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May 2019
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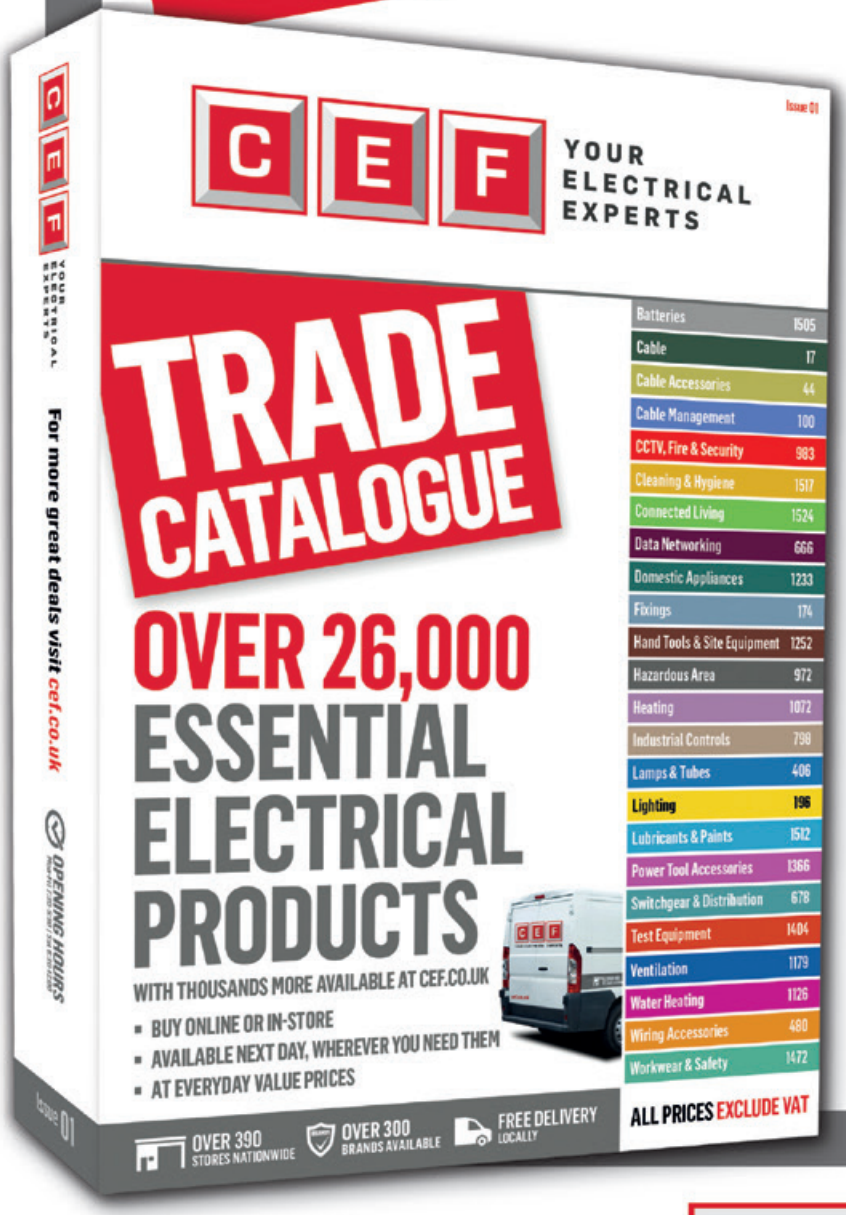

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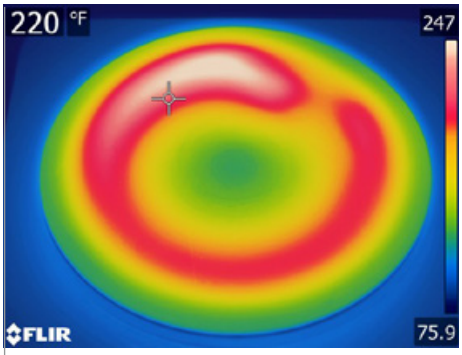

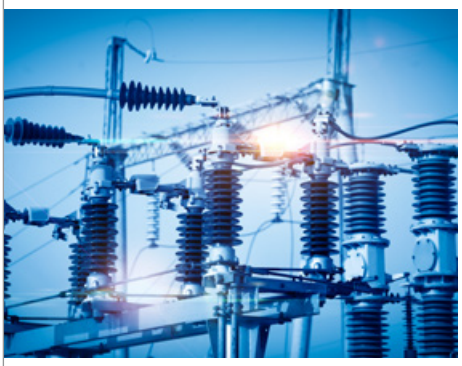

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New fleet of sustainable recycling trucks unveiled by EWRG

The Electrical Waste Recycling Group (EWRG) has unveiled its new fleet of sustainable recycling trucks with a bang at a special launch event.

EWRG has driven investment towards ensuring the fleet is up-to-date with vehicle emission standards to meet inner city emission requirements. The new trucks are packed with the latest driver aids including, five camera safety aids with real-time recording, plus pedestrian and cyclist safety devices. They are also monitored in real-time to ensure driver efficiency, measuring braking, acceleration and idle times.

Attendees of the fleet launch not only had the chance to sit in the cabs and see the world through the fleet's drivers' eyes, but also to tour one of the waste electrical treatment facilities where EWRG recycle 98% of the waste they treat. The announcement of the trucks' names was a significant part of the day, and after a competition run by EWRG encouraging customers, suppliers, staff and drivers to come up with names for each truck, nine names were chosen by a secret panel.

With over a hundred names to choose from, the final nine were: Donald Dump; Lamborgreenie; Recyclesaurus Rex; Recycletron; Bin Diesel; R2WEEE2; OhWEEE van Kenobi; Bumble WEEE; and Artic-WEEElated.

Seaward sparks change in law

A campaign led by UK electrical safety testing expert Seaward Electronic has sparked the introduction of tough new rules for landlords to keep private tenants safe.

Seaward's campaign was backed by Easington MP Grahame Morris, who sponsored an Early Day Motion calling for the topic to be debated in parliament.

The global company, which has its HQ in Peterlee in County Durham, makes electrical testing equipment for the domestic, medical and renewable energy markets.

Its campaign urged policy makers to change the law to require landlords to carry out regular electrical testing in their rental properties.

Morris said, "Seaward's successful campaign, which has been instrumental in changing Government policy, will help to save lives – as well as save families the hardship and pain caused by domestic fires."

But Mr Morris stated the Government needs to go further to ensure the legislation is implemented as quickly as possible.

And Seaward believes the rules need to go further to include portable electrical appliances as well as fixed installations.

Housing Minister Heather Wheeler MP announced a series of measures designed to bring England's policy in line with that of Scotland.

Landlords will be required to undertake five-yearly safety checks, with new guidance being published setting out minimum levels of competency and qualifications for inspectors.

Andrew Upton, managing director of Seaward said, "The new rules are an encouraging step in the right direction, and I'm pleased the Government is taking the safety of tenants seriously.

"However, it's disappointing to see that electrical appliances aren't included in the legislation this time – and we will continue campaigning to ensure this happens.

"I am also keen to see the outcome of the social housing green paper consultation and hope to see similar rules introduced for those tenants."

Andrew explained quick and simple measures such as portable appliance testing (PAT) can highlight problems the tenant or landlord may not be aware of, such as simple wear and tear and appliances that don't meet UK safety standards.

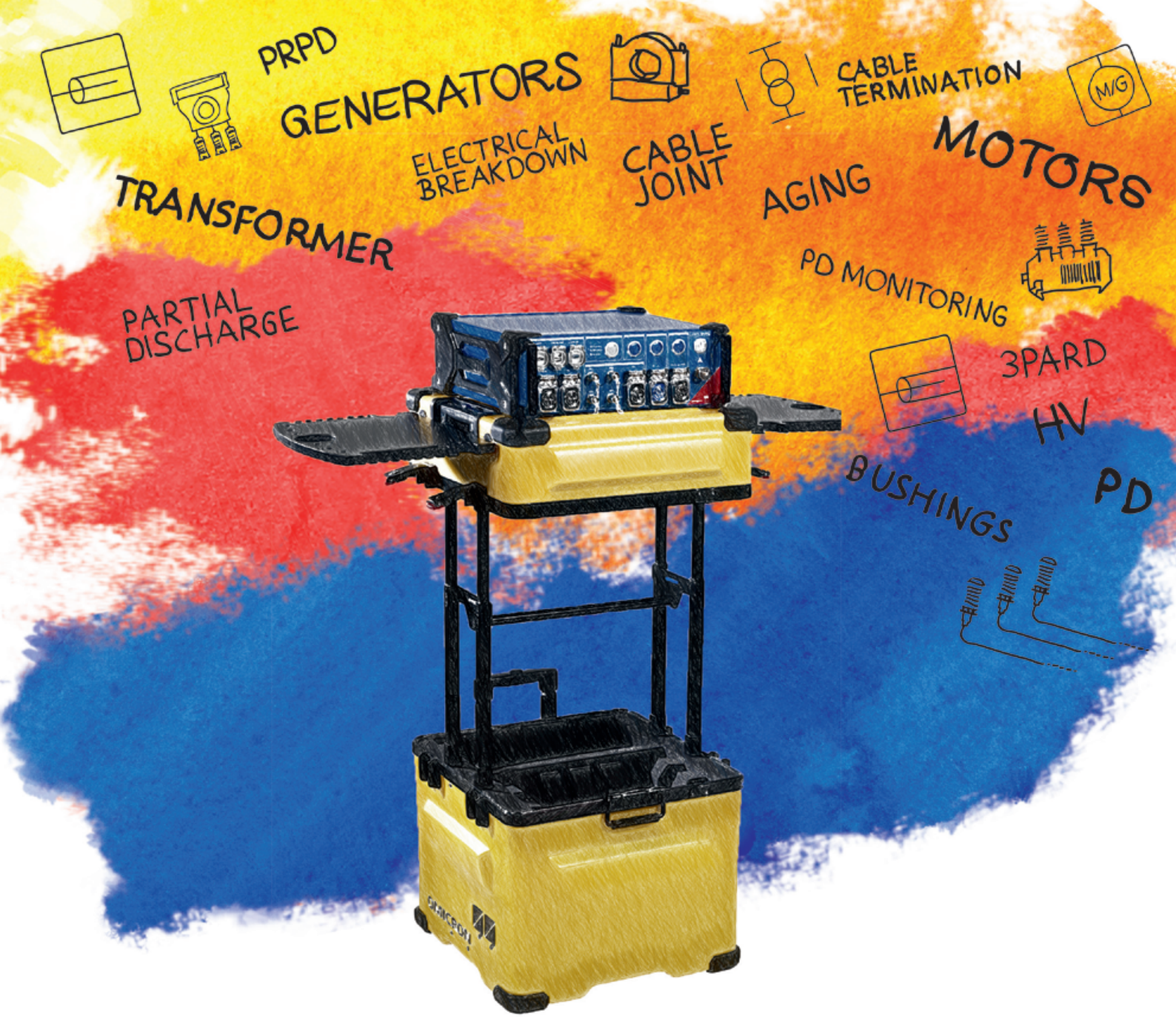
Government statistics for 2017-18 show that faulty electrical appliances were the second largest cause of fires in the UK.

Despite this there is no legal requirement in place for landlords to regularly test any portable electrical appliances they provide in their rental properties.

Grahame Morris added, "I welcome the Minister's announcement; however, we need a clear commitment on when the new legislation will be brought forward and assurances that any phasing of new electrical safety standards will not be prolonged and leave vulnerable families in dangerous sub-standard housing."

"The Government should adopt a standard that all homes should be safe homes and while I welcome the introduction of electrical safety checks within the private rented sector, the same standard should also cover social housing.

"I will be asking Ministers these questions in the weeks ahead, but today we should acknowledge the achievement of the electrical safety campaign run by Seaward."



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Gas overtakes coal for first time in recent history

Rising carbon costs and coal plant closures across Europe have resulted in gas-fired power generation overtaking output from other forms of fossil fuels for the first time in recent history, according to a new report from energy market analyst EnAppSys.

The report showed that gas plants across Europe produced 117TWh of electricity in the first quarter of 2019, compared with a combined 110.9TWh from coal, lignite and gas-to-coal plants. These figures are based upon the reporting of fuel mix through Entsoe, which is a largely complete dataset.

This is a dramatic shift from Q1 2015, when the coal and lignite plants provided more than double the electricity generated by gas plants (159.6TWh against 61.3TWh). Since then, levels of generation at gas-fired plants have risen by 91% whilst levels of generation from coal sources have dropped by almost a third.

Although overall renewable output declined 8% in Q1 2019 due to a significant fall in hydro generation, wind output hit a record high of 105.4TWh. This ensured that wind farms produced more electricity than hydro plants across Europe for the second successive quarter.

Meanwhile, plant outages and closures led to a 4% year-on-year drop in nuclear generation to 204.4TWh – the lowest quarterly output since the start of 2015. However, nuclear was still the dominant power source across Europe in Q1 2019, accounting for 29% of overall generation.

Seventeen percent came from gas plants, 16% from coal/lignite, while hydro and wind each produced 15% of the total. A further 4% came from solar, 3% from biomass and the remaining 1% from oil, peat and waste.

Jean-Paul Harreman, director of EnAppSys BV said, "The report has produced several notable trends in the European power generation market. The transition from coal to gas has been driven by higher-than-usual carbon taxes in Britain, costs associated with the EU Emissions Trading Scheme (EU ETS) and the acceleration of coal plant closures in several countries.

"This trend is likely to continue, with Germany looking to phase out coal quicker than originally anticipated and countries such as Estonia continuing to generate a large share of their electricity from high-polluting oil (or shale oil) sources.

"Much of the nuclear output was generated by power plants in France, although a lot of these plants – and other nuclear plants across Europe – are being phased out so in time these volumes will have to be replaced by alternative sources.

"Some of the slack will be picked up by hydro plants, which historically have contributed the largest share of renewable generation across Europe. However, in Q1 2019 hydro plants produced 7% less than in the previous quarter and 25% less than in Q1 2018.

"The largest source of renewable output in the quarter came from on-shore and off-shore wind farms, which produced 105.4TWh of power – up 8% on Q1 2018 and 57% since the first three months of 2015."

Report highlights increasing demand for skilled electricians

A new labour market report on the electrotechnical industry has estimated that between 12,500 and 15,000 additional skilled electricians will be needed over the next five years to accommodate forecasted growth.

Within this figure, the research suggests that even if an extra 5,000 new apprentices qualified by 2023 (representing a 33% increase), this would still leave a shortfall of 7,500-10,000 electricians needing to be sourced from elsewhere.

Emerging and future technologies are expected to be major drivers for this increase in skills needs over the next decade, with smart technology, e-mobility and Wi-Fi technology named as the top-three forces for change. Other areas that are likely to influence the sector include changes to regulations and public policy in areas such as energy efficiency and fire safety.

Whilst the largest proportion of the UK workforce is between 25 and 49 years old, England and Wales have only around 15% of their workforce under the age of 25, compared to 24% for Scotland and Northern Ireland.

Commissioned by The Electrotechnical Skills Partnership (TESP) and co-funded with industry charity National Electrotechnical Training (NET), the report is the first to provide an in-depth analysis of electrotechnical skills needs in over 10 years. Research specialist Pye Tait compiled the report after surveying almost 450 electrotechnical companies, with around 19,000 employees.

The report confirmed that apprenticeships are still highly rated across the sector and, based on up-to-date calculations published in this research, there is clear potential for a return on investment for those who recruit apprentices.

However, the number of apprentices currently recruited each year is insufficient to meet projected demands and employers identify various barriers to further recruitment, including some candidates' attitudes and behaviours.

They believe more needs to be done to widen the potential pool of applicants and the calibre and diversity of new entrants, for example through improved industry engagement with colleges and schools, and further development of alternative routes into the industry for college leavers, career changers and others from older age groups.

In response to the report and its findings, TESP is now developing an industry action plan to tackle the issues and recommendations raised. Work is already under way in several areas, including the development of new careers resources, promotion of industry-recognised qualifications and activity to forge closer ties between industry, schools and further education. The action plan will also take account of the large numbers of small and micro businesses in the industry, including sole traders, and how these might be better supported in future.

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GOSSAGE

Tempus non fugit

I confess I was always rather impressed by the Demand Response Association. Its public utterances were always pertinent, forceful and 'took no prisoners.' To my shame, I recall back in 2014 gently mocking its then chair, Sara Bell, for announcing that her own company Tempus Energy had lodged a legal action in the European Court of Justice (ECJ). She was petitioning against the entire way that the UK government was awarding funds under its electricity capacity market scheme. Good luck with that, I scoffed.

The court proceedings took a very long while – until November 2018. But to general amazement, the ECJ then found in Tempus Energy's favour. Cue much blustering and condemnation from all of the 'Big Six' electricity companies, each of which seemed to have been relying on receiving the bi-annual, multi-million-pound handouts (worth £5.6 billion to date), available primarily to them under the completely fossil fuel-supply oriented criteria.

They co-ordinated a disinformation campaign caricaturing the court judgement, led by their mouthpiece, the monolithic Electricity UK. All of which seems to have convinced government ministers that the ECJ had merely criticised the administration of, rather than the entire structure of, the scheme.

Cue a fight back from the Demand Response Association? Er, no. Because that association is no more. Back in 2016, it was subsumed into the Association for Decentralised Energy (née the Combined Heat and Power Association). And its new parent association, the ADE, has a number of other members who have – or whose owners have – been substantial beneficiaries of the old capacity market payment arrangements. Not for the first time, the ADE has been left trying to face two ways, and has ended up pleasing nobody.

The result is that, when the entire demand response proposition has created its greatest ever opportunity to break through into the electricity mainstream, there is absolutely no trade association rallying support at all. It is all just left to Tempus Energy and its indomitable CEO, Sara Bell. Concerning whom, I no longer scoff.

Irish stew

The island of Ireland as a whole is heavily reliant on electricity from Great Britain. The Republic and the North have constituted one single energy market ever since the 1998 Good Friday Agreement. Effectively, a discrete energy island – save for just two underwater power links, both of which go to Great Britain.

All this may yet be jeopardised by Brexit. Wary of this, state-owned Irish utility EirGrid is asking the European Commission to approve EU funding, definitely before October 31, for a planned €930 million underwater electricity link across the Celtic Sea to France.

The EU is already funding studies into the feasibility of the Celtic Interconnector project. It is eligible for construction funding as a 'project of common interest' for the EU by enhancing European energy connections. Such projects routinely receive EU funding, but the process normally takes several years.

The project is a joint venture between EirGrid and French utility RTE. They began planning for it well before the Brexit vote. But the vision of a disorderly Brexit has given the project new urgency.

There is no prospect of power flow stopping between the UK and Ireland, because energy trading isn't something that depends on EU membership. But the EU does govern the rules and standards around such flows, and that is what has people concerned.

For instance, if the British and Irish energy markets significantly diverge on energy standards, it could get harder to trade energy between them. It may also be harder to address chronic shortages if the energy regulators are no longer cooperating as they do now via joint EU bodies. Complications could also arise if disputes between the two regulators emerge, because those disputes could no longer be resolved by the European Court of Justice. Yet another Brexit-related conundrum?

A Brazilian cut

For those who despair about the political machinations of Brexitland, here is a cautionary tale from South America, and the way in which the electricity market is run there.

I understand that the previous president of Brazil, Michel Temer, has just been arrested on corruption charges. This is in connection with 'Operation Radioactivity,' the latest phase of Brazil's 'Operation Car Wash' (Operação Lava Jato).

Car Wash is the country's sweeping multi-year probe into corruption, money laundering, bribery and embezzlement, which began in May 2014. Brazilian federal prosecutors now allege that Temer, president of Brazil from 2016 to 2018 – in other words, when the investigation was already ongoing – led 'a criminal organisation'. Specifically, he took bribes in connection with the award of contracts for the construction of the Angra 3 nuclear power plant (on the Rio de Janeiro coast).

The prosecutors maintain that Temer's 'criminal organisation' committed crimes including cartel formation, active and passive corruption, money laundering and fraudulent bidding processes. Also arrested was the former energy minister and governor of Rio de Janeiro, Moreira Franco, making him the fifth governor of the state to be arrested in three years. And if Temer ends up in jail, he will be joining his two immediate presidential predecessors there.

To misquote LP Hartley, Brazil is a foreign country. They do things differently there. After all, nobody is bribing Theresa May for contracts in the building of Hinkley Point C nuclear power station, are they? Are they?

Follow the money

The US Senate recently voted against the proposed Green New Deal programme, designed to combat the threat of climate change by reducing sales of coal, oil and natural gas.

You may be interested to know that, between them, the senators who voted against the resolution accepted last year a total of $55 million in donations from fossil fuel interests.

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PD testing – an effective way to reduce cable failures

Faults on underground power cables are almost always disruptive and costly to fix. So there's a very big incentive to minimise the risk of such faults occurring.

One of the most effective ways of doing this is to use partial discharge (PD) testing, which looks for the characteristic electromagnetic signature of produced by small electrical discharges in air gaps, voids and cavities in cable insulation, and in joints and splices.

These discharges typically start long before these problems develop into a fault, so detecting them early gives time for action to be taken to avert outright failure.

A large percentage of failures on new cables are attributable to poor installation work. PD testing before a new cable is energised will reveal many of the issues, such as improper or incomplete stripping of insulation, improper shrinking of insulating sleeves, or nicks and cuts in the insulation.

> **Being able to predict faults on underground power cables is possible by using partial discharge (PD) testing**

The faults can then be rectified, almost always at the installation contractor's expense, before the cable enters service. PD testing is also an invaluable way of revealing similar issues after repairs have been carried out on a cable.

Regular PD testing on in-service cables provides useful data that can be trended or compared with data from similar cables to flag up changes that need further investigation. It is also an excellent tool for evaluating suspect cables.

While no test method can reveal every incipient fault, PD testing is undoubtedly the best form of "insurance" against cable faults that's currently available. And, considered in the light of the financial impact of a typical cable fault, it's insurance well worth buying.

Author: Tony Walker, Applications Engineer for HV Cable Diagnostics and Fault Location at Megger
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Power on

Buyer beware

Deepak Sharad, category manager for final distribution at Schneider Electric, discusses the importance of making procurement safe for the 18th Edition.

The 18th Edition of the IET Wiring Regulations builds on the changes that were introduced with Amendment 3 of the 17th Edition. The Wiring Regulations establish standards providing rules and guidelines for electricians and contractors for the design, erection and verification of electrical systems with the aim of making installations safer.

The latest regulation changes have been effective from January 2019, so it's key that electricians and contractors get trained and upskill their knowledge to ensure that their installations are compliant.

PROVIDING COMPLETE CIRCUIT PROTECTION

Through best practice, installers can ensure the highest levels of safety for their clients with a comprehensive system approach using a combination of miniature circuit breakers (MCBs), residual current devices (RCDs) and residual current circuit breakers with over current protection (RCBOs). The new regulations further advise on surge protection device (SPD) requirements and recommendations on arc fault detection devices (AFDDs) to give a complete circuit protection solution.

> **The 18th Edition now requires a surge protection risk assessment on installations in many cases**

The new regulations focus on the requirement for SPDs and take into consideration possible transient voltages through the network supply. The 18th Edition now requires a surge protection risk assessment on installations in many cases, unless it is decided to install SPDs irrespective, or there is an outright requirement to install them in the regulations.

The risk assessment can potentially bring its own challenges, as the calculated risk level (CRL) formula involved requires identification of the lengths of high and low voltage overhead lines and underground cables in the last km of the supply network to the premises.

The latest regulations also introduce new technologies such as arc fault detection devices (AFDDs), which help to increase safety as a means of providing additional protection against fires caused by arc faults.

PEACE OF MIND

When choosing products, it's critical to ensure you select safe and compliant systems that are tested and validated to the relevant standards and hold the correct certifications and markings.

Opting for trusted brands from reputable manufacturers, who provide the relevant technical documentation to support appropriate product standards, can help to safeguard the contractor and end client – bringing peace of mind to the installation.

Care and attention should be taken with offer selection to avoid purchasing non-compliant products. These can pose a safety risk and may not be appropriate for UK markets or adhere to product and installation standards.

DON'T TAKE THE RISK

It's sometimes tempting to source and procure outside of recognised industry channels to save money. The reach of the internet can give contractors the opportunity to forgo the traditional supply chain and deal with a community of global sellers that could include unauthorised or unscrupulous suppliers. Understanding your procurement route is critical to avoiding the purchase of counterfeit products inadvertently.

Non-compliant and counterfeit products can pose significant risk and have serious consequences for people and property, as they may not provide adequate protection against fire or electrocution.

Simple safety checks include inspecting the build quality and ensuring that key identifiers such as CE markings, manufacturer's brand, rating and part numbers are present and have not been tampered with.

TRUSTED PURCHASING CHANNELS

It's imperative that whichever supply chain or purchasing platform you choose to buy from, you can trust the goods you're receiving are genuine and compliant for the UK market.

To maintain a robust and safe industry, manufacturers, distributors and installers alike should hold themselves to a duty of care through their respective roles in the procurement value chain. Purchasing through recognised stockist networks reduces the risk and brings assurance that products are genuine and will be supported by the manufacturer's warranty. ER


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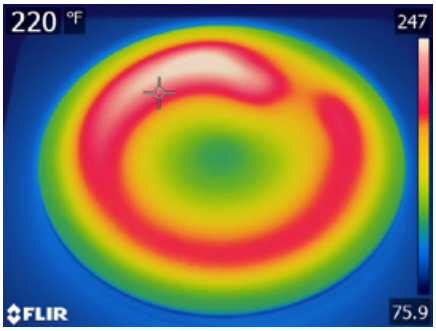
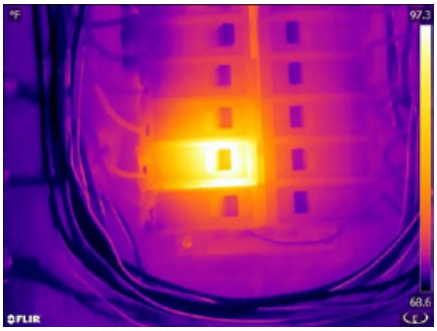
Critical thinking

An IR thermography camera is a useful tool for electrical inspection and data capture – but for an effective IR inspection, you need to be thinking 'FORD', says Andrew Baker, sales director north Europe, FLIR Systems Ltd.





When using an IR thermography camera for electrical inspection and data capture, accuracy is key. Whether the camera-operator is an experienced thermographer, or new to the technology, an important acronym to remember is 'FORD' – FOcus, Range and Distance.

Modern thermal imaging cameras are really smart – but that doesn't mean they can compensate for every miscalculation. Focus, range and distance are critical because none can be adjusted or corrected once a thermal image has been saved.

FOCUS POINT

To ensure images are meaningful and suitable for further analysis, the camera must be in focus, images must be taken in the correct temperature range and at an appropriate distance from the target.

Just like with any camera, whether digital or thermal, it must be optically focused before an image is captured. A blurry image isn't just unprofessional, it also produces inaccurate temperature measurements. Good focus equals better measurement, it's that simple.

HEATING UP

The temperature of the object to be measured must be within the range setting chosen. While many infrared cameras are able to detect and measure target temperature from -20°C to 1,500°C, they cannot do so within the temperature limits of a single image.

Most camera models break up the total temperature measurement specification into a number of defined temperature ranges, covering intervals of temperatures that the detector is able to see and image without going into saturation.

When an image is saved, all the data within a particular range is captured. Any temperature points which fall outside of that range, however, are not. So, being in the right temperature range before the image is saved is critical. This is all about resolution, the ability to resolve areas of thermal detail on an object, but also capture enough information to measure temperatures accurately.

> **Modern thermal imaging cameras are really smart – but that doesn't mean they can compensate for every miscalculation**

GO THE DISTANCE

An infrared image is made up of pixels, individual detectors that sense infrared radiation. All infrared cameras have limits to what they can resolve of a given sized target at a given distance.

Resolution is a function of the number of detectors in the camera and the size, or Field of View (FOV), of the lens. So, it's essential the camera operator gets close enough to put as many detectors on target as possible to ensure the best resolution of the object.

When measuring temperature, a good rule of thumb is to completely fill the spot circle on the measurement tool to ensure the camera is at the right distance to get the most accurate reading.

If the operator is struggling to fill the spot circle, even though he or she has moved as close and as safely to the target as possible, then switching to a telephoto lens (if available) is another option for better accuracy.

UNDERSTANDING THE SCIENCE

Continuous development of infrared cameras for electrical inspection has made the technology eminently affordable, easy to use and flexible to apply. Nevertheless, understanding the science behind thermal imaging is essential to its successful application, so basic training should always be considered with every camera purchase.

The FLIR Infrared Training Centre (ITC) is running a free webinar entitled IR for Electrical Inspection on Friday 31 May 2019. It is a general introduction that covers the basics and is suitable for every electrician, whichever brand of camera they use; to register, go to www.irtraining.eu. ER

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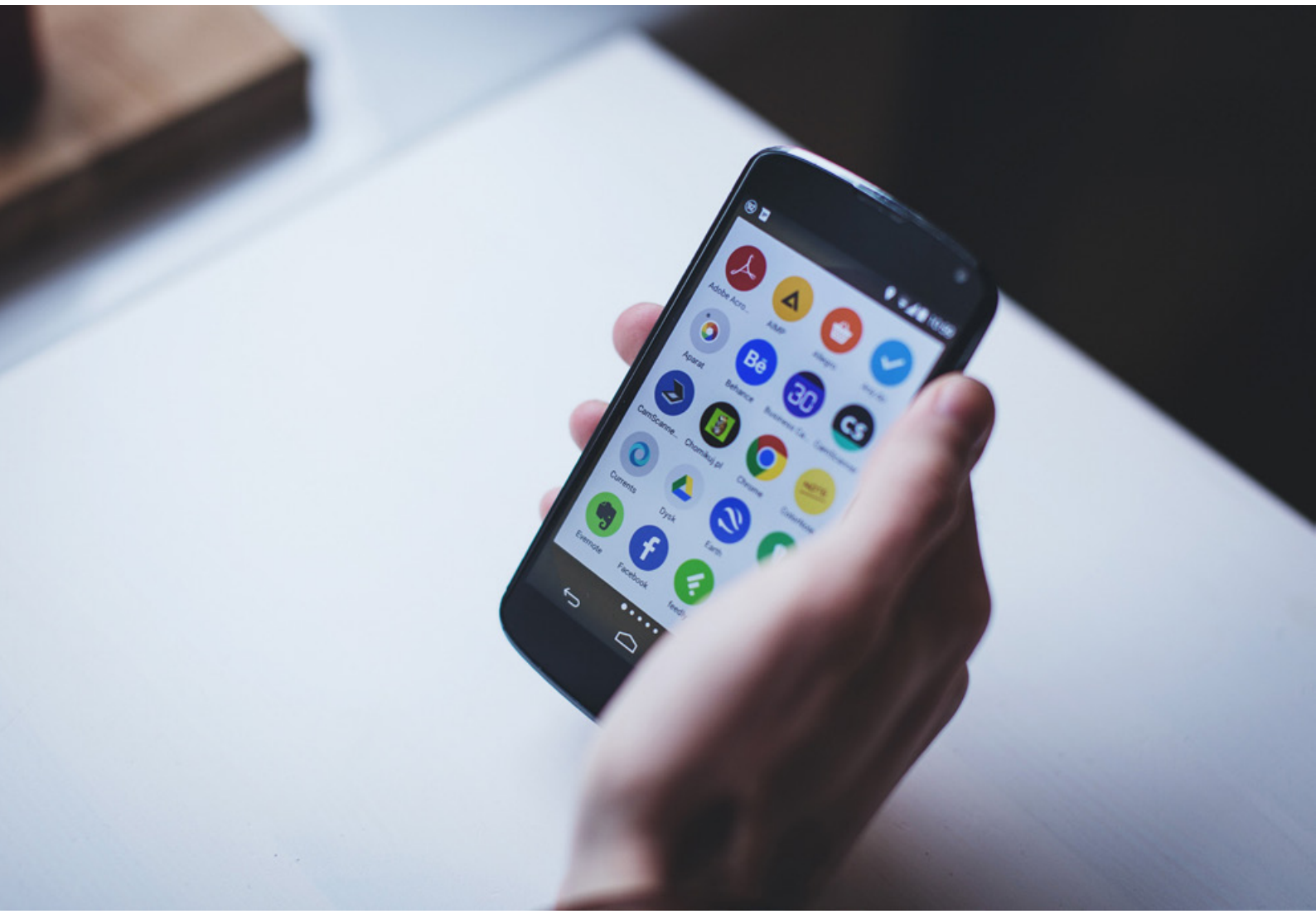


‘Appy hour

TradeSparky outlines a range of handy smartphone tools available from the convenience of your very own pocket.

Due to the vast range of apps that have been developed during the rise of the smartphone, the phrase ‘Is there an app for that?’ has now become a standard response for users when first confronted with a problem. Do you want to find someone locally who just wants a cuddle? There’s an app for that. Do you want to see how far you can throw your iPhone in the air? There’s an app for that. Do you want to know what it feels like to count a million dollars? There’s an app for that.

But with so many apps available in the marketplace, how do you know what is available or if they are any good at solving the problem they have been created for? Thankfully, we have taken the time to sift through the app stores to discover the gems that will make life easier. The apps we have chosen assist with everything from neutral current unbalanced loads to providing quick access to the latest football results.

> **“‘Is there an app for that?’ has now become a standard response for users when first confronted with a problem”**

ELECTRICAL CALCULATOR (£3.99)
iPhone

The Electrical Calculator app provides access to 49 electrical calculators, and also offers 16 electrical converters through in-app purchases. The calculators are complete with formula and handy circuit diagrams, and range from voltage and horse power, to various efficiencies and energy storage calculators.

The electrical convertors accessible through the app include field strength, capacitance and linear current density to name a few. For a full list of functions go to the Apple App Store. A free 'lite' version of the app is also available.

ELECTRODROID PRO (£3.99)
iPhone/Google Play

Electrodroid Pro is an extremely comprehensive and well laid out app which gives you access to approximately 30 electronics tools and references from your smartphone. Functions include a resistor colour code decoder, an Ohm's law calculator, an inductor design tool, an RMS convertor and an analogue-digital convertor, just to name a few. The app is also being continually expanded and updated.

ICERTIFI (FREE WITH SUBSCRIPTION)
iPhone

The iCertifi app has revolutionised electrical certification by allowing users to certify electrical installations directly from their phone without the need to sync to a computer. Each certificate is also completely traceable via the unique serial number, which is generated for each document. The app also includes various integrated tools such as instant fuse kA values and a range of calculators (three-phase volt drop, PFC, lux level, resistance, BTU to watts, kW to kVA) to test instrument verification and iZettle technology for secure payments. An Apple Watch app is also available which allows you quick access to a selection of the functions available.

The app is free, but there is a subscription of £64.99 for 12 months to enable you to send unlimited certificates (three-month and six-month subscriptions also available).

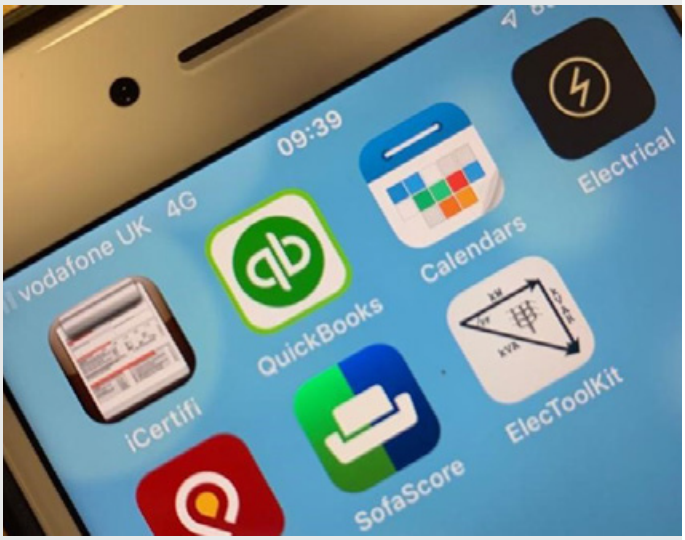
QUICKBOOKS ACCOUNTING (FREE)
iPhone/Google Play

Quickbooks is the best accounting app around. The app is free, but you need to be a subscriber to use it. However, the functionality it provides is well worth the investment. The app allows you to do everything from monitoring profit and loss and sending customer invoices to tracking expenses and reviewing bank transactions on the go. If you are self-employed, there is a 30-day free trial available, and at the time of writing, there is a '£3 a month for the first six months' deal available (usually £8).

CALENDARS BY READDLE (FREE)
iPhone

Calendars by Readdle is a powerful personal assistant which is used by over 8 million people. It is very easy-to-use and works well with both Google Calendar and the built-in iOS calendar. But what makes this app any better than the plethora of other calendar apps available in the apps store?

Well, some of the more advanced functionality includes the ability to manage appointments both online and offline, events can be moved around through a simple 'drag and drop' interface and information can be changed rapidly with custom keyboards. Also, for an extra £6.99, additional features such as meeting invites, natural language input and to-do lists are available.



PETROLPRICES (FREE)
iPhone/Google Play

The PetrolPrices app allows you to search and find the cheapest fuel prices within a 30-mile radius of your location. Results can be filtered by fuel type (unleaded petroleum, diesel, super unleaded, premium diesel, LPG fuel), station and distance, and detailed information including a route finder is provided for each station. The app provides coverage of 98% of UK forecourts and the makers claim that users can save up to £240 a year on fuel.

SOFASCORE LIVE SPORTS RESULTS (FREE)
iPhone/Google Play

SofaScore is an essential app that will let you keep a close eye on the game, in real time, in between appointments. It is available for Apple and Android Wear watches to allow you a quick glance at the score on-the-go and provides coverage for all leagues and competitions in 22 sports including football, rugby and cricket. Other features include detailed player analysis, a chat section and TV channels information. ER

Easy on-line PD measurement and monitoring

Frank Zokoll, Product Manager
OMICRON Energy Solutions GmbH, Berlin

The constant availability of medium- and high-voltage electrical assets used in the generation, transmission and distribution is important for a reliable power supply at both utilities and also industrial plants. Partial discharge (PD) is considered to be one of the major contributors to the degradation and failure of insulation systems in electrical assets.

Because PD activity is often present well in advance of insulation failure, asset managers can assess it over time and make informed strategic decisions regarding the timely repair or replacement of the equipment before an unexpected outage occurs. PD detection is therefore essential to ensure the reliable, long-term operation of electrical equipment.

Although users consider PD detection and monitoring as beneficial for trending insulation conditions in electrical assets, the system installation and data analysis were often too complicated and time-consuming for the average user. In addition, users wanted a system that is more flexible for short-term and long-term use on multiple assets, rather than investing

MONTESTO 200

in multiple systems. That is why OMICRON decided to develop a portable on-line PD measurement and monitoring system that is easier to install and use on various assets in the field.

ONE SYSTEM FOR VARIOUS APPLICATIONS

OMICRON's MONTESTO 200 combines on-line partial discharge (PD) measurement and temporary on-line PD monitoring functions into one portable system. The IP65 rated MONTESTO 200 can be used both indoors and outdoors for insulation condition assessments on various medium-voltage and high-voltage electrical assets under load, including motors and generators, power transformers and power cables. This versatility makes it possible for users to only invest in one system for assessing the insulation condition status of electrical assets throughout a utility or industrial plant.

For temporary PD monitoring, MONTESTO 200 can be mounted to a surface on or near the asset and then left unattended.

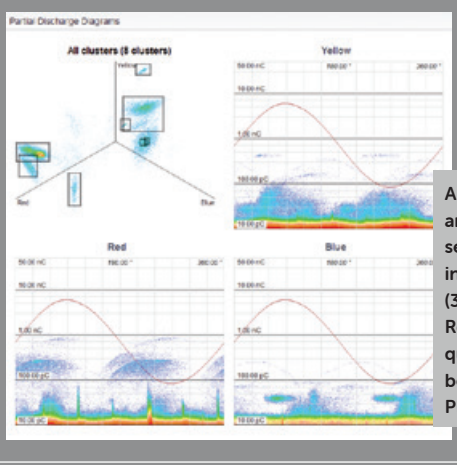
PLUG-AND-PLAY CONNECTIONS TO VARIOUS PD SENSORS

MONTESTO 200 is designed for use with a variety of PD measurement sensors from OMICRON and other suppliers, including coupling capacitors for rotating machines, bushing tap sensors and UHF drain-valve sensors for power transformers, as well as high-frequency current transformers (HFCTs) for power cables.

These PD measurement sensors can be permanently installed and connected to MONTESTO 200 via OMICRON's Terminal Box, which is also permanently installed at the asset. This enables safe and convenient plug-and-play connections while the asset is on line to avoid unnecessary downtime during setup.

EASY ON-SITE PD MEASUREMENTS

The lightweight and compact MONTESTO 200 comes with all the necessary connection cables in a wheeled case that is easy to transport to various locations for on-line PD measurements on site. The system's wide measurement frequency range can be freely adjusted to ensure an optimal signal-to-noise ratio. PD measurement data streams can be recorded and replayed later for detailed analysis.



All signal sources are automatically separated as clusters in the 3PARD (3-Phase Amplitude Relation Diagram) to quickly differentiate between noise and PD for each phase.

MONTESTO 200 is connected to pre-installed PD sensors via a terminal box for easy on-line PD measurements.

The convenient web interface allows users to remotely set up the system and access data.

REMOTE MONITORING SETUP AND DATA ACCESS

For temporary PD monitoring, users can easily mount MONTESTO 200 to a surface on or near the asset, connect it to the Terminal Box, and then leave it unattended. PD monitoring sessions can be quickly set up in less than 10 clicks of a mouse. MONTESTO 200 features a built-in computer that enables long-term data collection and archival. Users can access this computer from any remote location to set up monitoring sessions and to view the collected PD data with the system's convenient web interface. Users can also configure the system to automatically send email alarm notifications when PD levels exceed user-defined thresholds.

USER-FRIENDLY SOFTWARE

The MONTESTO 200 software simplifies system setup, PD data analysis and reporting. Unique software features, such as 3PARD (3-Phase Amplitude Relation Diagram) and Automatic Cluster Separation, automatically separate noise from PD signals to help users quickly and reliably determine the signal source. Data from third-party sensors can also be easily integrated for correlation with the PD data.

VARIOUS APPLICATION AREAS

MONTESTO 200 is intended for use by asset manufacturers, maintenance teams at utilities and industrial sites, as well as service providers for convenient on-line PD measurements and temporary PD monitoring. The two-in-one solution can be used, for example, to clarify asset insulation issues during warranty periods; to periodically check insulation condition during an asset's service life; to identify insulation issues that require immediate attention; to observe assets at risk over extended periods of time; and to plan maintenance and investment based on asset condition.

OMICRON has several years of experience in the field of PD measurement, monitoring and analysis on medium-voltage and high-voltage assets with customers in the asset manufacturing, power utility and industry sectors all over the world.

www.omicronenergy.com/montesto200

Frank.zokoll@omicronenergy.com

Product Manager MONTESTO 200

Getting smart

Paul Stead, head of sales and marketing at Saftronics Ltd, examines how the smart industry is affecting switchgear.

With over 40 years' experience of design and manufacture of low voltage switchgear, Saftronics Limited has kept at the forefront of electrical distribution technology. With the digital transformation of infrastructure, buildings and industry, power distribution, IT and the internet are all converging – resulting in a trend for analysis of energy consumption and monitoring the condition of electrical equipment.

Traditional switchgear provides very little data and maintenance is based on planned schedules that may cause downtime for process industry and disruption to power supply. This can lead to high annual costs and additional personnel to perform regular maintenance, and if switchgear is not maintained, failures or blackouts could occur.

As operators are constantly looking for new ways to reduce energy costs and gain higher productivity and efficiency, reducing maintenance costs and preventing downtime is a priority. Continuous monitoring of switchgear can give operators an understanding of how the electrical system is performing and when and where maintenance is required. With the evolution of Industry 4.0 and digitalisation, the focus has been shifted to digital or smart switchgear.

In its simplest form, switchgear manufactured with condition monitoring equipment gives a different approach – not only with maintenance tasks, but it can also identify load peaks and optimise the energy consumed in a production facility or building environment.

SO HOW DOES IT WORK?

Designing and planning power distribution switchgear for industrial plants, infrastructure and buildings is becoming more complex and demanding in the requirements. Whilst some OEMs of electrical components are still in the initial phases, there are solutions already available

for digital transformation of switchgear.

Digital switchboards can be fitted with components that provide greater visibility of not only current and voltage, but also power, power loss, temperature, operating cycles and other measured values or calculated data. Once these facts are recorded and analysed, operators can start to optimise and reduce maintenance that in turn will have an effect on running costs of the asset, as well as lifetime costs.

Modern switchgear fitted with these components can collect all the energy relevant data and increase the transparency of the electrical system, recording accurate power consumption and operational information. These values via communications interfaces can be made available in an automation or building management system.

As an example – in a data centre, if a server load is increased, this would be communicated to the automation or building management system. Cooling fans could be adjusted at an earlier stage to prevent the system failing due to overheating.

Switchgear can also be fitted with devices that continuously monitor the temperature of busbars and cable connection points. Faults and failures are frequently caused by poor connections, that may not be apparent at the time of installation.

Poor electrical connections can result in the effects of arcing or cause a fire in the switchgear. Periodic thermal monitoring with the use of an infrared camera will only give a snapshot, but continuous monitoring with infrared cameras and temperature sensor data can be recorded, and with smart technology, alert the plant operator 24/7.

STAYING APPY

The data and information of the switchgear's condition monitoring system can also be communicated to a cloud-based system. There are already many apps and tools available for operators to view, and configure the information that is more meaningful to their performance of the facility or when maintenance is required.

> **Smart switchgear is a powerful new way to keep electrical systems healthy, in peak condition and keep annual maintenance costs low**

An online app condition monitoring tool compares the current data to historical trends and other relevant data, to allow the operator to run the electrical system, optimise and reduce scheduled maintenance. This in turn will have a positive effect on the switchgear's lifetime running costs.

The switchgear will still require maintenance – however, with the use of smart components, it is possible to reduce the switchgear's operation and maintenance costs by 10 to 30%. Shutdowns for maintenance tasks can be better planned and in a production facility, this is key to gaining higher productivity and efficiency.

With digital switchgear and predictive maintenance, operators and maintenance teams can move away from the traditional time-based maintenance activities and simple monitoring tools, and let the smart components do the work. Utilising smart solutions in switchgear with condition monitoring and data collection capabilities provides transparency into the electrical system and, combined with knowledge, it can be possible to identify failing components before they become an issue, causing unscheduled downtime or blackouts.

Like a smartwatch can monitor your body's performance, help you identify areas for improvement and increase your performance, smart switchgear is a powerful new way to keep electrical systems healthy, in peak condition and keep annual maintenance costs low, allowing you to focus on other important tasks within your business. ER

Them's the brakes

From diesel to electric locomotives, the railway industry has seen numerous advancements since the opening of the Liverpool and Manchester Railway in 1830 marked the dawn of steam-powered rail travel. Simone Bruckner, managing director of Cressall Resistors, discusses how braking resistors have helped revolutionise the railway industry.

Around half a century ago, when diesel locomotives were replacing steam engines, dynamic braking was implemented to make rail operations safer and more efficient. Although safety will always be of paramount importance, as the industry advances, there are an increasing number of factors that must also be optimised. As fuel costs and environmental impacts assume greater importance, so does the need for options to increase energy efficiency and reduce emissions.

Initially, dynamic braking was seen as a tool for mountainous territory, where freight-car wheels were prone to overheating on long downgrades. Diesel locomotives for trains operating in level territory, relatively light trains like passenger trains, and slow-movers like yard engines did not have dynamic braking.

However, larger railroads, like the those of Pennsylvania and Santa Fe, began to request dynamic braking for diesel locomotives to help combat overheating. As the development of diesel progressed, railroads began purchasing dynamic braking units in greater numbers,

> **Dynamic braking refers the use of an electric motor as a generator to dissipate energy**

shedding the original notion that they should only be used in mountainous territory. This helped give them greater operational flexibility by allowing power to roam the system wherever it was needed, instead of being restricted to a particular region.

REGENERATIVE AND RHEOSTATIC

Dynamic braking refers the use of an electric motor as a generator to dissipate energy and is more precisely described by two terms — regenerative and rheostatic braking. The difference between the two types of dynamic braking is what is done with the electricity after it has been produced.

In regenerative braking, the electricity is either immediately reused by other locomotives, or it is stored for later use. This electricity can be transmitted through overhead wires or, in the case of electric locomotives, an electrified third rail. Alternatively, it can be stored onboard through the use of a flywheel, battery or other energy storage system.

Rheostatic braking occurs when the electrical energy produced is run through resistors and dissipated as heat energy. A rheostat is a device that regulates the current flowing through it by changing the resistance. For the case of rheostatic ▶

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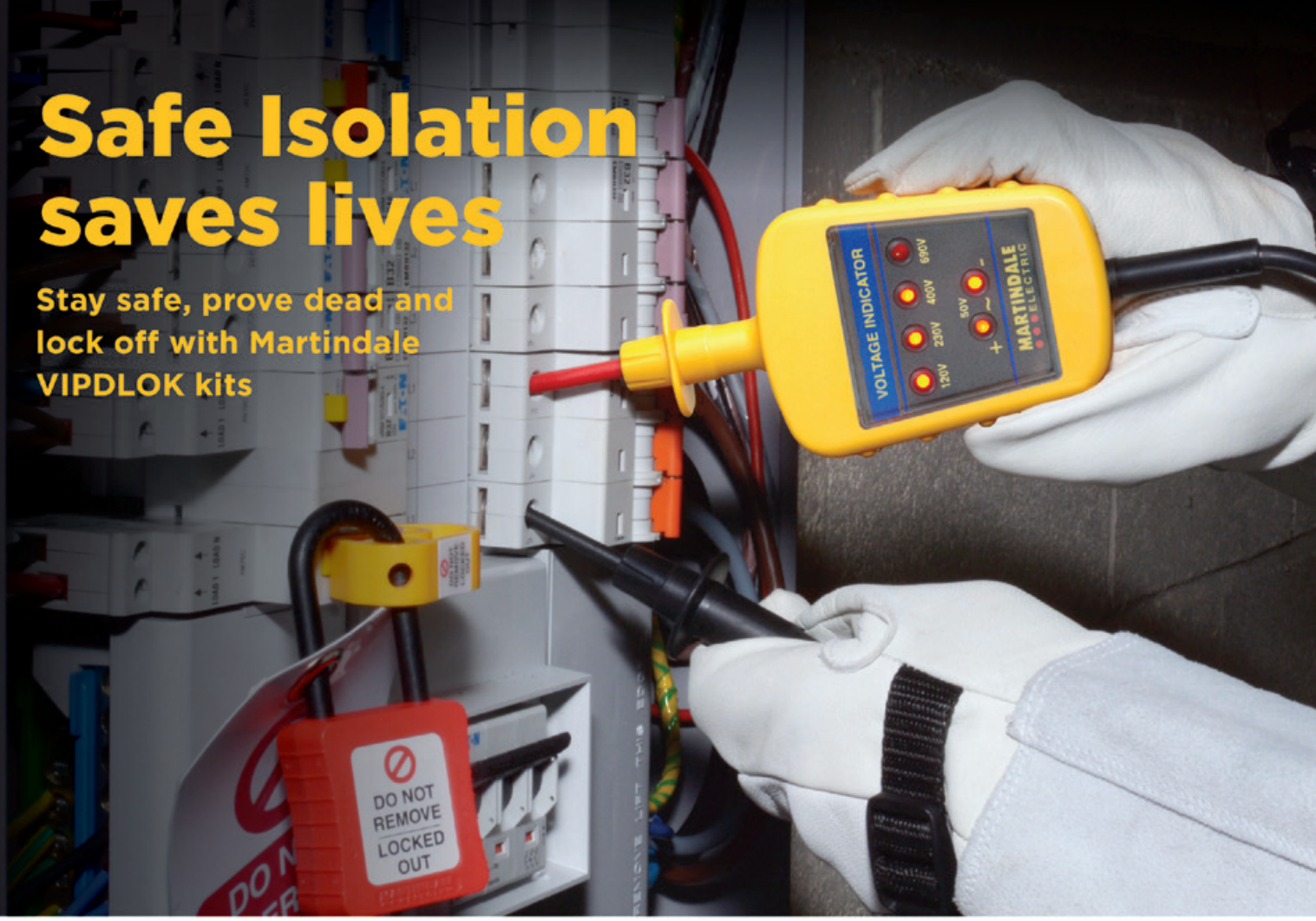

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braking, this resistance provides a force against which work may be done. While regenerative braking leads to a more efficient system because of the reuse of energy, the infrastructure that it requires is not always available. Diesel-electric locomotives run primarily on track that has not been electrified. For this reason, rheostatic dynamic braking is favoured.

> **As braking resistors for traction applications are in high demand, engineers need to consider the most efficient method of implementing them**

MAKING THE METRO EFFICIENT

Although rail and tram are among the most efficient means of public transport, they still consume a large amount of energy — especially during acceleration. The amount of energy required to accelerate a vehicle weighing hundreds of tons is huge, so any increase in energy efficiency will have significant benefits. Regenerative techniques — in which braking energy is reused for acceleration — hold the potential to improve this.

The majority of metro and underground electric trains employ regenerative braking systems, to feed power generated by the traction motors back into the line when coming to a halt at stations. On intensively used networks, such as the London Underground or Paris Metro, the braking power from the stopping trains is consumed and recycled by the other trains on the track.

This ability to balance the power needed to accelerate the trains with the power needed to stop them, makes metro systems one of the most energy-efficient of all forms of urban mass transportation. However, this success isn't always shared. When there are no other trains on the track, or the distances between trains is too great, it may not be possible to use all the regenerated power.

In these cases, the energy is dissipated in brake resistors, mounted either on the trains themselves or at fixed locations alongside the track. Resistors such as Cressall's expanded mesh resistors are particularly suitable for this application, as they are convection cooled and therefore silent, with no moving or wearing parts of any kind, and capable of dissipating very high powers in a compact space.

RESISTOR REPLACEMENT

As braking resistors for traction applications are in high demand, engineers need to consider the most efficient method of implementing them. For reasons of speed, simplicity and cost, it is usually more economical to replace old resistors rather than to take out a whole drive system and replace it with modern drives. This means that resistor providers should hold and offer extensive records of the railway resistors supplied for all types of electric and diesel electric locomotives, electric multiple units and metro cars.

In many cases where original equipment designs are not available or no longer manufactured, it is also useful for resistor manufacturers to design functionally equivalent replacements. If necessary, these should be retested to ensure that they will meet the same type-test criteria for electrical, thermal and vibration performance as the original equipment designs. Beyond the obvious need to match resistance values, it can be equally important to ensure that the active mass, type of material used and the electrical creepages and clearances are all appropriate.

The industry has come a long way since the Liverpool and Manchester Railway, just as dynamic braking is no longer limited to mountainous journeys. Although regenerative braking offers the most energy efficient option of dynamic braking in many railway applications, engineers should also know that this option isn't always available. As well as considering alternative resistor options, railway engineers should also consider how they go about implementing them – as replacement resistors can often be the most effective way to revolutionise.

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Key Note Speaker

Jim Phillips

Jim is Vice-Chair of IEEE 1584 and International Chair of IEC TC78 Live Working. For over 35 years, he has been helping tens of thousands of people around the world understand electrical power system design, analysis and safety. Having taught over 2500 seminars during his career to people from all seven continents, he has developed a reputation for being one of the best trainers and public speakers in the industry. For more information about Jim, visit www.Brainfiller.com

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A modern metro

Milan Sima, railway general manager at Saft, explains how the batteries on board new trains for the Chengdu Metro will keep the system running for over 11 million people.

By 2035, the Chengdu Metro in China is expected to carry over 14 million passengers every day, with 21 lines and a total track length of 714 km.

At the moment, work is taking place to deliver 130 new trains destined for lines 5, 8 and 9. But before work can take place, there needs to be careful consideration as to how the service can run reliably and securely.

Chengdu is one of the largest cities in Western China. It's got something for everyone, with a strong business and commercial community alongside a long history of culture and nature (it's home to a giant panda breeding centre and nature reserve).

Being host to an urban population of 11,430,000 and more than 260 Fortune 500 companies means that the roads get congested. That's why, in September 2010, the Chengdu Metro was built. It has grown fast and it now has six lines in operation, carrying a total of four million passengers a day.

To meet its ambitious growth targets, the Metro's engineers need to know they can rely on the systems they are specifying today for the coming decades.

RELIABILITY AND BACKUP

As with any modern metro system, passenger safety is a top priority. It's essential that safety, control, communication and comfort systems on board rolling stock will continue to operate in the unlikely event of a mains power outage. Therefore, train designers integrate backup batteries into their rolling stock.

> **The Metro's engineers need to know they can rely on the systems they are specifying today for the coming decades**

But train designers have to consider many factors before implementing the latest and greatest security tech. First, there are the challenges of limited space and pressure to minimise weight and conformance with safety standards. They also need to adopt components that provide long life, high reliability and high availability.

They have to do all of this while ensuring a low Total Cost of Ownership (TCO) and a reasonable timeframe. This means that maintenance budgets are kept in check and that trains are available for passenger services. Train builders have to rely on their suppliers to meet the manufacturing and delivery schedules, which are planned so that passengers experience reliable service from day one.

All these factors were at play for China Railway Rolling Stock Corporation (CRRC), when it was selecting the backup batteries for the 130 new trains for Chengdu Metro's lines 5, 8 and 9.

ADOPTING PROVEN TECHNOLOGY

CRRC selected Saft's MSX nickel-technology battery systems. This type of battery has a compact and lightweight design, enabling CRRC to free up space and reduce the weight of the new trains without compromising backup duration or power performance.

The technology has already been proven on board the CRRC trains that are already running on lines 3 and 4. This gave the manufacturer the confidence

to place a multi-million Euro, two-year contract with Saft for the new trainsets.

CRRC has deployed 434 MSX battery systems from Saft. They will be fitted to the 130 new Chengdu Metro trains, with different amounts fitted to trains on different lines, depending on the power requirements. Lines 5 and 9 will be fitted with four battery systems, while two battery systems will be fitted on the line 8 trains. Line 9 will be the first to have driverless operation, so needed extra attention in terms of performance and reliability of all the onboard systems.

> **As demand increases for smarter trains, so too does the demand for the smarter technology that makes it all happen**

These batteries are up to 40% smaller and 30% lighter than other nickel-based batteries, but still offer high-power performance and require minimal maintenance. All of the battery systems provide backup power for up to 45 minutes and the ones on board the line 5 and 8 trains will also provide traction power to enable stranded trains to travel short distances of up to 2km to reach the nearest station. The lightweight design, superior performance and exceptional reliability of these batteries has enabled CRRC to meet its objectives for low lifetime costs.

BESPOKE BATTERY SYSTEMS

Another consideration for train designers is whether to outsource the complete design of a battery system or to specify all the components individually. For the Chengdu Metro trains, the cells were designed and manufactured at Saft's specialist facility in Bordeaux, France, which has housed rail and R&D functions for 70 years. CRRC is building the cells into its own battery systems.

However, other rail programmes opt for a fully designed and tested package to fit into the space allowed. This includes all electrical and mechanical components housed in a battery box with moving tray for access. It integrates the cells, charger, electrical interface, fuses, switches and a water filling system with temperature sensors that provide data used by the charger to control charging.

PREPARING FOR DIGITAL RAILWAYS

One final consideration is the drive towards digital railways through the use of embedded sensors and condition monitoring equipment – and battery systems are no different.

Traditionally, it has been difficult to estimate the condition of the chemistry inside nickel technology batteries. Therefore, Saft introduced the COMMbatt monitoring system. This can be retrofitted to a battery system to collect real-time operational data from train backup batteries and compares it with measured performance data of rail batteries over decades. The result is a monitoring system that enables operators to shift towards preventive and condition-based maintenance.

As demand increases for smarter trains, so too does the demand for the smarter technology that makes it all happen. Smart batteries are crucial to creating the trains that customers want and need. ER

In the money

Sick of late payments? Inna Kaushan, CEO and co-founder of Solna explores how automated invoicing and credit scores can help electricians avoid awkward encounters, as well as mitigate any pain to their pockets.

The self-employed, sub-contractors, and sole traders, together with other small businesses play a vital role in the UK economy. In the last 12 months, almost three million people (around 10% of all those in work) have been engaged as freelancers or under self-employed status.

As an electrician, whether you are self-employed or running a small business with a few employees, you'll know that one of the major challenges is getting paid on your contract terms.

This is highlighted by recent research which reveals that only 19% of freelancers and the self-employed are paid on time, with related invoices being paid on average 18 days after their due date. In addition, nearly a quarter of UK businesses report that late payments are a threat to their survival.

Precious time spent chasing payments could instead be used for getting your next contract.

THE STRESS OF ADMIN

When you are working for yourself, you have a lot of admin to do. It can be quite stressful, creating uncertainty about not getting paid, alongside anxiety for some about having to manage and maintain your admin and cash flow. This is an increasing problem, with recent data showing that 52% of SME owners across business sectors blame poor cash flow for a negative impact on their mental health.

However, these issues can be solved by recent advances in cloud technology, which lets you automate your invoicing,

conduct frequent credit checks on clients, and set up reminders for overdue invoices. Cumulatively, this allows small businesses to add efficiencies to their cash collection, as well as helping avoid the worries associated with late payments.

CHECK YOUR CUSTOMERS, CREDIT STATUS

Checking and monitoring the credit scores of customers can be an effective way for small businesses to have up-to-date information on their clients' ability to pay their bills. A credit score is a numerical indicator of a consumer or business's ability to service debt. They are based on several factors such as records of servicing credit, County Court Judgements (CCJs) and a history of applications for credit.

These were once the preserve of large businesses. But as you'll be aware from all the TV advertising, consumers are increasingly becoming familiar with the idea of credit scores. These give them the tools to manage their own credit scores, which in turn helps make sure that they can access a wide range of personal finance products.

This increasing availability of information has created an opportunity for self-employed electricians and small businesses to become savvier about how credit scores work. This has resulted in established credit scoring companies offering the service to a wider customer base.

These companies allow smaller businesses to check on the financial health of their customers, and subsequently provide them with the insights and indications into how long both new and existing clients will take to pay them. This technology also helps them to identify any adverse changes to their credit activity.

USING AUTOMATION TO REDUCE THE ADMIN BURDEN

Processing invoices is cited by many as being one of their top five administrative burdens. 29% of those surveyed by the Association of Independent Professionals and the Self-Employed (IPSE) listed it as being a task which could otherwise be spent on winning or completing new work.

Whilst many still generate invoices with their own basic Excel or Word templates, there is now a choice of cloud invoicing tools on the market which can save you time in processing invoices, as well as chasing for associated payments.

Cloud invoicing, either used as a feature within cloud accounting software or as a stand-alone tool, allows you to create invoices on the go from smart devices, include direct payment options, monitor open rates and set up automatic chasers.

> **Nearly a quarter of UK businesses report that late payments are a threat to their survival**

Additionally, the fully customisable features of cloud invoicing allow you to stamp your own unique identity and brand on your paperwork. All of which can help make you stand out and be remembered – perhaps when a new contract comes up.

These services can help you reduce the time spent on chasing late invoices and help with managing cash flow due as payment is collected sooner.

FURTHER PRODUCTIVITY GAINS ARE POSSIBLE

There are several options on the market for cloud invoicing and credit score data, however, using one solution to take care of both of these can create further productivity benefits through saved time.

Using an all-encompassing product aggregates information from both invoice and credit score data, which provides enhanced insights into the likelihood of how customers will behave and their ability to make payments. This information can then be used to collect payments faster through a combination of both human intervention, as well as automated reminders.

The issue of late payment is a pertinent one for electricians who may well spend an average of around 20 days a year chasing invoices (the average for freelancers). So, anything that can be done to reduce this time, and speed up how quickly payments are received, can only be a positive. ER

Room for manoeuvre?

Vincent de Rul, director of energy solutions at EDF Energy, explains why when it comes to our energy consumption, flexibility is the foundation of the future.

The UK's energy system is undergoing significant changes to provide a reliable, low-carbon future. The integration of renewable and nuclear generation to the traditional energy mix, and the decentralisation and digitalisation of the energy market, so far, are some of the most notable shifts in the sector that are helping this future become a reality.

Critical to balancing these three elements is flexibility. Flexibility represents a range of simple energy solutions – such as Demand Side Response (DSR) and storage – that ensure the power we generate and deliver always matches the amount we consume. In other words, it is the point at which a decentralised, decarbonised and digitalised future becomes a practical solution that can deliver real benefits, not only to those who contribute to it, but also to the wider economy.

> **Globally, electricity demand is expected to grow by over 20%, with renewable sources expected to make up more than half of the global capacity**

Digitalisation is already improving the efficiency and sustainability of our current energy system. Through monitoring systems, businesses are now better able to understand what they consume down to a single asset level, therefore highlighting new energy saving opportunities.

But digital technologies are set to make energy systems around the world even more intelligent and reliable; identifying who needs energy and delivering it at the right time, in the right place and at the lowest cost – the system otherwise known as Demand Side Response.

Energy usage data has already enabled the grid and its fluctuating energy demands to be supported by businesses that are able to be flexible with their consumption. With a better forecasting of the total amount of energy that will be demanded from the grid at any one point, as well as better understanding of the amount of energy demand which is flexible, businesses that are able to shift or reduce their consumption during times of peak demand are rewarded, either in payment or a reduced energy bill.

But if we are to meet the expected increase in global electricity demand over the next decade, while increasing the share of energy from renewable sources, then flexibility needs to become a priority for more businesses and consumers.

Globally, electricity demand is expected to grow by over 20%, with renewable sources expected to make up more than half of the global capacity. If this is the case, the ability of the power system to adapt and flex to the fluctuations in demand will become an integral part of our energy future.

Flexibility is especially important as we move towards a low-carbon future, where intermittent sources such as wind and solar will require us to integrate new products, systems and services, to achieve a balanced system where supply meets demand.

One area of flexibility that has often been discussed in recent years is the rise of electric vehicles. The uptake of electric vehicles will increasingly place new demands on the grid, difficult to forecast in terms of location and volume – something that will only grow if the government's target for at least 50% of new cars and 40% of new vans being electric by 2030 is realised.

Yet we already have the technology in place to ease the stress placed on the grid. Energy solutions such as vehicle to grid (V2G) technology, which enables power to be drawn from car batteries and fed back into the grid when not in use, will be vital to support demand.

Given consumers and businesses are playing a more active role in the energy market – shifting from centralised generation towards a decentralised future – flexibility has also had an impact on the traditional relationship between energy providers and consumers.

> **Digital technologies are set to make energy systems around the world even more intelligent and reliable**

So where does all of this leave energy providers of the future?

We expect energy providers to deliver an end-to-end approach to energy management; a world in which asset engineering, energy management technologies, and access to

wholesale markets are all offered under one roof.

That is why we have engaged in a partnership with UK-based energy technology provider, Upside Energy, and have acquired engineering services firm Imtech, enabling us to carry out this kind of end-to-end proposition to optimise the energy consumption of customers and partners.

Innovation hubs like our Blue Lab are also playing an important role in helping us continue to drive developments in flexibility technologies. Working with a number of start-ups, we have been able to accelerate the transition to a sustainable, low-carbon society by bringing together the brightest minds in the sector.

It's undeniable that we are at a very exciting time in the energy sector, where collaboration is providing fantastic opportunities to transform our future relationship with energy for the better.

We recently signed a unique deal with UK-based energy storage provider Anesco, to optimise a combined 16MW of solar and battery assets at their Clayhill solar farm.

Together, we have committed to enhancing the efficiency and profitability of Clayhill's solar assets, by providing access to the full suite of revenues stack for such assets, through grid services and direct access to wholesale markets.

This, together with EDF Energy's long experience of energy trading, has allowed us to guarantee a minimum floor price. We hope that this proves to be a shining example of how cross-industry collaboration can help us to transition to a low-carbon economy in a reliable and profitable way.

Focusing solely on the cost-saving potential of flexibility fails to recognise its greatest potential; it is our gateway to a sustainable, circular economy, where income is generated by turning waste into resource. ER

Changed priorities

As incidents of meter cheating continue to rise, Lloyd Birkhead, group managing director at Grosvenor Services Group – part of Echo Managed Services – outlines the dangers and why it is essential energy companies do more to safeguard the public (and their wallets).

Energy companies should be working harder to tackle meter cheating. That's the firm opinion of almost nine in 10 (86%) energy billpayers, according to a survey we recently commissioned with the endorsement of Crimestoppers UK.

In 2017/18, the energy sector met just 67% of its theft detection obligation under Ofgem's energy theft incentive scheme, with just five out of 35 energy suppliers meeting or exceeding their individual residential targets.

Given that each instance of meter tampering potentially places individuals, their families and neighbourhoods at risk of injury or worse, isn't it time the sector came together to look at how to do more to help keep communities safe?

AN EMOTIVE ISSUE

A huge 92% of survey respondents said that they believe energy theft is wrong. Whilst some respondents did put the practice down to individuals being unable to pay their bills, half thought it was simply because people don't want to pay for what they have consumed, even if they can afford to do so.

Worryingly though, only 35% of respondents said they knew that meter tampering was a criminal offence, showing that more can be done to highlight the true impact of this crime.

95% of respondents expressed annoyance at learning that £20 is added to their bills because of energy theft. Surely this annoyance is an important driver to mobilise more reporting – and yet only 20% of respondents were even aware of this increase.

Then – and arguably even more concerning for the general public – there is the safety aspect. Indeed, energy theft increases the risk of fires, electric shocks and even deadly gas explosions. Not to mention, meter cheating leads to at least one injury or death every 10 days in the UK – a shocking figure that is not well publicised.

Key to addressing this issue is better consumer engagement and education, of both the financial and safety implications. This is crucial in supporting the sector to both detect more current instances of the crime and also deter future potential cases occurring.

> **Meter cheating leads to at least one injury or death every 10 days in the UK**

CONSUMER ENGAGEMENT AND EDUCATION

Engaging consumers around energy theft should have two key strands. The first lies in helping customers better understand the exact risks and impacts of meter cheating, thereby reducing customer apathy and encouraging people to report energy theft when they suspect it is taking place (and indeed, to discourage them from the practice themselves). Our recent survey found, for example, that one in four people would currently turn a blind eye if they became aware of an instance of meter tampering.

The second strand lies in the statistic that 75% of consumers don't currently feel confident in spotting signs that energy theft is taking place, according to our research. By empowering customers, landlords and communities to identify suspected meter cheating, energy firms can take advantage of intelligence on the ground.

Over half (54%) of our survey respondents said that they would 'without question' report an issue of meter tampering, whilst another 21% said they would as long as it was within their local vicinity – so there is a clear pool of reporting potential for energy firms to harness.

BETTER AWARENESS AND CLARITY ON WHERE TO TURN

Once an individual is aware of a potential case of meter cheating, whether through direct observation, inheriting a tampered meter or even having heard somebody bragging, they need clear information on what to do next. What's more, many need confidence that they can take action confidentially.

Our survey showed that 19% of people were unsure of how to escalate a case of meter cheating, and that there is a fear of potential repercussions from non-anonymous reporting that increases with age.

Awareness of the valuable Stay Energy Safe tip-off service was just 13%, showing clear space for the sector and its stakeholders to better educate customers through communication materials and at key customer touchpoints.

PUBLICISING POSITIVE WORK

The third piece of the puzzle for the sector lies in demonstrating to customers and the general public exactly what is being done to combat the issue and keep communities safer.

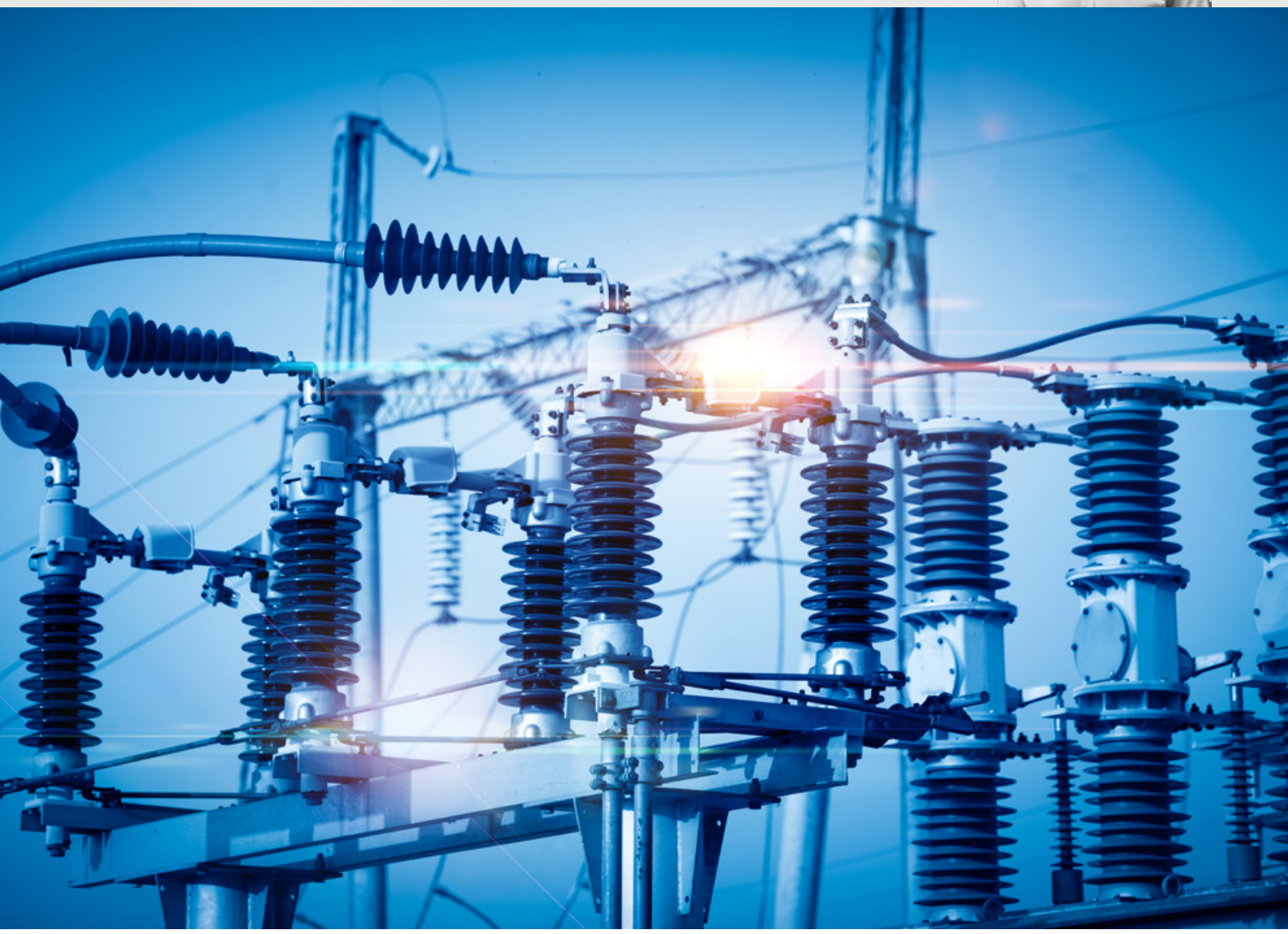
Doing more to let the public know about meter changeovers, arrests and convictions, how injuries have been prevented and inflated bills tackled, would give the public a far richer and more proactive understanding of the hard work taking place.

The sector should look to work with the media to raise more awareness. There's clearly scope to do more – just 14% of our survey respondents, for example, recalled seeing news coverage of the crime over recent months.

There is no doubt that energy theft is a serious issue, one with potentially deadly consequences. Now is the time for the sector to come together to look at further steps that can be taken to mitigate this hugely impactful crime. ER

Danger, Danger, high voltage

Surprisingly, despite the dangers, high-voltage electrical engineering can often be one of the safest areas to work. While it might sound like a daunting way to spend your nine-to-five, John Smith, managing director at Smith Brothers, looks at some of the sector's stringent health and safety regulations which protect workers – both on- and off-site.



This year, we're celebrating 20 years in business at Smith Brothers. From humble beginnings as a pair of small connection contractors working from the back of their van, founders Richard and John Smith have built a brand which now offers a range of services from LV up to 132,000 volts.

Although the firm has had to move with the times and has faced some significant obstacles along the way, whether we're working on a high or low voltage distribution system, a simple assignment or a complex turnkey project, one thing has always taken precedence above all else – health and safety.

As with most areas of the construction industry, health and safety is at the very top of internal priorities within the electrical engineering arena. The mitigation of risk is heavily audited and there are stringent rules and regulations in place to protect engineers, with a large percentage of project time spent on this alone.

Although perhaps best-known for their work on high-

voltage engineering projects, Smith Brothers' portfolio also covers low voltage distribution systems and complex turnkey projects – meaning they are involved in the construction-side of the project too. As a result, risk-management is not as simple as 'black and white'.

Health and safety planning begins well before work commences on-site, and one of the core elements of ensuring projects are carried out safely is through the completion of risk assessments and method statements (RAMS).

Regular RAMS ensure all necessary steps are taken – at each stage, and in every aspect of the project – to protect those on the ground. By logically looking at how work is going to be carried out, each job can be properly planned and resourced.

> **Regular RAMS ensure all necessary steps are taken – at each stage, and in every aspect of the project – to protect those on the ground**

Once on-site, people who regularly work in construction will have noticed how heavily protected the electrical works are. The areas in which equipment is housed and upgrades or installations are being conducted are always securely locked, to ensure only trained personnel are granted access. Those admitted must hold a permit-to-work issued by the authorised party, be thoroughly briefed and have read, understood and signed the associated RAMS documentation and safe work instructions prior to entering.

Workers in the electrical sector need the right credentials too, and there are various industry-recognised certifications a company can hold. For instance, the Electrical Contractor Association (ECA) provides assessment and certification services for those working across all building services, whilst Lloyd's Register operates a National Electricity Registration Scheme (NERS) on behalf of UK Distribution Network Operators (DNOs).

At Smith Brothers, we've worked hard to uphold a series of industry standards and have an enviable health and safety record. As a registered UK company holding BS-ISO 9002, quality is always a high priority. All work is carried out under a risk assessment and method statement as required by law, and as part of our commitment to health, safety, and the environment, we also hold OHAS 18001 and BS EN ISO 9001 certification too.

All employees/contractors are given a NERS passport which they must always carry on-site, and every member of staff involved in the project should carry a Construction Skills Certification Scheme (CSCS) and/or Electrotechnical Certification Scheme (ECS) card. Our team is also given continuous trade-specific training, which is rigorously monitored throughout.

Smith Brothers hosts a weekly 'toolbox talk' session with workers to run through safety requirements in accordance with our RAMS. A typical meeting usually covers what is expected from them, often including topics such as personal protection equipment (PPE)/abrasive wheels.

Regular equipment inspections and maintenance, thorough training of staff and the safety precautions taken before and during an assignment all help to minimise hazards. Therefore, the sheer number of regulations and processes in place within the electrical engineering industry, probably makes it one of the safest areas of construction.

New rules

Jim Phillips, PE, founder of Brainfiller.com, associate director of Electrical Safety UK Ltd and Vice-Chair of IEEE 1584 discusses what's changed in the 2018 Edition of IEEE 1584

The Greek Philosopher Heraclitus is credited with the phrase "The only thing that is constant is change." That is certainly the case with the new 2018 Edition of IEEE 1584 'IEEE Guide for Performing Arc-Flash Hazard Calculations'. Almost everything has changed – except the title!

The first edition of IEEE 1584 was published on September 23, 2002. Based on over 300 arc flash tests (considered a lot back in its day) it contained empirically derived equations for calculating the arcing short circuit current, incident energy and arc flash boundary. Since it was first introduced back in 2002, IEEE 1584 has gained widespread global use for performing arc flash risk assessments.

> **"Since it was first introduced back in 2002, IEEE 1584 has gained widespread global use for performing arc flash risk assessments"**

Although the 2002 edition was considered a landmark standard, considering many factors such as the effect of equipment types, conductor gap distances, differences in the rate of decay of incident energy with distance and more, there were many additional areas that needed addressed in a future edition.

One area was that the 2002 edition was based on arc flash tests with the electrodes placed in a vertical configuration as shown in Figure 1. Questions were later raised about other electrode configurations such as horizontal instead of vertical orientation and vertical electrodes terminating in a barrier such as Figure 2. The effect of the enclosure size was also a consideration. Sixteen years later with over 1800 new arc flash tests, the 2018 Edition was finally published on November 30, 2018.

NEW ELECTRODE/CONDUCTOR CONFIGURATION

When an arc flash occurs using the original model with three electrodes in a vertical orientation, the arc plasma is driven towards the bottom of the box and often spills out of the front.

Subsequent research has shown that incident energy can be influenced by the electrode orientation. As a result, many new tests were conducted using electrodes that include both a horizontal configuration and vertical electrodes that terminate into an insulating barrier.

When the electrodes are placed horizontally, the arc plasma is directed from the ends of the electrodes outward. Research has also indicated that if vertical electrodes are terminated into an insulating barrier, the arc hits the barrier and the plasma cloud is directed more towards the enclosure opening. The barrier configuration represents conditions that may occur such as when conductors terminate into a terminal block or other device.

To provide greater modelling flexibility for equipment, five different electrode/bus configurations as illustrated in Figure 3, were included in the testing program and subsequent model development which include:

- Vertical electrodes in a metal box/enclosure – VCB (also in 2002 Edition)
- Vertical electrodes terminated in an insulating barrier in a ▶

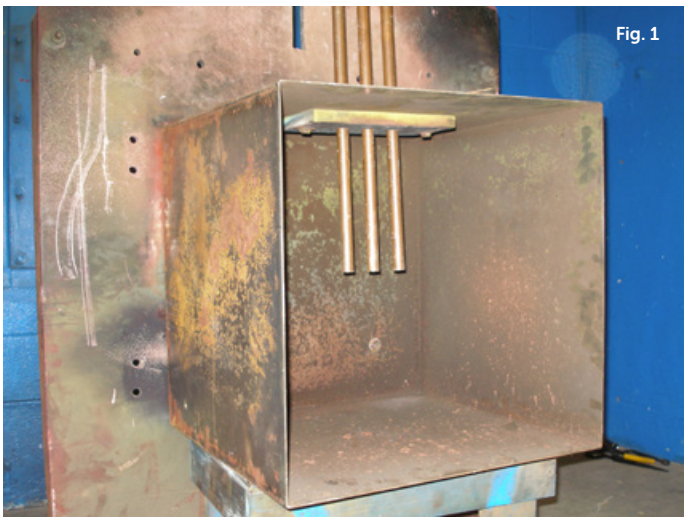


Fig. 1

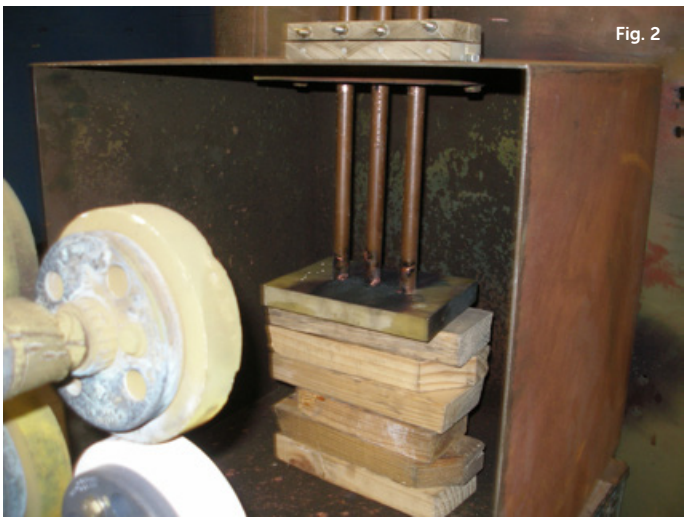


Fig. 2

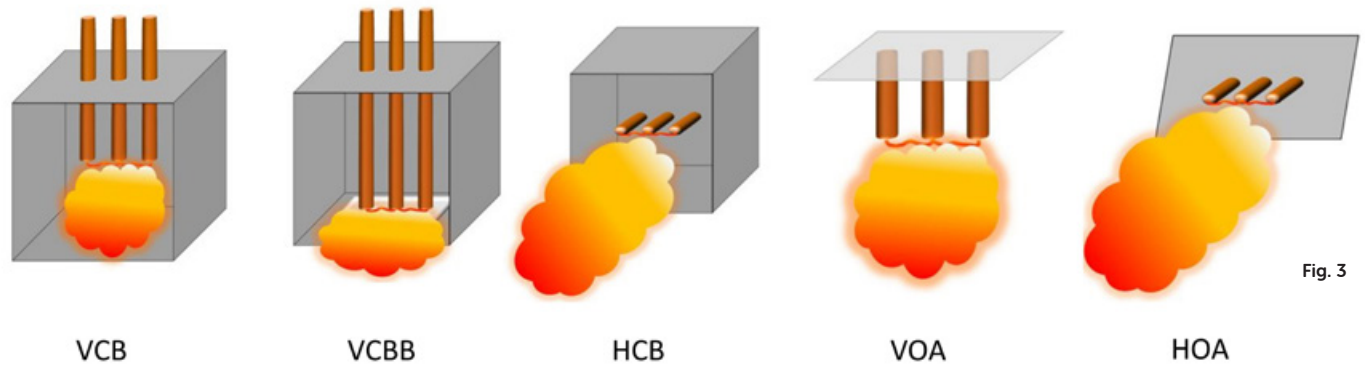


Fig. 3

metal box – VCCB
• Horizontal electrodes in a metal box – HCB
• Vertical electrodes in open air – VOA (also in 2002 Edition)
• Horizontal electrodes in open air - HOA

The results of the new arc flash tests have been used to develop the next generation of IEEE 1584 arc flash equations.

ENCLOSURE SIZE CORRECTION FACTOR

The enclosure size can have a significant impact on the arc flash energy being expelled and reaching a worker. The smaller the enclosure, the more concentrated the energy is – focusing it more towards the worker. Larger enclosures have less of a focusing effect resulting in less incident energy – assuming all other parameters remain the same.

The 2002 Edition accounted for the effect of the enclosure by considering only three different sizes representing medium voltage equipment, low voltage power equipment and low voltage distribution equipment. The 2018 Edition provides greater flexibility by not only including more enclosure sizes for more types of equipment, it also provides a new method to adjust the calculations for any enclosure size. This adjustment is known as the Enclosure Size Correction Factor (CF).

The new equations are based on a normalised enclosure size of 508 mm x 508 mm x 508 mm (20 inches x 20 inches x 20 inches). If the actual enclosure is larger, the correction factor CF can be determined using actual dimensions and then used to adjust the results for a more accurate (and lower) value of incident energy and arc flash boundary. Not including the correction factor would result in higher (more conservative) values based on the normalised dimensions.

There is also a correction factor for a "shallow" enclosure which is defined by a height and width less than 508 mm (20 inches) as well as the voltage being less than 600 V and a depth of 203.2 mm (8 inches) or less. For the shallow case, the correction factor also results in a decrease in the incident energy and arc flash boundary due to the closer proximity of the electrodes to the opening.

ARCING CURRENT VARIATION CORRECTION FACTOR

The first edition of IEEE 1584 included an 85% factor for reducing the calculated arcing short circuit current for systems up to 1kV. The reduction was to account for variations that may occur in the actual arcing current which could affect how fast a protective device may operate. If the reduced arcing current resulted in a longer clearing time and larger incident energy, results based on the adjusted current would be used.

Instead of a fixed 85% factor, the 2018 edition includes an 'Arcing Current Variation Correction Factor' based on using a new equation. This represents a more accurate arcing current variation as a function of the electrode configuration as well as other factors and applies for all voltages.

125 KVA TRANSFORMER EXCEPTION

Often referred to as the "125 kVA Exception", the 2002 Edition of IEEE 1584 contained language that permits a study to exclude calculations for circuits with voltages less than 240 volts and fed by transformers 125 kVA and smaller.

This exception was based on a few tests that indicated if an arc flash occurs at lower voltages and also with a lower magnitude of short circuit current, it would be difficult to sustain the arc and would result in a lower level of incident energy.

However, since 2002, there has been significant testing that indicates under certain conditions, it is possible to sustain an arc flash at much lower levels of short circuit current. Based on the results of additional testing, the 125kVA language has been deleted. Instead, new language states:

Sustainable arcs are possible but less likely in three-phase systems operating at 240 V nominal or less with an available short-circuit current below 2000 Amps.

"The enclosure size can have a significant impact on the arc flash energy being expelled and reaching a worker"

WHAT'S NEXT?

Are we done yet? No! Even after several decades, hundreds of people, tens of thousands of manhours and millions of dollars in research we still continue to learn more about arc flash. Future work may someday consider single phase arc flash, higher voltages, DC arc flash and much more. And so, the journey continues. ER

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- ✓ Have access to eRAMS – task/project-specific risk assessment and method statement software

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ESP ADDS SELF-TEST FITTINGS TO EMERGENCY LIGHTING RANGE

ESP's latest addition to its Duceri emergency lighting is a new range of self-test emergency light fittings, reducing the cost and time associated with manual testing and inspection.

By opting for self-test fittings, installers and contractors can save valuable time and expense, with each self-test fitting utilising an inbuilt processor to initiate 'self-tests'. Once an issue is discovered, the fitting will clearly display the fault via the status LED.

During initial power up, an automatic commissioning stage will begin. After the initial charge up time (up to 72 hours), the unit will carry out a full duration test. After all initial tests are completed successfully, the inbuilt processor will start the standard programmed test schedule, reporting failing functions via the status LED.

ESP • 01527 515150
www.espuk.com

FLEXICON RELEASES NEW HYGIENIC PRODUCT RANGE BROCHURE

Flexicon has published a new brochure demonstrating the company's wide range of flexible conduit products and solutions for hygienic environments.

The Hygienic Product Range brochure showcases Flexicon's cable protection products that allow efficient cleaning while providing system integrity in hygienic applications. It also highlights the company's new range of stainless steel 316 round connection boxes, incorporating hygienic design principals and offering a range of interconnection options.

Flexicon's hygienic range protects against the build-up of microbes and bacteria and ensures that cleaning processes do not damage or compromise equipment operation. Manufactured in accordance with EN1672-2 and EN ISO14159, the range offers high tensile strength – 70kg for LPC conduit and fitting, 130kg for LTP conduit and fitting – and is resistant to chemical and cleaning agents.

Flexicon • 01675 466900
www.flexicon.uk.com

NEW EX-PROTECTED FX60 LED FLOODLIGHTS FROM GLAMOX

Glamox has launched a range of ex-protected LED floodlights for Zone 1 and Zone 2 hazardous areas. The floodlights offer an extremely long rated life of 100,000 hours at an ambient temperature of 45°C, as well as low power consumption (only 40W per module) and low maintenance requirements.

The FX60 series of Ex de LED floodlights are suitable for installation in Zone 1 and 2 hazardous gas environments and can be supplied as single-, two-, three- or four-module versions that correspond to 4500lm up to 18,000lm system output, in 5,000k light colour.

The floodlights are manufactured in accordance with the European Directive (ATEX), IECEx and TRCU standards.

The FX60 is available in wide, medium or narrow beam versions, with clear safety glass. The floodlights operate in ambient temperatures from -50°C to +55°C.

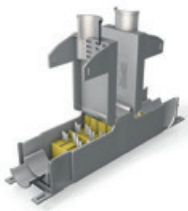
Glamox International • 0208 9530540
www.glamox.com/gmo

DRAKA CAT.6A FTP EXTENDERS OFFER SIMPLE CABLE EXTENSION

The Draka range of Cat.6A FTP extenders provide a quick, easy to use means of joining two 4- pair Cat.6A cables together, whilst maintaining 10 Gigabit component level compliance to ISO/IEC 11801:2002.

The Draka extenders are available in two versions: for solid only and for solid/stranded conductors (typically for installation cable to equipment cord), with the terminations compatible with 22-24AWG solid conductors and, in the case of the latter model, 26-27AWG stranded conductors.

With quick and easy wire pair termination which requires no specialist tools and a compact design enabling them to be readily used in a cable run, the Draka extenders are ideal for both planned cable extensions and repairs. They are suitable for use in Power over Ethernet and applications.



Prysmian • 02380 295 555
uk.prysmiangroup.com

WIRELESS LIGHTING CONTROL MADE EASY

Tridonic has launched two new Casambi Ready wireless modules in the basicDIM wireless range to allow for Bluetooth-based communication between luminaires. These new modules, along with suitable sensors, can offer considerable energy savings and allow for the lighting system to be individually adapted.

Thanks to the modules compact size, the passive basicDIM Wireless module and the constant-voltage basicDIM Wireless module can be easily integrated in the lighting installation.

They automatically establish a communication network with up to 127 light points, and the luminaires in the network can be wirelessly switched and dimmed and also assigned to groups.

Control is via the free 4remote BT app on an Android or iOS smartphone.

Tridonic • 01256 374300
www.tridonic.com

WIELAND'S SAMOS PLAN 6 BOOSTS EFFICIENCY

Wieland Electric's samos PLAN 6 project planning tool is user-friendly programming software with the option of automatic or manual configuration. samos PLAN 6 works in conjunction with samosPRO COMPACT programmable safety controller, a compact safety solution that offers all of the benefits associated with much larger and much more complex units.

Measuring 45mm in width, samosPRO COMPACT provides up to 20 safe inputs and eight safe outputs utilising four switchable safe in-/outputs. The system can be extended with additional modules to as many as 116 secure inputs and 56 secure outputs and any number in between. samosPRO COMPACT PLUS offers enhanced features such as safe monitoring of motors, drives and shafts.

Wieland Electric Ltd • 01483 531213
www.wieland.co.uk

BAXI HEATING CHOOSES MARTINDALE FOR ELECTRICAL SAFETY

Baxi Heating has provided 250 of its trainers and engineers with a range of Martindale Electric equipment, which includes the EZ650 earth loop and polarity checker for socket and spur testing.

The EZ650 simplifies the process for identifying a satisfactory earth, by combining a basic socket tester with an earth loop check that uses clear red/green LEDs, making it easy to interpret the results and see whether the earth loop value is within acceptable limits.

The EZ650 socket and loop tester can be used on both 13A sockets and fused spurs to quickly identify a hazardous earth before starting work, offering a simple solution to TB118 compliance.

Martindale Electric • 01923 441717
www.martindale-electric.co.uk

C.K DEXTRO VDE SCREWDRIVER RANGE – MAKING TOUGH JOBS EASIER

C.K dextroVDE screwdrivers are specifically designed for electricians, with ergonomically shaped handles complete with molybdenum-vanadium-steel blades for exceptional strength and durability.

The dextroVDE Slim Glo screwdrivers (49283PD) glow in the dark, with slim shafts allowing easy access to recessed screws and fixings without the need to remove insulation or compromise safety.

The C.K dextroVDE (T49183D) screwdrivers are available as a set of five slotted/PZ, featuring tip type marking for easy identification; long fine neck for precise fingertip control and handle injection moulded directly to blade.

Finally, the TritonXLS insulated set (T4729) is an insulated five piece slotted/PZD – providing that all important electrical safety during use and a voltage rating of 1000V.

Carl Kammerling International 01758 704704
www.carlkammerling.com

SAFETY FIRST - C.K'S SOLUTION FOR THE BEST IN CABLE ROUTING

The C.K MightyRods PRO are specifically designed to combat the issues of painful splintering and snapping, thanks to an innovative SplinterShield™ coating - Europe's first splinter-proof material - that protects the rods and allows both safe and efficient working conditions. C.K has also introduced its super-flexible SPIRA-FLEX rod, perfect for accessing tight corners, bends and other obstacles.

The C.K Gloworm Cable Router is perfectly designed for running cables around tight corners, through insulation filled walls, underneath flooring and across ceilings. Gloworm's clever glow in the dark phosphorescent polymer construction aids routing in low light conditions and easier navigation towards exit points. When charged under natural light, Gloworm provides an effective glow for up to 30 minutes.

Carl Kammerling International • 01758 704704
www.carlkammerling.com

OMICRON: PTM 4.40 SOFTWARE VERSION AVAILABLE

The Primary Test Manager™ (PTM) software from Omicron supports you during diagnostic tests on circuit breakers, current and voltage transformers, rotating machines, grounding systems, power transformers as well as associated equipment such as bushings and on-load tap changers (OLTC).

The software guides you through the testing process with comprehensive testing procedures and detailed wiring diagrams. Tests can be automatically assessed in accordance with the applicable international IEEE and IEC standards. PTM also provides powerful reporting functionalities such as customised, individual reports about the test object, test results and assessment.

Omicron • 0178 5848 20100
www.omicronenergy.com

FLUKE ANNOUNCES ITS MOST RUGGED TWO-POLE VOLTAGE TESTER

The newly redesigned Fluke T110, T130 and T150 Voltage and Continuity Testers now perform better than ever in cable bending tests.

The new design is so rugged that Fluke is offering a free extended warranty to anyone who registers a new T110, T130 or T150 before December 31, 2019, extending the warranty from two to three years for free.

For customers who act quickly, Fluke is also offering a free holster to protect the tester and leads between jobs to anyone who purchases a T110, T130 or T150 by June 30, 2019.

These rugged two-pole voltage/continuity testers offer a combination of light, sound, vibration and digital display to provide instant answers under any working condition.

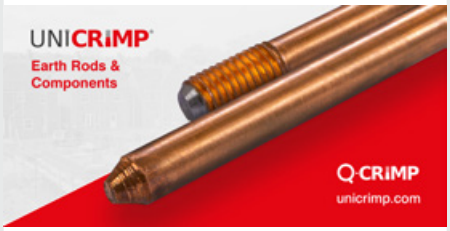
Fluke • 0207 942 0700
www.fluke.co.uk

DOWN TO EARTH SOLUTION FROM UNICRIMP

The new Unicrimp earthing product range comprises just 10 individual products, which together form an earthing system. At the heart of the system is the threaded earth rod, made with a low carbon, high tensile steel core and molecular bonded 99.9% pure copper coating for maximum conductivity, strength and durability.

Multiple earth rods can be joined together using threaded couplers and the threaded driving stud attaches to the top of the earth rod to protect against damage when driving the earth rod into the ground. A selection of clamps and two inspection pits make up the range.

This new complete earthing system has a consistent design throughout, making it adaptable to meet installers' needs and simplify the overall installation.



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Based in the UK for the last 50 years, we've worked together with a multitude of customers in all environments globally and since 1990 have installed more than 640,000 generator sets around the world, with as much combined power generation capacity as the entire UK power grid.

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