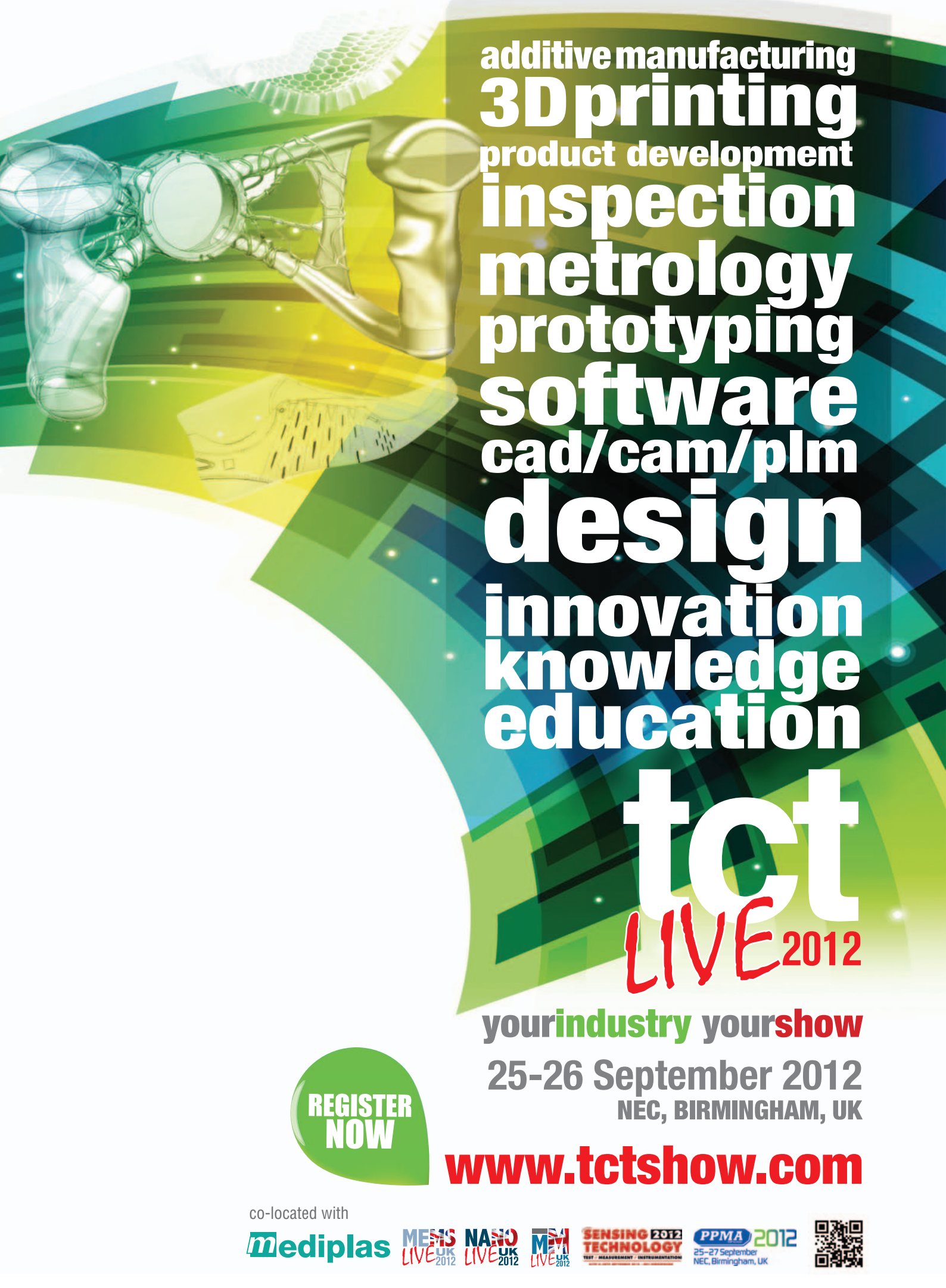
EUREKA

THE MAGAZINE FOR ENGINEERING DESIGN

In this issue: Design Software • Bearings & Linear Systems • Sensors, Test & Measurement • Materials


# What's driving design?

## The trends shaping the world of engineering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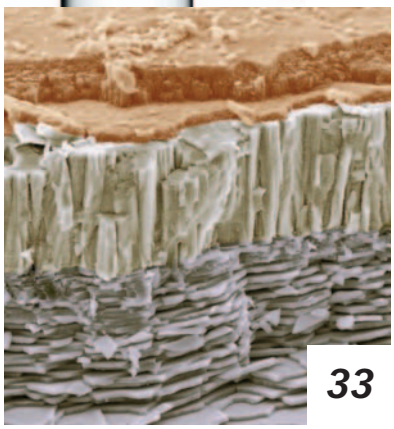

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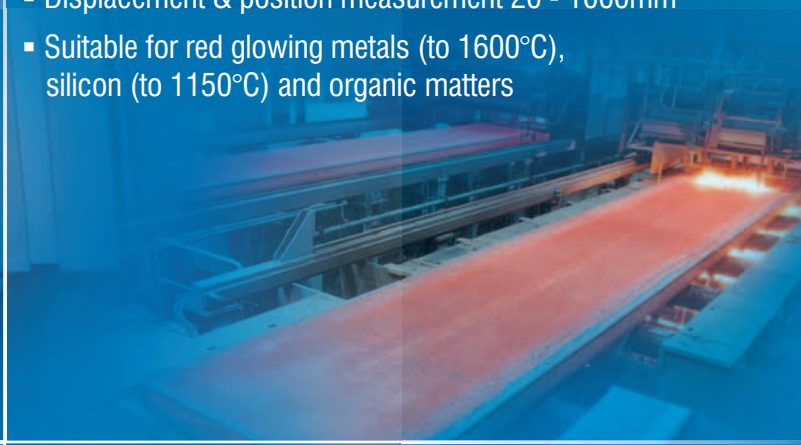

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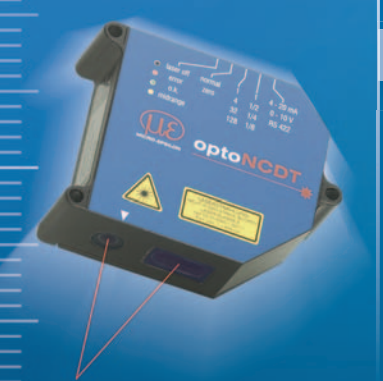


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# IP or not IP? That is the question

Paul Fanning, Editor (pfanning@findlay.co.uk)

At the UK Manufacturing Summit in March, one of the breakout sessions explored the vexed question of intellectual property – a subject close to the heart of any innovator or designer.

What was striking about this session was the level of scepticism with which delegates approached the subject and their tendency to regard IP as a 'rich man's toy' – and expensive luxury that was nice on paper, but was of limited value in the real world if one's antagonist had deeper pockets than you.

While acknowledging the truth of some of this, Anthony Albutt of leading IP legal specialist D Young & Co LLP, who led the session, went to great lengths to point out the options and strategies available to companies and to help the audience to understand ways in which they could not only protect their existing IP, but actually start to make it work for them.

While the discussion ranged widely and was constructive, it is fair to say that one of the clear and repeated messages was that too many engineers were not armed with sufficient information about IP and the legal issues surrounding it to make informed choices on the subject. One delegate pointed out that discussion of the subject probably represented at most a one or two-hour lecture over the whole of an engineering design course.

It is therefore with the intention of addressing this knowledge gap that *Eureka* has teamed up with D Young & Co to produce a new feature starting in this issue and appearing monthly for the rest of 2012. In it, we will attempt to address some of the key aspects of intellectual property law and, hopefully to answer any questions our readers may have. The feature appears on page 43 of this issue. We hope it proves valuable.

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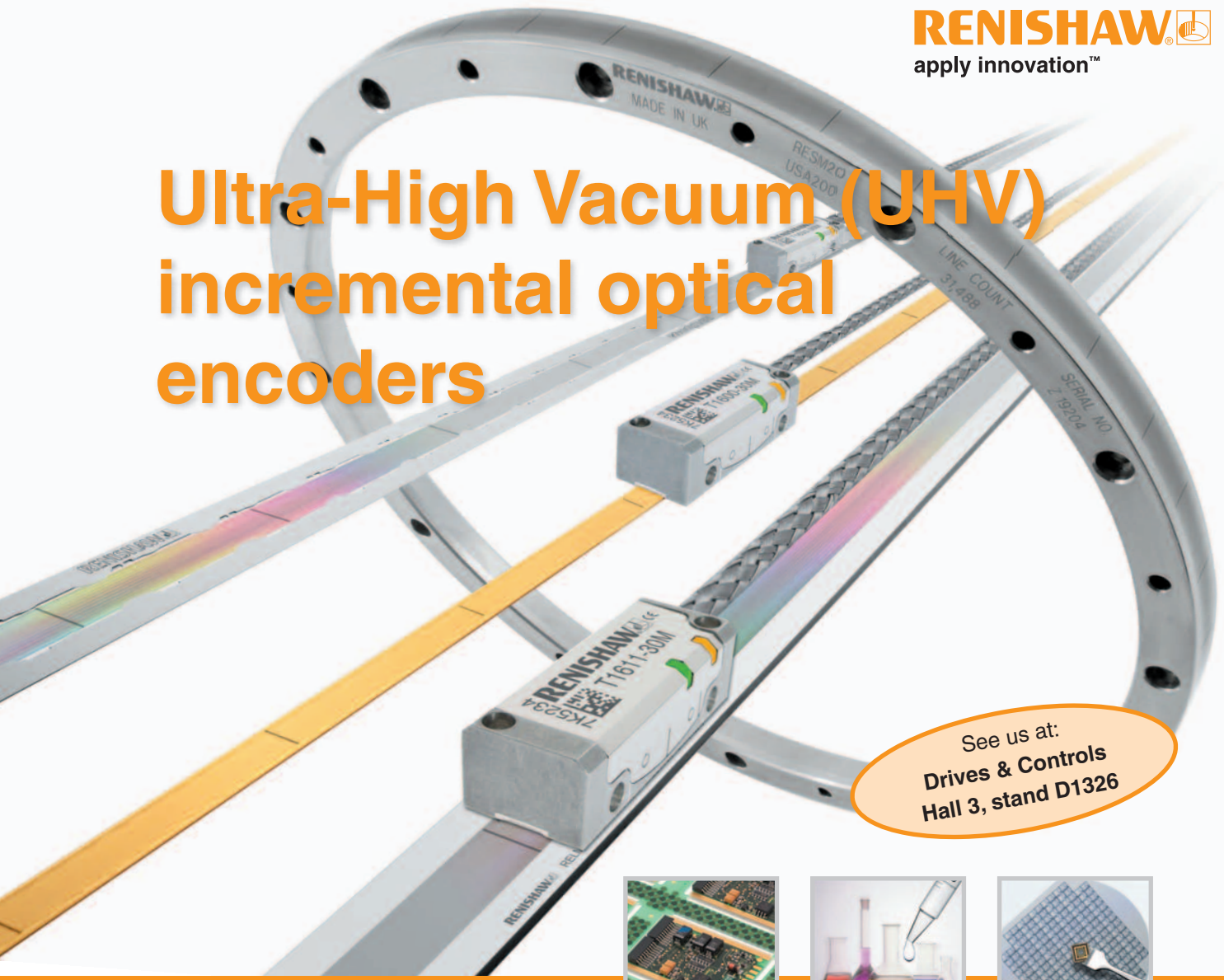


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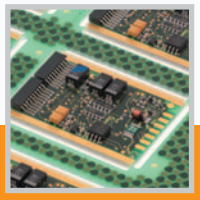

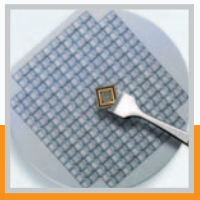

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# Nationwide search for young manufacturing stars launches

*Business Minister Mark Prisk*

Business Minister Mark Prisk has launched a nationwide search for the Make it in Great Britain 30 Under 30 – 30 young rising stars employed in the manufacturing industry, all aged under 30.

Nominations are invited from all areas of manufacturing, from fashion and textiles to aerospace. Entries will be judged by a panel of industry experts, who will be looking for truly exceptional young employees across the full range of sectors.

'30 Under 30' is a part of the Make it in Great Britain campaign, which aims to challenge outdated opinions and transform the image of modern manufacturing. Once selected, the '30 Under 30' will play an important role in promoting manufacturing careers to the next generation, highlighting the diversity of jobs in the sector which include design, sales, marketing and business management.

With multiple routes into manufacturing careers, including apprenticeships and pursuing Science, Technology, Engineering and/or Maths (STEM) at college or university, it is hoped that the '30 Under 30' will encourage more young people to see the opportunities the industry has to offer.

Business Minister Mark Prisk said: "Current perceptions of British manufacturing are out of date. Modern design, engineering and manufacturing offer varied and rewarding jobs for young people, yet many people don't realise this. We want 30 young people working in industry to explain to their generation just what they're missing."

Jürgen Maier, managing director, Industry Sector at Siemens Plc and one of the Make it in Great Britain Industry Champions said: "It is becoming increasingly hard to recruit the talent that we need if the industry is to continue to grow. There are a wealth of jobs in manufacturing – from the conception and design of a new product or process through to actually making and marketing it."

Please visit bis.gov.uk/makeitingreatbritain for further details.


## Government funding to boost nuclear innovation

The Government is to invest up to £15 million in research, development and knowledge transfer to stimulate innovation and support growth in the civil nuclear power sector.

The investment – through the Technology Strategy Board (TSB - www.innovateuk.org), the Department of Energy and Climate Change (DECC – www.decc.gov.uk), the Nuclear Decommissioning Authority (NDA – www.nda.gov.uk) and the Engineering and Physical Sciences Research Council (EPSRC – www.epsrc.ac.uk) – will fund feasibility projects, collaborative research and development, and Knowledge Transfer Partnerships (KTPs) that stimulate innovation and strengthen the UK supply chain.

Universities and Science Minister David Willetts said: "This is an important and exciting time for the UK civil nuclear industry. With potential for investment and innovation in the new-build and decommissioning markets, now is the right time to make sure that the UK is best placed to win orders and grow global market share.

"That's why we are launching this substantial new funding programme to enhance innovation and capability development and expand the UK nuclear industry to provide rewarding careers and contribute towards more stable and balanced economic growth."

## World's lightest carbon fabric developed

Swedish carbon fibre fabric innovator Oxeon has develop what it claims is the lightest carbon fibre fabric in the world weighing just 43gsm. The TeXtreme variant is designed for high-performance applications in Formula One and aerospace.

The TeXtreme fabric is an intermediate modulus carbon fibre and can be used with almost any resin system. The Spread Toe technique uses carbon fibre tapes to produce a weave that results in thinner laminates, straighter fibres and less crimp. Lower crimp reduces the amount of excess resin that needs to be used. The current weave consists of fibres that are ±90° but fibres can be orientated in almost any direction.

The TeXtreme fabric is a prototype and is undergoing application tests during the spring and is expected to be ready for sale by the summer. The previous lightest TeXtreme fabric was 76gsm.

**www.oxeon.se**

## Engineering Design Show grows apace

Aucotec, Proto Labs,Gabriel Chemie, Product Assessment & Reliability Centre Ltd (PARC), IQD Frequency Products, Anixter, ML Electronics and TRW Conekt have joined those set to exhibit at this year's Engineering Design Show. In addition, Materialise has confirmed it will host a workshop on the topic 'Designing for Manufacture'.

The Show, whose headline sponsors are Schaeffler, Heidenhain, Altium and Premier EDA Solutions, will take place on October 10th and 11th 2012 at the Jaguar Exhibition Hall at the Ricoh Arena, Coventry. For more details of the event or become an exhibitor, please visit the website or contact Luke Webster at lwebster@findlay.co.uk

**www.engineeringdesignshow.co.uk**

Engineering design show

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## COLOURFUL SENSOR CATCHES THE EYE

The new BFS 33M from Balluff is a true-colour sensor that can discriminate between objects with great accuracy. It precisely detects an object and switches the corresponding output. Up to seven objects can be signalled on the switching outputs in this way. In addition the L*a*b colour values can also be directly output on a serial interface. Special compensation and individualised calibration means the sensor achieves extremely high accuracy over a long period.

The BFS 33M is more than a simple colour sensor. As a True Colour sensor it precisely detects every colour in the technical colour space, making it ideal for use in a variety of demanding applications including robotics, automated assembly, in the packaging industry or wood processing industry. The rugged aluminium sensor housing meets the special needs of machine and systems builders. The sensor is always used in conjunction with a fibre optic cable, so that applications under especially harsh conditions and tight mounting spaces can be handled.

Together with an optional lens from Balluff even ranges of up to 400mm and beyond are easily within reach. Metal parts in finishing processes can be monitored, or various material qualities selected. The high switching frequency of 1.5 kHz makes it possible to monitor even fast processes such as in the printing industry.
**www.balluff.co.uk**

# Inverters up to 7.5kW available

The Lenze 8400 motec range of terminal box inverters has been extended and now covers powers from 0.37 to 7.5kW. By decentralising frequency inverters instead of fitting them in the control panel, machine cabling and installation is simplified. The motec range can be mounted directly on the motor in place of the terminal box, or onto a nearby surface - an option made easy with the enclosure rating of IP65. Either way, panel sizes can be reduced and the cost of cabling is lower.

Lenze offer the motec range as 'drive packages' consisting of the frequency inverter, the motor, and as appropriate an in-line or right angle gearbox. Two, four and six pole motors can be chosen together with options such as brakes, blowers and encoders. Power connection to the motec frequency inverter can be done with unshielded cables which reduce cost. Also the cable length can be minimised by looping the cable from one inverter to the next. The control connection can be from a simple AS-i bus, the more common industrial fieldbuses of PROFIBUS and CANopen, or even by PROFINET and EtherCAT real time buses.
**www.lenze.co.uk**

# New xiros ball bearing materials

Since xiros ball bearings were launched five years ago, polymer material and bearings expert igus has completed lots of development work resulting in five separate xiros ball bearing materials, many new dimensions and a wide range of different designs available ex-stock within 24 hours. In addition, specially developed engineering tools for design engineers, ranging from 3D CAD downloads through to the xiros Lifetime Calculator are available to use online.

Lubricant and maintenance-free, xiros polymer ball bearings can endure temperatures of up to +150°C, are highly corrosion-resistant, can be washed and cleaned, are non-magnetic and are light weight. xiros ball bearings provide an economic alternative for many applications where the use of conventional metallic ball bearings is problematic. These applications are varied, ranging from all kinds of medical equipment, pumps and measurement machines, through to transport and conveying technology.
**www.igus.co.uk**

# Solution to last month's Coffee Time Challenge

The solution to last month's challenge of how to create a gourmet tea experience in a busy retail environment comes from Cambridge Consultants, whose TeaTotal prototype brings a dynamic experience to the customer who loves tea. It allows for personalisation according to taste, and brews the 'perfect cup' in half the time of the standard tea process, maximising revenue for the retailer.

TeaTotal is a fully programmable tea brewing device, allowing the consumer to specify not only the leaf, but also the intensity of the tea flavour and the relative bitterness. Cambridge Consultants' design team was able to identify the independent variables that impact flavour, and how to separately manipulate them to deliver each consumer's ideal cup. Moreover, while a standard tea process brews tea in roughly four minutes, TeaTotal only takes around two minutes, creating faster throughput in a retail setting. The prototype has been designed to use loose leaf tea and the theatrical brewing pot fills with water, swirling the leaves around and steeping until the tea is poured into a cup and the spent leaves are ejected, all highly visible to the expectant consumer.
**www.cambridgeconsultants.com**

# Chains offer even longer service life

An improved generation of low-maintenance chains of the Everlast Plus series has been introduced by iwis drive systems. Thanks to advanced sintered metals the new black coated roller chains have a significantly extended service life.

The improved properties of the Everlast Plus chains result mainly from the improved modern sintered materials from which they are made. The goal in their development was to achieve a major reduction in their friction wear – and a corresponding extension of their wear lifespan – without the need for relubrication and without a marked increase in their production costs. In laboratory tests the chains with the new oil-soaked sintered bushes and a slightly modified bolt specification showed an improvement in wear lifespan of more than 300%. To visually distinguish the new Everlast Plus chains from their predecessors, all of their components are coated black.

**www.iwis.com**

# New submersible transmitters

A range of submersible dual output level and temperature transmitters is now available from Impress Sensors And Systems.

Manufactured in the UK by Impress Sensors, the transmitters are suitable for continuous submersion in liquids such as water, oils and fuels. The sensors are available in ceramic (IMCTL) or silicon (IMSTL). All sensors provide dual independent, 2-wire, 4-20mA outputs: one for level and one for temperature, with no signal loss over long cable lengths. The sensors offer nominal pressure ranges from 10mWG to 100mWG (ceramic) and 0.5mWG to 100mWG (silicon).

The temperature sensor is based on a platinum resistance thermometer with Class 'B' accuracy (other accuracy classes are also available). The sensor housing is either 316L stainless steel, high grade Duplex stainless steel or a Marine bronze option for the IMCTL, making the transmitters ideal for hydrostatic level measurement, where temperature is also a critical factor in measurements.

All sensors are temperature-compensated and calibrated and supplied with a traceable serial number and calibration certificate. Operating (media) temperatures are from -20°C to +60°C in non-freezing media. Cable material is PUR, with PVC, FEP or TPE as options.

**www.impress-sensors.co.uk**

# Lifting system thrives in limited space

Camloc Motion Control has launched its 'Camloc Hydraulic System', a compact, electro-hydraulic unit that is ideal for applications with limited space, including tail-lifts and access ramps, medical and patient-handling, to machine guards and height adjustment on industrial machinery.

Billed as 'the perfect solution' when electro-hydraulic lifting is needed on an application, this innovative design can be mounted horizontally or vertically. It is easy to install, robust and maintenance-free, and has been designed as a modular unit to allow customers the flexibility to build a system that best suits their individual applications.

The Camloc Hydraulic System is a self-priming 'plug & play' system with an in-built emergency release mode and features an IP40 rated motor with 72 hour salt spray corrosion resistance and IP54 rated cylinders with 144 hour salt spray corrosion resistance.

**www.camloc.com**

# What's driving **design?**


**What are the first questions you ask about any new design project?**

**SK**: What is the client looking to achieve? Obviously, the answer is always 'to make more money', but how you achieve that: whether it's by increasing market share, cost reduction or increasing competitive advantage and the perceived value of products. Understanding those goals is the first element.

The other key thing is to understand who's using it and why they're using it. What are their problems with it? Why do they use competitor products? Once you understand those areas of differentiation, you understand the opportunities to deliver advantages.

**MC**: We ask a series of questions and try to cover all six factors that cover design: Does the concept or design meet real user needs? Is the enabling technology appropriate to what we're trying to do? If it's not, someone else will compete with something that is appropriate or cheaper or whatever. Is the supply chain behind the product appropriate? Does the product fit the business strategy of the company you're working with? Does the product display the values of the brand? Is the product going to fit into the market you're aiming it at?

What we try and do is look at the thing holistically. You can't just look at the engineering; you can't just look at the IP; you can't just look at the technology. You could get all those things right, but if one of the other things is wrong, you're not going to get the return on investment. The customer is always the most important thing. It's very tempting in a technology space to fall in love with a nanotechnology or a photovoltaic solar panel, but at the end of the day, you have to bear in mind that the customer is paying, so – no matter how great the technology – that's where you've got to start.

**EW**: We're up near the higher end, so there are likely to be compelling reasons to come to Cambridge Consultants. One of those reasons tends to be that time to market is compelling, so there's a need to get there quickly. One of the things I often ask to determine whether it's our type of project is to ask whether the client has time to get it wrong and have another go. If they have, then they can probably do it cheaper than working with us.

One of the other points I look for is whether the project is multidisciplinary. If it's just software coding, for instance, there are cheaper places to do it, but if there are elements of software, mechanical, human factors, design interface and if it's novel, then we really start to become competitive.

**What are the biggest obstacles to successful design?**

**MC**: Corporate lethargy – It's much easier to do nothing than something. The risks are lower, it's cheaper. Markets are changing all the time, but people don't notice slow changes, which makes it

**Paul Fanning asks representatives of some of the UK's leading design consultancies what trends, drivers and technologies are affecting product development.**


easier to do nothing because slow changes don't force you to do something. In product development, you've got to inspire people to do it and give them confidence. That can only be achieved by good preparation and good analysis.

The other one is understanding what customers want, which is more difficult than you'd think. Customers react to what's around them and to what they've already got, but if you want to make a step change, you need to really understand their motivations rather than their current reactions, so you need processes to allow you to do that.

**SK**: The big influencing factors we see when facing a new design are, in common with many industries: 'Better, cheaper, quicker', basically. Those in various combinations are the biggest things.

The obstacles are where there is not enough time or money to make the improvements you'd like to. But you have to cut your coat according to your cloth.

**EW**: One of the things that can cause the wheels to come off down the line is if there are unclear objectives. We're often starting with a relatively clean sheet of paper and different parts of the client organisation can get carried away and start putting in objectives that they don't really want and that no-one will actually pay for, but that seem like a good idea at the time.

Right from the start we try to make sure that they can make whatever we're designing. So our project managers are trained to find out where the product will be manufactured and to ensure that any parts or subsystems we build in are either in their parts bin already or can be sourced from their approved supplier list.

**Mike Cane**
Founding Director
Cambridge Design Partnership

**Stephen Knowles**
Managing Director
Industrial Design Consultancy

**Eric Wilkinson**
Chief Operations Officer
Cambridge Consultants

### What trends do you see emerging in design?

**MC**: Emerging economies are opening up big new markets for companies, but those markets have very different drivers. So there's a challenge there of 'India has 10% p.a. growth, but what do Indians want to buy? And how do we make it at a price that makes sense?

Sustainability is a key one as well. We're seeing that as a must-have feature. Ten years ago, one in ten projects had sustainability as a key feature, but it's every project now.

The other trend is open innovation. We're finding customers are much, much more comfortable with doing innovative, product development projects with diverse teams – using external teams and companies, outside technology. Previously, large companies did tend to want to do everything in house, but there has been a change. There's now a much more flexible approach

**SK**: There is now integration between CAD and manufacture. Obviously, the technology has been around for a while, but it's now more widely adopted. It's becoming much more common to skip the engineering drawing stage and go straight from the 3D CAD to the finished part.

Sustainability is another one. With some clients with niche products, it doesn't tend to be a major factor in terms of their design planning, whereas when you move into the more fast-moving consumer goods or medical devices that are made in their millions or hundreds of thousands then it's a very big issue.

**EW**: If I had to pick out one, it would be that people expect technology to be accessible now. The area that's having the biggest impact is medical technology, where it's no longer enough to receive a treatment, people are interested in the experience of getting it and how easy it is to get.

The other trend is the massive explosion in interconnectivity and what it offers you. Not only does it enhance the user experience by offering additional functionality, but it can offer major user benefits as well. The ability of product companies to become service companies by virtue of technology is increasingly important to much of our client base. No longer can you ship a product and that's it. If a customer is taking advantage of services you offer by virtue of interconnectivity, then their relationship with you is much greater than if they just replace the product every few years.

**How has the economy affected how you design?**

**MC**: From our perspective, the various ups and downs of the economy have made things much more volatile. The underlying demand for the products is still there, but companies tend to be much more prone to get cold feet and projects tend to get delayed. They don't go away, they just get delayed.

Companies will do nothing and then, when competitive pressures just get too strong, they'll do all the projects at once, which means that work comes in huge peaks and troughs. There's not a reduction in activity, it's just more volatile.

**SK**: In the current economic climate, people are tending to be more unsure about projects and are therefore tending to delay making decisions until it's almost too late.

The other trend is that people will start a certain part of the project and then will put it on ice for six months. Then they'll say 'Go!' again. This usually comes down to business risk and available cash in the current economic climate.

**EW**: Our business model is about getting people to market quickly and offering business advantage. In the past, our customers have tended to include a number of well-funded start-ups. Today, we're seeing fewer start-ups, but the big blue-chip companies are still pressing on with great enthusiasm because they recognise that having differentiated products offers real commercial advantage.

**What is the key to a great design?**

**MC**: Great design works on many levels. It's very unusual that you get a great design that has one outstanding feature and that's it. Typically in great designs, everything is done well and that requires the holistic, multi-disciplinary approach .

You've got to get the software great, as well as getting the mechanical engineering, the design and everything else really great. You have to be a jack of all trades and expert in all of them to create a great design.

**SK**: The difference between good and ordinary design is the extent to which the way the user interacts with the product is taken into account. That is the real key to whether a product delivers satisfaction, dissatisfaction or real delight with an item.

There are lots of different strands to pull together and it's about bringing those strands together to deliver a product that delivers more than expected

**EW**: I like to see elegant, balanced design. Something where I can see that the different demands on the design have all been met. I don't particularly like things where expense is no object. I'm much more admiring if something has been designed to a price point and with the capacity for upgrades while also making it fabulous. For instance, I find elegantly designed four-seater cars much more impressive than two-seater cars. If you're designing something of one and a half tonnes, then only carrying two people just seems like lazy design to me.

It's about finding that overlap between elegance, simplicity, price point, upgradeability, low-cost manufacture and high-quality. I admire designs like that.

**Can you give an example of design from your company of which you're really proud?**

**SK**: The Video Laryngoscope we developed really encompasses all the best aspects of design. A surgical instrument used in anaesthesia, it delivers real benefits to the users and the patient being intubated as it is less likely to break teeth and create trauma.

It's also making life easier for the anaesthetist. It's a really beautiful product that you really want to hold and that's all combined with all the technology that's inside. It's the way in which the technology, the human side and the aesthetics come together to deliver a top-quality product.

**EW**: We did an inhaler for an Indian company called SunPharma, who wanted to launch a product as good as anything on sale from established western manufacturers that was better in terms of usability and they wanted to do it quickly. I think we really hit the nail on the head there in terms of the way it looked felt and performed.

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# Foam is where the art is

Paul Fanning finds out how an apparently humble foam product could change automotive design.

"Essentially 600,000 balloons fused together", is how Paul Compton, JSP's President and CEO EMEA, describes his company's product ARPRO. However, he believes this description should not obscure the possibilities of a product that is already being used worldwide, but has potential to be much more widely adopted.

ARPRO is an expanded polypropylene plastic foam material used in moulded parts in a variety of applications worldwide. Currently, its largest market is in the automotive industry where, says Compton, "it is pretty much in every car – everything from a Twingo to a Rolls-Royce".

The material was first used in the manufacture of bumpers by Nissan in the United States in the 1980s and, since then, has spread into all areas of cars, including sun visors, seat backs, trunk liners, toolboxes, wheel arches, undercarpet floor-levellers, head impact and side impact protection. Its benefits include durability, relatively low cost, high impact management and the fact that it reforms once hit (making it ideal for bumpers).

However, one advantage of the material that was not considered crucial 30 years ago now represents one of ARPRO's greatest strengths in the automotive market – its light weight. Says Compton: "Initially, it was about functionality rather than weight. The fact that it was lightweight was originally an additional benefit rather than a core thing. However, as time has gone on, its light weight is a lot more important now than it was in 1985."

## About ARPRO

**ARPRO expanded polypropylene can reduce system mass from 25 to 35 percent in systems like seating. It is inert, unaffected by exposure to oil, grease, petroleum and most chemicals. For safety, it has an extremely high strength to weight ratio, quickly returns to its original shape following dynamic stress, withstands multiple impacts without significant deformation and provides acoustical enhancement.**

**ARPRO is 100% recyclable and easily recoverable. When producing ARPRO, the waste streams are water and CO2, with imperfect product being recycled on site. The water is screened for any solids and then released to the local water**

Quite how much weight ARPRO could save can be seen in applications such as Inrekor (see Eureka, March 2012), where it is used as part of a sandwich panel to form the chassis and can take as much as 300 kilos or more out of the car (not all in the chassis, but in the fact that the lightweight chassis allows manufacturers to down-gauge the brakes, the wheels, etc). There is even an electric vehicle company currently looking at using it for the body of the car. "There is a point where you simply can't put any more ARPRO into a car," says Compton, "but we haven't found where that point is yet."

Even despite the obvious need for lightweighting, however, there remains considerable scope for educating designers within the automotive sector. Conservatism still abounds among designers and is not helped by other factors, claims Compton: "Designers only became aware of the functionalities of ARPRO slowly, unfortunately, as the sheer scale of OEMs means that there isn't a huge amount of inter-disciplinary crossover. The function of scale is such that, when we developed a seat application with Porsche, people were incredulous and knew nothing about the material. You can say "But the bumper guy knows all about it!" and they won't even know who the bumper guy is – he's probably in a different building or even a different site or country!"

Another challenge facing Compton is the need to improve the surface aesthetic of the product, which would open up a range of new markets for the company. Says Compton: "At the moment, you will find ARPRO in most cars, but it's usually hidden behind something else. This is because, when it's exposed, it has a problem. Designers may like the untreated surface, but consumers unfortunately do not."

He continues: "You can have a very nice surface. In general, you can't have a high-gloss surface. You can melt the surface for a crystalline surface, but you're limited in terms of the complexity of shape you can do that in. It tends to be only one plane you can do that on. You can see the beads and can see the voids – which do not matter to function, but do to appearance. You can eliminate that and the core vents with surface treatment."

Overall, Compton is extremely positive about the future, feeling that ARPRO will play an increasingly prominent part in car design, pointing to how far it has come already. He says: "I wouldn't have imagined in 1985 that you would have surfaces actually exposed within the car, but you increasingly do now. As consumers, people tend to think that, if something is an integral part of the car and performs, they accept it."

**www.arpro.com**


*"There is a point where you simply can't put any more ARPRO into a car, but we haven't found where that point is yet."*

# A sense of realism

**The virtual world is being increasingly exploited for engineering advantage. Justin Cunningham travels to the Virtual Engineering Centre to see how it is being deployed.**

Virtual engineering is becoming an increasing part of the design process. Engineers are spending more and more time in the virtual world, which is becoming ever more complex and realistic.

A recent visit to the Virtual Engineering Centre (VEC) shows just how far things have come, but more interesting is just how useful it's proving for UK industry. The centre was established by the University of Liverpool, along with project partners, BAE Systems, Morson Projects, STFC and NWAA. It is part funded by the European Regional Development Fund (ERDF) and the Northwest Development Agency (NWDA) and is based at the Science and Technology Facilities Council (STFC) Daresbury Laboratory in Cheshire. It supports both SME's and larger organisations to maximise the benefits of adopting virtual prototyping and immersive visualisation technologies and supports its implementation into organisations across the whole product life cycle.

One of the most unique things about the centre is its virtual engineering simulation laboratory, which focuses a lot on autonomous operation of unmanned aircraft and developing the systems needed to make them a reality.

"The idea is that manufacturers can bring along, for example, their sensor technology and find out how they might work in real life applications," says the Virtual Engineering Centre executive director, Tony Robotham. "At the moment we have dynamic models of the UAV but to add realism we put in things like lags, filters and noise and see how a sensor might behave."

To demonstrate that certification of a UAV is possible the group have developed a realistic computer model. Firstly, the environment is modelled. In this case, it is the UK with topography, the same airspace as well as physical environmental properties such as wind, rain and humidity. The second thing is an aircraft that is modelled to fly and behave like the actual aircraft would. Its specific flight properties such stall angle, lift to drag ratio's, and weight all play a part in the aircrafts relative performance and control.

These two models are then integrated with avionics that includes a suite of sensors and also the artificial intelligence to allow it to function autonomously. One of the biggest challenges is getting the aircraft to comply with 'the rules of the air'. For example, when an aircraft is simulated flying in civil airspace along a flight corridor and another aircraft is approaching, the rules of the air state both aircraft must turn to the right.

"In order to be able to fly in civilian airspace the aircraft must be able to make an autonomous decision and those need to be the same decisions as an actual pilot," says Dr Robotham. "So that capability is what we want to demonstrate.

"We have a UAV virtually flying along a standard flight path. We can simulation a variety of situations it might face. For example a sudden cross wind or have another aircraft flying towards it or put noise and distortion in sensor readings to see how it reacts. From that we can work with SMEs to develop the sensors and autonomous capability."

This virtual environment

that tests aircraft and the corresponding flight systems are modular. This enables different aircraft and flight characteristics to be tested, with different sensors and software, in any combination, to see what the performance is, and critically, if flight certification can be met.

At present it is up to manufacturers to provide models of their sensors, failure modes, performance with signal to noise ratios and performance with external g-force and vibration. However, the VEC is looking at ways of putting hardware in to the virtual system and actually stimulate it so the sensor is taking a real reading. This could be done in combination with a device that induces typical flight vibration and shock loads in to the sensor to see how it responds.

"We want to develop these virtual test beds so we can use it in the conceptual phase and to run thousands of 'what if' scenarios," says Robotham. "For example, we could see what happens when the aircraft flies faster and therefore ask the question would the sensor need twice the range if the aircraft is going twice the speed?

"The point is what might be a valid robust solution for one aircraft might not translate into another environment. We want to be able to use this analysis in the conceptualisation of new sensors so you can specify the requirement and that is going to drive future specification."

**Virtual Reality**

The VEC is also very much about using virtual reality to offer an 'immersive experience' to those that use its facilities. Perhaps the centre piece for all of this is its 6.0m x 2.1m active wall which allows visualisation on a 1:1 scale with things as large as Bentley cars and even aircraft wing spars. The entire system was supplied and installed earlier this year by Cheshire based Virtalis.

The active stereo projection system is synchronised to 3D glasses to give depth perception to the models which offer engineers a very realistic perspective of what it is they are trying to create. Bentley Motors sent the VEC the CAD data for one of their cars and a physical mock up of its seat and a steering wheel. By tracking the position of seat, steering wheel and the 3D glasses the virtual and real worlds can be integerated so that the onscreen image moves with the movements of the user's head. Additionally the index finger is tracked. The result is that by sitting in the chair, engineers can very accurately project where the dashboard dials should be, the sunroof controls, and radio controls.

"The designers wanted to be able to rest their hand on the gearstick and be able to touch the centre console button," says Robotham. "This allows them to exactly design that in, and visually see it was achieved, before it was ever built.

"When you sit in the seat you get a sense of looking across the car, the size of the cabin inside, the wing mirrors; we have found that engineering decisions and interpretation are greatly aided through advanced visualisation. Bentley has even used it to tune the intensity of the LEDs in the dashboard and have used that data to actually drive the LEDs they've ordered."

To further aid the immersive experience, the VEC is using haptic devices to interact with CAD models. Its desktop mounted device by Haption, the Virtuose 6D Desktop, uses three articulated branches attached in parallel to a cylindrical handle to provide six degrees of freedom, all with force-feedback. The device is in a separate laboratory and is used to check component clashes and also for other manual tasks.

"What we found was that the small desk mountable device was easier to use in a desktop setting with a head mounted display," says Robotham. "The tasks it is used for need to be close up with very fine controlled movements. We are getting cyber gloves which are wireless gloves to allow control and interaction of the virtual hand models on the large active wall."

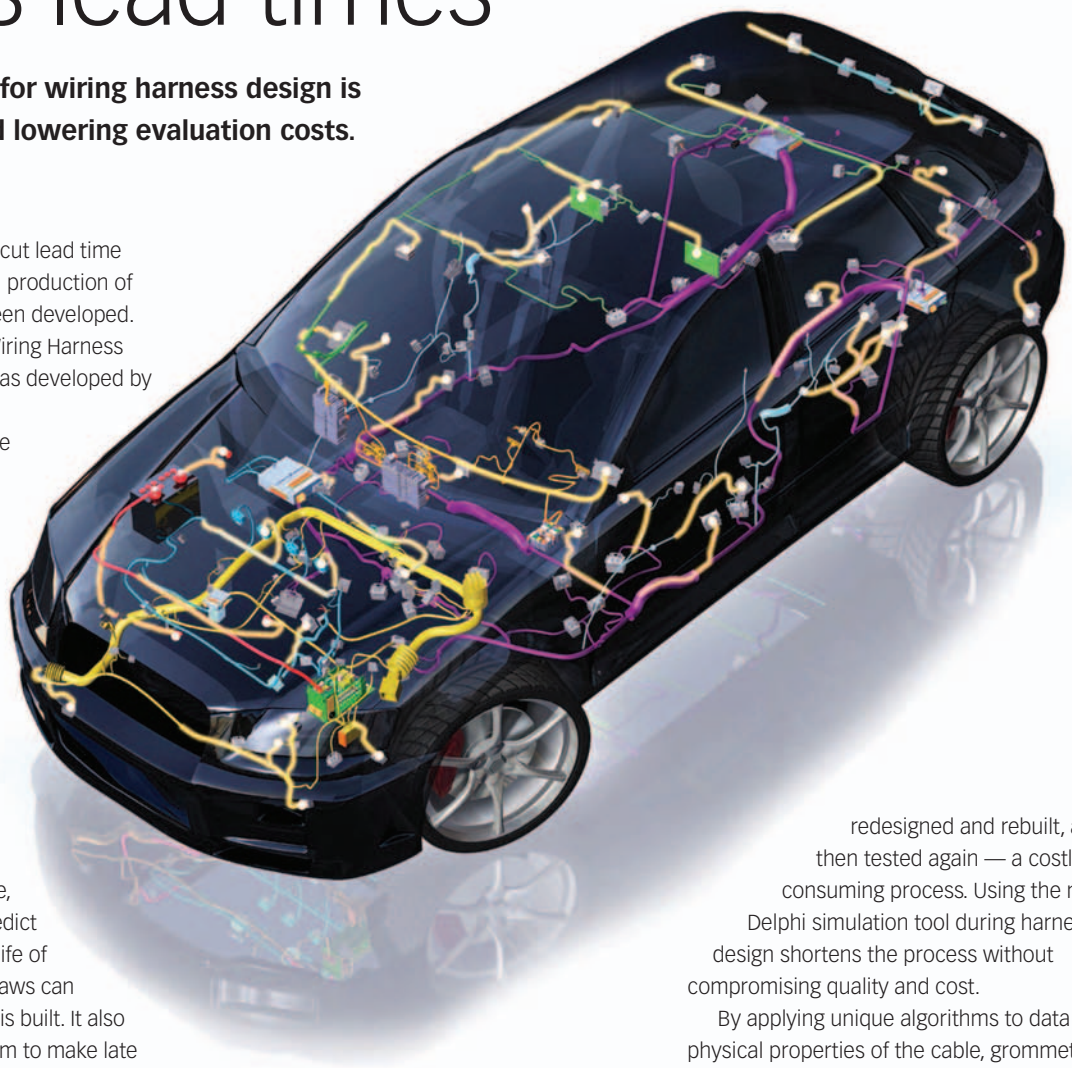
The VEC's link to the Daresbury Science and Innovation Campus allows it access to high performance computer power. That means that it can perform 1000's of simulations. But critically it also gives them the means to display, visualise, and explore the findings. The result is a virtual world where possibilities can be measured and tested, ideas developed, and concepts forged.

The power of modern virtual simulation might one day completely do away with physical testing. But for the meantime advanced simulation and immersive virtual reality means that more ideas can be explored early in the conceptualisation phase so that when manufacture does come round the product will be right first time. One thing is for sure, virtual engineering is here to stay and will continue to become more realistic and play an increasing role in helping engineers innovate.

**www.virtualengineeringcentre.com**
**www.virtalis.com**
**www.haption.com**

# Wiring simulation tool slashes lead times

**A new simulation tool for wiring harness design is reducing lead time and lowering evaluation costs. Paul Fanning reports.**



A new tool to help engineers cut lead time and costs in the design and production of vehicle wiring harnesses has been developed.

The simulation tool, called Wiring Harness Bend Fatigue Simulation Tool, was developed by a global team of Delphi Packard Electrical/Electronic Architecture engineers, enables vehicle designers and engineers to shorten the wiring harness design cycle without compromising the quality of the wiring harness.

"This tool allows us to identify, and then design in, the optimal wiring harness for a vehicle in a virtual environment," says Robert Seidler, engineering director, Global Core and Electrical/Electronic Architecture, Delphi. "Since engineers can predict wiring harness fatigue over the life of a vehicle, any potential design flaws can be corrected before the vehicle is built. It also affords the customer the freedom to make late design changes without having to worry it will delay their start of production." All this translates into Delphi's customers being able to feel even more confident in their ability to cost-effectively design a durable, efficient wiring harness that will last over the life of the vehicle.

A vehicle's wiring harness is a complicated assembly of cables and grommets surrounded by insulation. It typically is installed between static and moving vehicle body parts, such as doors, lift gates, and trunk lids. With repeated opening and closing of these parts, the wiring systems experience a significant amount of bending deformation.

Wiring harness durability depends on the ability of the cables to withstand this bending fatigue over time and can be simulated in three steps: First by predicting the behaviour of the wiring harness during flex applications; secondly by calculating the stress that will be applied to the harness bundle and cables; and finally by estimating the fatigue life of the harness.

Traditionally, harness durability could only be evaluated once the vehicle and wiring harness prototype had been designed and built. Cables in that newly-designed prototype were physically tested for strength and durability, redesigned and rebuilt, and then tested again — a costly, time-consuming process. Using the new Delphi simulation tool during harness design shortens the process without compromising quality and cost.

By applying unique algorithms to data on the physical properties of the cable, grommet, and insulation, engineers can model real-world wiring harness performance before the actual vehicle and harness are built.

"This approach is technically more robust, scientifically more accurate, and considerably faster than the validation process used in the past," said Jun Ma, engineering manager, simulation, Delphi Packard Electrical/Electronic Architecture. "Given a wide range of materials and conditions, our theoretical analysis can predict durability and help engineers determine the best design in a matter of days, significantly reducing validation time."

**www.delphi.com**

# PLM and ERP collaborate effectively

**Can ERP and PLM be made to work in harmony. *Eureka* examines one example that suggests they can.**

ERP, enterprise resource planning, the backbone management information system that handles the operational aspects of a business, and PLM, product lifecycle management, which manages the product attributes, are often portrayed as vying for a central starring role within manufacturing companies.

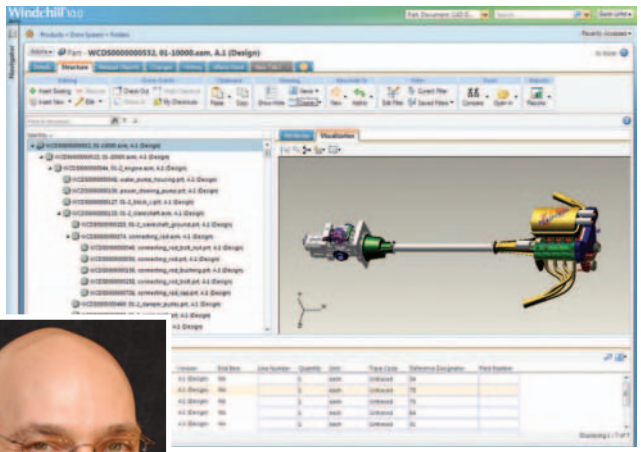
However, this is not just a wrong view: it's a potentially damaging one too, says Bill Neuman, vice president of software development at PTC. It can leave gaps between the two systems and it often duplicates data.

"We really need to think of PLM and ERP as complementary," he told a conference recently. PLM collects all the information about products from innovation through to their eventual recycling or disposal; it is concerned with defining and creating the products. ERP is about the operational side of products once they have been defined, so it handles business transactions, manufacturing schedules and items such as human resources records.

As defined traditionally, these are distinct and non-competing areas of influence, and PLM and ERP are themselves systems that integrate several individual elements, with their reach getting broader all the time.

One of example of this being successfully achieved is by General Dynamics in the UK, which outlined some of the steps it has taken in terms of uniting the information available to all sides of the business, from engineers through to office and business functions.

Some of the drive for this had come not through a specific push for integration but from a need to rationalise multiple systems in use in the UK business at a time when the group had won a major UK defence contract.



**"We really need to think of PLM and ERP as complementary," Bill Neuman, PTC**

Andrew Winch, applications manager at General Dynamics, says: "We had three ERP systems and three PDM (product data management) systems, and if we're honest the organisation was much the same with a lot of silos and sites with their own ways of working."

General Dynamics' philosophy on systems is to go for off-the-shelf systems and to use established vendors that can offer maintenance and a roadmap for upgrades, as well as strong support. In terms of standardising on ERP, which was decided as the first step, there was not a lot of controversy. Winch says Oracle was used by two-thirds of the UK group with no complaints.

"The PDM choice was more complex," he says, and the concept of a bill of materials that would unite the engineering side of the business was not really there. For example, CAD files generated in ProEngineer were routinely converted through an IntraLink data management system to a PDF format for storage in an entirely disconnected library system that was derived from an alternative supplier's system.

The group decided to take an interim position in which it would use the PDM elements offered by the ERP supplier as a way of starting the process by which it could start to unify operational and product data. Although this offered limited functionality, it could demonstrate the benefits that could be derived from a single system and form the basis for a bill of materials approach to data. At the same time, it upgraded the CAD system by converting the IntraLink system to the more powerful PTC Windchill.

Going further towards a fully integrated system, however, was difficult to justify in terms of payback. "The catalyst for the change was a major defence programme win: we saw that we needed to have better, more integrated systems," says Winch. In the end, General Dynamics got the integrated systems which were based on uniting Windchill with the Oracle system, but not the contract. It had, however, proved to its own satisfaction that this kind of integration was necessary to win major contracts in the future.

"The position today is that we have a single database and the different PDM systems have been consolidated into one with the ERP database," Winch said. The system releases different bills of materials from the central data based on the application, and benefits are already being realised in terms of synergies and the reuse of data. Winch does not see this as a quick-hit change: "It's a journey with long-term benefits, but it's the right thing to do," he says.

**www.ptc.com**

# Tape offers strength and versatility

**Adhesive tapes have a number of industrial bonding applications. Paul Fanning takes a look at the technology.**

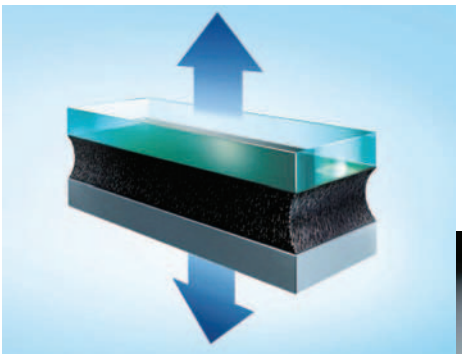
The common perception of adhesive tapes is of them as a temporary measure. Fit only as a placeholder rather than a permanent bond. This is understandable, of course, based as it is on the domestic application of tape, where it is very much as the poor relation to glues. However, in the industrial environment, there are a number of applications in which tapes can provide a valuable and long-term solution.

Of course, different substrates exhibit very different properties under changes in operating conditions such as temperature, humidity or exposure to U/V light. As general guidelines however, designers need to consider three main factors; surface energy, surface characteristics and potential expansion / contraction associated with temperature change.

Surface energy is the 'excess' energy at the surface of a material and is important for any adhesive technology because the surface energy of a substrate influences the ability of an adhesive to 'wet-out' i.e. spread out evenly on the surface. If wetting is inhibited by a low surface energy then it is only possible for a weak bond – if any – to be formed. Ideally, the surface energy of the adhesive should be (appreciably) lower than the surface energy of the substrate to which it is applied, typically between 2 to 10 dynes/cm. However, an acceptable bond can still be achieved if the surface energy of the adhesive is equal to the surface energy of the substrate.

With regards to surface characteristics: it's important to know if the surface(s) are rough or smooth as it will influence the choice of adhesive tape. For example, if both surfaces are smooth, such as glass or metal, then a tape with a filmic carrier is ideal. If however, the surfaces are rough or uneven, or if there is a discernible gap between the substrates when they are placed together, a double sided tape with a thicker carrier such as a foam tape should be used.

Expansion and contraction at temperature is another factor. Solids expand or contract as temperature varies, with this change in dimension occurring in all directions. However as they don't all expand and contract at the same rate, then depending on the difference, increased stress can be placed on an adhesive bond. This means that the type of carrier must then be taken into account when choosing a tape, and in such cases a foam tape has often been preferred as in construction it is able to accommodate such dimensional changes.



*ACXplus is specially developed for long-term bonding*

The potential of adhesive tapes in industrial applications can be seen in one of the newer products on the market. This comes from tesa, which recently showcased a radically new range of acrylic adhesive tapes with optimum viscoelasticity for constructive bonding applications – tesa ACXplus. This technology enables a new functional combination of its chemical components while acting as a solvent-free coating of high capacity acrylates especially developed for constructive long term bonding.

Key performance benefits of stress dissipation are available through the product's viscoelastic properties. Viscoelasticity embodies both elastic and viscous characteristics which allow the tapes to dissipate extreme physical stress. When two materials, for example glass and aluminium, are bonded with it, an optimal high strength bond is achieved even where extreme temperature conditions and high wind loads are experienced.

The product's high performance acrylic adhesive system provides optimal wetting and chemically adapts to bonded surfaces, giving a powerful bond on materials with different surface characteristics. In addition, tape thicknesses can be adjusted to compensate for rough and uneven surfaces. Decades of bonding can be confidently predicted as a result.

*Double-sided foam tapes are ideal for bonding dissimilar materials*

Jeremy Smith of tesa UK, says: "[It] offers a viable alternative to traditional mechanical fastening methods, taking constructive bonding to the next level in offering significant advantages which can be seen in its bonding strength, stress dissipation and resistance to the elements. With this technology, not only can we offer solutions for all known adhesive application areas, we can also start to embrace application areas where no adhesive bonding solutions have previously been available."

**www.tesa.co.uk**

# Fasteners ease electronic assemblies

New microPEM TackPin (Type T) fasteners for compact electronic assemblies enable sheet-to-sheet attachment, replacing costly screw installation in applications where disassembly is not required. Their use eliminates typical screw-related issues (including tapping, cross-threading, torque control, and vibration backout) and ultimately promotes quick and easy installation with minimal hardware. TackPin fasteners can serve as ideal alternatives to welds or adhesives.

Among notable applications, these aluminum fasteners can be specified to attach super-thin membranes and very thin cosmetic substrates, such as keyboards. The fastener's low-profile head also provides cosmetic benefits.


Type T microPEM TackPin fasteners install by first preparing properly sized mounting holes in the sheet to be attached and the base panel. After inserting the fastener into these holes, the fastener is pressed into place. The fastener clinches into the base panel and the fastener's head subsequently holds the top sheet (as thin as 0.2mm) firmly and permanently in place. The base panel can be as hard as HRB 45 or less on the Rockwell "B" scale and should be at least 0.89mm in thickness for blind holes or 0.5mm in thickness for thru holes. Upon installation, loosening due to vibration or other factors is not a concern.

**www.pemnet.com**

# Mobile apps launched to aid adhesive specification

Huntsman Advanced Materials has launched two mobile apps for Android and iPhone's. The apps enable the right Araldite adhesive or Araldite composite formulated system for specific substrantes.

The apps asks engineers to input the substrates they wish to bond and then advices on the appropriate adhesives including the latest epoxy, polyurethane, methacrylate and silane-teminated polymers.

It also asks customers for packaging preference from easy-to-use cartridges with static mixers and working packs for manual applications to drums for higher volume applications.

From adhesives with long open times for large area applications to fast-curing adhesives for early removal from fixtures and rapid through-put, the apps can advise on a range of adhesives with a range of properties.


The Araldite mobile apps will also be available on BlackBerry in May.

**www.huntsman.com**

# Fast-curing mould sealer

Frekote mould sealers from Henkel are favored worldwide by manufacturers in a variety of moulding processes. When applied to a mould, Frekote sealers form micro-thin, thermally stable surfaces that are chemically bonded to the mould surface sealing in micro porosity. Combined with Frekote release agents this results in multiple, contaminant-free releases and reduced manufacturing costs.


The Loctite Frekote CS-122 reduces the curing time to two hours resulting in a shorter waiting time before the user can apply the release agent. The new product also seals larger porosities because it allows for thicker coatings.

Application is easier as the product can either be sprayed or wiped on the surface. The Loctite Frekote CS-122 can be applied at room temperature between 13°C and 40°C making the energy consuming heating of the mould unnecessary. Cured, the sealing remains stable at temperatures of as much as 400°C. Due to an improved formulation compared to its predecessor, the recently launched CS-122 emits less odour making its application more comfortable for users.

**www.henkel.com**

# Permabond launches PBT bonding solution

Permabond Engineering Adhesives has launched a PBT (Polybutylene Terephthalate) bonding grade of structural epoxy adhesive. Its ES5741 has been developed to bond challenging blends of PBT offering excellent adhesion, high strength and high temperature resistance.

PBT is a thermoplastic that is commonly used to make injection moulded parts for the automotive, electrical and medical industries. However, certain blends prove particularly difficult to bond. As a result Permabond developed its ES5741 and has found it works well on a number of filled varieties of PBT where other adhesives have shown poor adhesion characteristics. Many parts manufacturers have previously resorted to using ultrasonic, friction or spin welding joining methods, which are not only costly, they also restrict the choice of materials being joined (so are unable to bond PBT to metal for example) and the dimensions, fit and geometry of the joint are also limited.


**www.permabond.com**

# Simulation yields better bearings

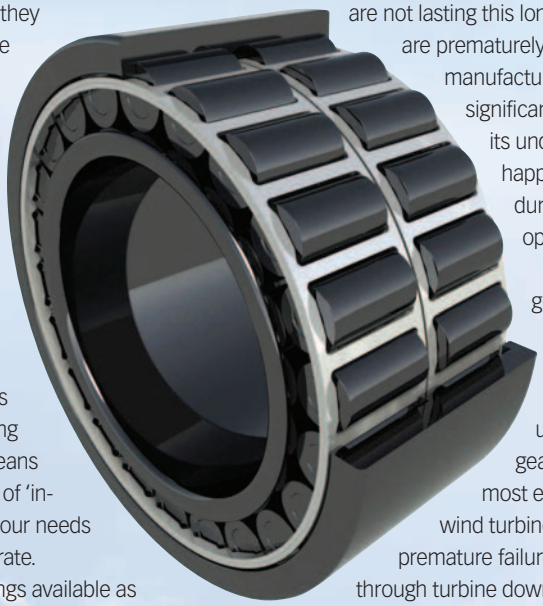
**The increasing need to specify more optimised bearings for wind turbines has led the industry to develop its own FEA tools. Justin Cunningham finds out the benefits.**

Bearings are one of those components with which most engineers feel pretty comfortable. They understand the principles, the physics and, for the most part, can do the calculations appropriately.

The conventional calculation method for determining bearing life is often referred to as the 'catalogue method'. The bearing industry has agreed to these particular calculation methods found in the specification ISO 281.

The basic life calculation considers bearing load, speed, load rating and bearing type. However, bearing life calculations need to be much more complex if they are to yield the accurate predictions of bearing life and reliable operation that many of today's application demand.

Increasing use of alterative materials, lubrication considerations, life expectancy, performance; engineers are continuously pushing the boundaries. This means that the understanding of 'in-service' bearing behaviour needs to be much more accurate.



The variety of bearings available as commercial-off-the-shelf has steadily been increasing and this means that it is possible to get a bearing that is very closely optimised to particular operational conditions.

Perhaps the most powerful tool available to engineers to help in the process is virtual simulation. Early virtual simulation is getting more ubiquitous and evermore accurate. Many of the major bearing manufacturers have been developing their own software to make sure that design engineers have the tools they need. Getting it right at the early stages has profound knock on benefit.

One area in particular where bearing selection has become particularly crucial is in the renewable energy industry. Turbines used to capture energy from the winds, tides and waves need to be hardy to the external environment and are expected to work for 20+ years.

However, the practicality is that bearings are not lasting this long and in many cases are prematurely failing. Bearing manufacturer SKF has made significant effort to develop its understanding of what happens to bearings during this type of operation.

It has found that gearboxes of wind turbines are suffering from persistent and unusual failure. The gearbox is one of the most expensive parts of a wind turbine system and premature failure adds to cost through turbine downtime as well as unplanned and expensive maintenance and repairs.

The failures that were occurring were abnormal and though SKF had encountered similar failures in other industries they were not at the rate encountered in wind turbines. "We don't think the failures are due to classical fatigue," says

Paul Meaney, manager of the Renewable Energy Application Development Centre for SKF. "There are other mechanisms that are driving the failures."

As the typical calculation to select bearings is based on stress and fatigue it had to question the tools and calculations used. The failures were more due to dynamic effects so the calculation had to include the dynamic effects and time domain so to better capture, at the design phase, events which could lead to this sort of failure.

"It is difficult because you traditionally look at the loads, lubrication and cleanliness and you can make a good prediction about the life of the bearing," says Meaney. "Now we are saying there are dynamic events which will occur that will initiate some damage. It is not that the older methods are not valid, it is just that they are no longer sufficient."

The company has been using and developing a multi-body simulation tool called Beast to better understand the behaviour of bearings in application. It is used during the product development phase. However, as it is a computer intensive tool it is not a tool you will apply for every bearing position for every design you do. Rather it is used where it is critical.

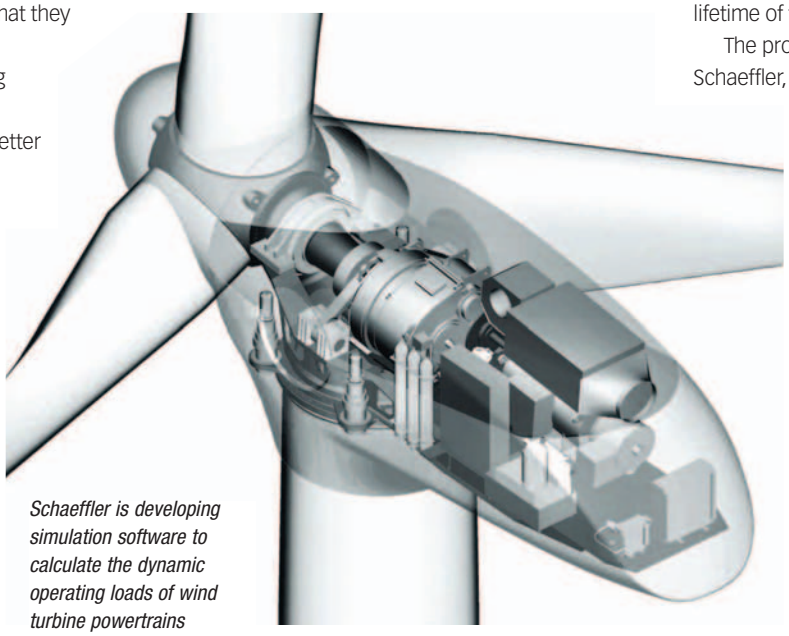
"It is used to optimise the bearing for particular applications and will be used in critical positional," Meaney adds. "Beast is one tool that we have; it is not the only tool. It looks at a single bearing or a very small system. We have other tools that look on a system level like a complete gearbox."

NSK too has been exploring virtual opportunities for optimising bearings for wind turbine applications. Its technical experts have developed sophisticated programs to better understand bearing dynamics and static load conditions and increase the accuracy of estimating bearing life.

Application data, environmental conditions, structural stiffness as well as many other influencing factors can be simulated by NSK to better predict the life in a given application. For wind turbines it is the excessive wind velocities and resulting dynamic loads that dramatically impact the turbine and subassembly.

Just calculating the lifetime of this type of bearing requires a large degree of expertise. This is why selecting bearings for wind turbines is more complex than in other areas. Numerous parameters must be taken into account. Besides the bearing loads and the rotational speeds in the application context, design engineers must consider the construction in which the bearing will be placed, i.e. the configuration of the shaft and housing, their materials, and their tolerances.

In ISO 281, annex 4, the calculation of modified service life rating is based on simplified rolling bearing geometry. In order to increase the accuracy of the results of these calculations, NSK has developed its STIFF simulation software application that takes the above mentioned parameters into account along with the exact interior geometry, internal operating clearance, pre-load, deformation of the shaft bearing system, lubrication conditions, load area and the load distribution between rolling elements and raceway.



*Schaeffler is developing simulation software to calculate the dynamic operating loads of wind turbine powertrains*

This model divides the rolling elements into lamina sections. A modified service life rating is determined for each lamina section of the rolling element and bearing raceway. This data is then integrated using the application spectrum of the bearing application.

For bearing arrangements in the wind turbine gearbox, the modified service life must be 175,000 hours, i.e. 20 years. The scope of the NSK's STIFF calculation software delivers results that enable rapid parametric analysis to assure the system design meets the design life criteria.

Another example of calculation methods employed by NSK is FEA work which examines the distribution of stress within the bearing and its supporting components. It can also run frequency analysis to examine vibration generation of the rolling bearing within the application.

Peter Kohl, a wind engineer at NSK says: "By the use of sophisticated numerical calculation tools which are able to simulate circumstances of the application and material properties such as temperature, lubrication, deformation of bearing components and contamination, it is possible to give a more reliable prediction about the real lifetime of the bearing."

The problem has also been recognised by Schaeffler, which is working closely with a gearbox manufacturer, a wind turbine manufacturer and a software developer. It is developing new simulation software that is better able to calculate the dynamic operating loads acting on wind turbine powertrains.

"Rolling bearing calculation software, Finite Element Analysis (FEA) and dynamic simulation tools will play a critical part in developing next-generation renewable energy systems," says Dr Steve Lacey, Engineering Manager, Schaeffler UK. "Used in combination with FEA tools, this complex, multi-body simulation model will enable design engineers to optimise the design of individual powertrain components and to establish how these interact with other systems across the entire powertrain."

Simulation tools such as these, which can be used at the initial wind turbine design stage, will prove invaluable in helping to make future wind turbine designs more reliable and cost effective under a wide variety of load conditions. New bearing designs can be developed and tailored to specific wind turbine requirements, including turbines for both onshore and offshore wind farms.

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*to highlight just a few...*

## Special radial sealing

**can bear over-pressures of over 210 bar**

Marzocchi Pompe produces a system of radial sealing at the shaft of its gear pumps and motors that can bear enormous internal over-pressures without resulting in damage. Particularly useful in single direction hydraulic motors when, in certain conditions of use, high over-pressures will be generated at the motor output. With bi-directional motors, the area adjacent to the seal ring of the drive-shaft is maintained at atmospheric pressure by the drainage circuit. In single-direction motors, this area is directly connected to the output so any over-pressure impacts directly on the seal ring, causing the lip to turn over or the ring to be expelled from its seat with a consequent leakage of fluid.


These products can also be supplied complete with anti-cavitation valves. The motors are supplied with an internal drainage circuit. In this case the hydraulic motor always drains inside with a lower pressure; the combination of this product with a high-performance sealing ring substantially increases its reliability. Marzocchi Pompe's solution is made up of a single-lip radial seal ring in a Teflon composite material and reinforcement ring, both of which are the result of a special design and construction process. The external reinforcement ring fully follows the form of the seal ring, and has been sized to bear the axial force generated by internal over-pressures. Before performing laboratory tests, it was necessary to strengthen the entire system that fastens the ring onto the flange, so that it could bear all the stresses submitted to the ring.

FEA software determined the best characteristics of the components. The new radial seal ring has a much stiffer structure than normal rings, making it necessary to employ special assembly procedures. The Teflon (P450) material adapts evenly to the texture of the machining on the shaft to guarantee a perfect seal. Because of the internal pressure, the lip of the seal ring is constantly compressed against the shaft. The increase in pressure is accompanied by an increase in friction, with heat being generated in the sliding zone as a result.

The properties of the P450 material make it possible to bear high-pressure loads, strong friction and temperatures between -30 and +200ºC. To guarantee a long operating life, it was necessary to perform in-depth research on the methods for grinding the area where the sliding of the seal ring's lip takes place.
Validation tests revealed that the system is able to work on a continuous basis at a constant pressure of 30 bar without the spilling of fluid and without the ring and the shaft exhibiting wear. Tests performed at higher pressures also demonstrated the possibility of the system functioning for short periods of time (several minutes) with over-pressures of up to 140 bar.

If the operating conditions must be maintained with extremely high over-pressure values (80-100 bar) for prolonged periods of time (over 30 minutes), the heat generated by the friction between the ring and the shaft can result in temperatures of over 300°C. This inevitably plays a part in deteriorating the structure of the P450 material used in the seal ring, as well as compromising the ground profile on the shaft, and thereby reduces its sealing function.
In the presence of pressure peaks, for example caused by errors of manoeuvre or incorrect timing of the valves of the hydraulic circuit, or in static conditions, with the shaft immobile, this sealing system can bear over-pressures of over 210 bar without leading to any loss of fluid or deformation of the components.

The robust and reliable characteristics of this product make it particularly suitable for applications that function as appendages of other machines without knowledge of the exact circuit characteristics.
**www.jbj.co.uk/MarzocchiTeflonSeal.html**

## Short Length Multiple Gear Pumps

When space is restricted and there is a need to drive multiple pumps from a single motor, standard multiple modular pumps may not be suitable, so something of a more compact design is needed hence these reduced length gear pumps.

These short length pumps can be supplied as 2 or 3 part modular configurations with various options of flange, shaft, inlet and outlet ports, and also one port feeding multiple elements if necessary.

Excellent torsional strength is achieved due to the internal splined joint. Careful design and optimal clearance between elements allow precise compensation of small misalignments between shafts of different pumps ensuring transmission of high torque.

For further information about size combinations, possible configurations and relative working conditions, please contact jbj Techniques technical department.
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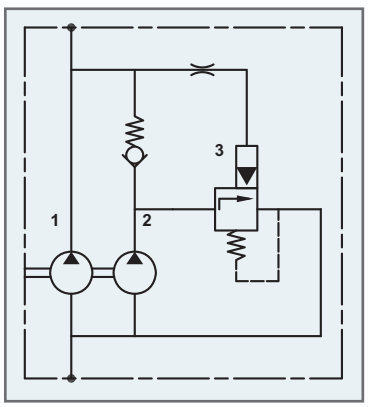
## High/Low Multiple Gear Pumps

Ideal pump for applications which require a fast approach and/or return of the actuator at low loads and slow motion of the actuator at high loads.

In particular these models offer the advantage of requiring lower power of the motor. The Marzocchi 1HL, 1PHL and 2HL High/Low hydraulic gear pumps are special double stage pumps with special integrated valves as shown in the hydraulic circuit diagram. specially designed for applications such as waste compactors, log splitters, clamp mechanisms, crimping machines, metal forming machines, etc.




1) First stage high pressure
2) Second stage low pressure
3) Unloading valve

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# Opportunity knocks for composites sector

**Material innovations from the composites industry are continually addressing the reservations and problems engineers face using the material. Justin Cunningham reports.**

A number of new materials have come to market in recent months that are offering a host of fresh opportunities for engineers. From resins to fibres, plastics to the more exotic; material innovations are helping deliver more economic and environmental solutions, as well as pushing the envelope of technical possibility.

Amber Composites announced that it is to supply a prepreg (pre-impregnated) composite with fibres made from sustainably-sourced woven flax. The flax fibres produced by Composites Evolution have a processing requirement similar to glass fibre but with lower weight and, of course, environmental impact. It also has good damping characteristics, which make it ideal for applications where vibration can be an issue such as in automotive structures.

Composites Evolution has been set up specifically to fill the niche of sustainable composite materials. These include fibre reinforcements, natural bio based resins, recycled as well as recyclable feed stocks.

Brendon Weager, managing director of Composites Evolution, says: "We have a lot of customers ask for prepreg using our Biotex flax fabric and we worked closely with Amber Composites to ensure this solution is now available."

The prepreg comes infused with Amber Composites Multipreg 8020 epoxy resin system. It is a low to medium cure prepreg which can be used in, but critically outside of, autoclave ovens. The initial fabric options are a 400g/m² 2x2 twill, and a 500g/m² plain weave. Like other bio based materials its strength limits it to semi structural and decorative applications, though improvements are continual.

One of the problems with using bio based fibres is ensuring the quality and reliability in the supply chain and making sure supply does not interfere with food crops. Jonathan McQueen, managing director of Amber Composites, says: "After evaluating many sources for sustainable fabrics, we are pleased to offer a proven solution from Composites Evolution which has created a capable material backed by a solid supply chain."

Last year the company showcased a canoe manufactured by Flaxland using flax fibre and resin derived from linseed oil. The aim was to showcase the possibilities and potential of the materials. It used marine plywood and European pine frame and covered it using the Biotex flax material impregnated with a UV cured bio resin.

Simon Cooper, owner of the builders Flaxland, is a traditional boat builder with a strong interest in using all natural materials. He says: "In recent years synthetic materials, such as coated polyester fabrics, have been used in boatbuilding. In an attempt to return to traditional boatbuilding methods, I became interested in the use of flax as a sustainable crop for the production of oil and fibre to make a boat. I wanted to find novel natural materials and in my search found the Biotex website."

Flaxland trialled many flax fabrics and found that Biotex had good impregnation, 'wet out' (the degree of resin impregnation) and very good tear

strength which, it says, is equal to the synthetic materials. The result was a flexible and strong canoe which was made without a mould tool.

Flaxland has made seven prototypes, using both the Biotex flax 4x4 Hopsack and Biotex 3H Satin weaves. The Hopsack version offers a resilient and durable canoe which has a net weight of less than 12kg and the Satin version gives a lighter option at just 8kg for racing. The canoe is currently undergoing long term durability and water resistance tests and has, so far, shown good results. Cooper is looking to roll out the design to larger rowing boats in the future.

Meanwhile, Bayer Material Science has continued to develop its polyurethane based resin system that can be used instead of epoxy resin systems. Polyurethane can be used with most fibres and it hopes this will facilitate the renewable industries desire for longer, lighter, turbine blades. It says the polyurethane composite also improves fatigue and fracture toughness over commercial epoxy resin systems.

Wind turbine manufacturers are demanding lighter, and stronger, blades as gravity induced bending loads dramatically increase dynamic stress making blades over a certain length unviable for all but a few composite compositions.

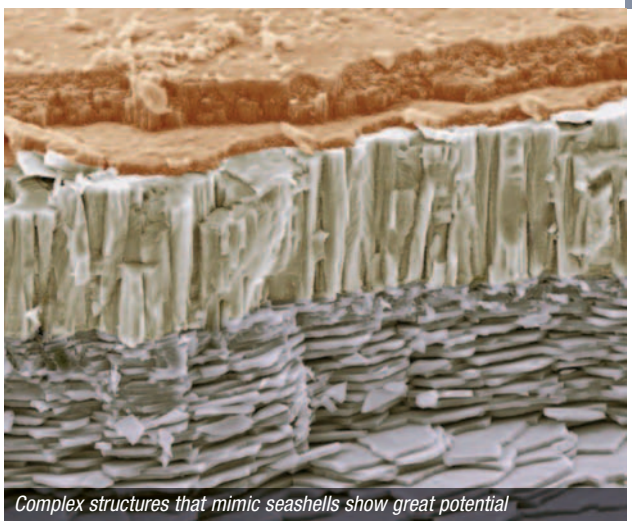
Bayer's Baydur polyurethane system possesses low viscosity and long gelling properties and it says when compared to a commercial epoxy and vinyl ester based composite, the Baydur polyurethane provides several key advantages. These include ultra low volatile organic compounds (VOCs), faster infusion time, superior tensile fatigue, improved inter laminar fracture toughness and fatigue crack growth as well as the use of raw materials from sustainable resources.

Bayer principal scientist Dr. Usama Younes conducted tests comparing the properties of incumbent epoxy and vinyl ester resin systems with a polyurethane resin system. The testing included two sets of long flow, vacuum infusion experiments designed to compare the flow rates of the different resins.

It also studied the effect of multi walled carbon nanotubes on fibre reinforced composite properties. He says the results showed a clear trend toward improvement in the fracture toughness of the composites from the presence of multi-walled carbon nanotubes.

"Incorporation of a small amount of multi-walled carbon nanotubes improves the fracture of both polyurethane and epoxy composites by as much as 48%." says Younes. "The addition of carbon nanotubes is a viable option to improve the strength of wind turbine blades."

Another new composite structure comes from material scientists at ETH Zürich which is working on composite materials that mimic the structure of seashells. Such complex structures are produced using tiny magnetic particles which guide the composites' stiffer elements into place. This technique will enable technologies from more durable coatings to stronger and lighter materials.



*Complex structures that mimic seashells show great potential*

Researchers discovered that they could enable a magnetic response in these nonmagnetic materials by attaching a small amounts of magnetic nano particles to the surface of the elements, just 1/1000th the diameter of a human hair.

This method only works for stiff elements of a defined size in the micrometer range, which happens to overlap with the sizes of key interest in the composite industry. Using stiffer elements on this scale provides orientation control using magnetic fields that are only 20 times that of the Earth. For comparison, credit card stripes emit magnetic fields approaching 2,000 times that of the Earth's field.

The team has already demonstrated that the technique can be used to produce an entire family of new composite structures, which exhibit programmable properties in any desired direction. The ETH team is currently working with commercial companies to put this technique into industrial use for lighter, cheaper, and stronger composite materials for the automotive, aerospace and renewable industries.

The general message from the composites industry is one of innovation. Almost all the companies involved in the supply chain, from the raw materials through to manufacture and disposal, are developing products and processes to better facilitate composite materials in to mainstream industry.

The message is clear, composite materials are going to play a vital role in the future. From cars to turbines, boats to buildings, the industry is developing materials that tick the check lists of designers and manufacturers. However, at present composites are still considered a premium material with cost and manufacturing capital outlay massively limiting factors. But, the industrial machine will continue turning, and at speed, and many feel it is only a matter of time before composites are thought of in the same way as metals and plastics are today.

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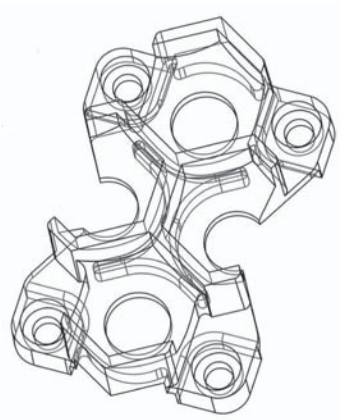

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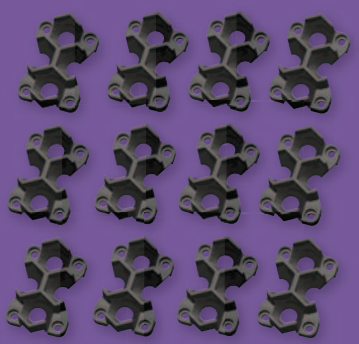

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# An engineering extravaganza

**The Drives And Controls Show will form part of the manufacturing and engineering series of shows, as Paul Fanning reports.**

Drives And Controls 2012 takes place between the 17-19th April 2012, at the NEC Birmingham and promises to offer a huge amount for visitors.

Following on from one of the most successful Drives and Controls ever in 2010, the event attracted 103 exhibitors – 16% more than the previous show held in April 2008, before the worst effects of the recession had been felt.

The 2010 show was also 22% larger than the 2008 event, covering an area of 2630m$^2$, and attracting more large-scale "showcase" stands. The event's growing international status was evident in a Chinese delegation with more than twice as many exhibitors as in 2008.

Despite the recent recession, the co-location of events that includes Drives And Controls, Air-Tech, and The International Fluid Power Exhibition (IFPEX) attracted more than 8600 visitors in 2010.

The total number of sq metres for the combined 2010 co-located events organised by DFA Media was 4762m$^2$. Ryan Fuller, exhibition sales director at DFA Media, believes this figure, along with visitor numbers will be significantly exceeded as manufacturing continues to regain confidence.

According to Ian Atkinson, managing director of the event organiser, DFA Media, the shows have achieved, "significant growth despite tough conditions for manufacturers." He says that this highlights industry's, "continuing commitment to support these important events."

As in 2008, the visitors came from


across the core industrial sectors and more importantly with live projects and looking to place orders. Drives and Controls exhibition sales director, Doug Devlin adds: "The exhibitors were delighted with the quality and quantity of leads, especially from Blue Chip companies."

Meanwhile, a stream of other companies have signed up to exhibit at the show, many for the first time. These newcomers include Charter Controls, REO, Sensor-Technik, Motion Control Products, British Encoder Products and Wieland Electric. First-timers from outside the UK include the German industrial communications specialist Insys, the Finnish mechanical power transmission manufacturer Katsa, and the Dutch supplier of flexible conduit Anamet. The French electrical CAD provider IGE-XAO, which has a UK operation in Sheffield, will also be making its show debut.

Former exhibitors which have booked recently to return to the show include Sick and Lamonde Automation.

A highlight of this year's Drives And Controls Show will be a pavilion organised by the European Power Transmission Distributors Association (EPTDA) and featuring up to 15 of its members. The pavilion will be modelled on one that the EPTDA has run successfully at alternate Hannover Fairs for more than a decade.

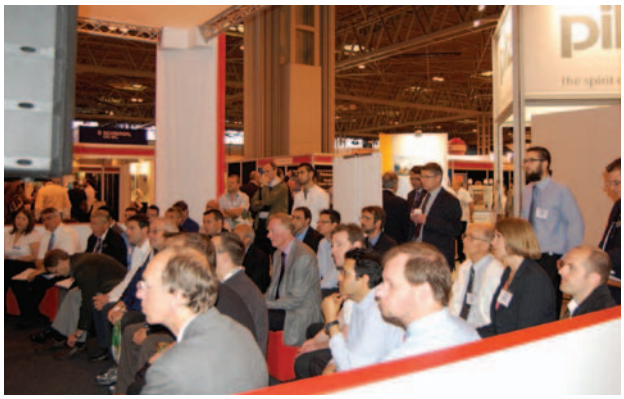
This will be the first time that the EPTDA has organised such an event away from Hannover. "It is a chance for our members to get a better grip on the UK market," says EPTDA executive vice-president Hans Hanegreefs, who expects most of his

members at the show to be from outside the UK, with one even travelling from the US to appear. The EPTDA is planning to hold a reception at the show.

"It's a clear indication that the UK is still seen as a gateway to Europe because of its cultural and language background," says Hanegreefs. "We hope that it will be very successful."

The EPTDA has more than 200 members – both distributors and manufacturers – based in 28 countries across Europe and further afield. Together, its members represent an annual sales volume of nearly €24bn and employ around 245,000 people. Members that have already booked to take part in the EPTDA pavilion at the Drives show include Iwis Chain, Bega Tools, Posi Lock Puller and Diamond Chain.

A highlight of this year's Drives and Controls, Air-Tech, and IFPEX



*A range of seminars will be available at the exhibition*

Exhibitions, is the new free-to-attend Energy and Safety seminar theatre, where themed panel discussions chaired by leading industry organisations including GAMBICA, The British Fluid Power Association (BFPA), and The British Compressed Air Society (BCAS), will focus on key energy management and safety topics including panel debates surrounding issues such as the use of software and programmable safety. Panel experts will look at how functional safety depends not only on selecting the right function in the first place and associated components, but increasingly on the use of software and software configurable components and networks. There are clear benefits to OEMs and end users, but what issues are faced by the person(s) responsible for implementing safety functions and what do they need to do?

In addition, at a time when UK industry is looking for ways to save money and fund new Capex purchases to invest in the future its panel discussion on Government Incentives will help to guide you through the application process and give you experienced advice on how to make the most of the incentives available.

Other key panel debates will

include helping visitors to know about the direct replacement for EN 954-1 – EN ISO 13849-1. The replacement of EN 954-1 is causing some confusion and its experienced panel will take you through the changeover.

It will also be discussing saving energy through intelligent control. When applied to electric motors, the potential for energy saving is significant, simply by stopping or reducing speed whenever possible. The seminar will look at different strategies for controlling motor driven systems, across a range of applications and control technologies.

There will also be important panel discussions surrounding key energy and safety related issues for the compressed air industry lead by The British Compressed Air Society (BCAS), that will help visitors re-examine their compressed air procedures. While the British Fluid Power Association will

chair a panel along with important industry consultants to offer a unique opportunity to ask pressing fluid power industry and related questions.

Other key Energy and Safety seminars include:

- Drive chain management as part of a best practice approach.
- The use of software and the programmable safety – how do latest standards deal with this, and what are the benefits?
- Green energy in industrial inverters.
- How to get the most out of your production machinery: optimising your power transmission drive system.
- The evolution of machinery safety CE Marking and Machinery Safety – what it is for, how it is achieved, what is required?
- Ecodesign – the user has to choose the most efficient system, not legislation.
- Energy efficient climate control.
- Turn it down, switch it off – keeping your motors under control.

Also new for 2012 is the Exhibitor Forum seminar theatre which will include more technical workshop style presentations, with practical issues being discussed concerning the various sectors that makes up Drives and Controls Exhibition, Air-Tech, and IFPEX.

**www.drives-expo.com**

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**In this new feature, *Eureka* has partnered with leading intellectual property law firm D Young & Co LLP to offer advice and information to help companies understand, use and protect their IP. Specialising in patents, trade marks, designs and related intellectual property rights, D Young & Co works with companies ranging from start-ups to established multi-nationals. In this issue, we examine some of the basic types of intellectual property.**

# What is Intellectual Property?

**Intellectual Property Rights (IPRs) are the intangible assets of a business. In the same way machine tools and stock are valuable assets so too are the intellectual property assets.**

**The term Intellectual Property is an umbrella term covering different intellectual rights. These include patents, trade marks, designs, copyright, domain names and know-how. Some rights are obtained automatically on creation of the asset whilst others are obtained by applying to the government to register your rights. Three key rights are explained below:**

## Patents

A patent is a legal document that gives the owner the right to prevent other parties performing acts defined within the patent. It is not, as some think, a licence for you to do something. A patent is applied for centrally in the UK at the UK Intellectual Property Office normally with the help of a scientifically and legally trained patent attorney. It lasts for a maximum of 20 years and confers a monopoly over those rights whilst the patent is in force. Fees are paid annually to the government to maintain the right. If you stop paying the patent lapses and the technology is freely available for others to use. You can patent a product or a process in just about any technical field, including computer implemented inventions. It is essential that you do not disclose your invention outside of your company (or outside of a confidentiality agreement) before filing the application.

Patents are country specific rights and international agreements allow companies to obtain corresponding rights in just about every country. A typical strategy involves filing a UK application then filing an international patent application called a PCT (an abbreviation of Patent Cooperation Treaty). The applicant then selects the countries of commercial interest and seeks patents in each one. Once granted, rights in each country or region can be licenced, sold or used to protect your commercial interests. The European Patent Office also provides a route to obtaining rights in most European countries.

**Example:**
Importantly, Intellectual Property Rights can be used in combination to protect a product or a product range. As an example consider a newly-developed mobile phone having an innovative polymer battery which is moulded to be integral with the inside of the casing. The phone has a new brand name and a striking new visual appearance. Here, a patent could protect the battery, a trade mark could protect the brand and one or more registered designs could protect the appearance of the phone. The combination of rights presents significant barriers preventing other parties copying the phone.

## Trade Marks

A trade mark is a sign used by a business to distinguish their goods or services from those of their competitors. Typically a trade mark may consist of a word or device (often described as a logo) although more unusual signs such as sounds or smells can also function as trade marks. Like patents it is possible to register your business' trade mark. Registration is not compulsory but doing so gives the owner the exclusive right to use the mark for the goods or services for which it has been registered in that country. Broader protection arises from registration in the case of trade marks which are well known or famous.

Registration is a significant deterrent to other traders and provides concrete proof of a claim to legal rights. While marks which have been used and acquired a reputation also enjoy legal protection in a number of countries, it is generally easier to protect a registered trade mark against unauthorised use.

Again, like patents, trade marks are country specific. However, there is a Europe-wide option in the form of a Community Trade Mark (CTM) confering Europe-wide protection and an "International registration" system.

## Designs

Design Rights protect the appearance of a product and fall into two categories: un-registered and registered rights.

An un-registered design right is an automatic right a company or designer has when a new design is created. It provides narrow protection against copying and lasts for a short period of time.

A registered design right, like a patent, is a right which has been granted by government and provides far broader protection.

It is possible to protect a 3-D visual appearance, such as the shape of a new mobile phone. It is also possible to protect 2-D aspects of visual appearance, such as surface decoration. A registered design may be concerned with the whole of a product, or just part of a product. For example, the shape of the whole of a mobile phone might be new, or it could be that just the shape of the antenna is new and thus commercially it is important to protect the shape of the antenna by itself. It is also possible to protect menus and icons used in computer software and user interfaces.

Further detailed information is available in the Knowledge Bank or by contacting a Partner at D Young & Co LLP. Both can be found at www.dyoung.com.

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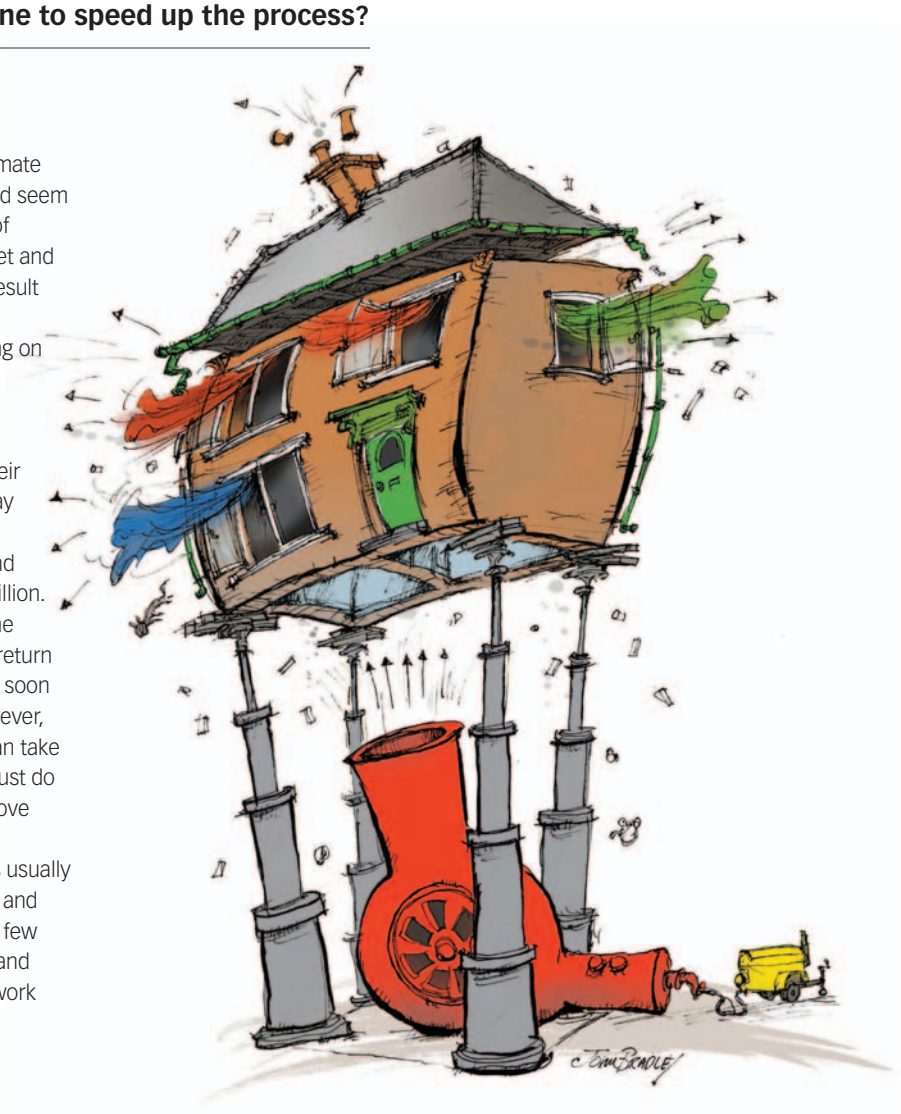
# Drying times

**Flood damage can be devastating and take months to dry out. So what can be done to speed up the process?**



Whether you are a believer in climate change or not, the last decade did seem to have more than its fair share of flooding. The UK is notoriously wet and whether flood waters were the result of human impact on the environmental, increasing building on flood plains, or just part of the natural pattern of things, they nevertheless remain extremely unpleasant for those that lose their homes. Insurers estimate they pay out some £1.5billion per year for flood damage and restoration, and they expect that to soon top £2billion.

Of course, those that suffer the misery of flood damage want to return to their properties and homes as soon as possible to begin repairs. However, once soaked through, building can take months to dry out, which they must do thoroughly, before people can move back in and begin restoration.

Removing the bulk of water is usually easily accomplished with pumps and water naturally receding in just a few days. But it is the residual water and damp embedded in walls, brick work and plaster that causes the most problems.

**The Challenge:**

Our challenge this month is therefore to come up with a way of drying rooms and buildings more quickly and efficiently. The solution should not be a way to avoid floods altogether, nor should it involve a pump to remove the bulk of water. The challenge is the best way to remove water and damp soaked in to buildings.

Current methods often involve using heaters, dehumidifiers and fans but this is rather inefficient, expensive and generates a lot of CO2 to continuously run them for months at a time. By shortening drying times houses are less likely to suffer from mould damage, families can get back to their property sooner, and in a flood damaged area more properties can be helped in a shorter period of time.

You could use desiccants to help in the process, or perhaps invent a special vacuum cleaner to suck the water from the floors and walls? Alternatively, if you are environmentally conscious you could try to harness the sun rays with giant mirrors and direct them where necessary; though you might be there a while... especially in the UK.

The device developed is remarkably elegant and simple, is twice as quick as traditional methods and it can easily be deployed. Find out the solution in next month's issue, but in the meantime, see if you can come up with something better.

**The solution to last month's Coffee Time Challenge of how to create a gourmet tea experience can be found in the Technology Briefs section on page 8**

## Adhesives

### Health and Safety Engineering Adhesives

Henkel, the global market leader in engineering adhesive technology, has introduced another 'world first' – the Loctite Health and Safety range that covers the lion's share of applications.

These hazard-label-free products are designed to make the COSHH assessment and acceptance process for engineering adhesives as easy as possible without any increase in cost price.

The new Loctite Health and Safety range encompasses thread locking, thread sealing, gasketing and retaining – a comprehensive product programme based on sustainability and responsibility without any compromise on performance.

@: technicalservice.loctite@henkel.com
✆: 01442 278100

www.loctitesolutions.com

## Adhesive Tapes

**Experts in tape engineering**

**For help and technical advice on our range of double sided, masking, and cloth tapes or converted products please phone:**

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**for your nearest authorised tesa distributor**

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www.tesa.co.uk

## Adjustable Shim Packs

### Spirol Shims provide solution for Armoured Vehicle Door Hinges

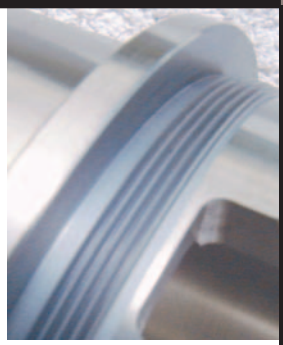
A military ground assault vehicle manufacturer approached Spirol Industries to provide quick delivery of adjustable shim packs for spacing of armoured vehicle door hinges. The spacing is critical providing proper sealing and locking engagement of the door systems. Spirol worked with the customer to determine the required adjustment and developed three Edge Bonded Shim Set proposals. The customer selected the Spirol solution as it offered safe and quick adjustment, a 70% cost reduction and a short manufacturing lead-time. Spirol's Edge-Bonded Shim Sets have all the performance and cost advantages of solid and loose shims, but instead of having to stack a number of individual shims, a single shim set can be quickly adjusted to the desired thickness and slipped into position. In this way, variable close tolerances can be achieved, saving considerably on the time required to pick various different thicknesses of loose shims.

@: uksales@spirol.com
✆: 01536 444800

www.spirol.com

## Coatings

### WS2 Stops galling of SS and Titanium



Stainless Steels and Titanium are both prone to galling and seizing. WS2 is a very low friction dry lubricant surface treatment, developed by NASA for use in deep space. It has been shown to provide a very cost effective solution, preventing both problems on threads and other sliding surfaces.

WS2 works well from -273° to 450° C and down to 10-14 Torr. WS2 has been applied to bearings and gears to extend life.

**Design Out maintenance problems with WS2!**

@: sales@ws2.co.uk
✆: 01430 861222

www.ws2.co.uk

## Electrical Connectivity

### Free Weidmuller App

**The Weidmüller App is now available in the App Store for free! You can access the latest news and information about Weidmüller's world of products whenever you want and wherever you are!**

The 'Weidmüller App' for iPod Touch, iPhone and iPad opens up a brand new way of obtaining information on the company's products which is fast, mobile and always up-to-date.

This appealing 'app' is impressive, with a clearly ordered interface and great functionality. With a simple structure and inviting start page, access to information is intuitive. Fingertip access to the desired information is available via buttons aptly named ie. 'News', 'Product Catalogue', 'Search', 'User Information', 'Enquiry List', 'Company Profile' and 'Innovations'.

@: marketing@weidmuller.co.uk
✆: 01162 823470

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## Finite Element Analysis (FEA)

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## Pumps

### NEW Flojet LF Plus Compact Pumps

**Streamlined body - quick clean capability – reliable diaphragm technology**

Versatile Flojet LF Plus low-flow industrial motor-driven pumps suit multiple industrial, agricultural, automotive and food processing applications. Proven reciprocating diaphragm technology ensures optimum performance in harsh environments from agricultural misting to chemical wash down for aircraft and automotive uses, plus filtration, cooling, liquid dispensing, food processing, pressure boosting, and automotive diesel fluid transfer applications.

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## Solenoids and Solenoid Valves

### Solenoids and Solenoid Valves

Penny+Giles are a UK based global supplier of linear solenoids and solenoid valves to OEMs in a wide range of industrial markets.

Typical applications include: · Medium Voltage Switchgear · Safety & Security · Automotive Braking · Cash Handling · Business Machines · Vending & Gaming Machines · Off-Highway Specialist Vehicles

We design and qualify in the UK, and manufacture in the UK or Asia. Our wide product range includes standard configurable designs in a range of solenoid types, but we also supply modified standard designs to suit specific applications, or unique custom designs for large scale OEMs.

@: solenoids@pennyandgiles.com
✆: 01388 771200

www.pennyandgiles.com

## Mechanical Engineer

**Location: Hythe, Hampshire**
**Type: Permanent**
**Salary/Rate: £45k-£50k**

An opportunity has now arisen in the engineering team at Hythe for the role of Mechanical Engineer. The main responsibilities for this role will be to act as site principal mechanical engineer, with overall responsibility for statutory compliance and engineering standards, and ensuring the plant is operated and maintained in line with these requirements.

The post holder will be the specialist site mechanical engineering resource, with overall responsibility for mechanical engineering standards and inspection/operation/maintenance, in line with those standards.

The successful candidate will have experience in the inspection and management of process plant equipment, in line with the Pressure Equipment Directive and the Pressure Systems Safety Regulations. In addition, the post holder will be the site's authority on a wide range of rotating equipment.

**For full details online, enter reference: qkCxLOv**

## Design Engineer

**Location: Great Yarmouth**
**Type: Permanent**
**Salary/Rate: £30k-£35k per annum**

This company is a leading UK-based oil and gas company, specialising in structures and platforms.

It is looking for a Mechanical Engineer or design engineer, with excellent FEA or hand calculation skills.

The role will be part of the growing design team, and will support the project engineers and managers with their designs from an analytical perspective. Experience of Mathcad and Solidworks would be preferred. However, others will be considered.

There is excellent scope for progression, and to be involved in new and interesting projects.

**For full details online, enter reference: qkCwqFP**

## Mechanical Engineer

**Location: London**
**Type: Permanent**
**Salary/Rate: Dependent on experience**

A leading projects and infrastructure company, specialising in mining projects, is looking for a Mechanical Engineer with P+ID experience, or with experience of either process design, metals or minerals, or designing plant or piping system layouts.

The role will be to design the complete 3D plant layout of complex sites.

Someone with experience of using Autodesk Plant 3D would be preferred. However, experience of Inventor or Solidworks would be considered. The role would suit either an experienced Mechanical Engineer or someone at a junior level with some of the above experience.

**For full details online, enter reference: qkCxEgL**

## Lead Instrument Engineer

**Location: Grangemouth**
**Type: Contract**
**Salary/Rate: £50-£55 per hour**

Principal/Lead Instrument Engineer working in the oil & gas industries sought. Min. qualifications HNC/HND in Instrument Engineering or related subject. TUV or similar IEC 61511 Functional Safety accreditation.

Preferred Qualification - Chartered Engineer, BSc/MSc in Control Engineering or related subject, MInstMC.

Essential Experience - More than five years' (senior) experience in instrumentation and controls engineering. Must be fully conversant with IEC 61508 and 61511, and have significant experience of the functional safety lifecycle, including generation of PFD calculations.

Capable of identifying and developing project-wide design deliverables, with familiarity of the interpretation of appropriate national and international industry standards.

Must be capable of C&I project scoping, estimating and portfolio management at all phases of project development, from conceptual feed to detail design.

**For full details online, enter reference: qkCxPcQ**

## Mechanical Engineer

**Location: Dundee, Scotland**
**Type: Contract**
**Salary/Rate: £30k-£35**

As a Mechanical Engineer, you will be required to perform modern product development tasks, including drawing board layout and interpretation and implementation. You will also be tasked with creating design concepts, updating the designs of existing mechanisms and progressing these through assembly.

A keen interest in electro/mechanical devices operating under S/W control, accompanied by CAD experience, is sought by this company.

**For full details online, enter reference: qkCxPZy**

## Design Engineer (Electronics)

**Location: Somerset**
**Type: Permanent**
**Salary/Rate: £32k-£38k per annum**

Exciting opportunity to join a growing company that manufactures subsea equipment, primarily for the oil and gas industry, and is a world leader in the design and supply of those systems. Due to recent developments, it is seeking an Electronics Design Engineer to work across key projects to ensure they are running efficiently and effectively.

**Candidates must have:**
- Design experience working with digital and analogue circuit design
- Some software design experience
- An understanding of communication transmission lines, along with serial communication protocol
- Familiarity with Linux OS
- HND/HNC or higher in Electronics

**Nice to have:**
- Experience of analogue and digital circuit simulation
- PCB design - SMD components on multi-layer boards
- Experience of software/firmware programming languages
- Fibre optic telemetry experience

**For full details online, enter reference: qkCw7zW**

## Senior Digital Design Engineer

**Location: Edinburgh**
**Type: Permanent**
**Salary/Rate: Dependent on experience**

With its unique focus and expertise in system power management, Dialog Semiconductor brings decades of experience to the rapid development of energy-efficient, highly integrated, mixed-signal integrated circuits, optimised for personal mobile and automotive applications.

It provides flexible and dynamic support and world-class innovation, and offers clients the reassurance of dealing with a globally established business partner.

Dialog Semiconductor is recruiting for a Senior Digital Design Engineer to work on the development of system and design strategy for its ASIC audio and power management driver products. Critical aspects of the role include block and top level design, from specification to synthesise, and STA clean netlist, design verification, and supporting DFT strategy and implementation. Strong skills within hands-on digital IC design development required.

**For full details online, enter reference: qkCxlBH**

## What recruiters say about us

DUGARD

**We've been tremendously impressed at Dugard with the service we've received from TotallyEngineering.**

**The first advert we submitted didn't sell the job we had to offer very well but our Account Manager (David Walter) worked closely with us in order to understand our business and requirements, which made it into a much more attractive prospect, which resulted in a big increase in quality applications.**

**We won't hesitate to use TotallyEngineering next time we have a position to fill, and can't recommend their service and team, highly enough.**

# cube67+ – THE PLUS FOR ADDED FLEXIBILITY

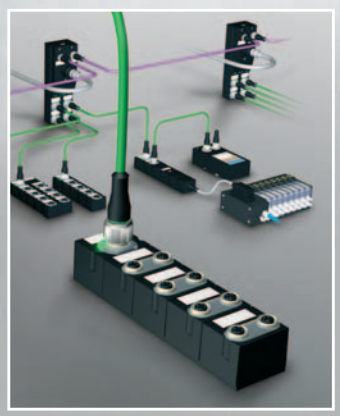
## The next generation

**The innovative multi-protocol fieldbus system from Murrelektronik, which has radically simplified and modernized decentralized installation has taken a step further with a plus.**

The single bus node can support up to 20 I/O modules in a 30m circumference and with a reduced number of cables. The range of I/O modules continues to grow and includes digital and analogue ports, safe outputs, logic, counter, valve island, temperature, I/O link etc. Both IP67 or IP20 are available.

**Cube67+ : a truly flexible system.**

- **More options**
- **More flexibility**
- **More distance**
- **More performance**

*Cube67 – the modular bus system*

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