metalube.com.br](mailto:ventas@metalube.com.br)

**Metalube China**  
Tel: + 86-(0)21-5489 2146  
[sales@metalube.cn](mailto:sales@metalube.cn)

**Metalube India**  
Tel: +91 22 2545 9338  
[sales@metalube.in](mailto:sales@metalube.in)

**Metalube UK**  
Tel: +44 (0)161 775 7771  
[post@metalube.co.uk](mailto:post@metalube.co.uk)



Offices in Manchester, Mumbai, São Paulo and Shanghai

[www.metalube.co.uk](http://www.metalube.co.uk)

# IT'S TIME ...

## ...to book your advertising in our Düsseldorf show issues



These issues will be **FREELY** distributed from our stands

4 - 8 April 2016

Ad space  
is filling up  
fast!



### Be seen at the show

## in the leading magazines for the wire industries

[www.read-euowire.com](http://www.read-euowire.com) / [www.read-wca.com](http://www.read-wca.com)



Contact our international advertising office:

Tel: +44 (0)1926 334137 - Emails: [euowire@intras.co.uk](mailto:euowire@intras.co.uk) / [wca@intras.co.uk](mailto:wca@intras.co.uk)

# Conductor preheater with integrated temperature measurement and control

MANUFACTURERS of cables, specifically automotive and data cables, require a reliable conductor preheating, to ensure an optimum adhesion of the insulation on the wire, and a controlled foaming. With the Preheater 6000 TC (temperature controlled) Sikora has an advanced solution for precise conductor preheating, the basis for high-quality cable production and repeatable control of the production.

In only a few applications, it may be sufficient to control the output power of a conductor preheating device only depending on the conductor size and type, the line speed and the required temperature. However, there are numerous influences on the accuracy of the conductor temperature, such as the ambient temperature, the initial temperature of the conductor and particularly the development of the temperature of the wire guiding short-circuit wheel within the first ten to 20 minutes after starting the production or after an interruption of the production.

The Preheater 6000 TC is positioned before the extruder and inductively heats



▲ Conductor preheater with integrated temperature measurement and control

the conductor to the desired nominal value. The integrated IR camera ensures a non-contact measurement of the wire temperature at the output of the preheating device.

The controlling module of the Preheater 6000 TC continuously adjusts the power of the preheating with the result that the wire always has the nominal temperature, independently of conductor material, the dimensions of the conductor and the line speed. No further setting is necessary.

LED displays directly on the Preheater 6000 TC show the measured temperature at different perspectives. The integrated, non-contact temperature control makes the Preheater 6000 TC unique. It is available for temperatures up to 250°C, for a product diameter of 0.32 to 4.5mm (0.08 to 16mm<sup>2</sup>) and for a line speed of up to 2,500m/min.

Three device models are available for the power range of 10, 20 and 30 kW. A power calculator at [www.sikora.net/powercalc](http://www.sikora.net/powercalc) helps choose the optimal device.

The Sikora temperature measuring system is also available as the stand-alone system Wire-Temp 6000.

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



- > Flat and Profile
- > Precision strip
- > Hi-carbon steel
- > Stainless steel
- > Flat copper conductors
- > Wire reduction
- > Aluminium
- > Copper alloys
- > Lithium, Beryllium
- > Precious metals

**BÜHLER REDEX**

[info@redex-group.com](mailto:info@redex-group.com)  
Hanaeur Str. 1-5  
75181 Pforzeim - Germany  
T. +49 7231 7755-0

[www.wire-rolling-mills.com](http://www.wire-rolling-mills.com)

## Ideal for tension and torque control

MAGNETIC particle clutches and brakes are suitable for tension and torque control. Clutches are used for rewind tensioning, and torque limiting. Brakes are used for unwind tensioning.

Performance, accuracy and life are greater than friction clutches and brakes, since magnetic particle units have no friction plates to wear or give off dust.

Slip torque is smooth and infinitely adjustable. Torque is varied from near zero to maximum by varying input current.

Units from 1oz inches to 300lb-feet, with heat dissipation up to 1,900 watts continuous duty are available from stock.

The DC constant-current power supplies power the clutches, with output current controlled manually with a potentiometer, or by a 0-10 volt signal voltage from a computer or PLC.

The Placid Industries follower potentiometer or ultrasonic sensor connects directly to the power supply to make a constant tension unwind system. As the roll diameter decreases, the current energising the brake is decreased to keep tension constant.

Placid's hysteresis brake produces torque without physical contact, ensuring torque is very precise and repeatable, and providing a very long life.

Applications include torque and tension control for web handling (unwinding), and load simulation for testing motors and drives.



▲ Tension and torque control from Placid Industries

Torque can be varied from three per cent to 100 per cent by varying input current. This also provides a very wide RPM range while the cog-buster automatically decogs (eliminates torque ripple) with one revolution.

**Placid Industries Inc – USA**  
Website: [www.placidindustries.com](http://www.placidindustries.com)

**magnetic**  
HIGH PERFORMANCE MOTORS

MAGNETIC S.r.l.  
via del Lavoro, 7 - I-36054 Montebello Vicentino (VI)  
tel. +39 0444 649399 - fax +39 0444 440495  
[www.magnetic.it](http://www.magnetic.it) - [sales@magnetic.it](mailto:sales@magnetic.it)

## New Steelmaster SMR gauges

ZUMBACH Electronic has introduced new modular additions to its line of rotating gauges.

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

SMR gauges rotate continuously at 60 or 100rpm. Up to three ODAC® laser heads take 2,000 measurements per second per head, fully synchronised. This results in up to 10 complete profiles per second, which is faster than other gauges before.

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

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

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

Standard and special software features include:

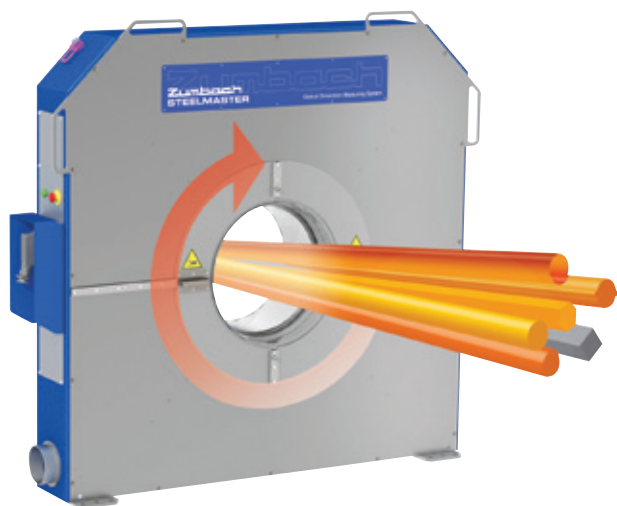
- EPM function for true section display, also with polygonal and asymmetric shape deviations
- Special functions for three-roll mills
- Head and tail scrap calculation
- Flexible, personalised screens

Major benefits include:

- Faster start-up
- Less scrap
- Tighter tolerances
- Display of true shape
- Suitable for hot and cold processes and QC
- Trouble-free maintenance with quick and easy access to the maintenance points

**Zumbach Electronic AG – Switzerland**

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



▲ The new Steelmaster SMR gauge from Zumbach

Visit us at wire South America 2015  
Stand number 808

## Our Tools for Wafios N 90

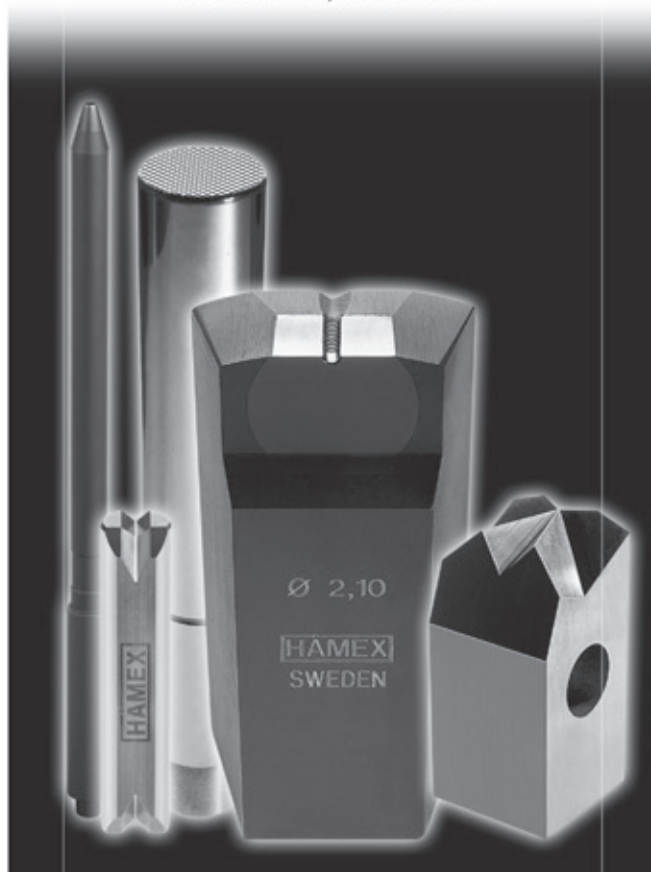
In the search for optimal results, more and more nail manufacturers are changing to Håmex. Håmex tools are the key to high precision, long life and low costs.

Håmex has more than 40 years experience in producing nail manufacturing tools. We will be pleased to help you get the most out of our technical skills and knowhow.

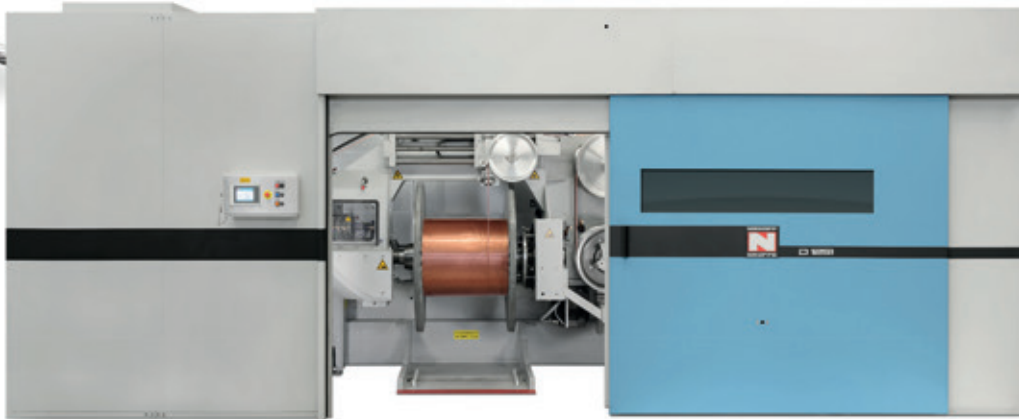
# HÅMEX

**Håmex Hårdmetallverktyg AB**

Box 1117, SE-581 11 Linköping, Sweden  
Phone +46-13-357650, Fax +46-13-357660  
[info@hamex.se](mailto:info@hamex.se), [www.hamex.se](http://www.hamex.se)



**Our capstan power opens a new range of possibilities. Sector-shaped conductors with a cross section of up to 120 mm<sup>2</sup>!**



Today's global markets are highly demanding and dynamic: When it comes to demands and products, there are both continuous and fast changes of pace within the realm of aluminium and copper wire production. While ensuring that these high expectations are met, there is a need for flexible machines that are highly adaptable to an ever changing production environment.

For maximum flexibility during production, NIEHOFF offers the D 1251 double twist bunching machine – with a capstan pulling force of 12,000 N. This high pulling force allows high-speed processing of strands with cross sections up to 95 mm<sup>2</sup> for copper and up to 120 mm<sup>2</sup> for aluminium – either bundled or as sectors. Such capability is unique in this class of machines. Additionally, the variance in the machine's vibration behavior has been reduced to an absolute minimum. The D 1251 is designed with a highly flexible concept, which can be optimally adapted to your needs.

NIEHOFF combines outstanding expertise along your entire value chain with our proximity to customers and reliable service for the entire lifecycle of your investment. It is just this combination that makes the difference, so you can concentrate on what is most important to you: Your crucial competitive advantage.

**Expertise, Customer Driven, Service – in good hands with NIEHOFF**

Maschinenfabrik NIEHOFF GmbH & Co. KG  
Fuerther Strasse 30, 91126 Schwabach, Germany  
Phone +49 9122 977-283 / Fax +49 9122 977-155  
service@niehoff.de

[www.niehoff.de](http://www.niehoff.de)



## Pneumatic and battery driven roll pushers

RENOVA has introduced the new powerful and reliable Moviroll roll pushers – pneumatic and battery driven. Renova's Moviroll systems allow the operator to effortlessly manoeuvre both large and small cylindrical loads on a flat surface and then place them on the roll stand shuttle cart.

Compact, heavy-duty, fast and with low or no maintenance requirements, the new Moviroll roll pushers allow the movement of the load in a continuous and regular way and are suitable for handling wire and cable rolls, corrugated, paper and tissue rolls in a simple and safe manner.

All Moviroll models are designed and made in Italy.

**Pneumatic model:** The MR pneumatic Moviroll uses the power of a pneumatic gear motor that is powered by pressurised and lubricated air at 6 bar (90 psi).

Two models, each with two different handle configurations (straight handle or curved 'S' handle) comprise the range:

- Models MR100/MR100 S have a thrust force of 10,000kg (22,000lb) and a lift

force of 2,500kg (5,500lb)

- Models MR200/MR200 S have an increased thrust force of 20,000kg (44,000lb) and a lift force of 5,000kg (11,000lb)

**Battery model:** The new MRE battery-powered Moviroll offers the advantage of free movement without the constraints of pneumatic connections or electrical cables.

It is equipped with a 24V DC IP 44 sealed brushed motor powered by a 24V battery and a sophisticated electronic system that supervises the operating parameters of the motor and battery, and intervenes to safeguard the Moviroll when they exceed those eligible.

In case of anomaly a flashing LED allows you to identify the problem and solve it. The high performance battery is housed in an 8mm chassis and ensures the operator to move from 60 to 120 rolls with only a battery charge. The MRE Moviroll is provided with a second battery (optional).

The plug and play batteries allow quick changes of the battery without interruption during operation. The intelligent charger autonomously

decides on the duration of the recharge, depending on the state of the battery charge.

Great importance has been given to the system design. The ergonomic handle and throttle have been designed in such a way as to simplify the Moviroll handling during both the forward gear and reverse gear. The throttle is equipped with a speed command that allows variable speed to suit any operator needs. The oversized rear wheels are designed to easily overcome obstacles such as holes, chains and shuttle cart.

The battery Moviroll is available in three models, each with two different handle configurations (straight handle or curved 'S' handle).

- Models MRE100/MRE100 S have a thrust force of 12,000N (26,450lb) and a lift force of 3,000kg (6,600lb)
- Models MRE200/MRE200 S have a thrust force of 16,000N (35,300lb) and a lift force of 4,000kg (8,800lb)
- Models MRE300/MRE300 S have a thrust force of 20,000N (44,100lb) and a lift force of 5,000kg (11,000lb)

**Renova Srl – Italy**  
**Website:** [www.renova-srl.it](http://www.renova-srl.it)

### STRANDING & CABLING EQUIPMENT

FOR POWER CABLES, STEEL ROPES, SUBMARINE, OFFSHORE AND UMBILICAL CABLES





**Rigid Stranders**



**Tubular Stranders**



**Planetary Stranders**

**MANUFACTURING RANGE**

- Take-Ups  
Pay-Offs
- Drum Twisters
- Bow Cablers  
Skip Stranders  
Double Twist Bunchers




**FLYMCA**  
new machinery

**SERVICE, QUALITY, EXPERIENCE**

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

[www.flyro.es](http://www.flyro.es)

**FLYRO**  
used machinery

Pol. Ind. Morero, P1-23  
Guarnizo (39611)  
Cantabria - SPAIN  
Tel: +34 942 559 855  
Fax: +34 942 559 865

# MEET US AT IWCS...

Atlanta, GA, USA

5<sup>th</sup> - 8<sup>th</sup> October 2015

[www.iwcs.org](http://www.iwcs.org)



# ...AND PICK UP YOUR **FREE** MAGAZINES AND CDS

[www.read-wca.com](http://www.read-wca.com)

[www.read-eurowire.com](http://www.read-eurowire.com)

**EUROWIRE** March 2015 • US\$37  
[www.read-eurowire.com](http://www.read-eurowire.com)

**swire**  
The International Magazine for the Wire & Cable Industries

**THE COMPLETE  
ENGINEERING BALANCE  
FOR YOUR DEMANDING  
CABLE DESIGNS**

Performance, safety, cost effectiveness  
and environmental stewardship

**SMOKEGUARD®**  
Low Smoke, Flame Retardant  
Specialty PVC & Clables

**SMOKEGUARD® HP**  
High Performance Fluoropolymer  
Flame Retardant

**MEGOLON®**  
Halogen Free Thermoplastic &  
Cross-linkable Compounds

**GARAFLEX™**  
Thermoplastic Elastomers for  
Flexible Low Temperature  
& Oil Resistant Applications

**GARATHANE™**  
Flame Retardant  
Thermoplastic Urethanes

**GW™**  
Flame Retardant PVC

**COLOR CONCENTRATE**

**AlphaGary Corporation**  
9635 Industrial Court  
Parsippany, NJ 07054, USA  
+1 973 832 8171 Voice  
+1 973 832 8172 Fax  
+1 973 832 8173 Email

**AlphaGary Limited**  
Baker Street  
Waltham Chase  
London, W13 9EG, UK  
+44 (0)20 8748 2222 Voice  
+44 (0)20 8748 2223 Fax

**AlphaGary**  
A Mexchem Company  
[www.alphagary.com](http://www.alphagary.com)

Wires • Cables • Fibre Optics • Springs • Fasteners • Precision Parts

**Wire & Cable**  
March 2015  
US\$37  
[www.read-wca.com](http://www.read-wca.com)

**ASIA 线缆**

**HANDING MACHINERY**  
Specialised designing  
and manufacturing wire  
and cable equipment

**JIANGSU HANDING MACHINERY CO., LTD**  
Tel: 0526-210-8020/788 Fax: 0526-210-8642/720  
Contact person: Liu Yuh  
Mobile: 0526-21015878/816  
E-mail: [handing@handing.com](mailto:handing@handing.com)  
JMS, Jiangyin City, Jiangsu Province, China

## LEADING MAGAZINES

for the wire and  
cable industries





# First contact-less, handheld optical micrometer

AEROEL has launched HWS.1 – Handy Wire Scanner – a fully portable optical micrometer for non-contact measurement of wires, cables and other similar products.

Developed using LED and CCD technology, it uses two crossed linear sensors to automatically compensate positioning errors (patent pending).

Thanks to a powerful single chip microprocessor, the micrometer is linearised and compensated to obtain the maximum precision in the entire field of measurement, regardless of an accurate positioning of the wire.

The measurement is started by pressing the trigger, which takes only a fraction of a second. The display provides the operator with interactive information to place the wire in the useful measurement area and displays the measurement result.

All measurements are saved in the memory of the scanner, associated with the date, time and the number of machine. Through a USB connection, data can be downloaded to any PC. The battery is charged via the USB connector with the supplied power supply. Battery life, with the micrometer always active, is approximately four hours.

The scanner has been designed to fit into a special holder to be fixed on a machine, and this contains an RFID tag that identifies the machine, and which is read by the instrument at the time of measurement.

The support allows the easy and quick placement of the scanner, and for the measurement of moving products, guaranteeing the maximum precision of measurements.

It is therefore possible, mounting a



▲ The HWS.1 from Aeroel

support on each line, to periodically monitor the production of all machines with just one micrometer.

The new micrometer HWS-1 enables an intermediate solution that can dramatically increase the frequency of checks inside a coil, with the non-contact technology making this possible.

With the measurement of products in motion, there is no need to stop the process or wait for the end of a reel. The number of checks carried out inside a coil can be significantly increased. With small investment it allows you to equip each machine with a specially designed holder, and gives two additional advantages:

- The positioning of the micrometer is greatly facilitated
- At the time of reading the diameter, the micrometer also reads the tag contained in the fixture. This lets you recognise and identify the position or the machine where you are measuring, and then combine the stored results with respective positions/machines

A single operator can monitor several lines/machines. At the end of the shift the stored data can be downloaded to a PC for reports to be checked, and for it to be printed.

In addition to this basic function, which improves the sampling frequency, there are a number of other uses such as the set-up or the diagnosis of the process. An example is the process of enamelling copper wire: the modern lines start from the copper wire drawing and produce the finished product, applying and drying several subsequent layers of enamel, up to the finished wire which is collected in reels.

Even in the case in which the line is fitted with a laser gauge to check the final diameter before the reeling, the handheld optical micrometer can be useful in case problems arise, however readily detected by the on-line gauge. The next question is: where, at which stage of the process the 'anomaly' has occurred that led to the alarm.

**Aeroel – Italy**  
**Website:** [www.aeroel.it](http://www.aeroel.it)



## New extruder from Japan

JAPAN Steel Works (JSW) has introduced the TEX 25 Alpha III laboratory co-rotating extruder. The new compact 25mm screw diameter machine, for production of compounds and masterbatches in engineering and high performance thermoplastics, is the smallest of seven TEX Alpha III extruders (up to 130mm diameter) available in Europe. Its introduction follows the K 2013 European launch of the TEX 44 Alpha III model.



▲ TEX 25 Alpha III

Wear-resistant LSP-2 modified tool steel screws and barrels in N60-S nickel-based alloy made by JSW promise long life of barrel and screw (high wear and corrosion resistance) for various kinds of compounds containing abrasive and/or corrosive materials and additives.

JSW's patented TEX-FAN flow analysis network research and development support tool developed for TEX twin-screw extruders analyses polymer melt pressure, temperature, residence time and fill factor with a special dedicated computer developed by JSW.

The TEX 25 Alpha III comes with the EXANET 64-bit RISC high-speed control system.

Its 15" colour LCD touchscreen provides for optimum process control and monitoring, storing thousands of settings and process parameters.

It integrates with ancillary equipment, from JSW compact JSW-TTF 20 and SFT-15 gravimetric feeders and mixers, TSF25 side feeder, through to strand pelletisation and underwater granulation.

Other JSW accessories include screen changers, a SFD-25 degassing side feeder, liquid injection nozzle with a plug, barrel cooling water unit, vacuum, liquid injection and gear pumps, strand cooling baths, pellet conveyors and compacters.

JSW signed a contract in February 2014 whereby Stork Technical Services in Antwerp, Belgium, provides western European JSW extruder servicing, overhaul, modernisation and enhancement, with future extension foreseen for installation, commissioning and maintenance of TEX twin-screw extruders throughout Europe. JSW has a technical centre in Overpelt in Belgium, where it showed the TEX 44 Alpha III extruder after the K 2013 launch.

**Japan Steel Works – Japan**  
**Website:** [www.jsw.co.jp](http://www.jsw.co.jp)

TEX 25 Alpha III series advantages include a new gearbox design combined with enhanced gears and bearings, screw shafts and barrels. The result is a high torque of up to 194Nm per shaft (or 387Nm in total) combined with wider processing windows as well as more powerful kneading and mixing.

A standard torque limiting function stops the screw to protect machinery and operators. A low-noise water-cooled version of the infinitely variable three-phase motor is optional, as is direct drive instead of the standard V-belt drive.

The NIC special kneading barrel invented by JSW achieves good mixing/dispersion at low shear rate and high viscosity without dead zones for good compound material properties, through introduction of several longitudinal grooves of particular geometry on the inside barrel surface for more screw-to-barrel clearance.

A TKD twist kneading disc kneading screw element with a twisted tip developed for energy-efficiency supports this "tip-clearance technology" by ensuring fast, relatively low-temperature material conveying, while retaining appropriate mixing efficiency. JSW claims such features make the Tex 25 Alpha III the "worldwide highest performance compact twin screw extruder".

While feed section water temperature control is manual, PID (proportional-integral-derivative, ie closed-loop/feedback) water and heater temperature control is used for other barrel sections. The extruder is suitable for research and development work with frequent material and process changes, as cartridge heaters and a patented barrel clamping mechanism enable easy and rapid barrel section block changes, achieving screw length/diameter (L/D) ratios of 42 with 12 blocks, 52.5 with 15, and 70 with 20 blocks. The machine accommodates vented or closed barrel sections and side feeding of abrasive reinforcements, heat- or shear-sensitive compound additives and materials into the melt via a later barrel section.



**W.T.M.**  
Wire Technology & Machinery

---

**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;
- Take-up and pay-off units for reels up to DIN 1600, also in traversing version with horizontal axis for precision flat wires laying;
- Caterpillars and capstans for any wire shape, for small and medium section;
- Cable peeling machines for large diameters;
- Ancillary, testing, special and customized equipment.

**W.T.M. s.r.l.**  
Via Austria, 12 - 35127 Padova - ITALY  
Tel. (+39) 049 8705566 - Fax (+39) 049 8705599  
[www.wtmachinery.com](http://www.wtmachinery.com)  
e-mail: [info@wtmachinery.com](mailto:info@wtmachinery.com)

# Connector with built-in fast connection technology

HELUKABEL has launched its new Profinet plug connector, the Helukar RJ45 Cat5 IP20, which has built-in fast connection technology.

The fieldbus-compatible plug comes in a linear and angled design. It is well-suited for industrial use in tight installation spaces.

Helukat has coloured contact elements which prevent the installer from committing connection errors. The clear labelling matches the wire sequence of the Profinet standard, whose four single wires can be quickly connected.

The metal housing enables it to be used in industrial applications. Transmission rates are up to 100 MHz Cat 5.

The shielded plug connector comes in a linear 180° version and an angled 90° version. Designed to protection grade IP 20, it can withstand operating temperatures of -4°F to 158°F (-20°C to +70°C).

The Helukat RJ45 Cat5 IP20 is compatible with AWG 22 and AWG 24 cables, and designed to be used with both bunched and solid wire conductor types.

The Profinet plug connector can be easily and quickly installed without the need for tools.

The single wires must be arranged in accordance with the colour coding of the RJ45 plug and, in the folded-up guide element, inserted into the contact points up to the stop.

To achieve a full connection, the user presses the guide element downward to the stop, closes the housing cover, and fixes the front screw cap with a quarter rotation.

The development of a 145°-angled version as well as an eight-pin variant is currently in the planning process, and will expand the product range once successfully completed.

**Helukabel GmbH – Germany**  
**Website:** [www.helukabel.de](http://www.helukabel.de)



▲ The new Profinet plug connector from Helukabel



is now



## Kkalpana Industries (India) Limited

A leading polymer compound manufacturer in India with a global focus, providing solutions to all your needs.

**PRODUCT RANGE FOR CABLES**

- PVC Compounds**
- HFFR Compounds**
- Sioplas Compounds (36 KV)**
- XLPE Compounds (36 KV)**
- Semi Conducting Compounds (36 KV)**
- PE Insulation & Jacketing Compounds**



**Kkalpana Products are**  
**RoHS & Reach Compliant**



**Manufacturing**  
India: Daman, Kolkata, Silvassa



**Warehouse**  
Istanbul & Sao Paulo





**Kkalpana Industries (India) Limited**

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

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

**Sales & Marketing Office:**  
106, Laxmi Plaza, Laxmi Industrial Estate, New Link Road, Andheri (W), Mumbai - 400 053  
Tel: +91-22-67021470 / 71 / 72, Fax: +91-22-67021473, E-Mail: [mumbai@kkalpana.co.in](mailto:mumbai@kkalpana.co.in)

Energising Lives Through Speciality Compounds

## Assured quality of cables in jacketing lines

FOR quality control of cables in jacketing lines, Sikora's X-Ray 6000 continuously ensures compliance with requested cable specifications regarding wall thickness, eccentricity, diameter and ovality.

In jacketing lines, the X-Ray 6000 is typically installed between two cooling trough sections. In this position, the device measures the outer jacket of the cable. An additional diameter gauge head at the end of the production line, combined with hot-cold control, considers the shrinkage of the diameter.

Customers who measure up to three cable layers during production choose the X-Ray 6000 Pro. For cable production lines where only one cable layer is measured, the X-Ray 6000 is available.

The X-Ray 6000 Pro measures the wall thickness, eccentricity,

diameter and ovality of up to three different cable layers. Typically, it is used on tandem extrusion lines. The system includes as standard the display and control device Ecocontrol 6000 with a vertically arranged 22" TFT monitor. It is either mounted directly at the X-Ray 6000 gauge head, on a separate stand, or is remotely integrated in the control cabinet of the line control.

The Ecocontrol 6000 is conveniently operated via a touchscreen and shows all measuring values numerically and graphically, as well as trend and statistical data. A line presentation with pictograms of the connected devices provides a clear overview. The device becomes most efficient with the optional automatic control of the line speed or extruder rpm under consideration of the minimum values. Reel and length-related data storage is included as standard.

The X-Ray 6000 measures the wall thickness, the eccentricity and the outer diameter of single layer cables. It is when it comes to jacketing lines where only the outer jacket is measured.

The production data is clearly displayed on a 7" monitor, which is integrated directly in the measuring system. The operation is intuitive via touchscreen.

In combination with the processor systems of the Ecocontrol series, automatic control of the line is possible. By controlling line speed or extruder rpm, the cable parameters are controlled to the nominal value.

The X-Ray 6000 is an economic and powerful alternative to the X-Ray 6000 Pro. It provides the functions that are of importance for quality control. From the very first day of operation, both X-ray devices underline their power and assure a continuous online quality control, resulting in stable and repeatable processes.

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



▲ Sikora's X-ray technology assures the quality of cables in jacketing lines

## NEW CONCEPT OF WIRE DRAWING AND STRANDING DIES

(VNT) VITRIFIED NANOCRYSTALLINE DIAMOND COMPOSITE TECHNOLOGY VNT

for Ferrous & Non Ferrous Wires & Tubes

SIZE RANGE: 0.800MM TO 70MM



- FOR COPPER, ALUMINIUM, STEEL WIRES & TUBES
- METAL SAVING
- EXTREMELY HARD DIE SURFACE
- IMMENSELY LOW FRICTION
- MORE BRIGHT SURFACE THAN PCD
- NO WEAR RING



A-53, G.T. Karnal Road, Azadpur, Delhi-110033 (India) Mobi.: 0091-9871890709 / 9810111137  
Email: [sales@ajexturner.com](mailto:sales@ajexturner.com), [info@ajexturner.com](mailto:info@ajexturner.com) | Website: [www.ajexturner.com](http://www.ajexturner.com)

## Marking innovation and performance

AT a time when machine-to-machine communication is proliferating in the industry, bringing with it significant gains in terms of efficiency and productivity, Technifor has risen to the challenge with a new range of laser marking machines that are making their mark as a true model of integration – Laser Solution F-Series.

The new electronics offer communication tools natively, allowing continuous and instantaneous interaction with the various workstations integrated into the chain of production. Dedicated and generic inputs/outputs, TCP/IP Ethernet, Profinet, RS232, USB, the configuration, control and data recording options are cutting-edge and allow for remote control.

The new connections eliminate the need for costly adapters and offer the prospect of a single central server managing a factory's entire fleet of lasers.

Ultra-fast, the choice of high-performance electronic components has resulted in marking equipment that is 50 per cent more time-efficient than the previous generation.

Available in a range of powers from 10 to 50W, the Laser Solution F-Series permits the direct and permanent marking of a wide variety of parts and materials (plastics, metals, ceramics etc).

From surface marking to deep engraving, it executes 1D and 2D codes, guaranteeing faultless scanning.

These new laser machines offer a real technical advantage to integrators and manufacturers who need to install marking stations on production lines.

Highly compact, the marking head is adapted to industrial constraints: small spaces, extreme conditions of temperature and vibration, it is robust and protected from dust or other splashes (class IP54). The solution can be integrated with no necessity for filtration or additional enclosure and it is immune to electromagnetic interference.

Designed to minimise installation costs and time, the equipment is easily interfaced with a PLC thanks to pre-programmed controls.

A control screen with integrated HMI

displays the operations in progress and offers self-diagnostic capabilities: machine status, event history, backup files and maintenance messages are accessible in real time.

Benefiting from a wealth of application experience with major car and automotive parts manufacturers, in precision mechanics, aeronautics, medical and other leading-edge sectors, Technifor delivers end-to-end equipment meeting its customers' expectations; contrasted and permanent high-speed marking; a reliable, safe and efficient production asset; and a modular and evolutive range.

The brainchild of Gravotech's Innovation and Technologies division, the Laser Solution F-Series is a synthesis of the technological advances made by the French company, demonstrating the extent of its development expertise dedicated to serving industry.

Expert in identification and traceability, Gravotech celebrates 20 years of expertise in laser technology.

**Technifor – France**

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



Wire & Plastic Machinery is constantly adding high quality wire and cable equipment to our Inventory.

Equipment Sales | Equipment Purchasing | Reconditioning Services

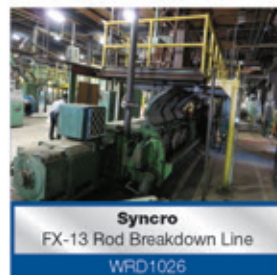
### LAST CHANCE – EQUIPMENT STILL INSTALLED & PRICED TO SELL!



**Northampton**  
1.8m Double Twist Buncher  
CBR1216



**MGS**  
Double Twist Buncher (760mm)  
CBR1222



**Synco**  
FX-13 Rod Breakdown Line  
WRD1026



**Wire + Cable Tech**  
CWF-13 Rod Breakdown Line  
WRD1027



**Watson**  
22" Rigid Strander, 37 Wire  
CBR1219



**Watson**  
22" Rigid Strander, 61 Wire  
CBR1221



**Davis-Standard 4 1/2" 24:1 L/D,**  
Thematic II Extrusion Line  
EXPL397



**(2) Skaltek**  
Coiling / Packaging Lines  
CLR260

**We want to purchase your surplus equipment! We buy individual machines to complete plants for Cash.**

Visit [wireandplastic.com](http://wireandplastic.com) to view our complete inventory or contact us at [info@wireandplastic.com](mailto:info@wireandplastic.com)

**TEL: +1.860.583.4646**

Advertorial on behalf of Decalub

## Wire dry cleaning enables direct galvanising

THE BH-S is a green dry cleaning process of great potential, used in-line in the most demanding applications, allowing the highest cleaning speed with all steel wires (including 0.90%C), mechanically descaled or acid cleaned, bare or pre-coated, drawn with calcium and sodium lubricants. Applications include wire cleaning from solid lubricant residue, or other contaminants (rust and scale), prior to galvanising, metallic coatings, Al or Cu cladding, heat treatment, etc, and wire rod cleaning prior to drawing.

The development of the BH-S wire dry

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

The BH-S system is particularly recommended for cleaning applications in which a conventional process is inappropriate, especially with wires drawn upon severe conditions resulting



▲ Wire cleaning by BH-S system

in increased heat and burned lubricant tightly bound to the wire surface and embedded in micro-cavities.

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

### VGP compliance

Metalube is delighted to announce that Rope-Tek™ WRD40 now complies with VGP (Vessel General Permit) standards demanded by the US Government for all commercial shipping above 79ft entering USA coastal waters. To comply with VGP standards Metalube has been issued with an EU EcoLabel. The company's licence number is UK/027/015.

Rope-Tek™ WRD40 is a new high-performance, biodegradable lubricant specifically designed from renewable raw material sources.

**Metalube Ltd – UK**

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

**Decalub – France**

**Email:** [info@decalub.com](mailto:info@decalub.com)

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

### High Precision Specialized Manufacturer of a Variety of Shaped Metal Wire & Bars for Special Requirement



## TAIWAN LINKIGI METAL CO., LTD.

was established in October 1981. We are a professional manufacturer of various high precision cold-rolled and cold-drawn special shaped and profile wire, rods and bars which can be widely applied to many different industries.

We are known for high quality, reasonable price and prompt delivery.

Add: No. 117, Long Hsiao Street, Kweishan Hsiang, Taoyuan Hsien, Taiwan

Tel: +886-3-350-2577 Fax: +886-3-350-2626 Email: [trade@tmetal.com.tw](mailto:trade@tmetal.com.tw) [www.tmetal.com.tw](http://www.tmetal.com.tw)

**JOIN the INDUSTRY LEADERS**  
**OCTOBER 5 – 8, 2015**  
**Hyatt Regency Hotel • Atlanta, GA, USA**

**World's leading conference  
for peer reviewed  
technical papers and presentations  
on technologies and trends  
in wire, cable, connectivity and assemblies**

***IWCS***



**THE**

**International  
Cable • Connectivity  
Symposium**

**for the communications, data,  
electronics, power, industrial,  
automotive and  
aerospace industries**

**One month earlier than usual.**

Phone: (+1) 717.993.9500

Visit: [www.iwcs.org](http://www.iwcs.org)

Questions: [phudak@iwcs.org](mailto:phudak@iwcs.org)



Copyright Mike DeLucia

## 64<sup>th</sup> IWCS conference in Atlanta, Georgia

**THERE** will be two major differences when IWCS throws open its doors this year.

Firstly, the date. This is the first time in its 64-year history that the conference and exhibition is being staged outside its traditional November date.

This is in a bid to be more beneficial for attendees and allow for fewer conflicts from the end-of-year work demands and holiday schedules.

Secondly, it is being staged in Atlanta, away from its traditional rotating 'homes' of Providence, Rhode Island, and Charlotte, North Carolina.

The conference and exhibition is being staged from 5<sup>th</sup> to 8<sup>th</sup> October at the Hyatt Regency Hotel, Atlanta, Georgia, USA.

**The one thing that has remained the same this year**

is the rich content with professional development and training courses, right through to the Thursday afternoon technical sessions.

Sandwiched in-between this will be the traditional table-top exhibition, with a number of companies taking advantage of the opportunity to showcase their new technology and developments.

There is also a reception on Tuesday evening, presenting the ideal networking opportunity for visitors and exhibitors alike.

This year's conference will also be the first under new chief executive Dave Kiddoo, who took over the reins in January this year.

Full details of IWCS are available from [www.iwcs.org](http://www.iwcs.org)

• Exhibitor details correct at the time of going to press, 24<sup>th</sup> July 2015



# IWCS 64<sup>th</sup> Conference 2015 exhibitor listing

AGC Chemicals Americas Inc.....	<b>313</b>	Kuraray America Inc.....	<b>702</b>
AlphaGary Corp.....	<b>201</b>	Lloyd & Bouvier Inc.....	<b>502</b>
American & Efird LLC.....	<b>212</b>	Lubrizol Corporation.....	<b>612</b>
Arkema Inc.....	<b>700</b>	Maillefer Extrusion Oy.....	<b>709</b>
Artofil.....	<b>209</b>	Medek & Schörner GmbH.....	<b>807</b>
Arya Chem Inc.....	<b>802</b>	MGS Manufacturing Inc.....	<b>402</b>
ASI/Silica Machinery LLC.....	<b>300</b>	Miltec UV.....	<b>602</b>
Borealis Compounds Inc.....	<b>512</b>	Nabaltec AG.....	<b>706</b>
Breen Color Concentrates Inc.....	<b>608</b>	NDC Technologies Inc.....	<b>109</b>
Cable Components Group LLC.....	<b>507</b>	OFS.....	<b>106</b>
Carris Reels.....	<b>406</b>	OptEM Engineering Inc.....	<b>207</b>
CERSA-MCI.....	<b>301</b>	Optimum Cable Systems Corp.....	<b>800</b>
CHASE/NEPTCO.....	<b>100</b>	Photon Kinetics Inc.....	<b>213</b>
Chengdu Centran Industrial Co Ltd.....	<b>303</b>	PrintSafe.....	<b>215</b>
Chromatics Inc.....	<b>112</b>	Roblon A/S.....	<b>808</b>
Clinton Instrument Company.....	<b>312</b>	Rosendahl Nextrom Technologies.....	<b>606</b>
Coats North America.....	<b>515</b>	S&E Specialty Polymers.....	<b>609</b>
Commission Brokers Inc.....	<b>500</b>	Saint-Gobain.....	<b>413</b>
Conneaut Industries Inc.....	<b>501</b>	Shanghai Kechen Wire & Cable Machinery Co Ltd.....	<b>113</b>
De Montfort University.....	<b>715</b>	Shenzhen Delifeng Trading Company Ltd.....	<b>412</b>
DeWal Industires Inc.....	<b>202</b>	Sikora International Corp.....	<b>208</b>
Dow Chemical Company.....	<b>701</b>	T & T Marketing Inc.....	<b>401</b>
DSM Functional Materials.....	<b>101</b>	Technical Marketing Services.....	<b>200</b>
Excelitas Technologies (OmniCure®).....	<b>708</b>	Teknor Apex Company.....	<b>407</b>
EuroWire.....	<b>414</b>	Unigel Inc.....	<b>601</b>
Fiber-Line LLC.....	<b>302</b>	Unitape USA LLC.....	<b>603</b>
Gauder Group Inc (Pourtier & Setic of America).....	<b>713</b>	Wardwell Braiding Co.....	<b>513</b>
Gem Gravure Company Inc.....	<b>803</b>	Web Industries Inc.....	<b>306</b>
Hengtong Optic-Electric Co Ltd.....	<b>114</b>	Weber & Scher Mfg Co Inc.....	<b>707</b>
Heraeus Noblelight America LLC.....	<b>108</b>	Windak Inc.....	<b>314</b>
Hubei EverFLON Polymer Co Ltd.....	<b>806</b>	Wire & Cable ASIA.....	<b>414</b>
Huestis Industrial.....	<b>801</b>	Wire & Cable Technology Intl/WCISA®.....	<b>115</b>
Huntsman International LLC.....	<b>600</b>	Wire & Plastic Machinery Corp.....	<b>307</b>
Inhol BV.....	<b>206</b>	Wire Association Intl/Wire Journal.....	<b>315</b>
International Wire & Cable Symposium (IWCS) Inc.....	<b>615</b>	Wire World Internet.....	<b>514</b>
Intras Ltd.....	<b>414</b>	wiredInUSA.....	<b>414</b>
Isotek Corporation – an Isabellenhütte Co.....	<b>607</b>	Wonderful Hi-Tech Co Ltd.....	<b>214</b>
J M Huber Engineered Materials.....	<b>400</b>	Yangtze Optical Fibre and Cable Joint Stock Ltd Co.....	<b>712</b>
Joe Snee Associates Inc.....	<b>107</b>	Zumbach Electronic Corp.....	<b>613</b>

# wire South America 2015

International Wire and Cable Fair



THE sprawling city of São Paulo, Brazil, plays host to wire South America in October, running alongside the ever-popular Tubotech.

At the last staging of the event two years ago there were stadiums still being built in anticipation of the country staging the 2014 football World Cup finals.

And while that tournament may have been disappointing for the hosts, the Imigrantes Exhibition Centre can certainly be deemed to have played a huge part in the successful staging of the fledgling wire exhibition.

More than 15,000 visitors attended the three-day show and that is expected to be beaten this year as São Paulo prides itself in being the economic capital of the country.

The business boomtown tops all the economic tables in the country: the largest industrial concentration; the most branches of foreign companies; the highest productivity.

This, of course, also gives the city the highest traffic density in the country. Well worth mentioning when planning your trip from hotel to the exhibition centre, although it is only a short drive from the city centre.

Also worth making a note of is the opening times. The exhibition centre is open from 11am to 7pm on Tuesday 6<sup>th</sup>, Wednesday 7<sup>th</sup>, and Thursday 8<sup>th</sup> October.

Take time to read about some of the exhibiting companies which are listed on the following pages, and which will give you the ideal opportunity to plan your time at wire South America 2015.

## Alphabetical list of Exhibitors

Company .....	Country
AEI Compounds Ltd .....	712
AGAPE Industrial Inc .....	714
Agena Resinas E Colas Ltda .....	507
AICON 3D Systems GmbH .....	605B
Anbao Qinhuangdao International Corp .....	720
Axjo America Inc.....	816
Aymak Makine Mühendislik Hiz Sanve Tic Ltd Sti.....	1015
B S Shakti Steel Pvt Ltd .....	647
Bansal Wire Industries Ltd .....	818
Beijing Holland Trading Co Ltd.....	635
Beijing Tongdaxinming International Trading Co Ltd .....	829
Bergandi Machinery Co Inc .....	804
Böllinghaus Steel GmbH .....	606
Borealis Poliolefinas Da America Do Sul Ltda .....	1008
BWE Ltd .....	710
Changzhou Winlong Import and Export Co Ltd .....	723-3
Cheng I Drawing Machinery Co Ltd.....	714
Chhaperia International Company .....	825
Comsuc Technology Development Ltd .....	826
Condat Lubrifiants .....	532
Conflandey Industries SAS .....	724
Conoptica AS .....	848
Copperclad SA de CV .....	807
D&D Manufactureira Ltda .....	501
Daloo Machinery Co Ltd .....	1006
Domeks Makine Ltd Sti .....	TBC
Dongguan Gemwell Electrical Machinery Co Ltd .....	TBC
Dongguan Qingfeng Electrical Machinery Co Ltd .....	831-5
Ernst Koch GmbH & Co KG .....	604
Eurobend GmbH .....	705A
Fasten Group Imp & Exp Co Ltd .....	721-3
Fisk Alloy Inc .....	803
Flymca & Flyro .....	823
Forever Cable Materials Group .....	831-3
Fort Wayne Wire Die Inc .....	817
Fuhr GmbH & Co KG .....	706A
Gauder & Co SA .....	1006
GMP Slovakia sro .....	708
Golden Technologies Wire & Cable Equipment Co Ltd .....	629
Gotex SA .....	727
Hamex Hardmetallverktug A/B .....	808
Hangzhou Linan Jinshengtai Foil Strip Co Ltd .....	719-1
Hefei Tongding Optical Electronic Technology Co Ltd .....	TBC
Heinze & Streng GmbH .....	821
Henan Evernew Machinery & Equipment Co Ltd .....	721-1
Henan Mi-Tel Imp & Exp Trading Co Ltd .....	812
Henrich Maschinenfabrik GmbH .....	704
Hipo Electrix Science & Technology Co Ltd .....	723-5
HMP Heinrich Müller Maschinenfabrik GmbH .....	702
IDEAL-Werk C+ E Jungeblodt GmbH + Co KG .....	701A
iiM AG measurement + engineering .....	706B
Inosym Ltd.....	626
Intras Ltd .....	725
Jiangsu Dewei Advanced Materials Co Ltd .....	721-2
Jiangsu Handing Machinery .....	721-5
Jiangsu Jiacheng Technology Co Ltd .....	824
Kablomar Kablo Ve Hammaddeleri San ve Tic Ltd Sti .....	820
Kieselstein International GmbH.....	701B
LongVision (Shanghai) Cable Materials Co Ltd .....	822
M & M Industries Co Ltd .....	TBC
Maillefer Extrusion Oy .....	631

## Alphabetical list of Exhibitors

MFL Group .....	620	Sket Verseilmashinenbau GmbH .....	704
Mixer SpA .....	712	Sneham International .....	627
Moltech AH .....	813	Spajic doo .....	522
Nantong Lili Hardware Products Co Ltd .....	828	Stappert Deutschland GmbH .....	605A
Nantong Siber Communication Co Ltd .....	721-6	Stolberger dBa Wardwell Braiding Co .....	704
NDC Technologies (Beta LaserMike Products) .....	805A	Stolberger KMB Maschinenfabrik GmbH .....	703
Nuhtel Makina San ve Tic Ltd Sti .....	806	Sulamericana De Feiras Industria E Comercio Ltda .....	507
Numalliance .....	608	Suzhou Star Materials Co Ltd.....	827
Ozyasar Tel ve Galvanizleme San AS .....	716	Synergychem Ptd Ltd .....	845
Paramount Die Company .....	610	Traxit International GmbH .....	603A
Pourtier sas, Gauder Group .....	1006	Troester GmbH & Co KG .....	705B
Proton Products International Ltd .....	626	Uefa Comercial Ltda .....	450/448
Queins Machines GmbH .....	703	Unigel (UK) Ltd .....	628
Rainbow Plastics India Ltd.....	825	Upcast OY .....	538
Rautomead Limited .....	810	Wagener GmbH & Co KG Stahldrahtwerk .....	603B
Reichenbach Equipamentos		Windak Inc.....	816
Industria E Comercio Ltda.....	1001/1001A	WiTechs GmbH .....	604
RichardsApex Inc .....	815	Wuxi Changxin Technology Co Ltd .....	719-2
Rosendahl Nextrom GmbH .....	625	Wuxi Pingsheng Science & Technology Co Ltd .....	836
Sar Medya Altan Kilinc .....	534	Wuxi Xingcheng Special Materials Co Ltd .....	719-5
Schlater Do Brasil Sao Bernardo Do .....	515	Wuxi Xinrun Industrial Furnace Co Ltd .....	TBC
Setic sas, Gauder Group .....	1006	X-Compound GmbH .....	705B
Shanghai Dehong New Materials Co Ltd .....	831-1	Xuzhou Lint Top Cable Technology Co Ltd.....	841
Shanghai Deilec Electrotechnics Co Ltd .....	728	Yangzhou Havet Machinery Co Ltd .....	832
Shanghai Hosn Machinery Technology Co Ltd .....	711	Yangzhou Tengfei Electric Cable	
Shanghai JNL Industry Co Ltd .....	834	& Appliance Materials Co Ltd .....	831-6
Shanghai Kechen Wire		Zhangjiagang SanFeng Machinery	
& Cable Machinery Co Ltd .....	723-2	& Electric Development Co Ltd .....	711
Shanghai Minmetals Development Ltd .....	719-3	Zhejiang Baichuan	
Shanxi Tianxiang Machinery Co Ltd .....	723-6	Conductor Technology Co Ltd .....	719-6
Shanxi Yiruidi Electrical Technology Co Ltd .....	831-2	Zhejiang Harbor Mechanical	
Shree Jay Jagdamba Stainless Steel Ltd .....	802	& Electrical Equipment Group .....	840
Sikora AG .....	602B	Zhejiang Tenglong Stainless Steel Products Co Ltd.....	722
Sinoleader Industries Group Co Ltd .....	814	Zhejiang Wanma MacroMolecule Material Co Ltd ...	723-1

## Agena Resinas E Colas Ltda Stand: 507

Agena supplies products for the wire and cable industry that provide:

**Longer tank life:** Longer solution life than regular products should be expected to help reduce costs and increase production.

**High lubricity:** Reduced wear on dies and capstans and better wire finish.

**Cleanliness:** Optimum detergency balance to provide cleanliness, less scum on top of the emulsion tank, less build-up in piping system and less plugging of dies.

**Low foaming:** At all concentrations, in normal waters.

**Stability:** High stable emulsions to prevent pH variations due to emulsion breakdown and oil separation problems, ensuring better performance and long bath life.



▲ The Agena plant

Agefil E-505/N is a new generation of copper wire drawing lubricant for rod and intermediate wires. It is an emulsifiable lubricant that disperses readily in water to form a very stable emulsion.

It represents the most recent technology in copper wire drawing with significant advances in detergency, fines settling, stability and hard water tolerance.

**Agena Resinas E Colas Ltda – Brazil**  
**Website:** [www.agna.com.br](http://www.agna.com.br)

## Borealis and Borouge Stand: 1008

Borealis and Borouge will be "Bringing Energy All Around" at wire South America 2015. With their increasing commitment to the growing South American market, both companies are proud to be represented together at the fair along with their premier brands including Borlink™, Visico™, Ambicat™ and Borstar®.

For nearly 50 years, Borealis has been a leading supplier of advanced energy and infrastructure plastics solutions for the pipe, wire and cable, and capacitor film industries.

Together with Borouge, its joint venture with the Abu Dhabi National Oil Company (ADNOC), Borealis provides services and products to customers around the world.

At this year's show, both companies will be highlighting their low voltage and medium voltage cables in the Borlink, Visico and Ambicat portfolios as well as their jacketing and communication insulation solutions under the Borstar brand umbrella.



▲ Low voltage cable from Borealis

The Borlink technology enables Borealis to offer a wide range of sophisticated extra-high, high and medium voltage cable applications as well as semicon products.

The Borstar technology supports several innovative polyethylene (PE) compound applications in communication cable jacketing, as well as very low shrinkage high density polyethylene compounds (HDPE) designed especially for fibre optic cables.

The effective Visico solutions in low voltage energy transmission and distribution cables offer innovations in providing, installing and extending the lifetime of cable systems.

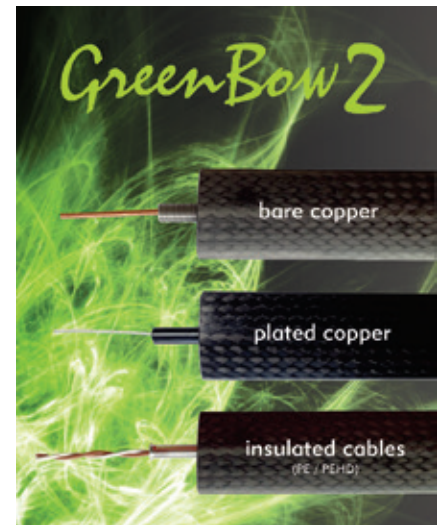
**Borealis AG – Austria**  
**Website:** [www.borealisgroup.com](http://www.borealisgroup.com)

**Borouge – UAE**  
**Website:** [www.borouge.com](http://www.borouge.com)

## Bow Technology Stand: 1006

With over 500 bow designs on offer (560 to 2,500mm, moulded, flat, closed-design, metallic, rod, special) available for more than 25 well-known brands of machines, the Bow Technology department of Gauder Group helps cable makers to optimise double twist machine operations.

The division is the patent owner of the power saving and multi-use "GreenBow2" (one bow fibre, three wire



▲ Green bow technology from Bow Technology

paths, an exclusive design enabling up to 30 per cent energy savings on bow motorisation), and recently launched "Basic Bow Technology", a new range of Niehoff D631, Lesmo DTO-630 and Samp BM630 conventional bows.

**Bow Technology – France**  
**Website:** [www.bowtechnology.com](http://www.bowtechnology.com)

## BWE Stand: 710

BWE's Conklad 315 machine is based on the highly successful and well-proven Conform 315 model.

The Conklad 315 is the smallest machine in the BWE Conklad range but incorporates many of the standard design features found on the larger machines, such as hydraulic shoe opening, feedstock shear, epicyclic gearbox and torque tube.

The Conklad 315 operates in tangential mode, using a single infeed rod, for cladding and sheathing operations. The machine has been optimised for high efficiency production of:

- Aluminium clad steel wire (AS wire)
- OPGW and CATV cables
- Sheathed composite cores
- Reinforced aluminium wire
- Solid aluminium conductor (SAC)

The basic machine construction is based on the proven BWE design, which has a record of reliable operation over many years of service.

Extreme rigidity, the ability to operate at high extrusion pressures, and separately controlled wheel and die temperature ensure that tooling clearances remain optimal throughout long periods of continuous operation. >>>



Visit us at  
wire South America 2015  
Stand 538

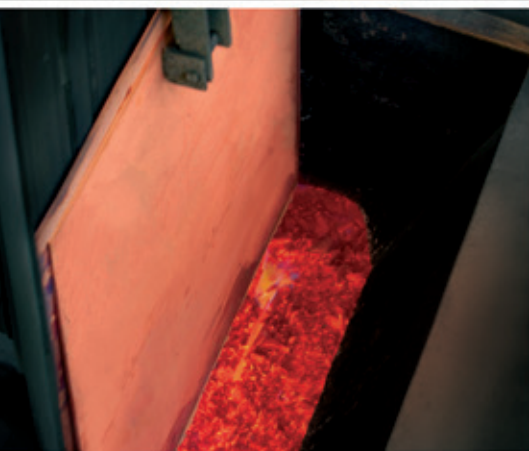


TUBOTECH 2015  
6 - 8 October



# Maximum versatility, minimum costs

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



Your winning formula:

## UPCAST® - 3rd generation Cu rod casting

With the continuous R&D work the original UPCAST® continuous casting technology has again been taken to the next level: with the new coolers and the latest furnace, inductor, automation and control system designs UPCAST® can now offer even more efficient and reliable Cu rod production process than ever before. Higher speed means more capacity with less costs and improved cast rod quality.

Possibility of using clean Cu recycled material in the process has become more and more important. UPCAST® can design a solution for you! All this is available also for existing customers due to unique upgradability of UPCAST® casting lines.

UPCAST® - Always greener.



Wherever. Better.



▲ The Conklad 315 from BWE

Automatic die heating and wheel cooling systems ensure rapid pre-heat to the correct starting temperature and maintain optimum extrusion conditions during production without operator intervention.

Overall economics are further improved by insert tooling that allows the wearing surface of the main tooling component, the die chamber, to be replaced at minimal cost.

BWE offers a wide range of services tailored to customers' needs, ranging from machine-only supply with customers providing their own ancillaries, to full turn-key systems including plant engineering, training, installation and commissioning.

**BWE Ltd – UK**  
Website: [www.bwe.co.uk](http://www.bwe.co.uk)

## Cable Services & Systems Stand: 1006

'C2S', a member of the Gauder Group, is a key partner to maintain, restore or improve cable equipment. The division is being assigned upgrading projects, services for cable makers, and a wide spare parts portfolio (all brands).

C2S is extending its services capability to the Cortinovis range of equipment and also offers services for all brands of machine.

The C2S engineering and commissioning team has recently been reinforced with ex-Lesmo and ex-Cortinovis engineers, and specialises in successfully up-grading Cortinovis lines and other brands.



▲ C2S upgrades

- Upgrades: Cortinovis, Ceeco, Stolberger, Hamana, Queins, Caballé and Brondel
- Bows: Niehoff, Setic, Samp, Cortinovis and Lesmo
- Spare parts: Pourtier, Setic and Niehoff

**Cable Services & Systems – France**  
Website: [www.cable-services-systems.com](http://www.cable-services-systems.com)

**CabWire World Conference 2015**  
Congress Center Düsseldorf, Germany  
3 November 2015  
*7<sup>th</sup> biennial cable and wire technical conference*

**Congress Center Düsseldorf**  
Tuesday, 3 November 2015

The 7<sup>th</sup> biennial conference returns to Düsseldorf, Germany, home of the wire industry, and is already attracting significant interest.

This non-profit event is co-organised by key industry associations, and at €175 per delegate offers incredible value for money – an unrivalled opportunity to learn about the latest industry innovations.

**REASONS why you need to be there:**

- Packed ferrous and non-ferrous programmes by industry leaders
- High quality keynote speakers
- Table top exhibition
- Evening reception – an excellent opportunity to network
- Backed by leading industry organisations
- Tour of a major industrial plant to see the latest technology in action
- A world-class venue in the world centre of the wire industry

CabWire 2015 has an impressive list of world-class speakers in ferrous and non-ferrous fields, headed by **Dr Klaus Probst** recently retired Chief Executive Officer, President and Head of Wire & Cable Division of **Leoni AG** and presentations from companies including **SAMP Spa** (Italy); **Maschinenfabrik Niehoff GmbH & Co KG** (Germany); **SICME Italia Impianti** (Italy); **Sikora AG** (Germany); **De Montfort Leicester University, School of Engineering and Sustainable Development** (UK); **NV Bekaert SA** (Belgium); **FMS Force Measuring Systems AG** (Switzerland); and **Ceeco Bartell Products** (Canada).



To register or for more information visit [www.cabwire.com](http://www.cabwire.com)



# The Wire Drawing Standard



Paramount Die is the leading designer and manufacturer of wire drawing inserts and tooling systems for the wire drawing industry. For more than 45 years we have been delivering the global wire drawing market with dies and wire drawing solutions that optimize wire drawing operations.

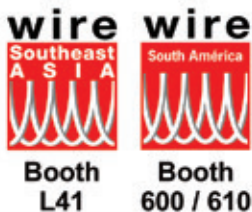
## Why Use Paramount Die?

**Productivity** - Maximize die performance by increasing machine utilization and decreasing production cost.

**Speed** - Achieve drawing speeds up to 45% faster than conventional cased dies.

**Efficiency** - Dramatically lower material and shipping costs.

**Consistency** - Highly efficient and automated production equipment allows us to provide premium quality solutions at a competitive price.



**PARAMOUNT DIE**  
DRAWING SYSTEMS FOR THE WIRE INDUSTRY

[paradie.com](http://paradie.com)

## Daloo Stand: 1006

Daloo, the Chinese member of the Gauder Group, offers medium-cost machinery with European quality to produce insulated power cable and overhead conductors.



▲ Daloo rigid stranders

Rigid stranders, tubular stranders, taping lines, rewinding lines, pay-offs, take-ups and pulling caterpillars are manufactured under French management following strict criteria, including quality control and critical component sourcing.

**Daloo – China**

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

## Eurobend GmbH Stand: 705A

With more than 20 years of experience in the construction of CNC machinery, Eurobend offers a wide range of equipment, such as 2D and 3D rebar benders, single-line and multi-line straightening and cutting machines, wire/rebar mesh welders, continuous stirrup and spiral reinforcement machines, etc.

Together with the full line of rebar processing equipment, Eurobend offers a complete range of welding lines ("PL" series) covering every wire mesh production demand.

Using the latest servo-motor technology, with user friendly software and advanced operation monitoring systems, the PL series is characterised by design simplicity, minimal maintenance requirements and adaptability to every production requirement.

The PL series mesh welding lines are divided into different categories depending on the type of mesh produced and/or the sector served:

*PL R & C series:* This series offers flexibility in the production of wire mesh in the form of sheets (and optionally in the form of mesh rolls) as the independent welding heads can be accurately placed at different distances to achieve different line wire spacing.

The PL C series is equipped with heavy-duty welding heads for the production of meshes with wire diameters up to 16mm and line wire spacing from 50mm upwards.

*PL X-Y series:* The PL X-Y offers increased flexibility covering every application within pre-cast concrete element production.

The PL X-Y series is designed for the production of standard and non-standard mesh designs and sizes, allowing the welding of uneven line and cross wire lengths and different line and cross wire diameters within the same mesh, due to the servo-driven moving welding head.

The wide range of wire feeding options available in the PL X-Y includes feeding from pre-cut wires and/or from coils.

## PBT & PBT Color Masterbatch

--- Professionally Producing Secondary Coating Materials for Optical Cable

RoHS / Reach / 2002/61/EC

ISO9001 Quality Management

ISO14001 Environmental Management

OHSAS 18001 Occupation Health Safety Management System



### The main customers



JINSEN®



**Yangzhou Jinsen Optoelectronics Co., Ltd**

**Add:** NO.6, Jinsen Road, Shaobo Industry Cluster Zone, Jiangdu District, Yangzhou City, Jiangsu Province, China.

**Tel:** 86-0514-86583655

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

**Fax:** 86-0514-86974000

**E-mail:** [yzjinsen@yzjinsen.cn](mailto:yzjinsen@yzjinsen.cn)

# wire South America 2015

When cross wires are fed from coil, straightening is achieved either through two-plane roller straightening devices or through MELC straightening units (either in single- or multi-line format, which allows automatic wire diameter changeovers).

**PL SF series:** The PL SF series of dowel side-frame and basket welding lines are claimed to be an industry leader in the US market since their launch nearly 15 years ago.

Featuring servo-driven operation, automatic feeding from coil and stacking of the final product, the PL SF series is used by a large number of producers of dowel side-frame and baskets in the USA.

**PL T series:** Using the same design and operating principle, the PL T series are compact welding lines for the fast and accurate production of wall reinforcements, also featuring servo-motor operation, automatic feeding from coil and automatic stacking.

Design simplicity together with robust construction ensures high volume production and minimal space requirements.

**PL T/B series:** For the production of various types of bar and mesh supports the PL T/B series offer flexibility and high output, due to the multi-line cross wire feeding system.

**PL TRIS series:** Another member of the PL series is the PL TRIS, for the production of lattice girders and various types of roof trusses as well as concrete slab elements.

It is equipped with a continuous bending system for the two diagonal wires and high speed cutting operations, to ensure accurate and consistent production.



▲ Easyweld from Eurobend

**Easyweld series:** The latest addition to the PL series of welding lines is the Easyweld series, which is designed for the fast, accurate and efficient assembly

of reinforcement cages. On the Easyweld series, the stirrups are loaded during the cage assembly process, providing continuous operation.

Also, the support bars are welded inside the cage assembly, contributing to the column reinforcement, and each welding is carried out with material addition, through the four robotic MIG stations used.

**Eurobend GmbH – Germany**  
Website: [www.eurobend.com](http://www.eurobend.com)



**Gauder**  
**Stand: 1006**

Creating solutions together with Gauder grants access to the largest stock of second-hand machines in Europe, with 25,000m<sup>2</sup> premises housing more than 1,000 machines, as well as a 2,700m<sup>2</sup> fully equipped workshop for equipment reconditioning and testing before delivery.

Viewing is immediately available for equipment for the production of non-ferrous and ferrous products in real time at [www.gauderonline.com](http://www.gauderonline.com)



## USED WIRE AND CABLE MACHINERY FOR SALE FERROUS AND NON-FERROUS

REF#	DESCRIPTION
60A-289	FRIGERIO Steel Rod Drawing Line. 10 X 760 mm blocks with 1250 mm Spooler and 760 mm Coiler. Enter 5.5 to 11 mm, speed 18 m/sec, Year 2000.
21-158	SHANGHAI ENGINEERING 10,000 ton/year Oxygen Free Copper Rod Upcasting Lines. 8 to 12 mm rod, 20 Coil Take-ups, 2 Systems Available.
21-159	OUTOKUMPU Oxygen Free Copper Rod Upcaster, 14,000 tons/year, 15 mm cast rod, 16 lines.
10-235	EBNER Bell Annealing System for Steel wire 62 ton Capacity, Gas Fired, Hydrogen Atmosphere. 800 °C Max temp.
10-233	HENRICH Continuous Resistance Copper Rod Annealer Model ES -01-DR-501-4; 18 - 6 AWG.
39-173	NOKIA MAILLEFER Semi-Automatic Telephone Wire Production Plant. 13 km of cable per 8 hour shift.
32-100	ITO SIN Continuous Lead Sheathing Extruder. 35 kg/min pure lead. 10 to 110 mm Cross Heads.
59A-252	NIEHOFF M85 Copper Rod Drawing, Ent. 8 mm dia. 13 dies, VG85 Annealer, Coiler and Spooler.
58-199	PWM EP500 Kold Butt Welder, 5 to 12 mm diameter.
20-187	NIEHOFF Drop Down Coiler, Mdl. WF-800, 800 mm diameter, with T-400 Dancer.
50-253	BARTELL Tubular Strander, Model 24B64, 10" Diameter.
60A-280	KOCH Steel Rod Drawing Line 8 Blocks, enter 11 mm.

[euro@mathiasen-machinery.com](mailto:euro@mathiasen-machinery.com)

[www.mathiasen-machinery.com](http://www.mathiasen-machinery.com)

Mathiasen Machinery, Inc.  
450 Town Street  
East Haddam, CT 06423 USA  
Tel: (860) 873-1423 / Fax: (860) 873-8866



## AK EXPORT IMPORT



We care about your business, because we care about ours.



We offer the best quality product at the right prices, worry-free returns and exchanges, no minimum quantity to order and great credit. You are assured of the highest product quality.

[www.akexport.com.tr](http://www.akexport.com.tr)

Tel: +90.216.339.2403  
Fax: +90.216.339.2961

Tel: +90.216.339.6624  
Email: [info@akexport.com.tr](mailto:info@akexport.com.tr)

Acibadem - Zerrin sok. Akman Apt. No:11/A 34660 Üsküdar, Istanbul, Turkey

# SEE US AT ...

## wire South America

São Paulo, Brazil

6<sup>th</sup> - 8<sup>th</sup> October 2015  
[www.wire-south-america.com](http://www.wire-south-america.com)



# ...AND PICK UP YOUR **FREE** MAGAZINES AND CDs

[www.read-wca.com](http://www.read-wca.com)

[www.read-eurowire.com](http://www.read-eurowire.com)

**euro wire**  
The International Magazine for the Wire & Cable Industries

March 2015 • US\$33\*  
[www.read-eurowire.com](http://www.read-eurowire.com)

**INTERWIRE**

**THE COMPLETE ENGINEERING BALANCE FOR YOUR DEMANDING CABLE DESIGNS**  
Performance, safety, cost effectiveness and environmental stewardship

**SMOKEGUARD®**  
Low Smoke, Flame Retardant Specialty PVC & Clables

**SMOKEGUARD® HP**  
High Performance Fluoropolymer

**MEGOLON®**  
Halogen Free Thermoplastic & Cross-Linkable Compounds

**GARAFLEX™**  
Thermoplastic Elastomers for Flexible Low Temperature & Oil Resistant Applications

**GARATHANE™**  
Flame Retardant Thermoplastic Urethanes

**CW™**  
Flame Retardant PVC

**COLOR CONCENTRATE**

AlphaGary Corporation  
Headquarters  
170 Pioneer Drive  
Lanham, MD 21050, USA  
+1 878 537 8221 Voice  
+1 800 222 6343 Mobile  
+1 878 537 8224 Fax

AlphaGary Corporation  
UK Industrial Office  
Plymouth, UK 20124, UK  
+1 781 889 2421 Voice  
+1 781 889 2421 Fax

AlphaGary Limited  
Baker Way  
Salford, Greater Manchester  
Lancashire, G11 5 MQ, UK  
+44 (0)161 496 0222 Voice  
+44 (0)161 496 0222 Fax

**AlphaGary**  
A Mexichem Company  
[www.alphagary.com](http://www.alphagary.com)

Wires • Cables • Fibre Optics • Springs • Fasteners • Precision Parts

**Wire & Cable**  
ASIA 线缆

March 2015  
US\$33\*  
[www.read-wca.com](http://www.read-wca.com)

**INTERWIRE**

**HANDING MACHINERY**  
Specialized designing and manufacturing wire and cable equipment

**JIANGSU HANDING MACHINERY CO., LTD**  
Tel: 86-512-83282888 Fax: 86-512-83282888  
Contact person: Lily Wu  
Mobile: 86-150-51079988  
Bygone: 86-150-51079988  
Website: [www.handing.com](http://www.handing.com)  
Email: [export@handing.com](mailto:export@handing.com)  
Add: Changzhou City, Jiangsu Province, China

## LEADING MAGAZINES

for the wire and cable  
industries





▲ Gauder has more than 1,000 second-hand machines

Gauder also has on offer new Mapré multi-compound extruders ranging from 38 to 150mm with L/D ratio 25.

**Gauder – Belgium**

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

**Hâmex Stand: 808**

Hâmex will show its complete range of exchangeable tungsten carbide inserts for dies and cutters for machine types such as Wafios and others. These eliminate the need for regrinding and allow replacement instead of the tools having to be scrapped.

The dies have a rotatable and exchangeable insert of tungsten carbide with up to three profiles. Changing from one profile to another can be done very quickly, which allows three nail dimensions to be manufactured with minimum setup times.

The cutters have an exchangeable insert with two cutting profiles. When worn to a certain level, the insert is turned 90° to a new cutting profile. When both cutting sides are worn out, a new insert can be fitted to the holder.

The assortment of cutting inserts includes inserts working on double wire machines, for instance Wafios N41 and N51.

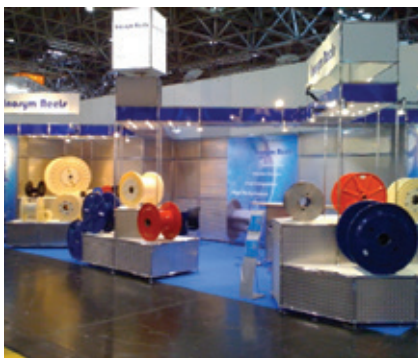
The complete programme of tungsten carbide tools for nail manufacturing includes dies and cutters for Enkotec machines, and chisel feeders, cutters, punches and wire guides for Wafios N90 machines.

**Hâmex Hardmetallverktyg A/B – Sweden**

**Website:** [www.hamex.se](http://www.hamex.se)

**Inosym Ltd Stand: 626**

Inosym will be displaying a range of steel and plastic reels to showcase the New Zealand company's production capabilities and quality.



▲ New technology on hand from Inosym

The team will be on hand to talk to customers about some of the new technology the company has introduced into its manufacturing plant and how this can benefit the wire and cable manufacturer.

This includes robotic welding and automated painting.

**Inosym Ltd – New Zealand**

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

**Maillefer Extrusion Stand: 631**

Maillefer's product portfolio has been developed around one central theme – customer value. It is not a new idea, but rather a growing priority.

The new ways of working and supporting its customers in their everyday manufacturing activity create new type of competitiveness for them.

The roots lie in the extrusion technology, on which nearly 20 applications are based. As an industry innovator, the company is constantly seeking new ways to improve existing practices. The portfolio includes over 50 technologies.

To better answer the diverse needs of wire and cable manufacturers worldwide, the portfolio is organised in three different solution levels – /Enter, //Extend and ///Explore.

These solutions vary in capacity, cost, automation, flexibility, product range, space requirements and maintenance needs.

Maillefer's wire and cable production solutions are available for building and automotive wires, dry or jelly-filled fibre optic cables, low, medium, high and extra-high voltage cables, rubber cables, telecom, LAN and coaxial cables.

**Maillefer Extrusion Oy – Finland**

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

- Electrolytic plating
- Candojet hot water cleaning
- Electrolytic & Ultrasonic degreasing
- Welding wire cleaning and copper coating
- Pickling & phosphating



**Copperjet - High speed copper coating on welding wire**



**CANDOR Sweden AB**

Tel: +46 11 21 75 00 Fax: +46 11 12 63 12  
Email: [info@candorsweden.com](mailto:info@candorsweden.com)

**Qunye**  
QUNYE ELECTRICAL CO., LTD.  
Qunye Spool Expert  
Comparable Trustable ISO9001:2008

Jiangsu Qunye Electrical co., Ltd. is specialized spools manufacturer. We have high standard workshops and office, first class equipment line and complete inspect facilities, advanced management and quality control to fulfill all customers' requirements. We could make spools according to standards or according to customers' specifications. We make all kinds of steel and plastic spools and sell spools well in domestic and overseas market. We have a good team, rigorous management and quality control. QUNYE spools.comparable, trustable.

Fax: +86-514-87383456  
Tel: +86-514-87381010 87381188  
E-mail: [qunye@qunye.com.cn](mailto:qunye@qunye.com.cn)

**GST REELS**  
World Reel Solutions  
For Wire & Cable Processing and Delivery

**PLASTIC SPOOLS**



**STEEL REELS**



**MANUFACTURING**  
Comsuc Technology Development Ltd  
Tel: +86 21 5109 5938  
Fax: +86 21 5169 3758  
Email: sales@comsuctech.com  
Web: www.comsuctech.com

**wire<sup>®</sup>**  
South America International  
Wire and Cable Fair

**visit us**

6-8 October 2015  
Imigrantes Exhibition Centre  
São Paulo, Brazil  
Collettiva Italiana ICE

**GUIDETTI**  
RECYCLING SYSTEMS

**25 years of experience**  
in wires and plastics recycling



www.guidettisrl.com

## Maschinenfabrik Niehoff Stand: 612 and 713

Maschinenfabrik Niehoff and Niehoff-Herborn Máquinas Ltda (NHM), its Brazilian subsidiary, will show an MMH 121 type multi-wire drawing machine, an SNH 801 type spooler and a D 631 type double-twist bunching machine with ARP 630 pay-off. All machines were built by NHM under Niehoff licence.

The multiwire drawing machine MMH 121 is designed to simultaneously draw 28 wires with a final diameter of 0.51 to 0.2mm (24 to 32 AWG) at a maximum production speed of 36m/s (7,086 fpm).

The wires can be processed to intermediate multi-wire bundles. Typical wires which can be produced on the MMH type drawing lines are copper wires for highly flexible cables, automotive cables, battery cables and installation cables.



▲ MMH 121 type multi-wire drawing machine

The machines are also suitable for aluminium wires, and wires made from copper and aluminium alloys and from other non-ferrous metals.

The wires drawn on such lines have homogeneous physical properties along their whole length and exceed the highest processing requirements.

Because of their modular design, Niehoff multi-wire drawing lines can be adapted to different customer requirements with great flexibility. More than 1,100 MMH lines are in use worldwide.

The SNH 801 type dynamic single spooler is designed for wires with an individual wire diameter of 0.15 to 4.5mm (½ to 5 AWG) or multi-wire bundles with a cross section of 0.018mm<sup>2</sup> to 5.5mm<sup>2</sup> (34½ AWG to 10 AWG). The maximum production speed is 50m/s (9,842 fpm), and the machine can accommodate spools with a maximum flange diameter of 800mm.

The D 631 type double-twist bunching machine is foreseen to produce strands with 0.09 to 6mm<sup>2</sup> (27½ to 9½ AWG) cross-section and a steplessly variable lay length of 6 to 100mm.

The maximum number of twists is 6,500 twists/min, and the maximum production

speed is 300m/min. A special feature is the patented opto-electronic NBAT system (Niehoff Bunching Automatic Traverse), which allows spools to be perfectly spooled.

Spooled wire can then be paid-off tangle-free at extremely high speeds with no damage. Other features include the energy-saving single bow (ECO-Bow) design, the contactless transmission of machine data within the machine and the NMS touch-screen display with colour user interface.

The ARP 630 type pay-off completes the portfolio for the production of strands. By clamping the spool with the help of pintles, spool loading becomes fast and easy.

Spools with various bore diameters can be used, and as an option particular spool lifting tables are available.

Also at the Niehoff stand, a complete island booth, will be Bühler Würz Kaltwalztechnik (cold rolling mills), Strecker (wire welding machines), HFSAB (lead extruders and cable repair and recovery systems) and Reber Systematik (filtration systems).

## Niehoff-Herborn Máquinas Ltda – Brazil

Website: [www.niehoff.com.br](http://www.niehoff.com.br)

## Maschinenfabrik Niehoff GmbH & Co KG – Germany

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

## Paramount Die Stand: 610

Paramount Die is a manufacturer of wire drawing die inserts and tooling systems for the wire drawing industry. For more than 45 years, the company has delivered dies and wire drawing solutions that optimise wire drawing operations.

Founded in 1968 by two brothers, Douglas and Gil Sarver, Paramount now services the ferrous wire industry worldwide. Known as an industry innovator, Paramount has introduced several products which it claims have become the wire industry standard.

The ParaLoc™ pressure system has contributed greatly to increasing drawing speeds and improving productivity in the wire industry. The exchangeable carbide drawing inserts have made mass production of wire dies possible and have led to both increasing wire die consistency and decreasing overall die cost.



▲ Extremely proficient and consistent automated production from Paramount

By producing several million wire dies per year, Paramount has the volume to justify utilisation of extremely proficient and highly consistent automated production equipment to produce its wire drawing dies.

**Paramount Die – USA**  
Website: [www.paradie.com](http://www.paradie.com)

## **Pourtier** Stand: 1006

The Pourtier member of the Gauder Group, along with Setic, provides rotating machines for non-ferrous cable, offering a wide range of twisting/stranding solutions to cable makers.



▲ Pourtier tubular stranders

Pourtier develops and produces heavy-duty rotating machines for the production of all types of power cable, especially HV and EHV, from overhead cable to insulated cable.

The company is also active in the market of submarine and umbilical cables with a complete range of stranding/paper lapping/cabling and armouring machines as well as oil pump cable.

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

## **Richards Apex Inc** Stand: 815

The RA400 is one of the fastest growing in Richards Apex's copper wire drawing line. Exceptionally clean running and low foaming, RA400 was designed to meet

the toughest demands from all corners of the world. It has been successful in a variety of operations, from rod breakdown to multi-wire and annealing systems.



▲ The Richards Apex production plant

To support the growing demand for its products and services worldwide, Richards Apex operates manufacturing sites in the, USA, Australia, UK and Mexico, combined with knowledgeable sales experts, representatives and stocking distributors.

**Richards Apex Inc – USA**  
Website: [www.richardsapex.com](http://www.richardsapex.com)

## **Rosendahl and Nextrom** Stand: 625

Rosendahl and Nextrom will be showing its manufacturing solutions for optical fibre and cable production. The company is an expert in extrusion, corrugation, optical fibre and SZ stranding technologies.

The company not only supplies high-tech process technology but also sustainable customer service, providing manufacturing solutions for the production of power cables, automotive wires, LAN cables, coaxial cables, extrusion crossheads, preforms, fibre draw towers, fibre UV-coating and fibre optic cables from one source.



▲ Rosendahl extrusion technology

From first contact onwards, the company provides customised high quality solutions and personal support to ensure total customer satisfaction.

**Rosendahl Nextrom GmbH – Austria**  
Website: [www.rosendahlnextrom.com](http://www.rosendahlnextrom.com)

**WIREX DIES & STEEL (I) PVT. LTD.**  
QUALITY DRAWING DIES DRAWS QUALITY WIRES

SINCE 1985

- + Wire Drawing Dies - PCD, Natural and Mono Diamond
- + Tungsten Carbide Dies - All Shapes
- + Enamelling Dies in all shapes (TC and PCD)
- + Stranding Dies and Compacting Dies
- + PCD, ND and TC Wire Guides / Nozzles and Extruder Dies

T.C. Die Reconditioning Machine

Wire Ultrasonic Die Reconditioning Machine

- + Dies Shop Equipments for Reconditioning of Drawing Dies
- + Diamond Tools - Paste - Powder
- + Ceramic Eyelets - Bush - Pulleys
- + Dies Measuring Pins and Steel Needles
- + Wire Drawing Lubricants (Dry & Wet)

For further details, please contact:

**WIREX DIES**  
105 - 110, Sushma Tower, D Block,  
Central Market, Prashant Vihar,  
Delhi - 110085 (India)  
Ph : 0091-11-27861053  
Mob.: 00919810878510, 00919650036231  
Email : [wirexdies@yahoo.com](mailto:wirexdies@yahoo.com), [prateek@wirex.in](mailto:prateek@wirex.in)

**[www.wirexdiamonddies.com](http://www.wirexdiamonddies.com)**

**Witechs**  
Wire Technologies

**WIRE COATING**

**HSBE-3300**  
**wire cleaning and coating machine for liquid lubricant carrier**

in-line cleaning with liquid.  
carrier-coating with inorganic salt mixture instead of pure borax.  
coating and drying at infeed-speed up to 4m/s.  
extensive control and monitoring panel for a safe production process.

**[www.witechs.de](http://www.witechs.de)**

## Setic Stand: 1006

Setic, combined with Pourtier, provides rotating machines for non-ferrous cable offering a wide range of twisting/stranding solutions to cable makers.



▲ *Setic double twist buncher*

Setic designs and manufactures high quality double twist bunchers/stranders for the power cable (LV conductors and cables, building wires) and automotive industry, as well as complete solutions to produce special, LAN, control, instrumentation, data and telephone cables with enhanced performance.

**Setic – France**

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

## Sikora Stand: 602B

Headquartered in Germany, Sikora is a manufacturer and global supplier of innovative measuring, control, inspection and sorting technology for quality assurance in the wire, cable, optical fibre, hose, tube and plastic industries.

▼ *The Centerview from Sikora*



The company will showcase its non-contact measuring systems based on progressive laser and X-ray technology that are suitable for various applications, such as the measurement of the diameter, wall thickness, eccentricity or ovality of cables.

Sikora's product range also includes spark testers for the detection of insulation faults, lump detectors for the detection of faults on the product surface, capacity measuring systems and devices for conductor preheating as well as temperature measurement and control.

In addition, it will present the innovative Purity Scanner, a system for online inspection and sorting of plastic pellets.

Directly integrated into the production line, Sikora technology ensures continuous product quality, and stable, repeatable processes.

On display will be the Wire-Temp 6000; the Centerview 8000; the Laser series 2000/6000, Lump 2000; Spark 6000 HF; X-Ray 8000 NXT and X-Ray 6000/PRO; the Purity Scanner 6000; Ultratemp 6000 and the Fiber Series 6000.

**Sikora AG – Germany**

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

## Troester GmbH Stand: 705B

Troester GmbH & Co KG is a supplier of machines and complete lines for the cable manufacturing and rubber processing industries, comprising CV lines for XLPE and rubber cables, silane lines, sheathing and insulation lines.

Troester will present information and new developments in the field of:

- High voltage CCV and VCV line concepts for XLPE power cables up to 1,000kV
- Low- and medium-voltage CCV lines for XLPE/rubber power cables 1 to 66kV
- Sheathing lines for medium- and high-voltage cables
- Upgrade solutions for existing CV and insulation lines



▲ *Troester extruder for rubber CV line and X-Compound kneader*

In addition X-Compound, the new company of the Troester Group, will join the booth and present kneader

technology for the continuous compounding of HFFR, PVC, XLPE, semi-conductive materials and EPR/EPDM.

**Troester GmbH & Co KG – Germany**

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

## Upcast Stand: 538

Utilising recycled copper in the process of casting OF-Cu rod has long been the target for manufacturers. The reason is simple and obvious: cost efficiency.

Upcast OY has developed its continuous casting technology and machinery to meet the requirements for using 100 per cent recycled material, or scrap as many operators call it, in the OF-Cu rod process.

Using recycled material in the Cu rod casting process has been very challenging with regard to both the quality control and the mechanical processing of the material.

The casting process itself does not remove the possible metallurgical impurities of the raw material. Therefore, it was recommended to charge only small quantities of recycled material together with the pure copper cathodes. This required extra manual work from operators, increasing the workforce.

With consistent development work and understanding the importance for the customers Upcast has been able to change the situation.

The first Upcast OF-Cu rod continuous casting line utilising 100 per cent recycled material from the other internal processes was delivered a year ago and has since been successful in operation.

The automatic charging technology of the new line is designed specifically for recycled material. The final product determines the criteria and limit values for the raw material. Thus, the purity of the recycled material is crucial for the process. Using scrap from other processes of the same manufacturer assures that the material is exactly the kind needed for the casting process.

In the past the charcoal covering the melt in the furnace has caused some problems in the material feeding and melting process of recycled material by preventing smaller pieces from fully sinking into the melt.

This can be prevented by pre-handling of the material, and the new line is also equipped with a hydraulic press



# wire South America 2015

forcing all the pieces into the melt. The automated processes together with the new advanced control system have also added to production efficiency.

For example, the automatic transfer of the melt results in less manual work, and the probability of human error is minimised.

The remote access system allows for a very quick fault detection followed by fast repair actions. This is extremely important in order to avoid longer disturbances or breaks in the process.

Furthermore, the system allows the customer to have all the possible process data enabling them to make adjustments for efficiency optimisation.

#### Upcast OY – Finland

Website: [www.upcast.com](http://www.upcast.com)

### Windak Group Stand: 816

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



▲ The SW6-14 offers maximum flexibility and high output

Windak will participate together with Axjo company, a well-known trademark and company in Europe, that currently delivers spools and drums in polymer materials to all large cable works in Europe as well as to users in Asia, Brazil and Africa, and now has a production factory in North Carolina, USA.

Windak is creating innovative and high quality cable packing machines, which are recognised by customers worldwide.

The company will display the automatic spoolers AR24 and SW6-14, which are

claimed to be very popular in the cable packaging industry, as well as other machines such as coilers, spoolers, accumulators, rewind systems, take-ups and pay-offs.

The SW6-14 is a dual head spooler developed for fully automatic packaging of cable and wire products onto spools between 165mm and 360mm (6.5" to 14") in overall diameter.

It can be run in both in-line and off-line applications. Full line integration can include an automatic palletiser, film unit, pallet conveyor, reel labeller, test equipment and meter marking on the cable.

The SW6-14 loads and unloads the spools automatically. The cut ends are secured with stretch wrap. The SW6-14 uses the same reliable catch cut mechanism as the high-speed SW6 spoolers. This design allows for a stop time of approximately one second.

The short stop time increases the line output up to 30-40 per cent against traditional spoolers.

#### Windak Group – Estonia

Website: [www.windakgroup.com](http://www.windakgroup.com)

## Stop by Stand 725 and collect your free magazine

EuroWire will again be exhibiting at wire South America, along with sister publications *Wire & Cable ASIA*, *wiredInUSA*, *Tube & Pipe Technology* and *Tube Products INTERNATIONAL* – all from the same stand, number 725.

You will be able to meet some of the staff and collect free copies of the most popular trade magazines in the respective industries.



## COMPACT AND FLEXIBLE SOLUTIONS



Wire multi-stand mill suitable for cold rolling of wires, bars and profiles.

EFFE 2015 single-drive  
Opening Stand option



**WIRE**



ENNE 150i single-drive



**STRIP & FLAT** Single and Tandem Rolling Mills



**APPLICATIONS:**

Electrical Contacts - Medical - Superconductor - Watch Making - Wire Reduction - Flattening

**MATERIALS:**

- Precious Metals
- Brazing Alloys
- Welding Wires
- Bi and Trimetallic
- Special Alloys



# Standardisation of PV wires and cables 2001-2014

By Faruk Yeginsoy, Leoni Struder AG

## Abstract

This paper will show the evolution from the first German TUV Rheinland document 2Pfg1169/2001 to 2Pfg1990/2012 and the influence of this document to national standards in the USA, Japan and Europe as well as to the development of the standards Cenelec EN50618 and IEC62930.

Furthermore it will give an insight to the necessary design, material combinations and production processes to comply with the above stated standards.

In particular the challenge was to comply with multiple standards as for example, the combination of UL and TUV.

An additional aspect will give an understanding to specific testing procedures of essential compound properties which have an impact on the expected very long operation time of PV wires.

## 1 Introduction

Starting at the end of the last century the worldwide interest in renewable energy was encouraging the PV industry to grow significantly and this growth around the world was irresistible. At that time the construction of PV systems was an expensive and long-term investment. The investors did not know how to estimate the quality of modules, and customers were asking for the expected lifetime of PV modules and PV installations. There was a strong need for a third-party assessment of safety and quality.

At this time the German TUV Rheinland started reviewing the safety and quality of photovoltaic modules with their own requirements.

Very soon it was clear that the module quality and module safety was dependent on the components, but there was a lack of standards for components considering the requirements of PV application. This was the beginning of the standardisation of PV wires.

## 2 The beginning

In 2001 the TUV Rheinland in Germany started testing PV modules and noticed many problems because of the cables.

Since no dedicated standard tests for these cables existed, the TUV Rheinland created their own standard. This was the birth of 2Pfg1169:2004.

This first standard was based on IEC60245-4:1994 (Rubber insulated cables - rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables).

At that time H07RN-F was the most used cable (rubber 60°C–90°C). In this early stage of PV installations, nobody realised that the requirements on PV cables were much higher.

### 2.1 First wiring failures after a few years

▼ **Figure 1:** Wiring failures caused by ozone and high temperatures



## 3 New requirements

After numerous wiring failures the PV experts recognised that the requirements of the first Pfg 1169 /2004 had been too low.

In 2006 a new experts group (German National Committee Working Group 411.2.3) started to work on a new version of the "Requirements for photovoltaic cables".

In the first part of the work, it was a joined group of module and cable experts. The focus was now on the period of use of PV wires. The working group was principally involved in following questions:

- How can we predict the lifetime of a cable?
- How many years does the lifetime of a cable have to be?
- How is ageing of cables to be understood?
- How can we test the ageing process?

### 3.1 Material ageing is the new focus

#### 3.1.1 Thermo-oxidation of polyolefins

One of the elementary chemical laws is the Arrhenius law. This law describes the correlation of temperature and process speed.

The thermal ageing of polymer is nothing else than a chemical process, and every chemical process is dependent on the process temperature.

Increasing the temperature by 10°C accelerates the process by a factor of two. This also works backwards. Decreasing the temperature slows down the ageing process by a factor of 0.5.

The specified temperature rating of a cable should be in combination to a specified time period.

Without a time indication, the temperature rating is useless. The standard temperature rating in the European cable industry is  $xxx^{\circ}\text{C}$  at 20,000h.

The PV industry standard period of use for PV modules is 25 years. These are roughly 150,000h. The assumed ambient temperature is  $90^{\circ}\text{C}$ , ie the minimum temperature rating shall be  $90^{\circ}\text{C}/150,000\text{h}$ . Normalised to the industrial standard time of 20,000h, the new temperature rating shall be  $120^{\circ}\text{C}/20,000\text{h}$ .

### 3.1.2 Photo-oxidation

Sunlight contains a high amount of ultraviolet radiation. The ultraviolet radiation that is absorbed by a polymer material will result in its degradation. The energy may be sufficient to cause the breakdown of the unstable polymer and, after a period of time, changes its components.

Polymer materials which are to be exposed to UV for long periods of time should be made from polymer compounds that are appropriately stabilised for such environmental conditions. The basic polyolefin polymers have limited outdoor life. However, most polyolefin, coloured (non-black) solar cables manufactured today contain an ultraviolet stabilisation package which is satisfactory for limited time of 5–10 years. But for prolonged outdoor service life, polyolefins should be formulated with a minimum of 2.5 per cent finely dispersed carbon black.

Implementing carbon black in polyolefins greatly increases the UV resistance. Carbon black acts as a UV absorbent and screens the polyolefin from damaging ultraviolet radiation.

Until now there has been no known physical or chemical interrelationship applicable to extrapolate an accelerated weathering test up to the lifetime of cables.

The conducted test durations in standards UL and TUV are 720h whose results cannot be extrapolated based on a mathematical formula. These tests provide only comparable results, but no real statement about the real lifetime.

As has been demonstrated through over four decades of outdoor experience with polyethylene jacketed communication cables, the addition of 2.5 per cent finely dispersed carbon black results in more than 25 years of protection against UV.

The dispersion of carbon black is an integrated part of the extrusion process of the jacket, which has a high impact on the UV resistance. The proper management of the machine parameters is the critical key factor for best results.

Carbon black is in EN50290 ("Communication cables. Common design rules and construction") a mandatory requirement for communication cables for exposed outdoor use.

### 3.2 Basic points of the new requirements in 2007

The main basic point of the new version of the Pfg1169/2007.8 is the thermal endurance test according to IEC60216 "Electric insulating materials – Thermal endurance properties" ( $120^{\circ}\text{C}/20,000\text{h}$ ).

In the application of this standard, it is assumed that an almost linear relationship exists between the logarithm of the time required to cause defined property change (less than 50 per cent elongation at break) and the reciprocal value of the corresponding absolute temperature.

This test is to conduct at least three different temperatures. The highest temperature shall be selected to result an endpoint not less than 100h and the lowest temperature is to be selected for the expected result not before 5,000h.

A straight line is drawn to connect the various recorded points. By extending the line until it intersects the 20,000h on the ordinate – axis (logarithm of time) it is possible to determine the temperature rating on the abscissa – axis (the reciprocal absolute temperature).

Additional essential points are:

- The used materials shall be halogen-free
- The used conductors shall comply with IEC 60228 class 5
- The cables and wires have to comply with IEC60332-1-2 (vertical flame test)

The result of this work was published by VDE as:

- VDE-AR-E 2283-4 "Requirements for cables for PV systems"

And by TUV as:

- TUV 2Pfg1169/2007.8 "Requirements for cables for use in photovoltaic systems"

### 3.3 The specification of PV wires by UL

In 2005 UL published the first edition of Outline 4703. The UL type 'PV' was created. This outline was based on UL854 (Service Entrance Cables). But in 2005, the NEC2005 (Article 690) was requiring USE, USE-2, UF and SE.

As recently as 2008, the PV type was mentioned for the first time in the NEC2008. The required wires were in this edition USE-2 or PV.

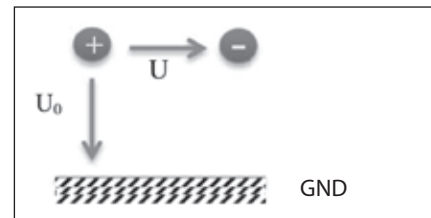
Mentionable is the acceptance of metric sizes of conductors in the UL outline 4703.

In 2010 UL published the fourth edition of UL outline 4703, which is the relevant version until today. In this edition is the reference standard UL 44 "Thermoset-insulated wires and cables".

### 3.3.1 The differences to TUV 1169/2007.8

The significant differences between UL and TUV are:

- Halogenated compounds are permitted in UL4703
- The required flaming test UL1581-1060 is more demanding than IEC60332-1
- No differentiation between DC and AC in UL4703
- 1,000V (or 2,000V) is permitted, which is more future-orientated
- Aluminium wires are permitted in UL4703
- No differentiation U0/U in UL4703



▲ Figure 2: Definition of  $U_0/U$

## 4 New challenge for the cable industry

### 4.1 TUV and UL approved cables 2006–2013

In 2006 the module manufacturers started to think globally. The new marketing requirement was to manufacture one type of photovoltaic module with all relevant approvals to sell them on all markets. The challenge was to create a cable which could combine the opposed specifications of UL (PV / USE-2) and TUV 1169. Particularly the following discrepancies had to be overcome.

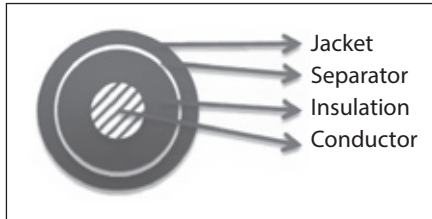
- Halogen-free compounds are highly filled with flame retardant minerals. The physical properties required by UL are a challenge for this kind of compound
- Passing the flame test required by UL is easy for halogenated compounds but difficult for halogen-free compounds
- The long-term stability test of UL is a real challenge for filled compounds because the flame-retardant additives are hygroscopic

However, it was possible to comply with all these requirements.

#### 4.1.1 The first solution

The outstanding characteristics of this design are:

- Three-layer extrusion in one pass (implied by increasing pricing pressure in the PV industry)



▲ **Figure 3:** Optimised design of a UL4703 and TUV1169 or TUV1169 wire

- Special developed polymer as separator
- Separable layers which have been required by many customers (UL definition: "Thermoset insulation having a jacket")
- The difference of these two cable families are different layers thicknesses because the UL has a higher requirement for the insulation thickness
- All compounds are thermoset (electron beam crosslinking)

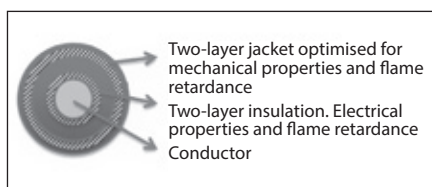
## 5 The next step

### 5.1 New requirements

In 2013 the new requirement of the PV industry was to increase the system voltage to save cable cost and to increase the efficiency of the PV systems. The voltage rating of the first generation of PV wires according to TUV1169 was based on generic industrial cable standards. The standard voltage rating of low voltage cables in the CENELEC and IEC is  $U_0/U = 600/1,000V$  AC or  $900/1,500V$  DC.

The nominal voltage rating of the new generation photovoltaic wire is  $U_0/U = 1,000/1,000V$  AC or  $1,500/1,500V$  DC. In the meantime TUV Rheinland developed 2Pfg1990/2012, which considers the new requirements.

### 5.2 New generation of UL4703 1,000V/ TUV 1,500V DC cables



▲ **Figure 4:** New design

The outstanding characteristics of this design are:

- Four-layer extrusion in one pass (implicated by further increasing pricing pressure in the PV industry)
- All compounds are thermoset (electron beam crosslinked)
- Layers not separable (UL definition: "Composite insulation without a jacket")
- Approvals: UL (1,000V)/TUV (2Pfg1990)/CSA 22.2 No. 271-11

## 6 The way to CENELEC and IEC

### 6.1 CENELEC

In 2011 the German National Committee for PV wires and cables started to work out a revision of VDE-AR-E 2283-4 "Requirements for cables for PV systems".

The target was now to apply this draft as a new work item to CENELEC TC20. The main topics were:

- Increasing the system voltage
- Adapting test procedures to the new voltage level

The result of this work is EN50618, which was published as a final draft in August 2014.

### 6.2 IEC

In 2013 IEC adopted the draft EN50618 on request of IEC TC82 as a basic paper to start to work out an IEC standard for photovoltaic wires.

This is now published as a committee draft IEC62930.

The IEC draft is 95 per cent identical to EN50618.

#### 6.2.1 The difference to EN50618

The main difference between EN 50618 and IEC 62930 is that in the IEC standard class two conductors are permitted for use for fixed installations.

## 7 What is new in EN50618 and IEC 62930

### 7.1 Design

There are no great differences in the design requirements of these new standards. Notice, however, the definition of black as preferred jacket colour.

Minor changes are in the required layer thicknesses, which are slightly increased.

### 7.2 Test requirements

Note that the material testing procedures have been widely changed by adapting IEC60811 "Electric and optical fibre cables – Test methods for non-metallic materials".

- All test samples now have to be taken from finished cables
- It is not permitted to conduct material tests on extruded tapes or moulded plates

*Paper courtesy of the 63<sup>rd</sup> IWCS Technical Symposium, Providence, Rhode Island, USA, November 2014.*

**Leoni Studer AG**  
 Business Unit Solar & Windpower  
 Däniken  
 Switzerland  
 Tel: +41 799138728  
 Email: faruk.yeginsoy@leoni.com  
 Website: www.leoni.com

# Karriere-Entwicklung

AUSZUBILDENDE sind ein wichtiger Teil des Rekrutierungsprogramms von William Hughes und das Unternehmen investiert daher weiterhin in diese wertvolle Ressource. Eine hervorragende Plattform für Jugendliche, um ihre Karriere zu entwickeln, wird durch den in Federn und Drahtbiegeteilen für die weltweite Automobil- und Raumfahrtindustrie sowie in der Ausbildung spezialisierten Hersteller geboten.

Während des Vierjahresprogramms haben die Auszubildenden eine einzigartige Gelegenheit Erfahrungen in der kompletten Palette der Herstellungsverfahren im Werk und Hauptsitz von William Hughes, in Dorset, UK, zu machen.

“Der Erfolg unseres Unternehmens setzt auf unser Team und das Ausbildungsprogramm bietet Jugendlichen die Möglichkeit ihre Karriere innerhalb unserer Organisation zu beginnen und weiter zu entwickeln,” sagte Emma Burgon, technische Leiterin.

“Aufgrund unseres ständigen Wachstums, schaffen wir kontinuierlich Möglichkeiten für ausgebildete Jugendliche gemeinsam mit mittleren und leitenden Führungskräften. Wir freuen uns sehr, dass viele dieser Stellen von Auszubildenden besetzt werden, nachdem sie die formale Ausbildung beenden werden.”

Eine sorgfältige Auswahl ist der Schlüssel für die Einstellung und Bindung des geeigneten Personals und William Hughes setzt lokale Ressourcen dabei ein, einschließlich Arbeitsämter, lokale Zeitungen



▲ Bewerber und Team im Werk von William Hughes

und Weiterbildungseinrichtungen, um potentielle Auszubildende anzuziehen. Interessierte Bewerber werden zur Teilnahme an einem “Open Evening” eingeladen, wo sie in die Unternehmensaktivitäten eingeführt werden und lernen wie das Ausbildungsprogramm verläuft. Sie werden auch im Werk und in den Büros herumgeführt, um selbst zu sehen wie es tatsächlich ist in der Produktion zu arbeiten.

Nach dem “Open Evening” werden ausgewählte Bewerber eingeladen eine Woche lang im Werk zu arbeiten. Das bietet eine hervorragende Gelegenheit, um zu beurteilen, ob sie sich für das Programm eignen. Werden sie ausgewählt,

so werden die Bewerber unterstützt, einen NVQ (nationaler beruflicher Befähigungsnachweis) -Kurs bezüglich der allgemeinen Fertigung zu besuchen, der gegebenenfalls in eine HNC- und HND-Ebene umgesetzt werden kann.

Die Fortschritte werden vom HR-Manager mit regelmäßigen Meetings und Bewertungen aus den Hochschulberichten überwacht. Die Flexibilität ist wichtig bei individuellen Programmen, die geändert und angepasst werden, um die Stärken und Interessen eines jeden Bewerbers zu berücksichtigen.

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

## Markteinführung eines neuen Produkts auf der Messe

Cimteq, der in UK-ansässige Softwarelieferant für Kabelaufbau und -herstellung, wählte die diesjährige Interwire-Ausstellung in Atlanta, USA, um das mit seinem Kernprogramm CableBuilder laufende CableBuilder3D einzuführen.

Mit diesem neuen Produkt wird der Ruf von CableBuilder als weltweit geschätztes Kabelaufbausystem weiterhin konsolidiert.

Dieses Produkt ist vollständig in das CableBuilder integriert und bietet umfassende Graphik-Funktionen bei der 3D-Modellierung, die Erstellung technischer Zeichnungen und vollständige CAD-Funktionen.

Das System kann die im CableBuilder erstellten Zeichnungen verarbeiten und automatisch in fast fotorealistische 3D-Zeichnungen transformieren.

Somit ist ein Fotograf oder die Weitergabe als Unterauftrag an eine externe Grafikagentur nicht mehr erforderlich.

Die Bilder können in Datenblätter integriert werden. Damit werden weitaus professionellere Veröffentlichungen geboten, die dann wiederum den Kunden des Kabelherstellers für den Einsatz - sowohl On- als auch Offline - in deren Marketingmaterial genutzt werden können.

Auf der Messe fand darüber hinaus, neben CableBuilder und CableBuilder3D, auch ein anderes Produkt von Cimteq viel Beachtung: CableMES, ein Manufacturing Execution System speziell für Kabel, basierend auf der Wonderware Plattform.

**Cimteq Ltd – UK**  
**Website:** [www.cimteq.co.uk](http://www.cimteq.co.uk)

## Wegweisend für das Internationale Fusionsenergieprojekt ITER

Ridgway Machines hat einen weiteren wichtigen Auftrag für das ITER, das internationale Projekt für den Bau eines Kernfusionsreaktors erhalten. Erteilt wurde dieser Auftrag von Sea Alp Engineering Consortium, ein in Europa ansässiger innovativer Forscher für Lösungen mit Spitzentechnologien für Forschungsprojekte auf dem Gebiet der Kernphysik. Damit werden zusätzliche Bandwickel-Kopfsysteme abgedeckt, die speziell entwickelt wurden, um Supraleiterspulen für die ITER-Poloidalfeld (PF)-Spulen zu isolieren.

Ridgway Machines, mit Sitz in Leicester, UK, hat bereits mehrere Bandwickel-Kopfsysteme für Toroidalfeld (TF)-Spulen als Teil der europäischen Lieferung für das ITER-Projekt entworfen und geliefert. Ridgway hat dann seine innovativen Projekte zur Lieferung weiterer Maschinen für das Bandwickel-Kopfsystem erweitert, zur Bandwicklung der von General Atomics gefertigten zentralen Solenoids (CS)-Spule, als Teil der Lieferung des USA-Konsortiums für das ITER-Projekt.

Dieser neue Auftrag für die PF-Spulen zeigt das von den Mitgliedern des Konsortiums entgegengebrachte Vertrauen, bezogen auf die beständige Qualität, Leistung und Planungstechnologie, die für die Herstellung aller drei

wichtigsten Spulenstrukturen innerhalb des Gefäßes des magnetischen Einschlusses Tokamak geboten werden.

ITER wurde als wichtigstes wissenschaftliches Experiment der Geschichte genannt und beabsichtigt die technische und wissenschaftliche Durchführbarkeit der Fusionskraft für gewerbliche Energie aufzuzeigen. Die Tokamak-Maschine von ITER wird eine der kompliziertesten, jemals entwickelten Maschinen sein – mit einer Höhe von 30 Metern und einem Gewicht von 23.000 Tonnen wird sie schätzungsweise 1 Million Bestandteile aufnehmen. Die Poloidalfeld (PF)-Magneten halten das Plasma von den Wänden fern und tragen auf diese Weise dazu bei, die Form und Stabilität des Plasmas zu erhalten.

Das Poloidalfeld-Spulensystem besteht aus sechs horizontalen Spulen, die außerhalb der toriodalen Magnetstruktur angeordnet sind. Aufgrund ihrer Größe wird die tatsächliche Wicklung von vier der sechs Poloidalfeld-Spulen in einem eigenen, 257 Meter langen Gebäude für die Spulenwicklung im ITER-Standort in Cadarache stattfinden.

**Ridgway Machines Ltd – UK**  
**Website:** [www.ridgwayeng.com](http://www.ridgwayeng.com)

# Veranstaltung “Women in manufacturing”

MILTEC Corporation veranstaltete eine Firmenbesichtigung und Karriererepräsentation für eine Gruppe weiblicher Mitglieder und potenzieller Mitglieder der Women in Manufacturing (WiM), eine nationale Organisation, die der Attraktivität, Bindung und Förderung von Frauen gewidmet ist, die sich für eine Karriere in der Fertigungsindustrie entschieden haben oder sie anstreben.

Die Veranstaltung begann mit einem Vortrag von Jane Seagraves, Verantwortliche für die Geschäftsentwicklung bei APPI Energy in Salisbury Maryland, und WiMs erste Affinity-Partnerin, die Strom- und Erdgas-Beratungsleistungen anbieten.

In der Präsentation hervorgehoben wurde die Mission von WiM, Frauen bei der Berufsausübung in der Fertigungsindustrie zu unterstützen, zu fördern und zu inspirieren, sowie Informationen über verschiedene Veranstaltungen zu geben, die die Vernetzung mit Branchenkollegen erleichtern.

Die Veranstaltung von Miltec unterstützt nicht nur WiMs Mission, sondern ermöglicht auch die Vernetzung unter



▲ Gäste bei der Veranstaltung “Women in Manufacturing” bei Miltec

Kollegen, die an der Besichtigung der Fertigungsstätte und des Betriebes von Miltec teilnahmen, sowie mehr über das UV-Härtungsverfahren zu erfahren.

Die Frauen von Miltec beschrieben ihre berufliche Verantwortung und schilderten die tatsächlichen Lebensgeschichten über wie Miltec ihnen eine berufliche Karriere in der Fertigung anbot.

Marilyn Blandford, CEO von Miltec, sagte: “Ich bin stolz auf unsere Frauen und fühle mich geehrt, von solchen starken

Frauen umgeben zu sein, durch die ich weiterhin jeden Tag lerne.”

Marilyn Blandford sprach über ihren eigenen Karriereweg, der als Erzieherin begann, und ermutigte die Gruppe der weiblichen Teilnehmerinnen, ihre Stärken zu erkennen, ihre Ausbildung fortzusetzen und zu verstehen, dass das Fachwissen der Frauen entscheidend für den Fertigungsbereich ist.

**Miltec Corporation – USA**  
**Website:** [www.miltec.com](http://www.miltec.com)

# Standardisierung von PV-Leitungen und -Kabeln 2001-2014

von Faruk Yeginsoy, Leoni Struder AG

## Übersicht

Diese Publikation zeigt die Entwicklungsgeschichte vom ersten deutschen TÜV Rheinland Dokument 2Pfg1169/2001 zum 2Pfg1990/2012 und den Einfluss dieses Dokuments auf die nationalen Standards in den USA, Japan und Europa sowie die Entwicklung der Cenelec-Standards EN50618 und IEC62930.

Außerdem wird ein Einblick in den erforderlichen Aufbau sowie die Werkstoffkombinationen und Produktionsprozessen geboten, um die oben genannten Standards erfüllen zu können. Die Herausforderung lag insbesondere darin, gleichzeitig mehreren Standards zu entsprechen, wie z. B. der Kombination von UL und TÜV. Einen weiteren Aspekt wird das Verständnis für spezielle Prüfverfahren wichtiger Compound-Eigenschaften vermitteln, die Einfluss auf die zu erwartende sehr lange Betriebszeit der Photovoltaik-Leitungen haben.

## 1 Einleitung

Durch das weltweite Interesse an erneuerbaren Energien musste sich die Photovoltaikindustrie seit Ende des letzten Jahrhunderts maßgeblich entwickeln und diese Entwicklung war weltweit unaufhaltsam. Zu dieser Zeit war der Bau von Photovoltaikanlagen eine teure und langfristige Investition; die Investoren wussten nicht wie sie die Qualität der Module einschätzen konnten und die Kunden fragten nach der erwarteten Lebensdauer der Photovoltaik-Module und -Installationen. Es bestand ein großer Bedarf an Bewertungen bezogen auf Sicherheit und Qualität durch Dritte.

Zu dieser Zeit begann der TÜV Rheinland die Sicherheit und Qualität der Solarmodule nach eigenen Anforderungen zu überprüfen. Sehr schnell wurde deutlich, dass die Modulqualität und -sicherheit von den Komponenten abhängen, jedoch bestand eine fehlende Standardisierung für Komponenten, die die Anforderungen der PV-Anwendung berücksichtigte. Das war der Beginn der Standardisierung der PV-Leitungen.

## 2 Der Beginn

Im Jahre 2001 begann der TÜV Rheinland in Deutschland die PV-Module zu überprüfen und stellte viele durch Kabel verursachte Probleme fest. Da keine spezielle Standardtests für diese Kabel vorlagen, erstellte der TÜV Rheinland seinen eigenen Standard. Das war der Ursprung von 2Pfg1169:2004. Dieser erste Standard basierte auf der IEC60245-4:1994 (Gummi-isolierte Leitungen mit Nennspannungen bis 450/750V - Teil 4: Flexible Leitungen). Zu dieser Zeit war H07RN-F die meistbenutzte Leitung (Gummi 60°C–90°C). In dieser frühen Phase der PV-Installationen realisierte niemand, dass die Anforderungen an PV-Kabel viel höher waren.

### 2.1 Erste Verdrahtungsfehler nach ein paar Jahren

▼ **Abb. 1:** Durch Ozon und hohen Temperaturen verursachte Verdrahtungsfehler



## 3 Neue Anforderungen

Nach zahlreichen Verdrahtungsfehlern erkannten die PV-Experten, dass die Anforderungen des ersten Pfg 1169 /2004 zu niedrig lagen. 2006 begann eine neue Expertengruppe (Arbeitsgruppe des Deutschen Nationalkomitees 411.2.3) an einer neuen Fassung der „Anforderungen für PV-Leitungen“ zu arbeiten. Am ersten Teil nahm eine Gruppe von Modul- und Kabelexperten teil. Der Schwerpunkt lag nun auf der Gebrauchsdauer der PV-Leitungen.

Die Arbeitsgruppe beschäftigte sich hauptsächlich mit nachfolgenden Fragen:

- Wie können wir die Lebensdauer eines Kabels prognostizieren?
- Wie viele Jahre soll die Lebensdauer eines Kabels betragen?
- Wie ist die Alterung der Kabel zu verstehen?
- Wie können wir den Alterungsprozess testen?

### 3.1 Materialalterung ist der neue Schwerpunkt

**3.1.1 Thermooxidation von Polyolefine**  
Eines der grundlegenden chemischen Gesetze ist das Arrhenius-Gesetz. Dieses Gesetz beschreibt die Korrelation zwischen Temperatur und Prozessgeschwindigkeit. Die thermische Alterung des Polymers ist nichts anderes als ein chemischer Prozess und alle chemischen Prozesse hängen von der Prozess-temperatur ab.

Bei einer Temperaturerhöhung von 10°C wird der Prozess um den Faktor zwei beschleunigt. Das wirkt auch umgekehrt. Bei einer Temperaturabnahme verlangsamt sich der Alterungsprozess um den Faktor 0,5. Der spezifische Temperaturnennwert eines Kabels sollte in Kombination mit einem bestimmten Zeitraum festgelegt werden.



Ohne eine Zeitanzeige ist der Temperaturnennwert nutzlos. Der Standard-Temperaturnennwert in der europäischen Kabelindustrie entspricht  $xxx^{\circ}\text{C}$  bei 20.000 Std. Die Standard-Gebrauchsdauer in der PV-Industrie für PV-Module entspricht 25 Jahren. Das sind grob 150.000 Stunden. Die angenommene Umgebungstemperatur ist  $90^{\circ}\text{C}$ , d. h. der mindeste Temperaturnennwert sollte  $90^{\circ}\text{C}/150.000$  Std entsprechen. Auf die industrielle Standardzeit von 20.000 Std normiert, sollte der neue Temperaturnennwert  $120^{\circ}\text{C}/20.000$  Stunden betragen.

### 3.1.2 Photooxidation

Das Sonnenlicht enthält einen hohen Anteil an UV-Strahlung. Die UV-Strahlung, die von einem Polymerwerkstoff aufgenommen wird, wird in seinem Abbau resultieren. Die Energie könnte ausreichen um die Aufspaltung des unbeständigen Polymers zu verursachen und, nach einem gewissen Zeitraum, seine Komponenten ändern. Polymerwerkstoffe, die über längere Zeiten UV ausgesetzt werden müssen, sollten aus Polymercompounds bestehen, die für derartige Umgebungsbedingungen entsprechend stabilisiert sind.

Die Basis-Polyolefin-Polymere haben eine eingeschränkte Lebensdauer im Freien. Allerdings enthalten heute die meisten hergestellten, gefärbten (nicht-schwarzen) Polyolefine-Solkabel ein UV-Stabilisierungspaket, das für einen begrenzten Zeitraum von 5 bis 10 Jahren zufriedenstellend ist. Für eine längere Lebensdauer im Freien sollten jedoch Polyolefine zumindest mit 2,5 Prozent feinverteiltem Ruß formuliert werden.

Das Einsetzen von Ruß in Polyolefinen bewirkt eine starke Erhöhung der UV-Beständigkeit. Ruß wirkt als UV-Absorptionsmittel und schirmt das Polyolefin gegen die durch UV-Strahlungen verursachten Schäden ab.

Bis heute ist keine physikalische oder chemische Wechselbeziehung bekannt, die geeignet ist, eine beschleunigte Witterungsbeständigkeitsprüfung bis zur Lebensdauer der Kabel zu extrapolieren.

Die durchgeführte Prüfdauer bei den Standards (UL und TÜV) entspricht 720 Stunden, wobei deren Ergebnisse nicht basierend auf eine mathematische Formel extrapoliert werden können. Die Tests liefern nur vergleichbare Ergebnisse, aber keine echten Aussagen über die tatsächliche Lebensdauer.

Wie über vier Jahrzehnte Erfahrung im Freien mit polyethylen-umhüllten Kommunikationskabeln bewiesen, ergibt der Zusatz von 2,5 Prozent feinverteiltem Ruß einen über 25 Jahre langen UV-Schutz.

Die Dispersion von Ruß ist ein integrierter Teil des Extrusionsverfahrens des Mantels und hat eine große Auswirkung auf die UV-Beständigkeit. Die ordnungsgemäße Verwaltung der Maschinenparameter ist der kritische Schlüsselfaktor, um die besten Ergebnisse zu erzielen.

Ruß ist in der EN50290 („Kommunikationskabel. Gemeinsame Regeln für Entwicklung und Konstruktion“) eine zwingende Voraussetzung für Kommunikationskabel, die im Freien eingesetzt werden.

### 3.2 Grundlegende Punkte der neuen Anforderungen im Jahr 2007

Der wichtigste grundlegende Punkt der neuen Fassung des Pfg1169/2007.8 ist die Prüfung des thermischen Langzeitverhaltens nach IEC60216 „Elektroisoliertstoffe – Eigenschaften hinsichtlich des thermischen Langzeitverhaltens“ ( $120^{\circ}\text{C}/20.000$  Std.).

Beim Einsatz dieses Standards wird davon ausgegangen, dass ein fast lineares Verhältnis zwischen dem Logarithmus der Zeit besteht, die gefordert wird, um eine definierte Eigenschaftsänderung (unter 50 Prozent Bruchdehnung) und den reziproken Wert der entsprechenden absoluten Temperatur zu verursachen.

Diese Prüfung wird mit zumindest drei unterschiedlichen Temperaturen durchgeführt. Die höchste Temperatur soll so ausgewählt werden, dass sich ein Endpunkt von mindestens 100 Std. ergibt und die niedrigste Temperatur soll das erwartete Ergebnis nicht unter 5.000 Std. bieten.

Eine gerade Linie soll gezeichnet werden, um die verschiedenen erfassten Punkte zu verbinden. Indem die Linie verlängert wird bis sie die 20.000 Std. auf der y-Achse schneidet – (Logarithmus der Zeit) kann der Temperaturnennwert auf der x-Achse – (die reziproke absolute Temperatur) festgelegt werden.

Die weiteren grundlegenden Punkte sind, dass:

- Die verwendeten Materialien halogenfrei sein sollen
- Die verwendeten Leiter die IEC 60228 Klasse 5 erfüllen sollen
- Die Kabel und Leitungen die IEC60332-1-2 (vertikaler Brandtest) zu erfüllen haben

Das Ergebnis dieser Studie wurde von der VDE veröffentlicht und zwar als:

- VDE-AR-E 2283-4 „Anforderungen für Leitungen für PV-Systeme“

und vom TÜV als:

- TÜV 2Pfg1169/2007.8 „Anforderungen an Leitungen für Photovoltaik-Systeme“

### 3.3 Die Spezifikation der PV-Leitungen durch UL

2005 hat UL die erste Ausgabe der Norm 4703 veröffentlicht. So wurde der UL-Typ „PV“ geschaffen. Diese Norm basierte auf die UL854 (Service Eingangskabel). Jedoch wurde von der NEC2005 (Artikel 690) im Jahr 2005 Kabel des Typs USE, USE-2, UF und SE gefordert.

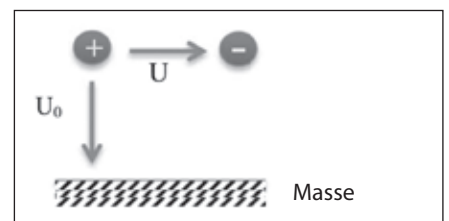
Erst 2008 wurde der PV-Typ zum ersten Mal in der NEC2008 erwähnt. Die geforderten Leitungen waren in dieser Ausgabe USE-2 oder PV. Nennenswert ist die Annahme von metrischen Abmessungen der Leiter in der Norm UL4703.

2010 veröffentlichte UL die vierte Ausgabe der Norm UL 4703, die bis heute die relevante Fassung ist. In dieser Ausgabe ist die Referenznorm UL 44 „Duroplastische Isolierung von Leitungen und Kabel“.

#### 3.3.1 Die Unterschiede gegenüber TÜV 1169/2007.8

Die wesentlichen Unterschiede zwischen UL und TÜV liegen darin, dass:

- Halogenhaltige Mischungen in der UL4703 zugelassen werden
- Der geforderte Flammtest UL1581-1060 anspruchsvoller als die IEC60332-1 ist
- Kein Unterschied zwischen GS und WS in der UL4703 besteht
- 1.000V (oder 2.000V) genehmigt wird, was zukunftsorientierter ist
- Aluminiumdrähte in der UL4703 zugelassen werden
- Kein Unterschied zwischen U0/U in der UL4703 besteht



▲ Abb. 2: Definition von  $U_0$  /  $U$

## 4 Neue Herausforderung für die Kabelindustrie

### 4.1 TÜV- und UL-bescheinigte Kabel 2006–2013

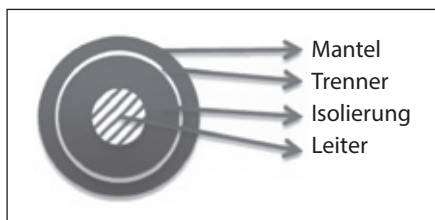
2006 begannen die Modulhersteller global zu denken. Die neue Vermarktungsanforderung lag darin, einen neuen Typ PV-Modul herzustellen mit allen entsprechenden Zustimmungen, der in allen Märkten verkauft werden konnte. Die Herausforderung bestand darin ein Kabel zu erstellen, das die entgegengesetzten Spezifikationen von UL (PV / USE-2) und TÜV 1169 vereinigen konnte. Insbesondere

mussten nachfolgende Unstimmigkeiten überwunden werden.

- Halogenfreie Compounds werden stark gefüllt mit flammwidrigen Mineralien. Die geforderten physikalischen Eigenschaften durch UL sind eine Herausforderung für diesen Typ von Compounds
- Den durch UL geforderten Brandtest zu bestehen ist zwar für halogenhaltige Compounds einfach, aber für halogenfreie Compounds schwierig
- Der langfristige Stabilitätstest durch UL ist eine eigentliche Herausforderung für gefüllte Compounds, weil die flammwidrigen Additive hygroskopisch sind

Dennoch konnten all diese Anforderungen erfüllt werden.

#### 4.1.1 Die erste Lösung



▲ **Abb. 3:** Optimierter Aufbau einer Leitung UL4703 und TÜV1169 oder TÜV1169

Die außerordentlichen Eigenschaften dieses Aufbaus sind:

- Dreischicht-Extrusion in einem Durchgang (wegen dem steigenden Preisdruck in der PV-Industrie)
- Speziell entwickeltes Polymer als Abscheider
- Trennbare Schichten, die von mehreren Kunden gefordert wurden (UL-Definition: „Duroplastische Isolierung, die einen Mantel aufweist“)
- Der Unterschied zwischen diesen zwei Kabelgenerationen sind unterschiedliche Schichtdicken, weil die UL gegenüber der Isolierungsdicke eine höhere Anforderung aufweist
- Alle Compounds sind duroplastisch (Elektronenstrahlvernetzung)

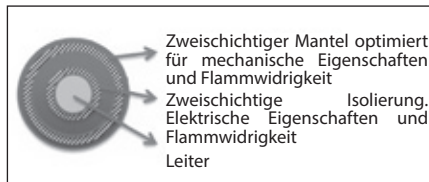
## 5 Der nächste Schritt

### 5.1 Neue Anforderungen

Im Jahre 2013 lag die neue Anforderung der PV-Industrie darin, die Systemspannung zu erhöhen, um Kabelkosten einzusparen und die Effizienz der PV-Systeme zu erhöhen. Die Spannungsnennwerte der ersten Generation von PV-Leitungen nach TÜV 1169 basierten auf allgemeinen industriellen Kabelstandards. Der Standard-Spannungsnennwert von Niederspannungskabeln nach CENELEC und IEC ist U0/U = 600/1,000V WS oder 900/1,500V GS.

Der Spannungsnennwert der neuen Generation von PV-Leitungen ist U0/U = 1.000/1.000V WS oder 1.500/1.500V GS. In der Zwischenzeit entwickelte TÜV Rheinland das 2Pfg1990/2012, das die neuen Anforderungen umsetzt.

### 5.2 Neue Generation von UL4703 1.000V/TÜV 1.500V GS-Kabeln



▲ **Abb. 4:** Neuer Aufbau

Die hervorragenden Eigenschaften dieses Aufbaus sind:

- Vierschicht-Extrusion in einem Durchgang (wegen des steigenden Preisdrucks in der PV-Industrie)
- Alle Compounds sind duroplastisch (elektronenstrahlvernetzt)
- Nicht trennbare Schichten (UL-Definition: „Verbundisolierung ohne einen Mantel“)
- Zulassungen: UL (1.000V)/TÜV (2Pfg1990)/CSA 22.2 Nr. 271-11

## 6 Der Weg zur CENELEC und IEC

### 6.1 CENELEC

2011 begann das Deutsche Nationalkomitee für PV-Leitungen und -Kabel eine Revision der VDE-AR-E 2283-4 „Anforderungen für Leitungen für PV-Systeme“ zu erarbeiten. Das Ziel war nun diesen Standardentwurf als ein neues Normungsvorhaben vom CENELEC TC20 einzubringen. Die Hauptthemen waren:

- Erhöhung der Systemspannung
- Anpassung von Prüfverfahren zum neuen Spannungsniveau

Das Ergebnis dieser Studie ist die EN50618, die August 2014 als endgültiger Standardentwurf veröffentlicht wurde.

### 6.2 IEC

2013 hat IEC den Entwurf EN50618 auf Anfrage von IEC TC82 als ein Grundlagenpapier angepasst, um einen IEC-Standard für PV-Leitungen zu erarbeiten.

Dieser wurde nun als Komitee-Entwurf IEC62930 veröffentlicht. Der IEC-Entwurf stimmt zu 95 Prozent mit EN50618 überein.

#### 6.2.1 Der Unterschied zur EN50618

Der wesentliche Unterschied zwischen EN 50618 und IEC 62930 liegt darin, dass in der IEC-Standardklasse zwei Leiter für den Einsatz in festen Verlegungen zugelassen werden.

## 7 Was in der EN50618 und in der IEC 62930 neu ist

### 7.1 Aufbau

Es bestehen keine großen Unterschiede in den Anforderungen beim Aufbau dieser neuen Standards. Es wird dennoch darauf hingewiesen, dass die Definition von schwarz als bevorzugte Mantelfarbe gilt. Geringfügige Änderungen liegen in den geforderten Schichtdicken, die leicht erhöht werden.

### 7.2 Testanforderungen

Zu beachten ist, dass die Material-Prüfverfahren weitgehend verändert wurden durch die Anpassung von IEC60811 „Kabel und Glasfaserkabel – Prüfverfahren für nichtmetallene Werkstoffe“.

- Alle Prüfproben sind nun von fertigen Kabeln zu entnehmen
- Es dürfen keine Werkstoffprüfungen auf extrudierten Bändern oder geformten Platten durchgeführt werden

*Dieser Artikel wurde freundlicherweise während des 63. IWCS Technical Symposium, Providence, Rhode Island, USA, November 2014 zur Verfügung gestellt.*

**Leoni Studer AG**  
Business Unit Solar & Windpower  
Däniken  
Switzerland  
Tel: +41 799138728  
Email: faruk.yeginsoy@leoni.com  
Website: www.leoni.com

# Развивая карьеры

Стажировки являются важной частью рекрутинговой программы William Hughes, и компания продолжает инвестировать в данный ценный ресурс. Экспертный производитель пружин и компонентов витой проволоки для глобальной автомобильной и аэрокосмической промышленности и стажировки предоставляют великолепную площадку для молодых людей для карьерного роста.

В рамках четырехлетней программы стажировки предоставляют уникальную возможность получения опыта в сфере полного производственного процесса на заводе William Hughes и в центральном офисе в Дорсете, Великобритании.

“В основе успеха нашей компании лежат люди, а наша схема стажировки предоставляет возможность молодым людям начать и развивать карьеру в пределах нашей организации,” - заявила Эмма Бургон, директор по инжинирингу.

“Так как мы продолжаем расти, мы постоянно создаем возможности для опытных операторов, так и для руководителей среднего и высшего звена. Мы рады тому, что большое количество должностей занимают стажеры по окончании стажировки.”

Тщательный отбор - это ключ к рекрутингу и сохранению нужных людей, и William Hughes использует местные ресурсы, включая центры занятости и местные газеты для дальнейших образовательных



▲ Стажеры и персонал на заводе William Hughes

учреждений и привлечения потенциальных стажеров. Заинтересованных кандидатов приглашают посетить открытый вечер, где их знакомят с деятельностью компании и объясняют, как работает схема стажировки. Для них также проводят экскурсию по заводу и офисам, чтобы предоставить возможность увидеть, как на самом деле выглядит работа на производстве.

После открытого вечера отобранных кандидатов приглашают для получения недельного опыта работы, что дает великолепную возможность оценить, насколько они подходят имеющейся схеме. После отбора кандидатов поддерживают

в получении национальной профессиональной квалификации в общем производственном процессе, которая затем может быть при необходимости повышена получением диплома о высшем образовании и диплома о высшем техническом образовании. Успешность отслеживается руководителем отдела кадров на регулярных собраниях и при рассмотрении отчетов об успеваемости. Гибкость важна в индивидуальных программах, которые изменяются и адаптируются в соответствии с сильными сторонами и интересами каждого кандидата.

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

## Демонстрация новой продукции на выставке

Британская компания по проектированию кабелей и разработке программного обеспечения для производства Cimteq выбрала выставку Interwire в Атланте, США для запуска CableBuilder3D в рамках своей ведущей программы CableBuilder. Новая продукция укрепит репутацию CableBuilder в качестве надежной системы по разработке кабеля по всему миру. Она полностью интегрируется в CableBuilder и оснащена многофункциональной графикой для возможностей 3D моделирования, создания технических чертежей и полными возможностями CAD.

Система может принимать проектирования, разработанное в CableBuilder, и автоматически переводить его в около-фотореалистические 3D чертежи, что позволяет обойтись без необходимости нанимать

фотографа или заключать договор на субподрядные работы с графическим агентством. Изображения могут быть интегрированы на опросные листы с целью предоставления большего количества профессиональной литературы заказчикам кабельных производителей в пакете маркетинговых материалов для применения в рамках производства и вне.

Помимо внимания, привлеченного на выставке CableBuilder и CableBuilder3D, большой интерес вызвала еще одна продукция Cimteq, CableMES, особая система для осуществления производства на основе платформы Wonderware.

**Cimteq Ltd – Великобритания**  
**Вебсайт:** [www.cimteq.co.uk](http://www.cimteq.co.uk)

## Лидерство в международном проекте ITER по энергии ядерного синтеза

Компания Ridgway Machines получила еще один крупный контракт для работы в международном проекте ITER по строительству термоядерного реактора. Данный заказ, размещенный Sea Alp Engineering Consortium, европейской инновационной компанией по предоставлению высокотехнологичных решений для научных проектов в сфере ядерной физики, включает системы головок для обмотки ленты, разработанные специально для изоляции сверхпроводящих катушек для катушек полоидального поля ITER.

Компания Ridgway Machines, расположенная в Лестер, Великобритания, уже разработала и поставила несколько систем головок для обмотки изоляции для катушек тороидального поля как части европейской поставки по проекту ITER. Затем Ridgway расширили свое инновационное проектирование для поставки дальнейшего оборудования системы головок для изоляционной обмотки центральной соленоидной катушки производства General Atomics как части объединенной поставки США для проекта ITER.

Недавний контракт на поставку для катушек тороидального поля демонстрирует уверенность членов консорциума в неизменном качестве, предоставлении эксплуатационной

технологии и технологии разработки для конструкций всех трех критических катушек в сосуде удержания магнитного поля Tokamak.

ITER был назван самым большим научным экспериментом в истории, целью которого является демонстрация технического и научного потенциала энергии синтеза ядер для энергетики промышленного масштаба. Оборудование Tokamak ITER является одним из самых сложных когда-либо проектируемых установок - 30 метров в высоту и весом 23 000 тонн, внутри которой будет находиться около одного миллиона компонентов. Магниты полоидального поля оттягивают плазму от стенок, таким образом сохраняя форму и стабильность плазмы.

Система катушек полоидального поля состоит из шести горизонтальных катушек, размещенных снаружи конструкции тороидального магнита. Из-за своего размера фактическая намотка четырех из шести катушек полоидального поля будет проводиться в специально отведенном здании для намотки длиной 257 метров на площадке ITER в Кадараше.

**Ridgway Machines Ltd – Великобритания**  
**Вебсайт:** [www.ridgwayeng.com](http://www.ridgwayeng.com)

## Женщины на производственном мероприятии

Компания Miltec Corporation провела экскурсию по заводу и презентацию о карьере для группы женщин и потенциальных членов Женщины на Производстве (Women in Manufacturing (WiM)), государственной организации, целью которой является привлечение, сохранение и обучение женщин, которые выбрали карьеру в производственной отрасли.

Мероприятие началось с презентации Джейн Сигрэйвз, директора по развитию бизнеса в APPI Energy в городе Солсбери штата Мэриленд и первого близкого партнера WiM, поставщика консалтинговых услуг в сфере электричества и природного газа.

Целью презентации стало подчеркнуть поддержку, продвижение и вдохновение женщин, выбравших карьеру на производстве, а также предоставление информации о нескольких событиях, укрепляющих связи с коллегами в отрасли.

Мероприятие Miltec не только поддержало данную миссию, но и позволило наладить связь с коллегами,



▲ Гости на дне, посвященном Женщинам на производстве в Miltec

которые посетили и увидели производственное предприятие и работу Miltec и узнали о технологии УФ-отверждения.

Женщины, работающие в Miltec, рассказали о своих рабочих обязанностях и привели истории из реальной жизни о том, как компания Miltec обеспечила им карьерный рост на производстве.

Президент Miltec Мэрилин Блэндформ заявила: "Я горжусь нашими женщинами и тем, что удостоена находиться в окружении таких сильных

женщин, у которых я могу учиться каждый день".

Она рассказала о своем карьерном росте, который начался с работы преподавателя и убедила группу женщин-посетителей признать свои сильные стороны, продолжить образование и понять, что женские навыки являются критическими для производственной сферы.

**Miltec Corporation – США**  
**Вебсайт:** [www.miltec.com](http://www.miltec.com)

# Стандартизация фотоэлектрических проводов и кабелей 2001-2014

Faruk Yeginsoy, Leoni Struder AG

## Аннотация

В данной работе продемонстрирована эволюция от первого документа немецкого TUV Rheinland 2Pfg1169/2001 до 2Pfg1990/2012 и влияние данного документа на государственные стандарты в США, Японии и Европе, а также на разработку стандартов Cenelec EN50618 и IEC62930.

Кроме того, в ней предоставлена информация по необходимому расчету, комбинациям материала и производственным процессам для соответствия вышеуказанным стандартам. Самой большой сложностью было соответствие нескольким стандартам, к примеру, комбинации UL и TUV. Дополнительный аспект демонстрирует особые процедуры испытания существенных характеристик компаундов, которые влияют на ожидаемый продолжительный срок эксплуатации фотоэлектрического кабеля.

## 1 Введение

Начиная с конца прошлого века мировой интерес к возобновляемой энергии вырос благодаря значительному росту фотоэлектрической промышленности, и данный рост был неоспоримым по всему миру. В то время строительство фотоэлектрических систем было дорогим и долгосрочной инвестицией, и инвесторы не знали, как оценивать качество модулей, а заказчики требовали предоставить ожидаемый

срок эксплуатации фотоэлектрических модулей и фотоэлектрических установок. Существовала большая необходимость в оценке качества и безопасности третьей стороной.

В это время немецкий TUV Rheinland начал рассмотрение качества и безопасности фотоэлектрических модулей в соответствии с их собственными требованиями. Очень скоро стало понятно, что качество и безопасность модулей зависела от компонентов, однако, не хватало стандартов для компонентов, учитывающих требования к фотоэлектрическому применению. Это дало начало стандартизации фотоэлектрического кабеля.

## 2 Начало

В 2001 году TUV Rheinland в Германии начал испытания фотоэлектрических модулей и обнаружил большое количество проблем, связанных с кабелями.

Так как специальных стандартных испытаний для данных кабелей не существовало, TUV Rheinland создал свой собственный стандарт. Это было рождением 2Pfg1169:2004.

Первый стандарт был основан на IEC60245-4:1994 (Кабели с резиновой изоляцией – номинальные напряжения до и включая 450/750 В – Часть 4: Жилы и гибкие кабели).

В это время самым используемым кабелем был H07RN-F (Резина 60°C–90°C).

На данной ранней стадии фотоэлектрических установок никто не представлял, что требования к фотоэлектрическим кабелям были гораздо выше.

### 2.1 Первые поломки кабелей спустя несколько лет



▲ Рисунок 1. Повреждения провода, вызванное озоном и высокими температурами

## 3 Новые требования

После многочисленных поломок кабелей эксперты по фотоэлектрическим системам осознали, что требования первого стандарта Pfg 1169 /2004 были слишком низкими. В 2006 году новая группа экспертов (рабочая группа 411.2.3 German National Committee) начала работать над новой версией «Требований к фотоэлектрическим кабелям». В первой части их работы участвовала совместная группа экспертов по модулям и кабелям. Основное внимание было уделено сроку эксплуатации фотоэлектрических кабелей. Рабочую группу принципиально интересовали следующие вопросы:

- Как можно прогнозировать срок эксплуатации кабеля?
- Сколько лет должен составлять срок эксплуатации кабеля?
- Как должен восприниматься износ кабелей?
- Как можно провести испытания процесса износа?

### 3.1 Теперь все внимание сосредоточено на износе материала

#### 3.1.1 Термоокисление полиолефинов

Одним из базовых химических законов является закон Аррениуса. Данный закон устанавливает зависимость между температурой и скоростью процесса. Термостарение полимера является ничем иным как химическим процессом, а каждый химический процесс зависит от температуры процесса.

Увеличение температуры на 10°C ускоряет процесс на показатель или два. Данное соотношение работает также в обратном направлении. Уменьшение температуры замедляет процесс износа на показатель 0,5. Указанный показатель температуры кабеля должен быть в сочетании с указанным временным сроком. Без указания времени значение температуры бесполезно. Стандартная предельная температура эксплуатации в европейской кабельной промышленности - xxx°C при 20,000ч.

Стандарт срока эксплуатации в фотоэлектрической промышленности составляет 25 лет. Это приблизительно составляет 150 000 часов. Предполагаемая температура окружающей среды 90°C, то есть минимальная расчетная температура должна быть 90°C/150 000 часов. Нормализованная до промышленного стандартного срока в 20 000 часов, новая расчетная температура должна быть 120°C/20 000 часов.

#### 3.1.2 Фотоокисление

Солнечный свет содержит большое количество ультрафиолетовой радиации. Ультрафиолетовая радиация, поглощаемая полимерным материалом, приведет к ухудшению его свойств. Энергия может быть достаточной для распада слабого полимера и после промежутка времени изменений его компонентов. Полимерные материалы, которые в течение продолжительного срока подвергаются воздействию ультрафиолета, должны быть сделаны из полимерных смесей, которые надлежащим образом стабилизированы для условий окружающей среды. Основные полиолефиновые полимеры имеют ограниченную устойчивость к атмосферному воздействию. Однако большинство полиолефиновых цветных

(не черных) солнечных кабелей, производимых сегодня, содержат ряд стабилизаторов ультрафиолета, который является удовлетворительным для ограниченного срока в 5-10 лет. Тем не менее для более долгого срока службы полиолефины должны быть получены с минимальным содержанием 2,5% высокодисперсной углеродной сажи.

Применение углеродной сажи для полиолефинов намного увеличивает устойчивость к ультрафиолету. Углеродная сажа действует как абсорбент ультрафиолета и защищает полиолефин от ультрафиолетовой радиации.

До сегодняшнего дня не была выявлена физическая или химическая взаимосвязь, применяемая для выявления ускоренного испытания воздействием атмосферных условий на срок эксплуатации кабелей. Продолжительности проведенных испытаний в стандартах (UL и TUV) составляют 720 часов, на основе данных результатов невозможно сделать выводы, опираясь на математические формулы. Данные испытания предоставили только сравнительные результаты, а не фактическое утверждение о фактическом сроке службы.

Как было продемонстрировано в течение более четырех десятилетий опыта применения кабелей связи с защитной полиэтиленовой оболочкой вне помещений, добавление 2,5% высокодисперсной углеродной сажи предусматривает более 25 лет защиты против ультрафиолета. Дисперсия углеродной сажи является неотъемлемой частью процесса экструзии оболочки, что имеет большое влияние на устойчивость к ультрафиолету. Надлежащее управление параметрами установки является ключевым фактором для достижения лучших результатов.

Углеродная сажа в EN50290 ("Communication cables. Common design rules and construction" "Кабели связи. Общая конструкция и строительство") является обязательным требованием для кабелей связи, применяющихся вне помещений.

### 3.2 Основные пункты новых требований в 2007

Основным пунктом новой версии Pfg1169/2007.8 является испытание на термостойкость в соответствии с IEC60216 "Electric insulating materials – Thermal endurance properties" (120°C/20 000 часов). В применении данного стандарта подразумевается, что почти линейная зависимость существует между логарифмом времени, необходимым

для получения определенной характеристики изменения (менее 50% растяжения после выхода из строя) и обратным показателем соответствующей абсолютной температуры. Данное испытание должно проводиться минимум при трех разных температурах. Самой высокой температурой должна быть температура, выбранная для получения ожидаемого результата не менее 100 часов, а самую низкую температуру необходимо выбирать для ожидаемого результата не менее 5 000 часов.

Прямой линией необходимо соединить различные полученные результаты. Продолжением линии до ее пересечения 20 000 часов на оси ординат (логарифм времени) можно определить расчетную температуру оси абсцисс (обратная абсолютная температура).

Дополнительными существенными пунктами являются:

- Используемые материалы не должны содержать галоген
- Используемые проводники должны соответствовать IEC 60228 класс 5
- Кабели и провода должны соответствовать IEC60332-1-2 (испытание вертикальным пламенем)

Результаты данной работы были опубликованы немецкой Ассоциацией электрических, электронных и информационных технологий VDE следующим образом:

- VDE-AR-E 2283-4 "Requirements for cables for PV systems"

И TUV:

- TUV 2Pfg1169/2007.8 "Requirements for cables for use in photovoltaic systems"

### 3.3 Технические требования к фотоэлектрическим проводам UL

В 2005 году UL опубликовал первое издание Outline 4703. Тип UL «фотоэлектрические» был создан. Описание было основано на UL854 (кабели ввода). Но в 2005 году NEC2005 (Статья 690) требовались USE, USE-2, UF и SE.

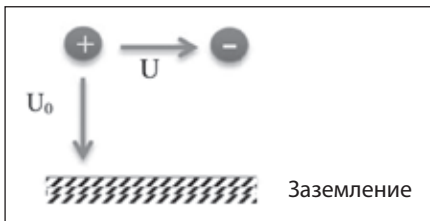
Лишь в 2008 году тип фотоэлектрические был упомянут в первый раз в NEC2008. Необходимые провода были в данном издании USE-2 или фотоэлектрические. Следует упомянуть приемку метрических размеров проводников в описании 4703 UL.

В 2010 году UL опубликовали четвертое издание описания 4703 UL, что является актуальной версией до сегодня. В данном издании упоминается стандарт UL 44 "Thermoset-insulated wires and cables".

### 3.3.1 Различия с TUV 1169/2007.8

Значительными различиями между UL и TUV являются:

- В UL4703 разрешены галогенные смеси
- Результаты необходимого испытания пламенем в UL1581-1060 являются более требовательными, чем в IEC60332-1
- Отсутствие различия между постоянным током и переменным током в UL4703
- 1 000 В (или 2 000 В) разрешены, что является более перспективным
- В UL4703 допускаются алюминиевые провода
- Отсутствие различия между  $U_0/U$  в UL4703



▲ Рисунок 2. Определение  $U_0/U$

## 4. Новый вызов для кабельной промышленности

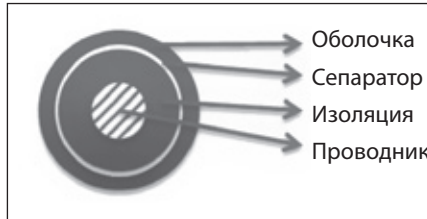
### 4.1 TUV и UL согласовали кабели 2006–2013

В 2006 году производители модулей начали применять глобальный подход. Новым требованием рынка было производство одного типа фотоэлектрических модулей со всеми соответствующими согласованиями для продажи их на всех рынках.

Вызовом стало создание кабеля, который смог бы сочетать в себе противостоявшие технические характеристики UL (PV / USE-2) и TUV 1169. Особенно необходимо было преодолеть следующие разногласия:

- Смеси, не содержащие галогенов, с большим наполнением огнестойких минералов. Требуемые UL физические характеристики являются вызовом для данного типа смесей
- Прохождение испытания пламенем, требуемое в соответствии с UL, легко достижимо для галогенизированных соединений, но трудно для соединений, не содержащих галогенов
- Испытания на долгосрочность UL являются большим вызовом для смесей с наполнителями, так как огнестойкие добавки гигроскопичны

Однако соответствие данным требованиям было достижимо.



▲ Рисунок 3. Оптимизированная конструкция провода UL4703 и TUV1169 или TUV1169

### 4.1.1 Первое решение

Выдающиеся характеристики данного дизайна следующие:

- Три слоя экструзии в одном калибре (что привело к тенденции повышения цен в фотоэлектрической сфере)
- Специально разработанный полимер в качестве сепаратора
- Отделяемые слои, которые запрашивались многими клиентами (определение UL: «Термореактивная изоляция с оболочкой»)
- Разница данных групп кабелей состоит в различной толщине слоев, так как требования к толщине изоляции у UL выше
- Все составляющие термореактивны (образование поперечных связей электронного луча)

## 5. Следующий шаг

### 5.1 Новые требования

В 2013 году новым требованием фотоэлектрической промышленности стало увеличение напряжения системы для сохранения стоимости кабеля и увеличения производительности фотоэлектрических систем.

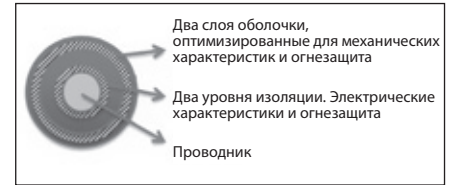
Номинальное напряжение фотоэлектрических проводов первого поколения в соответствии с TUV1169 было основано на общих промышленных кабельных стандартах. Стандартное номинальное напряжение кабелей с низким напряжением в CENELEC и IEC  $-U_0/U = 600/1000$  В переменного тока или  $900/1500$  В постоянного тока.

Стандартное номинальное напряжение фотоэлектрических кабелей нового поколения –  $U_0/U = 1\ 000/1000$  В переменного тока или  $1\ 500/1500$  В постоянного тока. В то же время TUV Rheinland разработал 2Pfg1990/2012, который учитывает новые требования.

### 5.2 Новое поколение кабелей постоянного тока UL4703 1 000 В/TUV 1 500 В

Выдающиеся характеристики данного дизайна следующие:

- Четыре слоя экструзии в одном калибре (что привело к дальнейшему повышению цен в фотоэлектрической сфере)



▲ Рисунок 4. Новая конструкция

- Все составляющие термореактивны (образование поперечных связей электронного луча)
- Слои не отделяемые (Определение UL: «комбинированная изоляция без оболочки»)
- Согласования: UL (1 000 В)/TUV (2Pfg1990)/CSA 22.2 № 271-11

## 6. Путь до CENELEC и IEC

### 6.1 CENELEC

В 2011 German National Committee, занимающийся фотоэлектрическими проводами и кабелями начал разрабатывать ревизию VDE-AR-E 2283-4 "Requirements for cables for PV systems" («Требования к кабелям и фотоэлектрическим системам»). Целью было применить данный образец для создания нового CENELEC TC20. Основными темами были:

- Увеличение напряжения системы
- Адаптация процедур испытаний к новому уровню напряжения

Результатом данной работы является EN50618, который был опубликован в окончательной редакции в 2014 году.

### 6.2 IEC

В 2013 IEC принял редакцию EN50618 по требованию IEC TC82 в качестве основного документа для начала разработки стандарта IEC для фотоэлектрических проводов. Сейчас это опубликовано как редакция комитета IEC62930. Редакция IEC на 95% идентична EN50618.

### 6.2.1 Разница с EN50618

Основной разницей между EN 50618 и IEC 62930 является тот факт, что стандарт IEC допускает применение проводников класса два для стационарной установки.

## 7. Что нового в EN50618 и IEC 62930

### 7.1 Расчет

Большим различий в требованиях к расчетам данных новых стандартов нет. Однако, стоит обратить внимание на определение черного

как предпочтительного цвета оболочки. Небольшие изменения есть в необходимой толщине слоя, которая слегка увеличилась.

## **7.2 Требования к испытаниям**

Следует отметить, что процедуры испытания материала сильно изменились при изменении IEC60811 "Electric and optical fibre cables – Test methods for non-metallic materials" («Электрические и оптоволоконные кабели – методы испытаний для неметаллических материалов»).

- Все образцы испытаний должны быть взяты с завершенных кабелей
- Запрещается проводить испытания материалов на лентах с экструзией или отлитых пластинах ■

*Работа опубликована с разрешения 63-его Технического симпозиума IWCS, прошедшего в ноябре 2014 в городе Провиденс штате Род Айленд, США.*

### **Leoni Studer AG**

Отдел солнечной и ветряной энергии  
Däniken, Швейцария

**Тел:** +41 799138728

**Email:** faruk.yeginsoy@leoni.com

**Вебсайт:** www.leoni.com



## Développement de carrières

LES apprentis représentent une partie importante du programme de recrutement de William Hughes et la société continue donc à investir dans cette ressource précieuse. Le spécialiste dans la fabrication de ressorts et de composants en fil plié pour le secteur automobile et aérospatial global et les programmes d'apprentissage offrent une plate-forme excellente à partir de laquelle développer leur carrière professionnelle.

Durant le programme quadriennal, les apprentis ont l'opportunité exceptionnelle d'expérimenter la gamme entière de processus de production réalisés dans l'usine de William Hughes et auprès du siège central dans le comté britannique de Dorset.

"Le succès de notre entreprise est basé sur son personnel et notre programme d'apprentissage offre aux jeunes l'opportunité de commencer et de développer leurs carrières professionnelles au sein de notre organisation" a déclaré le directeur technique Emma Burgon.



▲ Apprentis et personnel de l'usine de William Hughes

"Au fil de notre évolution continue, nous créons constamment de nouvelles opportunités pour les jeunes qualifiés ainsi que pour les cadres moyens et supérieurs. Nous sommes heureux de constater que plusieurs de ces positions sont occupées par des apprentis lorsqu'ils terminent leur formation officielle".

Une sélection rigoureuse est la clé pour recruter et maintenir le personnel idéal, et William Hughes utilise des ressources locales comme les services de l'emploi, les journaux locaux et d'autres centres de formation pour attirer des apprentis potentiels. Les candidats intéressés sont invités à participer à une soirée ouverte,

au cours de laquelle on leur présente et illustre les activités de la société et le programme d'apprentissage. Ils visitent également l'usine et les bureaux pour mieux comprendre ce que signifie travailler dans le secteur de la production.

Après la soirée ouverte, les candidats sélectionnés sont invités à travailler dans l'usine pendant une semaine ce qui représente une excellente opportunité pour les évaluer au sein du programme d'apprentissage. Une fois sélectionnés, les candidats sont encouragés à suivre un cours de NVQ (National Vocational Qualification) concernant le secteur

manufacturier en général et, le cas échéant, pouvant être converti en un niveau HNC (Higher National Certificate) et HND (Higher National Diploma). Le progrès est contrôlé par le directeur des ressources humaines au moyen de rencontres périodiques et l'examen des rapports de l'école. La flexibilité représente un facteur important dans les programmes personnalisés qui sont modifiés et adaptés en fonction des points forts et des intérêts de chaque candidat.

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

### Lancement d'un nouveau produit à l'exposition

Cimteq, fournisseur anglais de logiciel de conception et de fabrication de câbles, a choisi la foire Interwire de cette année à Atlanta, États-Unis, pour lancer son nouveau produit CableBuilder3D, fonctionnant avec le programme de pointe de la société CableBuilder.

Le nouveau produit renforce davantage la réputation de CableBuilder en tant que système de conception de câbles à un niveau mondial. Il s'intègre complètement dans le CableBuilder et il offre des fonctions graphiques de modélisation 3D étendues, de génération de dessins techniques et de fonctions CAD complètes.

Le système est conçu pour élaborer des projets générés avec CableBuilder et pour les transformer automatiquement en dessins 3D hautement photoréalistes, en éliminant ainsi le

besoin d'employer un photographe ou de sous-traiter à une agence graphique extérieure.

Les images peuvent être intégrées dans des fiches techniques pour offrir des publications plus spécialisées que l'on peut successivement fournir aux clients des fabricants de câbles pour les utiliser dans leur matériel promotionnel en ligne et hors ligne.

Outre l'attention attirée à la foire par CableBuilder et CableBuilder3D, un autre produit de Cimteq, CableMES, c'est-à-dire un système MES (Manufacturing Execution System) spécifique pour câbles basé sur la plate-forme Wonderware, a suscité un véritable intérêt.

**Cimteq – Royaume-Uni**  
**Website:** [www.cimteq.co.uk](http://www.cimteq.co.uk)

## Ridgway Machines en premier plan avec le projet international de recherche sur l'énergie de fusion nucléaire ITER

La société Ridgway Machines s'est adjugé un autre contrat important pour le projet international ITER concernant la construction d'un réacteur à fusion nucléaire. (International Thermonuclear Experimental Reactor). Signé par Sea Alp Engineering Consortium, un innovateur européen en ce qui concerne les solutions de technologie de pointe pour les projets de recherche sur la fusion nucléaire, cette commande concerne la fourniture de systèmes additionnels de têtes de rubanage spécialement conçus pour isoler les bobines supraconductrices des bobines à champ poloïdal ITER.

La société Ridgway Machines, située dans la localité britannique de Leicester, a déjà conçu et fourni plusieurs systèmes pour les bobines à champ toroïdal (TF), qui faisaient partie de la fourniture européenne du projet ITER. Ensuite, Ridgway a étendu ses projets innovants pour fournir des machines supplémentaires pour le système de têtes de rubanage afin d'effectuer le rubanage de la bobine à solénoïde central fabriqué par General Atomics, comme partie de la fourniture du consortium étatsunien pour le projet ITER.

Ce dernier contrat pour les bobines poloïdales prouve la confiance accordée par les membres du consortium quant

à la qualité constante, au rendement et à la technologie de conception des trois structures fondamentales des bobines dans la chambre de confinement magnétique du Tokamak.

ITER est considéré la majeure expérience scientifique de l'histoire et vise à démontrer la faisabilité technique et scientifique de l'énergie de fusion pour la production d'énergie à échelle industrielle. La machine Tokamak de ITER sera l'une des machines les plus compliquées jamais projetées: avec une hauteur de 30 mètres et un poids de 23 000 tonnes, elle logera environ un million de composants. Les aimants à champ poloïdal (PF) maintiennent le plasma séparé des parois du réacteur, en contribuant ainsi à maintenir la forme et la stabilité du plasma. Le système de bobines à champ poloïdal est constitué de six bobines horizontales situées à l'extérieur de la structure de l'aimant toroïdal. À cause de leurs dimensions, l'enroulement effectif de quatre des six bobines poloïdales aura lieu dans un endroit consacré à l'enroulement de bobines de 257 mètres de longueur, situé au siège ITER à Cadarache.

**Ridgway Machines Ltd – Royaume-Uni**  
**Website:** [www.ridgwayeng.com](http://www.ridgwayeng.com)

# Événement consacré à "Women in Manufacturing"

MILTEC Corporation a organisé une visite dans ses établissements et une présentation de carrières professionnelles pour un groupe d'associées et d'associées potentielles de Women in Manufacturing (WiM), une organisation nationale ayant pour but d'attirer, de retenir et de promouvoir les talents de femmes ayant choisi ou étant sur le point d'entreprendre une carrière dans le secteur manufacturier.

L'événement a débuté par la présentation de Jane Seagraves, directeur du développement des activités commerciales auprès d'APPI Energy de Salisbury Maryland, et premier partenaire d'affinité de WiM, qui offre des services de consultation dans le secteur électrique et du gaz naturel.

La présentation a souligné la mission de WiM en tant que moyen de support, de promotion et d'inspiration pour les femmes dans leur carrière professionnelle dans le monde de l'industrie manufacturière ainsi que les informations concernant les différents événements qui facilitent le réseau de contact avec les homologues du secteur.

L'événement de Miltec a non seulement supporté la mission de WiM, mais également permis le contact entre



▲ Invités à l'événement Women in Manufacturing organisé par Miltec

les homologues du secteur qui y ont participé pour visiter les établissements de production de Miltec et leur fonctionnement, et d'en savoir plus sur le processus de vulcanisation à UV. Les femmes de Miltec ont illustré leurs responsabilités professionnelles et ont raconté des histoires de vie réelle quant à l'opportunité offerte par Miltec de réaliser une carrière professionnelle dans le secteur manufacturier.

Marilyn Blandford, directeur exécutif de Miltec, a déclaré: "Je suis orgueilleuse de nos femmes et je me sens honorée d'être

entourée de femmes aussi fortes avec lesquelles je continue à apprendre chaque jour".

Mme Blandford a ensuite parlé de sa carrière professionnelle, qui a débuté comme éducatrice, et a encouragé le groupe de participantes à reconnaître leur force, à poursuivre leur instruction et à bien saisir que les habilités des femmes sont essentielles pour le secteur manufacturier.

**Miltec Corporation – États-Unis**  
**Website:** [www.miltec.com](http://www.miltec.com)

# Standardisation des fils et des câbles photovoltaïques 2001-2014

Par Faruk Yeginsoy, Leoni Struder AG

## Résumé

Le présent article illustre l'évolution du premier document 2Pfg1169/2001 au document 2Pfg1990/2012 rédigé par la société de certification allemande TÜV Rheinland ainsi que l'influence exercée par ce dernier sur les normes nationales aux Etats-Unis, au Japon et en Europe ainsi que le développement des normes Cenelec EN50618 et IEC62930.

En outre, l'article donne une idée concernant la conception, les combinaisons des matériaux et les processus de production nécessaires pour être conformes aux normes mentionnées plus haut.

En particulier, le défi consistait à respecter les différentes normes simultanément, comme par exemple la combinaison des normes UL et TÜV.

Un aspect supplémentaire sera également analysé qui permettra de comprendre les méthodes spécifiques d'essai des caractéristiques essentielles des composants qui influencent la longue durée opérationnelle prévue pour les câbles photovoltaïques.

## 1 Introduction

L'intérêt mondial pour l'énergie renouvelable qui a débuté à la fin du siècle dernier, a encouragé l'industrie photovoltaïque à s'accroître considérablement et cette croissance à un niveau global a été inexorable.

À cette époque la construction des systèmes photovoltaïques représentait un investissement coûteux et à long terme; les investisseurs ne savaient comment évaluer la qualité des modules

et les clients demandaient la durée prévue pour les modules photovoltaïques et les systèmes photovoltaïques. Il y avait une forte nécessité d'avoir une évaluation de la sécurité et de la qualité par des tiers.

À cette époque la société allemande TÜV Rheinland commençait la révision de la sécurité et de la qualité des modules photovoltaïques conformément à leurs exigences.

Sous peu, il était clair que la qualité des modules dépendait des composants; toutefois il y avait un manque de normes à la lumière des exigences de l'application photovoltaïque. Cela marquait le début de la standardisation des fils photovoltaïques.

## 2 Le début

En 2001, la société TÜV Rheinland en Allemagne commençait à essayer les modules photovoltaïques et remarquait la présence de nombreux problèmes dus aux câbles.

Étant donné qu'il n'existait d'essais standardisés spécifiques pour ces câbles, TÜV Rheinland créait sa propre norme. C'est ainsi que la norme 2Pfg1169:2004 a vu le jour.

Cette première norme était basée sur la norme IEC60245-4:1994 (Câbles isolés en caoutchouc – tensions nominales jusqu'à 450/750V - Partie 4: Câbles flexibles).

À cette époque le câble le plus utilisé était le H07RN-F (Caoutchouc 60°C–90°C).

Dans cette première phase des installations photovoltaïques, personne n'avait compris que les exigences des câbles photovoltaïques devaient être beaucoup plus élevées.

### 2.1 Premières pannes de câblage après quelques années.



▲ Figure 1: Pannes de câblage causées par l'ozone et par les températures élevées

## 3 Nouvelles spécifications

Après de nombreuses pannes de câblage, les experts des systèmes reconnurent que les exigences de la première norme Pfg 1169 /2004 avaient été trop faibles. En 2006, un nouveau groupe d'experts (Groupe de Travail du Comité National Allemand 411.2.3) commençait à travailler sur une nouvelle version des "Spécifications pour les câbles photovoltaïques".

Dans la première partie du travail, le groupe comprenait des experts de modules et des experts de câbles. L'objectif consistait à déterminer la période d'utilisation des fils photovoltaïques. Le groupe de travail s'était principalement penché sur les questions suivantes:

- Comment peut-on prévoir la vie utile d'un câble?
- Combien d'années est-ce que doit durer un câble?
- Comment peut-on établir le vieillissement d'un câble?
- Comment peut-on essayer le processus de vieillissement?

## 3.1 Le vieillissement du matériau est le nouvel objectif d'étude

### 3.1.1 Thermo-oxydation des polyoléfines

L'une des lois chimiques élémentaires est la loi d'Arrhenius. Cette loi décrit la corrélation entre la température et la vitesse du processus. Le vieillissement technique du polymère n'est qu'un simple processus chimique, et la totalité des processus chimiques dépend de la température du processus.

Une augmentation de la température de 10°C accélère le processus d'un ou de deux facteurs. Ce système fonctionne également dans l'ordre inverse. La diminution de la température ralentit le processus de vieillissement d'un facteur de 0,5.

La valeur nominale de la température spécifiée d'un câble devrait être en combinaison avec une période de temps spécifique. Sans aucune indication temporelle, la température nominale est inutile. La valeur nominale standard de la température pour l'industrie des câbles européenne est de xxx°C à 20 000h.

La vie utile standard des modules photovoltaïques dans l'industrie photovoltaïque est de 25 ans, correspondants à environ 150 000h.

La température ambiante estimée est de 90°C; par conséquent la valeur nominale minimum de la température devrait être de 90°C/150 000h. Normalisé conformément au temps standard industriel de 20 000h, la nouvelle valeur nominale de la température devrait être de 120°C/20 000h.

### 3.1.2 Photo-oxydation

La lumière du soleil contient une grande quantité de radiations ultraviolettes. Ces radiations, lorsque absorbées par un matériau polymérique en causent la détérioration. L'énergie peut être suffisante pour causer la rupture du polymère instable et, après une certaine période de temps, en modifie les composants.

Les matériaux polymériques devant être exposés aux radiations ultraviolettes pour des temps prolongés devraient être réalisés avec des composés polymériques convenablement stabilisés pour ces conditions environnementales.

Les polymères en polyoléfine de base sont caractérisés par une durée limitée à l'extérieur. Toutefois, la majorité des câbles solaires actuellement réalisés avec des matériaux en polyoléfine colorés (non noirs), contiennent un paquet de stabilisation ultraviolette qui donne des résultats satisfaisants pour une période limitée de 5 à 10 ans.

Cependant, dans le cas d'une vie utile prolongée à l'extérieur, les polyoléfines devraient être formulées avec un minimum de 2,5 pour cent de noir de carbone finement dispersé.

L'introduction du noir de carbone dans les polyoléfines augmente considérablement la résistance aux rayons ultraviolets. Le noir de carbone fait fonction d'élément d'absorption des rayons ultraviolets et protège la polyoléfine des dommages causés par les radiations ultraviolettes.

Jusqu'à présent, aucune corrélation physique ni chimique applicable n'est connue pour extrapoler un essai de corrosion accélérée jusqu'à la vie utile des câbles. La durée des essais réalisés conformément aux normes (UL et TÜV) est égale à 720h, et les résultats ne peuvent pas être extrapolés sur la base d'une formule mathématique. Ces essais ne fournissent que des résultats comparables, mais aucune donnée réelle quant à la durée effective.

Comme déjà démontré en quatre décennies d'expérience à l'extérieur avec des câbles de communications en polyéthylène, l'addition de 2,5 pour cent de noir de carbone finement dispersé offre une protection contre le rayonnement UV pour plus de 25 ans.

La dispersion du noir de carbone fait partie intégrante du processus d'extrusion de la gaine, qui a un impact élevé sur la résistance aux rayons UV. La gestion appropriée des paramètres de la machine représente un facteur clé critique afin d'obtenir les meilleurs résultats.

Le noir de carbone est présent dans la norme EN50290 ("Câbles de communication. Règles de conception communes et de construction") en tant qu'exigence obligatoire pour les câbles de communication qui sont utilisés à l'extérieur.

## 3.2 Points fondamentaux des nouvelles exigences en 2007

Le point essentiel de la nouvelle norme Pfg1169/2007.8 est représenté par l'essai de résistance thermique conformément à la norme IEC60216 "Matériaux isolants électriques – Propriétés d'endurance thermique" (120°C/20 000h).

Dans l'application de cette norme, il est supposé qu'il existe une relation presque linéaire entre le logarithme du temps requis pour causer un changement de propriétés défini (moins de 50 pour cent d'allongement à la rupture) et la valeur réciproque de la température absolue correspondante.

Cet essai doit être effectué au moins à trois températures différentes.

La température la plus élevée sera sélectionnée pour obtenir un point final non inférieur à 100h; la température la plus basse sera sélectionnée pour donner le résultat prévu pas avant de 5 000h.

Il faut tracer une ligne droite pour connecter les différents points enregistrés. En prolongeant la ligne jusqu'à ce qu'elle intersecte le 20 000h sur l'axe des ordonnées (logarithme du temps), il est possible de déterminer la valeur nominale de la température sur l'axe des abscisses (température absolue réciproque).

D'autres points essentiels sont les suivants:

- Les matériaux utilisés doivent être sans halogènes
- Les conducteurs utilisés doivent être conformes à la norme IEC 60228 classe 5
- Les câbles et les fils doivent être conformes à la norme IEC60332-1-2 (essai vertical d'inflammabilité)

Le résultat de ce travail a été publié par l'organisme de normalisation VDE comme:

- VDE-AR-E 2283-4 "Exigences pour les câbles des systèmes photovoltaïques"

Et par l'organisme de normalisation TÜV comme:

- TÜV 2Pfg1169/2007.8 "Exigences pour les câbles à utiliser dans les systèmes photovoltaïques"

## 3.3 Spécifications pour les fils photovoltaïques de UL

En 2005 UL a publié la première édition de la norme 4703. C'est ainsi que UL créa le premier câble "PV". Cette norme était basée sur la norme UL854 (Câbles d'entrée de service). Toutefois en 2005, la norme NEC2005 (Article 690) exigeait les câbles du type USE, USE-2, UF et SE.

Seulement en 2008, le type PV fut mentionné pour la première fois dans la norme NEC2008. Les fils requis dans cette édition étaient du type USE-2 ou PV. L'on peut également citer la transposition des dimensions métriques des conducteurs par la norme UL4703.

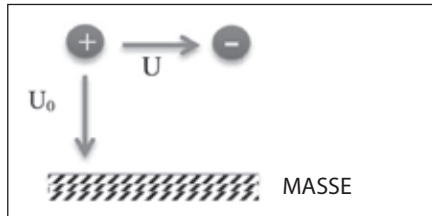
En 2010, UL publia la quatrième édition de la norme UL4703, qui constitue la version applicable jusqu'à aujourd'hui. Dans cette édition, il y a la norme de référence UL 44 "Fils et câbles isolés avec matériel thermodurcissable".

### 3.3.1 Différences par rapport à la norme TÜV 1169/2007.8

Les différences significatives entre les normes UL et TÜV sont les suivantes:

- Les composés halogénés sont permis dans la norme UL4703
- L'essai d'inflammabilité UL1581-1060 est plus strict par rapport à la norme IEC60332-1
- Il n'y a aucune différence entre CC et CA dans la norme UL4703

- Sont permis 1 000V (ou 2 000V), des valeurs plus orientées vers le futur
- Les fils d'aluminium sont permis dans la norme UL4703
- Il n'y a aucune différenciation entre U0/U dans la norme UL4703



▲ Figure 2: Définition de  $U_0/U$

## 4 Nouveau défi pour l'industrie du câble

### 4.1 Câbles approuvés par TÜV et UL 2006-2013

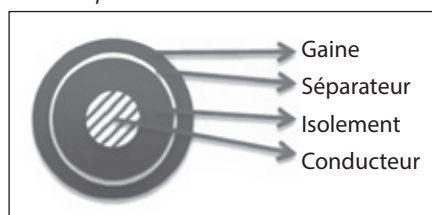
En 2006 les fabricants de modules pensèrent globalement. La nouvelle exigence de commercialisation était représentée par la fabrication d'un type de module photovoltaïque avec les autorisations nécessaires à la vente sur tous les marchés.

Le défi consistait à créer un câble pouvant combiner les spécifications opposées de UL (PV/USE-2) et TÜV 1169. En particulier, il était nécessaire de surmonter les écarts suivants:

- Les composés sans halogènes sont hautement chargés de minéraux retardeurs de flamme. Les propriétés physiques demandées par UL constituent un défi pour ce type de composés
- Passer l'essai d'inflammabilité demandé par UL est facile pour les composés halogénés, mais il est difficile pour les composés sans halogène
- L'essai de stabilité à long terme de UL représente un défi pour les composés chargés puisque les additifs retardeurs de flamme sont hygroscopiques

Toutefois, il a été possible de satisfaire la totalité des spécifications.

#### 4.1.1 La première solution



▲ Figure 3: Conception optimisée du fil UL4703 et TÜV1169 ou TÜV1169

Les caractéristiques principales de cette conception sont les suivantes:

- Extrusion en trois couches et un pas (due à la croissante pression des prix dans l'industrie du photovoltaïque)
- Polymère spécialement développé en tant que séparateur
- Couches séparables demandées par nombreux clients (définition UL: "Isolement thermdurcissant avec gaine")
- La différence entre ces deux familles de câbles consiste en les épaisseurs des différentes couches puisque UL exige une spécification plus stricte en ce qui concerne l'épaisseur de l'isolement
- Les composés sont thermdurcissants (réticulation au moyen de faisceaux d'électrons)

## 5 La phase successive

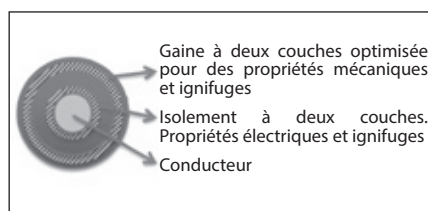
### 5.1 Nouvelles exigences

En 2013, la nouvelle exigence de l'industrie photovoltaïque consistait à augmenter la tension du système pour épargner le coût des câbles et pour augmenter l'efficacité des systèmes photovoltaïques.

La tension nominale des fils photovoltaïques de première génération conformément à la norme TÜV1169 était basée sur les normes génériques des câbles industriels. La tension nominale standard pour les câbles de basse tension des normes CENELEC et IEC est  $U_0/U = 600/1\ 000V\ CA$  ou  $900/1\ 500V\ CC$ .

La tension nominale standard du fil photovoltaïque de nouvelle génération est  $U_0/U = 1\ 000/1\ 000V\ CA$  ou  $1\ 500/1\ 500V\ CC$ . Entretemps, TÜV Rheinland a développé la norme 2Pfg1990/2012, qui transpose les nouvelles exigences.

### 5.2 Nouvelle génération de câbles UL4703 1 000V/TÜV 1 500V CC



▲ Figure 4: Nouvelle conception

Les caractéristiques les plus importantes de cette structure sont:

- Extrusion en quatre couches et un pas (due à la croissante pression des prix dans l'industrie photovoltaïque)
- Les composants sont thermdurcissants (réticulation au moyen de faisceaux d'électrons)
- Les couches ne sont pas séparables (définition UL: "isolement composite sans gaine")
- Approbations: UL (1 000V)/TÜV (2Pfg1990)/CSA 22.2 N° 271-11

## 6 Le parcours jusqu'à CENELEC et IEC

### 6.1 CENELEC

En 2011, le comité national allemand pour le secteur des fils et des câbles photovoltaïques travaillait pour une révision de la norme VDE-AR-E 2283-4 "Exigences concernant les câbles des systèmes photovoltaïques".

L'objectif était maintenant d'appliquer cette étude préliminaire en tant que projet d'une nouvelle norme pour le comité technique CENELEC TC20.

Les sujets principaux étaient:

- Augmentation de la tension du système
- Adaptation des méthodes d'essai au nouveau niveau de tension

Le résultat de ce travail est la norme EN50618, qui fut publiée en tant qu'étude finale en août 2014.

### 6.2 IEC

En 2013, IEC a adopté l'étude préliminaire de la norme EN50618 sur demande du comité technique IEC TC82 comme document de base pour commencer à développer une norme IEC pour les fils photovoltaïques.

Cette norme est actuellement publiée comme étude préliminaire du comité IEC62930. L'étude préliminaire de IEC est identique à l'étude EN50618 pour 95 pour cent.

#### 6.2.1 Différences par rapport à l'étude EN50618

La différence principale entre les études EN 50618 et IEC 62930 est que la classe standard IEC permet l'utilisation de deux conducteurs pour l'installation fixe.

## 7 Quelle est la nouveauté des normes EN50618 et IEC 62930

### 7.1 Conception

Il n'y a aucune différence fondamentale dans les exigences de conception de ces nouvelles normes.

Il faut toutefois remarquer que la définition de noir est indiquée comme la couleur préférable pour la gaine.

Il y a des changements secondaires dans les épaisseurs requis pour les couches qui sont légèrement augmentées.

## 7.2 Exigences d'essai

Il est à remarquer que les méthodes d'essai des matériaux ont radicalement changé en adaptant la norme IEC60811 "Câbles électriques et à fibre optique – Méthodes d'essai pour les matériaux non métalliques".

- La totalité des échantillons d'essai doivent être pris des câbles finis
- Il n'est pas permis d'effectuer d'essais de matériaux sur des bandes extrudées ou sur des plats façonnés

## 8 Le futur proche

Depuis la réalisation de cette étude, le EN50618 a été publié.

Le TUV Rheinland a également révisé le 2Pfg1169 et 2Pfg1990. IEC62930 sera publié plus tard cette année. ■

*Cet article a été présenté au 63<sup>ème</sup> Symposium Technique IWCS qui s'est tenu à Providence, Rhode Island, États-Unis, en novembre 2014.*

**Leoni Studer AG**  
Business Unit Solar & Windpower  
Däniken  
Suisse  
**Tel:** +41 799138728  
**Email:** faruk.yeginsoy@leoni.com  
**Website:** www.leoni.com

# Sviluppo di carriera

GLI apprendisti costituiscono una parte importante del programma di reclutamento di William Hughes e quindi la società continua ad investire in questa valida risorsa. Lo specialista nella fabbricazione di molle e componenti in filo curvato per il settore automobilistico e aerospaziale globale e i programmi di apprendistato offrono la piattaforma ideale per i giovani da cui sviluppare la propria carriera professionale

Durante il programma quadriennale, gli apprendisti hanno l'eccezionale opportunità di sperimentare l'intera gamma di processi produttivi realizzati nella fabbrica e presso la sede centrale di William Hughes nella contea britannica di Dorset.

"Il successo della nostra azienda si basa sulla nostra gente ed il nostro programma di apprendistato offre ai giovani l'opportunità di iniziare e sviluppare le loro carriere all'interno della nostra organizzazione," ha dichiarato il direttore tecnico Emma Burgon.

"Nella nostra continua evoluzione, creiamo costantemente nuove opportunità per i giovani qualificati, così come per dirigenti a livello intermedio e alto. Siamo lieti che molte di queste posizioni siano occupate da apprendisti dal momento in cui terminano la loro formazione ufficiale".

Un'accurata selezione è la chiave per reclutare e mantenere il personale ideale, e William Hughes utilizza risorse locali come centri per l'impiego, giornali locali



▲ Apprendisti e personale dello stabilimento di William Hughes

ed enti di formazione professionali per attirare potenziali apprendisti. I candidati interessati sono invitati a partecipare ad una serata a porte aperte dove vengono loro presentate le attività della società e viene loro illustrato il programma di apprendistato. Vengono anche accompagnati nello stabilimento e negli uffici, in modo che capiscano cosa significhi lavorare effettivamente nella produzione.

Dopo la serata a porte aperte, i candidati selezionati vengono invitati a lavorare in fabbrica per una settimana e ciò costituisce un'eccellente opportunità per valutarne l'idoneità nell'ambito del programma di apprendistato. Una

volta selezionati, i candidati vengono incoraggiati a seguire un corso di NVQ (National Vocational Qualification) in fabbricazione generale, che può essere convertito in un livello HNC (Higher National Certificate) e HND (Higher National Diploma) ove necessario. Il progresso è controllato dal direttore delle risorse umane attraverso riunioni periodiche e l'esame delle relazioni scolastiche. La flessibilità è un fattore importante nei programmi personalizzati che vengono modificati e adattati secondo i punti di forza e gli interessi di ciascun candidato.

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

## Lancio di un nuovo prodotto in occasione della fiera

Cimteq, fornitore inglese di software di progettazione e fabbricazione di cavi, ha scelto la fiera Interwire di quest'anno ad Atlanta, Stati Uniti, per lanciare CableBuilder3D, che funziona con il programma di punta della società CableBuilder.

Il nuovo prodotto consolida ulteriormente la fama di CableBuilder come sistema di progettazione di cavi a livello mondiale. Si integra completamente nel CableBuilder e offre funzioni grafiche di modellazione 3D ampie, generazione di disegni tecnici e funzioni CAD complete.

Il sistema può elaborare i progetti generati con CableBuilder e trasformarli automaticamente in disegni 3D altamente fotorealistici, senza dover ricorrere ad un fotografo o subappaltare un'agenzia grafica esterna.

Le immagini possono essere integrate in schede tecniche

per offrire pubblicazioni più specializzate che possono successivamente essere fornite ai clienti dei fabbricanti di cavi per utilizzarle nel loro materiale di marketing sia online sia offline.

Oltre all'attenzione attirata alla fiera da CableBuilder e CableBuilder3D, un altro dei prodotti di Cimteq, CableMES, ovvero un sistema MES (Manufacturing Execution System) specifico per cavi basato sulla piattaforma Wonderware, ha suscitato un notevole interesse.

Nel complesso, Cimteq ha avuto un enorme successo alla fiera, come riferito dall'amministratore delegato Ali Shehab: "È stato magnifico incontrare alcuni dei nostri clienti e poter sentire i loro commenti e le loro esperienze positive."

**Cimteq Ltd – Regno Unito**  
**Website:** [www.cimteq.co.uk](http://www.cimteq.co.uk)

## Ridgway machines in primo piano con il progetto internazionale di ricerca sull'energia da fusione nucleare ITER

La società Ridgway Machines si è aggiudicata un altro importante contratto per il progetto internazionale ITER per la costruzione di un reattore a fusione nucleare. Questo contratto firmato da Sea Alp Engineering Consortium, innovatore europeo in soluzioni di alta tecnologia per progetti di ricerca di fisica nucleare, comprende la fornitura di sistemi di teste di nastratura aggiuntive progettati specificamente per l'isolamento di bobine superconduttrici delle bobine del campo poloidale (PF) di ITER.

Ridgway Machines, situata nella località britannica di Leicester, ha già progettato e fornito vari sistemi di teste di nastratura per le bobine di campo toroidale (TF) che facevano parte della fornitura europea del progetto ITER. Successivamente, Ridgway ha ampliato i propri progetti innovativi per fornire altre macchine per il sistema di teste di nastratura al fine di effettuare la nastratura della bobina del solenoide centrale fabbricata da General Atomics, come parte della fornitura del consorzio statunitense per il progetto ITER.

Questo ultimo contratto per le bobine poloidali dimostra la

fiducia riposta dai membri del consorzio per quanto riguarda la qualità costante, il rendimento e la tecnologia di progettazione delle tre strutture fondamentali delle bobine all'interno della camera di confinamento magnetico del Tokamak.

ITER è considerato il maggiore esperimento scientifico della storia e si propone di dimostrare la fattibilità tecnica e scientifica dell'energia da fusione per la produzione di energia su scala industriale. La macchina Tokamak di ITER sarà una delle macchine più complicate mai progettate: con un'altezza di 30 metri e un peso di 23.000 tonnellate, alloggerà approssimativamente un milione di componenti. I magneti del campo poloidale (PF) mantengono il plasma separato dalle pareti, contribuendo così a mantenere la forma e la stabilità del plasma. Il sistema di bobine di campo poloidale è costituito da sei bobine orizzontali situate all'esterno della struttura del magnete toroidale.

**Ridgway Machines Ltd – Regno Unito**  
**Website:** [www.ridgwayeng.com](http://www.ridgwayeng.com)

# Evento "Women in Manufacturing"

MILTEC Corporation ha organizzato una visita ai propri stabilimenti e una presentazione di carriere per un gruppo di socie e di potenziali socie di Women in Manufacturing (WiM), organizzazione nazionale che ha lo scopo di attrarre, trattenere e promuovere talenti di donne che hanno scelto o stanno intraprendendo una carriera nell'industria manifatturiera.

L'evento ha avuto inizio con la presentazione di Jane Seagraves, direttore dello sviluppo delle attività commerciali presso APPI Energy di Salisbury Maryland, e primo partner per affinità di WiM, che offre servizi di consulenza nel settore elettrico e del gas naturale.

La presentazione ha sottolineato la missione di WiM come mezzo di supporto, promozione e ispirazione per le donne nell'intraprendere carriere professionali nel mondo dell'industria manifatturiera, nonché informazioni sui vari eventi che facilitano la rete di contatto con i colleghi del settore.

L'evento di Miltec non solo è stato di supporto alla missione di WiM, ma ha anche consentito il contatto fra i colleghi del settore che hanno partecipato per



▲ Ospiti all'evento Women in Manufacturing organizzato da Miltec

vedere gli stabilimenti di Miltec e il loro funzionamento e imparare di più sul processo di vulcanizzazione a UV. Le donne di Miltec hanno illustrato le loro responsabilità lavorative e hanno raccontato storie di vita reali circa l'opportunità offerta da Miltec di costruirsi una carriera professionale nel settore manifatturiero.

Marilyn Blandford, direttore esecutivo di Miltec, ha dichiarato: "Sono orgogliosa delle nostre donne e mi sento onorata di essere circondata da donne così forti,

dalle quali continuo ad imparare ogni giorno".

La Blandford ha quindi parlato della propria carriera professionale, che ha avuto inizio come educatrice, e ha incoraggiato il gruppo delle partecipanti a prendere coscienza della propria forza, proseguire la loro istruzione e capire che le abilità delle donne sono fondamentali per il settore manifatturiero.

**Miltec Corporation – Stati Uniti**  
**Website:** [www.miltec.com](http://www.miltec.com)



# Standardizzazione dei fili e dei cavi fotovoltaici 2001-2014

A cura di Faruk Yeginsoy, Leoni Struder AG

## Riassunto

Il presente articolo illustra l'evoluzione dal primo documento 2Pfg1169/2001 al documento 2Pfg1990/2012 redatto dalla società di certificazione tedesca TÜV Rheinland e l'influenza di quest'ultimo sulle norme nazionali negli Stati Uniti, nel Giappone e nell'Europa nonché lo sviluppo delle norme Cenelec EN50618 e IEC62930.

Inoltre, l'articolo darà un'idea sulla progettazione, le combinazioni dei materiali e i processi di produzione necessari per soddisfare le norme sopra citate. In particolare, la sfida consisteva nel rispettare le varie norme contemporaneamente, come ad esempio la combinazione delle norme UL e TÜV.

Verrà anche analizzato un ulteriore aspetto che consentirà di comprendere meglio le procedure specifiche di prova delle caratteristiche essenziali dei composti che influenzano la lunga vita operativa prevista per i cavi fotovoltaici.

## 1 Introduzione

L'interesse mondiale per l'energia rinnovabile che ebbe inizio alla fine dello scorso secolo, incoraggiò l'industria fotovoltaica a crescere notevolmente e tale crescita a livello globale fu inarrestabile. In quell'epoca la costruzione dei sistemi fotovoltaici rappresentava un investimento costoso e a lungo termine; gli investitori non sapevano come valutare la qualità dei moduli e i clienti richiedevano la durata prevista per i moduli fotovoltaici e i sistemi fotovoltaici.

C'era una forte necessità di avere una valutazione da parte di terzi che garantisse la sicurezza e la qualità dei sistemi.

In quel momento TÜV Rheinland iniziò la revisione della sicurezza e della qualità

dei moduli fotovoltaici secondo i propri requisiti. In breve tempo apparve chiaro che la qualità e la sicurezza dei moduli dipendevano dai componenti, ma vi era una carenza di norme per componenti che considerasse i requisiti dell'applicazione fotovoltaica. Ciò segnò l'origine della standardizzazione dei fili fotovoltaici.

## 2 Le origini

Nel 2001, TÜV Rheinland in Germania iniziò a collaudare i moduli fotovoltaici e notò la presenza di molti problemi dovuti ai cavi.

Dal momento che non esistevano prove standardizzate specifiche per questi cavi, TÜV Rheinland creò la propria norma. Fu questa l'origine della norma 2Pfg1169:2004.

Questa prima norma si basava sulla IEC60245-4:1994 (Cavi isolati con gomma - tensioni nominali fino a 450/750V - Parte 4: Cavi flessibili).

A quell'epoca il cavo più utilizzato era l'H07RN-F (Gomma 60°C-90°C).

In questa prima fase delle installazioni fotovoltaiche, nessuno si rese conto che i requisiti dei cavi fotovoltaici dovevano essere molto più elevati.

### 2.1 Primi guasti del cablaggio dopo pochi anni

▼ **Figura 1:** Guasti di cablaggio causati dall'ozono e dalle temperature elevate



## 3 Nuovi requisiti

Dopo numerosi guasti nel cablaggio, gli esperti dei sistemi fotovoltaici riconobbero che i requisiti della prima norma Pfg 1169/2004 erano stati troppo bassi.

Nel 2006, un nuovo gruppo di esperti (Gruppo di lavoro del Comitato Nazionale Tedesco 411.2.3) iniziò a lavorare su una nuova versione dei "Requisiti per i cavi fotovoltaici". Nella prima parte del lavoro, il gruppo comprendeva esperti di moduli ed esperti di cavi. L'obiettivo consisteva nel determinare il periodo di utilizzo dei fili fotovoltaici. I punti principali che furono analizzati dal gruppo di lavoro erano i seguenti:

- Come si può prevedere la durata di un cavo?
- Quanti anni deve durare un cavo?
- Come si può stabilire l'invecchiamento di un cavo?
- Com'è possibile testare il processo di invecchiamento?

### 3.1 L'invecchiamento del materiale è il nuovo obiettivo di studio

**3.1.1 Termo-ossidazione delle poliolefine**  
Una delle leggi chimiche elementari è la legge di Arrhenius. Questa legge descrive la correlazione fra la temperatura e la velocità del processo. L'invecchiamento termico del polimero non è altro che un processo chimico e tutti i processi chimici dipendono dalla temperatura del processo.

Un aumento della temperatura di 10°C raddoppia la velocità del processo. Questo funziona anche all'inverso. La diminuzione della temperatura rallenta il processo di invecchiamento della metà (fattore di 0,5). Il valore nominale della temperatura specificato di un cavo si dovrebbe determinare in combinazione con un periodo di tempo specifico. Senza un'indicazione temporale, la temperatura nominale è inutile. Il valore nominale standard della temperatura per l'industria dei cavi europea è xxx°C a 20.000 ore.

La vita utile standard dei moduli fotovoltaici dell'industria fotovoltaica è di 25 anni, corrispondenti approssimativamente a 150.000 ore. La temperatura ambiente presunta è di 90°C; pertanto il valore nominale minimo della temperatura dovrebbe essere di 90°C/150.000 ore. Normalizzato secondo il tempo standard industriale di 20.000 ore, il nuovo valore nominale della temperatura dovrebbe essere di 120°C/20.000 ore.

### 3.1.2 Foto-ossidazione

La luce del sole contiene una gran quantità di radiazioni ultraviolette. Queste radiazioni assorbite da un materiale polimerico ne provocano il deterioramento. L'energia può essere sufficiente per causare la rottura del polimero instabile e, dopo un certo periodo di tempo, modificarne i componenti.

I materiali polimerici che si devono esporre alle radiazioni ultraviolette per periodi prolungati, dovrebbero essere realizzati con composti polimerici adeguatamente stabilizzati per tali condizioni ambientali. I polimeri poliolefinici di base sono caratterizzati da una durata limitata all'esterno. Tuttavia, la maggior parte dei cavi solari realizzati con materiali poliolefinici colorati (non neri), fabbricati attualmente contengono un pacchetto di stabilizzazione ultravioletta che risulta soddisfacente per un periodo di tempo limitato di 5-10 anni. Per una vita operativa prolungata all'esterno, le poliolefine dovrebbero essere formulate con un minimo di 2,5 per cento di nerofumo finemente disperso.

L'introduzione del nerofumo nelle poliolefine aumenta considerevolmente la resistenza ai raggi ultravioletti. Il nerofumo funge da elemento di assorbimento dei raggi ultravioletti e protegge la poliolefina dai danni causati dalle radiazioni ultraviolette.

Ad oggi non è nota alcuna correlazione fisica o chimica applicabile per estrapolare una prova di resistenza agli agenti atmosferici accelerata fino alla vita utile dei cavi. La durata delle prove realizzate secondo le norme (UL e TÜV) è di 720 ore, e i risultati non possono essere estrapolati sulla base di una formula matematica. Queste prove forniscono solamente dei risultati comparabili, ma nessun dato reale circa la durata effettiva.

Come dimostrato in 40 anni di esperienza all'esterno con cavi di comunicazione rivestiti di polietilene, l'aggiunta del 2,5 per cento di nerofumo finemente disperso consente una protezione dai raggi ultravioletti per oltre 25 anni. La dispersione del nerofumo costituisce parte integrante del processo di estrusione della guaina, che ha un impatto elevato

sulla resistenza ai raggi UV. La gestione adeguata dei parametri della macchina rappresenta il fattore chiave critico per ottenere i migliori risultati.

Il nerofumo è presente nella norma EN50290 ("Cavi di comunicazione. Regole generali di progettazione e costruzione") come requisito obbligatorio per cavi di comunicazione che vengono utilizzati all'esterno.

### 3.2 Punti fondamentali dei nuovi requisiti nel 2007

Il punto fondamentale della nuova versione della norma Pfg1169/2007.8 è la prova di resistenza allo shock termico secondo la norma IEC60216 "Materiali isolanti elettrici - Proprietà di resistenza alla sollecitazione termica" (120°C/20.000 ore). Nell'applicazione di questa norma, si suppone che esista una relazione quasi lineare fra il logaritmo del tempo, richiesto per causare un determinato cambio di proprietà (meno del 50 per cento di allungamento a rottura) e il valore reciproco della temperatura assoluta corrispondente. Questa prova deve essere realizzata almeno a tre diverse temperature. La temperatura più elevata deve essere selezionata per arrivare a un punto finale non inferiore a 100 ore e la temperatura più bassa per dare il risultato previsto non prima di 5.000 ore.

Si deve tracciare una linea retta per collegare i vari punti registrati. Prolungando la linea fino a che intersechi le 20.000 ore sull'asse delle ordinate (logaritmo del tempo), è possibile determinare il valore nominale della temperatura sull'asse delle ascisse (temperatura assoluta reciproca).

Altri punti essenziali sono:

- I materiali utilizzati devono essere privi di alogeni
- I conduttori utilizzati devono essere conformi alla norma IEC 60228 classe 5
- I cavi e i fili devono essere conformi alla norma IEC60332-1-2 (prova della fiamma verticale)

Il risultato di questo lavoro è stato pubblicato dall'organismo di normalizzazione VDE come:

- VDE-AR-E 2283-4 "Requisiti per cavi di sistemi fotovoltaici"

E da TÜV come:

- TÜV 2Pfg1169/2007.8 "Requisiti per cavi da utilizzare in sistemi fotovoltaici"

### 3.3 Specifiche per fili fotovoltaici di UL

Nel 2005 UL pubblicò la prima edizione della norma 4703. UL creò il primo tipo di cavo fotovoltaico "PV". Questa norma si basava sulla norma UL854 (Cavi di ingresso di servizio). Tuttavia nel 2005, la norma NEC2005 (Articolo 690) richiedeva cavi del tipo USE, USE-2, UF e SE.

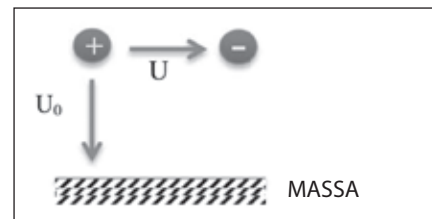
Solo nel 2008, il tipo PV fu menzionato per la prima volta nella norma NEC2008. I fili richiesti in questa edizione erano del tipo USE-2 o PV. Va citata l'accettazione delle dimensioni metriche dei conduttori nella norma UL4703.

Nel 2010, UL pubblicò la quarta edizione della norma UL4703, che costituisce la versione applicabile fino ad oggi. In questa edizione si trova la norma di riferimento UL 44 "Fili e cavi isolati con materiale termoisolante".

### 3.3.1 Differenze rispetto alla norma TÜV 1169/2007.8

Le differenze significative fra le norme UL e TÜV sono le seguenti:

- I composti alogenati sono consentiti nella norma UL4703
- La prova di infiammabilità UL1581-1060 è più esigente rispetto alla norma IEC60332-1
- Non vi è alcuna differenza fra CC e CA nella norma UL4703
- Sono consentiti 1.000V (o 2.000V), valori più orientati verso il futuro
- I fili di alluminio sono consentiti nella norma UL4703
- Non vi è alcuna distinzione fra U0/U nella norma UL4703



▲ Figura 2: Definizione di  $U_0/U$

## 4 Nuova sfida per l'industria del cavo

### 4.1 Cavi approvati da TÜV e UL 2006-2013

Nel 2006 i fabbricanti di moduli iniziarono a pensare globalmente. Il nuovo requisito di commercializzazione era rappresentato dalla fabbricazione di un tipo di modulo fotovoltaico con tutte le necessarie approvazioni per venderlo in tutti i mercati.

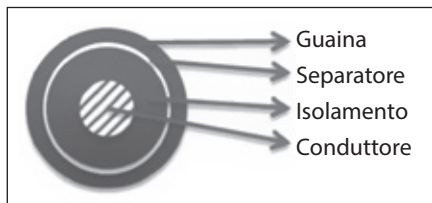
La sfida consisteva nel creare un cavo che potesse combinare le opposte specifiche di UL PV / USE-2) e TÜV 1169. In particolare, era necessario superare le seguenti discrepanze:

- I composti privi di alogeni sono altamente caricati di minerali ritardanti di fiamma. Le proprietà fisiche richieste da UL costituiscono una sfida per questo tipo di composti
- Superare la prova di infiammabilità richiesta da UL è facile per i composti alogenati, ma è difficile per i composti privi di alogeni

- La prova di stabilità a lungo termine di UL è una vera sfida per i composti caricati poiché gli additivi ritardanti di fiamma sono igroscopici

Tuttavia è stato possibile soddisfare tutti questi requisiti.

#### 4.1.1 La prima soluzione



▲ **Figura 3:** Progettazione ottimizzata del filo UL4703 e TÜV1169 o TÜV1169

Le caratteristiche più importanti di questa struttura sono le seguenti:

- Estrusione in tre strati e una passata (dovuta alla crescente pressione dei prezzi nell'industria del fotovoltaico)
- Polimero specialmente sviluppato come separatore
- Strati separabili richiesti da numerosi clienti (definizione UL: "isolamento termoindurente con guaina")
- La differenza fra queste due famiglie di cavi è costituita dagli spessori dei vari strati poiché UL presenta un requisito più alto per quanto riguarda lo spessore dell'isolamento
- Tutti i composti sono termoindurenti (reticolazione mediante fasci di elettroni)

## 5 Il passo successivo

### 5.1 Nuovi requisiti

Nel 2013 il nuovo requisito dell'industria fotovoltaica consisteva nell'aumentare la tensione del sistema per risparmiare sul costo dei cavi e per aumentare l'efficienza dei sistemi fotovoltaici.

La tensione nominale dei fili fotovoltaici di prima generazione conformemente alla norma TÜV1169 si basava sulle norme generiche dei cavi industriali.

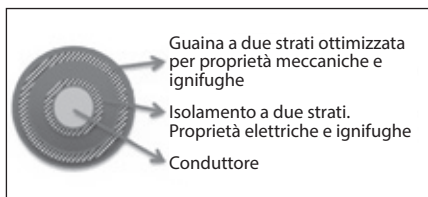
La tensione nominale standard per i cavi di bassa tensione delle norme CENELEC e IEC è U<sub>0</sub>/U = 600/1.000V CA o 900/1.500V CC.

La tensione nominale del filo fotovoltaico di nuova generazione è U<sub>0</sub>/U = 1.000/1.000V CA o 1.500/1.500V CC.

Nel frattempo, TÜV Rheinland ha sviluppato la norma 2Pfg1990/2012, che recepisce i nuovi requisiti.

### 5.2 Nuova generazione di cavi UL4703 1.000V/TUV 1.500V CC

Le caratteristiche più importanti di questa struttura sono:



▲ **Figura 4:** Nuova progettazione

- Estrusione in quattro strati e una passata (dovuta alla crescente pressione dei prezzi nell'industria fotovoltaica)
- Tutti i componenti sono termoindurenti (reticolazione mediante fasci di elettroni)
- Gli strati non sono separabili (definizione UL: "isolamento composito senza guaina")
- Approvazioni: UL (1.000V)/TÜV (2Pfg1990)/CSA 22.2 N° 271-11

## 6 Il percorso fino a CENELEC e IEC

### 6.1 CENELEC

Nel 2011, il comitato nazionale tedesco per il settore dei fili e dei cavi fotovoltaici iniziò a lavorare per una revisione della norma VDE-AR-E 2283-4 "Requisiti per cavi di sistemi fotovoltaici". L'obiettivo era ora di applicare questa bozza come progetto di una nuova norma per il comitato tecnico CENELEC TC20. Gli argomenti principali erano:

- Aumento della tensione del sistema
- Adattamento delle procedure di prova al nuovo livello di tensione

Il risultato di questo lavoro è la norma EN50618, che fu pubblicata come bozza finale nell'agosto del 2014.

### 6.2 IEC

Nel 2013, IEC adottò la bozza EN50618 su richiesta del comitato tecnico IEC TC82 come documento di base per iniziare a sviluppare una norma IEC per fili fotovoltaici. Questa norma è ora pubblicata come bozza del comitato IEC62930. La bozza IEC è identica alla bozza EN50618 per il 95 per cento.

#### 6.2.1 Differenze rispetto alla EN50618

La differenza principale fra EN 50618 e IEC 62930 è che nella classe standard IEC è consentito l'utilizzo di due conduttori per l'installazione fissa.

## 7 Qual'è la novità nelle norme EN50618 e IEC 62930

### 7.1 Progettazione

Non vi sono differenze rilevanti nei requisiti di progettazione di queste

nuove norme. Si noti, tuttavia, che la definizione di nero viene indicato come il colore preferibile per la guaina. Vi sono cambiamenti minimi negli spessori richiesti per gli strati che sono leggermente aumentati.

### 7.2 Requisiti di prova

Va notato che sono cambiate sostanzialmente le procedure di prova dei materiali adattando la norma IEC60811 "Cavi elettrici e a fibra ottica - Metodi di prova per materiali non metallici".

- Tutti i campioni di prova devono essere presi da cavi finiti
- Non è consentito effettuare prove di materiali su nastri estrusi o piatti sagomati

*Documento presentato per il 63° Simposio tecnico IWCS, Providence, Rhode Island, U.S.A., novembre 2014.*

**Leoni Studer AG**  
Business Unit Solar & Windpower  
Däniken  
Svizzera  
Tel: +41 799138728  
Email: faruk.yeginsoy@leoni.com  
Website: www.leoni.com

# Desarrollando carreras profesionales

LOS aprendices constituyen una parte importante del programa de contratación de William Hughes, por lo que la empresa sigue invirtiendo en este valioso recurso. El especialista en fabricación de muelles y componentes de alambre curvos para los sectores globales automovilístico y aeroespacial y los programas de aprendizaje ofrecen la plataforma ideal para los jóvenes donde desarrollar su carrera profesional.

Durante el programa de cuatro años, los aprendices tienen la magnífica oportunidad de practicar en toda la gama de procesos productivos llevados a cabo en la fábrica y oficina central de William Hughes de la localidad británica de Dorset.

"El éxito de nuestra empresa se basa en su gente y nuestro programa de aprendizaje brinda a los jóvenes la oportunidad de despegar y desarrollar sus carreras profesionales en nuestra organización," dijo Emma Burgon, directora de ingeniería.

"A medida que vamos creciendo, vamos creando oportunidades para jóvenes capacitados, así como para gerentes de nivel intermedio y senior. Nos alegra que muchos de estos cargos sean ocupados por aprendices después de terminar su capacitación oficial."

Una cuidadosa selección es la clave para contratar y mantener al personal ideal y



▲ Aprendices y plantilla de la fábrica William Hughes

William Hughes utiliza recursos locales como centros de empleo, periódicos locales e instituciones de formación profesional para atraer a potenciales aprendices. Los candidatos interesados son invitados a asistir a una velada de puertas abiertas donde se les presentan las actividades de la empresa y se les ilustra el programa de aprendizaje. Se les enseña además la fábrica y las oficinas, para que entiendan lo que significa trabajar en el sector manufacturero.

Después de la velada de puertas abiertas, los candidatos seleccionados son invitados a realizar una semana de trabajo en la fábrica, lo cual representa una excelente oportunidad para valorar su aptitud de cara al programa de

aprendizaje. Una vez seleccionados, los candidatos son animados a seguir un curso de NVQ (National Vocational Qualification) en fabricación general, que puede ser convalidado con un nivel HNC (Higher National Certificate) y HND (Higher National Diploma). El progreso es seguido por el director de recursos humanos mediante reuniones concertadas periódicamente y el examen de los informes académicos. La flexibilidad es un factor importante que se implementa mediante programas personalizados que son modificados y adaptados según los puntos fuertes y los intereses de cada candidato.

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

## Lanzamiento de producto nuevo en la feria

Cimteq, proveedor inglés de software de diseño y fabricación de cables, eligió la feria Interwire de este año celebrada en Atlanta, Estados Unidos, como base de lanzamiento para su nuevo producto CableBuilder3D, que funciona con el producto bandera de la empresa, CableBuilder.

El nuevo producto consolida la fama de CableBuilder como sistema de diseño de cables reconocido en todo el mundo. Se integra totalmente en CableBuilder y ofrece un gran número de funciones gráficas de modelado 3D, generación de planos de ingeniería y funciones CAD completas.

El sistema procesa diseños creados con CableBuilder y los transforma automáticamente en planos 3D altamente realistas desde el punto de vista fotográfico, sin necesidad

de solicitar los servicios de un fotógrafo ni de subcontratar una agencia gráfica externa.

Las imágenes pueden ser integradas en hojas de datos para darles un aspecto mucho más profesional y poder entregárselos seguidamente a los clientes de los fabricantes de cables para usarlos en su material de marketing en línea y fuera de línea.

Además del interés despertado en la feria por CableBuilder y CableBuilder3D, otro de los productos de Cimteq, CableMES, sistema de ejecución de manufactura específico para cables basado en la plataforma Wonderware, suscitó igualmente gran interés entre los visitantes.

**Cimteq Ltd – Reino Unido**  
**Website:** [www.cimteq.co.uk](http://www.cimteq.co.uk)

## Abriendo camino en el proyecto de fusión nuclear internacional ITER

Ridgway Machines ha obtenido otro importante contrato para el proyecto de fusión nuclear internacional ITER (International Thermonuclear Experimental Reactor). El contrato, dado por el Sea Alp Engineering Consortium, innovador europeo en soluciones de alta tecnología para proyectos de investigación en física nuclear, cubre el suministro de los sistemas de cabezas de encintado adicionales diseñados específicamente para aislar las bobinas superconductoras de las bobinas de campo poloidal del ITER.

Ridgway Machines, ubicada en la localidad británica de Leicester, ya ha diseñado y suministrado varios sistemas de cabezas de encintado para las bobinas de campo toroidal, que formaban parte del suministro europeo para el proyecto ITER. Seguidamente, Ridgway amplió sus diseños innovadores para suministrar más máquinas para el sistema de cabezas de encintado utilizado para encantar la bobina del solenoide central fabricada por General Atomics, que era parte del suministro del consorcio estadounidense para el proyecto ITER.

Este último contrato para las bobinas poloidales revela la

confianza depositada por los miembros del consorcio por lo que se refiere a la calidad constante, rendimiento y tecnología de diseño ofrecidos para la fabricación de las tres estructuras fundamentales de las bobinas de la cámara de confinamiento magnético del Tokamak.

ITER es considerado el mayor experimento científico de la historia con el que se quiere demostrar la factibilidad técnica y científica de la energía de fusión para obtener energía a escala comercial. El reactor Tokamak ITER será una de las máquinas más complicadas jamás diseñadas, con una altura de 30 metros y un peso de 23.000 toneladas, y alojará aproximadamente un millón de componentes.

Los imanes del campo poloidal mantienen el plasma separado de las paredes del reactor, ayudando así a mantener la forma y estabilidad del plasma. Las bobinas de campo poloidal están constituidas por seis bobinas horizontales situadas fuera de la estructura del imán toroidal.

**Ridgway Machines Ltd – Reino Unido**  
**Website:** [www.ridgwayeng.com](http://www.ridgwayeng.com)

# Evento dedicado a “Women in Manufacturing”

MILTEC Corporation organizó una visita a sus instalaciones y una presentación de carreras profesionales para un grupo de socias y potenciales socias de Women in Manufacturing (WiM), organización nacional dedicada a atraer, promover y retener talento femenino de mujeres que han elegido desarrollar o ya están desarrollando su carrera profesional en el sector manufacturero.

El evento inició con una presentación de Jane Seagraves, directora de desarrollo empresarial de APPI Energy de Salisbury Maryland, y primer partner por afinidad de WiM, que presta servicios de asesoría sobre electricidad y gas natural.

En la presentación se destacó el papel de WiM como medio de soporte, promoción e inspiración para mujeres animándolas a realizar sus carreras profesionales en el mundo de la manufactura, y se ofreció información sobre eventos que facilitan la toma de contacto con otros iguales industriales.

El evento de Miltec no sólo fue de soporte para el papel desempeñado por WiM, sino que también hizo posible la toma de contacto entre iguales que asistieron para ver las instalaciones manufactureras



▲ Invitadas al evento Women in Manufacturing organizado por Miltec

y el funcionamiento de Miltec y saber más sobre el proceso de secado por UV. Las mujeres de Miltec describieron sus responsabilidades laborales y narraron historias de la vida real sobre la oportunidad que les brindó Miltec de construirse una carrera profesional en el sector manufacturero.

Marilyn Blandford, directora ejecutiva de Miltec, comentó: “Estoy orgullosa de nuestras mujeres y me siento honorada de estar rodeada de mujeres

tan extraordinarias de las que sigo aprendiendo cada día.”

Habló sobre el camino profesional que recorrió ella misma, que empezó como educadora, y animó al grupo de mujeres asistentes a tomar conciencia de su fuerza, continuar su formación y entender que las habilidades de las mujeres son fundamentales para el sector manufacturero.

**Miltec Corporation – Estados Unidos**  
**Website:** [www.miltec.com](http://www.miltec.com)

# Normalización de alambres y cables fotovoltaicos 2001-2014

Por Faruk Yeginsoy, Leoni Struder AG

## Resumen

En este artículo se ilustrarán la evolución del documento 2Pfg1169/2001 al 2Pfg1990/2012 de la alemana TÜV Rheinland y la influencia de este documento en las normas nacionales de Estados Unidos, Japón y Europa, así como también el desarrollo de las normas Cenelec EN50618 y IEC62930.

Este artículo permitirá hacerse una idea sobre el diseño, las combinaciones de materiales y los procesos de producción necesarios para cumplir las normas citadas. En particular, el reto era cumplir varias normas a la vez, como por ejemplo la combinación de las UL y TÜV.

Se analizará también otro aspecto que permitirá comprender mejor los procedimientos específicos de prueba de las características esenciales de los compuestos que determinan la larga duración esperada de los cables fotovoltaicos.

## 1 Introducción

El interés mundial por la energía renovable, que despertó a finales del siglo pasado, impulsó el fuerte crecimiento de la industria fotovoltaica, que a escala mundial resultó irrefrenable.

En aquel tiempo la construcción de sistemas fotovoltaicos era una inversión costosa y a largo plazo; los inversores no sabían cómo evaluar la calidad de los módulos, y los clientes exigían la duración esperada de los módulos y sistemas fotovoltaicos.

Había una fuerte necesidad de una certificación de terceros que garantizara la seguridad y la calidad de los sistemas.

En ese momento, la alemana TÜV Rheinland inició a revisar la seguridad y la calidad de los módulos fotovoltaicos según sus propios requisitos.

En poco tiempo quedó claro que la calidad y la seguridad de los módulos dependían de los componentes, pero faltaba una normativa de componentes que considerara los requisitos para la aplicación fotovoltaica. Éste fue el inicio de la normalización de los cables fotovoltaicos.

## 2 El inicio

En 2001, la TÜV Rheinland de Alemania inició a probar módulos fotovoltaicos y observó muchos problemas debidos a los cables.

Dado que no existían pruebas normalizadas dedicadas para estos cables, la TÜV Rheinland creó su propia norma. Fue el nacimiento de la 2Pfg1169:2004.

Esta primera norma se basaba en la norma IEC60245-4:1994 (Cables aislados con goma de tensiones asignadas inferiores o iguales a 450/750 V - Parte 4: Cables flexibles).

En aquel tiempo el cable más usado era el H07RN-F (Goma 60°C–90°C).

En esta primera etapa de las instalaciones fotovoltaicas, ninguno se dio cuenta de que los requisitos para los cables fotovoltaicos debían ser mucho más exigentes.

### 2.1 Primeros fallos del cableado después de pocos años

▼ **Figura 1:** Fallos de cableado causados por ozono y altas temperaturas



## 3 Nuevos requisitos

Después de numerosos fallos del cableado, los expertos en sistemas fotovoltaicos reconocieron que los requisitos de la primera norma Pfg 1169/2004 eran poco exigentes. En 2006, un nuevo grupo de expertos (Grupo de Trabajo del Comité Nacional Alemán 411.2.3) inició a trabajar sobre una nueva versión de los "Requisitos para cables fotovoltaicos".

En la primera parte del trabajo, el grupo comprendía expertos de módulos y expertos de cables. El objetivo era determinar el ciclo de vida útil de los alambres fotovoltaicos.

Los puntos principales que fueron analizados por el grupo de trabajo eran:

- ¿Cómo podemos predecir la duración de un cable?
- ¿Cuántos años debe durar un cable?
- ¿Cómo se nota el envejecimiento de los cables?
- ¿Cómo podemos probar el proceso de envejecimiento?

### 3.1 El envejecimiento del material es el nuevo objetivo de investigación

**3.1.1 Termo-oxidación de las poliolefinas**  
Una de las leyes químicas elementales es la ley de Arrhenius. Esta ley describe la correlación entre temperatura y velocidad de las reacciones químicas del proceso. El envejecimiento térmico del polímero no es más que un proceso químico y todos los procesos químicos dependen de la temperatura del proceso.

Un aumento de la temperatura de 10°C duplica la velocidad del proceso. Y viceversa, una disminución de la temperatura reduce la velocidad del proceso de envejecimiento a la mitad.

La temperatura nominal específica de un cable se debería determinar en combinación con un tiempo específico. Sin una indicación de tiempo, la temperatura nominal es inútil.

El valor nominal estándar de temperatura para la industria de cables europea es  $xxx^{\circ}\text{C}$  a 20.000h.

La vida útil estándar de los módulos de la industria fotovoltaica es 25 años, que corresponden aproximadamente a 150.000h. La temperatura ambiente supuesta es  $90^{\circ}\text{C}$ ; por lo tanto, el valor nominal mínimo de la temperatura debería ser  $90^{\circ}\text{C}/150.000\text{h}$ . Normalizado según el tiempo estándar industrial de 20.000h, el nuevo valor nominal de temperatura debería ser  $120^{\circ}\text{C}/20.000\text{h}$ .

### 3.1.2 Foto-oxidación

La luz del sol contiene una gran cantidad de radiación ultravioleta. La radiación ultravioleta absorbida por un material polimérico causará su degradación. La energía puede ser suficiente para causar la rotura del polímero inestable y, después de un cierto tiempo, modificar sus componentes.

Los materiales poliméricos que se deben exponer a radiación ultravioleta durante largo tiempo deberían ser realizados con compuestos poliméricos debidamente estabilizados para dichas condiciones ambientales. Los polímeros de poliolefinas básicos tienen una duración limitada en exteriores.

Sin embargo, la mayoría de los cables solares de poliolefina de colores (no negros) fabricados en el día de hoy contiene un paquete de estabilización ultravioleta que resulta ser satisfactorio para un tiempo limitado de 5-10 años. Pero, para una vida operativa prolongada en exteriores, las poliolefinas deberían ser formuladas con un mínimo de un 2,5 por ciento de negro de carbón disperso finamente.

Agregando negro de carbón a las poliolefinas, se aumenta enormemente la resistencia a los UV. El negro de carbón actúa como elemento de absorción UV y protege la poliolefina de los daños debidos a la radiación ultravioleta.

Hasta hoy no se conoce ninguna relación física o química aplicable que permita extrapolar una prueba de resistencia a la intemperie acelerada para determinar la duración de los cables. La duración de las pruebas realizadas según las normas (UL y TÜV) son 720h, y los resultados no pueden ser extrapolados basándose en una fórmula matemática. Estas pruebas proporcionan solamente resultados comparables, pero no datos reales sobre la duración efectiva.

Como se ha demostrado durante cuatro décadas de experiencia en exteriores con cables de comunicación con cubierta de polietileno, la adición de un 2,5 por ciento de negro de carbón disperso finamente

ofrece una protección contra los UV de más de 25 años. La dispersión del negro de carbón forma parte integrante del proceso de extrusión de la cubierta, que tiene una fuerte influencia sobre la resistencia a los UV. La correcta gestión de los parámetros de la máquina es el factor clave para obtener los resultados mejores.

El negro de carbón está presente en la norma EN50290 ("Cables de comunicación. Reglas comunes de diseño y construcción") como requisito obligatorio para cables de comunicación para uso expuesto al exterior.

### 3.2 Puntos básicos de los nuevos requisitos en 2007

El punto básico de la nueva versión de la norma Pfg1169/2007.8 es la prueba de durabilidad térmica según la norma IEC60216 "Materiales aislantes eléctricos - Propiedades de durabilidad térmica" ( $120^{\circ}\text{C}/20.000\text{h}$ ).

En la aplicación de esta norma, se da por supuesto que exista una relación casi lineal entre el logaritmo del tiempo requerido para causar un determinado cambio de propiedades (menos de un 50 por ciento de alargamiento a rotura) y el valor recíproco de la temperatura absoluta correspondiente. Esta prueba debe ser realizada a por lo menos tres temperaturas distintas. La temperatura más alta debe ser seleccionada para tener un punto final de no menos de 100h y la temperatura más baja debe ser seleccionada para obtener el resultado esperado no antes de 5.000h.

Una línea recta debe ser dibujada para conectar los distintos puntos registrados. Prolongando la línea hasta que se intersecan las 20.000h en el eje de las ordenadas (logaritmo del tiempo), es posible determinar el valor nominal de la temperatura en el eje de las abscisas (la temperatura absoluta recíproca).

Otros puntos esenciales son:

- Los materiales que se usan deben ser sin halógenos
- Los conductores que se usan deben cumplir la norma IEC 60228 clase 5
- Los cables y alambres deben cumplir la norma IEC60332-1-2 (prueba de llama vertical)

El resultado de este trabajo fue publicado por el comité de normalización VDE como:

- VDE-AR-E 2283-4 "Requisitos para cables de sistemas fotovoltaicos"

Y por TÜV como:

- TÜV 2Pfg1169/2007.8 "Requisitos para cables a usar en sistemas fotovoltaicos"

### 3.3 La especificación para alambres fotovoltaicos de UL

En 2005, UL publicó la primera edición de la norma 4703. De esta manera, UL creó

el primer tipo de cable fotovoltaico "PV". Esta norma se basaba en la norma UL854 (Cables de entrada de servicio eléctrico). Pero en 2005, la norma NEC2005 (Artículo 690) requería cables de tipo USE, USE-2, UF y SE.

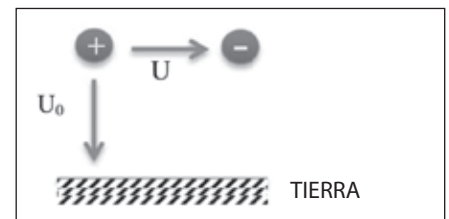
En 2008, el tipo fotovoltaico fue mencionado por primera vez en la norma NEC2008. Los alambres requeridos en esa edición eran de tipo USE-2 o PV (fotovoltaicos). Cabe mencionar la aceptación de las medidas métricas de los conductores en la norma UL4703.

En 2010, UL publicó la cuarta edición de la norma UL4703, que es la versión aplicable hasta hoy. En esa edición se encuentra la norma de referencia UL 44 "Alambres y cables aislados con material termoestable".

### 3.3.1 Diferencias respecto a la norma TÜV 1169/2007.8

Las diferencias significativas entre las normas UL y TÜV son las siguientes:

- Los compuestos halogenados están permitidos en la norma UL4703
- La prueba de inflamabilidad UL1581-1060 es más exigente respecto a la IEC60332-1
- No hay distinción entre CC y CA en la norma UL4703
- Se permiten 1.000V (ó 2.000V), lo que está más orientado al futuro
- Los alambres de aluminio están permitidos en la norma UL4703
- No hay distinción entre U0/U en la norma UL4703



▲ Figura 2: Definición de  $U_0/U$

## 4 Nuevo reto para la industria del cable

### 4.1 Cables aprobados por TÜV y UL 2006-2013

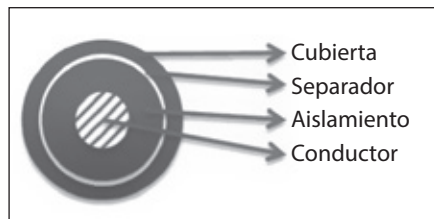
En 2006 los fabricantes de módulos iniciaron a pensar globalmente. El nuevo requisito de comercialización era fabricar un tipo de módulo fotovoltaico con todas las aprobaciones necesarias para venderlo en todos los mercados. El reto era crear un cable que pudiera combinar las especificaciones contrastantes de UL (PV / USE-2) y TÜV 1169. En particular, se debían superar las discrepancias siguientes.

- Los compuestos sin halógenos poseen una carga elevada de minerales retardantes de la llama. Las propiedades físicas requeridas por UL son un desafío para estos tipos de compuestos

- Pasar la prueba de inflamabilidad requerida por UL es fácil para los compuestos halogenados, pero es difícil para los compuestos sin halógenos
- La prueba de estabilidad a largo plazo de UL es un verdadero desafío para los compuestos rellenos porque los aditivos retardantes de la llama son higroscópicos.

Pero fue posible cumplir todos estos requisitos.

## 4.1.1 La primera solución



▲ **Figura 3:** Diseño optimizado del alambre UL4703 y TÜV1169 ó TÜV1169

Las características destacables de este diseño son:

- Extrusión en tres capas en una pasada (debido a la creciente presión sobre los precios en la industria fotovoltaica)
- Polímero especialmente desarrollado como separador
- Capas separables requeridas por muchos clientes (definición UL: "Aislamiento termoestable con cubierta")
- La diferencia entre estas dos familias de cables son los espesores de las distintas capas, porque el tipo UL presenta un requisito más alto para el espesor del aislamiento
- Todos los compuestos son termoestables (reticulados por haz de electrones)

## 5 El paso siguiente

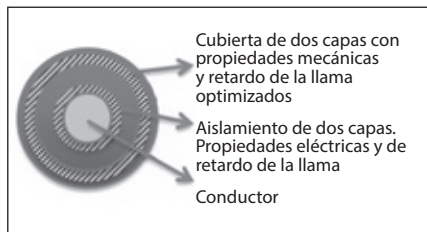
### 5.1 Nuevos requisitos

En 2013 el nuevo requisito de la industria fotovoltaica era aumentar la tensión del sistema para ahorrar en el coste del cable y aumentar la eficiencia de los sistemas fotovoltaicos.

La tensión nominal de la primera generación de alambres fotovoltaicos según la norma TÜV1169 se basaba en las normas genéricas de los cables industriales. La tensión nominal estándar para los cables de baja tensión de las normas CENELEC y IEC es  $U_0/U = 600/1.000V$  CA ó  $900/1.500V$  CC.

La tensión nominal del alambre fotovoltaico de nueva generación es  $U_0/U = 1.000/1.000V$  CA ó  $1.500/1.500V$  CC. Pero entretanto, la TÜV Rheinland desarrolló la norma 2Pfg1990/2012, que tenía en cuenta los nuevos requisitos.

### 5.2 Nueva generación de cables UL4703 1.000V/TUV 1.500V CC



▲ **Figura 4:** Nuevo diseño

Las características destacables de este diseño son:

- Extrusión en cuatro capas en una pasada (debido a la creciente presión sobre los precios en la industria fotovoltaica)
- Todos los compuestos son termoestables (reticulados por haz de electrones)
- Capas no separables (definición UL: "aislamiento compuesto sin cubierta")
- Aprobaciones: UL (1.000V)/TÜV (2Pfg1990)/CSA 22.2 N° 271-11

## 6 El camino hacia CENELEC e IEC

### 6.1 CENELEC

En 2011, el Comité Nacional Alemán para alambres y cables fotovoltaicos inició a preparar una revisión de la norma de uso VDE-AR-E 2283-4 "Requisitos para cables de sistemas fotovoltaicos".

El objetivo era aplicar este borrador como nuevo elemento de trabajo para el comité técnico CENELEC TC20.

Los asuntos principales eran:

- Aumentar la tensión del sistema
- Adaptar los procedimientos de prueba al nuevo nivel de tensión

El resultado de este trabajo es la norma EN50618, que fue publicada como borrador final en agosto de 2014.

### 6.2 IEC

En 2013, la IEC adoptó el borrador EN50618 a petición del comité técnico IEC TC82 como documento de base para iniciar a desarrollar una norma IEC para alambres fotovoltaicos, que ahora está publicado como borrador del comité IEC62930.

El borrador IEC es idéntico al borrador EN50618 en un 95 por ciento.

#### 6.2.1 Diferencias respecto al borrador EN50618

La diferencia principal entre los borradores EN 50618 y IEC 62930 es que en la clase estándar IEC se permite usar dos conductores para la instalación fija.

## 7 Lo nuevo de los borradores EN50618 y IEC 62930

### 7.1 Diseño

No hay grandes diferencias en los requisitos de diseño de estas nuevas normas. Pero, nótese que se indica como negro el color preferido para la cubierta.

Hay cambios menores en los espesores requeridos de las capas, que han aumentado poco.

### 7.2 Requisitos de prueba

Nótese que se han cambiado notablemente los procedimientos de prueba de los materiales adaptando la norma IEC60811 "Cables eléctricos y de fibra óptica - Métodos de ensayo para materiales no metálicos".

- Todas las muestras de prueba deben ser tomadas de cables acabados
- No está permitido efectuar pruebas de materiales en cintas extruidas o placas moldeadas

*Este documento es presentado por cortesía del 63º Simposio Técnico IWCS, Providence, Rhode Island, EE.UU, noviembre de 2014.*

**Leoni Studer AG**  
Business Unit Solar & Windpower  
Däniken  
Suiza  
Tel: +41 799138728  
Email: faruk.yeginsoy@leoni.com  
Website: www.leoni.com



# editorial index

Aeroel .....	47	Leeco Spring International .....	28
Alloy Wire Ltd.....	18	Madem Reels .....	16
BASEC .....	15	Messe Düsseldorf GmbH.....	25
Blachford Inc.....	26	Metalube Ltd.....	27, 52
CILS.....	18	Miltec Corporation.....	77, 82, 88, 94, 99
Cimteq Ltd.....	21, 76, 81, 87, 93, 98	Numalliance .....	22
Clifford Welding Systems (Pty) Ltd.....	12	Placid Industries Inc .....	42
Crafts Technology.....	18	Plasmait GmbH .....	39
Datwyler .....	34	Q8oils .....	38
Davis-Standard LLC.....	12	Queins Machines GmbH.....	22
Decalub.....	52	R & M.....	24
Flymca and Flyro .....	11	Renova Srl .....	45
Frigeco.....	35	Ridgway Machines.....	77, 82, 88, 94, 99
Gladding Braided Products .....	10	Sikora AG .....	41, 50
Guill Tool & Engineering .....	13	Technifor .....	51
Helukabel GmbH.....	49	Whitelegg Machines Ltd.....	28
Huber Engineered Materials .....	16	William Hughes Ltd.....	76, 81, 87, 93, 98
InnoVites BV .....	19	Wire & Plastic Machinery Corp .....	12
Japan Steel Works .....	48	Zumbach Electronic AG .....	36, 43

THIS PUBLICATION AND ITS FULL CONTENTS OF LAYOUT, TEXT, IMAGES, AND GRAPHICS IS COPYRIGHT PROTECTED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL INCLUDING PHOTOCOPYING, RECORDING OR ANY OTHER STORAGE OR RETRIEVAL SYSTEM WITHOUT THE PUBLISHER'S WRITTEN PERMISSION. THE PUBLISHER, OWNERS, AGENTS, PRINTERS, EDITORS AND CONTRIBUTORS CANNOT BE HELD RESPONSIBLE FOR AND HEREBY EXCLUDE ALL LIABILITY WHATSOEVER FOR ERRORS, OMISSIONS OR THE ACCURACY AND CLAIMS PRINTED OR INFERRED IN THE EDITORIAL OR ADVERTISEMENTS PUBLISHED IN THIS, PREVIOUS OR SUBSEQUENT EDITIONS OR FOR ANY DAMAGES, COSTS OR LOSSES CAUSED THEREBY. EUROWIRE RESERVES THE RIGHT TO EDIT, REWORD AND SUBEDIT ALL EDITORIAL SUBMISSIONS IN ACCORDANCE WITH EDITORIAL POLICY. EUROWIRE EXPRESSED GRAPHICALLY OR BY TEXT IS A REGISTERED NAME AND STYLE TRADEMARK OF INTRAS LTD, UK. ALL MATTERS RELATING TO THIS DISCLAIMER ARE GOVERNED BY THE LAWS OF ENGLAND.

EUROWIRE IS PUBLISHED SIX TIMES PER YEAR AND INCORPORATES THE TITLE AND PUBLISHING RIGHTS ONLY OF THE FORMER SERIES OF PUBLICATIONS KNOWN AS 'TRANSFIL EUROPE'. EUROWIRE IS CIRCULATED TO ENGINEERS, MANAGERS AND PERSONNEL IN THE WIRE, CABLE, FIBRE OPTIC AND WIRE PRODUCT INDUSTRIES UPON RECEIPT OF A COMPLETED SUBSCRIPTION FORM. AN ANNUAL SUBSCRIPTION IS AVAILABLE FROM INTRAS LTD, UK, AT EUROS 140.00, £120.00, US\$195.00.

# advertisers index

ADC Sarl.....	29	Lämneå Bruk AB.....	19
Aeroel Srl .....	Front cover	Magnetic Srl .....	42
Agir Technologies.....	25	Mathiasen Machinery Inc .....	65
Ajex & Turner Wire Dies Co .....	50	Metalube Ltd.....	39
AK Export Import .....	65	Metalwire BV.....	15
AlphaGary Corporation.....	Back cover	Mobac GmbH.....	2
Anbao (Qinghuangdao) Wire & Mesh Co Ltd .....	11	Maschinenfabrik Niehoff GmbH & Co KG.....	44
Borealis.....	23	Numalliance .....	29
Bühler Redex.....	41	Paramount Die Co.....	63
BWE Ltd.....	35	Pourtier, a member of the Gauder Group.....	5
Candor Sweden AB.....	67	Rosendahl Nextrom GmbH .....	17
Comsuc Technology Development Ltd.....	68	Setic, a member of the Gauder Group .....	5
Contrôle Mesure Systèmes SA.....	29	Shanghai Nanyang Electrical Equipment Co Ltd.....	16
Decalub .....	15, 52	Sheng Chyeen Enterprise Co Ltd.....	Inside back cover
Deyang Jiechuang Wire & Cable Machinery Co Ltd.....	20	Sikora AG .....	3
Eurobend.....	13	Sjogren Industries Inc .....	26-27
Eurolls SpA.....	37	Solvay .....	29
Flymca SL.....	45	Supermac Industries India Ltd .....	9
Fuhr GmbH & Co KG.....	38	Taiwan Linkigi Metal Co Ltd .....	52
Gauder, a member of the Gauder Group .....	5	Tien Chen Diamond Industry Co Ltd .....	11
GMP Slovakia sro .....	24	TJK Machinery (Tianjin) Co Ltd.....	14
Golden Spot Industry Inc .....	36	Upcast Oy.....	61
Guidetti Srl.....	68	WTM Srl.....	48
Hämex AB.....	43	Wire & Plastic Machinery Corp .....	51
Inosym Ltd.....	21, 47	Wirex Dies & Steel India Pvt Ltd .....	69
International Wire & Machinery Association.....	62	WiTechs GmbH .....	69
Invimec Srl .....	72	Yangzhou Jinsen Optoelectronics Co Ltd .....	64
IWCEA France.....	29	Yuang Hsian Metal Industrial Corporation .....	22
IWCS .....	53	Zhangjiagang Sanfeng Machinery & Electrical Co Ltd.....	1
Jiangsu Qunye Electrical Co Ltd .....	67	Zumbach Electronic AG.....	Inside front cover
Kkalpana Industries (India) Ltd .....	49		

\* Front cover courtesy of Aeroel Srl showing their HWS.1 Handy Wire Scanner.

For more details please call +39 0432 671301, or email sales@aeroel.it Website: www.aeroel.it

*EuroWire is published 6 times per year and is distributed to persons in the wire, cable, fibre optic and wire product manufacturing and supply industries, as well as manufacturers and suppliers of machinery, equipment and services. Registered readers in Europe, NAFTA, Latin America, Africa and certain Middle East countries will receive all editions via surface or air-assisted mail services as requested from the publishers. Additional information on air mail services and subscriptions can be obtained from the publisher, Intras Ltd, UK.*

# SEE US AT ...

## wire Southeast ASIA

Bangkok, Thailand

16<sup>th</sup> - 18<sup>th</sup> September 2015

[www.wire-southeastasia.com](http://www.wire-southeastasia.com)



# ...AND PICK UP YOUR **FREE** MAGAZINES AND CDs

**STAND J01**

[www.read-wca.com](http://www.read-wca.com)

[www.read-eurowire.com](http://www.read-eurowire.com)

**euro wire**  
March 2015 - 1000217  
[www.read-eurowire.com](http://www.read-eurowire.com)

**ETERWIRE**

**THE COMPLETE ENGINEERING BALANCE FOR YOUR DEMANDING CABLE DESIGNS**  
Performance, safety, cost effectiveness and environmental stewardship

**SMOKEGUARD®**  
Low Smoke, Flame Retardant Specialty PVC & Chlorides

**SMOKEGUARD® HP**  
High Performance Fluoropolymer

**MEGOLON®**  
Halogen Free Thermoplastic & Cross-Linkable Compounds

**GARAFLEX™**  
Thermoplastic Sheathings for Flexible Low Temperature & Oil Resistant Applications

**GARATHANE™**  
Flame Retardant Thermoplastic Urethanes

**CW™**  
Flame Retardant PVC

**COLOR CONCENTRATE**

**AlphaGary**  
A Mexidchem Company  
[www.alphagary.com](http://www.alphagary.com)

Wires • Cables • Fibre Optics • Springs • Fasteners • Precision Parts

**Wire & Cable**  
March 2015  
[www.read-wca.com](http://www.read-wca.com)

**ETERWIRE**

**ASIA 线缆**

**HANDING MACHINERY**  
Specialized designing and manufacturing wire and cable equipment

**ETERWIRE**  
ETERWIRE LTD  
170 Phoenix Drive  
Lynnwood, WA 98149, USA  
+1 800 533 8271 Voice  
+1 800 232 8341 Video  
+1 878 838 0263 Fax

**ETERWIRE**  
ETERWIRE LTD  
170 Phoenix Drive  
Lynnwood, WA 98149, USA  
+1 800 533 8271 Voice  
+1 800 232 8341 Video  
+1 878 838 0263 Fax

**ETERWIRE**  
ETERWIRE LTD  
170 Phoenix Drive  
Lynnwood, WA 98149, USA  
+1 800 533 8271 Voice  
+1 800 232 8341 Video  
+1 878 838 0263 Fax

## LEADING MAGAZINES

for the wire and cable industries



 **SHENG CHYEAN**  
省權實業股份有限公司

**Cold Draw Bar Equipment**  
(Ferrous and Non Ferrous)



Chain Draw bench



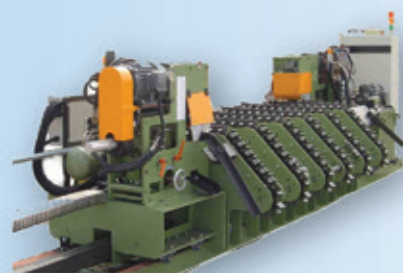
Combined Drawing Machine



Rk Two Roller Straightening Machine



Peeling Machine



Chamfering Machine

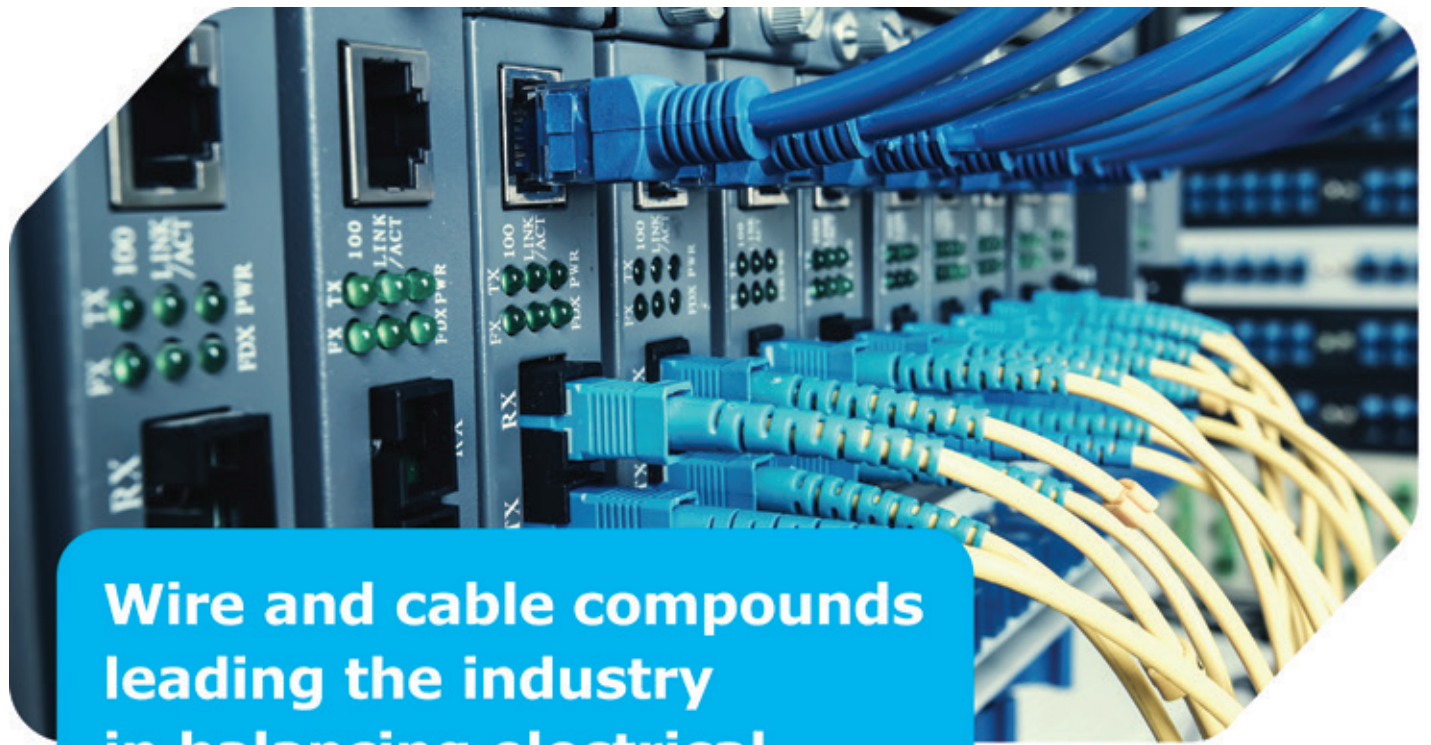


Website: [www.tw-sc.com.tw](http://www.tw-sc.com.tw) Youtube: <http://goo.gl/mucgy9>

Email: [tw.sc@msa.hinet.net](mailto:tw.sc@msa.hinet.net)

Tel:+886-4-7588533 Fax:+886-4-7588500

Address: No.217-1, Yu-Pu RD., Yu-Pu Village, Hsienhsi, Changhua, Taiwan



**Wire and cable compounds leading the industry in balancing electrical, mechanical, thermal and fire performance.**

**AlphaGary**

**We develop tailored plastic compounds solutions for specific product requirements**

<b>LSHF</b>	Low Smoke Halogen Free	MEGOLON® Series
<b>FR PVC</b>	Flame Retardant PVC	GW Series
<b>PLENUM</b>	Low Smoke Plenum	SMOKEGUARD® Series
<b>TPE</b>	Thermoplastic Elastomer	EVOPRENE® Series
<b>TPV</b>	Thermoplastic Elastomer Vulcanizate	GARAFLEX® Series
<b>TPU</b>	Thermoplastic Elastomer Urethane	GARATHANE® Series
<b>TPO</b>	Thermoplastic Olefin	GPE & GPO Series
<b>CPE</b>	Chlorinated Polyethylene	GCPE Series

**AlphaGary United States**

**Massachusetts**  
170 Pioneer Drive, Leominster MA 01453 USA  
Tel: + 1 978 537 8071

**North Carolina**  
9635 Industrial Drive, Pineville NC 28134 USA  
Tel: + 1 704 889 7861

**AlphaGary United Kingdom**

Beler Way, Leicester Road Industrial Estate,  
Melton Mowbray, Leicestershire LE13 0DG  
England  
Tel: + 44 (0) 1664 502222  
Fax: + 44 (0) 1664 502250

For information call:

**USA + 1 978 537 8071**

**UK + 44 (0) 1664 502222**

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

[enquiries@alphagary.com](mailto:enquiries@alphagary.com)

