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wire
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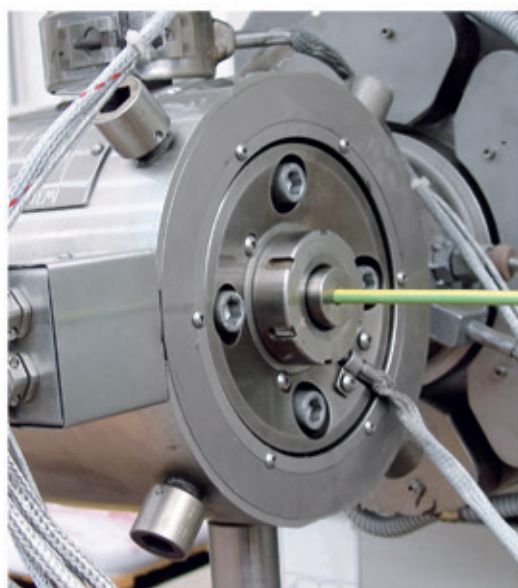
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2017

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Venue: Puerta de Oro - Centro de eventos y convenciones. Barranquilla - Colombia.

Organizator: Andinafairs S.A.S.

Exhibitors: 100 companies (Plus 200+ Exhibitors in the Industrial fair by Corferias).

Area: 2000m² (Plus 5000+m² In the Industrial fair by Corferias).

Exhibitors Registration Date: April 2017.



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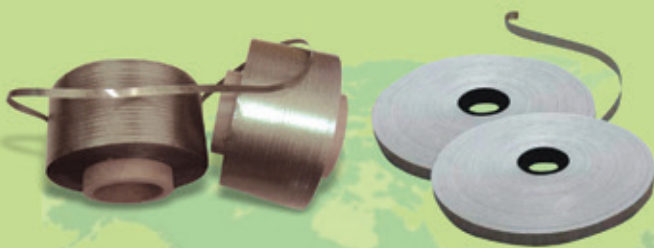


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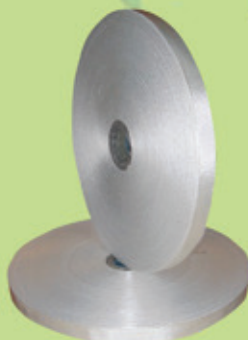
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作者: Frank Böhme 博士, Ralf Pietsch 博士, Highvolt Prüftechnik Dresden GmbH

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Next Issue

Getting Technical -

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

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Boom times ahead for SE Asia

Thriving infrastructure and manufacturing sectors in Southeast Asia are leading to increased optimism ahead of this year's wire Southeast Asia exhibition, being held in Bangkok, Thailand, from 19th to 21st September.

The energy and transport sectors will account for a shade over 62 per cent of the total ASEAN infrastructure investments needed by 2020. Spending in power and transport in Thailand, Malaysia, Indonesia and the Philippines alone will account for some US\$524 billion by the same period.

All this clearly spells good news for the wire and cable industry, which is also due to benefit from US\$5.9 billion investment in the Singapore to Kuala Lumpur high-speed rail link, which will span 217 miles and is expected to begin operations in 2026.

The fastener market is also expected to grow in line with the plans, and this sector is expected to be heavily represented at the exhibition. You can read the full story on page 8.

New markets are also opening up with news that Messe Düsseldorf will be handling all international visitors to Iran Wire, being staged in Tehran, from 5th to 8th December this year.

Mapping the entire spectrum of wire, cables, tubes, pipes, profiles and related industries, Iran Wire is expected to welcome 200 exhibitors to present their innovative technical products. The four-day trade fair is organised by the Iranian Aria Group Conference and Exhibition Development Company in the nation's capital city.

Messe Düsseldorf is also responsible for the smooth on-site operation at the Tehran International Permanent Fairground, as well as international exhibitor registration and stand design. The story is on page 18.



David Bell
Editor

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When and where

2017

5-8 June:
wire Russia –
trade exhibition – Moscow,
Russia

Organisers: Messe
Düsseldorf and VNIKP
Fax: +7 499 246 9277

Email:
info@wire-russia.com

Website:
www.wire-russia.com

2017

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

Organisers:
Messe Düsseldorf
Asia Pte Ltd
Fax: +65 6337 4633
Email: wire@mda.com.sg

Website: www.
wire-southeastasia.com

2017

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

Organisers:
Messe Düsseldorf GmbH
Fax: +49 211 4560 668
Email: info@
wire-south-america.com

Website: www.
wire-south-america.com

2017

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

Organisers:
IWCS
Tel: +1 717 993 9500
Email: phudak@iwcs.org
Website: www.iwcs.org



○ Exhibitors and visitors at wire Southeast Asia two years ago

wire Southeast Asia boost

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

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

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

A major ASEAN infrastructure initiative is the ASEAN Power Grid (APG) with investment requirement of US\$5.9 billion, as well as the Singapore-Kuala Lumpur high-speed rail which will span

217 miles and is expected to start operations in 2026.

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

This infrastructure growth, alongside the expansion of the automotive, new energy, high-speed rail, urban transport, aerospace, petrochemical, infrastructure construction and other application industries, has brought new opportunities for the fastener industry.

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

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

skills and supporting facilities of fasteners.

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

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

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Website: www.wire-southeastasia.com

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Success on a global scale for BAR

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

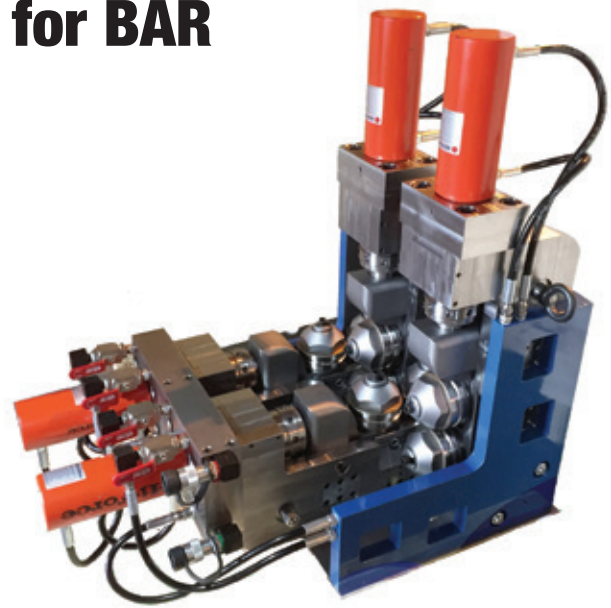
Following on from its effective attendance at the wire 2016 exhibition, securing multiple worldwide contracts, Bar Products and Services has expanded into China, Mexico and Europe.

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

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

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

Bar Products and Services is a major supplier in the field of wire rope compaction. Along with the supply of compaction units and rollers to cover a range of strand diameters from 2mm to 40mm it also supplies numerous



○ Wire compaction unit from Bar Products

other high quality tooling and offers a rapid service on a worldwide basis.

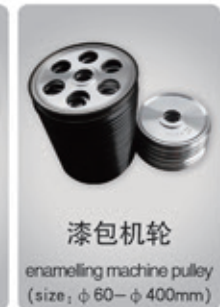
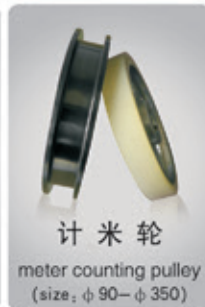
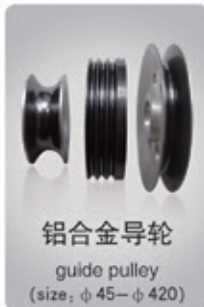
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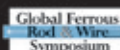


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Fibre and 5G development in Oman

OMAN'S ministry of transport and communications is pressing ahead with plans for fibre optic cabling and 5G services across the majority of Oman.

The ministry also announced a series of grid connection projects for remote areas of the Sultanate and the possibility of a third operator entering the Omani telecoms market to help reduce prices.

A statement said that opening up of military and security frequencies to the civilian market had a "positive impact on the spread of 3G and 4G services in Oman," and had "enabled the current operators to increase coverage and enhance service quality, especially in remote areas." The ministry stated in its report that these networks would prove vital to 5G, now being tested by telecom providers.

A ministry statement assured customers that steps were being taken to "ensure to all the benefactors that there are ongoing efforts to observe the requirement of increasing coverage, services quality, services prices and customer's services with the operators."

Mobile broadband services saw an increase of 85.5 per cent of the total population in September 2016, triggered by the spread of networks that support broadband as well the increase in the use of smart devices.

A total of 312 stations covering over 410 villages in Oman governorates have been established across Oman. All the stations are expected to be completed by the end of the second quarter of 2017.

Pakistan-China connection

A project to connect Pakistan with China via high-speed fibre optic cable is anticipated to be completed by 2017, a full year ahead of schedule.

Phase one of the project began in 2016 under the China-Pakistan Economic Corridor project, with work on eight sections of between 100km and 125km length having already begun.

The 820km fibre optic cable will be placed from Khunjerab to Rawalpindi and, in second phase, between Rawalpindito Gwadar and Karachi.

The cable will be laid through the hilly areas of Khunjerab to Karimabad, Naran, Masnsehra, Abbottabad, Taxila and Rawalpindi, some of the most hazardous parts of the country. Extreme weather and very low temperatures are the major obstacles for the first phase of the project.

Once finished, this back-haul fibre optic cable will provide Pakistan with direct telecommunications access to China and central Asian states, and from there to Europe and to and from the USA. At present, Pakistan is connected to the world via four undersea fibre optic cables, with five more in progress.

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Experts predict solar to drive renewable energy

INDUSTRY experts at January's World Future Energy Summit and Solar Expo in Abu Dhabi predicted that rooftop solar will help drive renewable energy to the next stage of its development in the Middle East and South Asian markets.

Renewable energy, particularly solar, is making rapid progress in the region, with organisers estimating that buyers at WFES have more than 200GW of planned capacity to be added within the next decade.

The industry expects to see rooftop solar driven by initiatives such as the Shams Dubai programme by Dubai Electricity and Water Authority (Dewa), which encourages PV systems on residential, commercial and industrial buildings.

The projects themselves vary in size from just a few to thousands of solar panels. One initiative under the Shams Dubai programme is the installation of 88,000 solar panels on buildings belonging to port operator DP World, producing enough energy to power around 3,000 homes.

"We are at a point where solar energy is clearly at the centre of the UAE's electricity plans, and we are beginning to see rooftop solar play an important part in this growth," said Sami Khoreibi, CEO of Abu Dhabi-based Enviromena.

"Official targets are being set for installing rooftop solar

panels, and policies allowing customers to sell electricity back into the network are in place. This will fundamentally change the way we think about electricity in the region."

Enviromena has constructed 42 solar projects in nine countries throughout the region, including rooftop solar installations at Yas Marina Circuit and solar car park shades at Masdar City.

World Future Energy Summit – Abu Dhabi

Website: www.worldfutureenergysummit.com

Pakistan investments

Pakistan's secretary of water and power, Mohammad Younus Dagha, and the chairman of State Grid Corporation of China have signed an agreement to develop an HVDC transmission link between Matiari and Lahore. With the capacity to transmit 4,000MW it will be the first such high capacity transmission line in Pakistan.

Construction was due to begin in January, and is expected to take around 20 months. China is investing \$1.5 billion in the project – the latest in a series of significant Chinese investments, most of which fall under a planned \$55 billion worth of projects towards a China Pakistan Economic Corridor (CPEC).

Local production for HV equipment

Taihan Electric Wire Co, a South Korean manufacturer of industrial cables, is to build a production plant in Saudi Arabia in cooperation with a local electric power equipment company, Mohammed Al-Ojaimi Group.

The new facility will help to meet growing demand for high voltage electric equipment within Saudi Arabia and its neighbouring countries.

Taihan Electric Wire and Mohammed Al-Ojaimi Group have established a 60-40 joint venture, Saudi Taihan, in Riyadh, to build a plant to produce HV electric equipment for the first time in Saudi Arabia.

The new venture aims to install all necessary facilities by the second quarter of 2017, and plans that construction of the factory will be complete by the third quarter.

Saudi Taihan will mainly produce cable connectors and insulating materials, the company has revealed. Previously, Saudi Arabia has depended on imports from Germany and the US for all of its HV equipment needs.

A Taihan Electric Wire official confirmed that the decision to build the factory followed increasing demand for HV electric equipment across Gulf Cooperation Council (GCC) countries, including Saudi Arabia, and that the company expects the new joint venture to pave the way to other markets such as Africa and Europe.

Taihan Electric Wire Co – South Korea

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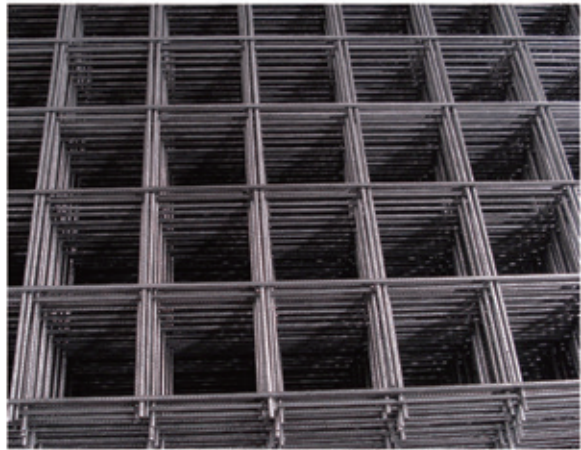
MOUTON



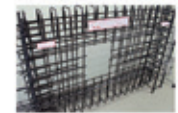
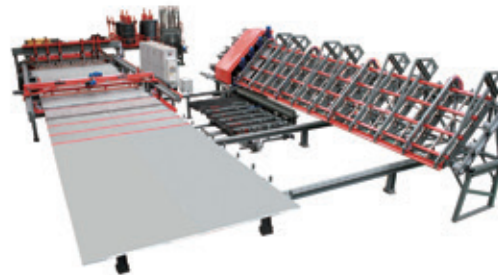
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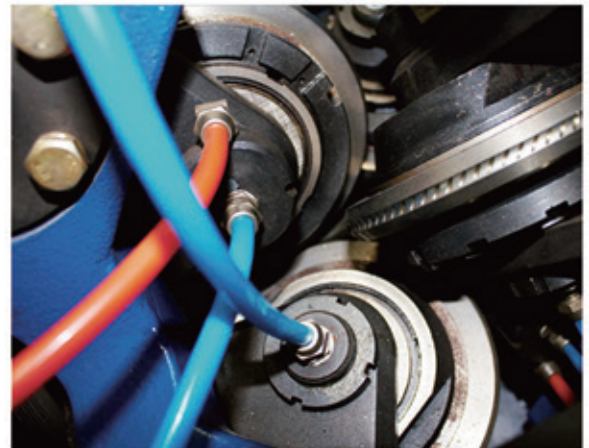
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Pilot farm gets new Abu Dhabi investor

ABU Dhabi-based Masdar has acquired a stake in Hywind Scotland, a 30MW floating offshore pilot wind farm in the North Sea. Through the transaction, Statoil and Masdar have agreed to share the development risk and Masdar will cover 25 per cent of previous and future costs.

Due to start commercial operation in late 2017, Hywind Scotland is the world's first floating offshore wind farm. The objective of the Hywind pilot farm is to demonstrate cost-efficient and low risk solutions for future commercial-scale floating wind farms.

"Having met with representatives of Masdar at the Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC) late last year, I am greatly encouraged by this substantial international investment in Hywind Scotland," said Keith Brown, cabinet secretary for the economy and fair work, Scottish Parliament.

"This pilot project aims to take advantage of Scotland's huge offshore wind resource by operating in waters exceeding 100m depth, demonstrating cost efficient and low risk solutions for commercial scale parks.

"Major investments, such as this one made by Masdar, highlight the importance of continued investment in

Cable bid

China Power Complete Equipment Co Ltd has accepted a bid from ZTT Group to provide cables and accessories for its Binhai North phase 2 wind farm.

The bid, of €40.8 million, covers the supply of cables and accessories manufactured in ZTT's submarine cable factory in Jiangsu. Delivery was expected in April 2017.

The Binhai North phase 2 is under development by the State Power Investment Corporation (SPIC). The wind farm comprises 100 4MW wind turbines and a 400MW substation, which will be installed approximately 22km offshore.

China Power Complete Equipment Co Ltd – China
Website: www.cpcec.com

offshore wind, are a sign of increasing confidence within the sector, and position Scotland at the forefront of the global race to develop the next generation of offshore wind technologies."

Located off the Aberdeenshire coast, Hywind Scotland covers an area of

around 4km² and consists of five 6MW floating wind turbines anchored to the seabed. Hywind Scotland is the second offshore wind partnership between Masdar and Statoil after the 402MW Dudgeon Wind Farm.

Masdar – United Arab Emirates
Website: www.masdar.ae

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Messe Düsseldorf organises participation of exhibitors at Iran Wire 2017

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

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

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

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

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



○ Tehran will play host to Iran Wire

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

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

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Single brand name for exhibitions

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

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

“Join the best – worldwide” marks the visual union of the international wire, cable and tube trade fairs, presented with a unified logo to show that they belong to a single umbrella brand.

A standardised corporate design ensures the uniform appearance of the individual trade fairs while at the same time demonstrating that they are members of a single product family.

Whether in Germany, Brazil, China, India, Russia or Thailand – together with its foreign subsidiaries and in cooperation with international industry and business associations as well as local organisers – Messe Düsseldorf is the host of successful regional satellite events.

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

Overcoming land restrictions

UPSOLAR (Singapore) Pte Ltd, a subsidiary of solar PV module manufacturer Upsolar, together with floating technology specialist Koine and Upsolar's local installation partner CW, recently deployed a floating PV system at Tengah Reservoir in Singapore.

The system is part of a joint project overseen by the Solar Energy Research Institute of Singapore (SERIS) and spearheaded by the Singapore Economic Development Board (EDB) and PUB, Singapore's national water agency.

Upsolar is one of eight companies selected to install its solar panels to eventually produce close to 100kW of electricity. The panels are mounted on a floating structure designed by Koine Multimedia, and the installation was conducted by CW Group in October 2016.

The project will provide analysis into the cost, benefits and challenges of floating PV systems. SERIS will analyse the PV system, and PUB will study the effects on the surrounding water environment.

Upsolar (Singapore) Pte Ltd – Singapore Website: www.upsolar.com

Wind power plan in South Korea

South Korean Saemangeum Development and Investment Agency (SDIA) has signed a memorandum of agreement (MOA) with Special Purpose Company (SPC) Saemangeum Offshore Wind Ltd for an offshore wind power project.

The SPC consists of Kepco KPS and Mirae Asset. The project is valued at \$367.74 million and will be entirely funded by private capital. Construction will begin in April and the project is scheduled for completion in the second half of 2018.

The offshore wind power complex will consist of 28 turbines – 24 turbines with 3.5MW capacity, and four turbines with a capacity of 3MW to 3.2MW. The investment will include the construction of a 33,000m² wind power equipment factory.

The SDIA expects the complex to supply electricity to 62,000 households a year.

South Korean Saemangeum Development and Investment Agency – South Korea
Website: www.saemangeum.go.kr

Low-loss contract

A three-company consortium formed by J-Power Systems Corp (JPS), a wholly owned subsidiary of Sumitomo Electric Industries Ltd, Mitsubishi Corporation, and Ceylex Engineering (Pvt) Ltd of Sri Lanka, has been appointed to install overhead power lines between Habarana and Veyangoda in Sri Lanka.

The billion-yen project, planned under a Japanese ODA loan secured by the Ceylon Electricity Board, will install two 220kV circuits over 150km between the two cities. JPS is responsible for manufacturing the conductors for the project, which will be completed by October 2019.

Improved efficiency of the transmission line is needed to advance Sri Lanka's economic development, so a large capacity conductor with minimum transmission loss has been selected for the project.

JPS's low-loss conductor will be used, for the first time in Sri Lanka, along the entire length of the network between Habarana in the mid-north region of the country and Veyangoda near the capital.

J-Power Systems Corp – Japan Website: www.jpowers.co.jp

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Pioneering Zumbach – a glance back at the last 60

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

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

Customised drives – the first manufactured products

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

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

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

The vision of a new kind of DC motor drive

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

Zumbach’s vision involved developing and building a small and affordable

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

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



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

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

The first production articles and growing success

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

From the basics

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

Changing times and new visions

In the early 1960s, Zumbach realised that its business with drives could not guarantee a viable future for the company. The field was marked by new technical possibilities and thus growing numbers of competitors, who began to force down prices and margins. The machine tool industry would also soon begin its process of decline.

Around 1972, a plan was developed to

years of Swiss reliability and quality...

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

The product range – and the company – continues to grow

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

The Odac 24 was the first gauge with absolute measurement to be sold in large quantities. "Odac®" became a registered trademark; and more than 80,000 Odacs of all types and for a huge range of applications have been sold since then.

In 1994, Bruno Zumbach handed the management of the group over to his son Rainer. In the following years the group expanded and founded further subsidiaries, amongst others in Asia. Besides these own Zumbach companies, additional representatives have since been contracted.

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

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

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



○ Zumbach Electronic AG today

trading companies could offer this expertise.

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

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

Expansion into the plastics industry

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

Expansion into the steel industry

In the late 1980s, Zumbach also ventured into a completely new field: the steel industry. This concerned the measurement of huge, red-hot steel pipes for the oil and gas industry. They

were later joined by rods and wire rod that must be measured at speeds of up to 400km per hour.

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

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

Produce more, better, and at lower cost

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

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

Zumbach AG – Switzerland
Website: www.zumbach.com

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○ 2年前的东南亚线缆展的展商和参观者

在展会中展示基础设施的蓬勃发展

东南亚线材展览会 (wire Southeast Asia) 于9月19-21日重返泰国曼谷的贸易展览中心 (BITEC)。这两个专业贸易展会举办的恰是时机，而且极具战略意义。因为随着东南亚地区基础设施建设和制造业的兴起，电线电缆行业也有望迎来美好前景。在线参展注册网址现已开放：www.wire-southeastasia.com

据亚洲发展银行 (ADB) 称，截至2020年，能源和运输业的基础设施投资需求将占据整个东南亚国家联盟 (ASEAN) 基础设施投资需求的62.6%。这一数据被Goldman Sachs的推测证实。他对四个东盟国家 (泰国、马来西亚、印度尼西亚和菲律宾) 在电力和运输方面的支出进行了预测，预计到2020年，这一支出可达5240亿美元。东盟电网计划 (APG) 是东盟地区一个主要的基础设施计划，其投资需求已达59亿美元，此外还有新加坡-吉隆坡高速铁路项目，该项目将覆盖217英里，计划于2026年开始运营。

在制造方面，根据麦肯锡全球研究所的报告所述，一旦东盟全面实施东盟经济共同体的整合策略，并且获取全球制造市场的大部分份额，那么截至2030年，该地区的年GDP可达2800-6250亿美元。基础设施的发展，以及汽车、新能源、高速铁路、市内交通、航空宇宙、石油化学、基础设施建设等其他应用行业的扩展，为紧固件行业带来了新的发展机遇。

为反映上述全球趋势，2017东南亚线材展览会将首次为紧固件技术准备一个特殊展区。一个紧固件展亭将专门用于展示紧固件技术的上下游产业链。展示内容将包括标准的和非标准的紧固件、紧固件在各行业的应用、紧固件制造技术、以及紧固件的支持设备。

东南亚线材展览会的动态展示阵容将包括各领域的创新机械，如：电线电缆制造，加工和表面处理，紧固件技术，测量、控制和测试工程中的新工艺，以及专业领域。此外还将展示各种全新和升级版工具和辅助材料。一系列会议和研讨会也将围绕展会展开。2015年，在东南亚国际管材线材展览会 (wire and Tube Southeast Asia) 上，来自33个国家的411个参展商向来自56个国家的7144位访客展示了自己的产品。

其中有近33%的访客来自泰国境外，主要来自孟加拉国、印度、马来西亚、新加坡、台湾、印度尼西亚、缅甸和巴基斯坦，此外还有来自中国、日本、韩国和越南的代表团。此次展示设有来自奥地利、中国、德国、意大利、台湾、英国和美国的七个国有展亭及其国家团队。

Messe Düsseldorf Asia Pte Ltd – 新加坡
网址: www.wire-southeastasia.com

先驱者 Zumbach – 60 年征程

1957年5月1日，瑞士比尔(瑞士和全球手表业的中心)。一位不到三十岁的年轻电气工程师Bruno Zumbach想自己独立建造一些东西，于是就产生了创立电子公司的想法。当时的电子行业仍处于萌芽期，主要使用的元件还是继电器和真空管。晶体管都是不可思议的东西，所有的集成线路和微处理器也未出现。不过，当时的瑞士经济发展良好，在比尔有很多生意红火的设备制造工厂。

自定义驱动 - 首批制造产品

首批订单，不论是单个订单还是小批量订单，针对的是各种设备的驱动系统。它们涉及到手表、光学、消毒和仪器等各类设备。在初始阶段，公司接到的最大而且“最大胆”的订单，应该是瑞士圣加仑州戈绍黄油中心的自动化项目。利用一个完全非接触式驱动，实现整个黄油的生产分配系统的自动化，这在当时是一门全新的技术。这也是这类驱动首次出现在瑞士。由于成本原因，所有控制元件，即那些所谓的逻辑块，均在公司自家工厂内进行研发和批量生产。甚至连驱动、挡光板和其他物品也是在比尔的工厂生产。

对于全新直流电机驱动的设计

当时，比尔和瑞士其他地区有很多外圆磨床制造商，他们需要低摩擦而且可微调的驱动。Bruno Zumbach很快意识到，这将是一个很大的市场。但问题是，当时的闸流管技术很难带来令人满意的解决方案。Zumbach的设计是，用一个单块换流器和一个与之相配的直流电机和控制器，研发并构建一个小巧又实惠的“Ward Leonard”驱动。当时，只有很高的驱动产出才能使用和负担得起这项技术。这个“Ward Leonard”愿景很快将成为Zumbach的技术基础，并且持续多年。

首批生产产品和逐步走向成功

首批生产订单很快到来。这款新驱动证明了自己的价值，并且确立了自己的地位。Tripet、Charmilles、Kellenberger、Tschudin、Studer等领先的磨床公司纷纷成为公司的长期客户。最后，成百上千个Zumbach驱动成功进入市场，有些至今还在使用中。

从基础开始

1964年，工人数量增加到20人左右，工作场地需要扩张。几个月后，公司在奥尔蓬德建立了一家小工厂，该厂至今仍是公司主要建筑的核心(外墙已翻新)。

多变时代中的新愿景

在20世纪60年代早期，Zumbach 意识到要想取得未来的成功，不能只依靠驱

Zumbach是在线测量行业的先驱者，能生产全面的非接触式在线测量和控制仪器。该公司的生产技术已应用于全球，并且在今年举办了60周年庆典。不论是在电缆业，还是在塑料、橡胶、钢铁或金属业，都有客户使用Zumbach的技术，信任其仪器和系统的质量和可靠性。



○ 公司最初是在一个租来的小作坊里，办公室在位于Biel市中心的一个又小又旧的工厂建筑里



○ 今天的仲巴赫电子公司

动业务。该领域具有新的技术可能性，因此竞争者会越来越多，这样会迫使价格和利润下降。机床工业也会很快进入衰退期。1972年，公司制定了一套生产电缆偏心距检测仪的方案。1974年，Zumbach 获得了新款电感Ex-Test 7设备的专利，在当时还比较新颖的在线测量设备领域赢得了第一个巨大成功。

产品范围和公司一起成长

Zumbach最成功的产品是光学直径测量设备。与之类似的Odac款产品诞生于1975年，绝对测量Odac®仪表则诞生于1977年。Odac 24是首款大批量销售的绝对测量仪表。“Odac®”后来被注册为商标。至今已售出80000多个Odac设备，包括各种款式以及各种应用。1994年，Bruno Zumbach将公司的管理权交接给他的儿子Rainer。在随后几年，公司进一步发展，并在包括亚洲在内的很多地区建立了分公司。如今，Zumbach除了自己的公司外，还签约了其他代表公司。这样以来，Zumbach的目标之一——贴近客户便能得到最大程度的实现，而且在过去 20 年内，公司的当地服务能力也在不断壮大。公司成功研发

了无数以市场为导向的创新产品，如非接触式型材和形状测量系统，以及能让信号和能源进行革新性非接触式传输的旋转测量装置，同时也应用了现代技术(如线性传感技术等)。这样Zumbach集团便可实现它的进一步目标：始终以最理想的性价比向客户提供最佳解决方案。能够同时向所有市场提供服务对公司而言十分重要，因此公司开始在最主要的国家寻找代表办事处。产品的成功销售离不开专业知识和当地服务，然而只有少数贸易公司能达到以上专业水准。因此，从1970年起，公司在多个国家建立了销售和服务办事处，稍后又注册了公司。首家分公司于1979年在美国成立，随后分别在英国、德国、法国、西班牙、意大利、印度和台湾成立，2001年入驻中国。目前，公司在奥尔蓬德和海外一共有20多个销售工程师，可以确保产品在全球市场的成功。

向塑料行业的拓展

塑料行业是一个巨大的增长型市场。各种类型的管材都需要接受直径和壁厚测试，这样便能促进其他设备的生产，比如使用超声波等其他技术的特殊设备。各类型材也形成了一个相关的细分市场，如今可以用具有光隙法和图像处理能力的设备进行实时测量和监控。

向钢铁行业的拓展

20世纪80年代末期，Zumbach还涉足了一个全新的领域——钢铁行业。其工作任务是对石油和天然气行业的大型高温钢管进行测量。之后又对长杆和钢丝绳条进行测量，而且测量速度最高要达到每小时400千米。尽管当前的Odac测量头尚可使用，但仍需开发一套复杂的制冷和机械防护系统。首批系统售往意大利、法国和西班牙。这些钢铁系统仍在不断发展和升级，如今已在总销售额中占据较大比例。

提升产量和品质，降低成本

Zumbach系统集成到制造流程，能够帮助客户用更少的材料成本创造更多产品。它们也能减少停工时间，提升设备的操作安全性，并且实现完美的质量控制。此外，这些系统还能通过更严格的公差、更好的传输能力、更简单的后续制造、以及简单的导体配对等常规设置，快速在电缆制造中实现质量提升。

Zumbach AG – 瑞士

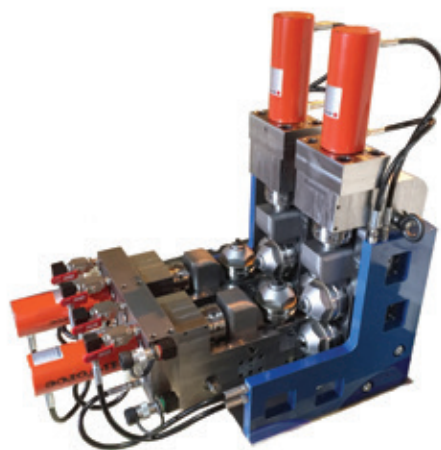
网址: www.zumbach.com

BAR斩获全球成功

Bar Products and Services Ltd是一家线材、管材和杆材行业的全球供应商，正在庆祝其不断扩大的全球成功。Bar Products and Services在2016年的线材展览会上收获颇丰，与海外客户签订了多个订单，如今，该公司又将其业务打入了中国、墨西哥和欧洲市场。今年已有六个“钢索/钢绞线压实装置”连同压实辊销往印度和墨西哥，适合从2毫米到40毫米不等的钢绞线尺寸。此外还有五台钢索业的机器将运往中国，一台运往欧洲。钢索/钢绞线压实装置的销售由BAR的联营公司负责，该公司在线材和钢索制造方面具有多年经验和专业知识。Bar Products and Services的钢绞线压实装置具有很多优点，包括快速更换压实辊、快速安装、减少摩擦、线缆分布更均匀等特点。

Bar Products and Services是钢索压实业的主要供应商之一，并为之自豪。除供应“压实装置”和压实辊（适合的钢绞线直径从2毫米到40毫米不等）之外，该公司还供应很多其他的优质机床，并且能在全球提供快捷服务。

BAR Products and Services Ltd – 英国 网址: www.barproductsandservices.com



○ 说明待填写

连接巴基斯坦与中国

一个用高速光纤电缆连接巴基斯坦和中国的项目将于2017年完工，比计划整整提前了一年。

该项目隶属于中国-巴基斯坦经济走廊项目，于2016年开始第一阶段建设，有八段长度在100-125千米的线路已经开始建设。这条电缆总长820千米，首先建设从红其拉甫至拉瓦尔品第，第二阶段再从拉瓦尔品第至瓜德尔和卡拉奇。

这条电缆将贯穿从红其拉甫到Karimabad、纳兰、曼塞赫拉、阿伯塔巴德、塔克西拉和拉瓦尔品第的多山地段，是该国最危险的地段之一。第一期项目所面临的主要困难是严苛的天气和极低的温度。

一旦竣工，这条迂回的光纤电缆将使巴基斯坦与中国和中亚各国实现直接远程通信，并借此与欧洲和美国实现通信往来。目前，巴基斯坦通过四条海底光纤电缆与世界连接，此外还有五条电缆在建设中。

多个展会共享品牌名

“Join the best – worldwide（成就卓越 – 走向世界）”将会成为Messe Düsseldorf为其电线电缆产品举办的所有国际活动的品牌名。德国的杜塞尔多夫在举办贸易展会方面具有悠久的历史，展会面向线材、线缆、管材、钢材和铁材领域，涵盖金属制造、加工及精加工等诸多行业。除杜塞尔多夫举办的一系列一流线材管材贸易展会外，“Join the best – worldwide”还结合了在全球组织的10个国际贸易展会，包括：中国上海线材管材展会、印度孟买线材管材展会、俄罗斯莫斯科线材管材展会、东南亚曼谷线材管材展会、南美线材展会、以及巴西圣保罗管材及泵阀展会（TUBOTECH）。

“Join the best – worldwide”标志着国际线材、线缆和管材展会在视觉上的统一，呈现统一标识来表示这些展会属于同一个组织品牌。一个标准化的团队设计可以确保各个展会外在形象整齐统一，同时彰显出它们是同一产品家族的成员。Messe Düsseldorf的金属和流体技术全球产品组合总监Friedrich-Georg Kehrer说：“在内容和视觉形象方面，‘Join the best – worldwide’组合，包括在杜塞尔多夫举办的一流线材管材展会以及10个附属国际展会，将共同彰显出它们源自同一家族。”

无论是在德国、巴西、中国、印度、俄罗斯还是在泰国，Messe Düsseldorf都能通过与海外分公司、国际行业和商业团体以及地方组织的合作，举办成功的区域性附属展会。这些附属展会已成为各自区域的主要信息和贸易平台，并获得了广泛认可。

Messe Düsseldorf GmbH & Co KG – 德国 网址: www.messe-duesseldorf.com

电缆竞标

中国电能成套设备有限公司接受了ZTT集团的投标，为其滨海北2期风力电场项目提供电缆和配件。此次的竞标金额为4080万欧元，涵盖了ZTT在江苏的海底电缆工厂所生产的电缆和配件。交接日期定在2017年4月。滨海北2期项目由国家电力投资集团（SPIC）开发。该风力发电场包括100个400千瓦特的风力涡轮机和1个4亿瓦特的变电站，该变电站将建在离海岸22公里的地方。

China Power Complete Equipment Co Ltd – 中国
网址: www.cpcec.com

巴基斯坦地区的投资

巴基斯坦水和能源部秘书长Mohammad Younus Dagha和中国国家电网公司董事长签署了一份在默蒂亚里县和拉合尔之间建立一条高压直流输电线路的协议。该线路可传输40亿瓦特电力，是巴基斯坦境内首个高容量输电线路。

该项目计划于一月份开工，预计在20个月左右完工。中国将为该项目投资15亿美元。这是一系列中国重大投资项目中最新的一个，这些投资项目多数与中巴经济走廊（CPEC）项目相关，该项目的计划总投资额为550亿美元。

中方先前在巴基斯坦的投资，包括由上海电气集团对K-Electric大部分股份的收购。K-Electric是向卡拉奇及其周边地区提供服务的电力生产和销售公司。

风能计划

韩国新万金发展和投资机构 (SDIA) 与特殊目的公司 (SPC) Saemangeum Offshore Wind Ltd 就一个近海风力发电项目签订了一份备忘录协议 (MOA)。SPC 由 Kepco KPS 和 Mirae Asset 组成。该项目总价值为 36774 万美元，所有资金将全部来自私人投资。项目建设将于 4 月份开始，计划在 2018 年下半年完工。这个近海风力发电设施将包括 28 个涡轮机，其中 24 个涡轮机的容量为 350 万千瓦特，4 个涡轮机的容量为 300-320 万千瓦特。该项投资还包括建设一个占地 33000 平方米的风力发电设备工厂。SDIA 预计该综合设施每年将向 62000 个家庭提供电力。SDIA 委员 Lee Byeong-guk 表示：“Saemangeum (新万金) 是进行可再生能源项目，包括风力发电项目，的理想地点。”

South Korean Saemangeum Development and Investment Agency - 韩国
网址: www.saemangeum.go.kr

Messe Düsseldorf 组织参展商参加 2017 伊朗线材展会

伊朗线材展会 (Iran Wire) 将于 12 月 5-8 号在德黑兰举行，该展会是伊朗唯一一个涵盖所有线材、线缆、管材、管道、型材和相关行业的展会。所有想在伊朗展示并销售其产品的相关行业国际公司都将在伊朗线材展会上找到独特的平台，并以此为兴趣点，打入伊朗的新兴市场。展会上将有约 200 位参展商展示其在线材、线缆、管材、管道和型材领域的技术创新产品。此次贸易展会持续四天，由德黑兰的伊朗 Aria 会议和展会发展公司组织。Messe Düsseldorf 是其海外独家联合机构，负责招揽国际参展商，并处理相关事宜。此外，Messe Düsseldorf 还在组织层面提供众多服务，包括国际参展商登记、展台设计和德黑兰国际展览中心 (Tehran International Permanent Fairground) 现场的顺利运行。

来自线材和管材行业公司，若想参加伊朗线材展会，可联系 Daniel Ryfisch (+49 211 4560 7793, ryfisch@messe-duesseldorf.de) 和 Cem Bağcı (+49 211 4560 478, bagcic@messe-duesseldorf.de)

Messe Düsseldorf GmbH & Co KG
- 德国
网址: www.iranwire.ir

高压设备的当地生产

韩国工业电缆制造商 Taihan Electric Wire Co 将与沙特阿拉伯当地的电力设备公司 Mohammed Al-Ojaimi Group 合作，在沙特阿拉伯建立一个生产基地。该工厂将进一步满足沙特阿拉伯及其周边国家对于高压电力设备的增长性需求。

Taihan Electric Wire 和 Mohammed Al-Ojaimi Group 在利雅得以 60-40 的持股比例成立了一家合资公司 Saudi Taihan，该公司将首次在沙特阿拉伯建立工厂，以生产高压电力设备。这个新公司计划在 2017 年第二季度之前完成所有必要设施的安裝，并在第三季度前完成工厂建设。

据公司消息，Saudi Taihan 将主要生产电缆接头和绝缘材料。在此之前，沙特阿拉伯的所有高压设备都要从德国和美国进口。Taihan Electric Wire 的一位管理者表示，建设工厂的决定来自于沙特阿拉伯等海湾合作理事会 (GCC) 国家对高压电力设备的增长性需求，此外，该公司希望新成立的合资公司能帮他们铺平通往非洲、欧洲等其他市场的道路。

Taihan Electric Wire Co - 韩国
网址: www.taihan.com

克服陆地限制

太阳能光伏组件制造商 Upsolar 的子公司 Upsolar (Singapore) Pte Ltd 与浮动技术专家 Koine 和当地的安装公司 CW 联手合作，在新加坡的登格蓄水池 (Tengah Reservoir) 设立了一个浮式光伏系统。

该系统属于一个联合项目，该项目由新加坡太阳能研究所 (SERIS) 监督，由新加坡经济发展委员会 (EOB) 和新加坡国家水管理局 (PUB) 领导。

Upsolar 是八家入选的太阳能板公司之一，它安装的太阳能板最终可产生近 100 千瓦的电力。这些太阳能板安装在由 Koine Multimedia 设计的漂浮结构上，安装工作由 CW 集团于 2016 年 10 月完成。该项目会对浮式光伏系统的成本、优点和面临的挑战进行分析。SERIS 会对光伏系统进行分析，PUB 则研究其对周围水环境带来的影响。

“Upsolar 很荣幸能加入这个可以为浮式光伏系统创造新机遇的项目。” Upsolar 集团亚太地区总经理 Roy Li 表示。

“新加坡的陆地限制给太阳能光伏系统的安装带来了巨大挑战，但是我们相信浮式光伏系统可以解决这一问题，而且我们非常愿意参与未来的相关项目。”

Upsolar (Singapore) Pte Ltd - 新加坡
网址: www.upsolar.com

低损耗合约

由 Sumitomo Electric Industries Ltd、Mitsubishi Corporation 和 Ceylex Engineering (Pvt) Ltd 这三家斯里兰卡公司联合成立的全资子公司 J-Power Systems Corp (JPS)，被委托负责安装斯里兰卡 Habarana 至 Veyangoda 段的架空电力线路。这个项目投资数十亿日元，贷款来自日本的政府开发援助，由锡兰电力局做担保。该项目将在两个城市之间安装两条超过 150 千米的 220 千伏线路。JPS 负责生产该项目所用的导体，预计在 2019 年 10 月完工。

这条输电线要求有较高的效率，以促进斯里兰卡的经济發展，因此该项目选择的是一款容量大、传输损耗极低的导体。JPS 的低损耗导体将首次在斯里兰卡应用，而且从斯里兰卡中北部的 Habarana 到首都附近的 Veyangoda 的整条线路都将使用该导体。

J-Power Systems Corp - 日本
网址: www.jpowers.co.jp

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○ Rosendahl's helical tape applicator Rota 500

High-speed taping at 1,000rpm

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

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

For those cables that require helical taping, Rosendahl has introduced the

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

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

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

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

RosendahlNextrom – Austria
Website: www.rosendahlnextrom.com

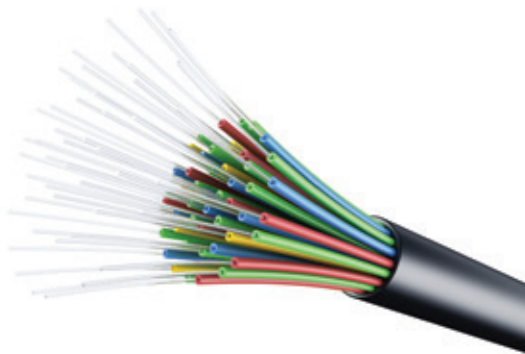
Low-smoke HFFR wire and cable compounds get halogen-free assessment from UL

UL has recognised seven Halguard® low-smoke, halogen-free flame retardant (LS-HFFR) compounds for wire and cable as “halogen-free” in accordance with a new assessment programme, it has been announced by the vinyl division of Teknor Apex. Also listed as in compliance are 14 halogen-free colour concentrates from the company’s colour division.

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

The seven Halguard LS-HFFR products listed include:

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



○ Cable with an HFFR jacket

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

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

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

Teknor Apex – USA

Website: www.teknorapex.com

Advantek ADWANTEK TECHNOLOGIES CO.,LTD

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Web:www.adwantek.com

www.candorsweden.com

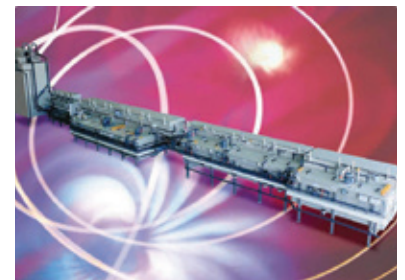
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Single wire plating plant

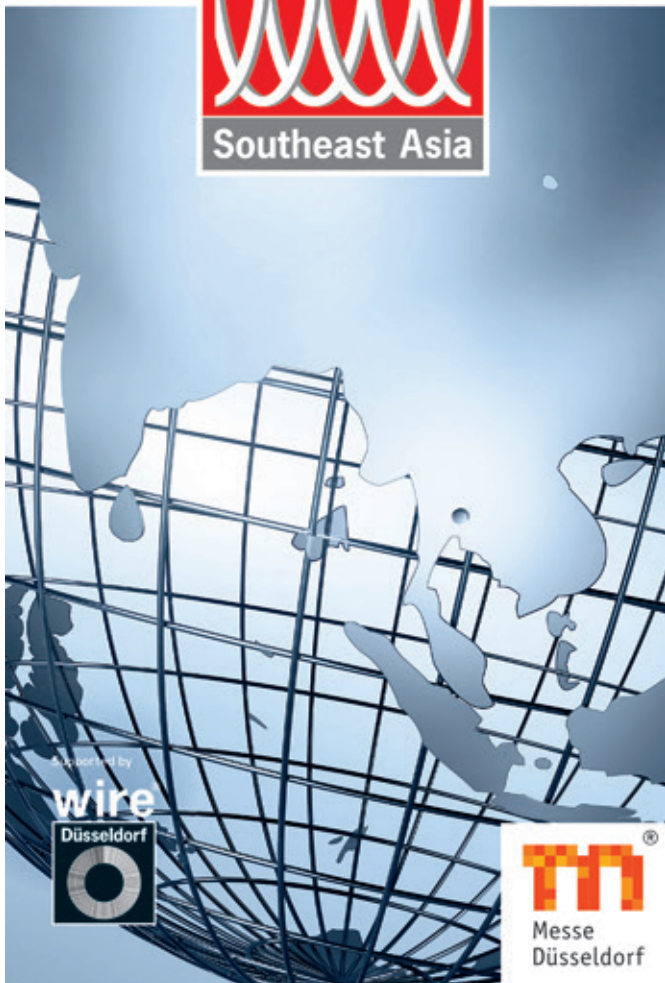


CANDOR Sweden AB
Tel: +46 11 21 75 00 Fax: +46 11 12 63 12
Email: info@candorsweden.com

Bangkok,
19-21 September 2017

Thailand | www.wire-southeastasia.com

12th International Wire and Cable
Trade Fair for Southeast Asia



○ The crimp test being done at Mecmesin's UK headquarters

Wire crimp pull tester

A NEW rugged and rapid-throughput tester for quality testing wire terminal strength is available from Mecmesin Ltd. Simple controls combine with accuracy and ease of use to make the CrimpTest-1 kN a high-reliability everyday tester, requiring minimal training and maintenance.

Motorised pull testers improve accuracy and reduce operator strain and injury. For added safety, this ergonomically designed horizontal tester pulls samples away from the user. A single button press runs a test, and just four multi-function buttons provide for all settings, operation and output to an RS232 statistical printer.

Peak force at break is displayed along with clear pass and fail indication. Four speed settings are available: 25, 50, 100 and 200 mm/min, to comply with all regular test standards. Units of force can be displayed in N, kgf or lbf.

This bench tester is designed for continuous use within the production environment, and is IP52 rated against ingress from dust, wire fragments and water.

Versatile fixtures are available for pull testing crimped, soldered or welded terminals, and cable ties, to 1 kN:

- Slotted rotary crimp receptacle with stepped loop pin (standard)
- Self-tightening cam grip (standard)
- Wedge grips for flat or round terminals (optional)
- Cable tie fixture (optional)

Applicable international test standards:

- ASTM B913: Standard test method for evaluation of crimped electrical connections to 16-gauge and smaller diameter stranded and solid conductors
- SAE AS39029 and AS7928: general specification for terminals, lug: splices, conductor: crimp style, copper
- IEC 60352-2: solderless crimped connections
- BS 5G 178 (Part 1): crimped joints for aircraft electrical cables and wires
- DEF STAN 59-71: crimped electrical connectors for copper conductors
- ISO 1966: crimped joints for aircraft electrical cables
- NASA-STD-8739.4: space applications, crimping, cabling and harnessing

Mecmesin Ltd – UK

Website: www.mecmesin.com

The benefits of vibration on drawing dies

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

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

- Greater reductions per pass: Without friction, the strain on the tag is reduced, allowing greater reduction per pass. In general, the softer the material the larger the ratio between force used traditionally to overcome friction and that used to deform the material through the die. Often this can be achieved in one pass rather than the traditional two.
- Improved surface finish: The resulting surface finish is excellent.
- Improved lubrication: There is a wider choice of lubricants, which can mean a cleaner product and in some cases avoid the need for cleaning after annealing.
- Simple die changes: Dies simply screw into the base of the transducer unit making for uncomplicated changes.
- Greatly enhanced die life: Due to the virtual elimination of friction the life of the die is massively increased.
- Energy savings: The elimination of friction in the die saves more power than is used by the ultrasonic equipment. The reduced capstan power consumption gives the financial benefit of reduced energy costs and often the productivity benefit of increased draw speeds.
- Reduced stock inventory: The greater reductions per pass possible by using ultrasonic technology can lead to fewer stock sizes having to be kept, reducing stock and therefore cost.
- Operator control: Though advanced technology, it has been designed to make for uncomplicated control and does not need extra operator involvement.



○ Transducer/die assembly fitted to a Schumag drawing machine

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

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

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

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

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The “Bullet II” extrusion head from Guill

GUILL Tool introduced The Bullet® in 2015, an extrusion head with fixed centre design, multi-port spiral flow design and gum space adjustment, plus the added feature of no fastening hardware, so cleaning and restart are easier and faster than any conventional head on the market currently, according to company sources. The company has now launched the Bullet II.

The Bullet II allows quick tooling changes, as the tips remove from the back and the die removes from the front of the unit. The absence of fastening hardware eliminates leaking, as does the taper body and deflector design pioneered by Guill. Additionally, the new patent pending CAM Lock® deflector retaining system offers these additional benefits to extruders and machine builders:

- It only takes a half turn of the Cam Lock® to remove and install the deflector and tip
- No fastening hardware required



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

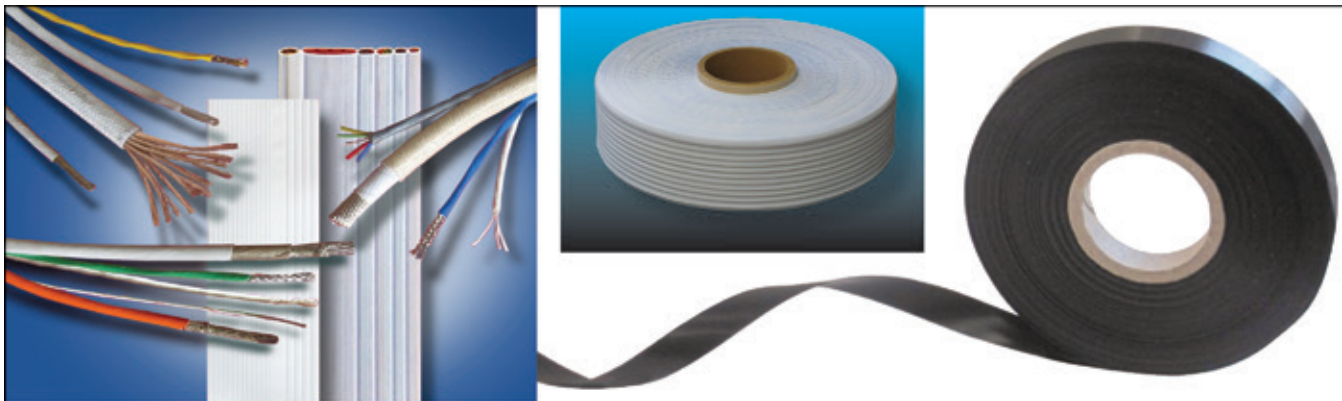
- Fast tool changes, threaded retaining ring for the die and threaded tip retainer
- Dies are removed from the front and tips from the rear

- Tooling retainers also provide gum space adjustment
- Hassle free air/vacuum connections
- Simplified cleaning
- Reduces downtime and lowers operating costs

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

A vacuum chamber and kit for assembly and disassembly are included with the unit. Optional keyed tooling capability offers machine designers and end users quick orientation, so the overall unit design enables faster disassembly, proper cleaning and restart, allowing the line to become more profitable, more quickly.

Guill Tool and Engineering – USA
Website: www.guill.com



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Pushing the limits of fastener manufacturing

IN an engine, seven types of screws out of approximately 70 are considered critical, and are crucial to achieving the engine's specified design performance: bolts for the cylinder head, crankshaft, con rod, flywheel, and main bearing cap, as well as for the camshaft cap, camshaft sprocket and VCT.

Having developed specialised engine expertise over three generations, the Italian fastener company Brugola OEB Industriale SpA has focused on manufacturing these critical bolts, which are essential to assembling an engine's vital components. These bolts must perfectly combine with vital engine components to ensure the performance and dynamic structural integrity of the engine despite high vibration and heat.

When Brugola recently opened its first factory in the USA, the company sought to expand into the American market as well as enhance the precision of its critical engine bolts.

While the company retains automotive

customers such as BMW, Bugatti and Aston Martin in Europe, its third-generation president, Jody Brugola, recognised the importance of implementing state-of-the-art 3D laser gauging and axial vision inspection equipment to ensure ultra-precise fastener dimensional accuracy and eliminate all defects.

So before the company opened its Plymouth, Michigan, plant, one of its key investments in guaranteeing the quality of its engine bolts was to select an advanced, sophisticated gauging system.

In order to make certain that all of its fasteners were flawless, Brugola turned to a high-speed 360° laser gauging device. The machine uses eight sensors and real-time part velocity calculation to essentially create a 3D profile of each part, along with measurement of a wide range of user-defined features to determine if each part meets exact dimensional requirements.

The device Brugola selected for its critical fasteners, called the GI-360, measures a number of crucial fastener features such as head and shaft diameter, length, straightness, concentricity, thread angle and diameter (including major, minor and pitch diameter). It also detects any damaged threads, along with cracks on the bolt head and flange.

To meet the rigorous demands required for flawless dimensional precision, Brugola turned to a leading gauging equipment manufacturer, General Inspection, to develop a number of novel inspection features.

When the fastener inspection system manufacturer worked to improve the accuracy of dimensional measurements, the result was a redesigned version of the device, the GI-360T, which includes a tilt and lift feature for the laser head. This ensures the lasers are perpendicular to the part and corrects for the cosine error of headed parts, providing improved measurement readings for diameter (0.005mm) and length (0.01mm), total error.

With Brugola's dedication to zero defect manufacturing of its critical engine fasteners, the company sought to further enhance the fastener inspection system. As an option on its high-speed fastener inspection system, Brugola selected an axial viewer lens system for 360° head crack detection.

In support of Brugola's goals, General Inspection improved crack detection in order to detect cracks, scratches, or missing features on the side flange of bolts. This speciality lens 'sees' around the head of the part.

Brugola OEB Industriale SpA – Italy
Website: www.brugola.com



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New lightweight line of fibre optic reels

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

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

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

Hannay Reels – USA
Website: www.hannay.com



○ The AVF-14 series from Hannay Reels



○ Rosendahl螺旋绕包机Rota 500

每分钟1000转高速绕包

Rosendahl的全新螺旋绕包解决方案，无论是在线还是离线状态下都可高速运转。

电缆的高速生产以及足够的生产长度已经成为制造商的普遍要求。这不仅有利于持续生产，也能提高投资回报。

Rosendahl为需要进行螺旋绕包的电缆准备了Rota 500螺旋绕包机。该设备针对聚合带材料设计，支持高速绕包，转速可达每分钟1000转。直径为20至60毫米的产品均可在 Rota 500 上绕包。

该设备为同心式绕包机，可用于在线和离线解决方案。通过带硬纸芯的大号带盘（直径500毫米，长500毫米），可以实现很长的包带长度。

不同的电缆设施需要不同的包带材质。比如，有的用作电缆芯和护套间的隔离材料，有的用作吸水膨胀包带，有的用于粉末式绕包等。Rota 500不仅具有灵活性，也能保证较高的生产率。

RosendahlNextrom – 奥地利
网址: www.rosendahlnextrom.com

低烟无卤阻燃电线电缆复合剂通过了美国保险商实验室 (UL) 的无卤评估

Halguard®的七款电线电缆用低烟无卤阻燃 (LS-HFFR) 复合剂已根据一套新的评估程序获得了UL的认可, 该消息由Teknor Apex的乙烯基部门发布。

同时获得合规认证的还有该公司颜色部门提供的14款无卤颜色浓缩剂。

从去年开始, UL项目通过燃烧测试对电缆组件进行无卤认证, 主要测试酸气浓度、酸度和电导率。合规标准将列入UL AATJ2.指南信息。

被列入的七款Halguard LS-HFFR产品包括:

- 五款高性能58000-58300系列复合剂。该系列Halguard LS-HFFR复合剂能在不影响电缆的物理性能和导电性能的基础上, 比其他高性能HFFR材质表现出更好的阻燃性能。这些产品被推荐用于数据中心电缆、控制电缆、能量电缆等其他要求较高的应用设施, 在这些地方, 低发烟率和极

低火焰蔓延率十分关键。获得UL无卤认证的产品包括Halguard 58100、58205、58210、58215和58350。其中最后两款产品在光纤设施中在挤压后表现出较低的收缩性。

- 两款低成本58600系列复合剂。该系列Halguard LS-HFFR复合剂专为一般用途的护套应用而设计, 比高价复合剂更经济节约, 基本不会妨碍产品性能。该系列的优点包括阻燃性能较高, 挤压后收缩性较低。Halguard 58600系

列复合剂适用于地铁、集体运输、信号塔、数据中心等基础设施应用的电缆, 也适用于电子电气设备的内部线路。获得UL无卤认证的产品包括Halguard 58600和58610。

Teknor颜色部门获得的UL认证适用于14款浓缩剂, 这些浓缩剂以弹丸形式提供, 采用了乙烯醋酸乙酯(EVA)和聚乙烯(PE)聚合物作为载体树脂。这些新款浓缩剂可以与当前以EVA或聚烯烃为基础的无卤阻燃(HFFR)复合剂共用。

“Halguard LS-HFFR 系列产品满足了非常广泛的应用要求, 包括物理性能、灵活性、加工性、阻燃性、挤压后收缩性、成本要求等。”乙烯基部门营销和业务发展总监Mike Patel表示。

“UL的无卤评估也进一步扩大了客户的选择范围, 对于需要在集体运输等密闭空间或公共基础设施中进行安装的客户而言更有好处。”

Teknor Apex – 美国
网址: www.teknorapex.com



○ 带HFFR护套的电缆

Mecmesin 新型数字电线压接拉力测试仪

Mecmesin有限公司出品了新款实用型快速批量测试仪, 用于电线端子强度的高质量测试。

CrimpTest-1 kN控制简洁, 结合了精确性和易用性, 是极其可靠的日常测试仪, 将培训和维护需求降至最低。

自动化拉力测试仪提高了精度, 降低操作人员疲劳程度和损伤。为了增强安全性, 这款符合人体工程学设计的水平测试仪拉伸样品远离用户。

○ 正在Mecmesin位于英国的总部进行压接测试



按下单个按钮便可启动测试, 仅使用四个多功能按钮, 即可完成所有设置、操作并输出至RS232统计打印机。

测试仪还会显示断裂时的最大作用力, 并明确给出“合格/不合格”指示。可以设置四种速度: 25、50、100、200mm/min。——符合所有常规测试标准。作用力单位可选用N、kgf 或 lbf。

此基准测试仪设计用于在生产环境中连续使用, 其防尘、防污、防水等方面符合IP52防护等级。

以下多种固定装置可用于1 kN压接拉力测试、焊接或熔接端子、以及电缆扎带:

- 带阶梯环插销的开槽旋转压接插座 (标准)
- 自张紧凸轮夹具 (标准)
- 用于扁头端子或圆头端子的楔形夹具 (可选)
- 电缆扎带固定 (可选)

适用的国际测试标准:

- ASTM B913: 标准测试方法, 用于评估压接电气连接至厚度16-gauge及较小直径的绞股线和实心导线
- SAE AS39029 和 AS7928: 通用规格, 用于端子和手柄: 捻接, 导线: 压接方式, 铜
- IEC 60352-2: 无焊压接连接
- BS 5G 178 (第 1 部分): 用于航空电缆和电线的压接接头
- DEF STAN 59-71: 用于铜导线的压接电气连接器
- ISO 1966: 用于航空电缆的压接接头
- NASA-STD-8739.4: 空间应用、压接、布线和管理

Mecmesin Ltd – 英国

网址: www.mecmesin.com

挑战紧固件制造的极限

在发动机所使用的大约70种螺杆中，对发动机实现设计性能至关重要的七类包括：用于气缸盖、曲轴、连杆、飞轮、主轴承盖、凸轮轴盖、凸轮轴链轮及VCT的螺栓。

意大利紧固件公司 **Brugola OEB Industriale SpA** 已开发超过三代专业发动机技术，专注于制造对发动机重要组件装配必不可少的关键螺栓。上述螺栓必须完美结合重要发动机组件，在高振动和发热情况下确保发动机性能和动态结构完整性。

Brugola最近开设了在美国的第一家工厂，力图拓展进入美国市场，并提高其关键发动机螺栓的工艺精度。

虽然该公司拥有诸如宝马、布加迪和阿斯顿·马丁等欧洲汽车制造商客户，不过第三代董事长 **Jody Brugola** 已经认识到实施顶尖3D激光测量和轴向视觉检测设备的重要性，该设备可以确保超精密紧固件尺寸精度并消除所有缺陷。

因此在开设密歇根州普利茅斯工厂之前，公司确保其发动机螺栓质量的关键投资之一是选择先进、精密的测量系统。

为确保所有紧固件完美无缺，**Brugola**采用高速360度全方位激光测量设备。该设备使用八组传感器和实时零件速度计算，创建各零件的3D轮廓，广泛测量各种用户定义功能，以确定各零件是否精准符合尺寸要求。

“对各零件进行360度全方位测量至关重要。”高速测量及分类紧固件检验系统开发商 **General Inspection** 的产品经理 **Chris Alexander** 说。“缺陷可能发生在任何位置，因此需要进行360度全方位检验。必须展开全方位测量，否则可能遗漏缺陷。该设备对各零件周围360度进行测量，检测任何细小的螺纹损伤，哪怕只是轴上的微小部位。”

Brugola为其关键紧固件选择的设备是 **GI-360**，测量许多至关重要的紧固件功能，比如机盖/机轴直径、长度、直线度、同心度、螺纹角和螺纹直径（包括大径、小径和中径）。还能检测任何已损坏螺纹、以及螺栓头和法兰上的裂纹。

为了满足完美尺寸精度的严格要求，**Brugola**与行业领先的测量设备制造商 **General Inspection** 合作，开发出许多新颖的检验功能。

紧固件检验系统制造商努力改进尺寸测量精度，重新设计开发出新版设备 **GI-360T**，为激光头提供了倾斜与抬升功能。这确保激光垂直于零件，修正带头零件的余弦误差，改善测量读数——总误差为直径(0.005mm)及长度(0.01mm)。

Brugola专注于关键发动机紧固件的零缺陷制造，力求进一步强化紧固件检验系统。作为其高速紧固件检验系统上的可选项，**Brugola**选择使用轴向检视镜头系统，用于360度全方位头部裂纹检测。

为了支持 **Brugola** 的目标，**General Inspection** 改进了裂纹检测功能，用于检测螺栓法兰侧翼的裂纹、划痕或遗漏情况。此专业镜头可以‘查看’零件头部周围的情况。

紧固件检验系统制造商使用更宽视角的镜头，开发出将表面和光线变化影响降至最低的复杂图像分析软件。

LED 环形闪光灯还改善了各零件头部的照明情况，以更好地实现成像。

Brugola OEB Industriale SpA – 意大利
网址: www.brugola.com

Guill的“Bullet II”挤压头

Guill于2015年推出了工具 **The Bullet®**，根据公司报道，这款全新挤压头具有固定中心设计、多端口螺旋流设计和橡胶空间调节功能，此外还不包含紧固硬件，与当前市场上的传统挤压头相比，清洗和重启更加方便快捷。如今，该公司又推出了这款独一无二的专利工具的新一代产品：**Bullet II**。**Bullet II**允许用户快速更换工具，移除装置后方的机头和前方的模具。无紧固硬件的设计，以及由 **Guill** 率先推出的锥形机身和导向设计，可以避免泄漏。此外，这款正在申请专利的新一代 **CAM Lock®** 导向器固定系统还为挤压机和设备制造商提供了以下好处：

- **Cam Lock®** 只需转动1/2便可移除和安装导向器和机头
- 无需紧固硬件
- 快速更换工具，螺纹式模具扣环和螺纹式机头扣圈
- 模具从装置前端移除，机头从后端移除
- 工具固定件也允许进行橡胶空间调节
- 无忧空气/真空连接
- 清洗方便
- 减少停机时间，降低操作成本

这款挤压头大、小容量都适用，只需更换一个组件，而且更换简单方便。十字头系列



- **Bullet II** 不含螺母、螺栓等硬件，拆卸、清洗和重启更加方便

产品也已上市，用户可以指定产品的“口径”，也就是其最大的模具ID。

该套装置还包括一个真空仓和工具箱，用于组装和拆卸。可选的带键工具性能，可帮助设备设计师和终端用户快速定位，以便更快地对整个装置进行拆卸、适当清洗和重启，提升生产线的利润率和效率。

Guill Tool and Engineering – 美国
网址: www.guill.com

Hannay Reels 新款 轻型光纤绕线盘

Hannay Reels最近推出一套新型专用光纤绕线盘，用于解决通信行业的独特需求。

绕线盘套件专门设计用于野战光缆和光电复合缆，包括 **Broadcast SMPTE**、**TAC** 和/或 **optical CON**。采用轻型金属构造，含有带保护索环的外部/或内部存储仓，方便接入电缆，同时还提供防尘防污保护。采用不反光黑色磨砂饰面，足以适应恶劣的户外条件，全新的 **AVF-14** 和 **AVF-18** 系列非常适合现场活动、移动广播装置、采矿作业，以及军事通信。

Hannay Reels – 美国
网址: www.hannay.com



- **AVF-14** 系列，来自 **Hannay Reels**

Fair Dates: 28th-30th June 2017

Move-in: 26th-27th June Move-out: 1pm, 30th June

**Location: Ground floor, C area, China Import Export Fair Pazhou Complex
in Guangzhou (Canton), China**



www.julang.com.cn

Organiser: Guangzhou Julang Exhibition Design Co Ltd

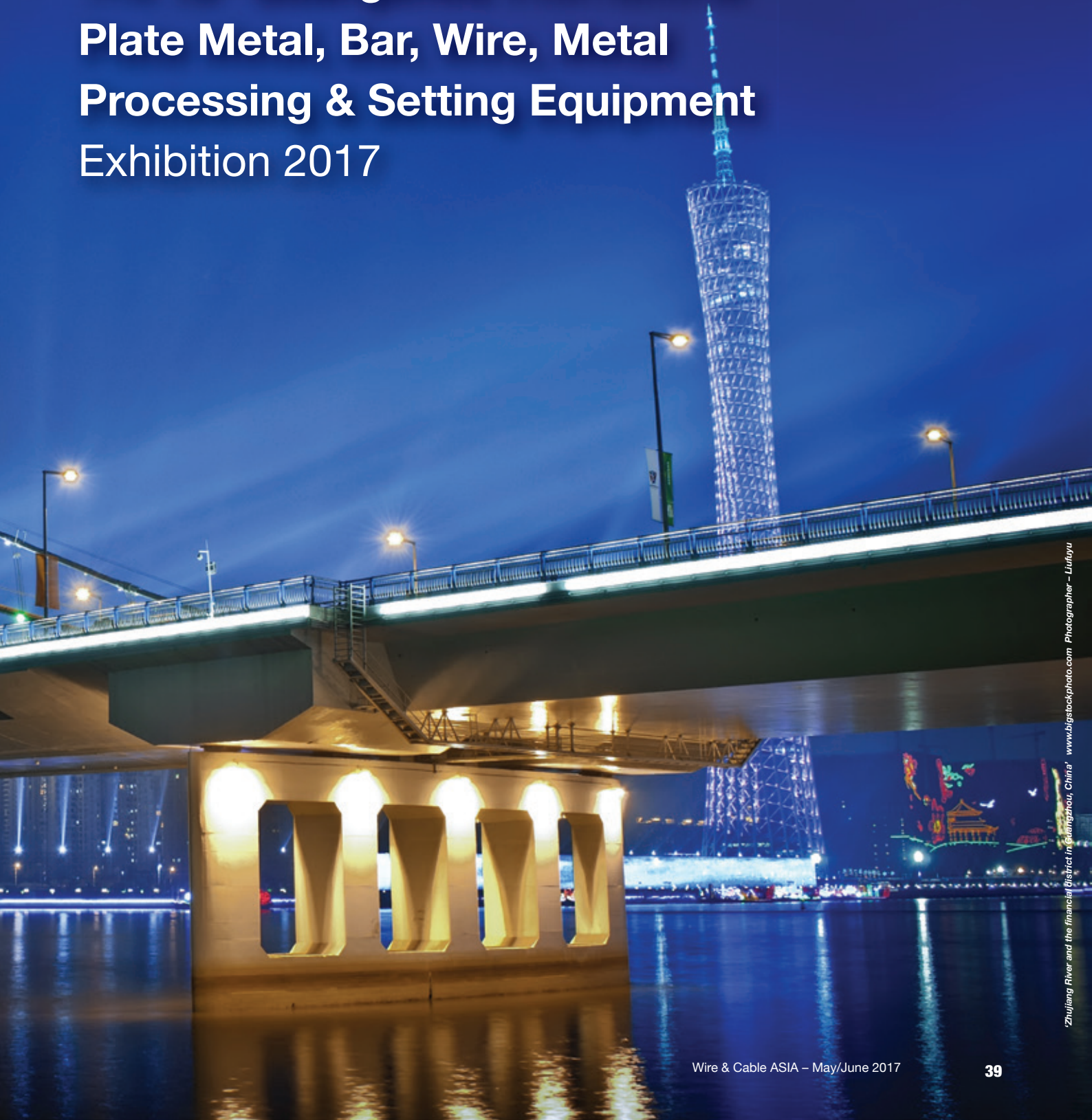
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The 18th Guangzhou International Plate Metal, Bar, Wire, Metal Processing & Setting Equipment Exhibition 2017



Zhujiang River and the financial district in Guangzhou, China' www.bigstockphoto.com Photographer - Lufuyu

India Insight

Indian power link

ABB and India's Power Grid Corporation of India Ltd will work together on the Raigarh-Pugalur 800kV UHVDC transmission link between Raigarh, in central India, to Pugalur in the southern state of Tamil Nadu.

At 1,830km the link will be among the longest in the world, and with a capacity of 6,000MW is expected to meet the electricity needs of over 80 million people.

The two-way link will integrate thermal and wind energy for transmission of power to high consumption centres located thousands of kilometres away, supporting electricity demands in the south when wind strength is low, and transmitting clean energy to the north when there is excess wind power.

ABB CEO Ulrich Spiesshofer said: "Delivering reliable electricity to India's energy demand centres is a top priority for the Indian government to support the country's impressive growth momentum...With our state-of-the-art UHVDC technology, we enable the balancing of renewable and conventional electricity supply over long distances in a smart and reliable way."

The project, valued at over \$840 million, is scheduled for completion in 2019.

ABB – Switzerland
Website: www.abb.com

India Power Grid Corporation – India
Website: www.powergridindia.com

LED acquisition

The board of Shilpi Cables Technologies Ltd (SCTL) has approved the 100 per cent acquisition of UAE-based Gulf Aglow LED Lighting FZCO.

The purchase will give Shilpi Cables an entry into the high growth LED market with an established partner, licensed to sell under the Westinghouse brand and its own Galux brand in 54 countries, as well as a vast manufacturing capability.

Subject to the necessary regulatory approvals, the acquisition is expected to be completed within three months.

Shilpi Cables Technologies Ltd – India
Website: www.shilpicables.com

Sales consideration

Shares in the Indian manufacturer Usha Martin gained nearly nine per cent after its board of directors appointed a consultant to evaluate the possibility of the sale of its wire and wire rope business.

The company confirmed: "A committee of independent directors will oversee the process, and recommend suitable offers to the board for its consideration," adding: "[The] actual sale of the business will only be undertaken by the company after due consideration, and by following due process of law, and with appropriate regulatory, shareholders' and lenders' consent as applicable."

During 2016 the company recorded increasing net losses.

Usha Martin – India
Website: www.ushamartin.com

Knowledge sharing

KEI Industries rose 2.56 per cent on the Bombay Stock Exchange after the company revealed it had signed a technical collaboration agreement with Switzerland's Brugg Kabel AG.

KEI Industries has signed the agreement with Brugg Kabel AG to manufacture extra-high voltage cables, above 220kV and up to 400kV, at its manufacturing facility at Chopanki in Rajasthan. Operation of the new production line began in January.

The collaboration agreement will allow KEI complete knowledge transfer, including design, manufacturing, testing, techniques, and training of its manufacturing and design personnel. Manufacture of cables, jointing techniques, and complete EHV cable and system design will also be included.

KEI Industries – India
Website: www.kei-ind.com

Storage first for India

Mitsubishi Corporation and AES India, a subsidiary of the AES Corporation, will develop a storage facility for the electric grid operated by Tata Power Delhi Distribution Ltd.

The companies will develop and own the 10MW Advancion system, believed to be India's first grid-scale energy storage array. The Advancion system will be constructed in Rohini, Delhi, at a site operated by Tata Power-DDL, and is expected to be operational by the end of 2017.

"For a rooftop solar programme to be successful, it is important for the distribution network to integrate it with energy storage solutions to take care of power generation spikes and fluctuations, system stability, reactive power compensation and grid emergencies," said Praveer Sinha, CEO and MD, Tata Power-DDL.

There are plans for the installation of 160,000MW of solar and wind generation in India over the next five years, and

energy storage will play a critical role in ensuring its integration into the grid, AES added.

Mitsubishi Corporation – Japan
Website: www.mitsubishi.com

AES India – India
Website: www.aes-india.com

Acquisition in harness

Motherson Sumi Systems Ltd (MSSL) is to acquire the Finnish wiring harness maker PKC Group.

Helsinki-headquartered PKC is a global tier 1 supplier of wiring harnesses and associated components to OEMs in the heavy and medium duty commercial vehicles and locomotive segments across North America, Europe, Brazil and China. The company has over 22,000 employees.

MSSL is a supplier of wiring harnesses for commercial vehicles in the North American and European markets.

The proposed acquisition of PKC will support MSSL's expansion into the global wiring harness market for commercial vehicles. The companies show minimal overlap between their operations, in terms of geographical presence, but synergy in their product segments.

Motherson Sumi Systems Ltd – India
Website: www.motherson.com

Indo-Nepal power sharing

In view of the power projects under development, Nepal and India have agreed to lay new cross-border transmission lines. The Indo-Nepal Joint Working Group and Joint India-Nepal Steering Committee on Power Cooperation have discussed new Butwal (Nepal) to Gorakhpur (India) and Lumki (Nepal) to Bareilly (India) transmission lines, and the establishment of new 400kV substations at Dhalkebar, Butwal and Hetauda (all in Nepal).

The Power Grid Corporation of India has expressed its readiness to design special training courses to meet the requirements of the Nepali engineers in operational and commercial issues.

During discussions Nepal conveyed its appreciation of India's efforts to supply more electricity to Nepal, making several regions, including Kathmandu, free of load-shedding this winter.

The current import of 380MW of power from India has been possible after the installation of an additional transformer at Muzaffarpur, and by technical improvements at Tanakpur at Nepal's request.

With the commissioning of two new lines, Raxaul to Parwanipur and Kataiya to Kusaha, installed capacity for the export of power to Nepal was expected to increase by up to 120MW by the end of February 2017. Further, with the completion of a 220kV substation at Dhalkebar, installed capacity will increase to almost 700MW by the middle of 2017.

At Mobile World Congress 2017, a new pragmatism about 5G timing and speeds but no scarcity of new partnerships and trials

"It's time again for carriers and vendors to serve up bold claims about what 5G cellular will do for users," wrote Stephen Lawson of *NetworksAsia*, acknowledging a certain thematic sameness that has crept into Mobile World Congress. But he also noted something new about the 2017 edition of the big annual event: a dash of realism.

"5G is not ready yet," T-Mobile USA's CTO Neville Ray conceded (27th February). "It's maturing quickly, but it's not real today." Like most other carriers, T-Mobile is testing pre-standard 5G technology, and *NetworksAsia* was able to report that Mr Ray is enthusiastic about fifth-generation wireless systems in the long term.

But the T-Mobile official reminded his audience in Barcelona, Spain, that some aspects of 5G – like using ultra-high frequencies to reach mobile devices – still face big technical challenges, and that 4G will be around for years after the first important 5G rollouts circa 2020.

Mr Lawson noted that, in "a shift from flashy promises of mobile broadband speeds a year ago," enterprise uses were the focus for many of those attending this year's show, held 27th February-2nd March.

The key enterprise benefits worth exploring, vendors told him, are high reliability, low latency, and longer Internet of Things (IoT) battery life through more efficient networks. ("Networking Enterprises Enter the 5G Spotlight at MWC," 2nd March)

Among Mr Lawson's other takeaways from Mobile World Congress 2017:

- New partnerships and trials showed the major mobile players stepping up their efforts to develop the technologies behind 5G and get a standard finished faster.

Intel, Qualcomm, Ericsson and several other vendors and carriers said they would create an early version of the 5G NR (New Radio) specification that, using elements of LTE, will allow for 5G-like network deployments as early as 2019;

- In a keynote address, the CEO of South Korean operator KT said that his company would launch the world's first commercial 5G service in 2019 after carrying out trials at next year's Winter Olympics in Pyeongchang;
- Verizon announced that Cisco Systems will help it roll out 5G trial services at several hundred cell sites and several thousand customer locations in the USA. The Cisco contribution will include backhaul equipment, a virtualised packet core, and virtual managed services software;
- Ericsson announced yet more 5G trials – for a total of more than 30 – with NTT DoCoMo, Vodafone and Telstra. Nokia highlighted the trials it is conducting with carriers, including the Verizon project. Huawei announced a virtualised 5G core for distributed networks.

"Device hardware makers are getting into the game, too," Mr Lawson reported from Barcelona. Intel announced the readiness of its first 5G-modem silicon using a 14nm process.

And Qualcomm announced the expansion of its Snapdragon X50 5G modem line, to work on frequencies both below 6GHz and in the much higher millimetre-wave bands where much of 5G will happen.

Next-generation mobile networks are seen as advancing mobile to a unified fabric connecting people to everything

London-based IHS Markit Ltd views 5G as a catalyst that will thrust mobile technology into the elite class of general-purpose technologies (GPTs) that includes the printing press, electricity, the steam engine, the telegraph and the Internet.

An IHS white paper evaluates the potential of 21 unique 5G-use cases that will affect productivity and enhance economic activity across a broad range of industry sectors.

"The 5G Economy: How 5G Technology Will Contribute to the Global Economy" also examines the central role the 5G value chain will play in continually strengthening and expanding current mobile technology platforms and the contribution that 5G will make to positive, sustainable global economic growth.

Key findings include:

- The 5G value chain will invest an average of \$200 billion annually to continually expand and strengthen the 5G technology base within networks and business application infrastructure;
- 5G deployment will fuel sustainable long-term growth to global real gross domestic product (GDP). From 2020 to 2035, the total contribution of 5G to real global GDP will be equivalent to an economy the size of India – currently the seventh-largest economy in the world.
- In 2035, 5G will enable \$12.3 trillion of global economic output. That is nearly equivalent to USA consumer spending in 2016; and more than the combined spending, that year, by consumers in China, Japan, Germany, the United Kingdom and France;
- The global 5G value chain will generate \$3.5 trillion in output and support 22 million jobs in 2035. This figure is larger than the value of today's entire mobile value chain.

Taking the emotional temperature of smartphone users, Ericsson and Vodafone find scant tolerance for substandard service

In a project reported by *Advanced Television* (London), Vodafone Germany and the Swedish telecom equipment and services company Ericsson tapped neuroscience to understand what mobile broadband customers really think about poor network performance. Electroencephalography (EEG) equipment was used to monitor the brain activity of 150 Vodafone subscriber-volunteers in Düsseldorf. The result showed that even small delays and disturbances raise levels of tension and stress, and have a negative impact on subscriber loyalty and operator brand. (“Research: Just One-Second Delay Annoys Mobile Broadband Subs,” 21st February)

The smartphone users taking part in the experiment were required to complete 13 specific tasks in ten minutes, while a hampering degradation in quality-of-service was simulated. The tasks included common actions such as browsing web pages, streaming videos and uploading “selfies”. In addition to the EEG equipment, eye-tracking gear and pulse meters monitored the attention span and heart rate of the participants.

To Guido Weißbrich, the director of network performance at Vodafone Germany, the joint study proves how quickly smartphone users react unfavourably when a broadband network is not performing at its best. He told *Advanced Television* that, since a mere one-second delay when downloading or uploading content has a significant negative impact on the user experience, “streaming services must do everything to avoid lengthy buffering or freezing of content.”

Bradley Mead, who heads managed services and network design and optimisation at Ericsson’s Business Unit Network Services, concurred. Noting the potential of the new “valuable data” for optimising and engineering networks to maximise the customer experience, he said, “It is essential for operators to understand how people actually feel about the

service they provide and how it really impacts their day-to-day lives”.

Publishing a fifth voluntary report on its taxes paid, Vodafone seeks to promote transparency

Vodafone is one of very few multinational companies to make non-compulsory disclosure, on a country-by-country “actual cash paid” basis, of its total contribution to public finances, including details and explanations of tax payments and key taxation matters. In its most recent report the London-based telecom group also includes revenue and profit before taxes. Published on 20th February, this provides an updated accounting of the year ended 31st March 2016, including direct and indirect cash taxes paid by Vodafone in the countries in which it does business, as well as such non-taxation-based government revenue contributions as spectrum fees.

Over that period, Vodafone reckons its cash contribution to public finances at more than \$14.2 billion in the group’s countries of operation, compared with \$11.6 billion in the previous reporting period (2014-15). The year-on-year increase was attributed primarily to the results of spectrum auctions in Germany and India. The group paid \$320 million in direct taxes in the UK during 2015-16. Vodafone noted that it has published five tax transparency reports, on a voluntary basis, since 2012. Its stated purpose in doing so is to promote greater understanding of the various taxation systems, which it considers “integral to increasing trust [among] business, policy makers, and the public.”

Elsewhere in telecom . . .

➤ The 2017 global edition of the “Mobile Economy” report from GSMA projects that the number of unique mobile subscribers around the world will surpass five billion later this year, and will increase to 5.7 billion by the end of the decade. By that point, almost three-quarters of the world’s population will be subscribed to a mobile service. Subscriber growth over this period will be driven primarily by large Asia markets

such as India, which alone is forecast to add 310 million new unique subscribers by 2020. The London-based GSMA is a trade body that represents some 800 mobile operators worldwide. Its study, published on 28th February, also highlights the on-going shift to mobile broadband networks and smartphones, and the mobile industry’s growing contribution to the global economy.

➤ *JURIST*, the public-service website for legal news, on 17th February took note of Dutch media reports that the Netherlands has proposed legislation to empower its government to block or undo mergers in the telecommunications sector. According to a statement from the Netherlands Ministry of Economic Affairs, the industries covered in the bill are in the category “telephony and the Internet”: Internet hubs, data centres, and hosting and certification services, all of which are deemed important for the “continuity, reliability and safety of services and infrastructure.” Minister Henk Kamp stated the rationale for the bill:

“Netherlands benefits from the fact that we have an open economy in which the market is doing its job. So we take more business abroad than the other way about. Our country, however, has not benefited from takeovers by foreign companies that are linked to criminal activities, which are classified as financially vulnerable or have a non-transparent ownership structure. Given the national interests at stake, we lay a legal basis for the telecommunications sector in order to prevent such takeovers”. Mr Kamp’s statement also pointed out that the European Union permits member-countries to intervene in takeovers for reasons of overriding public interest, such as when national security, public law and order, or security and protection of vitally important industrial sectors are at stake.

The draft legislation has been released to stakeholders for a commentary period. Mr Kamp hopes to present the bill to the Council of State in the second quarter of 2017, then to the House of Representatives.

2017年世界移动通信大会提出了关于5G时机和速度的新实用观点，但是鲜少新的合作或测试

“通信公司和供应商又要提出关于5G蜂窝数据能为用户提供哪些服务的大胆论断了。” NetworksAsia的Stephen Lawson写道，提出世界移动通信大会已经出现了主题千篇一律的现象。不过他也注意到在这次2017年度大会上出现了一些新的东西：一点现实主义。“5G还没有准备好。” T-Mobile美国的首席技术官Neville Ray承认(2月27日)。“它成熟得很快，但是现在还没有准备好。”与其他电信公司一样，T-Mobile正在测试预标准化5G技术。而且据NetworksAsia报道，Ray先生看好第五代无线网络系统的长远发展。不过这位T-Mobile管理者在西班牙巴塞罗那演讲时提醒听众，5G的某些方面，例如使用超高频率来连接移动设备，将会面临重大技术挑战，在2020年左右5G首次使用之前，4G还会存在多年。Lawson先生指出，“一年前对于移动带宽速度作出浮夸承诺的现象已经转变”，企业应用是这次参加2月27日-3月2日大会的很多人的关注方向。据供应商说，最值得探索的重要企业受益点是通过更加有效的网络，提供高可靠性、低延迟性和更长的物联网电池寿命(《网络企业成为世界移动通信大会5G的关注点》，3月2日)。

以下是Lawson先生得到的关于2017年世界移动通信大会的部分信息：

- 新的合作关系和尝试表明，主要的移动参与者正在加大开发5G支持技术的力度，力争更快地完成标准。英特尔、高通、爱立信以及其他几家通信公司表示，他们将会创建一份初版5G NR(新无线电)规范，使用LTE元素的情况下，最早2019年就能实现类似5G网络的部署；
- 在一个主题演讲中，韩国电信公司KT的首席执行官说，在明年平昌冬奥会进行测试后，他的公司将于2019年发布世界上首项商用5G服务；
- 威瑞森公司宣布，思科公司将会协助它在美国的几百个蜂窝基站和几千个用户位置开展5G测试服务。思科提供的协助包括回程设备、虚拟化分组核心和虚拟托管服务软件；
- 爱立信宣布将与日本电信电话公司、沃达丰和澳洲电信进行更多5G测试，总数有30多个。诺基亚强调了它正在与通信公司进行的一些测试，包括威瑞森项目。华为发布了用于分布式网络的虚拟化5G核心。

“设备硬件制造商也在加入进来。” Lawson从巴塞罗那发回的报道说。英特尔宣布它的首款采用了14纳米进程的5G调制解调器硅已经完成。高通宣布扩大骁龙X50 5G调制解调器生产线，致力于低于6赫兹和更高的毫米波段，这是大部分5G将要使用的范围。

人们认为新一代移动网络将使移动电话上升为连接人类与一切事物的统一体

总部位于伦敦的IHS Markit Ltd认为5G将促进移动技术进入通用目的技术(GPTs, 包括印刷机、电能、蒸汽机、电报和互联网)的精英层级。IHS白皮书评价了21个独特的5G用户案例的潜力，这些将会影响众多行业领域的生产能力，并增强经济活动。《5G经济：5G技术如何促进全球经济》还考查了5G价值链在持续增强和扩展当前移动技术平台方面的核心作用，以及5G在全球经济积极持续增长方面将会作出的贡献。

主要调查结果如下：

- 5G价值链平均每年投入2000亿美元用于持续扩展和增强网络和商业应用基础架构的5G技术基础；
- 5G部署将会促进全球实际国内生产总值的长期持续增长。从2020年至2035年，5G对实际国内生产总值的

总贡献将会达到印度的经济规模，该国目前为全球第七大经济体。

- 2035年，5G将会带来12.3万亿美元的全产全球产出。这接近于美国2016年的消费支出，并且超出中国、日本、德国、英国和法国同年的消费支出总和。
- 2035年，全球5G价值链将会带来3.5万亿美元的产出，并提供2200万个工作岗位。这个数字超出了现在整个移动电话价值链的总价值。

IHS 5G经济影响白皮书可在这里免费下载www.ihsmarkit.com

通过收集智能手机用户的情绪温度，爱立信和沃达丰发现用户对不达标服务的容忍度极低

根据Advanced Television(伦敦)中的报导，沃达丰德国公司和瑞典电信设备与服务公司爱立信利用了神经科学来

了解移动宽带用户对于较差网络性能的态度。脑电图(EEG)设备被用来监测杜塞尔多夫的150名沃达丰用户志愿者的大脑活动。结果显示，即使微小的延迟和干扰都会提升用户的紧张和烦躁水平，并且对用户的忠诚度和电信公司品牌带来负面影响(《研究：仅仅一秒的延迟都会激怒用户》，2月21日)。

参加该实验的智能手机用户被要求在10分钟内完成13项特定任务，同时会模拟不顺畅的低级服务质量。任务包括普通操作，例如浏览网页、播放视频和上传“自拍”。除了EEG设备，眼球追踪装置和脉搏测量器也在监控受试者的注意力时长和心率。

沃达丰公司的网络性能主管Guido Weißbrich认为，这项联合研究能够表明智能用户在宽带网络表现不佳时会多快做出负面反应。他告诉Advanced Television的记者，在下载或上传内容时仅仅一秒的延迟都会对用户产生极大的负面影响，“流媒体服务必须尽全力避免内容缓冲或停止时间过长。”

在爱立信业务单位网络服务处管理服务及网络设计及优化工作的Bradley Mead对此表示赞同。他注意到了“有价值的数据”的潜力，它们可以用于优化和设计网络，从而最大化客户体验。他说：“很关键的一点是，通信公司要了解用户对其所提供服务的实际感受，以及它如何影响他们的日常生活。”

沃达丰公布了第五份按国家交税的资源报告，力图推进透明化

沃达丰在按国家“实际支付现金”的基础上，披露了它对公共财政的总贡献，包括税务支付和重要税务问题的细节及解释。该公司是少数几个非强制性披露这些信息的跨国公司之一。在最新报告中，这家总部在伦敦的电信集团还提到了税前收益和利润。这份报告公布于2月20日，提供了止于2016年3月31日的财政年的最新信息，包括沃达丰在其开展业务的国家内缴纳的直接或间接现金税费，以及向政府缴纳的非税费用——频谱费用。

在这段期间，沃达丰对其开展业务所在国家的公共财政的现金贡献超过142亿美元，上个财政年为116亿美元(2014-15财政年)。年同比增长主要归因于在德国和印度的频谱拍卖。2015-16财政年，该集团向英国直接缴税达3.2亿美元。

沃达丰指出，自2012年以来，沃达丰在自愿的基础上已经发布了五份税务透明报告。该集团称这样做的目的是促进对各种税务系统的了解，它认为这是“增强企业、政策制定者和大众之间的信任关系的必要因素。”

'The Wall'

In a step toward delivering on a campaign promise, the Trump administration seeks input on walling off the USA from Mexico

US Customs and Border Protection, the largest law enforcement agency of the Department of Homeland Security, on 24th February issued a preliminary request for proposals in advance of a formal solicitation "for the design and build of several prototype wall structures in the vicinity of the United States border with Mexico." Vendors were asked to submit prototype concepts, with cost estimates to follow promptly. Although no funding for the project has been arranged, the agency said that "multiple awards" were contemplated by mid-April.

Mr Trump in January signed an executive order to begin preliminary steps toward building a wall which could stretch almost 2,000 miles from the Gulf of Mexico to the Pacific Ocean. As reported by *Bloomberg News*, Konstantin Kakaes, an international security fellow with the New America Foundation, estimated the cost of a 1,000-mile concrete wall 50 feet high, with 10 feet below ground, at \$38 billion. According to *Bloomberg* reporters Cary O'Reilly and Robert Levinson, construction companies that may respond to the preliminary request for proposals include Bechtel Group Inc, which builds airports and nuclear power plants and has done almost \$3 billion in USA government work since the beginning of fiscal 2013; BL Harbert International Inc, a construction company (\$2 billion); and Caddell Construction Co (\$1.9 billion).

Presuming the barrier is in fact erected, an irony of the massive undertaking to wall the USA off from Mexico is that one of the major beneficiaries could be Mexico's Cemex SAB, the largest cement maker in the Americas. Messrs O'Reilly and Levinson pointed out that Cemex is one of the best-positioned companies to profit because it has operations on both sides of the border. ("Trump Administration Makes Its First Move to Build Border Wall," 24th February)

Aircraft

An analyst sees military orders as helping the world's two big plane makers to weather the downturn in their industry

"The great boom is over," aerospace consultant Richard Aboulafia said at an industry conference in the Seattle area in February, in reference to the decline in demand for commercial jetliners made by Boeing Co, of the USA, and Europe's Airbus. But the Teal Group analyst said he expects rising sales of military aircraft to head off any "bust cycle." Mr Aboulafia, who writes and edits Teal Group's *World Military and Civil Aircraft Briefing*, a forecasting advisory covering some 135 aircraft programmes and markets, told Reuters that multi-year backlogs of jetliner orders at both big plane makers will cushion the downturn. Rising sales of spy and fighter planes will also help.

Defence spending is expected to rise in the USA under President Donald Trump, at least initially. ("Global Aerospace Boom Is Over, But Likely No Bust Ahead – Analyst," 15th February). As noted by *Reuters*, in the commercial aircraft market a ramp-up in output of single-aisle Boeing 737 and Airbus A320 aircraft will likely go according to plan. The two plane makers aim to increase output by more than 30 per cent through to the end of the decade and need the income from these high-volume assembly lines to hit their financial targets. "This is the part of the market where you're going to see continued growth," said Mr Aboulafia. But he believes twin-aisle aircraft face a much tougher future because there are more models competing even as demand is declining. "Everyone wants too much from this market," he said: orders are "plateauing."

Reuters reporter Alwyn Scott noted these caveats from Mr Aboulafia:

- ① Higher interest rates and a possible border tax (the value added tax on imported goods favoured by President Donald Trump) could hurt the USA aerospace industry by causing a further strengthening of the dollar;
- ② Also, the risk of a major trade dispute is as high as at any time since World War II. A USA-China trade dispute would, the aerospace analyst believes, likely benefit Airbus since China could easily retaliate against the USA by curbing orders of Boeing planes.
- ③ Reuters also observed that any aerospace industry slowdown always has implications for suppliers, who must anticipate the flow of orders as a guide to the capacity they will need to meet changes in aircraft production.

From the US military, a portable capture system for drones anticipates launch and retrieval from ships, trucks and ground facilities

As drones figure ever more prominently in the news, thought needs to be given to capture of the unmanned craft in case of misadventure. Michael Cooney, the online news editor at *Network World*, has reported on a research project for catching full-sized military drones mid-flight without destroying them. The brainchild of the Defense Advanced Research Projects Agency (DARPA), the system known as SideArm has features in common with the launch-and-trap system for planes berthed on aircraft carriers.

DARPA said that SideArm developer Aurora Flight Sciences (Manassas, Virginia) has successfully tested a full-scale system that repeatedly captured a 400-pound Lockheed Martin Fury unmanned aircraft launched from a catapult and accelerated to flight speed. A Fury can achieve over 130mph. SideArm is reportedly capable of recovering aircraft up to 1,100 pounds. ("How to Catch a 400 Pound Drone Traveling at Full Speed," 6th February). According to DARPA, the small size of the system derives from the concentration of its equipment into a single rail that folds for easy transport. In a departure from the traditional method of catching the drone in a net, SideArm snags a hook on the back of the drone and directs the hook to travel down

the rail. This approach is said to enable slower and more constant and controlled deceleration, which is easier on the drone.

DARPA, the agency of the USA Department of Defense responsible for the development of emerging military technologies, said that SideArm is designed for rapid setup and adaptation to current and future unmanned aircraft. It fits in a standard 20-foot shipping container for transport by truck, ship, rail, and both fixed-wing aircraft and helicopter. The ultimate goal for the system is the launch of large drones from ships, trucks and fixed ground facilities, and their retrieval. Now that a non-destructive system is in hand, Mr Cooney wrote, DARPA says it is working “to identify potential partners and to explore using SideArm with other unmanned platforms.”

Money matters

From the founder of Microsoft, an unconventional proposal for managing the displacements of automation: a tax on robots

Bill Gates believes that robots who replace human workers should be taxed at the same rate as those workers. In an interview with editor Kevin J Delaney of *Quartz*, the Microsoft founder cited the example of a human worker who does \$50,000 worth of work in a factory and whose income is taxed accordingly. “If a robot comes in to do the same thing,” Mr Gates said, “you’d think that we’d tax the robot at a similar level.” (“The Robot That Takes Your Job Should Pay Taxes, says Bill Gates,” 17th February). Mr Gates suggested that governments should tax companies’ use of robots as a way of slowing the spread of automation. These taxes, paid by a robot’s owners or makers, would be used to help fund retraining of the labour force. Former factory hands and other workers would be redirected to education, health services, and other fields in which human input is essential.

Such a policy would, he said, by intentionally slowing down the speed of adoption of automation, gain time for managing the transition. Mr Delaney of *Quartz* observed that the idea of what amounts to a tax on efficiency would seem anathema to much conventional economic wisdom. For decades, he wrote, “the dominant line on automation has been that displaced workers shift into more productive roles, in turn growing the total economy.” But Mr Delaney acknowledged that this thesis “has begun to show cracks.” Mr Gates, with his focus on reducing the pressures on working people at the man/machine interface during this period, is very firm that the free market will not be able to cope with the speed of the transition. In his view, government bears the major responsibility for managing automation’s impacts, and an adequate period of adjustment is a necessity.

Another point made by Mr Gates is that automation will not thrive if it generates a resistance movement that restrains technology. To *Quartz* he stressed the importance of gaining general acceptance of the advance of robotics and artificial intelligence over the

next 20 years or so. Taxation of working robots should, he thinks, hold appeal for people struggling to come to terms with a concentrated version of the steady, incremental labour displacements that went the way of the 20th century.

Briefly noted . . .

According to a report released on 16th February by the Federal Reserve Bank of New York, a substantial increase in total USA household debt in 2016 (to \$12.58 trillion) was led largely by growth in student debt and auto loans. Reporting this in *Time* magazine, Katie Reilly cited the record \$1.31 trillion in USA student debt reached last year, “emphasising a student loan crisis that has drawn attention from both political parties.” Student loan balances have consistently increased over the 18-year history of the New York Fed’s report. According to *Bloomberg*, Americans’ outstanding loans for higher education doubled since 2009, representing more of an increase than any other form of household debt.

Cybersecurity

As more companies come to view hacking attacks as inevitable, sophisticated defences are in increasingly high demand. But, according to a report from ISACA (Rolling Meadows, Illinois), an independent non-profit association that develops and shares IT best practices, efforts by organisations to protect themselves come up against a severe shortage of able assistance. As reported by Bob Violino of *Information Management* (28th February), a survey of 633 US cybersecurity professionals conducted by ISACA in October 2016 found that 59 per cent say they receive as few as five applications for each of their job openings, and only 13 per cent receive 20 or more. (In contrast, studies show that most corporate job openings attract 60 to 250 applicants). Compounding the problem, 37 per cent of the ISACA respondents said fewer than one in four candidates they consider has the qualifications needed to keep a company secure. ISACA board chair Christos Dimitriadis told Mr Violino that a quarter of the reporting cybersecurity firms said filling a priority position can take six months or longer. In Europe, almost one-third of cybersecurity job openings remain unfilled.

Shimon Brathwaite of *Business New Daily* asserts that, for small businesses in particular, being ready for a data breach is essential to survival if – or, more likely when – one should occur. Referencing a report from the risk management site Experian Data Breach Resolution, he listed some points that should inform these preparations (“Five Data Breach Threats Your Small Business Should Prepare For,” 17th February):

“Aftershock” breaches – repeated unauthorised log-ins after usernames and passwords obtained in previous breaches are sold on the dark web – will continue to rise in 2017. To mitigate the password-reuse risk, companies could implement two-factor authentication to verify users. Secondary authentication methods can be such password alternatives as tokens, SMS alerts, geolocation confirmation, or biometrics;

- ④ Nation-state cyberattacks will move from espionage to war. Experian expects cyberattacks to continue against the United States, and – absent any international agreement governing engagements in cyberspace – attacks will increase and could escalate existing tensions among countries;
- ④ Criminals will focus on payment-based attacks, since many small firms lag in their transition to EMV chip readers and PIN. Experian recognises there are legitimate barriers to adopting this technology. However, it says, the risk of not adopting it is high, as attackers have demonstrated the ability to exploit older technology;
- ④ International data breaches will cause big headaches for international companies. New regulations in Canada, Australia and the European Union require companies to notify customers whose data has been stolen. To prevent breaches, Experian advises all organisations to train employees on how to spot phishing attacks; keep all security software fully patched; and have contingency plans for responding to a ransomware attack;
- ④ As deployment of new mobile apps exposes new vulnerabilities, health care will become the most targeted sector for cybercrime. Preventing data breaches is critically important here, as health care consumers typically react strongly to instances of compromised personal information.

Telecom

The new head of the USA Federal Communications Commission wants to reinstitute a 'light-touch' regulatory approach

In a rare display of unity, the two major political parties in the USA have both pushed for an overhaul of the Telecommunications Act, which underpins telecom policy and defines the powers of the Federal Communications Commission (FCC). Dating back to 1934, and updated in 1996 to add provisions specific to the Internet and cable TV service, the act has long been seen as ripe for another congressional do-over. Last summer's court decision affirming the FCC's net neutrality rules prompted another wave of calls for action, on grounds that Congress must more clearly define the FCC's role in regulating the Internet. On 28th February, at the Mobile World Congress in Barcelona, the new head of the FCC made plain his own stand in the matter.

As reported by Grant Gross, who monitors USA government telecom policy for the IDG News Service, chairman Ajit Pai presented himself as very much a free-market adherent firmly opposed to government regulation. ("New FCC Chairman: Net Neutrality Rules Were 'a Mistake,'" 1st March)

Net neutrality is broadly defined as requiring Internet service providers to enable access to content and applications without favouring or blocking particular products or websites.

In Mr Pai's view, its adoption by the FCC, together with the agency's reclassification of broadband as a regulated common carrier, deviated from Washington's long-standing "light-touch" regulatory approach toward the Internet.

To Mr Pai, the FCC's net neutrality rules "injected tremendous uncertainty" into the broadband market. Asserting that "uncertainty is the enemy of growth," he suggested that broadband investment is down since the FCC passed the regulations.

But, as noted by Mr Gross, some net neutrality advocates disagree. According to the digital rights group *Free Press*, broadband investment was up by nearly nine per cent over the two years since passage of the rules, compared to the prior two-year period.

Capital investment from broadband providers stood at \$76 billion in 2015, down slightly from 2014, trade group *USTelecom* said. But that number was the second-highest of any year since 2001, according to the group.

④ Jacob Kastrenakes of the Verge provided some background on Mr Pai, a member of President Donald Trump's Republican party but an appointee of former president Barack Obama. An FCC commissioner since 2012, when he was confirmed by the Senate, Mr Pai does not share the progressive views of Mr Trump's predecessor and is by no means someone Mr Obama, a Democrat, would have chosen to lead the commission.

The new commissioner owes his position to Mr Obama's observance of a tradition that permits the minority (then Republican) party to pick two commissioners, since the majority (Democrats, at the time) may legally hold no more than three seats on the five-person commission. ("Trump's New FCC Chief Is Ajit Pai, and He Wants To Destroy Net Neutrality," 23rd January)

Government spending

From a leading Canadian public policy think tank, a timely warning on expecting too much from huge infrastructure outlays

Published on 2nd March by the Fraser Institute, "Myths of Infrastructure Spending in Canada" would make sobering reading for US President Donald Trump. Mr Trump is banking heavily on an infrastructure spending plan of his own to energise the American economy, create tens of thousands of new jobs, and rebuild roads, airports and other big facilities across the US.

As Ottawa and several provincial governments plan to collectively spend hundreds of billions of dollars over the coming decade on infrastructure, the Fraser Institute authors – director of fiscal studies Charles Lamman and policy analyst Hugh MacIntyre – strongly advise against outsize expectations in these matters.

Abridged and lightly edited, these excerpts from their report dispel five misconceptions so divorced from fact as to qualify as "myths":

From the Americas

Myth 1: Government must ramp up infrastructure spending to make up for past neglect.

The net stock of government infrastructure per person (total value net of depreciation) has been growing steadily over the past 15 years and is now at the highest level since 1971. After adjustment for inflation, it has grown 27.3 per cent from \$16,394 per person in 2000 to \$20,876 per person in 2015. Since 2008, annual spending to acquire new public infrastructure has been particularly high, with Canada ranking relatively high on international comparisons of government capital spending.

Myth 2: Infrastructure is largely the domain of governments.

Those who argue that Canada would benefit from increased infrastructure spending usually overlook the major contribution made by the private sector. For over 40 years, the net stock of infrastructure per person from non-government organisations has exceeded that of the government sector. In 2015, the net stock of non-government infrastructure represented 72.6 per cent of Canada's total infrastructure stock, up from 63.4 per cent in 1971.

Myth 3: Increased infrastructure spending will spur economic growth.

In practice, not very much of public infrastructure spending goes toward the high-in-demand roads, railways or ports that can increase long-term economic growth by improving the economy's productive capacity. Just 10.6 per cent of what the federal government plans to spend on new infrastructure will go for trade and transportation projects. Most will favour so-called green and social infrastructure, such as public housing, community centres and hockey arenas. While these initiatives may be appreciated by the local community, they are unlikely to provide productivity gains. Moreover, infrastructure spending generally fails to stimulate the economy in the short term because of delays in fulfilment and errors in targeting the sectors of the economy in greatest need.

Myth 4: With interest rates low, now is the time to ramp up government infrastructure spending.

Failure to account for other relevant fiscal and economic costs exaggerates the opportunity provided by low interest rates. Other fiscal considerations include the future operation and maintenance costs of a new infrastructure asset, which can be up to 80 per cent of the total lifetime cost and are not influenced by current interest rates. In addition, the economic costs of the taxes that fund infrastructure spending add considerably to overall costs and should be properly accounted for. A more fundamental problem is that the interest-rate argument wrongly assumes infrastructure spending should always be largely or completely financed by debt.

Myth 5: The federal government should take the lead on infrastructure.

Government grants give Ottawa influence over which projects are undertaken and how they are managed, imposing federal priorities that may not reflect the particular needs of a given region. Conditional grants can distort local

decision-making by encouraging recipient governments to undertake projects likely to receive funding over others that may be of higher local priority.

Federal infrastructure grants can also lead to a deterioration in the recipient government's accountability to taxpayers.

Automotive

To commend their product to the Japanese, USA carmakers may have to learn to blow their horns louder

Writing from Tokyo, Jonathan Soble of the *New York Times* observed that, even as Japanese cars command a wide swathe of the United States market, American brands are barely visible in Japan, where Toyota, Honda and other domestic brands rule the roads. Of the nearly five million cars and light trucks sold in Japan last year, Mr Soble reported that just 15,000 were American, or a mere 0.3 per cent of the total. He wrote: "Toyota sells more vehicles at a single mega-dealership in California."

This has long frustrated American auto executives and trade negotiators and is a source of resentment in the new administration in Washington. President Donald Trump has accused Japan of shutting out American producers by throwing up regulatory barriers and rigging the currency market in favour of Japanese brands. In a meeting with American executives in January he said, "They do things to us that make it impossible to sell cars in Japan."

Mr Soble noted that such talk is alarming to the Japanese, whose auto industry is "a pillar of the economy." From the standpoint of Yoshihiro Masui, a car collector unusually well positioned to offer an opinion, the problem lies elsewhere. ("Trump Wants More American Cars in Japan. Japan's Drivers Don't," 9th February)

"Of course American cars don't sell in Japan," the *Times* was told by Mr Masui who owns, in addition to a replica Model T with a race car's engine, a gleaming white Ford Thunderbird – the latest of nearly 70 Detroit-made vehicles he has bought and sold over the years. "Dealers don't make an effort to convince people. I've never seen a TV commercial. You go to a car show, they're not there."

🗨️ "German cars are popular in Japan, but American cars hardly sell at all," Akio Mimura, chairman of the Japan Chamber of Commerce and Industry, said at a news conference in February. "If they're going to sell cars in Japan, it's obvious that [the American carmakers] need to make an effort to appeal to Japanese customers."

🗨️ "Japanese cars are boring," one of Mr Soble's local respondents told him. But this is apparently not well known in Japan.

It would seem that a first step in the effort recommended to the carmakers of Detroit by Mr Mimura might be a visit to Madison Avenue for a persuasive ad campaign.

Dorothy Fabian
Features Editor

“墙”

特朗普政府进一步履行竞选承诺，就美墨边境修墙征求意见

美国国土安全部最大的执法机构——海关及边境保护局于2月24日发布了初步征求建议书，随后发布了“在美墨边境附近设计和修建多个墙体原型结构”的正式征求。

供应商被要求提交原型概念，然后尽快提交成本预算。尽管还未给该项目安排资金，该局称“多项奖励”预计四月中旬到位。

特朗普先生在一月份签署了一份总统命令，要求启动修墙的预备步骤，这面墙从墨西哥湾绵延到太平洋，全长将近2000英里。据彭博新闻报道，新美国基金会的一位国际安全人士Konstantin Kakaes估计，全长1000英里、高50英尺、地基10英尺的一面混凝土墙的成本为380亿美元。

据彭博新闻记者Cary O'Reilly和Robert Levinson报道，可能参与此次应征建议的建筑公司包括Bechtel Group Inc，该公司修建过机场和核电站，自2013财政年以来为美国政府修建的工程总费用约为30亿美元；BL Harbert International Inc (20亿美元)；Caddell Construction Co (19亿美元)。

假设真的要修墙的话，这项美墨隔离墙庞大工程的讽刺之处在于，最大的受益者之一将会是墨西哥的Cemex SAB，这是美洲最大的水泥制造商。O'Reilly和Levinson先生指出，Cemex是最有可能从中盈利的公司之一，因为该公司在边境两边都有业务。（《特朗普政府启动边境墙第一步》，2月24日）

飞机

一位分析师认为军事订单能够帮助世界两大飞机制造商抵御行业衰退

“繁荣期已经结束。”航空顾问Richard Aboulafia二月份在西雅图的一个行业会议上说，他指的是美国波音公司和欧洲空客公司的商用飞机的需求下滑。但是这位蒂尔集团的分析师还说，他期待军用飞机销量的增加能够抵挡“衰退周期”。

Aboulafia先生编写了蒂尔集团的《世界军用和民用飞机介绍》，这份预测分析报告谈到了135个飞机项目和市场。他告诉路透社记者，两家大的飞机制造商数年来的喷气客机订单积压将会对衰退起到缓冲作用。侦察机和战斗机的销量增加也会有所帮助。唐纳德·特朗普总统执政期间，国防支出有望增长，至少在初期如此。（《全球航空繁荣期已经结束，但是可能不会衰退——分析师》，2月15日）

路透社指出，在商用机市场，单通道波音737和空客A320的产量增加可能会如期进行。这两家飞机制造商的目标是在2020年之前使产量增加30%以上，并且需要依靠这些大容量生产线的收入来实现他们的财务目标。

“你将在这部分市场看到持续增长。”Aboulafia先生说。但是他认为双通道飞机将面临更为严峻的未来，因为尽管需求在下降，竞争型号却越来越多。“每个人对市场的期望都太高。”他说，订单进入“稳定期”。

路透社记者Alwyn Scott记录了Aboulafia先生给出的以下告诫：

- ① 提高利率或征收边境税（唐纳德·特朗普总统支持对进口商品征收增值税），可能会引发美元升值，进而损害美国航空业。

- ② 同时，贸易纠纷的可能性自二战以后一直都很高。这位航空分析师认为，中美贸易纠纷很有可能会令空客受益，因为中国很容易通过限制波音订单来报复美国。

- ③ 路透社还观察到，任何航空行业的衰退总是会对供应商产生影响，他们必须预测订单流，以此来引导他们需要的产能，以应对飞机生产行业的变化。

金钱问题

微软创始人对自动化替代品的管理提出了一项非传统的提案：对机器人征税

比尔·盖茨认为，取代人类工人的机器人应该被按照同样的比例征税。在接受Quartz编辑Kevin J Delaney的采访时，这位微软创始人举了一个例子，一名收入为5万美元的工厂工人以及他按照这个金额缴纳的税金。

“如果机器人做同样的工作，”盖茨先生说，“你会想，我们应该按同样的比例对机器人征税。”（《抢走你饭碗的机器人应该缴税，比尔·盖茨》，2月17日）

盖茨先生建议政府对使用机器人的公司征税，作为减缓自动化扩张的一种方法。这些由机器人拥有者或制造商缴纳的税款将用作保留人类工人的资金。以前的工厂工人及其他工人将转到教育、健康服务等必须由人操作的领域继续就业。他说，这样的政策通过有意降低自动化采用速度，为管理自动化转变赢得了时间。

Quartz编辑Delaney评论说，这个主意相当于按照效率征税，对大部分传统经济人士来说，可能是个诅咒。他写道，几十年来，“自动化的主导观点是将被替换的工人转到更有成效的角色，从而发展整体经济。”

但是Delaney承认这种论点“已经出现裂缝”。盖茨先生的关注点在于降低处于人机交界面的工人在这段时期的压力，他坚信，自由市场无法处理这种转换速度。他认为，政府背负着管理自动化影响的主要责任，适当的调整期很有必要。

- ④ 盖茨先生的另一个观点是，如果自动化带来的是限制技术的抵制运动，自动化就不会繁荣发展。他向Quartz强调了在接下来的20年内，取得大众对自动化和人工智能的认可非常重要。他认为，20世纪曾经出现过稳定、渐进的劳动力替代，对于那些努力适应当前的密集替代的人来说，对工作机器人征税应该具有吸引力。

新闻简报.....

- ⑤ 根据纽约联邦储备银行2月16日发布的一份报告称，2016年美国家庭债务总数的显著增长（12.58万亿美元）主要来自学生贷款和汽车贷款的增长。Katie Reilly在时代杂志报道此事时，提到了去年美国学生贷款达到1.31万亿美元，“突出了吸引两党注意力的学生贷款危机”。在纽约联邦储备银行过去18年的报告中，学生贷款余额持续增长。据Bloomberg报道，自2009年以来，美国未支付的高等教育贷款已经翻了一倍，超出了任何一种家庭贷款类型的增长。

网络安全

- ⑥ 随着越来越多的公司将黑客攻击视为不可避免的事，对成熟防御机制的需求越来越多。但是，根据信息系统审计与控制协会（ISACA）（伊利诺伊州Rolling Meadows）——一个开发并分享IT最佳实践的独立非盈利协会——称，机构

自我保护的努力面临人手严重短缺的威胁。据Information Management的Bob Violino报道(2月28日), ISACA在2016年10月组织的涉及633名美国网络安全专业人士的调查发现, 59%的调查对象说他们的每个招聘职位的应聘人数只有5个, 只有13%的调查对象收到的应聘简历超出20个。(与之对比, 研究表明, 大部分公司招聘职位会吸引160到250个应聘者)。更复杂的问题是, 37%的调查对象表示他们认为应聘者中只有不到四分之一的人满足保持公司网络安全的资质要求。ISACA理事长Christos Dimitriadis告诉Violino, 四分之一的网络安全公司称需要六个月甚至更长时间才能招到重点职位的人选。在欧洲, 几乎三分之一的网络安全职位依然空缺。

- ④ Business New Daily的Shimon Brathwaite称, 小公司为了生存, 尤其要为数据外泄做好准备, 以免真的发生事故。他引用了风险管理网站Experian Data Breach Resolution的一份报告, 列出了关于准备工作的一些要点(《小公司应该准备应对的五种数据外泄威胁》, 2月17日):
- ④ “余震”外泄——上次外泄获取的用户名和密码在黑网上被售出后, 重复出现的未授权登录——在2017年将会继续增加。为了降低密码重复使用的风险, 公司可以实施双重认证来验证用户。二级认证方法可以使用暗号、手机短信提醒、地理定位认证或生物测定学等替代密码;
- ④ 国家之间的网络攻击将从间谍转变成战争。益百利公司认为网络攻击将会继续针对美国, 而且由于缺乏网络空间活动的国际监管协议, 攻击将会增加, 并且升级国家之间的现有矛盾;
- ④ 犯罪分子将关注基于支付的攻击, 因为很多小公司在EMV芯片读取和PIN转移过程中行动迟缓。益百利公司发现采用这种技术存在法律障碍。不过, 它说不采用这种技术的话风险会很高, 因为攻击者已经能够熟练运用更老的技术了;
- ④ 国际数据外泄将会给跨国公司带来大麻烦。加拿大、澳大利亚和欧盟的新法规要求公司通知数据被盗走的客户。为了避免泄露, 益百利公司建议所有机构培训员工如何识别钓鱼式攻击; 确保所有安全软件都装好补丁; 并制定应急计划, 以应对勒索攻击;
- ④ 由于部署新的手机软件会带来新的漏洞, 医疗保健最有可能成为网络犯罪的目标领域。防止数据外泄在这里极其重要, 因为医疗保健客户通常会就对破坏个人信息的情况反应激烈。

电信

美国联邦通讯委员会新任领导人意图重新建立“轻触式”监管方法

美国两大政党少有地团结一致, 督促彻底检查《电信法》, 该法案增强了电信政策, 并界定了美国联邦通讯委员会(FCC)的权力。该法案颁布于1934年, 1996年增加了关于互联网和有线电视服务的条款, 该法案早就应该再接受国会更新了。

去年夏天, 法院判决批准FCC的网络中立规则, 这引发了另一波呼吁行动, 要求国会更加清晰地界定FCC在管理互联网中的角色。2月28日, 在巴塞罗那举行的世界移动通信大会上, FCC新任领导人清楚地表达了他对此事的观点。

美国国际数据集团通讯社负责监控美国政府电信政策的Grant Gross报道称, 理事长Ajit Pai自诩为自由市场的信徒, 坚决反对政府监管。(《新FCC理事长: 网络中立法则是“一个错误”》, 3月1日)

网络中立性被广泛界定为要求互联网服务供应商在不支持或阻碍某个产品或网站的前提下, 提供内容和应用。在Pai先生看来, FCC采用这种规则, 并作为一个受监管的公共通信公司对带宽重新分类, 这些都违背了华盛顿对互联网长期存在的“轻触式”监管方法。

Pai先生认为, FCC的网络中立规则为宽带市场“注入了极大的不确定性”。他断定“不确定性是增长的敌人”, 并暗示自从FCC通过该规则以来, 宽带投入有所下降。不过, 据Gross所说, 一些支持网络中立的人并不赞同。数字版权团队Free Press表示, 与之前的两年相比, 自通过该规则以来的两年内, 宽带投入增长了近9%。

贸易团体美国电信协会说, 2015年来自宽带供应商的资本投资为760亿美元, 与2014年相比略有下降。不过该协会说, 这个数字是自2001年以来的第二高。

④ Verge的Jacob Kastrenakes提供了关于Pai先生的一些背景资料。他是唐纳德·特朗普总统所在的共和党人士, 不过是由巴拉克·奥巴马任命的。Pai先生自2012年起被参议院批准担任FCC委员, 他并不支持特朗普前任总统的进步观点, 也绝不是民主党人奥巴马会挑选作为委员会首领的人。这位新委员能够就职, 得益于奥巴马遵守的一项传统, 那就是允许少数党派(当时是共和党)挑选两名委员, 因为多数党派(当时是民主党)按照法律在五人委员会中最多可拥有三个席位。(《特朗普的新FCC领导是Ajit Pai, 而他却想破坏网络中立》, 1月23日)

汽车

为了打入日本市场, 美国汽车制造商可能要学会敲响喇叭

纽约时报驻东京记者Jonathan Soble观察到, 尽管日本汽车控制了美国的大片市场, 美国品牌在日本很少见到, 路上行驶的多是丰田、本田等国产品牌。Soble说, 去年日本汽车和轻型货车销量约500万辆, 只有15000辆来自美国, 仅占总数的0.3%。他写道: “加州的一个大经销商的丰田销量都比这个数字多。”

这是美国汽车董事长和贸易谈判家们长久以来的困扰, 也让华盛顿的新政府大为恼火。唐纳德·特朗普总统指责日本通过抛出监管障碍和操纵货币市场为日本品牌谋利, 排斥美国制造商。在一月份与美国汽车董事们的一次会面中, 他说: “他们设法使我们无法在日本销售汽车。” Soble指出, 这样的话是在警示日本, 该国的汽车行业是其“经济支柱”。汽车收藏家Yoshihiro Masui倒是适合给出意见, 从他的角度来看, 问题在其他地方。(《特朗普想在日本多卖汽车, 日本司机们并不想》, 2月9日)

“美国车当然在日本不好卖。” Masui先生告诉纽约时报记者。除了带赛车引擎的Model T复制品和一辆闪亮的白色福特雷鸟外, 他这些年来买入卖出了将近70辆底特律生产的汽车。“经销商并没有努力说服人们。我从来没看到过电视广告。去车展也见不到。”

④ “德国车在日本很受欢迎, 但是美国车基本都卖不出去。”日本工商联合会主席Akio Mimura在二月份的一个新闻发布会上说。“如果他们想在日本卖车, 显然(美国汽车制造商)需要努力吸引日本消费者。”

④ “日本车很没劲。” Soble的一位调查对象告诉他。但很显然, 这种看法在日本并不多。看起来, Mimura先生给底特律汽车制造商的第一个建议, 就是去麦迪逊大道学学什么是有说服力的广告。

Dorothy Fabian —— 专题编辑

The principle of online fault location on HVAC and HVDC cables during test and operation

By Dr Frank Böhme, Dr Ralf Pietsch, Highvolt Prüftechnik Dresden GmbH

Abstract

This paper deals with an alternative method for monitoring of long and very long HVAC and HVDC cable systems concerning the detection and localisation of fatal breakdown errors during routine and commissioning tests, as well as under service conditions. The principle is based on Time Domain Reflectometry (TDR) and is compared with the classic method of TDR fault location.

The basic concept is described and explained with theoretical and experimental results. Thereby the theoretical considerations are made by a detailed simulation of the measuring network including HV cable. The practical experiments were performed on MV and HV cable samples under both AC and DC stresses.

The presented technology is implementable for land and submarine cables. Special attention is paid to the measurement technique and to the applicable evaluation by software algorithm. The proposed online fault location requires well-adapted measurement hardware, which keeps its performance under testing and service conditions even when a powerful breakdown occurs.

The hardware mainly consists of an HV divider and a transient recorder. The operation of the measuring system should be completely invisible and long-term reliable until the cable system fails. Therefore, the same HV measuring device is used as it is installed for the HV measurement during cable tests or under service of the cable system. For the latter, the measuring system could also be used for other quality and diagnostic measurements.

Introduction

In the last few years the number of newly installed HV cable systems has largely increased. This was necessary to fulfil the rising demands of the public power networks.

On the one hand it is more and more difficult to find the space for new routes of overhead lines. On the other hand the technique of HV DC transmission systems becomes much more important. Such systems often contain HV cables.

An important example is the connection of offshore wind farms to onshore power nets, where the export cables are long HVAC or very long HVDC submarine cables. Most of these cables are difficult and expensive to access, after laying, and commissioning (with the exception of cables laid in cable tunnels). A simple visual check after a failure is impossible. The well-known fault location method TDR tends to their limits in such cases.

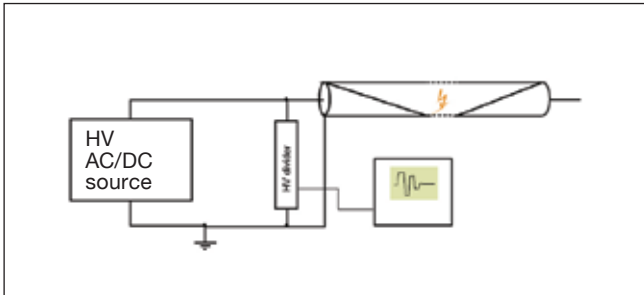
The aim is to provide an online tool and device for fast diagnosis and especially fault location in case of breakdown. For testing such cables and cable systems in the factory and on site a number of standards and recommendations should be considered (eg ^[1], ^[2] and ^[3]).

Concept of Measuring Method

The described TDR method differs from the known classic one. While the classic TDR is applied after the fault event, this method continuously monitors the cable system and evaluates the signals generated by the breakdown itself. That means the measuring system must be connected and in operation during the complete test or the service of the cable.

○ **Table 1:** Comparison of fault location methods

	Classical TDR	Online breakdown TDR
Application	After the fault event, offline	During the fault event, online
Artificial impulse application	Yes for reflection measurement	No signals from the breakdown itself
Reflections from the far end or failure site	Dependent on the kind of fault	None complete breakdown at failure site
Cable length	Some 10km State-of-the-art	>100km expected length
	(more depends on fault type)	(to be verified)



○ **Figure 1:** Principle circuit for online fault location

Only in the case of tests with a separate HV source repeated measurements can this be done. The applied testing voltage can be increased up to a certain voltage level to enforce the breakdown again.

A comparison of the two TDR measurement methods is shown in *Table 1*.

An advantage of the online method is the absence of reflections from the far end. The breakdown causes a very low impedance at its location and the signals are reflected from here. A simplified circuit for online measurements is shown in *Figure 1*.

The measurement on both cable ends with two measuring devices improves the fault location accuracy. Of course, this option depends on the configuration of the power cable system and the access to its cable ends. This option is not considered in the experimental tests yet.

Theoretical Considerations and Simulation

The physics of cables and their behaviour is very complex and has been widely discussed in literature. It shall not be repeated in this paper (example for reference see [4]). Only two basic equations are needed here:

$$v = \frac{1}{\sqrt{L' \cdot C'}} \quad \text{Equ. 1}$$

$$v = \frac{2 \cdot l}{T} \quad \text{Equ. 2}$$

When using this kind of TDR the exact knowledge of the propagation velocity v determines the accuracy of the fault location. (It differs to the TDR measurement for partial discharge (PD) fault location where only the time relation of the reflections determines the accuracy.)

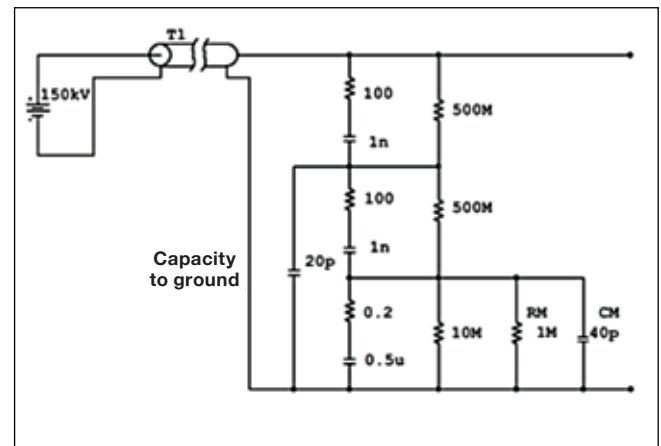
Therefore this propagation velocity has to be known exactly to be determined in advance. When the parameters L' and C' of the cable are effectually known, the propagation velocity can be calculated by *Equation 1*. However, if it is possible, an initial measurement of the propagation velocity should be done for each commissioned cable.

The situation changes when the TDR signals are measured on both cable ends. Then the knowledge of the velocity is not necessary (similar to the PD fault location) and the fault location is calculated by:

$$l_x = \frac{T_x}{T_x + T_y} l_{\text{cable}} \quad \text{Equ. 3}$$

with T_x and T_y as the signal propagation measured from both cable ends. Of course, the calculation by knowledge of the propagation velocity is still valid and the measurements can be verified when the right cable length is also known.

The test circuit was simulated with OrCAD PSpice and with realistic cable parameters[5]. It allows the simulation of the signal propagation in very long cables and the signal distortion by the measuring circuit on the cable end.

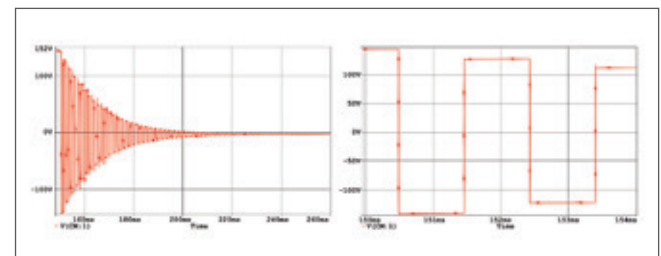


○ **Figure 2:** Simulated circuit

The simulation was made with a cable length of 100km and a propagation velocity of 171.25m/μs. The failure was simulated at a distance of 83km from the cable end where the measuring circuit was connected.

The simulation results in *Figure 3* show a time $T = 970 \mu\text{s}$ and with the aforementioned velocity v the distance to the failure is calculated to $l_x = 83.06\text{km}$. The negligible deviation from the reference value is the result of a slightly inaccurate time measurement of the simulation results.

○ **Figure 3:** Simulation results



Measuring Equipment

The measuring circuit consists of two main components, the HV divider and the transient recorder. While only one type of transient recorder processes the signals from measurements on AC and DC cables, the HV dividers differ for AC and DC applications.

A capacitive HV divider is preferably used for measurements on AC cables. For DC cables a broadband divider with a resistive arm is necessary to achieve the required response characteristic. This response characteristic is also essential when other voltage measuring devices are taken for the online TDR measurements, eg instrument transformers which are installed in power nets. Their ability has still to be approved.

The triggering of the signal processing is also essential for the measuring quality and accuracy. The simulation and experiments confirmed that a simple edge triggering is sufficient on DC cable systems. On AC cable systems the operational voltage itself prevents such simple edge trigger. A very fast breakdown detection device is therefore implemented to release the signal processing.

The required components of the transient recorder depend on its application for cable testing or monitoring. The recorder for cable testing is a small plug-in device which operates by its own PC or by that of the computerised HV test system. It mainly contains the measurement hardware (Figure 4).



○ Figure 4: 3D models of transient recorders for cable tests (left) and cable monitoring (right)

The recorder for cable monitoring is a robust and small stand-alone device. Besides the measurement hardware it contains a PC with especially adapted software. This PC runs continuously over years, can be restarted and operated remotely and must be supplied by an uninterrupted power supply (UPS) just in case the cable fails (Figure 4).

Experimental Tests

Practical measurements on different cable samples were carried out to prove the measuring principle and the simulation results.

Thereby the AC or DC cable samples were wound on cable drums or turntables.

AC cable (XLPE, 20 kV)

The test configuration consisted of two MV cables connected together in series and of slightly different lengths (Figure 5).

Parameters:

- Cable 1: 758m
- Cable 2: 708m
- Further parameters: unknown
- AC voltage: up to 10kV, 50Hz, connected to near end of cable 1 (see Figure 1, Figure 6)
- Measurement equipment: transient recorder for fault location, broadband divider (resistive-capacitive), AC high voltage divider (undamped capacitive)

The artificial breakdown was generated by using a spark gap (Figure 5) which was installed either at the far end of the complete cable length or at the connection point between the two cables.



○ Figure 5: AC cable with spark gap (detail)

The voltage was increased up to 10kVrms until the spark gap was fired. The resulting signals of the travelling waves were recorded.

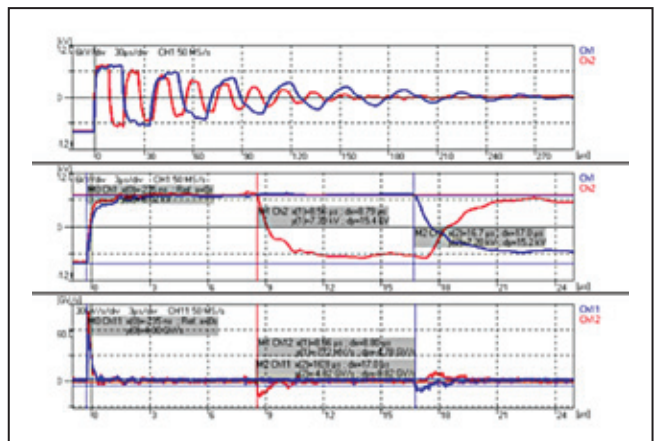
The signals were taken from the HV circuit using a resistive-capacitive broadband divider (for reference measurements) or an undamped capacitive HV AC divider of type WCF^[6] (Figure 6).



○ Figure 6: AC source and HV divider

The HV divider output was connected with the transient recorder by a coaxial measuring cable. The reference measurement with the broadband divider is shown in Figure 7.

○ Figure 7: Measurement with broadband divider



Thereby channel 1 (Ch1, blue) shows the signal reflections when the spark gap is connected at the far end of both cables and channel 2 (Ch2, red) shows the signal reflections when the spark gap is connected to the connection point between the cables.

The upper diagram is the complete signal recording over about 300µs. In the middle diagram the first and the second reflection are zoomed out. In the lower diagram the differentiated curves are shown with Ch11 related to Ch1 and Ch12 related to Ch2.

From this measurement the propagation velocity is determined to $v = 172.5\text{m}/\mu\text{s}$ based on $T = 17.0\mu\text{s}$ of Ch1 and according to Equation 2. Now the $T_r = 8.79\mu\text{s}$ of Ch2 indicates exactly the length of the cable sample of 758m.

Assuming an uncertainty of $\pm 0.2\mu\text{s}$ of the time evaluation for both full length and partial length, the following cable lengths to failure can be estimated.

		$T_{\text{partial length}} [\mu\text{s}]$		
		8.77	8.79	8.81
$T_{\text{full length}} [\mu\text{s}]$	$v [\text{m}/\mu\text{s}]$	calculated length [m]		
16.8	170.5	748	749	751
17	172.5	756	758	760
17.2	174.5	765	767	769

Table 2: Calculated cable lengths for different signal propagation times

Based on the determined cable length of 758m the maximum deviation is 11m, which is 0.75 per cent of the full cable length.

Furthermore, the measured signal shows a significant decline. This comes from the damping of the cable itself and from its dispersion.

Comparison of the waveforms in Ch1 and Ch2 show that the reflection losses are also a substantial part of the cable losses, because the decrease of the voltage as a function of the number of reflections is more or less constant.

After this initial test the same measurements with an undamped capacitive divider were carried out. The goal was to find out if it is possible to get usable results of fault location even with a voltage divider with a lower bandwidth (Figure 6).

Figure 8 shows the results of a measurement with a divider type WCF normally used in resonant test systems for cable tests. It is clear to see that such a divider is actually not suitable for such fast transient measurements. Nevertheless, there is still a possibility to evaluate a fault position.

In the lower diagram of Figure 8 the curves are filtered with a numerical low-pass Bessel filter to find the transition points of the reflection. Assuming a well-known propagation speed ($172.5\text{m}/\mu\text{s}$) the fault can be located at 759m. But it is clear that the uncertainty of determination is much higher than before.

A second test with the same divider was performed, but this time the divider type WCF was damped with a resistor of 150Ω .

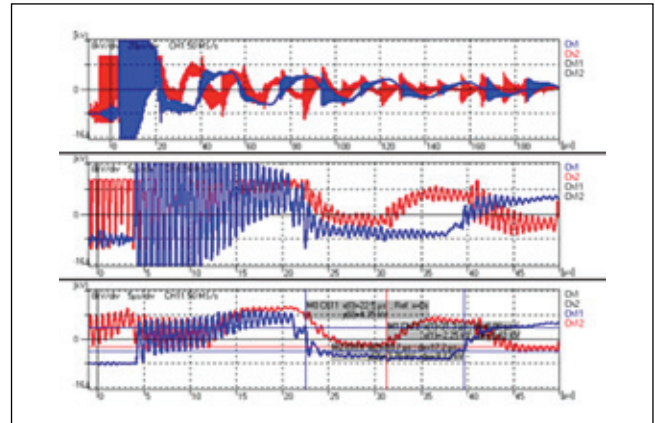


Figure 8: Measurement with divider type WCF, undamped

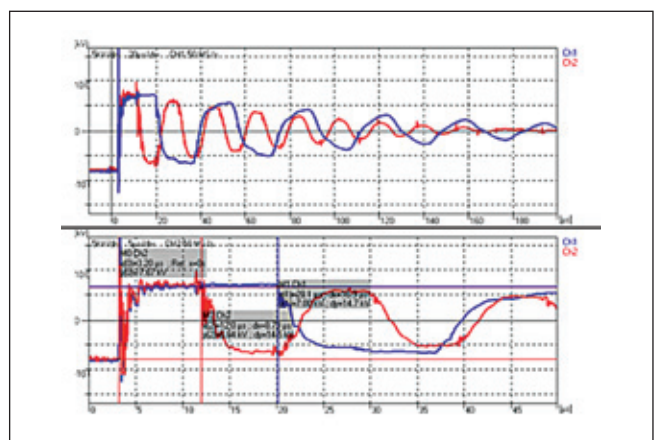


Figure 9: Measurement with divider type WCF, damped with 150Ω

It is shown that the damping resistor eliminates the majority of the oscillations after the transition in the waveform. Therefore, a further filtering is not necessary for the evaluation. As before, the fault can be located with the well-known propagation velocity: the result of the calculation is 758m.

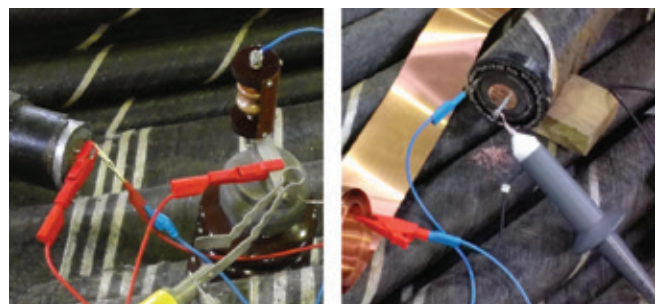
DC cable (PE (for DC), > 100kV)

The test configuration consisted of one cable on a turntable. The cable was connected to an adjustable DC source.

The breakdown test was performed by using a spark gap at the far end of the cable (Figure 10).

The voltage was increased until the spark gap got fired. The resulting travelling waves were recorded.

Figure 10: DC cable, detail spark gap and attenuator



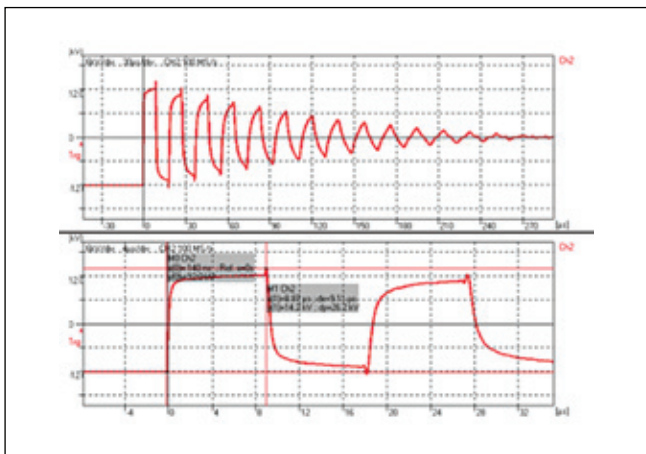


○ **Figure 11:** Measurement equipment

Parameters:

- Cable: 779m
- Capacity: 310nF/km
- Inductivity: 110μH/km
- Voltage: up to 12 kV, DC, both polarities
- Measurement equipment: transient recorder for fault location, broadband divider (resistive-capacitive attenuator) (Figure 10, Figure 11)

The same measurements as with the AC cable were performed.



○ **Figure 12:** Measurement with broadband attenuator and negative DC voltage

From Equation 1 the propagation velocity v_0 can be calculated as 171.25m/μs. With that information the cable length l_1 can be determined.

As a cross check the propagation velocity v_0 was calculated from the measurement with the known cable length l_0 .

Voltage kV	Cable length l_1 with known v_0 [m]	Velocity v_1 , with known l_0 [m/μs]
+ 6.5	778	171.4
- 6.5	776	171.7
+ 11.5	780	170.9
- 11.5	777	171.7

○ **Table 3:** Calculated cable lengths and propagation velocity

The maximum deviation from the reference values is < 0.4 per cent.

Field Tests, Conclusions

The experimental tests have shown the practical feasibility of the proposed method for fault location on AC and DC cables.

They also have shown that damping and dispersion of the measured signal depend strongly on the monitored cable.

Nevertheless, the experiments have been limited to a relatively low voltage and to a short cable length. There has been no further knowledge about the behaviour of cables which are laid in the soil or in the sea.

It is assumed that the much higher voltage during test or operation will have a positive effect on the measured signal. It is also presumed that the dispersion and damping on a laid cable is lower than on the drum or turntable.

Furthermore, the reflection losses as seen in the measurements should not play a big role in a real situation.

All of these assumptions are not proven so far. Therefore, the results of the described tests can be taken as a first step, which has to be continued with field tests on laid cables.

The proposed method might be helpful as a monitoring tool during commissioning or routine tests on long cables, but also as an always-online tool to monitor the cable under service conditions.

In case of a fatal breakdown the monitored signal shall help to find the location of the fault in a very short time and without further investigations.

References

- [1] CIGRÉ 490. Recommendations for Testing of Long AC Submarine Cables with Extruded Insulation for System Voltage above 30 (36) to 500 (550)kV
- [2] CIGRÉ 496. Recommendations for Testing DC Extruded Cable Systems for Power Transmission at a Rated Voltage up to 500kV
- [3] IEC 62067. Power cables with extruded insulation and their accessories for rated voltages above 150kV ($U_m = 170kV$) up to 500kV ($U_m = 550kV$) – Test methods and requirements
- [4] CIGRÉ 297. Practical aspects of the detection and location of partial discharges in power cables
- [5] Leibner, Sebastian, Untersuchungen zur Fehlerortung an langen HVDC-Kabeln, Diplomarbeit, 2013
- [6] Highvolt data sheet 1.31/4, AC Capacitor, Type WC

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测试和运行过程中高压交流电 (HVAC) 和高压直流电 (HVDC) 电缆的在线故障定位原理

作者: Frank Böhme 博士, Ralf Pietsch 博士, Highvolt Prüftechnik Dresden GmbH

摘要

本论文介绍了在常规和试运行测试期间以及运行条件下, 检测和定位较长和超长 HVAC 和 HVDC 电缆系统的严重故障错误的可选方法。本文以时域反射法 (TDR) 为理论基础, 并与经典的 TDR 故障定位法进行了对比。

基本概念已通过理论性和实验性结果进行描述和分析。因此理论思考是通过包括高压 (HV) 电缆的测量网络的精细模拟而得出。实践实验分析了中压 (MV) 和高压 (HV) 电缆样本在交流 (AC) 和直流 (DC) 电压应力下的性能。

本文所述技术可应用于陆地和海底电缆。重点关注的地方是测量方法和软件算法的适用评估。本文所述的在线故障定位需要配备适应良好的硬件, 即便在严重故障错误发生时, 也能在测试和运行条件下保持性能。

所述硬件主要包括一个高压分压器和一个瞬态记录器。测量系统在电缆系统出现故障前, 其运行应保持完全不可见以及长期可靠性。因此, 所使用的测量设备正是在电缆测试或电缆系统运行期间所安装的设备。因为该测量系统也能用于其他质量和诊断测量。

概述

去年新安装的高压电缆系统数量大幅增长。这一举措是为了满足不断增加的公共电网需求。一方面, 为新的高架电缆寻找安装线路越来越困难, 另一方面, 高压直流电传输系统的技术变得更受重视。这些系统常常包括高压电缆。

举一个重要实例, 将近海风力发电场连接至陆地电力网时, 需要采用的出口电缆是较长的 HVAC 或超长的 HVDC 海底电缆。这些电缆在敷设和运行后, 往往很难再接近, 或者需要很高的成本和技巧才能接近 (敷设在电缆通道中的电缆除外)。一旦出现故障, 无法进行简单的人工检查。在上述情况下, 即便是广为人知的 TDR 故障定位法也无计可施。

本文的目的是介绍一款能够在发生故障时进行快速诊断和故障定位的在线工具和设备。

在工厂和现场检测上述电缆和电缆系统时, 需要考虑一些标准和建议 (例如 [1]、[2] 和 [3])。

测量方法概念

本文所述的 TDR 方法与已知的经典方法不同。经典 TDR 方法是在故障发生后使用, 本文中的方法则会持续监控电缆系统, 并评估故障自身生成的信号。因此, 该测量系统在整个

	经典 TDR	在线故障 TDR
应用	出现故障后, 离线	故障期间, 在线
人造脉冲应用	对反射测量表示肯定	无来自故障自身的信号
来自远端或故障位置的反射信号	取决于故障类型	故障部位没有完全崩溃
电缆长度	约 10 千米 一流的 (更多取决于故障类型)	>100km 预期长度 (待验证)

○ 表1: 故障定位方法对比

电缆测试或运行期间, 必须时刻保持连接和运行状态。只有采用单独高压电源的测试, 重复测量才可实现。可将测试电压升高至特定电压电平, 以促使故障再次发生。

两种 TDR 测量方法在表 1 中进行了对比。

在线测量方法的优势在于没有来自远端的反射。故障部位会产生很低的阻抗, 从而生成反射信号。在线测量方法的简化线路可参见图 1。

用两个测量设备测量电缆两端, 可提高故障定位的准确性。当然, 这一方案取决于电力电缆系统的配置以及到达电缆两端的方式。目前在实验测试中尚未考虑该方案。

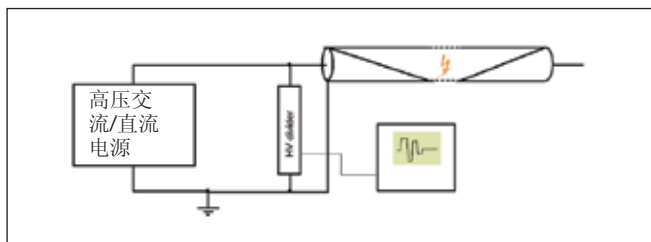
理论思考和模拟

电缆的物理特性和运行状况十分复杂, 在文献中已有广泛讨论。本文在此不再赘述 (参考示例请参见 [4])。此处只需两个基本方程式:

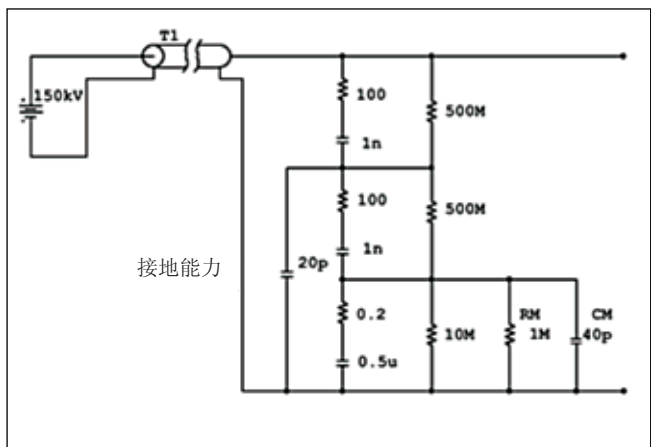
$$v = \frac{1}{\sqrt{L' \cdot C'}} \quad \text{方程式 1}$$

$$v = \frac{2 \cdot l}{T} \quad \text{方程式 2}$$

采用本文的 TDR 方法时, 对传输速度 v 的精确了解决定了故障定位的准确性。(而局部放电故障定位的 TDR 测量方法则不同, 在该方法中, 只有反射的时间关系才会决定定位的准确性。)因此需要提前确定传输速度的精确值。当有效获取电缆参数 L' 和 C' 后, 便可通过方程式 1 计算传输速度。但是在可行条件下, 应对每条运行电缆的传输速度进行初始测量。



○ 图1: 在线故障定位的原理线路



○ 图2: 模拟线路

在测量电缆两端的TDR信号时，情况会发生变化。这时便没有必要获取传输速度（与局部放电故障定位类似），故障定位的计算方式为：

$$l_x = \frac{T_x}{T_x + T_y} l_{cable} \quad \text{方程式 3}$$

用 T_x 和 T_y 作为从电缆两端测得的信号传输。当然，通过传输速度计算得出的值仍然有效，当获知电缆的正确长度时，还可对该测量值进行验证。

测试线路由OrCAD PSpice电路仿真程序和真实电缆参数模拟生成^④。它可以对超长电缆的信号传输以及测量线路在电缆终端造成的信号畸变进行模拟。

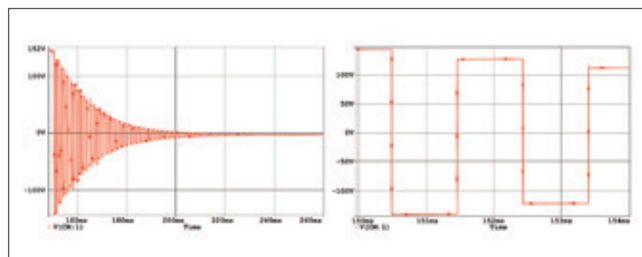
模拟中采用的电缆长度为100千米，传输速度为171.25m/μs。模拟中的故障位置距离上述电缆终端83千米，该位置连接了测量线路。

图3中的模拟结果显示，时间 $T = 970\mu s$ ，再结合上文所述的速度 v ，计算出故障部位的距离 $l_x = 83.06km$ 。所得结果与参考值相比略有偏差，该偏差由模拟中的时间测量误差导致，可以忽略。

测量设备

测量线路包括两个主要组件：高压分压器和瞬态记录器。来自交流和直流电缆的测量信号，由同一类型的瞬态记录器进行处理，但交流和直流电缆使用的高压分压器却不同。

对交流电缆的测量首选电容性高压分压器。对于直流电缆，若要取得所需的响应特性，需要使用带电阻臂的宽带分压器。使用其他电压测量设备（如电力网中安装的仪表变压器）进行在线 TDR 测量时，响应特性同样十分关键。它们的性能仍待审批。



○ 图3: 模拟结果



○ 图4: 电缆测试用瞬态记录器（左）和电缆监控仪（右）的3D模型

触发信号处理对于测量的质量和准确性也十分关键。通过模拟和实验可以得出，在直流电缆系统上只需进行简单的边缘触发。在交流电缆系统上，工作电压自身便可阻止上述简单的边缘触发。因此可安装一个超快速故障检测设备，用于释放信号处理。瞬态记录器所需的组件取决于它被用于电缆测试还是监控。用于电缆测试的瞬态记录器是一个小型内置设备，依靠自身计算机或某个计算机化的高压测试系统运行。它包含的主要是测量硬件(图4)。用于电缆监控的瞬态记录器是一个稳健的小型独立设备。除测量硬件外，它还包括一个配有特别改编软件的计算机。此计算机连续运行多年，需要通过远程控制进行重启和操作，而且必须由不间断电源(UPS)供电，以免电缆发生故障(图4)。

实验测试

通过对不同电缆样本进行实践测量，来验证测量理论和模拟结果。因此这些交流或直流电缆样本被缠绕在电缆卷轴或转盘上。

交流电缆（交联聚乙烯，20 kV）

测试配置包括两条长度略微不同的串联中压电缆(图5)。

参数：

电缆 1: 758m
电缆 2: 708m

其他参数：

未知
交流电压：高达10kV，50Hz，连接至电缆1的近端（参见图1和6）

测量设备：

用于故障定位的瞬态记录器，宽带分压器（电阻性-电容性），交流高压分压器（无阻尼电容）

○ 图5: 带火花隙的交流电缆（详情）



人为故障通过一个火花隙（图5）生成，该火花隙安装在完整电缆长度的远端，或是安装在两条电缆的连接处。将电压提升至10kVrms，直到火花隙燃烧。记录行波的结果信号。

信号通过一个电阻性-电容性宽带分压器（用于参考测量）或一个无阻尼电容性WCF[®]（图6）高压交流分压器从高压线路中获取。

高压分压器输出端通过一个同轴测量电缆连接至瞬态记录器。宽带分压器的参考测量参见图7。因此，通道1(Ch1, 蓝色)显示了火花隙连接至两条电缆的远端时产生的信号反射，通道2(Ch2, 红色)显示了火花隙连接至电缆连接处时产生的信号反射。上方图表显示了300μs的完整信号记录。中部图表将前两个反射进行了缩小。下方图表显示了不同的曲线，其中Ch11与Ch1相关，Ch12与Ch2相关。

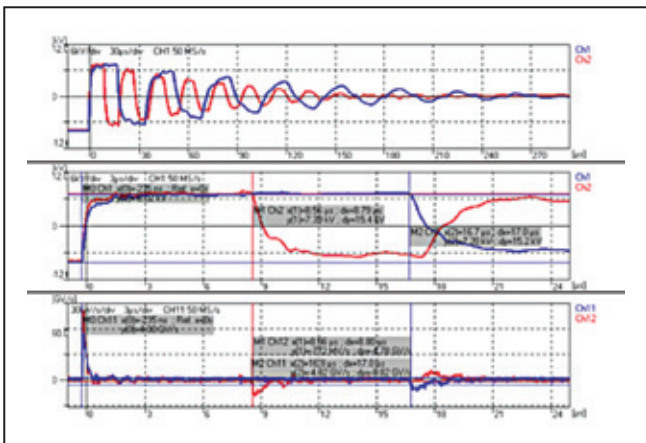
通过这些测量，根据方程式 2 以及 Ch1 时间 $T = 17.0\mu s$ ，得出传输速度 $v = 172.5m/\mu s$ 。如今，Ch2 时间 $T_x = 8.79\mu s$ ，恰好能表明电缆样本的确切长度 758m。

假设全长和局部长度在时间评估上均存在 $\pm 0.2\mu s$ 的不确定性，则能预估出以下故障电缆长度。根据已确定的电缆长度 758m，最大的偏差是11m，占总电缆长度的 0.75%。

○ 图6: 交流电源和高压分压器

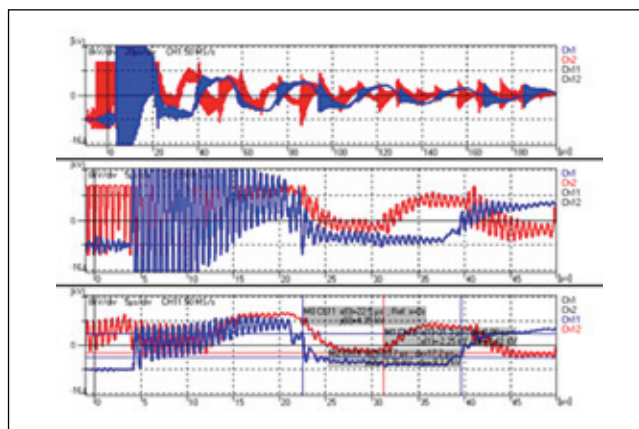


○ 图7: 宽带分压器的测量

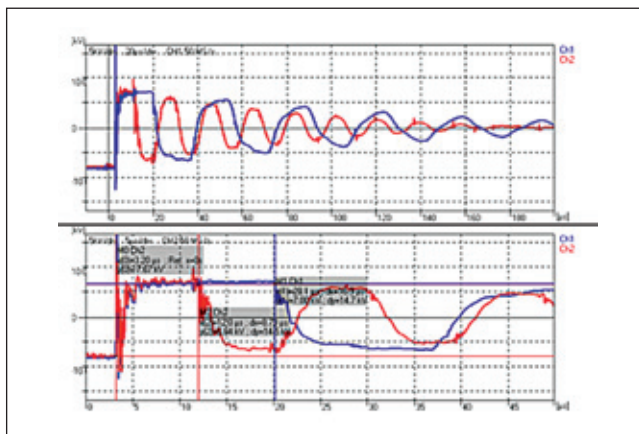


		T _{局部长度} [μs]		
		8.77	8.79	8.81
T _{全长} [μs]	v [m/μs]	计算长度 [m]		
16.8	170.5	748	749	751
17	172.5	756	758	760
17.2	174.5	765	767	769

○ 表2: 不同信号传输时间的电缆长度计算结果



○ 图8: 无阻尼 WCF 型分压器的测量



○ 图9: 带 150Ω 阻尼的 WCF 型分压器的测量

此外，所测得的信号表现出明显减弱。这由电缆自身的阻尼和发散引起。通过对比Ch1和Ch2中的波形，可以看出反射损失也是电缆损耗的一个重要部分，因为电压在反射数的作用下所降低的量基本保持恒定。

在初始测试后，继续采用一个无阻尼电容式分压器进行相同的测量。其目的是确定使用较低带宽的分压器能否得到有用的故障定位结果(图6)。

图8显示了使用WCF分压器时的测量结果，该分压器通常用于电缆测试的谐振测试系统。很明显可以看出，该分压器实际上并不适合上述快速瞬态测量。不过，它仍有可能对故障位置进行评估。在图8中下方的图表内，采用数字低通贝塞尔滤波器对曲线进行过滤，以发现反射信号的转变点。假设传输速度为常见值(172.5m/μs)，则故障位置可能在759m处。但显而易见的是，测量的不确定性比之前高出很多。

采用同样的分压器进行二次测试，不同之处是在WCF 型分压器上加装一个150Ω的电阻。

可以看出，阻尼电阻可以在波形转变后消除大部分振动。因此，无需再为此次评估安排进一步过滤。同之前一样，在常见传输速度下，计算得出的故障位置为758m。

直流电缆（聚乙烯(直流用)， > 100kV）

测试配置包括一个缠绕在转盘上的电缆。电缆连接至一个可调直流电源。故障测试在电缆远端设置了一个火花隙(图10)。升高电压，直至火花隙燃烧。记录行波的结果信号。

参数：
 电缆： 779m
 电容： 310nF/km
 电感： 110μH/km
 电压： 高达12kV，直流，两种极性
 测量设备： 用于故障定位的瞬态记录器，宽带分压器（电阻性-电容性衰减器）(图10,11)

测量方式同交流电缆一样。

根据方程式1，得出传输速度 v_0 的计算值为171.25m/μs。根据以上信息，可以确定电缆长度 l_j 。作为交叉验证，又用已知的电缆长度 l_0 计算出传输速度 v_0 。

与参考数值的最大偏差小于0.4%。

现场测试，结论

实验测试已经证明，本文所述方法在交流和直流电缆的故障定位方面具有可行性。此外还证明，所测信号的阻尼和分散对所监控的电缆具有很强的依赖性。然而，这些实验均限制于较低的电压和较短的电缆长度。目前对于敷设在土壤和海洋中的电缆的运行尚没有进一步的了解。

据推测，测试或运行过程中的较高电压会对所测信号产生积极影响。另外一个推测是，与缠绕在电缆轴或转盘上的电缆相比，敷设电缆会具有较低的分散和阻尼。此外，测量中出现的反射损失在实际情况下应该没有很大影响。

图10: 直流电缆火花隙和衰减器详情

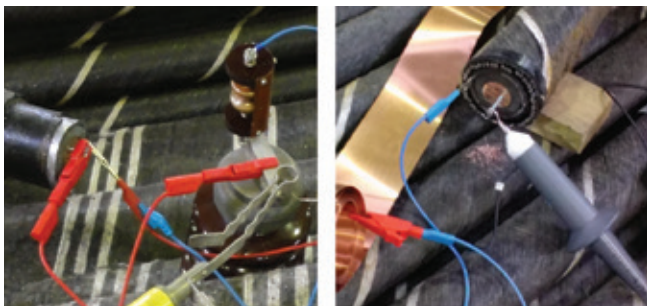


图11: 测量设备

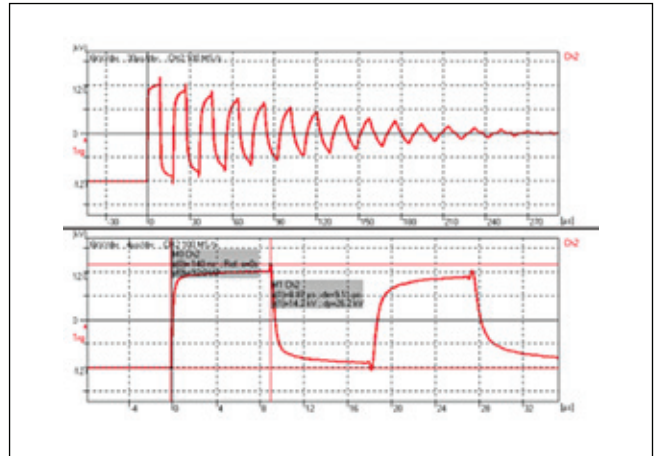


图12: 宽带衰减器和负直流电压的测量

电压 kV	电缆长度 l_j , 已知 v_0 [m]	速度 v_j , 已知 l_0 [m/μs]
+ 6.5	778	171.4
- 6.5	776	171.7
+ 11.5	780	170.9
- 11.5	777	171.7

表3: 电缆长度和传输速度的计算结果

目前这些推测尚未得到证实。因此，本文所述的测试结果可作为初步分析，需要在敷设电缆的现场测试中进一步验证。

本文推荐的方法可用作长电缆运行或常规测试中的监控工具，也能用作运行条件下的电缆的即时在线监控工具。当发生严重故障时，监控所得的信号可用于快速确定故障位置，避免进一步调查的麻烦。

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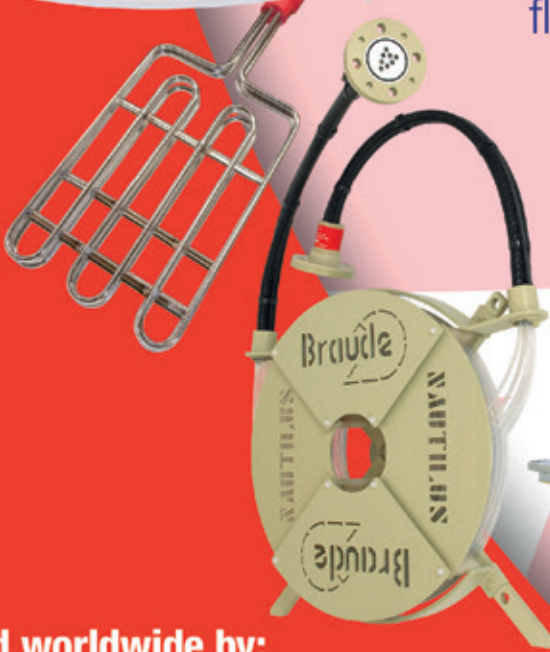
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