

EUREKA

THE MAGAZINE FOR ENGINEERING DESIGN

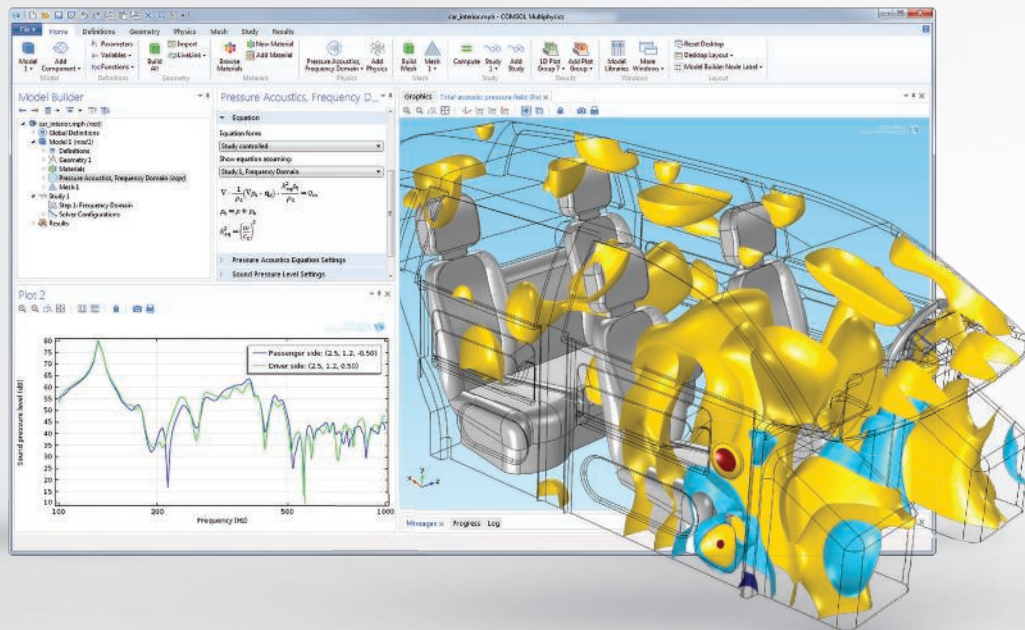
In this issue: Materials • Design Software • Sensors, Test & Measurement • Bearings & Linear Systems

Gridlock on the network

Keeping up with chargeable devices, electric vehicles and renewable energy



ACOUSTIC ANALYSIS: This model simulates the acoustics inside a sedan and includes sound sources at the typical loudspeaker locations. Results show the total acoustic pressure field and the frequency response at points inside the cabin.



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As renewables come online and electric vehicles take to the roads, balancing demand with supply has never been trickier. But could a solution exist in the problem?

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A liquid metal catalyst could be the answer to grid-scale energy storage, and allow renewable energy to become more competitive.

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Successful bearing application requires good measurement. Here, Paul Fanning looks at some of the available tools.

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Hail and farewell



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

This will be the last comment piece that will appear under my name and, as is traditional on these occasions, it falls to me to offer some summation of my tenure as editor of *Eureka*.

That said, summing up nearly five years in four hundred words was always going to be a challenge. However, it's probably best to start by saying how much I've loved editing *Eureka* and that I'm immensely proud of what we as a team have done in the last few years to turn it into the market-leading magazine, website and brand it should be.

Of course, this period has seen the stable of *Eureka* products expand considerably. When I took over in January 2010, there was 'just' the magazine, the website and the *British Engineering Excellence Awards*. Since then we have added *Eureka Specifier*, *Engineering Materials* and *View From The Top* in terms of print products; redesigned the website; and, perhaps most significantly, helped to launch and grow the *Engineering Design Show* (which will take place for the third time later this month). But none of these projects would have been feasible without the success of this, the core product.

Editing *Eureka* is a great job. The bewildering diversity of boundless innovation behind the products and technologies ensures there is always something to write about, while the infectious enthusiasm and amazing knowledge of the individuals I have met has ensured there is never a shortage of opinions or explanations.

But my time here is drawing to a close. I will be moving on to edit a title in the marine engineering sector, which will involve me discovering a whole new industry, but may mean that I still see some familiar faces. After this issue, *Eureka's* future will be in the capable hands of Tim Fryer (tfryer@findlay.co.uk), whom some of you may already know as the deputy editor of *Eureka's* sister title *New Electronics*.

I know I am leaving *Eureka* in safe hands and that Tim will do a great job. However, that won't stop me taking an interest in how things progress and in the design engineering sector. After all, once you get the *Eureka* bug, you never really lose it. Finally, I would just like to express my appreciation to everyone I have met, corresponded with or spoken to over the last five years who has helped make my tenure on *Eureka* so very enjoyable. Many thanks.

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Millbrook invites companies to join Technology Park



Millbrook has been given planning permission to build a 24,900m² Technology Park at its Bedfordshire site.

The development, it says, will offer R&D companies, start ups and established engineering companies the opportunity to be located on site, creating new jobs within the automotive engineering and technology sectors.

"We're delighted that the planning application has been accepted," said Millbrook's CEO Alex Burns. "The Technology Park will help to enhance the future of automotive engineering with new facilities for research and development, and encourage increased partnership opportunities with world class companies." www.millbrook.co.uk

UK manufacturing growth holds up, but orders weaken – CBI

The UK's manufacturers had a mixed month in September, with production continuing to rise steadily but order books deteriorating, according to the CBI's latest Industrial Trends Survey.

The survey revealed that output growth remained solid in the last quarter and is expected to strengthen further in the coming three months. But firms saw total order books fall below "normal" levels, and export order books worsened significantly, and are now at their weakest since January 2013.

Stocks adequacy fell back below average and inflation expectations remain muted, with manufacturers once again expecting flat output prices over the next three months.

Katja Hall, CBI deputy director-general, said: "Against a backdrop of acute political uncertainty at home and abroad, exports orders for UK manufacturers are faltering, which is disappointing.

"However, it's encouraging that output growth has remained solid and firms expect production to rise strongly in the next quarter."

Other findings include:

- 34% of firms saw the volume of output rise in the last three months, and 19% said it fell, giving a balance of +15%.
- Expectations are for stronger growth next month with 36% predicting a rise in the volume of output and 9% a decline. That gives a balance of +27%.
- 14% of firms said their export order books were above normal and 38% said they were below normal, giving a balance of -24%, against a long-run average of -20%.
- Output price inflation expectations remained muted: 8% of firms expect output prices to rise over the next three months and 7% expect them to fall, giving a balance of +1%.
- 16% of firms said their present stocks of finished goods were more than adequate, and 6% reported they were less than adequate, giving a rounded balance of +9%.

The survey of 488 manufacturers across the UK was carried out between August 20 and September 10.

www.cbi.org.uk



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Next-gen pylon to be made in UK

UK steel maker Mabey Bridge is to build the support towers for a new generation of pylon structures that could be rolled out across the UK network. The contract awarded by National Grid is for the first six T-shape pylons that are due to be trialled at a test facility in Nottinghamshire.

The new electricity pylon designs mark a departure from the traditional lattice structures that currently dot the British countryside.

The designs for the T-pylons were decided as part of a competition organised by the Department of Energy and Climate Change, Royal Institute of British Architects and National Grid. The new design is a single pole with T-shaped cross arms which hold wires and conductors in a diamond shape. The layout means the pylon can stand at a height of just 35m, about 10 to 15m shorter than existing lattice towers.

Mark Coia, managing director of Mabey Bridge, said: "We are extremely proud to manufacture these exciting new electricity pylon designs for National Grid.

"We look forward to working with National Grid over the coming years as the prototype of the T-Pylon design is developed further to support Britain's electricity grid."

www.mabeybridge.com



Engineering graduates are highest earners

Students graduating from engineering courses are among the highest earners according to The Times Good University Guide 2015 shows. Of the top ten listed subjects, six are engineering related.

The top engineering subject, and second on the overall salary list, is Chemical Engineering at £29,582, followed by General Engineering at £26,362, Mechanical Engineering at £26,076, Aeronautical and Manufacturing Engineering at £25,343, Electrical and Electronic Engineering at £24,639 and Civil Engineering at £24,524.

For comparison, the average overall starting salary for graduates is £21,982.

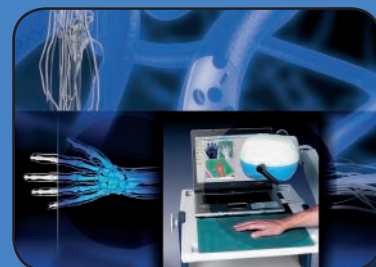
IET chief executive Nigel Fine said: "It's very encouraging to see that graduates beginning their engineering careers are starting on such good salaries.

"There has never been a better time to be an engineer: demand that far outstrips supply, competitive graduate salaries and fantastic career prospects are typical characteristics of the engineering profession today."

www.theiet.org

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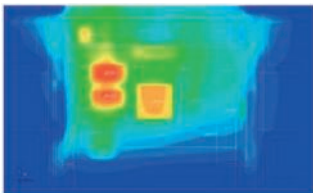
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The Engineering Design Show: Will you be there?

Don't miss the focused exhibitions, comprehensive conference programme and practical workshop sessions.

The award winning Engineering Design Show, which will once again be co-located with the Electronics Design Show and the inaugural Embedded Design Show, is expected to attract more than 4,000 visitors and 250 exhibitors when it opens on 22-23 October at the Ricoh Arena, Coventry.

The Shows will still remain true to the founding principle of catering specifically for design and electronic engineers, offering best



practice learning and practical design ideas for visitors through focused exhibitions, comprehensive conference and practical workshop sessions.

Alongside the exhibitions, there will also be a number of high-level keynote conference sessions delivered by prominent industry experts. This year's Eureka Conference programme has been announced and sessions are available to book via the registration page of the website.

The Eureka Conference speakers will be representing some of the UK's leading brands including: Infiniti Red Bull Racing; Cambridge Consultants; Siemens Magnet Technology; GKN Aerospace; Millbrook; Roll-Royce; and Mercedes AMG Petronas. In addition, a packed schedule of technical Workshops is expected to attract many visitors keen to get hands-on, practical advice on technology and industry issues.



The Engineering Design Show will once again incorporate Engineering Materials Live! to cater specifically for the engineering materials sector. Also running alongside these shows will be a new event called the Embedded Design Show, which will focus on this growing sector within electronic engineering.

Ultimately, the co-location with the Electronics Design Show, the incorporation of Engineering Materials Live! and launch of the new Embedded Design Show is aimed at continuing the Engineering Design Show's aim of offering design engineers a comprehensive event that meets the needs of today's industry professionals.

Running parallel to the Engineering Design Show conference programme will be the workshop programme, which is intended to give practical, hands on advice on a range of technical issues.

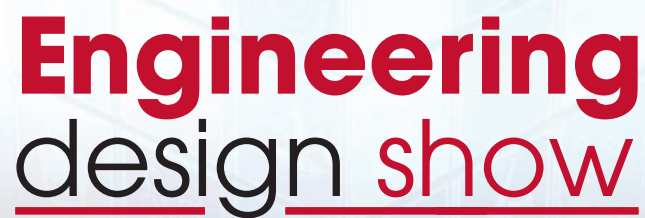
Two workshop theatres will cover 20 sessions across both days. Speakers confirmed include

representatives from Schaeffler, Materialise, Henkel, Nylacast and DuPont.

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Connecting sensors to the industrial internet - why this will determine the future of your business

*Lynn Baranowski, Programme Manager,
Products & System Division,
Cambridge Consultants*

Companies everywhere are waking up to the changes that the industrial internet is bringing to their products, their customers and their



way to doing business. In this presentation find out the steps required to connect industrial machinery, the opportunities to create 'brilliant' machines from 'smart' ones, and some of the challenges and pitfalls to be aware of.

Designing in quality from the start

*Mick Carlisle, Chief of Engineering
Transmissions, Rolls-Royce*

Rolls-Royce's Chief of Engineering Transmissions, Mick Carlisle, will be

discussing the importance of designing in quality right from the beginning of the design process.

The potential for robotics, and strategies for innovation

*Rich Walker, Managing Director,
Shadow Robot*

Robotics is regularly described as a 'disruptive innovation', yet engineers have been using robots for decades. So has anything changed in the robotics world and how can you look at what you do with these new tools in mind? Rich Walker, MD of Shadow Robot will discuss this and the technology his company has used to produce innovations such as the Dexterous

Hand, which offers a truly anthropomorphic approach to robot manipulation.

Designing Team GB's Olympic winning bikes

*Dimitris Katsanis, Composites Engineer, Metron
Advanced Equipment*

The man tasked with building the best bike in the world in just six months, gives a 'behind the scenes' insight into how Team GB's Olympic winning bikes were designed for optimal speed and performance.

Product design in a virtual environment

*Dr Joseph Darlington,
Technology Manager, MTC*

In this presentation, Dr Joseph Darlington, Technology Manager of the Manufacturing Technology Centre, will be discussing how virtual reality can help manufacturers gain competitive advantage.

Design integration in modern Formula One

*Bob Bell, Technical Director,
Mercedes AMG Petronas*

An overview of the design disciplines that are utilised to produce a modern F1 car and its supporting infrastructure, in particular the critical importance of successful systems integration and the 'noble art' of design compromise!



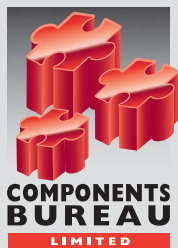
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Exhibitors show capability

With over 100 exhibitors at this year's show, the floor is sure to be buzzing with ideas, inspiration, solutions and know how. Here are just a few solutions to give you a flavour of what to expect.

RS Components Stand F9

RS Components is returning to the Electronics and Engineering Design Show as a headline sponsor, and is a key participant in the exhibition and workshop programme, which will highlight a broad cross section of cutting-edge technology and product innovation free-of-charge to an anticipated 4,000 delegates from the UK's design engineering community.

RS will present how a different approach to design can help accelerate the prototyping process. It will examine the products, tools and software the company is offering to address the ever-increasing demand for shorter design schedules and faster development time across all engineering disciplines.

The company's DesignSpark Mechanical 3D design software will be a major feature, enabling visitors to experience this easy to learn 3D modelling tool for free.

Find out why it is helping to remove the barriers of time, cost and complexity from electronic and mechanical design.

Cambridge Consultants Stand B5

Product design and development firm Cambridge Consultants will be demonstrating the DropTag on its stand and in the Innovation Zone of the show.

The DropTag platform is a family



of connected sensors, smartphone apps and backend data analytic systems that can be applied to a range of industries. It can be used, with ease, to monitor the condition of a 150ft wind turbine blade, when parts of it are moving at up to 150mph. The tiny DropTag 'puck' fixed to the surface of a blade and can tell, in real time, twist or vibration.

Quadrant Stand B85

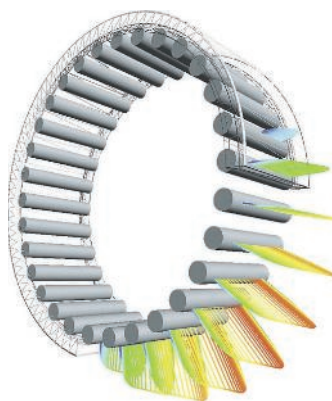
Quadrant's leading range of thermoplastic materials include high-molecular-weight (UHMW) polyethylene, nylon, acetal and ultra-high performance polymers such as PEEK, PAI, PBI and PI, and polymers that resist temperatures to over 425°C. The company has been able to use its materials expertise to offer solutions in many sectors including aerospace, automotive, rail, medical,



oil and gas and renewable energy. If you have a demanding application, it is well worth seeking their expertise and find out if you can benefit from using high performance thermoplastics.

Schaeffler Stand D40

Schaeffler will be demonstrating its online design software packages, information sources, training aids and apps, to help engineers source the optimum bearings for an application. It provides a suite of design software packages to offer a quick and easy way of performing



complex calculations in a fraction of the normal time. While you are there, be sure to set a lap time on its racing simulator, for your chance to win a Schaeffler DTM remote control car. And be sure not to miss a practical and hands-on demonstration of its software in action in the workshop session in Theatre 1 at 11.15 on day 1 (22nd October).

EMS-Grivory Stand E60

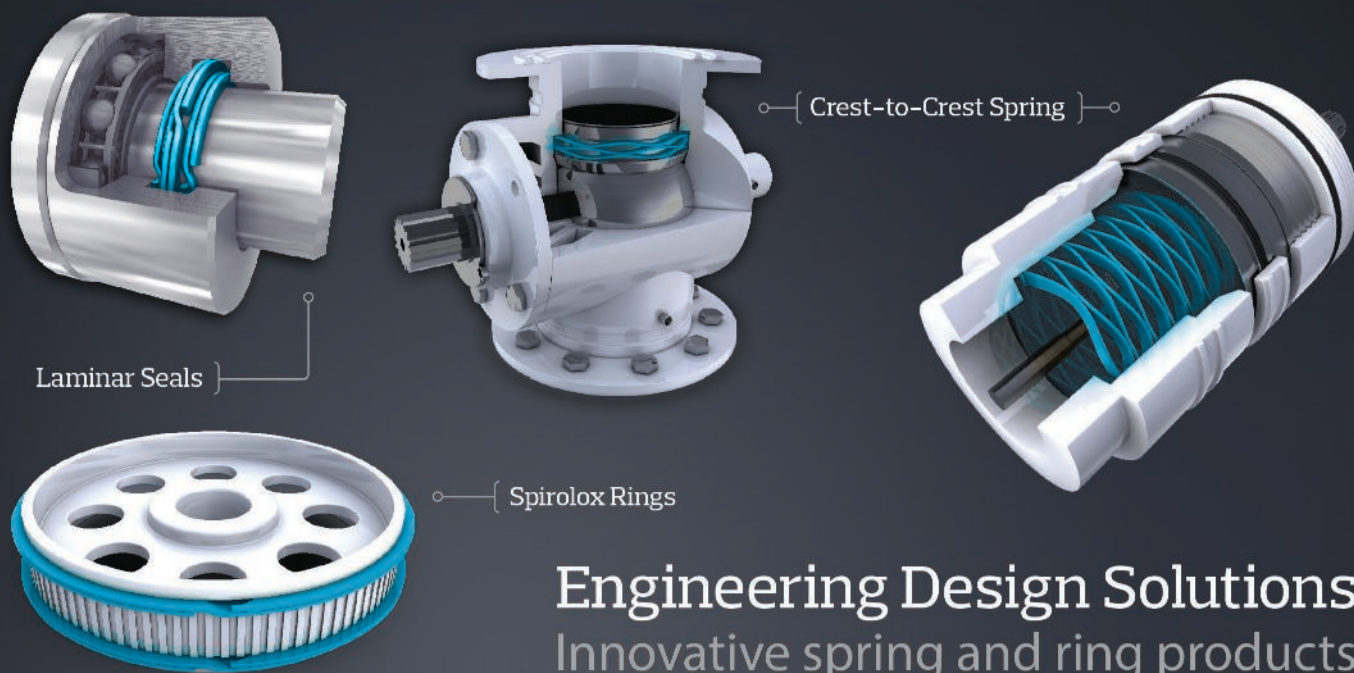
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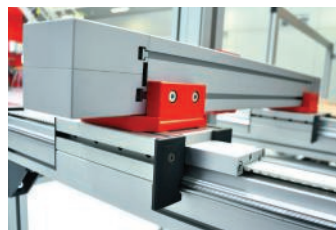
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Minitec

Stand F46

MiniTec will showcase its Profile System machine framing and machine building system at this year's show. The durable aluminium or stainless steel profiles are available in a wide range of sectional size.



The comprehensive selection of associated modular ancillary components combines with MiniTec's free of charge online or offline CAD software, or close design support from its UK based support centre, for cost-efficient, flexible and scalable design and build of structural machine frames or fully motion-automated equipment.

Profile System applications include safety and guard screens, workbenches, special fixtures, consoles and test stands - with automated machine applications in industry and science for production equipment, pick and place systems, conveying and parts handling, test equipment and more.

Curtiss-Wright

Stand C60

Curtiss-Wright Surface Technologies improves operating performance and life and protects components against failures such as fatigue, cracking, corrosion, erosion and chemical attack. Its surface treatments are successfully used in the aerospace, automotive, energy, medical and other general industries.

Approvals include FAA, AS9100 Rev C, NADCAP, ISO9001:2008 and ISO13485 as well as customer and

industry standard specifications.

Go along to its stand to find out about its services including controlled shot and laser shock peening, shot peen forming, super finishing, coatings including dry film lubricants, thermal spray and parylene and material analysis.

Graphite Additive Manufacturing

Stand C75

Graphite Additive Manufacturing is a supplier of 3D printed parts in high-performance materials. It will be exhibiting items produced by Stereolithography (SLA) and Selective Laser Sintering (SLS) technologies on its stand during the show.



These displays will feature functional parts built in nylon, rubber and Graphite's own carbon fibre reinforced material (as supplied to their F1 team customers). The materials and 3D printing techniques are well suited to short run production jobs within automotive and other manufacturing industries. Visitors will also be able to see many components produced in a wide range of ABS-like materials incorporating painted, metal plated and clear polished finishes.

Nylacast

Stand E70

Be sure to visit Nylacast on the show floor to discover the capabilities of its unique polymers, which are constantly replacing traditional materials and metals in a



host of industries, from oil and gas to high volume automotive parts. Its materials can offer improved performance opportunities coupled with increased efficiencies and cost savings.

Nylacast are renowned worldwide for the supply of full engineering solutions from concepts to end of life components in any quantity, to the highest of qualities.

Nylacast will also be delivering a workshop session focused around the fundamental points of Materials Selection as a design engineer in Theatre 2, at 14.15 on day 1 (22nd October).

Goodfellow

Stand G80

Goodfellow is generally accepted as being a premier supplier of materials for research, development, prototyping and specialised manufacturing. At the Engineering Design Show, Goodfellow's will be exhibiting some of the new products added to its range including ceramic, refractory metal and polymer high tech fasteners, graphene, precision spheres, stainless steel non-woven fabric and many more new items for design engineers.

There is no minimum order quantity and items are in stock ready for immediate worldwide shipment with no extra shipping charge. Custom-made items are available to special order, so be sure to specify your requirements.

Stanley Engineering Fastening

Stand F41

Stanley Engineered Fastening is expanding its Spirallock product line, adding stainless steel hex flange nuts, key inserts and micro-threaded inserts, as well as newly redesigned taps.

Spirallock is a technologically advanced fastening system ideally suited for threaded joint applications subjected to heavy shock and vibration, extreme temperatures, long hours of strenuous operation and millions of loading cycles without the need for retightening,



eliminating the need for secondary locking methods.

Spirallock provides reliable fastening solutions for many different industries.

Henkel

Stand E30

Structural bonding adhesives are increasingly replacing traditional mechanical joining methods, particularly in industries where uniform stress distribution and light weight are important design criteria.

Henkel is a leading innovator in this field with the originator of anaerobic adhesives under its Loctite brand. The company has continued to develop its products to offer new attributes and improved performance such as increased temperature resistance and will demonstrate these products at the Engineering Design Show.

Metal Replacement

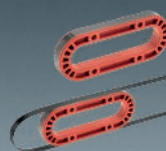
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Technology briefs

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WDS hook clamps offer high force with rapid adjustment

Flexibility and easy adjustment are important requirements for many machining operations as materials can be easily and accurately positioned and then clamped down to prevent accidental slippage.

The range of hook clamps with collars from WDS Component Parts delivers extremely high clamping forces, along with rapid engagement and disengagement for ultimate flexibility in use.

As the UK's leading manufacturer and supplier of workholding components for machining and industrial applications, WDS offers a vast range of clamping tools that are designed for reliable operation.



The range has been designed to complement the existing product catalogue by offering simple installation and quick clamping and unclamping for

applications that require rapid adjustment. They apply direct, downward force whilst retaining an extremely low profile, which is ideal for confined spaces.

Standard hook clamps are available in a range of sizes with maximum clamping forces between 7.9kN and 13.5kN while CAM hook clamps are available with a clamping force of 10kN. The clamps are constructed from heat treated steel and supplied in a chemical black finish.

www.wdsltd.co.uk

Motor to maximise uptime



Eaton has launched Hyde-MAC, a low-speed, high-torque (LSHT) direct drive, radial piston motor – featuring a cam lobe design – for variable speed applications. With class-leading low speed performance, Hyde-MAC is ideal for offshore, marine, metal recovery, mining, pulp and paper and off-highway stationary applications.

The Hyde-MAC motor, created using a MacTaggart Scott heavy-duty motor design, combines MacTaggart Scott's motor expertise with Eaton's extensive industry knowledge, particularly in oil and gas, mining and manufacturing applications.

The motor increases component life with two inlet and outlet ports reducing pressure drops at high power by generating less heat overall and through a symmetrical 18 piston/roller assembly design, which eliminates piston side-loading and reduces wear.

To help maximise uptime, the Hyde-MAC motor is a direct drop-in replacement for some of the industry's most popular motors, which helps reduce switching costs by eliminating the need to replace the machine shaft and torque arm.

Longer component life not only increases uptime, but reduces the total lifetime cost of ownership. Hyde-MAC's repairable wear surfaces, including shaft seals, wear rings, piston seals and bearing pads, can be replaced on-site by one of Eaton's skilled distribution partners.

www.eaton.com/hyde-mac

Solution to last month's Coffee Time Challenge

SPONSORED BY MICRO EPSILON



The solution to last month's challenge of coming up with a means of drying the body after a swim or shower comes from a team of designers from USA who have turned the idea of the a hand dryer upside down to create the Body Dryer.

According to Tyler Overk from the Body Dryer Team, the body dryer is designed out of a need to, "replace bacteria filled and environmentally harmful bathroom towels."

The Body Dryer is sturdy enough to support a 325lbs (170kg) person and is reportedly capable of drying a damp individual in approximately 30 seconds using compressed, ionised air. It has strategically angled vents to provide optimal removal of the water and the air stream can be personalised through different shaped nozzles on the footplate that develop a cylindrical tunnel of air around the user. There's also the option of hot or cold air and a digital scale is built into the unit.

The Body Dryer team has already more than doubled its \$50,000 crowd funding goal through Indiegogo. It's anticipated the unit will sell for US\$250.



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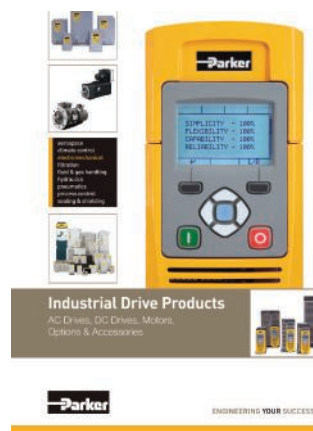
Industrial drives catalogue

Motion and control technologies experts, Parker, has published its new full colour 166-page guide on industrial drives. Featuring the company's complete industrial drive portfolio, the catalogue is available as a printed version and for customers who prefer the flexibility of a digital format it is also offered as a 'flipbook', which can be found on its website.

Encompassing information on AC Drives, DC Drives, Motors plus options and accessories, the catalogue features extensive reference material to help customers make an informed choice when it comes to specifying industrial drives.

In addition, for customers seeking to know how drives can benefit their particular application there are dedicated areas within the publication highlighting how improvements can be made in areas including productivity and energy efficiency.

www.parker.com



Robust thermoplastic pumps



A range of ARBO thermoplastic mechanically sealed centrifugal pumps have been developed in polypropylene, polyethylene, PVDF and PTFE. The material can resist the effects of aggressive chemicals that cause corrosion problems for many

metallic pumps. By manufacturing all wetted parts out of a solid block without, thus avoiding injection moulding, eliminates the potential for stress-cracking. Furthermore, the combination of tough, non-metallic materials and stress relieving production methods provides outstanding chemical and temperature resistance to ensure safe and reliable pumping.

Introduced in the UK by pumping specialists Michael Smith Engineers, these compact yet robust pumps are designed to handle flows up to 500m³/hr, heads to 90m and are available in close or long coupled designs.

www.michael-smith-engineers.co.uk

Less petroleum in plastics

Bayer Material Science has conducted research into using carbon dioxide as a raw material for making plastics. In laboratory tests, the company has been able to reduce the need for petroleum at a precursor level through the incorporation of CO₂.

Dr. Christoph Gürtler, a project manager at Bayer, said: "We have succeeded in reducing the petroleum content for making other plastics to just 60%."

The project known broadly as 'Dream Polymers' is continuing activities to find new and innovative uses for CO₂. A technology using the greenhouse gas to produce key components for high-quality foam (polyurethane) is already moving toward commercial use.

Bayer claims the number of plastics that can be produced using a carbon dioxide enhanced process is increasing.

Gürtler adds: "It's possible to manufacture thermoplastic polyurethanes, films and casting elastomers in this way."

Researchers have proved the principle in laboratory tests and are now moving toward commercialising the process.

www.materialscience.bayer.com

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Shifting the

The changing face of how we generate, distribute and use electricity is undergoing perhaps its biggest change ever. As renewables come online and electric vehicles take to the roads, balancing demand with supply has never been trickier. Justin Cunningham reports.

The UK's power generation and distribution network is undergoing perhaps its greatest ever change as it enters a new era of operation. For more than 50 years, networks have been designed on the assumption that no household uses all its appliances at once, and not at the same time as its neighbours. However, questions about whether this is still valid are being raised with the advent of electric vehicles and shift to more renewable power.

By 2020, it's estimated that between 500,000 and 2 million electric vehicles will be used daily in the UK. Each electric vehicle battery is the equivalent of as many as 400 laptops, so each household charging a car, especially at the same time, creates huge problems for both generators and distributors of power. This, coupled with a move away from fossil fuel power stations to renewable energy, is a daunting task as it means substituting a steady predictable base load to the grid with an intermittent supply that has a lower producing capacity.

If, for example, everyone charges their cars at the same time (which is likely), for those few hours the network would go in to overload. It's clear there is a need for better monitoring and management of the grid to run its current assets at their most efficient, and future need to store energy to smooth the intermittency caused from renewable power generation.

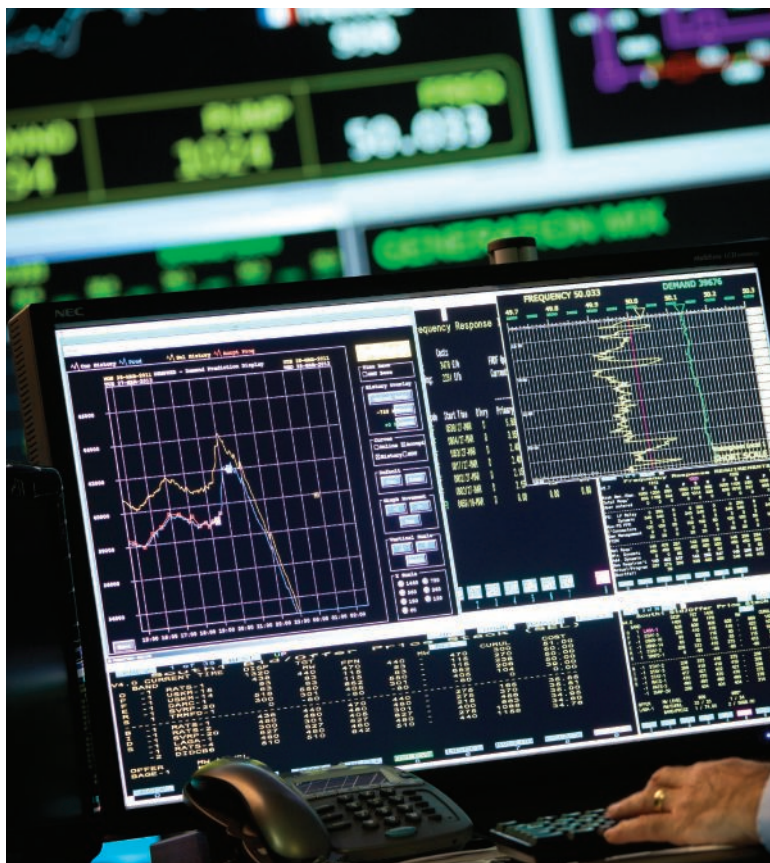
Brian Shewan, development manager for low carbon networks at Scottish and Southern Energy Power Distribution, says: "As a power engineer, I like peak power. We design everything with peak in mind,

but, going forward, we're not going to be able to do that. We now need to design for profiles of behaviour and usage.

"While we are sure demand for electricity will increase, we also think that this will only be at certain times of the day and night. So we need to use the network in a more intelligent way."

My Electric Avenue

Understanding how to mitigate and manage the problems caused by entire streets and even estates of electric vehicles being put on charge at the same time is the focus of My Electric Avenue, a Low Carbon



balance of power



WE'VE GOT A PRODUCT THAT IS ABLE TO SHIFT AROUND DEMAND, WE MONITOR CAPACITY AT THE SUBSTATION AND WHEN IT REACHES A LIMIT IT SENDS A SIGNAL DOWN TO DIFFERENT CHARGING POINTS TO SAY SWITCH OFF, SWITCH BACK ON IN 30 MINUTES, CALLED A SPREE."

DAVE ROBERTS



Networks (LCN) Funded project between EA Technology and Scottish and Southern Energy. It sees 10 households in the same street using the all-electric Nissan Leaf as its daily car. Typical usage is being monitored, including the times of day they wish to charge.

An essential part of the project is to evaluate a charging point technology that communicates to a local feeder station with the aim to reduce peak loads on the grid and stop it becoming overloaded.

"We've got a product that is able to shift around demand," says Dave Roberts, future networks director at EA Technology. "We monitor capacity at the substation and when it reaches a limit it sends a signal down to different charging points to say switch off, switch back on in half an hour, for example. This is called a spree."

The hope is that the spree could work over quite short periods of time, perhaps seconds, to gradually feed electricity to all the charging points. It may mean a car may take an hour or two longer to fully charge, as the electricity is continuously spread around different charging points, the peak load on the grid will be dramatically reduced.

A solution in the problem

While posing one set of problems, electric vehicles may offer a solution to another. As the amount of renewable electricity flowing in and out of the grid increases, its intermittent nature means demand is often out of sync with supply. Electricity needs to be used almost as soon as it's produced, so it should only be produced when needed. And this means more energy storage to act as a buffer between supply and demand.

The potential of having an electric vehicle in every house on a street enables the possibility of implementing a vehicle to grid (V2G) system. The average vehicle is parked for 95% of its life, so utilising the batteries of an electric vehicle for temporary electricity storage is an obvious solution. The concept allows V2G to provide power during peak times to help balance loads by 'valley filling'. Vehicles would charge at night, when demand is low, and send power back to the grid when demand is high.

V2G could also help buffer renewable power flowing in to the grid by storing excess energy produced during windy periods, and send it back when needed, stabilising the intermittency problem. Some see this application as a possible method of penetrating the baseline electricity requirement that largely relies on large centralised fossil fuel and nuclear power stations.

The National Grid and Big Data

The premise behind Big Data is the idea of capturing minute details about very large and complex systems. Big Data is touted as a future trend to look out for and it's hoped it will provide fresh insight into big societal challenges from providing better healthcare to tackling climate change. Delivering the UK's future energy demand is one such challenge.

It's an enormous and daunting task, and it's hoped it can be made more manageable by having a clear view of equipment behaviour and user trends at national, regional and local levels.

Continuously monitoring the electricity distribution network is something a team from the National Grid has been busy working on, at the moment to quantify the quality of electricity. It has to balance the demand for electricity with the supply of electricity on a second by second basis. However, direct current connections with Europe, as well as increasing electricity from renewable energy sources, produce a number of quality issues and as a result have to be monitored closely. The current methods of monitoring are not fit for purpose and would have problems scaling any further. So, with the help of National Instruments, National Grid has developed a monitoring system to measure voltage and current to get a complete picture of power quality. The monitors, which use NI's CompactRIO platform, are programmed using LabView. It has given the National Grid the platform it needs to evolve and scale as requirements change.

"We know we need better data in this new era of electricity transmission," says Dr Danson Joseph, a system design manager at National Grid. "We can't manage what we can't measure."

Despite having quite a narrow remit at the outset, it has become apparent that it has opened Pandora's Box, still only scratching the surface of what might be possible. But one of the biggest problems is the sheer volume of data that it logs.

Peter Haigh, power systems engineer at National Grid, says: "I see 'Big Data' as a critical advantage; as a thing that needs to be controlled and managed. It's harvesting information that is useful to form knowledge to make decisions, be it controlled decisions on a system, investment decisions or whatever. The way we correlate it and distil it down in to something useful can guide the way we plan the network. That is the value to the business."

Although the remit of the project has clear short term deliverables, the scope and potential of the work being undertaken is huge. And



continuous monitoring systems are in the process of being placed in 110 sites around the UK. And engineers at National Grid are getting more curious about what 'knowledge' can be leveraged from the data.

"If it is something that can be calculated from a voltage or current measurement, then we can do it," says Dr Joseph. "And once we have a monitoring fleet deployed completely, or even partially but with good coverage, we will start seeing things we haven't been able to measure before and that is when we can start getting more creative."

At the moment, the system is essentially logging voltage and current to gain a view of network performance and to manage connections. As offshore wind farms and interconnections to Holland and France cause major problems in power quality, this is one of the biggest challenges and an area that is intensely scrutinised.

"The system gives us a way of managing on an individual project level, the impact of each connection. It also gives us trended system wide data," says Dr Joseph. "This is an opportunity to start looking at a bigger picture, on the national scale."

The data from the permanent monitors will correlate through to a central server and be available through a web application, allowing different users to access, for example, geographical trends or changes over seasons.

And as more wind power comes online, it will be able to assess, in real-time, how much electricity is fed in to the grid, and how it's distributed and used. This is also set to speed development work for new connections, so fast charging points for electric vehicles or the planned roll out of more electric rail connections.

"We don't want to find there is a problem with power quality at a certain connection after two years of operating it," says Haigh. "So we can provide a power quality map to planning officials so they can see the areas with the most reliable power, best quality or least intermittency. We recognise as the sector evolves we need to be agile and stay flexible. And as we add more of these, the resolution will get greater and we'll be able to start using this data as we design and install new systems and infrastructure."

"At the moment, designs are based on rules of thumb, but that's got to change. If we start to quantify things, we can design closer to the point of failure, not so we hit the point of failure, but so we are able to run our assets at a higher capacity. This way we'll be able to get the biggest bang for our buck in the future, and handle all the challenges facing the industry."

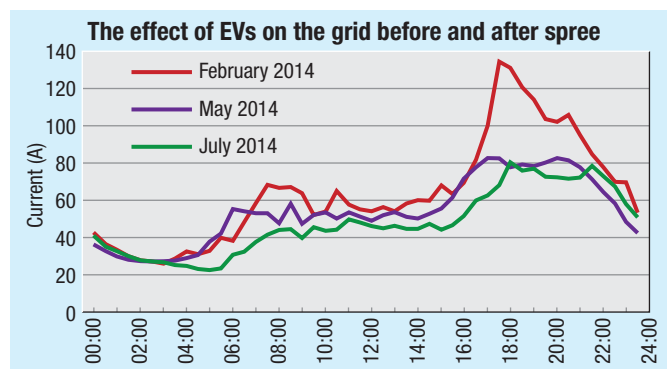
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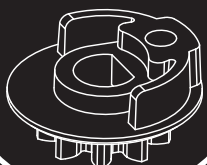


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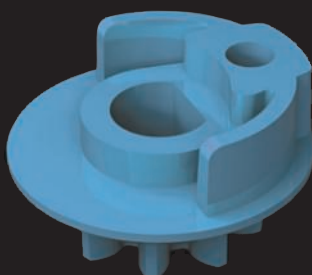
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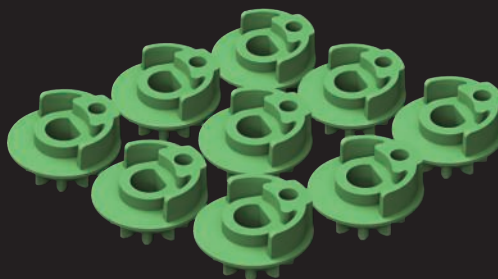
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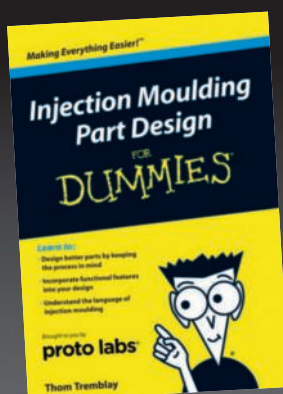
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Mind the gap

Through his day job at Siemens Industry along with his various other roles, Mike Houghton is on a mission to address the skills gap and develop the next generation of engineers. But are these engineers good enough? Do they even exist? Tim Fryer finds out.

Mike Houghton's responsibilities as Siemens divisional director include managing 300 engineers. Recently, his group looked at its formation in the future and the skills gap it discovered bears relevance to the British engineering industry as a whole. With its normal attrition rate, and drop off as people near retirement age, the group estimated that in five years half of its engineers will be new to the Siemens business. The company is facing a startling reality and it's one that is true across industry.

Houghton said: "We need to go back to the drawing board and think about how we are going to bridge this gap. Our current methods of bringing new people into the business need to be enhanced and we need to do something different in the short and medium term."

Most companies will have heard about this skills shortage, but few will have done such an exercise to define the problem. But why do we have this problem in the first place – is it down to the way engineering is taught in schools?

"I think you have to contextualise it," said Houghton. "Maths and physics, by themselves, aren't very interesting. But if you contextualise it, show how maths and physics can support them in a career, that is when it becomes interesting. Formula One cars don't work without people who understand maths and physics."

Conceding that not everyone can get a job in Formula One, Houghton believes it has the glamour and excitement to show young people the appeal of working on high end engineering.

"It is that sort of passion that we need to ignite at an early phase," he said. "Just giving them physics is not going to do it unless they have a real bent for it, as I did. You have to capture the imagination, the earlier the better, between 7 and 11 is the ideal time."

There is no silver bullet, but Houghton believes it is the role of teachers first and then 'STEM ambassadors' that will make a difference.

"I think everyone in positions like mine, within the engineering industry, has an obligation to get involved with young people, get them involved earlier and try to create a passion for engineering," he said.

Despite this 'obligation', Houghton said industry should only send out the right representatives. "If people are motivated to do it, they will do a great job inspiring young people in STEM subjects. I don't think we should try to mandate it – it is either in you or it isn't."

One of the difficulties faced by schools is the range of initiatives on offer – sorting out which robotic contest or factory visit will be of most advantage to them when it comes to fulfilling curriculum obligations.

Siemens has an information portal for key stages 2 and 3 designed to give students the chance to manage their own manufacturing and engineering facility. This aims to attract 1.9 million British schoolchildren by the end of this year and 4 million by the end of 2016. Another scheme is E3, which offers students holiday employment through school and university so they are more prepared for the workplace on graduation.

Such diverse offerings highlight the problem which schools face, albeit a good problem to have. Houghton said: "It is great that companies do this good stuff, but there is no coordination between what companies are doing. With hundreds of such initiatives, which ones do you pick?"

A lack of coordination and consistency is also at the heart of Government thinking according to Houghton. "We need longevity," he adds. "If employers and academics are going to have faith in something, it needs to be a cross party, long term strategy. That is the most important thing for us in industry."

Houghton pointed to the positive moves to 'rebalance' the economy

with a greater emphasis on manufacturing. However, compared with Germany's 'Industry 4.0', or US 'Industry Renaissance', he is concerned that 'rebalancing' could be less specific and interpreted in different ways as time goes on. "But," he said, "at the moment, I am pleased with what this Government has set out to do. And UTCs started out in the previous Government, so that is a bit of cross party thinking."

UTCs (University Technical College) are still in their infancy; the first opened in 2010 and now there are 17. Nevertheless, the first students are starting to come off

that particular production line.

"I am very impressed by them," claimed Houghton. "One of the things they do as part of the curriculum is to teach students to be competent orators – debating engineering topics in a group. I thought these students are miles ahead of the standard students I have met."

But is the Government doing enough? It seems widely accepted that the shortage of engineers, in terms of the 'pipeline' of new graduates coming through, will last until at least 2020. Is there more the Government could do?

Houghton suggested: "It could come up with additional incentives to support engineering. For instance, if we are struggling to attract more students into engineering type degrees, we could offer reduced fees in areas where the economy needs some sort of additional support. That might be a way of stemming the short term gap."

www.siemens.com

"We need to go back to the drawing board and think about how we are going to bridge this gap."

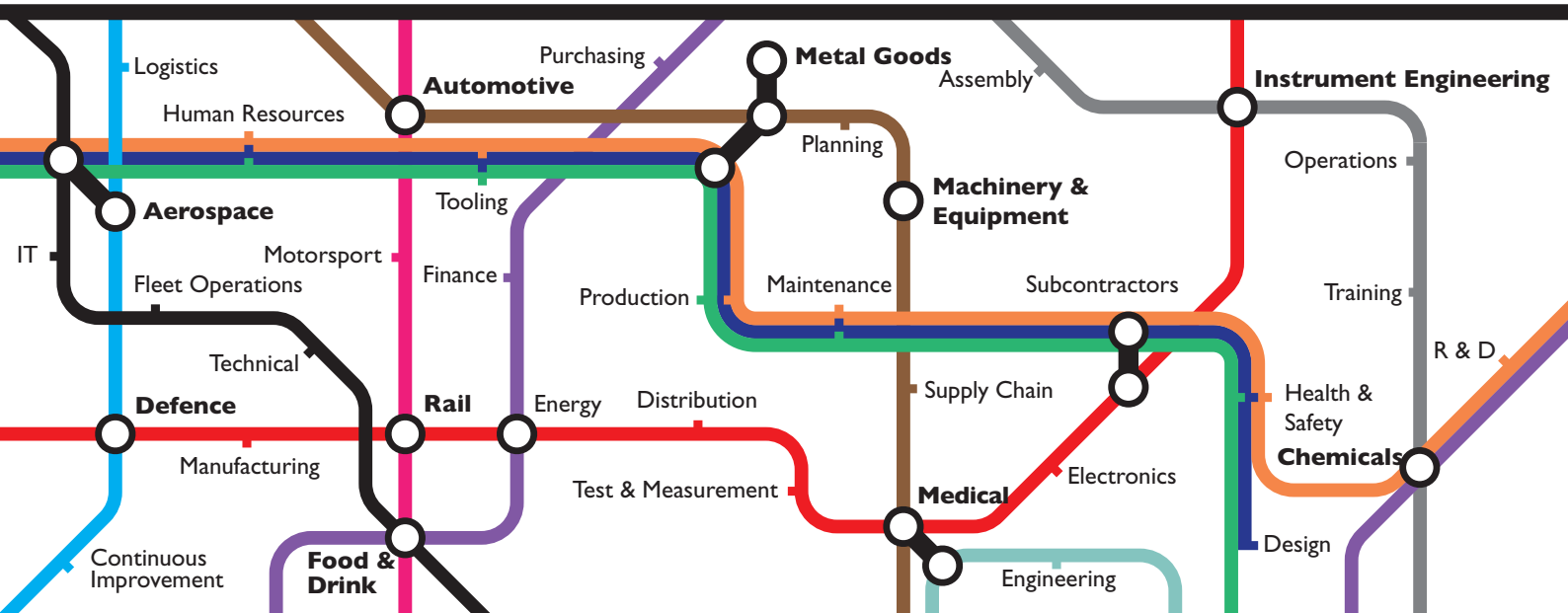
A portrait of Mike Houghton, a middle-aged man with short brown hair, smiling slightly. He is wearing a light blue button-down shirt under a dark blue blazer. The background is a blurred indoor setting with white architectural lines.

CV

Mike Houghton has been the divisional director of Industry Customer Service, Siemens Industry, since 2011. He is responsible for two business units comprising of 11 business segments and 300 employees.

Additionally, Houghton is a member of the HQ Extended Leitkreis (Board) for Industry Services; Siemens Industry Country Leadership Team; a supporter of the Local Enterprise Partnership for Mersey Region; a member of the IET's Skills Policy Panel; and Program lead for IFB2014 (International Festival for Business) for Siemens Industry. Prior to this role, he held a number of senior posts within Siemens UK, including general management of Service Support and Training, general manager of Industry Automation Solutions; chemical and pharmaceutical sales manager UK and operations manager for Process Industries UK.

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Grid-scale storage

Research into a liquid metal catalyst could be the answer to grid-scale energy storage, and allow wind and solar energy to become more competitive. *Eureka* finds out more.

Researchers from the US based Massachusetts Institute of Technology (MIT) have developed a liquid battery system that could allow grid-scale electrical energy storage.

The liquid battery catalysts use layers of molten metal separated by layers of molten salt that act as the electrolyte. The different densities of the three materials allow them to naturally separate into layers, like oil floating on water.

Work initially began using magnesium and antimony with a salt catalyst. While this was successful, it meant an operating temperature of 700°C. However, by using lithium and then a mixture of lead and antimony, the temperature of the liquid battery has been reduced to 450°C without any drop off in performance.

The lead researcher at MIT, Donald Sadoway, says: "The new formula allows the battery to work at a temperature more than 200°C lower than the previous formulation. In addition to the lower operating temperature, which should simplify the battery's design and extend its working life, the new formulation will be less expensive to make."

Extensive testing has shown that even after 10 years of daily charging and discharging, the system should retain about 85% of its initial efficiency, a key factor in making such a technology an attractive investment for electric utility companies as they wrestle with questions around energy storage.

Currently, the only widely used system for

utility-scale storage of electricity is pumped hydro. This sees water pumped uphill to a storage reservoir when there is excess power and when the power is needed, it is forced down through a turbine to generate power. Such systems can be used to match the intermittent production of

Donald Sadoway:

"The fact that we don't need a mountain, and we don't need lots of water, gives us a decisive advantage"



power from irregular sources, such as wind turbines and solar power generation, however the inevitable losses of friction in pumps and turbines mean a round trip efficiency of about 70%.

Sadoway says his liquid-battery can already deliver the 70% efficiency and with further refinements could do better. And unlike pumped hydro systems, which are only feasible in locations with sufficient water and an available hillside, liquid batteries could be built anywhere and at any size.

"The fact that we don't need a mountain, and we don't need lots of water, gives us a decisive advantage," says Sadoway. "Now we understand that liquid metals bond in ways that we didn't understand before. I think there's still room for major discoveries in this field."

The biggest surprise for the researchers was that the antimony-lead electrode performed so well. They found that antimony could produce a high operating voltage and that lead gave a low melting point. However, mixing the two combined both advantages with a voltage as high as antimony but with a melting point between the two constituents. The fact there was no drop off in voltage was a genuine surprise.

Going forward, the team will continue to search for other combinations of metals that might allow even lower operating temperatures, lower-cost production, and better storage performance.

www.mit.edu

Smart plastic for camera smartphones

Smartphones have become a popular choice for photography. The focus now is on further improving the image quality, for example with better flashes. A particularly high-performance plastic from Bayer is helping to make this possible, resulting in photos with greater clarity and truer colours. At this year's photokina in Cologne, the leading international imaging trade fair, the camera phones are sharing the spotlight with 'action cameras.' Materials from Bayer are claimed to make these products exceptionally rugged and safe.

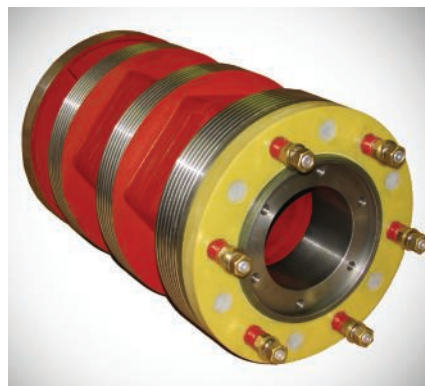
In the smartphone segment, demand is growing for products that deliver top-quality photos. As a result, LED lenses for camera flashes are becoming increasingly important. Bayer MaterialScience has therefore developed a material solution that extends the service life of the lenses. Conventional materials, by comparison, are softer and therefore more easily damaged. Not only that, the Bayer innovation also improves image quality.

The plastic behind this is Apec, a special polycarbonate that combines a range of properties such as light weight, good formability, high transparency and, particularly important, outstanding heat resistance.

Polycarbonate, which Bayer invented some 60 years ago, is also being used in the action camera segment. These cameras are most commonly used for capturing images of outdoor activities. Sports cameras that are particularly well-suited for challenging sports such as surfing and snowboarding feature numerous components made from the plastic, including the waterproof housing that enables dives of up to 60m.

www.materialscience.bayer.com

Slip rings ensure better wind turbine life



Morgan Advanced Materials Electrical Carbon business announces that its quality engineered slip rings, can reduce down time and improve the life of equipment whilst reducing maintenance time and costs. Made with the latest innovations in resin compounds Morgan's moulded slip rings

encapsulate all current carrying components, inhibit harmful dust intrusion and contamination, and increase the dielectric strength. They can also be specially engineered to improve airflow, which reduces the amount of thermal build up.

These key benefits make them ideal for use in wind turbines as well as numerous other industrial, traction power and signal transmission applications. Slip rings are offered in a wide range of both standard and customised sizes and designs and can be manufactured in either moulded or fabricated versions. High quality slip ring transmitter systems are available in 1 to 8 rings from Morgan, with outside diameters ranging from 24 to 500mm and feature high mechanical, thermal resistance and excellent dielectric properties.

www.morganadvancedmaterials.com

Slimline plastic level sensors



A range of slimline (21mm diameter) submersible plastic level sensors for continuous level measurement in confined spaces and small-size boreholes is now available from instrumentation specialist Impress Sensors & Systems.

The LMK 806 series of PVC-housed submersible ceramic level sensors is specially designed for hydrostatic level measurement of wastewater and other aggressive media, particularly where the sensor needs to be

mounted inside a confined space such as an existing small size borehole, ¾ inch pipe or tube. Typical applications include wastewater treatment plants, chemical dosing stations, sewage lift stations, water recycling plants, storage tanks and landfill sites.

LMK 806 level sensors benefit from a PVC housing that provides maximum media compatibility and protection from virtually any aggressive media, including most acids and strong alkalis. Different cable materials (e.g. PVC, PUR, FEP) and seals are available to suit a range of different media.

The sensing technology on the LMK 806 series is a flush-mounted ceramic sensing element, which provides high reliability in long-term installations. Reliability is further enhanced by a nose cone, which, when removed, exposes the flush diaphragm. This allows the sensor to be easily cleaned and any solid media removed, thus preventing clogging.

Nominal pressure ranges are from 0 - 6mWG up to 0 - 200mWG. Accuracy is +/-0.5% FSO to IEC 60770 and so includes all setting errors, making this a high accuracy level-measuring instrument. The sensor provides excellent linearity, long-term stability and a high level of electrical protection (emission and immunity according to EN 61326) to prevent damage once the unit is installed in the field. Output signal is 2-wire, 4 - 20mA.

www.impress-sensors.co.uk

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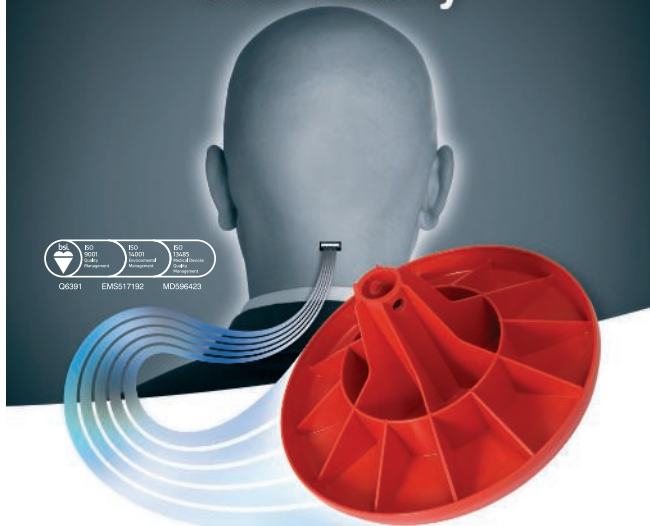
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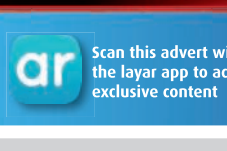
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High performance couplings are plain sailing

An innovative design of shaft clamp is delivering key benefits in a range of power transmission applications, not least in the highly challenging marine environment.

Marine power transmission systems make stringent demands on shafts and clamping components. Not only must they deliver high torque capacity, but they must also offer high levels of reliability combined with ease of maintenance. Marine power transmission systems can require frequent disassembly for maintenance, so quick mounting or dismantling is an essential feature. Then there is the challenging marine environment and the fact that there is often very little space in which to work.

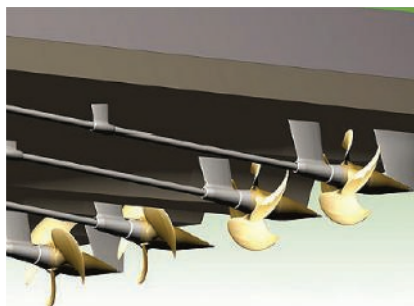
As yachts increase in size, outboard propulsion systems become inappropriate, whilst on the largest yachts and highest powered craft exotic propulsion systems such as water jets are becoming fashionable. But for yachts between 40 and 100 feet in length by far the most common propulsion arrangement where speeds above 40 knots are not required is the in-board drive with conventional submerged propellers.

All propulsion systems have their advantages and disadvantages, but in-board drive lines benefit from an inherent simplicity and, when properly maintained, a near unlimited life. The emphasis on maintenance is crucial. The underwater appendages are subject to shock and there will always be inherent vibration. Excessive vibration would likely indicate serious wear due to misalignment, but there is inherent misalignment in all in-board systems: the engine is installed on rubber mounts and the shaft mounted in rubber bearings, so both engine and shaft can move. In addition, the boat hull itself is not completely rigid so there is more potential for movement.

While it is vital that shaft coupling alignment is extremely accurate, it can be seen that it will be virtually impossible to eliminate misalignment between the shaft itself and the engine. When the engine is running, the shaft will tend to self align to a degree, but there will always be wear. Because of this, there is a need for reasonably regular

maintenance to check and, if necessary, replace the rubber mounts and other key components. This makes ease of disassembly and dismantling of the drive line critical for a cost-effective propulsion system.

Maintenance is further complicated by the fact that space is at a premium on yachts even of the very largest sizes, and in-board drives are often installed in areas where there is very little working space. This also impacts on power, with the torque handling capacity of a conventional coupling



directly related to its physical size.

So in a traditional in-board marine engine, the coupling between the engine and the shaft is one of the primary limiting factors in the maximum torque capability of the drive train. Traditional shaft clamping components fail to address all of these issues. Most mechanical shaft connections require numerous bolts; in the cramped engine and shaft tunnel, this makes the shaft a challenge to install and certainly does not facilitate easy maintenance.

ETP-HYCON hydraulic shaft clamping connection couplings from Abssac offer a completely different kind of shaft connection, offering robust and compact high power transmission. Designed to deliver reliability, but also quick mounting and dismantling, the ETP-HYCON couplings are ideal for a host of applications in difficult environments and heavy operations, including marine engine drives.



Used to connect shafts within a driven system, the ETP-HYCON couplings use hydraulics to create the friction seal between the shaft and the coupling. The coupling consists of a double-walled hardened steel sleeve, filled with a pressure medium. The outer sleeve has two hydraulic connection points and the inner sleeve is coated with unique dry frictional substance called ETP-HFC on the inside wall. When mounting, the two hydraulic connections are pressurised simultaneously. The captivated pressured oil

lubricates the contact surfaces in the axial space between the seals. This pressure initiates the movement of the outer sleeve, which is forced to linearly move a small distance because of the axial force created by the oil pressure. The linear

**ETP-HYCON
RSX-119**



movement of the outer sleeve against the inner sleeve mechanically compresses the inner sleeve to an even surface pressure on the shaft. At a set pressure calculated to both holding force and required torque transmission capability, the hydraulic hoses are disconnected and the ETP-HYCON is completely installed. A rigid and strong shaft connection has been created.

Dismantling of the ETP-HYCON is done in the reverse way as in assembly, which also ensures an even dismantling pressure and no damage to the shaft. The ETP-HFC coating more than doubles the coefficient of friction from 0.15 (about the standard for conventional mechanical couplings) to better than 0.3. This means designers can specify a smaller shaft connection device with lower mass for any given torque requirement, making the whole assembly dynamically more efficient.

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Detailing complexity

With the advent of multiphysics simulation, fresh insight in to complex systems has brought new levels of understanding about the interaction of physical phenomena and how to optimise them. Justin Cunningham reports.

Einstein once said that he'd spend 95% of his time thinking about a problem, and 5% coming up with a solution. The message is, the more you understand about a problem, the easier it becomes to find a solution. And this is ultimately the premise for multiphysics simulation.

Done well it will yield detailed insight in to the highly complex interactions of multiple physical phenomena acting on and around an object. For example, mechanical, electrical, chemical and fluid flow can all be combined, so a battery, or fuel cell, that combines both electromagnetism and chemical reactions can be accurately modelled with its performance simulated.

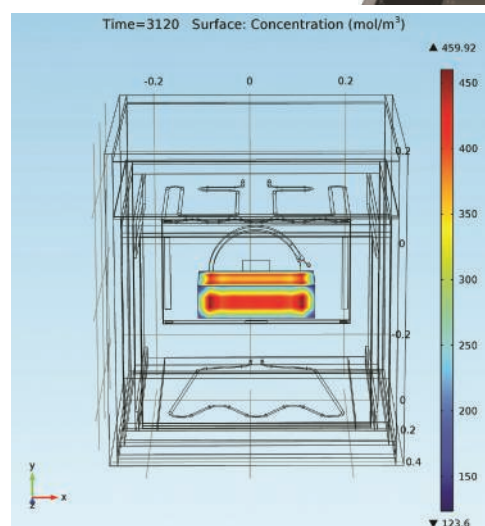


One of the most successful products currently on the market is Cambridge based Comsol Multiphysics. Whilst a reasonably sized outfit, its software has been far reaching, being put to use all over the world. Its product suite uses a base level multiphysics platform that essentially enables users to define and build simulations in the typical finite element analysis (FEA) style.

While the user interface is simple enough to use, make no mistake, to really exploit the potential of Comsol's simulation software requires expertise in the problem at hand. It is heavyweight simulation, which is perhaps why it is popular with university researchers and the academic community. However, it is increasingly getting put to use by industry as the results can give designers and engineers fresh insight in to the physical behaviour of products and systems to enable step change improvements that may have previously been difficult to find.

Its extensive library of materials and multiphysics coupling modules include the physical behaviours of all manner of phenomena and their interaction including mechanical, electrical, fluid and chemical, with individual modules spanning most major areas of interest from wave optics to heat transfer to

The simulation of a domestic oven helped optimise its design and ultimately reduce its energy consumption



geomechanics to acoustics. It also benefits from being able to interface with most major 3D CAD packages, allowing the formats of most models to be imported.

However, Comsol is not restricted to a specific domain as it allows users to define and build models that are specific and unique to the problem at hand. This allows a simulation to consider all number of variables and allow it to be as representative as possible.

FEA, more generally, can often simplify

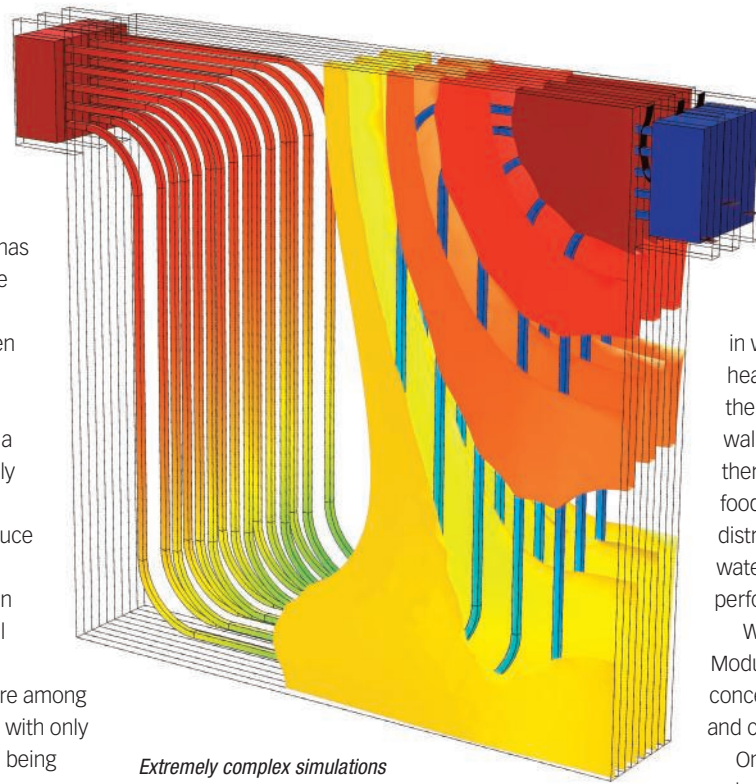
problems and omit many of the more complex interactions meaning that unforeseen results occur when physical testing and trials are carried out. However, Comsol allows any number of its standard physics coupling modules to be used and if a coupling, or physical phenomena, is not available a user can use their own custom code based equations built from scratch. And this is the big advantage of Comsol's software; its ability for users to tailor the physics, and physical properties, to more closely represent whatever it is being modelled.

At its recent user conference in Cambridge, a number of projects were highlighted to show how the software has been used to great effect. One example came from Whirlpool and the work it is doing on the European led Greenkitchen project, which aims to dramatically improve the energy efficiency of many household appliances and bring about a more proactive approach to eco-friendly design and manufacture in the sector.

"The overall project is aiming to reduce energy and water consumption in the average European kitchen," says Nelson Garcia-Polanco, a research and thermal engineer at Whirlpool working on the Greenkitchen project. "Electric ovens are among the worst in terms of energy efficiency, with only about 10-12% of the energy consumed being used to actually cook the food.

"We are testing solutions and are close to reducing energy consumption by 15% and we have a target of 20%. This improvement in efficiency would result in a reduction of 50 million tons in CO₂ emissions per year from European households."

The focus for Whirlpool is to undertake a detailed study of one of its ovens and model the standard testing process for measuring cooking efficiency. One of the main goals is to improve heat exchange in ovens to understand the interaction between heating elements, the air within the cooker, as well as the surrounding



Extremely complex simulations are possible such as the inner workings and behaviour of this fuel cells above

metal and glass walls. It aims to also promote an energy-efficient design by the better distribution of heat in the oven while minimising thermal losses. Clearly, material selection and position of the heating element were two variables needing different options to be tried and tested to see the optimal combination.

Garcia-Polanco and his team began by recreating the heat transfer processes of conduction, convection, and radiation within the oven and in the surrounding area of an oven. The

model that they created was based on Europe's standard test to determine an oven's energy efficiency. The test uses a porous brick that has been soaked in water for 8 hours, and is then heated for 50 minutes at 200°C with the temperature changes in the brick, walls and glass measured using thermocouples. The brick represents food and so the temperature distribution and evaporation of the water is used to assess the performance and energy usage.

Whirlpool uses the Heat Transfer Module in order to analyse the concentration of water inside the brick and compute the simulation.

Once the model was complete and analysis run, the results were compared to actual test results to assess any variance in data and ensure the model could be used to accurately predict temperature changes and ultimately bring about design improvement more quickly.

"The model predicted that an average of 166g of water would have evaporated after the 50-minute heating cycle," says Garcia-Polanco. "The actual value was found to be only slightly higher, at 171g."

Whirlpool continues to use the simulation to gain an accurate insight in to the effect various design and material changes have on its ovens. The use of virtual simulation has saved time and money by accurately quantifying the effects of material changes and heating element position changes. And going forward it will allow Whirlpool to more quickly determine the optimal materials, design and layout of future ovens.

"It's important for us to be able to accurately analyse the transient heating process and we can use specific parametric studies to measure the emissivity of the glass and cavity walls, the insulation of the cavity walls, the material properties and the heating element design," says Garcia-Polanco. "We can then adjust the position of the element or change the materials and accurately simulate the effects this has. We hope this enables us to meet our energy reduction targets and allows our appliances to save people energy and money."

www.comsol.ltd.uk

PTC Creo 3.0 to boost interoperability

PTC's Creo latest release will integrate with third-party CAD models from other major CAD software companies including Solidworks, Siemens PLM, Catia and Autodesk.

The approach being dubbed 'Unite Technology' offers users two options in handling third-party data.

First is the ability to open Catia, NX and SolidWorks models in their original format and integrate them into a Creo component as if they were native files. The relationships with third party data can be defined, for example, between a bore hole in a SolidWorks model and a bolt from a Creo parts library. So a Creo assembly can have a part or sub assembly inserted from a one of these CAD systems without translation or additional software.

The second option opens Catia, NX, SolidWorks, Autodesk Inventor and SolidEdge and directly converts file data via a neutral format, into Creo geometry. This allows editing within Creo's direct-modelling functions or in the Flexible Modelling Extension of Creo Parametric.

PTC now offers companies the possibility to switch to Creo without massive data migration and is pitching the system primarily to SolidWorks users.



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Connected sensing

When it comes, the Internet of Things will rely on sensing technology. Here, Paul Fanning looks at some of the ways in which this is already happening.



Hardly can the phrase 'Internet of Things' appear on the page before the person writing it senses the eye-rolling and wandering attention that the use of a buzz-phrase inevitably brings with it.

It would be redundant to rehearse the arguments about hype that invariably attend any mention of the Internet of Things, since discussions of the hype surrounding it have become almost as ubiquitous as the hype itself.

More useful, perhaps, is to look at the reality rather than the hype. And a key aspect of the Internet of Things lies in the sensor technology that will – and indeed is – underpinning it.

Some examples come from Silicon Labs, which has introduced two economical, easy-to-use development kits to accelerate the design of environmental and biometric sensing applications for a wide range of Internet of Things (IoT) products. Target applications for the kits include home security systems, smart thermostats, smoke detectors, weather stations, smart watches, fitness bands, heart-rate earphones and other wearable products.

Silicon Labs' SLSTK3201A environmental sensing development kit streamlines the process of developing IoT products that sense relative humidity (RH), temperature, ultraviolet (UV) light, ambient light, proximity and human gestures. The development kit combines an EFM32 Zero Gecko microcontroller (MCU) starter kit with a sensor expansion board. The kit also features a gesture-controlled weather station application

that tracks RH, temperature and UV index.

The company's new biometric sensing development platform makes it easier to measure heart rate and blood oxygen level (SpO2), as well as UV index, relative humidity and temperature. The platform includes the BIOMETRIC-EXP-EVB expansion card featuring Silicon Labs' Si114x optical sensors and Si701x/2x humidity and temperature sensors. The sensor card plugs directly into Silicon Labs' EFM32

A handheld equine ECG is currently in use by horse trainers

Wonder Gecko MCU starter kit. Silicon Labs also offers an optional wearable-form-factor that supports wrist-based heart rate monitoring and connects to the biometric sensor card through an I2C mini-flex cable.



The environmental and biometric sensing kits operate on coin-cell batteries, demonstrating the industry-leading ultra-low power consumption of Silicon Labs' MCU and sensor IC products for battery-powered IoT and wearable applications. Each sensor expansion card features Silicon Labs' TS3310 boost dc/dc converter to help minimise energy consumption.

The award-winning Si701x/2x relative humidity and temperature sensors combine a single-chip, mixed-signal IC with a proven technique for measuring humidity using a polymer dielectric film. The integrated CMOS design ensures long-term reliability and superior ease of use, reducing manufacturing cost and complexity. An optional, factory-installed filter cover provides added protection against sensor contamination throughout the device's entire life. The Si701x/2x sensors offer best-in-class low-power consumption and exceptional RH sensing precision.

The Si1132/4x optical sensors are the industry's first single-chip digital UV index sensor ICs designed to track UV sun exposure, heart rate and blood oximetry for wearable and smartphone products. The devices also provide ambient light and infrared (IR) proximity sensing capabilities for health and fitness applications.

Conventional UV sensors combine UV-sensitive photodiodes with an external MCU, ADC and signal processing firmware.

Advantech's new, comprehensive IoT solution is the

UTX-3115 fanless and wide-temp embedded box coupled with the Intel Gateway Solutions for Internet of Things. The solution features a pre-integrated software and hardware platform containing a Linux operating system, security and management features. This out-of-the-box solution simplifies customer deployment of IoT products and it allows secure data aggregation, filtering, and analysis from edge devices to the cloud through WiFi and/or even 4G technologies. Advantech is a premier member of Intel Internet of Things Solutions Alliance.

Miller Chang, Vice President of Advantech Embedded Computing Group says: "Advantech understands customers require readily-available solutions to tackle the complexity of IoT infrastructure. That's why we've worked with Intel to develop the new UTX or Ultra Thin ITX form factor system integrated with the Intel Gateway Solutions for IoT as an ideal gateway product. This joint effort is a demonstration of Advantech's capability in offering a full lineup of IoT centered products, from Wireless Sensor Networks and Gateways, to Intelligent Systems and IoT Software."

Kumar Balasubramanian, general manager, IoT Solutions Group, Intel, says: "Intel and Advantech have been working together to accelerate the development and deployment of the Internet of Things, which in turn helps drive business transformation. The UTX-3115 embedded box is an excellent showcase of our joint efforts. It is a gateway product that connects legacy systems and provides seamless communication between devices and the cloud."

UTX-3115 is a mini-size system supporting a wide-range of operating temperatures from -20



The UTX-3115 embedded box is the pre-integrated Intel Gateway Solutions for Internet of Things

to 60°C, and rich I/O expansion. It's designed for IoT applications such as factory automation, smart buildings, logistics and environmental monitoring. It offers one serial port, which can be connected to sensors or control devices for data aggregation, dual gigabit LAN ports, 1 USB 3.0 port and two USB 2.0 ports. In addition, it also comes with one half-size miniPCIe slot and one full-size miniPCIe slot that supports Wi-Fi and 3G /4G proprietary WWAN networks.

Running on the UTX-3115 fanless and wide-temp embedded box is the pre-integrated Intel Gateway Solutions for IoT, which bundles together Wind River IDP2.0 technology, McAfee security functionality, and a wide variety of connectivity protocols, developer tools, and programming environments. This brings the benefits of IoT to legacy infrastructures with local device management and data sharing through a system of systems approach. Embedded system customers can enjoy benefits such as not needing to replace existing infrastructure equipment and devices, being able to securely

aggregate, share, and filter data from the edge to the cloud, and being able to focus on adding new value-added services.

UTX-3115 is also bundled with Advantech SUSIAccess which provides remote device management and system recovery powered by Acronis, and system protection powered by McAfee, allowing users to easily monitor, configure, control, and even recover multiple systems through a single console from a remote site. For example, in building energy management, UTX-3115 is able to acquire data from local or remote sensors or actuator devices, send it to the cloud to be turned into actionable information, and have it received back for processing. SUSIAccess allows users to easily check this information to control and monitor all the sensors or actuator devices inside buildings and alert in case of any abnormal energy distribution.

Another real-world 'Internet of Things' development comes from innovative technology and design consultancy Cambridge Design Partnership, which has successfully launched a new company Gmax Technology to commercialise advanced connected and wearable devices that revolutionise sports training. Focusing initially on the elite equine sports market, Gmax is manufacturing a range of connected products that deliver unprecedented insights into the physiological effects of training. This allows sports scientists to optimise performance and create a winning edge.

Gmax technology has been working for over five years to overcome the challenges to create practical and effective connected monitoring devices in the demanding commercial equine training environment. Supported in the past by both Technology Strategy Board SMART awards and Knowledge Transfer Partnership grants, the company has been able to bring this disruptive innovation to the horse racing industry.

The Gmax product range is initially targeted to exploit some potentially lucrative niche markets. The Gmax 'Vetcheck' is the first hand held equine ECG and is currently in use at Dubai International Endurance City. The flagship product, the Gmax 'Trackwork' is used to gather live performance data from groups of training horses, allowing owners and trainers to monitor fitness during training anywhere in the world. It is currently in use in the UK by the Coral Champions Club allowing over 4000 of their



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Will Bradley: "The demand for connected devices for the Internet of Things is growing rapidly."

members to follow the training of their horses over the internet. Finally, Gmax 'Treadmill' monitors horses during treadmill exercise sessions so that a complete history of training responses can be created.

Gmax came about as a result of Cambridge Design Partnership's expertise in designing medical diagnostic devices and products for the IoT. The company's multidisciplinary team was

able to overcome not only the technical challenges of developing novel sensors and wireless communications systems to operate in harsh environments, but also the data analysis and usability challenges that are key to making these systems really compelling and valuable to trainers.

Horse training methods have remained virtually unchanged for 150 years, now Gmax

has the opportunity to provide a completely new approach. In human athletics, it has become increasingly commonplace for athletes to rely on technology to reduce injury and maximise performance. Through the use of Gmax's innovative systems, horse trainers can now bring this same approach into a sport that is worth billions of dollars globally.

Will Bradley, managing director of Gmax says: "The demand for connected devices for the IoT is growing rapidly. The multidisciplinary approach of the Gmax team has allowed us to create products that combine novel sensors with wireless communications, which deliver valuable insights into the physiological effects of training.

"These innovative solutions are already in use by the horse racing industry and we expect similar products to be developed for a variety of markets such as human healthcare and sports training."

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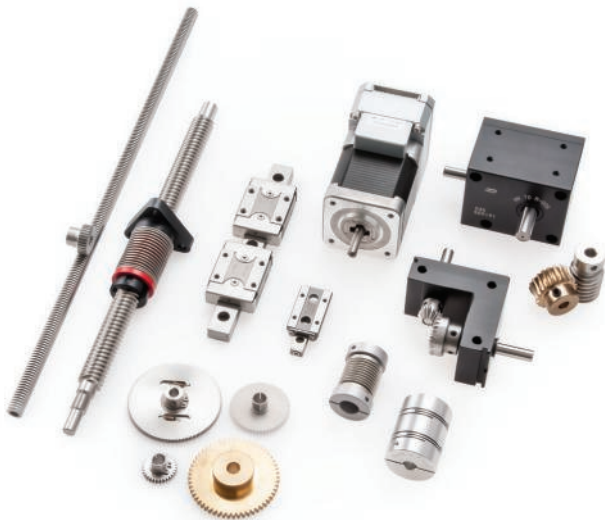
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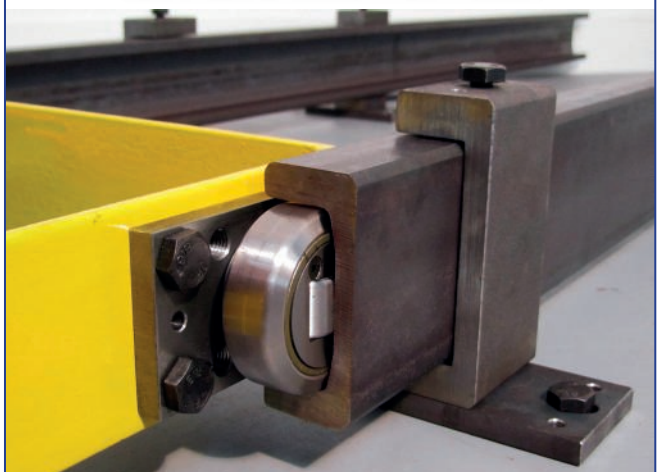


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The TKSA 11 features an inductive proximity sensors with an easy to use app for smartphones and tablets

MEASURING UP

Successful bearing application requires good measurement. Here, Paul Fanning looks at some of the available tools for this purpose.

Measurement is a key ingredient to successful bearing application and anything that ensures the correct angles and alignment will have a positive impact on the end result.

For instance, it is estimated that misaligned shafts can cause up to 50% of all machine failures, affecting reliability, seal couplings and belts. Additionally, incorrect alignment adversely affects energy consumption.

For this reason, SKF has launched the first of a new generation of shaft alignment tools. The TKSA 11 is the only instrument of its type to feature inductive proximity sensors, and an innovative and easy to use app for smartphones and tablets. It's an ideal entry level tool for maintenance and production engineers to carry out shaft alignment quickly, simply and accurately on motor, fan, pump and compressor applications amongst many others.

Shaft alignment has traditionally been carried out using laser tools, dial gauges or simply by line of sight and a straight edge. Laser tools can be expensive, whilst dial indicators are accurate but difficult to use, and line of sight methods are inaccurate.

The TKSA 11 incorporates two inductive proximity sensors within a compact and robust electronic measuring unit, which is attached to the moveable machine side, on shafts or coupling sleeves, with a reference bar being attached to the fixed machine side.

With an easy to use app, the user is led through the measurement and correction of shaft misalignment, while a live view of the measuring unit and horizontal machine position facilitate accurate alignment.

The technology can be used in bright sunlight and enables high measurement accuracy regardless of the distances between the mounting brackets. This makes it ideal for aligning narrow couplings or for use in confined spaces. Optional extension rods and extension chains are also available to use with large couplings and shafts, further extending its application range.

The measuring unit connects to an iOS smartphone or tablet via Bluetooth, with the app exploiting the computing and display performance of the mobile device to provide

intuitive alignment using the live view and animations. The easy to use interface has clear on-screen instructions and helps users perform quick alignment tasks, with the option of a report with signature and a picture available for export as a pdf.

Meanwhile, Schaeffler has developed an angular measuring system suitable for direct-driven, highly dynamic, high precision rotary axes in machine tools. The system incorporates an inductive (absolute) angular measuring system integrated in a rotary table bearing.

The SRM measuring system combines high measuring speed and measurement accuracy with a reduced design envelope and increased robustness. The system is insensitive to contamination (e.g. lubricants and coolants), offers a rotary axis with an open centre (freeing up space in the centre of the machine) and reduces alignment errors. With fewer mechanical components, the system is also easy to replace and maintain.

The YRTSMA bearings from Schaeffler can be fitted to the rotary axes as an alternative to optical angular measuring systems. YRTSMA bearings are available with bore diameters from 150mm up to 1030mm.

By fitting the YRTSMA bearing to the rotary axis, information about the absolute angle is available immediately after switching on the machine.

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Floating down the line

A major issue in the manufacture of semi-conductors and microchips used in printed circuit boards is particle contamination that can dramatically increase production costs and reduce the operational life of the end-product. Eureka finds out more.

The manufacturer of semi-conductors and microchips used in printed circuit boards (PCBs) requires an ultra-clean production environment, such as an inline vacuum deposition process.

Consumer products, from televisions to mobile phones, handheld game consoles, tablets and personal computers, all contain sensitive electronics which are manufactured in this way.

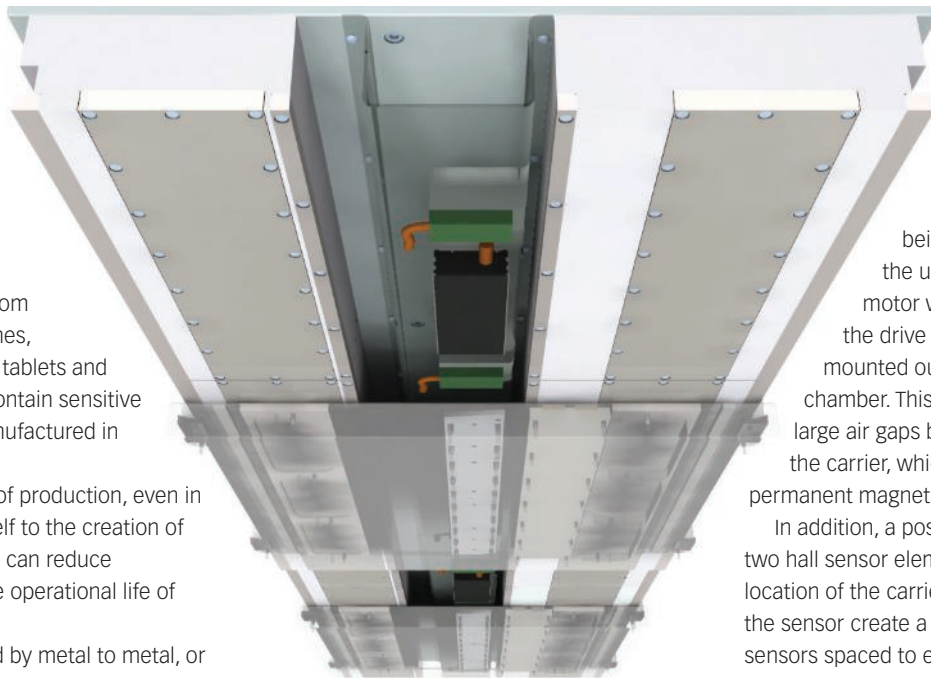
However, the process of production, even in a vacuum, often lends itself to the creation of tiny particles of dirt which can reduce production quality and the operational life of the end product.

Particles are generated by metal to metal, or metal to grease contact inherent in conventional methods of inline transport. Electronics manufacturers are currently using a variety of methods from chain drives to conveyor belts with linear motors which are complex, expensive and, crucially, particle generating.

Typically, the layout includes a vacuum-sealed process chamber with the carrier inside a vacuum. The problem with this method is that the bearings are also inside the vacuum, which immediately results in metal to metal contact and the potential for particle ingress.

What's more, particles are not the only problem. This type of production is neither scalable nor flexible. Increases in demand cannot be quickly accommodated and the line will need extensive service and maintenance.

The requirement is therefore to get away from any touching of components during the manufacturing process, which in turn improves



by the switching of the current which activates the magnet. The carrier is then driven down the production line.

The alternative, currently being extensively tested, is the use of an inverted linear motor with magnets underneath the drive carrier with the coil units mounted outside the process chamber. This type of system enables large air gaps between the magnets and the carrier, which levitates above the permanent magnetic tracks.

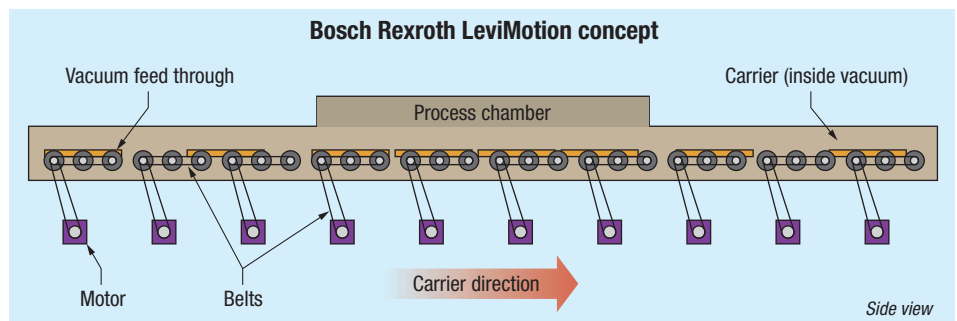
In addition, a position sensor, consisting of two hall sensor elements, controls the exact location of the carrier. Magnets moving over the sensor create a sinusoidal wave with the sensors spaced to ensure the phase difference is 90°. Interpolation of the signals gives the exact carrier position.

The carrier is also equipped with an automatic alignment procedure and advanced carrier control offers a full degree of movement on five axes, including pitch, roll and yaw. This type of system has two advantages. Firstly, a series of coils can be constructed and up to 32 carriers can be used, rather than just the single carrier with the standard linear

product quality and cost of production.

One potential solution, that is currently being extensively tested, is magnetic levitation, such as the Bosch Rexroth LeviMotion concept, which combines inverted linear motion technology with a completely contactless transportation system.

With a standard linear motor system, there is one moving coil with the motion controlled





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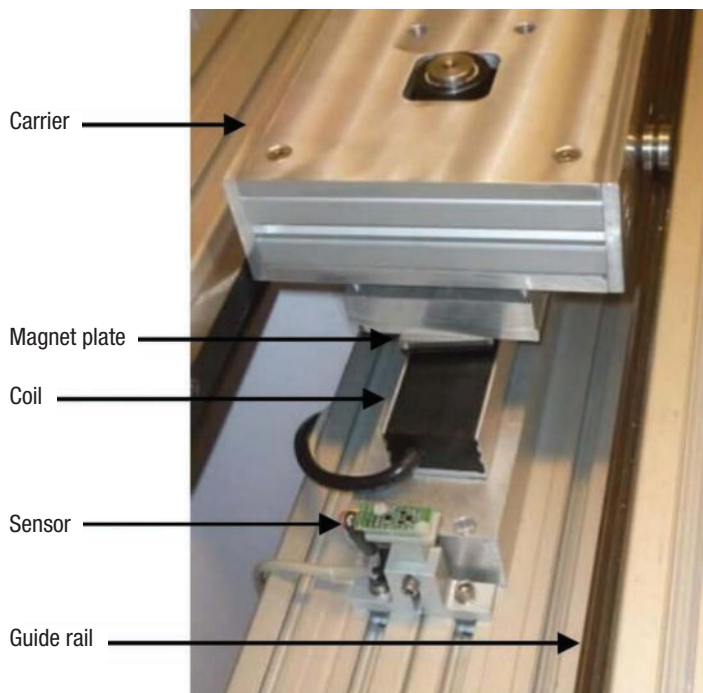
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motor. Secondly, with the coils mounted underneath the carrier, any ingress particles fall away, rather than onto the carrier, which improves product quality.

In short, with the inverted linear motor having no active parts due to the bearings being located in fixed positions, there is much less potential for particle ingress.

With this method there is no friction or wear and the movement of the carrier is contactless and clean, with no particle generation and no lubrication. What's more, this method of transport is frictionless with no bearing related disturbances like sticking or slipping or fluctuating stiffness.

In addition, only passive or sealed components are located in the process chamber which, leads to lower maintenance costs and a lower cost of ownership.

This type of line can offer high speed and high positioning accuracy with constant speeds and low ripple. What's more, testing has shown excellent planarity over long transportation distances with automatic alignment procedure in the bearings' air gap.

In terms of production throughput, the carriers can achieve speeds of up to 5cm/s and can carry loads from 1kg to 1000kg. Most importantly, the carriers are capable of repeat positioning of 10-20 μm along with exceptionally high positioning accuracy and minimal velocity ripple.

Whilst this combination of Bosch Rexroth's NYCe4000 LMS drive system and Mecatronix's magnetic levitation is only currently being tested, it has already gained significant interest from electronics manufacturers. It is easy to see why as the combination provides a potential solution to particle generation which has dogged semi-conductors and microchip manufacture for years.

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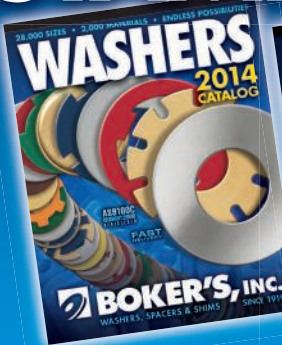


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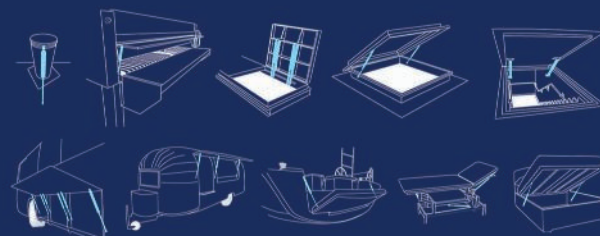
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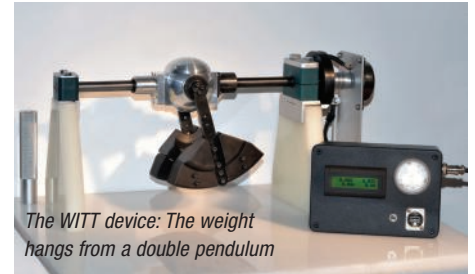
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Collecting chaos

Harvesting energy from random and chaotic motion has led to the development of an innovative mechanical device that has far reaching potential application. Justin Cunningham finds out more.



While energy can't be created or destroyed, it can certainly be captured or lost. Indeed, people, like nature, all expend an extraordinary amount of energy everyday that has the potential to be recovered.

It was this concept of capturing and using random and chaotic movements that saw engineer Martin Wickett embark on an eight year journey of invention and development that led to the aptly named WITT, that's the Whatever Input to Torsion Transfer device.

At the time a keen cyclist, Wicketts set out with the idea of capturing acceleration forces from every direction acting on a bicycle and turning that energy in to something useful.

He started by thinking about the mechanisms used in automatic watches. These use a counterweight with two separate one-way clutches. This type of mechanism takes inputs from two directions on a single axis and turns them in to a single rotational movement. The rotating shaft lends itself to electricity production, as it can be easily connected to a generator.

The brainwave

However, the watch mechanism only takes one-axis of motion, so movements in other directions are not able to be captured. Keeping to the same

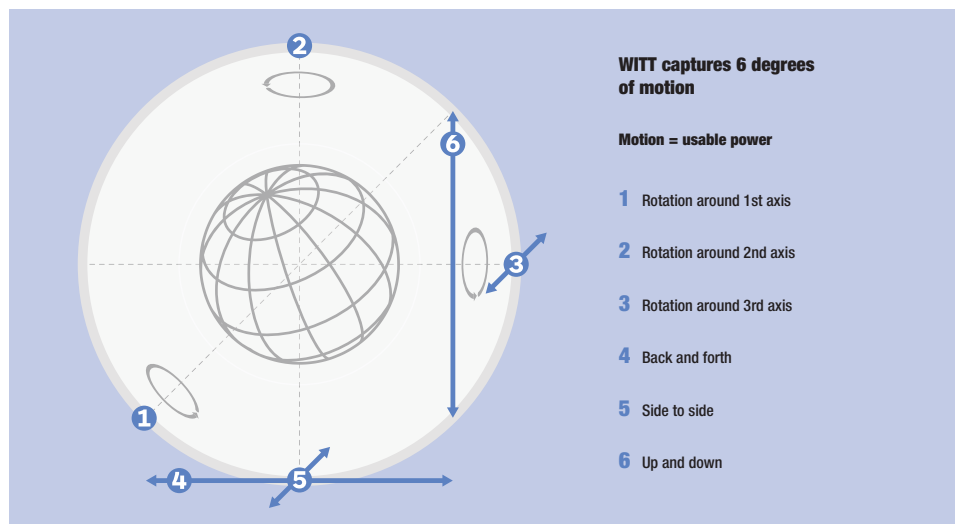
elegant principle, Wickett had a brainwave; the idea of adding another stage to the mechanism, essentially making it three dimensional.

By using a double pendulum arrangement, a weight swings freely on one axis while an attached shaft allows rotation in another. While this captures lateral movements, the swinging nature of the pendulum captures vertical motion, enabling energy to be harnessed on all six axes.

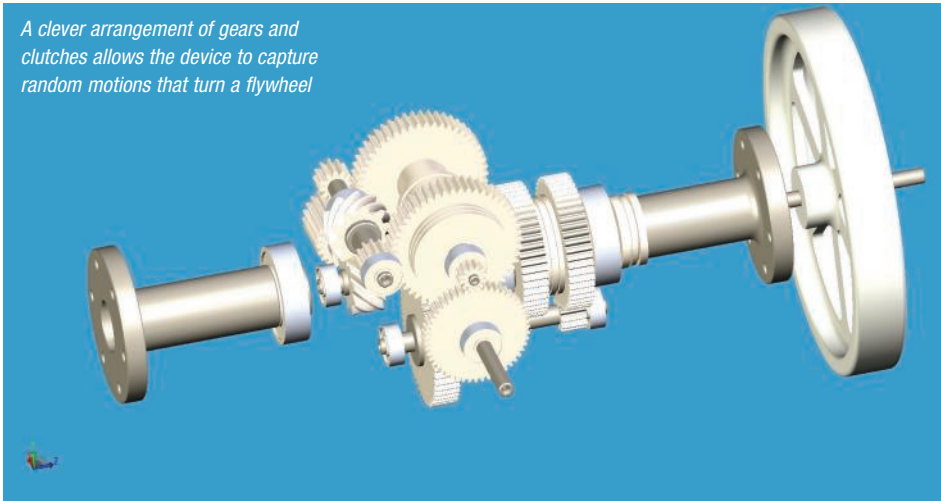
Wickett was sure the principle in the watch could now be modified and applied to his new

layout and allow the resultant output to be a rotating shaft. So, like any good inventor, Wickett locked himself in the shed and began to tinker. After sometime, the inner mechanics of gears and clutches were devised in such a way that a working prototype was build and an application for a patent was soon granted.

"We were initially surprised at quite how effective it was," says Will Boulton, product and development manager at the since formed WITT Energy. "You imagine having two sets of gears is going to produce a fair amount of resistance and slow everything down because of the interference between the two inputs. But actually, the way it works, with the clutches, is incredibly effective. Any movement results in some fairly rapid acceleration of the attached flywheel."



A clever arrangement of gears and clutches allows the device to capture random motions that turn a flywheel



The flywheel is important as it keeps the momentum in the rotating shaft and also helps to iron out some of the random inputs that can be experienced. The device needs chaotic motion to operate as the mechanism is unable to transfer purely vertical inputs. After the initial proof of concept, funding from the Technology Strategy Board (TSB) soon followed and a more robust demo unit was built.

"Once we had a demo unit we could see the power it could produce, and that has been our calling card since," says Boulton. "Every time we go somewhere people ask us if we have considered using it for this or that application. There are potential uses everywhere."

However, in an effort to develop a commercial product and establish the technology, WITT Energy partnered with a number of other companies and universities to get a production ready and fit for purpose device.

Together the consortium is targeting the marine industry, specifically for use on navigational buoys. The potential to convert wave energy to electricity would allow the buoys to perform scientific measurement, have sensors and navigational aids integrated, as well as the potential for mounting lights on top.

Its partners helped WITT get the device ready for production. Gearbox manufacturer MCT Reman helped in design for manufacture while marine power electronics company, Triskel Marine Services looked at reducing energy consumption of systems to be mounted on the buoys.

"Marine is an obvious area for WITT as there is a lot of random motion from waves," says Boulton. "There are lots of marine based applications

where they would like to have continuous power but it's difficult to carry that many batteries and renewable generation is sometimes not practical. As well as navigational buoys, yachts and even sea kayaks look like they could easily have a unit retrofitted.

"Our device is standalone, produces zero emissions and is self contained. You don't need to see it or hear it. You plug it in and get free power out. It's not heavy and is only about the size of a shoebox."

With computer models predicting the shoebox sized marine WITT device should be able to produce up to 15W. Tests are being carried out to verify these predictions, with its first commercial product to be launched early next year.

However, there is still room for optimisation and the team is busy making sure the gearbox, the pendulum length and weight, the flywheel size and weight, the generator type and output, along with the control electronics are all well matched to capture and convert as much energy from waves as possible.

Shoebox power: the device has been integrated in to a marine ready unit



Far reaching applications

Such is the enthusiasm from potential end users that WITT Energy is looking at scaling the device both larger and smaller. At the larger end of the spectrum is the possibility of using it as a tuned mass damper, a device often used on tall buildings to stop swaying. These devices, at the moment, are energy negative meaning they absorb energy but are not able to re-use it. A large WITT device offers the potential to capture the energy of the swaying buildings and convert it in to electricity.

The obvious large scale application for the WITT device is a wave energy renewable power generator. However, the company is all too aware about the long route to market. While many wave energy devices are still being trialled, no significant sites are under development despite calls for the technology for more than 20 years.

"It is a great opportunity," says Boulton, "But it is a much bigger nut to crack and a lot of the devices in this market have had a rocky road. A majority need direct contact with the sea. You need really effective seals to keep water away from the moving parts and they are susceptible to damage by the harsh nature of the environment. We can seal our device off almost completely, so that is a real advantage. But, first of all, we need to establish the technology and get a good understanding of how it operates in the marine environment."

While this is perhaps further away in terms of development, WITT Energy has received more grants from Innovate UK for nearer term developments. One project with ANT Scientific, a specialist in miniaturisation, is looking to assess if the mechanism can be scaled down so it could be worn. The feasibility study is to assess whether peoples movements could be used to effectively charge a small device like a tablet or smartphone.

"We are looking at how much power is useful for something like a phone, and therefore how big does our unit have to be to produce that," says Boulton. "It's a really exciting time, exploring all the potential applications and it's not long until we get some products in the market place next year. And of course, we are always looking to develop opportunities with new partners."

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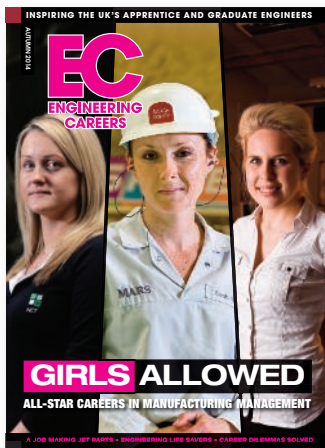
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Registered Community Designs are a significant aspect of IP protection in the sphere of portable devices. Here, Jonathan Jackson of D Young & Co LLP explains.

Over recent times portable devices have developed the capacity to store an increasing amount of information. Users have therefore required new and innovative ways of easily displaying and accessing this information. Many companies have invested huge amounts of time and money in developing Graphical User Interfaces (GUIs). The same GUI is typically provided across all of the devices produced by a particular manufacturer, so that the consumer becomes familiar with the particular look and feel of a family of products. For example, Apple's iPad, iPhone and iPod adopt the same GUI. This investment in the GUI should be protected by intellectual property rights to ensure that the look and feel of the products remains distinctive and exclusively associated with the company's products, preventing third party copying.

In Europe, the appearance of the GUI can be protected across the EU using Registered Community Designs (RCDs). The RCD does provide useful protection as it extends to the GUI applied to any device. Therefore, in terms of protection, it does not matter whether the GUI is applied to a competitor's smartphone, tablet or set-top box; if the design is applied to any product, action can be taken.

RCDs are particularly useful where the layout of the icons on a screen are aesthetic. Additionally, RCDs are useful when a company wishes to protect the look and feel of the GUI. For example, colour choices, shading and font choices can all be protected.

Although aesthetics are important in GUIs, many GUIs also improve the operation of the device. For example, a GUI that improves the precision of icon selection by the user may be capable of patent protection. These utilitarian features are particularly valuable to companies and where these features are independent of aesthetics, it will be worth acknowledging the investment made in advancing the technology by also investing in patent protection.



"RCDs are useful when a company wishes to protect the look and feel of the GUI. For example, colour choices, shading and font choices can all be protected."

Obtaining patent protection for a GUI in Europe is sometimes challenging. This is because case law has evolved at the European Patent Office (which examines patent applications) to a position where it has been decided that any aspects of an invention which relate to solely to the presentation of information cannot be used to confer inventive character in the invention. As such, these inventions will not be capable of patent protection.

Of course, many aspects of a GUI do relate solely to the content of the information being presented. As noted, these would not be

capable of patent protection in Europe. However, in some instances the structure of the GUI assists the user in selecting content via icons. Patent protection for this type of GUI may have just become easier in view of a recent case decided by the Board of Appeal at the EPO. This case law is used as precedent when examining other similar cases.

Case T0781/10 related to a device that had menu icons displayed on a background image. The icon was selectable by moving the focus using a direction button. Specifically, the difference between the invention and a known GUI resided in "the background screen management unit [being] configured to change a view point of the background screen when the focus is moved, in accordance with a direction in which the focus is moved".

It was held by the Board that the problem with GUIs that this difference addressed was to "increase the user's awareness of the currently selected menu hierarchy, and thereby achieve a more effective man-machine interface". Moreover, this difference enhanced the precision of the input device.

It should be noted that in this case, the claimed invention related to how the icon was displayed or changed rather than the form of the icon. As this invention provided a technical contribution over existing GUIs, and because the invention was more than a mere presentation of information, the claimed invention was deemed to have the required inventive character. Patent protection was therefore granted.

This case shows the importance in selecting the correct IP protection. Where the uniqueness of the GUI resides in the aesthetics of the GUI, then RCDs are the most appropriate form of protection. However, where the uniqueness resides in the utilitarian function of the GUI, patent protection is most appropriate.

If you have any queries, please contact the author.

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Like riding a bike

Learning to ride a bike is a rite of passage for parents and children alike. It's an iconic scene, parents running along behind, pushing, before letting go with a combination of excitement and worry. It inevitably ends with a bit of a wobble and a crash at the end, but fortunately it's usually a case of dusting down and starting again. It's a repeat and master process, which usually culminates in: "I'm doing it, I'm doing it!"

Riding a bike is not easy and the physics of it all are actually quite complex. Being stable on two wheels requires a continual change of centre of gravity as weight is shifting from side to side. It's one of those things that require somewhat of a knack, and that usually takes time to develop. However once learned, it's said, you'll never forget the skill.

Many parents use stabilisers on the back wheel to make the whole thing much sturdier and support any wayward sideways movements caused from pedalling. However, though this provides a safety net from falling over, it doesn't allow children to master the actual act, and inevitably when the stabilisers do come off, it's back to square one.

The challenge

The challenge this month is therefore to come up with a more effective training aid to teach children how to ride a bicycle for the first time. Now, any solution should still allow parents to get involved and enjoy the excitement and experience of it all, but perhaps it could help speed up the process,

maybe from weeks to days... maybe even as little as a few hours of an afternoon.

The bicycle balancing training aid should be as inclusive as possible, allowing children with disabilities to be able to take on the challenge and experience the thrill of riding a bike for the first time, whether it's a vision impairment, some kind of nervous or anxiety disorder, or where mobility and balance can be difficult. Obviously any solution needs to put safety first.

Perhaps, also, some method of adjusting the amount of support provided can be engineered that allows first time riders to go from extreme stability to just a little bit, allowing youngsters to be gradually weaned

off the feel of stabilisation. This is at stark contrast with the all or nothing approach currently on offer from stabilisers.

And this doesn't mean a redesign of an entire bike. Indeed, it would be ideal if any stabilising system or device could be retro fitted to virtually any bike.

The solution we have in mind borrows a well known balancing aid technology that has been successfully applied in numerous two-wheeled vehicles. However, it's not the only solution, so in the meantime, see if you can come up with anything better.

The answer to last month's Coffee Time Challenge to design a better way of drying yourself after a bath or swim, can be found on page 19.



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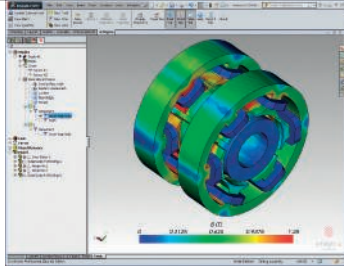
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Flowmeters

Top 10 Tips for Selecting a Flowmeter

Drawing upon over 40 years of experience, Trevor Foster – an internationally recognised authority in flow meter technology and applications offers sound, non-commercial advice on what to consider when selecting, implementing and maintaining a flowmeter system.

To download a free copy:
www.flowmeters.co.uk/flowmeters-top-tips.php



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