EUREKA
THE MAGAZINE FOR ENGINEERING DESIGN

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Doing it better

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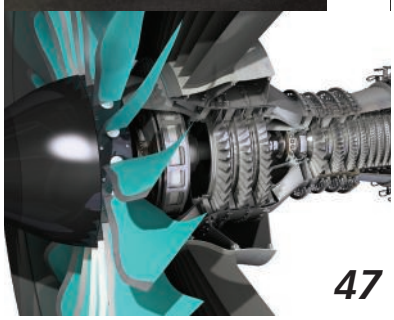

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These are exciting times

Tim Fryer, Editor (tfryer@findlay.co.uk)

As David Moyes found out at Manchester United, taking your place in a winning team can have its pitfalls - I am therefore taking nothing for granted as I join *Eureka* as its Editor. And beyond the obvious 'challenge' and 'great opportunity', which don't become any less true despite their clichéd status, this is a very positive time to be joining the team. For many reasons, these are exciting times.

Firstly, and from an inward looking perspective, the *Eureka* 'portfolio' is going from strength to strength. We have just closed the doors on the *Engineering Design Show* (EDS), an exhibition and conference which has, in only three years, grown in status to genuinely lay claim to being an event that is both award winning and industry leading.

Having shown that engineers will come out to events if the content is right - 4000 engineers attended EDS in Coventry last month - we're now launching a similar event for the North East, an area rich in engineering heritage that is reinventing itself to address the modern industrial environment. '*Manufacturing and Engineering North East*' will take place in Newcastle next July [see page 40].

On top of that our website is undergoing a redesign, our sister magazine *Engineering Materials* continues to grow in reputation, the 2014 *BEEAs* programme revealed true excellence in UK engineering and, more than anything else, *Eureka* continues to be individually requested by over 16,400 readers - a true indication that the printed word is still of value to engineers!

Coupled with this are the changing dynamics within the engineering sector. After so many decades of industrial decline there now appears to be political consensus that we need to design and make things in the UK. Even in these times of austerity, the Government is making strategic investments in the technology sector aimed at stimulating growth.

Meanwhile the role of the design engineer is changing as more disciplines converge, and more products require greater functionality. Yet our ability as a country to fill these increasing engineering roles seems to be lagging by a decade, as engineering retains its male-orientated, oily-rag image amongst school children. It presents a huge challenge.

All these issues, along with the technology of course, will be explored by *Eureka* going forward. Exciting times, indeed.

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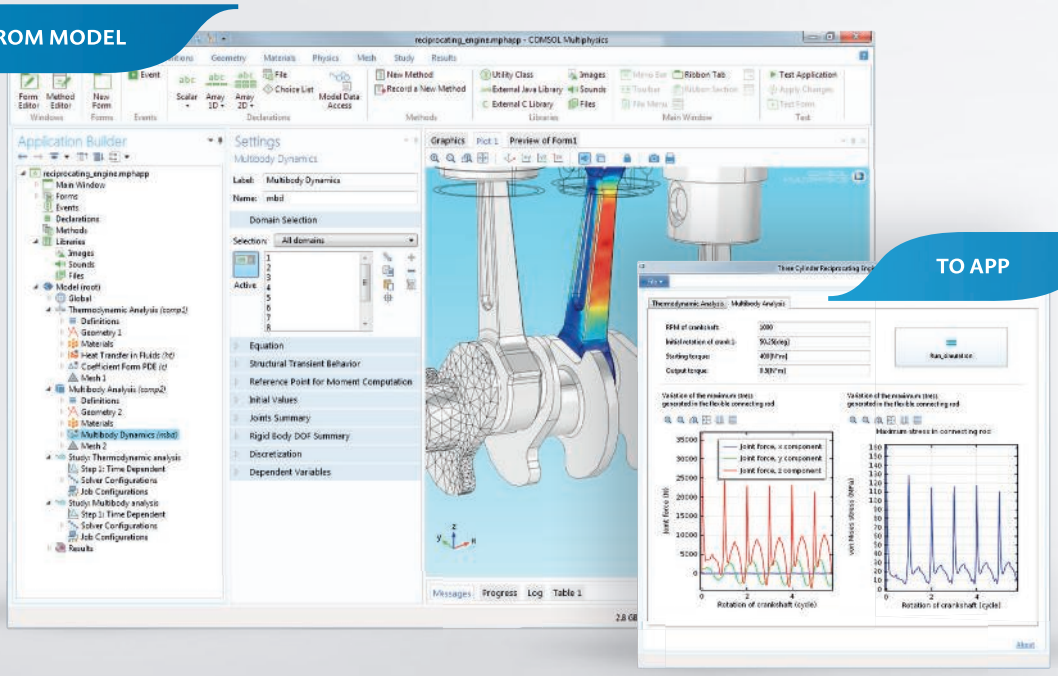

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EDS becomes UK 'centre of excellence'

The Ricoh Arena, Coventry became the centre of design engineering excellence on 22 -23 October as over 4000 engineering professionals converged to attend the Engineering Design Show. Visitors and exhibitors alike praised the show for its quality and content with most committing to attend again next year.

Ed Tranter, executive director of organiser Findlay Media, said of the event: "When we launched the Show three years ago it was with the aim of providing a dedicated exhibition for the design engineering sector. The support we have received from the industry has been fantastic and enabled us to build a hugely successful event that we can all be very proud of. This year's Show has proved to be an absolute triumph and I want thank everyone involved for making it such a success."

The PPA award-winning Engineering Design Show was co-located with the Electronics Design Show and provided visitors with the opportunity to see and discuss the latest advanced engineering techniques and technology from over 200 market-leading companies. Once again, the high level keynote conference sessions, given by design leaders representing companies including Infiniti Red Bull Racing, Cambridge Consultants, Gurit, Mercedes AMG Petronas, Siemens, Rolls-Royce and Millbrook, were all extremely well attended.

There will be a full review in Eureka's December issue.

Engineering event for the North East

Recognising both the strength and depth of the engineering sector in the North East of England, a new event will be launched in 2015 that specifically addresses both the region and the industry. 'Manufacturing and Engineering North East' will follow the same formula adopted by the Engineering Design Show, which has proved so successful in the Midlands over the past three years.

"With its huge industrial base, The North East is the perfect place to host the show," said Ed Tranter, (pictured above) executive director of show organiser Findlay Media. "We are looking forward to creating an event for manufacturers and engineers that is focused on their needs and their needs alone." The event will take place at Newcastle's Metro Radio Arena between 8-9th July 2015.

NORTH EAST MANUFACTURING & ENGINEERING

Climer to become first female president of IET

Naomi Climer, president of Sony Media Cloud Services will become The Institution of Engineering and Technology (IET) President on 1 October 2015.

Climer, currently IET Deputy President, has spent her career immersed in the rapidly changing world of media and entertainment technology from the analogue, pre-internet days of TV and radio through to the multi-channel, multi-platform, mobile experience of today. She has a strong interest in diversity issues and has been an active campaigner for the need to encourage women within the engineering profession in the UK.

"Engineering is a hugely exciting and diverse career with the opportunity to do something life- or world-changing," said Climer. "But there is a big job to do to increase public understanding of the important role engineering plays in their daily lives and get more young people excited about the possibilities of an engineering career. It will be an honour to become the President of the IET and of course to be the first female in that role."

Winning Women With Bright Ideas

A children's cutlery set and a musical memory box for dementia sufferers were the winning designs in the Women With Bright Ideas competition.

The Dragons Den-style competition was launched by the Engineering and Innovation Network South West and 25 budding entrepreneurs and designers from all over the country entered their ideas. The seven best entries were presented to an audience at Wiltshire College on 17 October.

In the end, two products stood out and the judges were unanimous in having a joint winner: The Musical Memory Box designed by Chloe Meineck to aid people with dementia and doddl, an ergonomically designed cutlery set which will revolutionise mealtimes for young children, designed by two sisters Rosie Phelps and Catherine Dodd.

Successful scooter

A scooter that folds into a square the size of a piece of A4 paper was the winning entry in the 2014 Power of Aluminium Design Competition.

Aimed at final year design students in UK universities, the competition, sponsored by Sapa Profiles, received entries from a number of faculties with students from London South Bank University scooping the top two prizes.

The scooter (pictured) which clinched first prize was the brainchild of George Mabey, 22, a final year Engineering Product Design student at London Southbank University (LSBU), the runner-up, also from LSBU, was Benjamin Hunt, 19, with his 'busking stand' guitar amp.

The scooter works by linking extruded parts of aluminium with a tensioning cable which, when tightened, pulls the sections together in a rigid structure that can support the weight of an adult.

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NEWS

Tenfold reduction in 3D printing cost

Hewlett-Packard is set to enter the 3D printer market with a device based on a new technology called Multijet Fusion, but products won't appear on the market until 2016.

Steve Nigro, HP's senior vice president, inkjet and graphics solutions, claimed 3D printing has captured the world's imagination. "I believe it has the power to change industry, but there are big technology challenges to be solved. For example, it's slow and high quality only comes with an expensive product."

He said Multijet Fusion is the result of years of research into disruptive technologies. "Using this approach, you will be able to make functional parts ten times faster than any other 3D printing technology in the market. You will get precise, high resolution details and robust mechanical properties."

The machine itself looks much like a photocopier. Production of a part starts with the application of a layer of powdered material on the print bed. A multi chemistry process is then used, including a fusing agent that is applied where the particles need to be fused together, and a detailing agent where the fusing action needs to be reduced or amplified; this allows parts to be produced with sharp and smooth edges.

Developing aerospace

Casting solutions provider, Grainger & Worrall, has been awarded a £1.2m grant to develop its aerospace component production and development capabilities. The match-funded grant, which comes as part of the Government's Sharing in Growth initiative, will be used to drive continued innovation at the high-precision engineering company's UK headquarters in Shropshire.

Edward Grainger, director at Grainger & Worrall, commented: "We've built our global reputation in high-performance engineering by investing in two important assets - our operations and our people. Being awarded match funding to further develop our resources is extremely significant and will help us to continue delivering best practice across our manufacturing, engineering and administration processes."

TECH BRIEF

Go with the cold flow

Titan Enterprises has developed a high pressure version of its 900 Series turbine flow meter for measuring refrigerant flow.

Adapted with steel reinforced polymer components, to give a pressure rating of 40 Bar, the low inertia turbines of the 900 Series flow meter are suited for measuring the low viscosities (0.3 to 0.4 centipoises) encountered with volatile refrigerant fluids measured in the liquid form. The pressure drop through the 900 Series flow meter has been designed to be low enough to prevent gas break-out and ensure reliable flow measurement. The 900 series has been developed to give high performance (± 0.1% repeatability) across 6 flow ranges from 0.05 to 15 litres per minute.

Ball screws with **precision**

With over 30 years of experience, Abssac offers one of the most comprehensive ranges of precision ball screws in the UK.

Whether the requirement is for a precision rolled or precision ground ball screw, Abssac can assist in specifying the right part for the application. Once the ball screw has been specified, the company can then offer a cost effective end journal machining facility, enabling delivery of the ball screws ready to fit thrust or radial bearings, eliminating potential scrap rates. Abssac is accustomed to developing linear solutions within tight cost budgets.

Precision rolled

Put simply, the rolling process forms a thread for less cost than a ground one. Ball screws that have been cold rolled formed are ideal for applications that do not require the finite accuracy of the ground ball screw equivalents, but are still required to reliably transmit an axial load with a high degree of accuracy.

Precision rolled ball screws still achieve accuracies of C7-20 (that's 52 microns per 300mm of cumulative lead accuracy - 20 microns of axial backlash).

Small and precise - the latest in the Abssac ball screw range

Precision Ground

Ball screws that have been formed by a grinding process are used where acute linear accuracy is paramount within the application. Abssac offers a quality program of diameter and lead combinations with a variety of ball nut styles.

Abssac has recently launched three new products

Firstly, an end deflection series, which re-circulates the ball bearings in the end plate of the ball nut, has recently been developed. This design reduces the diameter of the ball nut. The new FEB and FDB series are available in diameters of 6, 8, 10 and 12mm with leads ranging from 2.5 to 10mm. As standard this new series offers a lead accuracy of C3 and C5 in a ground format or C7 and C10 in the rolled format.

Secondly is a stainless rolled steel ball screw available in 6, 8 and 10mm diameter with leads of either 1 or 2mm. Called the SUS series, capable of transmitting dynamic loads up to 2300N, the standard product is hardened to HRC55. Standard screw lengths which can be supplied machined ready to fit into an application are 300mm for the 6mm diameter and 400mm for the 8 and 10mm diameters.

And finally, Abssac is now supplying what is believed to be the world's smallest precision ball screw and nut assembly. With an amazing screw diameter of only 1.8mm and lead of 0.5mm, the new miniature ball screw range is ideally suited to the ever-smaller requirements of medical, optical and military application requirements. Using a ground screw format, the hardened steel ball screw can be supplied complete with machined journal ends.

A standard 6mm diameter nut body is used to house the 0.4mm diameter ball bearings, which are captivated in a re-circulating ball nut design. Remarkably, the new product range offers a C3-05 accuracy grade (i.e. 0.005mm axial play). Fixing the nut to the application is made simply by a range of nut flange sizes.

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NEWS

Youngsters STEAM ahead

Over half (52%) of 11-18 year olds want to pursue a career in STEAM (science, technology, engineering, digital arts and maths) related industries, but are being held back from doing so by lack of access to technology in the classroom.

That is the result of research from Autodesk who asked 1000 schoolchildren in the UK what they want to be when they grow up. Nearly one third (30%) said scientist, engineer, inventor or app developer as a potential future career, while only a few said they wanted to be prime minister (2%) or a celebrity (13%).

More than half of pupils (57%) said a lack of access to technology is stopping them from using more of it in the classroom. The majority of pupils also highlighted they didn't feel they had the same access to technology in school that they have at home – over three-quarters (78%) said they can use tablet computers at home with a similar number (73%) saying they can't use them in the classroom. A third (33%) also said they don't feel their school knows enough about new technology.

"We've heard for a long time about a growing STEAM skills gap in the UK, but this research shows a real enthusiasm for careers in these industries amongst the next generation," claimed Pete Baxter, Vice President and Head of Autodesk UK. "However as a country we should be doing everything we can to nurture this enthusiasm within our classrooms so that we can develop the skilled workforce we need to succeed in the future. We believe younger students can be inspired to further their STEAM education through regular hands-on access to highly visual and creative tools and technologies, while older students need the opportunity to master professional tools and techniques to ensure they hit the ground running when they begin their STEAM careers. That's why today we're extending free access to our full portfolio of 3D design software beyond secondary schools to higher education institutions."

TECH BRIEF

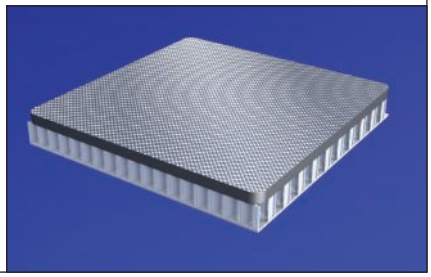
Honeycomb adds strength

Morgan Advanced Materials is claiming a groundbreaking new capability of brazing carbon fibre, ceramics, composites, or other engineered materials directly to a titanium honeycomb. This technique brings together the best qualities of both components, ensuring a final material that is strong, lightweight, and impact and heat-resistant.

Carbon fibre and other similar non-metallic engineered materials have exceptional thermal conductivity capabilities, and are able to remain strong at temperatures exceeding 1000°C. Titanium honeycomb adds greater strength to the carbon fibre and eliminates fracturing issues by transferring forces from impact better than the carbon fibre alone.

In addition, the strength of the braze bond equals or exceeds the strength of each component material, unlike the reduced strength of adhesive, riveted, or other bonds. The addition of the titanium honeycomb to the carbon fibre allows easy joining of the titanium to other structures through traditional joining techniques.

This material is suited for aerospace applications, especially on lifting surfaces such as wings or flaps, where strength, low weight and a thin cross-section are important, and the rear sections of engines, where combined high strength and thermal transfer is key.



NEWS

Phoenix has Universal appeal

Universal Engineering has acquired precision aerospace component manufacturer Phoenix CNC Engineering. Phoenix machines components for a number of Tier 1 aerospace companies and OEMs. The management recognised that in order to transition from a tactical supplier of late definition, speed shop and spares to a strategic supplier of volume parts to aircraft manufacturing programmes, additional capabilities were required.

Glenn Richardson, managing director of Phoenix CNC Engineering commented: "As soon as we met the team from Universal it was evident that combining the two organisations would create a capability and expertise that would meet all of the characteristics that our customers expect of their future strategic suppliers."

TECH BRIEF

3D printed guardians

Objet Connex technology from Stratasys has played a starring role in one of this year's biggest movie blockbusters, through its continued use by leading movie costumes and props specialists, FBFX.

FBFX was part of the team behind the off-beat science fiction adventure movie, Guardians of the Galaxy, a role which saw it create various 3D printed pieces including the entire 'armour' outfit for the character, Korath, played by Djimon Hounsou. According to Grant Pearmain, director of costume and props at FBFX, this was produced almost entirely using Stratasys' Objet500 Connex technology and represents the first time the company has produced a fully 3D printed costume worn in a movie.

The same Objet500 Connex technology was employed to produce the memorable Star Lord helmet (above) worn by lead-actor, Chris Pratt. Several prototype versions were 3D printed, as well as vacuum-cast versions created from a 3D printed mould. The actual prop worn in the movie featured 3D printed interior and exterior detailing using Stratasys' VeroGray material.

Solution to last month's Coffee Time Challenge

SPONSORED BY MICRO EPSILON

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The solution to last month's challenge of developing a better stabiliser and training aid for learning to ride a bike comes from Kickstarter Company, Jyrobike. Like the name suggests, key to its system is a gyroscope placed in the front wheel to help it balance.

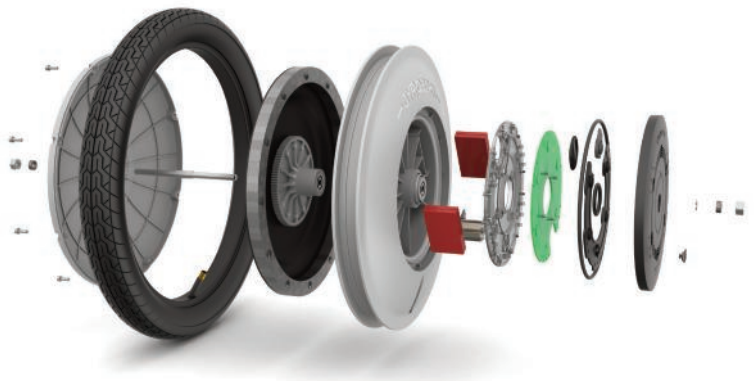
The gyro can be set to provide a lot of stability, or dialled down to provide just a little bit. This helps those using the wheel to gradually get used to riding on two wheels.

It also allows parents to stay involved, but is an invisible hand keeping kids stable as they take their first few metres under their own pedal power.

Jyrobike has also said it has seen that its gyroscopic wheel can speed the process of learning to ride solo to just a few hours in some cases. And because the amount of stability it can provide, it is being successfully used to help children that have previously found riding a bike difficult because of a disability, to join in and experience the joy of going for a ride.

Jyrobike is built around the idea that a bicycle becomes inherently more stable when it travels at higher speeds. It uses a fast spinning disc placed inside the front wheel to provide a gyroscopic force that automatically balances the bike. The wheel is battery-powered, rechargeable, motor-driven and intelligently controlled; all housed in the sealed wheel hub unit.

www.jyrobike.com



TECH BRIEF

Stuck on transport

SG 805 is an enhanced methyl methacrylate (MMA) adhesive from SCIGRIP that offers increased temperature resistance.

Primarily formulated for the bonding of components in the automotive, transportation and heavy truck sectors, SG 805 allows customers greater flexibility of material selection and processing operations including paint curing cycles. SG 805 will appeal to manufacturers of composite structures who are seeking to improve the aesthetics of their components whilst optimising part design, production speeds and ultimately reducing costs.

This development follows on from SCIGRIP's recent product offerings that highlighted extended working times, thick bond lines, Fire Smoke and Toxicity (FST) certification and low print through capabilities.

Can you do it **better**?

That was the question asked by Peter Poon, co-founder of Romax Technology, as he accepted the Grand Prix trophy at the British Engineering Excellence Awards. Tim Fryer and Graham Pitcher report.

"I had to start a company as I'm disabled, I'm nearly blind," said Poon in an impromptu acceptance speech. "I had to keep busy, to occupy my mind, so I sketched out a system of how to design gearboxes that will be right first time."

It is a design that is now deployed around the world. He continued: "We have people come for training from various companies such as Porsche - people are surprised why they come for training, but I say it is because we do it better."

The company Poon launched, Romax Technology is based in Nottingham and it was this year's winner of Consultancy of the Year (Sponsored by the Institution of Engineering Designers) as well as the overall 'best of the best' Grand Prix Award winner.

The company came, said Poon, "from a humble beginning with an engineer who has a desire to improve things. With everything around you, you can ask 'can you do it better?' You will always find a way to do it better. I think that is deep in my psyche, and in my blood, and I subscribe to it any success I have had."

Romax Technology's success at the BEEAs this year is down to the leading position it has established for itself in the design of bearings and gearboxes. It now has more than 100 customers in the automotive industry and is involved with 14 of the top 15 manufacturers.

Romax's approach is something all companies should embrace. It looks to engineer a better world for its clients and customers; it puts innovation at the heart of everything it does; it looks for continuous improvement; and believes it can deliver value and build loyalty through long term partnerships.

In determining who would win this year's Grand Prix, the judges concluded: "In order to work with 14 of the world's automotive giants, you have to be pretty good. To have tripled in size since 2009 shows true British engineering excellence."

Also in the Consultancy of the Year category the judges Highly Commended the entry from Product Partners.

But who else was on this year's roll of honour? The following companies were the judged to be top of the class in 2014 for British engineering excellence.

SMALL COMPANY OF THE YEAR

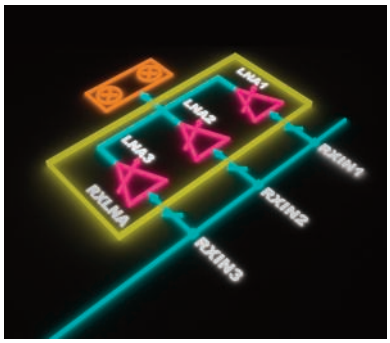
Sponsored by D Young & Co LLP

Lime Microsystems

Lime Microsystems specialises in field programmable RF transceivers for next generation wireless broadband systems. Lime launched the first commercial chip in 2009. Until then, the solution either required multiple devices or devices only to be built for target markets with high volumes.

Although a multinational later launched a competitive product, Lime says it continues to compete against this company by producing a more configurable device suitable for use by a broader customer base and by promoting its use through an industry movement.

Lime's technology has been adopted by more than 250 organisations for applications ranging from consumer communications



equipment to software defined devices for use by the emergency services.

The Judges said:

"A small company that has shown impressive growth as well as a good plan for achieving more."

START UP OF THE YEAR

Sponsored by Cambridge Consultants

Aeguana Digital

Aeguana Digital was established in December 2012. The three energetic founders had previously been involved in the vending market and found it slow moving with little innovation and high costs. They set out to change things.

The result is Digital Vend, described as a machine that is cost effective, reliable and that provides real time data to the operator. A patented vend mechanism allows it to be adjusted to fit any small product, whilst users can engage with it via rich media digital ads.

Digital Vend collects real time data and allows for content to be 'pushed' to it. Amongst the innovations is the use of a Raspberry Pi to ensure a low cost, yet powerful solution.

The Judges said:

"They spotted an opportunity in an apparently staid market, took action and achieved a great deal in a very short time."

DESIGN TEAM OF THE YEAR

Sponsored by techUK

Houlder

Houlder was charged by MPI Offshore with the development and supply of a pair of gripper arms that would allow offshore wind turbine piles to be maintained in position during installation. The arms needed to: aid the installation of piles in up to 40m of water; handle piles weighing up to 650 tonnes; and handle piles up to 65m long and 7m in diameter.

To do so, Houlder assembled a 10 person team to deliver the design through all key milestones from initial feasibility discussions to detailed engineering and all in less than 60 weeks, that's 13,000 person hours.

Houlder's project team designed the arms from initial front end engineering design and product specification through to detailed engineering and fabrication.

The Judges said:

"A fantastic example of a huge, multidisciplinary project that meets a unique and demanding engineering challenge."

GREEN PRODUCT OF THE YEAR

Sponsored by National Instruments

LC Super Hybrid programme, Controlled Power Technologies

Controlled Power Technologies has addressed the need for greener automotive technology and developed technology which is applicable to car, bus and truck designs.

Its LC Super Hybrid programme is set to bring what the company calls a 'substantial reduction' in CO_2 emissions for a price premium of around £750.

The LC Super Hybrid approach combines Valeo's electric supercharger and CPT's integrated starter-generator technologies. The result is said by CPT to enable aggressive downsizing and down speeding of existing engine families, delivering CO_2 reduction and fuel economy improvement.

The Judges said:

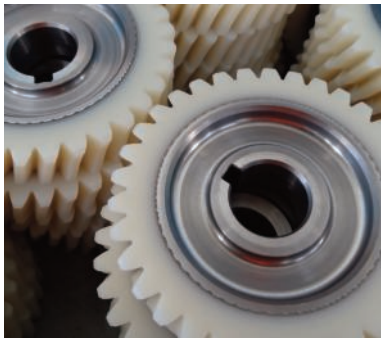
"A real world solution to one of the world's biggest environmental issues: how to make clean electric motoring affordable and accessible."

MATERIALS APPLICATION OF THE YEAR

Sponsored by Engineering Materials magazine

Nylacast

The worm wheel is a safety critical component for any electric power



steering system. Nylacast's worm wheel is made from a combination of polymer and steel. The steel inner hub provides dimensional stability and strength, while the outer ring is made from a custom formulated grade of copolymer 6.12 developed by Nylacast's R&D department.

This outer ring allows the gear to have self lubrication properties when working alongside a mated steel worm, ensuring it runs smoothly. The polyamide is cast, rather than extruded or injection moulded, allowing a very accurate globoidal gear tooth profile to be specified.

More than 11million devices are now deployed on 45 vehicle models around the world with no reported failures or defects having been reported.

The Judges said:

"An impressive application of a polymer in a mass market context, the challenges of which required a very smart choice of materials."

ELECTRONIC PRODUCT OF THE YEAR

Sponsored by Digi-Key

CSRmesh, CSR

CSR has exploited its expertise in Bluetooth to develop CSRmesh to enable Internet of Things applications for the home environment. This wireless mesh technology takes advantage of Bluetooth to allow a system to be configured and controlled.

Bluetooth Smart enabled devices such as sensors, lamps, doors and white goods can be linked together and controlled from, for example, a mobile phone. CSR estimates the market for such systems to be worth in excess of a whopping $300billion by 2020.

CSRmesh differs significantly from other solutions in that it doesn't entail a complex set up process or any kind of home gateway. It also allows direct control from anywhere in a house.

The Judges said:

"A bold innovation that is making a serious play for a vast and highly competitive market."

MECHANICAL PRODUCT OF THE YEAR

Sponsored by Institution of Mechanical Engineers

Hi-Traq subsea crawler, IHC

Hi-Traq provides the ability to ensure the safe burial of inter-array cables for the offshore renewables industry through the use of an innovative self levelling system controlling four, independently driven undercarriage tracks.

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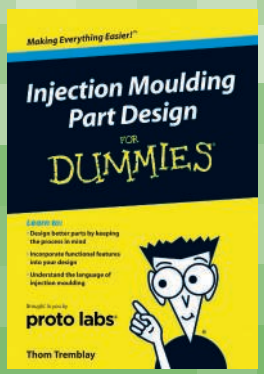

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for inter-array cable burial. A four track crawler system would provide better manoeuvrability than two track, skid-steer vehicles, while it's patent pending levelling system enables vertical trenches to be cut whilst the device is on slopes of up to 20°.

The Judges said:

"A world first turnkey project that met all customer requirements in an extremely challenging environment."

YOUNG DESIGNER OF THE YEAR

Sponsored by RS Components

Joel Gibbard, Open Hand Project

Joel Gibbard's interest in robotics moved him to want to portray the technology as something to 'revere, rather than fear'. In his final year project for his Honours Degree in Robotics at the University of Plymouth, he designed a low cost prosthetic hand, something that his professors said would not be achievable in just two semesters. But he proved them wrong, creating a fully functional prototype that has already won three awards.

Gibbard, the man behind the Open Hand Project, is creating Dextrus; something intended to replicate much of the functionality of the human hand. Moreover, to increase its value, he is creating Dextrus as an open source project; all the information needed to create one is on the Open Hand Project's website.

The Judges said:

"A highly motivated, dedicated young engineer with multidisciplinary skills and an impressive record of achievement already."

Congratulations also to Matti Coleman, whose entry was Highly Commended by the judges.

DESIGN ENGINEER OF THE YEAR

Sponsored by Premier EDA Solutions

Mike Franklin, Crawley Creatures

Peter Greenhalgh, ARM

The judges could not decide which of two outstanding candidates should take the Award in this category and so took the unusual step of giving Awards to both.

Mike Franklin from Crawley Creatures summed up what the judges were looking for - engineers who produced innovative designs within strict commercial limits and those who have also put something back into their profession. Each project at Crawley Creatures requires a bespoke solution, allowing Franklin to draw on his electromechanical, software and mechatronic knowledge. He sees the objective clearly and excels in designing and manufacturing an end product that not only meets the client's needs, but also exceeds expectations in terms of cost, efficiency, durability and sustainability. Whilst designing is his work, it is also his hobby. In 2005, he claimed the World Record for the fastest walking robot with Scuttle, an eight legged device.

The Judges said:

"Achieving deep innovation using creativity, originality and ingenuity – all while working with limited resources and to extremely tight deadlines."

Joel Gibbard

Mike Franklin

Peter Greenhalgh

One of Britiain's great electronics success stories is ARM. Amongst the IP on its portfolio are the big.LITTLE configuration and the ARM Cortex-A53, the company's first 64bit processor. The latest big.LITTLE software and platforms can save 75% of CPU energy in low to moderate demand applications, whilst increasing performance by 40% for more demanding workloads.

Meanwhile, the Cortex-A53 processor has been designed to be a power efficient device, capable of supporting 32bit and 64bit code. Not only is it suited for use in smartphones, it is also being considered by a number of developers for use in data centres. Both projects were led by Greenhalgh from the initial design stage to verification and implementation.

The Judges said:

"A leading creative force behind one of the worlds – let alone the UK's – great design engineering success stories."

Next year's BEEAs programme will be announced early in 2015, with entry open from April.

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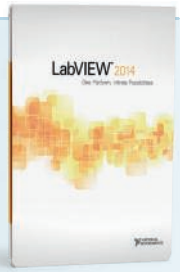

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NATIONAL INSTRUMENTS

CV - Hermann Hauser

In his long and successful history as an entrepreneur and venture capitalist, Hauser, who is Austrian by birth, has founded or co-founded companies in a wide range of technology sectors. These include Acorn Computers (where he helped spin out ARM), Active Book Company, Virata, Net Products, NetChannel and Cambridge Network Limited. He was a founder director of IQ (Bio), IXI Limited, Vocalis, SynGenix, Advanced Displays Limited (acquired by Cambridge Display Technology), Electronic Share Information Limited, E*Trade UK and has supported many other start-ups. He co-founded Amadeus Capital Partners in 1997 with Anne Glover and Peter Wynn.

UK finds its technology footing

The Catapult programme was intended to revitalise the British technology sector – but is it working? Hermann Hauser, the architect of programme, is reviewing progress and spoke to Tim Fryer about his findings.

Intent on stimulating British industry, the Labour government in 2010 commissioned technology entrepreneur Hermann Hauser to assess the state of British industry and suggest ways of developing it in the future. His proposals were taken on board enthusiastically by the incoming Coalition government and Hauser's core strategy, the Catapult programme, was born.

Hauser was asked to review progress by Innovate UK (formerly the Technology Strategy Board) who administers the scheme. His report, following a six month review process, has just been published – deliberately in advance of the Chancellor's autumn statement. So what does the review reveal? How is the programme progressing?

Hauser said: "I have had no continued influence since the initial report, so maybe my expectations were low, but I was really quite surprised by the progress that had been made."

Progress is unsurprising in the High Value Manufacturing (HVM) Catapult as it had a head start on the others, having been previously funded by the Regional Development Agencies.

"In truth it is not one Catapult but seven covering different aspects of manufacturing," continued Hauser. "HVM is already up and running and doing very well, especially on my criteria of a third, a third and a third. I was keen to see a third of the money coming from industry – it is what keeps these Catapults honest. If the industry is not willing to pay for a third of it, maybe it is not doing something that is interesting to industry. In the case of the HVM they already get 40% of their income from industry, so I knew that industry already had an interest in the problems they were working on."

Under the Catapult funding model the remaining two thirds should come equally from Innovate UK's set aside funds and from other funding programmes, which may typically be from other government departments or EU competitions and schemes.

Hauser outlined the principle: "The key criterion is that industry is willing to fund a third of it for really innovative research. That is what Catapults are about – innovative projects that industry would not be doing if there wasn't a Catapult. Why should we spend tax payer's money on a project that industry would do themselves anyway? So it is really to encourage industry to be willing to take up on really risky projects. You need that very advanced stuff for industry to stay competitive."

Meeting the funding criteria, as HVM does, is a measure of success and Hauser believes it should benefit from further investment: "If the industry third is growing, then the Government ought to grow its third too."

The other Catapult that was formed from existing capabilities was Satellite Applications. Hauser commented: "It is going very well. Normally people will build incubators and hope that small companies will come and fill them. With the Satellite Applications Catapult it is the inverse problem, there were so many SMEs camping out there that they had to build an incubator. Since relationships with SMEs was one of our main objectives with the Catapults, this is a very good result."

The other five Catapults (Connected Digital Economy, Future Cities, Cell Therapy, Transport Systems and Offshore Renewable Energy) are in an earlier stage of development, mostly having only started on building their infrastructure within the last year.

"You would always want them to move faster than they are," admitted Hauser, "but they are all doing pretty well against the business plans that they have been set by Innovate UK in terms of completing the teams, buying the kit that they need and establishing themselves in the premises they have. The next big step, especially for the new ones, is getting the projects in that will prove that they are doing what we want them to."

All Catapults were selected through a competitive process and were intended to reflect sectors that the UK could create world-leading industry expertise in. But are seven enough? Hauser hopes his review will demonstrate the need for more.

"The job of a Catapult is to be the catalyst"

"There are going to very serious budget constraints next year, whether there is going to be any chance of adding growth to the Catapult funding I don't know," he added. "My feeling is that seven Catapults are probably too few for the UK. In comparison, Germany has 67 Fraunhofers but they started just after the Second World War, so they have on average added one a year. My feeling is that one, or maximum two, a year is the right rate of growth."

So what does Hauser believe could be the next 'low hanging fruit' that could be worthy Catapult material?

"Precision medicine has a good chance of getting funding going forward," he said. "Others I have a lot of sympathy with – and I am not the one who makes selections, I just look at the main areas that I think are deserving – are the Internet of Things and machine learning, because they are making big waves. They have a platform characteristic so they support a large number of companies. Machine learning, in particular, cuts across a large number of sectors."

"The job of a Catapult is to be the catalyst," concluded Hauser. "Its output is really the ease of use of university research by companies that can then do the user interface to it. And we have got lots of small clever companies who can design clever user interfaces."

Carbon cars see the light

It takes revolutionary cars to accelerate technology to the mass market, and that is happening with a novel fixing technique that has potential beyond the automotive sector. Tim Fryer reports

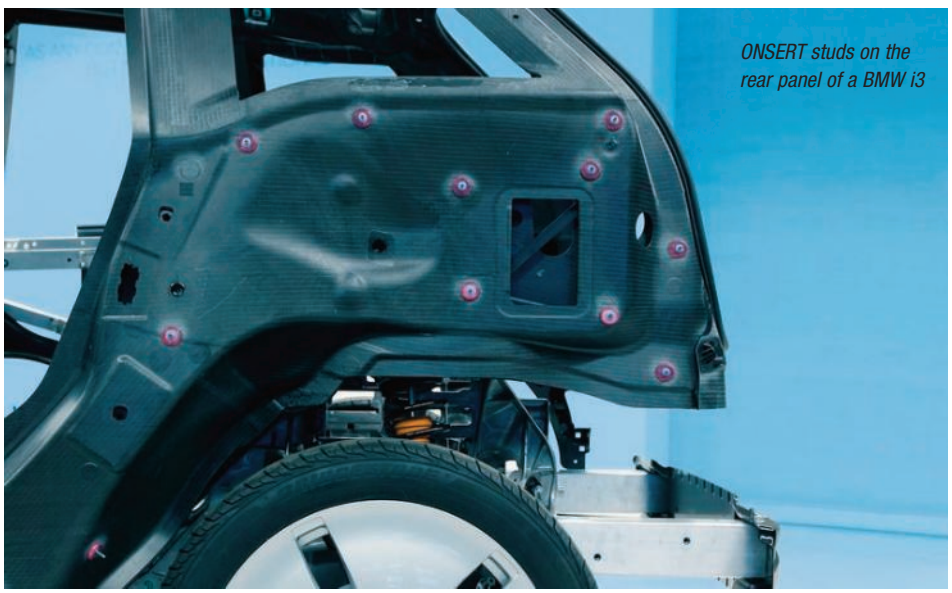
There are various ways of making cars perform better. You could gain speed by utilising a jet engine, but that may be counterbalanced by the cost of installing and running it. Aerodynamics becomes more significant as speed increases, but even then automotive designers have put enough lumps of plasticine in enough wind tunnels to have a pretty good idea of what is a good shape for a car aerodynamically speaking.

Another obvious contributing factor is weight, but while it is well recognised that a lighter car will be able to use less fuel to go faster, this is an area that still has much untapped potential. One company, heavily involved in providing fastening solutions to the automotive industry, is Bollhoff and it has been focussing on 'lightweighting' activities for half a dozen years.

Andy Witts is managing director of Bollhoff Fastenings UK and he outlined the background: "We recognised that there was going to be a shift to more lightweight materials - we were very involved with the McLaren SLR project which was the first ever real total carbon fibre car."

The company did have fasteners in that car but they were existing products designed for use in a carbon steel bodied car rather than one constructed of carbon fibre reinforced plastic (CFRP). "It was workable but it wasn't optimised for a CFRP vehicle," stated Witts. "So we decided that we would try and create something that would allow us to work more easily with those materials and to provide some additional benefits for the customer."

Inside a traditional steel car body as it passes down the assembly line there will be an array of fixings which will be used for non-structural purposes like anchoring pipes and hoses, engine dressings and so on. These will be applied to the panels by stud (resistance) welding – a common, cheap process that allows studs to be placed anywhere by appropriate programming of a robot. The process – pick, place and weld – is ideal for mass production.



ONSERT studs on the rear panel of a BMW i3

The Bollhoff hand curing tool and [below] any design of stud is possible

Carbon fibre cars are only just making the transition from the technology demonstrator environment of the supercar to the practicalities of a production vehicle. Witts acknowledged: "Carbon vehicles have been the domain of Top Gear – the supercars that are ultra lightweight and ultra expensive. They are test beds basically for the volume manufacturers." But that transition to the production environment is now underway.

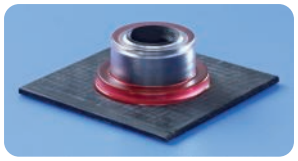
Unlike the stud welding process, attaching fastenings to CFRP has not always been of satisfactory quality, nor is it as easily automated and therefore as cheap. The standard method involves drilling a hole in the substrate and inserting a mechanical fastening, which typically needs an action on both sides of the panel and the stud itself is relatively expensive. Another issue is the difficulty in creating a clean hole when drilling, with delamination of the CFRP substrate always a danger.

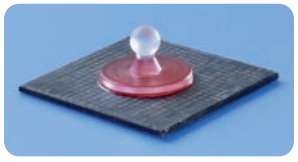
There was therefore a void between existing practices used on metallic cars and the current 'best option' for use in CFRP vehicles. Bollhoff set up a development programme to address the issue, and it did so with another German manufacturer, Delo, that specialises in advanced adhesives.

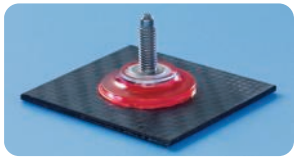
"They had a breakthrough with a light curing product which we found very interesting," said Witts. "They were really looking for something to do with it and we saw the potential of using our fastening systems with their adhesive system together to make a two component fixing. And that is where ONSERT came from."

ONSERT is both a product and a process. It consists of a mechanical fixing, which at the moment is typically a metallic threaded or unthreaded stud. This stud has a 'foot' which is over-moulded around it and then adhesive is applied to the flat base of the foot. The part can then be offered to the panel and is flashed with blue light for four seconds to cure the adhesive. The light source, at 400nm, is at the same point of the spectrum as regular daylight so if the product is not fully cured then it will continue to cure in daylight.

Witts claimed: "Basically what we have done is effectively duplicated the stud welding process. We have equipment that feeds the stud with the over-moulded foot, dispenses the adhesive, puts it in the magazine and then the robot picks it up, places it and cures it. So the process effectively a replica of stud welding except using adhesive and CFRP rather than steel and welding."







It is a system that has already been used to good effect in a production vehicle environment. BMW launched its range of all-electric cars with the i3 city car and will shortly add the i8 sports car. In terms of being available from the show room, these could lay claim to be the first carbon fibre production cars. The company has taken 18 ONSERT systems for use in the manufacture of these electric cars and equally have been valuable partners in the development of the system over the past year.

Witts commented: "We focussed our development with the ONSERT product on the i3 and i8 programme because there is a definite volume need for that. What it has done for BMW is it has streamlined their process. It does away with quality risk and enables them to use familiar technologies on the same production line."

It is a system that is not restricted to applications with CFRP. The first application in the UK is with a well known luxury 4x4 manufacturer. Its new model, due to be released in January 2015, created a roof channel so that they could keep the join between aluminium roof and side panels out of sight. This channel needed a finishing strip to cover it and the company developed a solution that involved bonding 24 ONSERT studs into the roof channel and then attaching the finishing strip to them. "We can bond to most substrates," added Witts. "We are having a few problems with organic materials like wood, but most plastic, metallic and ceramic materials are fine. Delo will alter the acrylic adhesive material to suit requirements."

Bollhoff has a long history in the automotive sector and so it was an obvious starting point for implementing this technology, but Witts sees endless opportunities for designers.

"It can be in any configuration – applications are as broad as your imagination," he said. "Obviously from our point of view, we like to produce as many of the same parts as we can so that the customer can get the economies of scale in manufacturing, but from the customers point of view designers can design whatever suits them. We create the metal part, put it into the mould machine and mould the attachment foot. That has to be clear to allow the blue light to shine through it. It is interesting that the handful of applications we have got are mostly based on a 5mm stud with a thread or a Christmas tree type fixing. But we can do pretty much what the designer wants."

Beyond some of the higher volume potential uses in aerospace and white goods, for example, the development of a hand tool to do the curing, essentially an LED torch, opens the door for both prototyping and low volume applications.

www.bollhoff.com
www.delo.de

Parallella aims to provide access to supercomputing

Rapid developments

There are an ever increasing number of ways to make ideas come to life. RS Components talked to Tim Fryer about some of the more recent offerings

Electronics does not traditionally come under the remit of design engineers – the complexities of electronics design being a step too far for most mechanical or even electrical designers. However, electronics is becoming more accessible. The rise and rise of development boards like Raspberry Pi and Arduino, originally aimed at students and hobbyists, has resulted in new doors being opened for engineers wanting a fast and effective way of prototyping or building low volume systems.

Martin Keenan, head of applications strategy at RS Components, commented: "For an industrial engineer who hasn't designed from component level this access to electronics is pretty new."However, this does provide access, without requiring a full working knowledge. For example the Atmel Cortex M3 microprocessor that is at the heart of the Arduino Due development board has a datasheet of 1500 pages – an impenetrable information source for design engineers.

"Industrial and mechanical engineers haven't got the time or the resource to evaluate everything if it is prohibitively complex," said Keenan. "So these engineers are becoming integrators and cobble things together - I think all engineers are when it is at the proof of concept, idea testing and prototype stages."

Parallella development

RS will bring the Parallella development board to the UK having signed a distribution agreement with Adapteva, producer of the Epiphany multicore coprocessor and developer of the Parallella-16 board.

Parallella was introduced to the industry through a successful Kickstarter crowdsourcing campaign with the objective of democratising access to supercomputing. The open-source single board computer, the size of a credit card, can be used as a development platform, embedded engine, teaching platform or research tool and is easily scalable by clustering boards to create a mini-supercomputer for advanced parallel computing applications.

"Adapteva is changing the way that people do computing as traditional approaches are nearing the end of their power efficiency," said Andrea Olofsson, CEO and Founder of Adapteva. "Parallella puts new capabilities in the hands of the novice and the expert. We are making parallel programming an everyday, low cost, accessible technology."

Using these platforms during development – and beyond – has become standard practice as Keenan explained: "What they are doing is taking those rapid prototyping solutions such as Arduino, Raspberry Pi and the Parallella board [newly introduced in the UK via RS Components] and running end applications on them. Some of those end users will use the boards for rapid prototyping and then change it when they have reached a settled solution, especially if it moves to high volume. What they need is a concept that will work to make their mind up on whatever architecture they want to use. We want to help them get started so they can test these different architectures. When they have committed, from what we see, if it is high volume they tend to design out and so it becomes a custom solution."

Even this relatively recent methodology may change with a new product in the Raspberry Pi family. "The Raspberry Pi compute module is certainly going to change things," claimed Keenan. "There is little to be gained by redesigning Raspberry Pi for a lot of industrial applications now because of the form factor they have now introduced. It is easy to plug that new form factor into an existing system and hang different systems and solutions off it. I think Raspberry Pi is going to lead the way in that regard." [see box p28]

Software for prototyping

Keenan concedes that there is some excellent design software on the market but current solutions fall into one of two 'buckets'.

One bucket, said Keenan, is for high end tools: "Often they are optimised for high end customers who need extensive documentation, who need to track lots of changes and so on. Inherently they are not designed to be adaptable and to change things. They are designed for, and are brilliant at, taking an idea, sticking to it and pushing it out the end with the final product. The other bucket would be low cost entry level tools that generally have limitations. An example would be things like SketchUp and Blender which are free 3D design tools but are not targeted at engineers. They are targeted at the mass market and so designing anything complex in them becomes difficult."

"We are focused for early in the design cycle – it is where engineers want to spend their time because that is where they can differentiate their designs."
Martin Keenan, RS Components

The gap between the two categories, claims Keenan, can be filled by DesignSpark Mechanical, a package which aims to 'give every engineer the power to quickly design and change product concepts in 3D without having to learn complex traditional CAD software.

Keenan said: "We are focused for early in the design cycle – it is where engineers want to spend their time because that is where they can differentiate their designs."

Consistent with the arguments above concerning engineers starting to dabble in electronics, DesignSpark Mechanical allows the import of electronic designs.

3D printing

DesignSpark Mechanical, using SpaceClaim, does give access to that other major prototyping trend of the day – 3D printing. It is an area in which RS is expanding its portfolio. Keenan said: "3D printing is moving so quickly and becoming so much more accessible. The advancements keep coming in both the low cost of the printers and the materials.

"For example the entry level Omerod RepRapPro range are kits that engineers will assemble themselves, optimise themselves, optimise the firmware and source codes themselves, it is all open source. And you can get pretty sophisticated resolution out of those printers at a very low cost. The caveat being that you have to spend some time in optimising them, but there is a vibrant open source community that can help with that."

RS has also made progress in terms of the types of 3D printing materials and has just signed an agreement with Verbatim to cover two materials. Kennan said: "One is a biodegradable corn based filament that is non-toxic and eco-friendly and ideally suited to prototyping. But also they have got a high end material that is, for example, impact resistant."

All these facets have come together as part of a deliberate policy concluded Keenan: "Nobody else has this complete range to help any engineer get off the ground, build rapid prototypes and innovate."

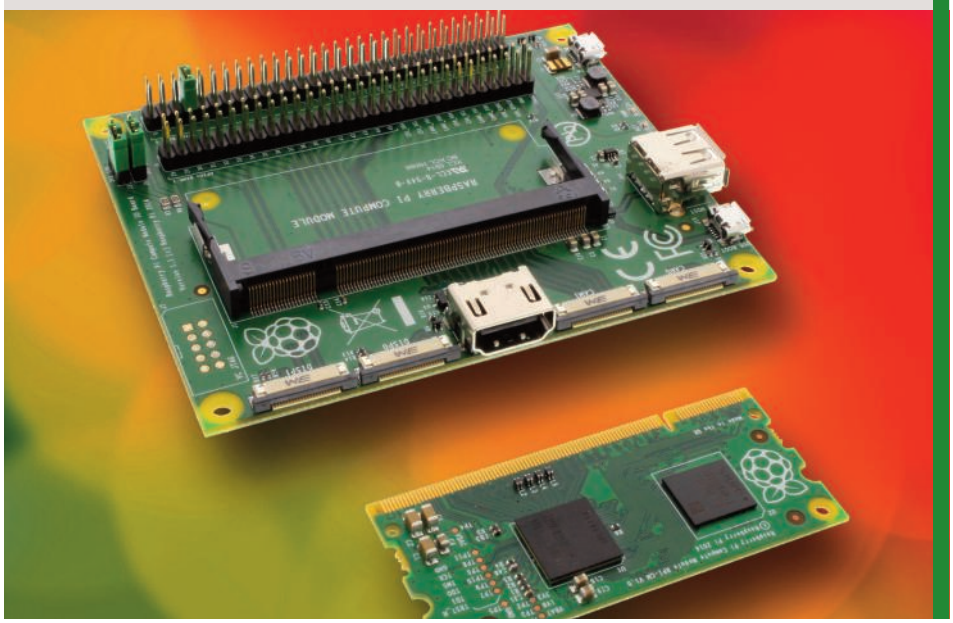
www.arduino.cc
www.raspberrypi.org
www.rs-components.com
www.parallella.org

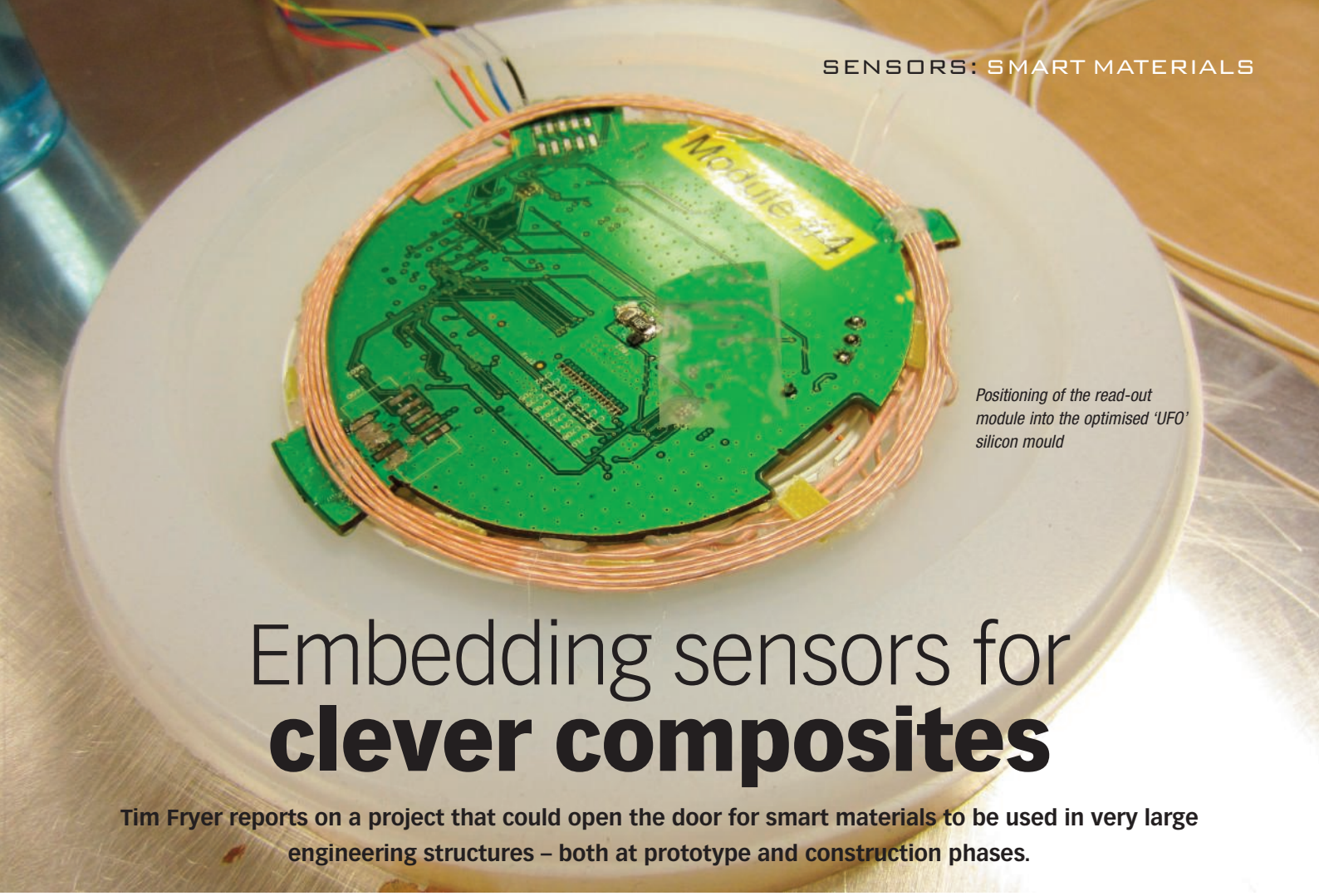
A Pi in the system

The Raspberry Pi Compute Module is the latest product to emerge from the Raspberry Pi Foundation's development team. The Compute Module can initially be ordered as part of a development kit, bundled together with the Compute Board Module IO Development Board, which brings out all of the IO connectivity to form a prototyping platform for design engineers.

The Compute Module IO Development Board is a simple, open-source development board that the Compute Module plugs into and enables the designer to program the module's Flash memory and easily access the processor interfaces via pin headers and flexi connectors, similar to the standard Raspberry Pi. It provides the necessary HDMI socket and USB connectors to create an entire system that can boot the user's operating system and allow engineers to start designing with the Compute Module.

Eben Upton of the Raspberry Pi Foundation said: "The idea for the Compute Module came about from our observations of how a substantial number of industrial and commercial equipment designers were incorporating a Raspberry Pi into their end system. We wanted to find a solution that would provide them with all the computing resources of the Raspberry Pi in a compact format but leave the IO to the end system manufacturer."





Positioning of the read-out module into the optimised 'UFO' silicon mould

Embedding sensors for **clever composites**

Tim Fryer reports on a project that could open the door for smart materials to be used in very large engineering structures – both at prototype and construction phases.

In applications like wind turbines, tidal blades, aeroplane wings, ship propellers and hulls, it would be beneficial to have a self-sustaining, fully embedded monitoring system in order to ensure the integrity of the structure. A project was set up under the European Framework 7 to look at the possibility of developing such monitoring systems.

Dries Van Thourhout is a Professor at Ghent University and senior researcher at IMEC (a Belgium research institute), which was the co-ordinating partner in the 'SmartFiber' project – a project that intended to use existing fibre optic sensor technology to test the condition of a material. Van Thourhout explained: "The goal was to make a miniature interrogator system including the methods to embed them in composite structures."

This is important for composites used, for example, in wind turbines. Van Thourhout said: "The people who design these structures do not know exactly when they will break so they overdesign them. In general, therefore, they are too heavy or perhaps wind turbines are never run at full capacity because they are afraid that they will break. At the moment there is no good way to read out over a long period of time if there is breakage or damage to the blade."

Fibre Bragg Gating (FBG) sensors, the actual data collection device in the SmartFiber project, are an established technology. FBGs are created by modifying an optical cable with UV light. When light from a broadband light source is coupled into a FBGs fibre, only a narrow spectrum of frequencies of the input light is reflected: the central wavelength of this spectrum is commonly called the Bragg wavelength. The light that is not reflected by the Bragg grating further propagates through the fibre.

A mechanical strain applied to the sensor will result in a change of the period of the grating and also of the refractive index in its proximity. The resulting relative shift in the Bragg wavelength, is proportional to the applied strain and thus can be used as a measure for it.

However, while embedding 125µm fibre optics in composites had been done before, even something this small could have a negative impact on strength and durability. To obviate this, FBGS Technologies, one of the partners in the project, developed a draw tower fibre Bragg grating (DTG) with a

The SmartFiber project partners

The sensor system was assembled by Optocap on a printed circuit board designed by Xenics. The optical subsystem consists of a silicon photonics integrated circuit developed by IMEC and photodiodes and read-out integrated circuits (ICs) provided by Xenics. Fraunhofer IIS was responsible for the wireless interface. It provides power to the embedded system and at the same time reads out the acquired data at high speed. After connecting the system to an optical fibre sensor chain manufactured by FBGS International, it was casted in an epoxy shape specifically designed by Ghent University to minimise the impact on the composite material.

Finally, together with the attached fibre sensor chain it was embedded in the blade of a tidal turbine by Airborne.

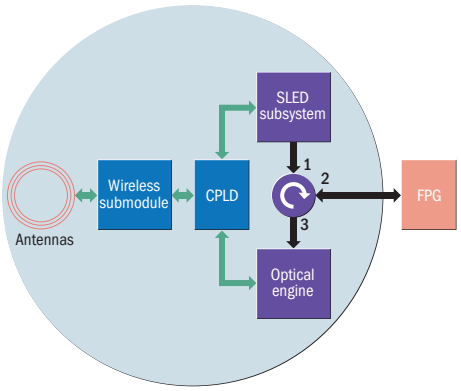
'cladded' diameter of just 60µm, which researchers found to be as strong in pull tests as commercially available fibres.

While sensors have previously been hand placed in composites before, a robot platform was used as the basis for an automated system in the project. A dedicated optical fibre placement head was designed and built for mounting onto the robot arm, with a view to providing a complete manufacturing solution for a composite part in the future.

The main part of the project involved the development of the embedded read-out unit. The core of the interrogator is a photonic integrated circuit (PIC) fabricated in a Silicon Photonics platform. The signal transmitted by the PIC, is picked up by means of an array of photo-detectors, and then the resulting electrical signal is processed before being transmitted to the external read-out unit through the wireless channel. The external read-out unit, in addition, provides the wireless power supply to the embedded interrogator.

The 'optical engine' block is the core of the interrogator, where the optical signal reflected by the FBG is transformed into an electrical signal that, after further processing, will allow calculation of the position of the FBG peak. The optical engine includes the pigtailed PIC, the detectors and the read-out circuit (ROIC). The light source (SLED), the detectors and a set of sensors and actuators integrated on board, are controlled by a Complex Programmable Logic Device (CPLD).

The interface to the outside world is



provided by the wireless sub-module – a double inductive coil – which provides both data and power transmission.

The embedded interrogator unit is 10cm in diameter. Van Thourhout said: "It is UFO shaped because it is designed to have little impact on the composite. What is important is not the diameter but the thickness, we had to keep it as thin as possible. The height is now 7mm."

Such a size could still have an impact on the structural integrity of the composite admitted Van Thourhout: "An action point would be to further reduce the height. There are some obvious ways to reduce it to about half, but if you want to go really thin, like 1mm, you need to look at unpackaged chip sensors, which are determined more by volume. If you have sufficiently large volumes you can make it smaller, but if it is for limited volumes you can't afford to work with unpackaged chips. That is the trade off we are struggling with right now."

Although not designed for a particular material, performance of the whole system is not consistent in both glass fibre based composites and composites based on carbon fibre – in the latter sensing still works but it is much more difficult to get the wireless signals through.

Van Thourhout said: "Fraunhofer does have some indication that at lower frequencies it should work, but that is something that needs to be worked on further. Within the glass it certainly works, but even there the curing temperature can vary a lot. The composites we used had a relatively low curing temperature, around 100°C. Some composites use a higher curing temperature and that can be a limitation on the electronics inside."

Would such a system ultimately be adopted in all applications that require such monitoring, or would it just be used as a design tool during prototyping and development?

"It all depends on the price," said Van Thourhout. "At the moment I think it will be for designing new composite structures. In the project we looked at tidal turbines which is new and at the development stage. People are looking at developing new shapes of blades and ways of monitoring these new blades. So I think in the first place it will be employed to help in the design procedure but ideally in the end we want it in every blade or every large composite structure."

www.smartfibre-fp7.eu

Getting connected

You've got a good product idea, but it needs connectivity: what's your next move?

It's hard to avoid mention of the Internet of Things, or IoT, at the moment. There is a great deal of hype in the consumer world – for example, we are seeing an increasing number and variety of connected sports and fitness devices. There is also significant activity across medical, enterprise, retail – name a market sector and it's getting connected.

So why should developers of products get 'connected'? Ruth Thomson, head of consumer product development with Cambridge Consultants, explained. "Connectivity increases the types of products a company can offer, and it opens up the opportunity to provide services to its customers.

"Imagine if you could provide feedback on a player's golf swing to help them improve their technique, track the movement of assets around a factory to improve efficiency or help a patient monitor their usage of a medical device to help them be compliant with the prescribed regime.

"Connectivity is also a good way for companies to increase the level of engagement with customers – and vice versa. At the moment, when you buy a product and walk out of the store, your conversation with that brand and its marketing messages is over. With a connected coffee machine, for example, you could provide the consumer with vouchers and offers, you could allow them to register a device and purchase consumables at a click of a button, they could even join in a community of other people who love that device in order to share ideas."

So where do you start? If you have an idea for a connected product/service, how do you even start thinking about how to make it a reality? Ruth suggests this is where Cambridge Consultants can help. "We have deep expertise in all the technical disciplines required for connected system development – from wireless communications to algorithm and hardware development – but, most importantly, we understand how to balance the requirements across the system so you get a product/service that not only functions technically, but which also delivers commercially. We can help clients with the full development, but we can also help them explore the potential directions for a new idea to help them get started. We can help companies to understand what they need to do in order to get their products connected. We want to make the first step as easy as possible."

But what if you haven't got an idea yet? What if you just want to explore what the IoT could mean for your business? Well, again, Cambridge Consultants can help and will work with you to identify possible options. Ruth said: "Companies come to Cambridge Consultants because they want to understand what connectivity means for their business and what they need to do to get their products connected."

Ruth's advice? "Start by considering your minimum viable product." This doesn't mean stripping it down to the bones; instead, think about what is needed for a product to be successful. "What are the elements your customers will want? Remember that some of these elements may need to be traded off before the design can move on."

Then think about the electronics. "Connected devices obviously need electronics to drive them," Ruth said. An option for the developer is to use a component available off the shelf. This may be good enough, but it may be possible to achieve a superior product by investing more in the development.

Power is another factor to be considered. Is your product mains powered or will it use a battery? If it's battery powered, what type of battery? And should that battery be rechargeable? How long should the device operate before recharging?

Appcessory Toolkit speeds design of injection pen

Cambridge Consultants used the Appcessory Toolkit to design an injection pen that makes daily management of diabetes an easier, more accurate task. Called KiCoPen, the device captures the exact dose delivered – and sends the information to an associated smartphone app.

Current market offerings allow patients to know when their last insulin dose was given by freezing the time the cap was taken off the pen. This, however, leaves room for error if the cap falls off accidentally. By confirming the injection and the exact dose of insulin delivered via their smartphone, patients can be more confident in the control of their condition.

KiCoPen also uses energy harvesting – from the motion of the cap removal and replacement – to power the electronics.

What kind of wireless communications will the product need? Can it work via Bluetooth, for example, or will it need GSM style connectivity? And if it's wireless, what kind of antenna will be needed?

And then there's the algorithm. You're likely to be measuring something and therefore creating data, so you will need smart maths to convert this data into actionable information. Also, you need to think about the antenna design. There is lots to think about!

All of these issues need a technical investigation in order to de-risk them and to help the company clarify its thoughts in order to understand what is possible and what makes sense for its business."

One way of clarifying your thoughts is to take advantage of Cambridge Consultants' Appcessory Toolkit. "It's a workshop style approach," Ruth explained, "which allows companies to explore various design parameters alongside Cambridge Consultants' experts. Let's take the simple example of a pedometer. We know it will need an accelerometer, a battery, communications and maybe an LED.

"We can 'plug' these components into the toolkit, after which scripts will take the information and generate a PCB layout. This will give you a good indication of the size. If it's too big for your use case, you can play around with the options of different components and visualise the impact on the size."

The Appcessory Toolkit approach also allows the power requirements for a design to be evaluated. Ruth said: "You can see how long the battery might last for. This might meet expectations, but it might not. Again, you can play with the options to improve the power performance.

"For example, the LED is often a major power drain. By changing the LED pattern, we could add multiple days of battery life. The Appcessory Toolkit workshop educates people about what it means to create connected devices without them having to invest significant time and money. They will get a quick answer to their basic design questions and will be able to move forwards with confidence into the product development process."

Cambridge Consultants

• Cambridge Consultants has created a 'top 10 tips' guide to creating a connected device, which you can download free at: www.CambridgeConsultants.com/connected-device-guide

The hunt for **age old ice**

Peering into the past requires drilling deep in to the Antarctic ice. But to make sure they get the location right, a team of engineers has to do some ground work first. Justin Cunningham finds out more about the challenge.

With a mixed agenda of exploration, engineering and understanding of past climatic events, the British Antarctic Survey is to take part in an ambitious project to find one million year old ice. It hopes the findings will offer fresh insight in to the effect carbon dioxide has had on the climate in the past, and by doing so, will help improve our current understanding of climate change and how best to tackle it.

The Antarctic is the most untouched land mass on the planet. Like rings of a tree trunk, layers of snow and ice laid down over millennia enable scientists to peer back in time. But first they need to find a suitable site that has the necessary prehistoric ice reserves.

Analysis of ice allows scientists to look back through history at the various ice age cycles and the effect that human produced CO_2 has had. From sediment records it's known that in the past the planet was warmer and it's now thought that the planet will get warmer once again in the future.

Julius Rix, a drilling engineer with the British Antarctic Survey, explained the challenge. He said: "We are looking for a continuous record of ice from the present day all the way back one million years. Unfortunately, once the ice at the bottom of the core has melted the data is lost, which is what happened at Dome C over a decade ago. That limited the data age to 800,000 years."

Dome C is a French-Italian research station on the high east Antarctic plateau. Its average surface temperature is close to -55°C. Research teams only visit during the polar summer when temperatures are at their least harsh.

"We'd like to get to ice from 1.5million years ago but we don't know if that's even possible," said Rix. "The ice begins to melt at the bottom, so we were losing the oldest ice because of heat produced from geothermal activity in the earth, and ice on top acting as insulation, melting it."

Part of the problem is that Antarctica is twice the size of Australia and remains largely uncharted. While satellite data and computer models have revealed fresh insight, geothermal activity and hence temperatures deep below the thick ice sheets still remain a mystery.

Finding the oldest cores means finding deep ice still intact. BAS has typically used large 5-inch

Dome C (above) and the specially designed drill to collect 'clippings' as opposed to an ice core. While less accurate it is substantially quicker

diameter drills with a hollow core that enables samples to be collected in the bore of the drill. This is a slow process that takes months to get to the necessary 3km depth of one million year old ice. So choosing a site that has a relatively high geothermal temperature could spell disaster and ruin many months of effort.

However, to make sure they get it right, the British Antarctic Survey is taking part in a project that will drill six separate 3-inch holes, 600m down. The aim is to assess geothermal activity and help the selection of a future main site to hunt for age old ice.

"By drilling shorter holes quickly and putting in temperature sensing cables we get a profile for the top 600m," said Rix. "Then the modellers will be able to extrapolate the rest of the information.

"We use an 8m drill on the end of a cable, it's known as wire line drilling. The drill has two cutting blades, a bit like a conventional drill, and these are attached to an outer barrel that spins. As the outer barrel spins, the spiral of the drill moves ice chippings [akin to swarf] upwards."

Helping with the design and specification of the motor and gear unit for the drilling rig was Paul Williams, a senior sales engineer at Maxon Motors. He said: "Conventionally you drill a core, take it out and then move on to the next one. With this, we are trying to move quickly, so it looks more like a conventional drill and we take the chippings. We know the depth where they come from so we can measure the age of the ice."

The normal concept is to use a heavy motor and gearbox to enable the 5-inch bore holes to be drilled out. However, as the team is going to be drilling smaller holes to a relatively shallower depth, a motor and gearbox needed to be re-specified. However, as the team had not done this before, it was difficult to know what was actually needed. So part of the work was to calculate the forces and torques required.

In order to get the power, it uses an epicycle gear module from Maxon Motor. This holds the planet gear stationary, with the sun and annulus turning, enabling the outside of the barrel to turn at the necessary speed and torque. The actual drill remains stationary allowing chippings to travel up where they can be collected.

"You pull out the whole drill, empty it, and you get chippings," said Rix. "The chippings might be mixed up in the spiral, and we will not get that fine resolution of mm you get from a core. It is every 0.5m or so - so we will get an average reading. However, we can then compare that rough data with accurate data of other cores and find out its age. Then the climate modellers will be able to map the geothermal surface activity and determine the best location to drill a full core and look for the million year old ice."

BAS contacted Maxon Motor as it had a very specific requirement of a powerful motor, with high torque, in a small diameter to fit in the drill. They needed to be able to vary the speed but get constant torque, even at a slow speed.

Initial calculations suggested that a motor in the kW region would be required. So Maxon Motor initially spec'd a 42mm 1.2kW motor to meet the requirement. However, it then looked at an alternative, a 250W motor in combination with a gearbox.

"What we found was we didn't need the torque we thought we needed," said Rix. "The major thing affecting it was the cutter design, so we tried different drill bits and found the design used for ice fishing was orders of magnitude better than anything else, and that allowed us to use a conventional off the shelf motor."

Maxon Motor's off-the-shelf combination has proved to be more than capable and did not even need a different lubricant at the extreme temperatures the drill is exposed to.

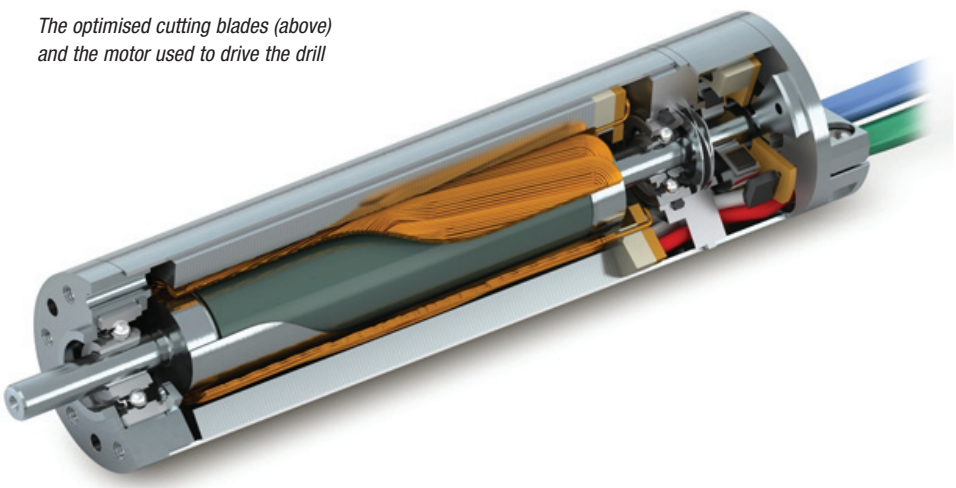
Power at the drill sites is generated using a standard Honda 5kW generator as it is able to work well in the low temperatures and high altitude.

"Climate change is going to affect all of us," said Rix. "With this research we can be more confident of what the effects of climate change are and how to react to them.

"Finding ice greater than one million years old is a massive international undertaking, and we're contributing to that by identifying the best possible location to drill. And, I haven't been to that part of Antarctica, so it is an exciting prospect. Getting invited to go to the high east Antarctic plateau doesn't happen very often."

www.maxonmotor.co.uk
www.antarctica.ac.uk

The optimised cutting blades (above) and the motor used to drive the drill



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Spotlight *on the* North East

An event dedicated entirely to the engineering and manufacturing sectors is being launched that puts the spotlight on the North East.

British engineering and manufacturing leads the world in many fields ranging from aerospace and automotive to additive manufacturing and advanced materials. The work of engineers across all sectors contributes, according to the Royal Academy of Engineering, over £480billion a year to the UK economy, with engineering firms employing more than 5.4million (figure from Engineering UK) people across the UK.

However, while it may be true that there has never been a more exciting time to work in engineering and manufacturing, a missing cog in the engine has always been a focal point dedicated to the people working within them.

Recognising this need, Engineering Materials' parent company and leading B2B publisher Findlay Media has launched Manufacturing & Engineering North East – an event aimed exclusively at engineering and manufacturing professionals.

The event will be held for the first time at Newcastle's Metro Radio Arena next year on 8-9th July. As well as promoting the proud heritage of the manufacturing industry within the region, the aim is to provide a platform for engineers and manufacturers to meet, learn and discuss ideas and meet future challenges. Professionals working in both sectors will be able to come together to showcase the North East's strengths and share their passion for growth.

Ed Tranter, executive director of Findlay Media, commented: "Engineering and manufacturing are at the heart of the North East's economy. Over 10,000 manufacturing and design sites operate within 100 miles of Newcastle and, with inwards investment from larger manufacturers such as Nissan in Sunderland and Hitachi in County Durham, the heartbeat is stronger than ever.

"With its huge industrial base, the North East is the perfect place to host the show. We are looking forward to creating an event for manufacturers and engineers that is focused on their needs and their needs alone."

With keynotes from senior manufacturing and engineering professionals at leading brands across the aerospace, automotive, medical and defence sectors, the co-located Manufacturing & Engineering North East conference will provide delegates with compelling content spanning all areas of production, design and manufacturing management. In addition, high quality practical workshops will also take place on both days within the two theatres on the show floor.

The practical, hands on workshops will be free to attend and will provide best practice learning and insight into the latest manufacturing and engineering techniques. Subjects to be covered will range from design software, control and automation, materials, fastening and joining, power systems and additive manufacturing.

Key facts

8-9th July 2015, Metro Radio Arena, Newcastle

Manufacturing & Engineering North East will comprise three key elements, covering the full range of design, production and manufacturing:

- Keynote conference sessions from market-leading engineering and manufacturing businesses
- Practical, hands-on workshop sessions
- An exhibition with access to market leading suppliers - the exhibition was 80% sold at launch

"Manufacturing & engineering are a huge part of the North East's heritage, culture and economy. We are delighted to support an event that will not only champion the sector, but will bring new business to the region."

Helen Golightly North East Local Enterprise Partnership

A number of leading trade bodies and institutions have already pledged their support the event including the Manufacturing Advisory Service (MAS), North East Local Enterprise Partnership, Gateshead and Newcastle Inward Investment and the Institution of Engineering Designers (IED).

"The support we've received so far has been phenomenal," said Tranter. "It just proves that the time for an event dedicated solely to engineering and manufacturing disciplines has come of age."

Chris Sumner, managing director of headline sponsor FANUC UK, said: "The North East is home to some of the world's leading manufacturers. FANUC already has an extensive customer base helping the region to maintain its manufacturing heritage. The range of FANUC products that are available to assist new customers to improve their manufacturing processes is immense and we want to take this opportunity to demonstrate these to benefit the entire region."

Another exhibitor at the inaugural show will be plastics expert igus. The company's managing director Matthew Aldridge added: "The North East is a market of huge importance. Having successfully exhibited at previous Findlay Media events we have every confidence that Manufacturing & Engineering North East will deliver new business for igus."

Colin Chapman, marketing manager for Henkel believes the appeal of the Show lies in its location, and the fact that it caters specifically to the needs of engineers and manufacturers: "We recognise that this is the perfect event for us to reach our target audience in this hugely important region."

While the conference and workshops will be free to attend, space will be limited for each session and pre-registration will be required. To find out more about Manufacturing & Engineering North East and to register your interest, go to the website: **www.menortheast.co.uk**

How to be cool: life lessons for electric motors

Improving the efficiency of electrical conversion and new methods of thermal management may mean that in future motors run far cooler than they do today. By Bill Bertram

First, let us look at the basics of motors and their thermal management. Heat is a byproduct of the conversion of electrical input to mechanical output, as performed by a motor or other rotating electrical machines. In fact, it is part of the inefficiency, as is noise. Motor designs are steadily becoming more efficient, which means they are producing less heat – but still enough to require consideration by designers of motor-driven systems.

The simplest form of heat dispersal is through conduction into the surrounding air or structure of the driven machinery. To assist with this, a heat sink – usually a finned block of aluminium with a large surface area – can be affixed to the motor to absorb the heat and dissipate it quickly to the atmosphere. A variation of this is found on many industrial motors, which have a finned cover over much of their body length.

Another common method for keeping electric motors cool is forced draught air cooling. Industrial motors often have an integral fan, mounted on the rear of the output shaft, so that it spins at the same rate as the driven load. This is protected by a perforated cowl, which also protects inquisitive fingers from the fan blades. This type of motor is often referred to as, 'totally enclosed fan cooled' (TEFC). A variation on this, often used with servo motors, is an independently excited electric fan. A cooled motor can operate at higher load and is likely to have a longer working life than an uncooled motor. Forced ventilation is also used when the speed of the motor is controlled by a frequency inverter. At low speeds the fan, borne by the motor's shaft, becomes inefficient so a forced ventilation is needed to deliver the volume of air required to cool the motor down.

ANOTHER COMMON METHOD FOR KEEPING ELECTRIC MOTORS COOL IS FORCED DRAUGHT AIR COOLING.

Liquid cooling

A liquid coolant has a greater capacity than ambient air to absorb heat from a motor. Water, glycol or other liquids can be used as coolant. With water there is the option to use an open loop cooling system, in which water, typically from the mains supply, is circulated around the motor to absorb heat, and then discharged into a drain.

However, closed loop systems are also used and, indeed, must be used with non-water cooling. In these, the coolant is constantly recirculated through a heat exhanger to cool it before it is reused. The heat exchanger can be simply air cooled, with the heat dissipated to atmosphere, or the heat energy can be stored and/or transferred for use elsewhere.

There are other, less common, cooling systems, too. For instance, laboratory researchers developing super high-performance motors may find it necessary to use ultra-cold liquid nitrogen as the cooling agent. Elsewhere, subsea ROVs (remote operated vehicles) typically use very hardworking servomotors as propulsion drives, yet do not have an engineered cooling system; instead, exploiting the ocean depths as an 'infinite heat sink'.

Cool and exotic

More exotic methods of motor cooling also exist and may become more common as motor uses and performance develop. For instance, in some high-performance applications heat generation may be extreme and therefore require rapid removal. In such cases it may be possible to cool the windings directly by having enclosed coolant channels running along the stator slots and between the windings.

It is even possible to consider directly cooling the conductors by immersion in an electrically non-conductive coolant. Suitable fluids for this include deionised water (poor electrical conductor) and transformer oils (which are specially formulated to be non-conductive).

Other methods of cooling include spraying oil directly onto the end-turns of the conductors.

For industrial engineers, heat dissipation is often not a problem; motors either have enough free air flow or their standard cooling fan is more than adequate. However, consideration must be given to thermal management if a motor is to be used in:

- a hot climate,
- in a confined space where natural air flow is likely to be restricted,
- if it is possible for the motor to come into contact with flammable materials or with users' hands,
- if thermal expansion could become an issue.

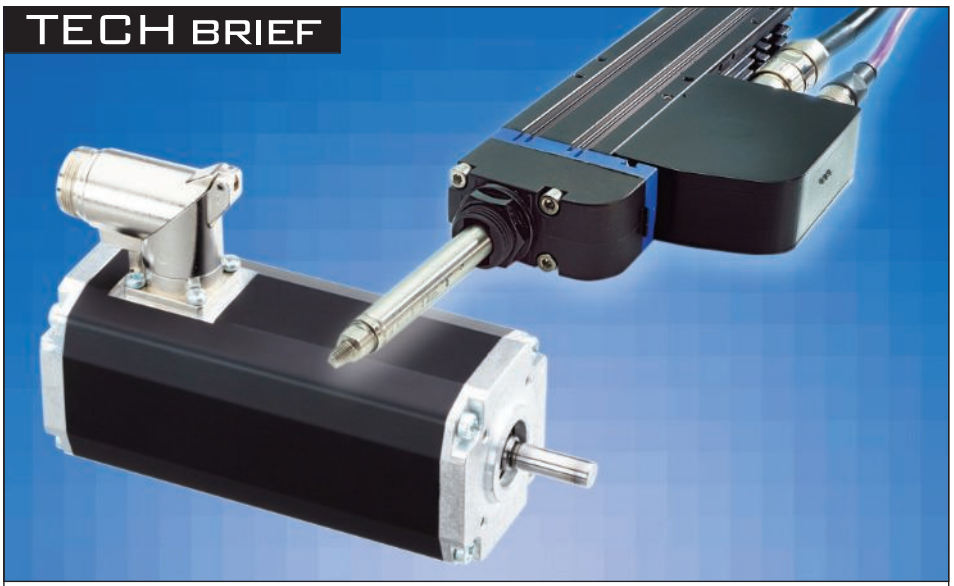
Instead, machinery engineers should bear in mind that the heat generated by electrical motors is the result of electrical and mechanical losses, i.e. inefficiencies. Therefore, if a motor is found to be running hot, it may be worth looking at the efficiency of the drive system. Replacing an older motor with a modern high-efficiency unit may solve thermal issues as well as reducing power consumption. Alternatively freeing a sticking bearing may pay dividends. Another possibility is that it may be practical to recover the heat energy through a water jacket and use it elsewhere.

In fact, the cooling of rotating machines is codified in the standards IEC 34.6 and AS 1359.21, which provide guidelines on which cooling arrangements are likely to be appropriate in particular situations.

In an odd turn of events, automotive engineers may make the next big leap in electric motor development. Electric and hybrid vehicles are developing apace, and for them, dissipating heat from the electric motor is a major issue. The obvious solution is a radiator system, similar to those already found on cars, but the potential returns are such that it is worth exploring other options – and any new technology may transfer into industrial drives and other fields.

Bill Bertram is managing director of Regal Beloit C&I Europe

TECH BRIEF



ASSISTED CONTROL AIDS INTEGRATION

Dunkermotoren has launched an interesting new tubular linear motor. The ST11 features an integrated controller option that is aimed to provide machine builders and designers with the benefits of easy integration, significantly reduced and simplified wiring. It has a range of analogue and digital inputs and outputs, with CAN, Profibus and EtherCAT communications protocols available as standard. Once programmed only power is required to operate in stand-alone mode, with programming completed using Dunkermotoren's 'Drive Assistant'.

The new controller mounts with all models in the ST11 series and maintains a combined IP67 rating with the motor, although can also be positioned away from the motor in the same way as a conventional controller.

Although suited for use in a wide range of motion control applications, being faster than stepper motors with ballscrews and more precise than belt-drive systems, the ST11 with Integrated Controller is claimed to be particularly suited for replacing pneumatics in all-electric machines due to its efficient, low-maintenance and environmentally sound features.

Rolls commits to **geared turbofan**

The aircraft engine manufacturer explains its plans for finding the efficient engines of tomorrow, and why it has waited until now to begin development of a geared turbofan. Justin Cunningham reports.

The gas turbine has been the staple combustion engine for large aircraft since the 1950s. That's unlikely to change any time soon, however, advances in materials have enabled step change improvements in reliability with other advances, such as the more precise control of the combustion process, offering further enhancement.

However, the current engine architecture used by the major engine manufacturers is reaching its limit. As bypass ratios are pushed higher, and the consequential diameter of the fan becomes larger and one primary limiting factor comes in to play.

Efficiency and speed

Larger fan blades mean the tip speed of the blades begin to create shockwaves as they near the speed of sound. Consequently a shockwave begins to form and this massively hinders efficiency.

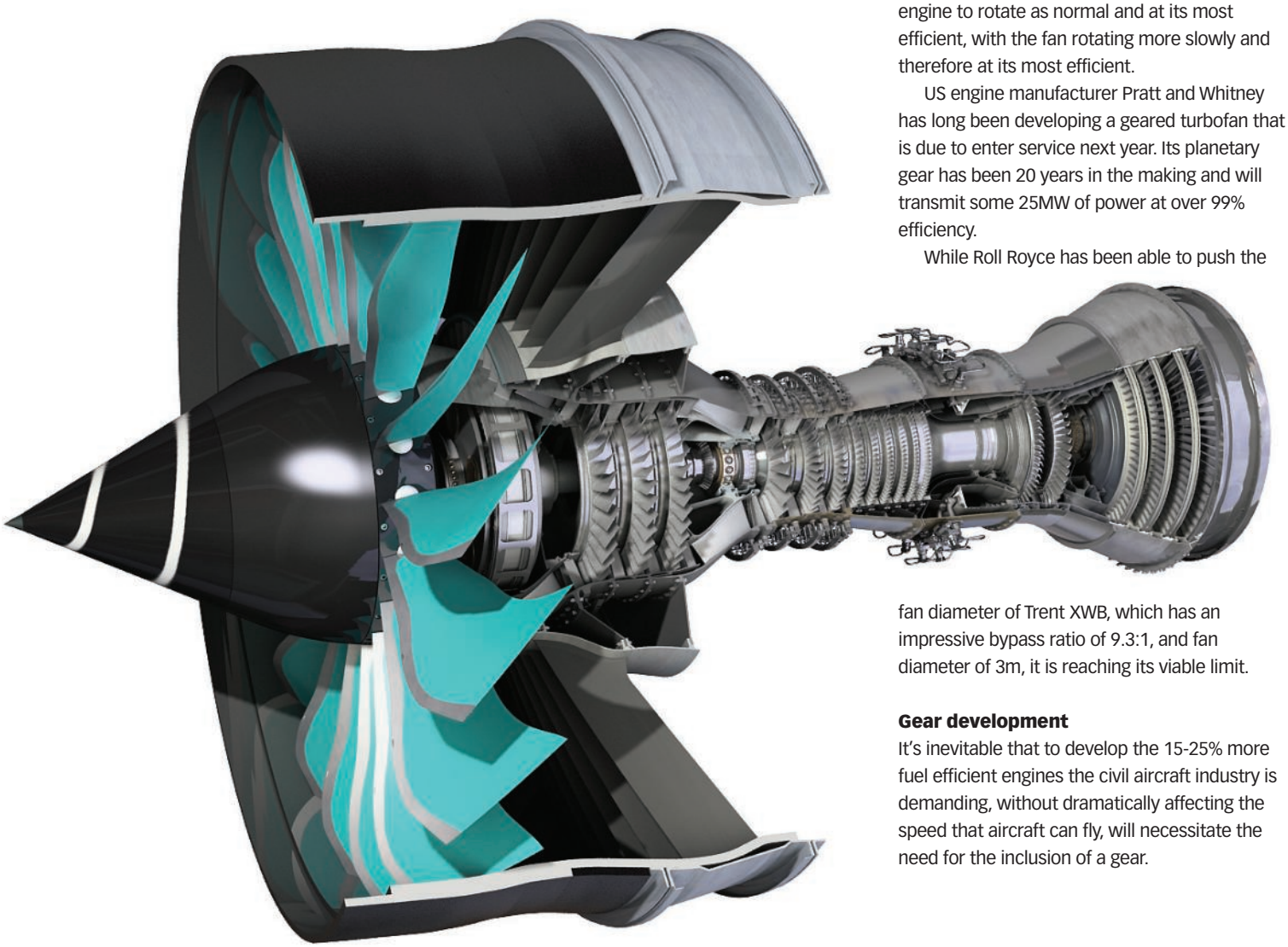
The result of all of this is that having larger diameter engines, and longer fan blades, will require the overall fan speed – so the speed of rotation – to be slower than the shaft speed of the engine transferring the mechanical power.

Consensus is narrowing in the aircraft industry that engines need to, and will get, larger and that means a fundamental need for the integration of some kind of reduction gearbox between the main shaft of the engine and the fan.

The concept is to allow the main core of the engine to rotate as normal and at its most efficient, with the fan rotating more slowly and therefore at its most efficient.

US engine manufacturer Pratt and Whitney has long been developing a geared turbofan that is due to enter service next year. Its planetary gear has been 20 years in the making and will transmit some 25MW of power at over 99% efficiency.

While Roll Royce has been able to push the fan diameter of Trent XWB, which has an impressive bypass ratio of 9.3:1, and fan diameter of 3m, it is reaching its viable limit.



Gear development

It's inevitable that to develop the 15-25% more fuel efficient engines the civil aircraft industry is demanding, without dramatically affecting the speed that aircraft can fly, will necessitate the need for the inclusion of a gear.

Professor Ric Parker, director of research and technology at Rolls Royce, said: "Our basic engine architecture is quite different to Pratt and Whitney's. They have got a 2-shaft engine and we have got a 3-shaft, so the tipping point in terms of fan size and weight, where it gets so big and heavy that we need to put a gearbox in there, is quite different."

It does appear that Pratt and Whitney has stolen a march on other aircraft engine manufacturers. However, its inherent 2-shaft architecture has meant that its tipping point came perhaps a decade or more earlier that the 3-shaft architecture used by Rolls.

A reduction gear becomes advantageous, and perhaps a necessity, for Pratt around bypass ratios of 11:1 or more. If they didn't use a gear on larger future engines, they would quickly suffer from diminishing returns.

However, Rolls Royce is likely to be able to comfortably push its bypass ratio to 13:1 and perhaps even as much as 15:1 before a gear becomes necessary.

It means while there is still a fundamental need for a gear in the longer term as engine fans get larger, its distinct 3-shaft engine has enabled it to stave off the costly and technologically demanding development of an appropriate gear until recently. And there is good reason for that.

"Our first gear application is going to be right at the top end of the thrust range," said Professor Parker. "Whereas Pratt and Whitney has a gearbox that transmits about 25MW, we are talking about a 50MW gearbox. So even when we achieve 99% efficiency in that gear, we have got to find somewhere for that 500kW to go. That will probably be lost as heat in the oil system, but that is still a lot of heat for the oil. So we have to be sure we are going to get a very efficient gearbox, more than 99%."

Jargon Buster – Bypass ratio

The modern turbofan can be thought of as a gas turbine driving a ducted fan. While the turbine itself provides some propulsion, it's the ducted fan air that provides most of the propulsion.

Air passing through the ducted fan is not combusted, and bypasses the core of the engine. The amount of air that passes through the fan relative to the air that passes through the core is known as the bypass ratio. A larger bypass ratio is advantageous as it means the core of engines is made smaller to aid thermal efficiency, and a larger fan creates more forward thrust.

Different configuration helps Rolls develop later

Pratt and Whitney's 2-shaft engine architecture has meant it has had the 'balancing point' where it needs to incorporate a gear much earlier.

In a 2-shaft engine there is the ducted fan and then a compressor booster stage that turns the fan at the same speed. At the back of the engine a low pressure turbine is attached to the same shaft that also turns the fan.

The problem is as the fan becomes bigger, the fan needs to rotate more slowly. This means the LP turbine at the back becomes heavier as additional compressor stages are added to recover work.

In Rolls Royce's 3-shaft engine, it still has a large LP turbine turning the fan, but there is also a second intermediate pressure shaft that has its own compressor and own speed. So the tipping point in terms of fan size and weight – where it gets too big and heavy that a gearbox is needed – is at a much larger size.

Daunting development

While the prospect of developing a gearbox for any future aircraft engine with this efficiency and reliability is a daunting task, this is Rolls Royce. It has immense and world-class experience in designing and producing gearboxes with one of the most recent examples being the contra-rotating lift fan for the Joint Strike Fighter (JSF) combat aircraft.

That gearbox is able to transmit 21MW from the main engine to the vertical lift fan and is incredibly well engineered, being both compact and highly efficient.

It's unclear at the moment what type of gear configuration Rolls will opt for, as that's part of the development work currently being undertaken. And the company remain tight lipped about divulging more details.

However, any gear is likely to be a planetary set up that's been speculated could have a ratio of around 3:1.

Efficiency is at the heart of making the gear viable, so precise manufacture and assembly will be vital, as will the development of the oil cooling system.

While Pratt and Whitney has taken 20 years to develop a gear, Rolls has ambitious plans to have a geared turbofan flying by 2025 in what is being called its UltraFan, which will house numerous advanced components and technologies, and yield the 25% fuel efficiency improvement over its existing baseline engine model, the Trent 700.

"I'm confident that the gas turbine can be developed much further, and will remain the basis of aircraft power for the next 30 or 40 years. In terms of sheer power density, nothing yet has come close to it," he concluded.

www.rolls-royce.com

The perfect slice

It's the staple breakfast for many, but getting toast right can be a bit of an art. Everyone seems to have clear and strong views about just what is the right amount of 'toast' makes up the perfect slice. Invariably there are those that like hot bread to others that want crispy carbon cremation. However, over doing it or under doing it can be a problem, especially if you are making it for someone else.

While many modern toasters have numbered settings, there is very little consistency between brands and models.

And while others might allow adjustment from light to dark, often the darkest setting might only just start to yield the desired burn.

This is to the annoyance of all of us that have to learn the idiosyncrasies of our individual toasters. Perhaps you need to toast on full power and then again on the lightest setting to get it just right, or are you a maverick that keeps 'popping and looking' until it's perfect.

The challenge

So the challenge this month is therefore to come up with a way of judging the perfect slice of toast. Of course, 'perfect' is in the eye of the beholder so the toasting system must be able to be easily adjusted.

The key here, however, is that any setting knob or button should yield exactly the same results. No matter the type of bread, its temperature, or its size, the toaster should be able sense the amount the bread that has been toasted and use that as its trigger to end the process. The challenge is really about integrating a mechanism for controlling the process, and those process engineers among you are at a distinct advantage.

If it helps, the heating elements can be changed for something more efficient, or gradual, or controllable, but the toaster must remain competitive in price and any sensing system should not add much to the overall cost.

Key, also, is the control interface. This is toast we are talking about, so any controls need to be simple, intuitive and fool proof. Light brown must mean light brown, and nothing in-between. But all this should not add complexity.

You could opt to keep humans in the loop by having a clear toaster, so users can peer through and manually pop the toaster at the desired time. But, really, this is about modernising the age old toaster and moving away from the problematic timer.

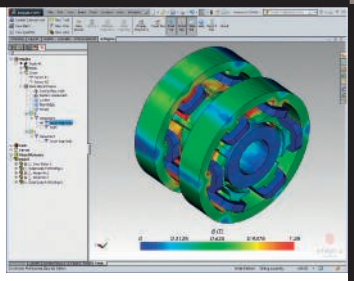
The solution we have in mind is simple in principle and exploits modern sensing technology to give all the desired improvements to overcome this trying breakfast bind at little extra cost. Our solution will be in the December issue of Eureka, in the meantime see what you can come up with.

If you have a solution you would like to share with us, email it to: tfryer@findlay.co.uk

The answer to last month's Coffee Time Challenge to improve the stabiliser training wheels for children learning to ride bicycles, can be found on page 12.

3D Electromagnetic Field Solver

Infolytica - MagNet for SolidWorks



MagNet for SolidWorks is the new embedded 3D electromagnetic field solver from Infolytica. Instead of using a live-link, or connecting two standalone tools, the simulation of any electromagnetic device can now be performed seamlessly within the integrated Solidworks environment using the new add-in.

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Titan Enterprises has developed and is supplying a high pressure version of its 900 Series turbine flow meter for measuring refrigerant flow.

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Pumps

Hydra-Cell Excels in Zero Liquid Discharge

The addition of super duplex stainless steel to the range of liquid head materials available now enables Hydra-Cell G15 pumps to manage the tough-to-handle waste waters processed in 'zero liquid discharge (ZLD) systems. As water becomes an ever more expensive commodity, industrial, oil, chemical and petrochemical companies are increasingly turning to ZLD systems, minimizing wastewater discharge and maximising water recovery.

Frequently these wastewaters have high levels of Total Dissolved Solids (TDS) and many contain particulate matter that can cause severe wear in pumps with tight tolerances and rapidly degrade seals. Having no tight tolerances and no dynamic seals to wear, Hydra-Cell pumps are proving to be ideal for this application. Many of these waste streams have a high chloride content, which causes rapid corrosion, even within stainless steel pumps. Because of the way the Hydra-Cell pump is designed, it has only been necessary to incorporate 2507 Super Duplex liquid ends (manifolds and valve plates) in order to overcome this potential corrosion problem. A plunger or piston pump would require substantial modification of many components in order to overcome such a corrosion threat.

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Press monitoring boosts operating time

Long runtimes & precision are needed for industrial presses

How do you ensure the quality of workpieces produced on a production line are always constant? Modern industrial production would be unthinkable without presses, with modern presses running up to 800 strokes per minute and ranging from the production of coins to large automobile parts.

One way to achieve this is by using HBM sensors and PMX press monitoring. PMX measuring chains record pressing forces as they occur with absolutely no interference, either in a direct force flow or in a force shunt measurement. The high resolution of the PMX, 24 bits, also makes it possible to record very small partial forces. For example, sensors based on strain gauges and carrier frequency amplifiers can be placed on each column of a 2-/4-frame press. PX455, the four-channel measuring card for full and half bridges, force transducers and load cells reliably records these signals.

Internal calculation channels analyse the measurement signal in terms of its curve and peak forces. The PX878 multi input/output card has a total of eight digital inputs, eight digital outputs and five analogue outputs. This makes it possible to calculate limit values quickly in up to 50 µsec, which ensures a high level of machine protection. The analogue outputs can be used for output of measurement or computing channels – ideal for service and maintenance.

PX01PN, the Profinetcard with IRT protocol, ensures that these reliably predictive signals are directed via real-time Ethernet interfaces to the press controller, so that the press parameters can be readjusted.

With an automation system concept of this kind, press manufacturers can increase the runtime and quality of their presses while lowering maintenance costs. The concept is becoming increasingly common in retooling, i.e. retrofitting or upgrading presses.

Founded in Germany in 1950, HBM is today the technology and market leader in the field of test and measurement. HBM's product range comprises solutions for the entire measurement chain, from virtual to physical testing. The company has production facilities in Germany, USA and China and is represented in over 80 countries worldwide.

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