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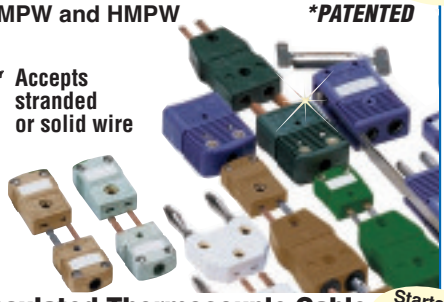

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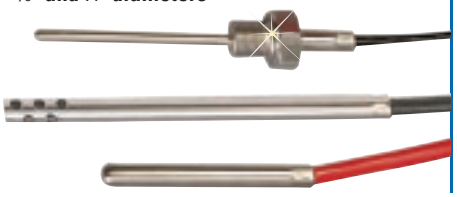

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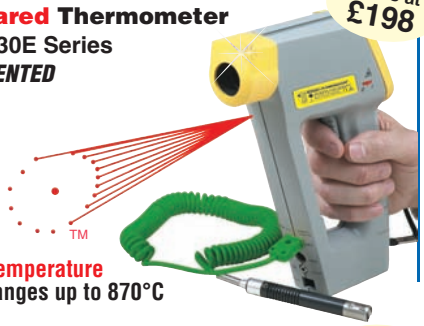

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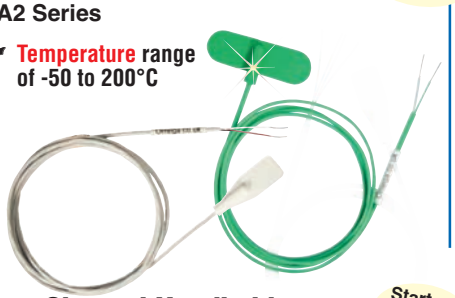

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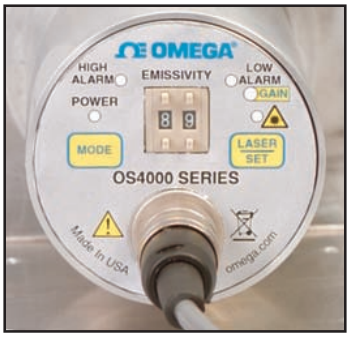

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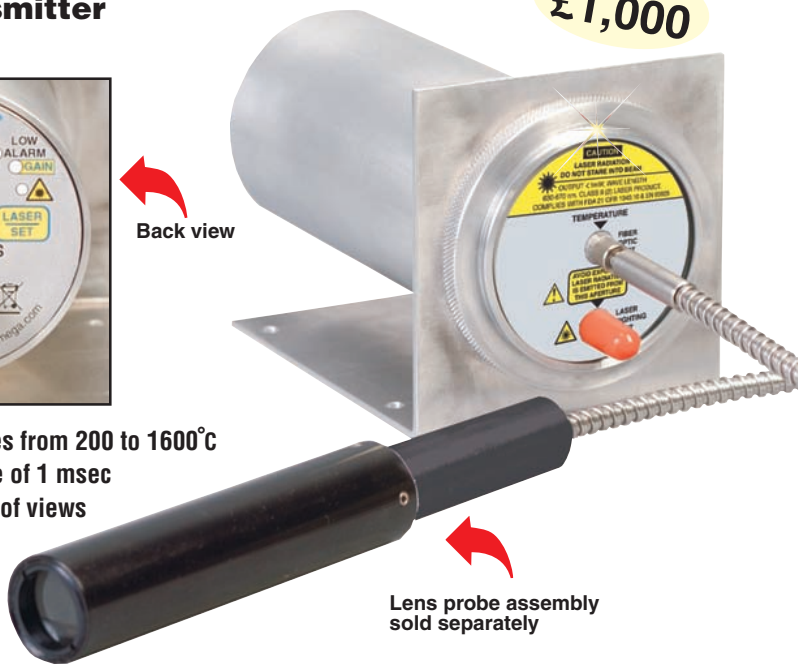

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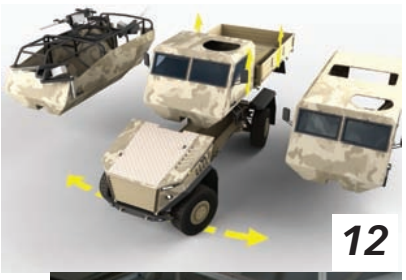

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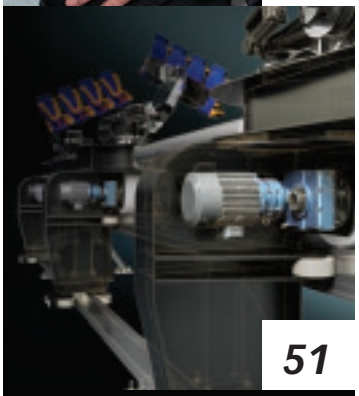

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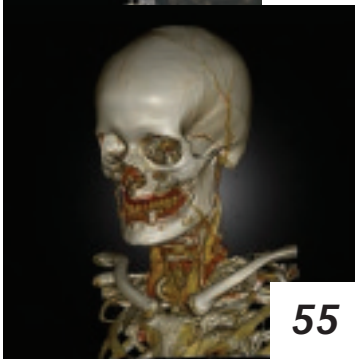

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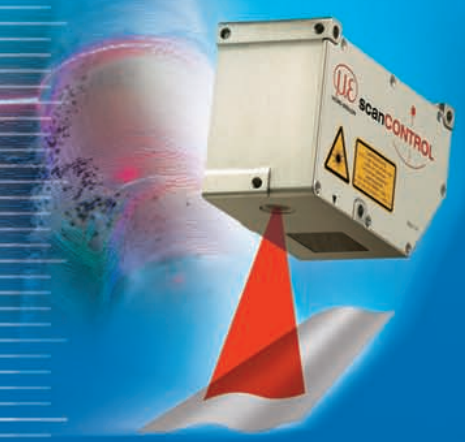

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Starting a drift to technology

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

In his recent MacTaggart lecture at the Edinburgh International Television Festival, Google's Executive Chairman Eric Schmidt put his finger on the dichotomy that has bedevilled the UK's education system for decades.

Bemoaning what he referred to as "a drift towards the humanities", Schmidt said: "Engineering and science aren't championed. Even worse, both sides seem to denigrate the other. To use what I'm told is the local vernacular, you're either a 'luvvy' or a 'boffin'."

He added that, in order to change the way UK society perceives technology, schools need to reignite children's passion for science, engineering and maths.

In fact, this message simply echoes what many from the science and engineering community have been saying for decades. However, perhaps because the address was delivered to a group of television executives, or because it was delivered by a the executive chairman of such a powerful entity as Google, this warning does seem to have actually caused people to sit up and pay attention.

It is all too easy for some to forget that, behind its 'cool' corporate image and apparent quirkiness, Google is where it is thanks to some extremely brilliant science, maths and engineering. This is perhaps an uncomfortable thought for those in the educational establishment who have encouraged this "drift to the humanities", many of whom are only too explicit in their belief that to encourage vocational education is to offer a 'second-rate' education to those who choose this path.

This educational perception of practical skills as something to be viewed with suspicion or even mockery has held back the UK's development too long. Hopefully, Mr Schmidt's words will be heeded.

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BEEAs 2011 Shortlist announced

The shortlist of entries for the 2011 British Engineering Excellence Awards has been announced by organiser Findlay Media. The awards, which aim to promote the quality of British engineering design, will be presented on October 13 at the Globe Theatre, London. Full details of the event can be found at **www.beeas.co.uk**

The shortlist is as follows:

Consultancy of the Year – sponsored by Prototype Projects:
Bytesnap;
Magna Parva
Plextek
Triteq
Vocis

Design Engineer of the Year – sponsored by Mouser Electronics:
Shaun Addy, Cubewano
Robert Elliott, ARM
Steve Naday, Dexela

Design Team of the Year – sponsored by element14
Aber Instruments
Artemis Intelligent Power
IHC Engineering Business
Nexeon
Pelamis Wave Power
TDK-Lambda

New Product of the Year (Electronic) – Sponsored by Digi-Key:
Bridgeworks, Sanslide
ISDI/University Of Lincoln, DynAMITe Imagers
Oxford Digital, Simulink-2-Tiny
RF Engines, Channelcore Flex
Triteq, Eykona Wound Imaging System
Wolfson Microelectronics, WM5100

New Product of the Year (Mechanical) – Sponsored by igus® (UK) Ltd
Aceon Battery Technology, Solar Docking Station
Cybaman Technologies, Cybaman Replicator
Edwards Vacuum, GXS Dry Screw Vacuum Pump
Fireco, Freedor
Libralato Holdings, Pure Hybrid Powertrain
MAS Design, Pacific iF Mode Folding Bicycle

Green Product of the Year – Sponsored by National Instruments
Ashwoods Automotive, Hybrid Drive System
e2v, ProWave Vermiculite Processing System
Enecsys, Duo Solar PV Micro Inverter
HT Products, LS-R Calibrated Reference Leak
TDK-Lambda, GWS250

Mechatronic Design of the Year
Artemis Intelligent Power, Digital Displacement Wind Turbine Transmission
CTR Future, TMX90 Laser Machine
Magna Parva, COPMA System
Railability, Railreach 500-900
RF Golf, RF Golf Ball System
Specialised Imaging, Tracker 2

Small Company of the Year – Sponsored by D Young & Co LLP
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ICS Electronics
Oxford Digital
Oxford Technical Solutions
Peratech
Race Technology
Sprint Electric

Start Up Of The Year – Sponsored by Cambridge Consultants
Cambridge CMOS Sensors
Neul
Redtail Telematics
TBS Cubed

Young Design Engineer Of The Year – Sponsored by RS Components
Daniel Campling, Undergraduate Student
Will Deacon, ARM
Adam James, Xtrac
Darren Jones, Fireco

'Team UK' announced for WorldSkills London 2011

Semta is calling on companies to visit WorldSkills London 2011 and support Team UK, the country's top engineering talent.

Engineering competitors from across the UK have been battling it out through WorldSkills UK regional and national heats over the last two years to gain a place in Team UK. The winners, who were revealed at the final selection events in three colleges across the West Midlands, will represent the UK against the best students, apprentices and employees from around the world on 5-8 October.

From colleges, universities and employers of all sizes from across the UK, the confirmed engineering representatives between the ages of 18 – 25 making up Team UK are:

- **Jake Rambaldini** (Welding), Doosan Babcock Energy Ltd
- **Phillip Spowart** (CNC Turning), Rolls Royce PLC
- **Ross Varnam** (Autobody Repair), Parker Motor Services
- **John Couldridge** (Automobile Technology), Inchcape Honda
- **Darren Lewis** (Mobile Robotics), Middlesex University
- **Puja Varsani** (Mobile Robotics), Middlesex University
- **Andrew Fielding** (Electronics), MBDA UK
- **Kai Burkitt** (Manufacturing Team Challenge), BAE Systems
- **Rachel Carr** (Manufacturing Team Challenge), BAE Systems
- **Sam Andrews** (Manufacturing Team Challenge), BAE Systems
- **David Nicholl** (CNC Milling), Schlumberger
- **Chris Downey** (Mechatronics), Northern Regional College
- **Mark Maginty** (Mechatronics), Russell Electrical Contractors
- **Ryan Sheridan** (Mechanical Engineering Design – CAD), Motherwell College
- **Kerry McStea** (Aircraft Maintenance), RAF

Since taking on responsibility for WorldSkills UK engineering competitions in 2008, sector skills council Semta has increased the number of registered competitors from 12 to 334.

Philip Whiteman, chief executive of Semta said: "WorldSkills is a fantastic showcase for careers in science, engineering and manufacturing. These are the skills that shape the world. Leading employers are with us in supporting and competing in the event. We are urging other employers to visit and see the benefits of investing in skills.

"Semta research shows that 32,000 new employees will be needed across the UK engineering, manufacturing and science sectors each year between now and 2016 to cover retirements and industry growth. We need to convince potential recruits that this is a sector where careers are secure, stimulating and well-rewarded. I look forward to seeing Team UK in action in October and wish them every success."

WorldSkills attracts over 1,000 competitors from 51 countries and regions to compete in 45 different skill areas.

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30% energy-savings available

The VFC eco energy saving function is now available for the panel-mounted drives of Lenze's Inverter Drives 8400 platform. Previously, VFC eco featured in the 8400 motec decentralised inverters. The function cuts energy requirements significantly, especially in partial load operation. Combined with the new L-force MF three-phase AC motors, this Lenze BlueGreen Solution provides maximum energy efficiency.

According to Lenze calculations, the VFC eco mode reduces losses to such an extent that energy savings of up to 30 per cent can be achieved. VFC eco is available as a cost-free standard option with the 8400 inverters series StateLine, HighLine and TopLine in a power range 0.25 to 45kW.

Lenze's new L-force MF three-phase AC motors also enable improved energy efficiency. These motors are specially designed to operate with frequency inverters.

www.lenze.co.uk

Solution to last month's Coffee Time Challenge

The solution to August's Challenge of how to prevent fingers being trapped in doors comes in the form of Safehinge ALU, a British invention that prevents finger trapping by eliminating the dangerous gap normally found at the hinge side of doors.

The range achieves finger safety by integrating components with the door which allow the door to pivot without creating a gap at the hinge. This is done using a specialist pivot set and integrating a curved aluminium profile with the door. Integrated finger protection is installed once, lasts the life of the door and offers whole life cost savings up to 75% (equal to around a £500 saving per door) when compared with conventional hinge cover solutions.

The solution is the brainchild of Philip Ross and Martin Izod, two former product engineering design students from the University of Glasgow and the Glasgow School of Art, who formed the company in 2007.

The company now supplies leading local authorities, such as Manchester City Council, Dundee City Council and Neath Port Talbot Council, and working together with them to establish new standards in safety and buildings fit for the 21st century.

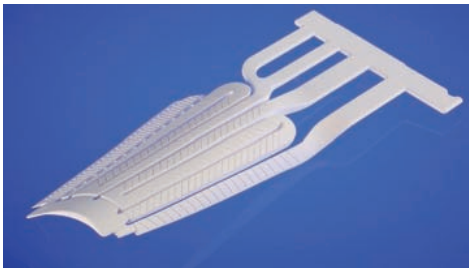
www.safehinge.com

Corrosion-resistant grab handle

Elesa's new EBR grab handle in glass fibre reinforced technopolymer incorporates a spring loaded security lock with the operating pin in AISI 304 stainless steel. Consequently high corrosion resistance makes this handle applicable for environments where regulations, hygienic concerns or climatic/ environmental factors make it important to use corrosion-resistant materials.

Typical applications include sliding style doors, marine/building or furniture industries and for machine guards in industrial environments. Operation is by means of a pushbutton – recessed when closed for security and safety. Mounting is by 8mm hex machine screws concealed by push fit covers. Related products from Elesa include lobe knobs, grab handles, T handles, foldaway handles and a selection of enclosure handles in ergonomic design styles.
www.elesanow.co.uk.

Certech strengthens ceramic cores



Morgan Technical Ceramics (MTC) Certech has pioneered a new manufacturing technique which strengthens its ceramic cores used in the investment casting process by 20-30%. The ceramic cores, which are used to cast high performance aerospace and industrial turbine blades, can now be manufactured with a tougher coating, enabling customers to improve yields and achieve associated cost savings.

MTC Certech manufactures high quality ceramic cores using a proprietary low-pressure injection moulding and firing process. The cores are then coated using a new urea impregnation method, which gives them a tough coating.

Traditionally a PVA glue coating is used, but through using this new technique, MTC Certech has increased the strength of its ceramic cores significantly. As a result, they are less susceptible to fracture and failure during the manufacturing process of turbine blades and customers can achieve increased product output with reduced wastage.

MTC Certech's cores allow the creation of internal cavities with highly complex geometries during the investment casting process. Thin sections of 0.5 mm and tolerances of up to +/- 0.08mm can be achieved.
www.mtccertech.com

Benchtop UV conveyor offers fast cure

Intertronics' new DYMAX UVC-5 conveyor system is a bench-top unit offering the benefits of rapid throughput UV curing as part of a production line or as stand-alone equipment for curing UV adhesives as well as UV curable inks and coatings. The DYMAX UVC-5 offers very high intensities for fast UV curing (up to 10 metres per minute) with complete shielding from UV light and consistent cure times. This cost-effective and versatile conveyor system is ideal for production and lab environments.

The UVC-5 features a 120mm wide belt, with a lamp head which is height adjustable on the belt, from ~15mm to a maximum of ~60mm (custom conveyors are available for larger objects). Curing time can be adjusted by changing the belt speed from 1 to 10 metres per minute. The intensity of up to 400 mW/cm2 (UVA range) provides fast and complete cure for potting and conformal coating applications.
www.intertronics.co.uk

Fast-acting light curing adhesives bond fasteners

International fastening and assembly specialist Bollhoff and world-leading manufacturer of industrial adhesives DELO have joined forces to introduce Onsert – an innovative fastening system that enables the bonding of fasteners in seconds to a wide range of substrates. Onsert can be used on most thermoplastics, CRFP (carbon fibre reinforced plastic), SMC (sheet moulding compounds) GMT (glass mat thermoplastics), glass, lacquered or electroplated surfaces, metals, stainless steel and aluminium.

The technology is expected to deliver significant benefits to manufacturers in the automotive and electronic industries where it will replace moulded inserts as well as traditional mechanical and heat based fastening methods.

While the bonding of fasteners is an established technique in the aerospace industry, where it provides excellent mechanical properties, conventional processes can involve time consuming mechanical operations and curing times of up to 24 hours.

Onsert enables high performance fasteners to be placed virtually anywhere, automatically, on a plastics part without the need to design-in large bosses to accommodate moulded-in inserts. Unsightly sink marks are therefore eliminated on mouldings, improving product appearance, while heat, pressure and cycle times can be reduced to improve process efficiency.
www.bollhoff.com/uk

Secure your operations with proactive maintenance

Imagine the conditions in the North Sea. They take their toll on all types of equipment. Bearings are no exception. At one of the major production platforms, failing motor bearings used to cause gas compressors to break down as often as every third month. Each time, that meant 25% lost production for several days.

Jim Marnoch and his team provided SKF ProActive Reliability Maintenance services. After thorough analysis of the vibration signatures and the damaged bearings, they found a long term solution. SKF NoWear bearings along with a new sealing arrangement made all the difference, allowing the compressors to run 6 times longer than before.

At today's high oil prices, for every breakdown that can be avoided, the platform operator saves tens of million dollars. On top of that, these improvements also reduce health, safety and environmental risks. It's another great example of knowledge engineering at work. Find out more at www.skf.com/poke

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Jim Marnoch, SKF

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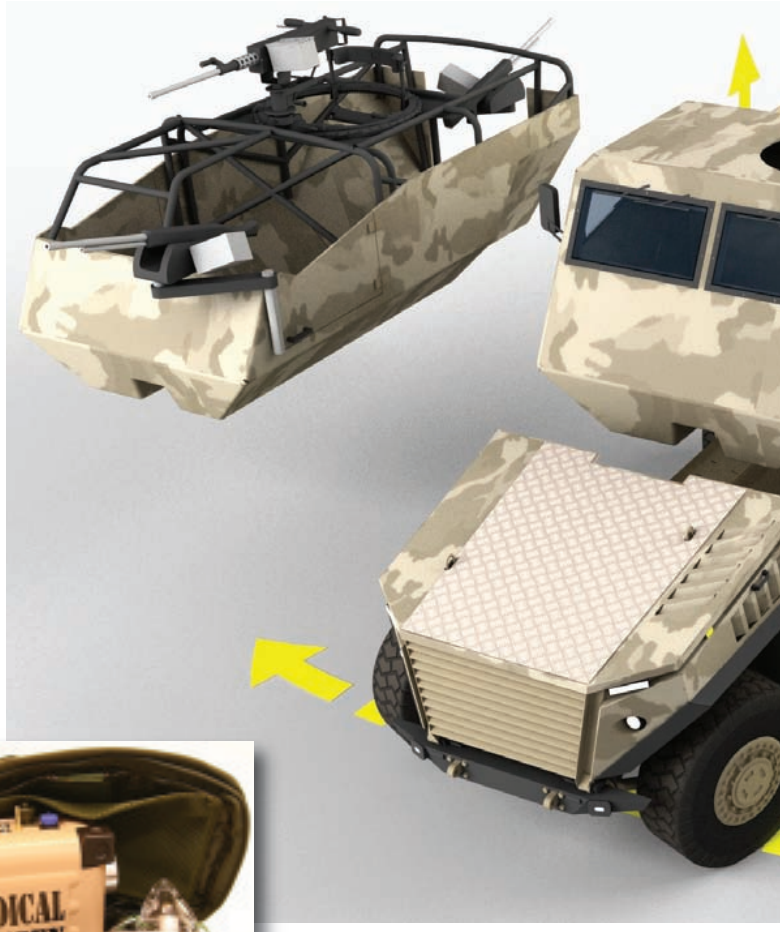
The front line of

There can be few more demanding tasks for design engineers than designing for defence applications. Here, not only are there all the usual trials and tribulations of product design, but allied to these is the fact that the product is going to face incredibly arduous conditions and that its success or failure will have life or death consequences.

One company that has faced these issues many times is leading engineering consultancy Ricardo, which has many years' experience in this field, having worked extensively on both the Land Rover Defender platform and, more recently, on the Foxhound Light Protected Patrol Vehicle (LPPV) chosen to replace it.

Chris Barnes, Ricardo's global product group director for defence vehicles, was intimately involved with these projects and has a number of observations to make on the challenges involved in working in this sector. One of the most significant of these, he believes is the speed with which it is often necessary to turn defence projects around. "The fact that a lot of military vehicles are UORs [Urgent Operational Requirements]," he says, "makes the situation extremely dynamic and fast-moving. If you're a designer working for Ford on the new Transit, it will be a four or five-year process where you know the stages you're going to go through over those years and you move from gateway to gateway. A military programme is far more diverse and far more fast-moving because the only reason the budget has been signed off is because you're under pressure to get the vehicle into theatre quickly. You have to counter a specific threat level. You have to go through all the same processes that other automotive companies do, but you have to do it much more quickly and therefore much more dynamically.



"If you take an automotive manufacturer," he continues, "they have a very detailed gateway quality assurance process that may be four or five years in duration. Typically in defence applications, you don't have that timescale, but you still have to be able to ensure you can get quality assured products to the market. So another key element for us is to take what we know in the automotive arena in terms of the quality approach and apply that in defence while using digital tools to significantly shorten the timescales."

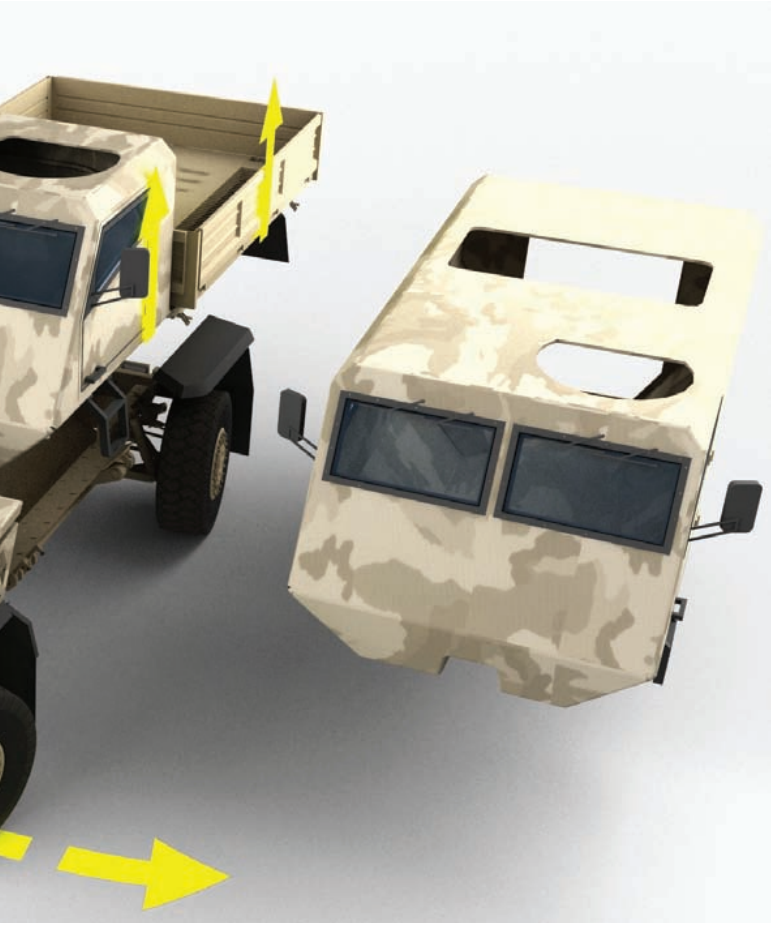
These digital tools (which involve early CAE analysis on body and chassis structures, durability and performance assessment, acceleration, noise vibration characteristics and everything around thermal performance criteria and then vehicle dynamics) are designed with one aim in mind – to try and reduce the number of physical prototypes required and get to a design solution as early as possible to try and discern whether the design concept we have meets the performance criteria defined in the requirements document.

Says Barnes: "In the commercial automotive sector you can have as many as 200-300 prototypes on a new platform. You simply can't do that with a military vehicle. You have to get to a physical concept level as fast as possible while minimising your spend on physical hardware – you simply do not have the funds to fund a huge prototype fleet. You have to rely heavily on digital tools, ensure the users have their requirements set as early as possible and then be able to move that quickly forward into the production environment."

Another difficulty Barnes highlights is that of ensuring a clear design brief. He says: "The biggest challenge in defence is getting the

innovation

Designing for military applications throws up a number of problems not faced in the civilian world. Paul Fanning finds out more.



customer to understand what they want. Typically, the MoD changes its mind the whole time. Even when you get into production, it's still changing its mind."

The problem, he claims, often starts with the failure to ensure clarity at the very beginning and the sheer number of variations required. He says: "They'll often start with a very vague set of requirements and they don't generally get that much more defined. We've had requests to change the GVW [gross vehicle weight] of Foxhound as much as three months into production – that's how significant changes can be. Also, there's never a single point of contact, so you have multiple users, different people who hold the budget, different people who set the requirements, different individuals and then you've got multiple end users – special forces, logistics, front line troops – all of whom have different requirements." It was this requirement for differing users that led Ricardo and partner Force Protection to opt for a modular design on the Foxhound Project.

However, this confusion in terms of liaison and brief need not necessarily be the case in defence applications. An example of an 'Urgent Operational Need' design that has so far managed to avoid some of these pitfalls can be found in the collaboration between Cambridge Design Partnership and the MoD in the design of a battlefield oxygen generator.

Getting oxygen to casualties on the front line within the first hour dramatically improves their chances of survival. At the moment, their best option for that is using an oxygen cylinder, but these present a number of problems: the first is that they are heavy; the second is that they're pressurised to 200-300bar and are incredibly dangerous if they are hit by shrapnel or a round of ammunition. Thus, as things stand, because of the issue of weight and the danger, oxygen is not there in that crucial 'golden hour'.

Cambridge Design Partnership responded to this need with a proposal for an oxygen concentrator solution. Stephen Lamb, a consultant at CDP explains the key innovation of the invention, saying: "Oxygen concentrators are already quite widely used already and are widely proven. And many of the portable oxygen concentrators are powered by batteries. But, because they're relatively powerful devices, you need a large, heavy battery to power them and you want it to have more than one hour's duration. The innovation here was to use diesel, which is the standard military fuel type, to power a small engine to replace the heavy batteries – making the whole solution lighter, smaller and safer."

The result is a source of oxygen that can run for hours on less than a litre of diesel fuel. There is also the potential to use the compact engine as an electrical power generator. This could power emergency lighting or patient monitoring instruments. The weight saving achieved by this method is significant. Typically, an off-the-shelf oxygen concentrator powered by batteries would be 8 or 9kg, while this solution is able to reduce that to 3kg.

Clearly, the design criteria for such a system are hugely affected by its status as a battlefield project. Says Lamb: "The two fundamental driving design factors – weight and safety – are directly derived from the scenario being on the front line. Now obviously this differs from a civilian application in that, in the civilian world, weight would not be so crucial as it's not being carried in someone's rucksack and you're certainly not being shot at most of the time! So equally, a high pressure system wouldn't be a problem in a civilian application, but certainly is when you're on the front line. If you were, for example, a paramedic in an ambulance, then these issues of a pressurised container and weight would not be problems. But weight and safety concerns arise purely because of

the military nature of the application."

Additional environmental factors unfamiliar to civilian applications also had to be taken into account. Says Lamb: "In terms of our work in the lab and design work, the early proof of principle stage is fairly similar to other applications, but the long-term implications for our design are very much altered by the fact that it's a military product. So weight needed to be much lower and robustness was crucial. It needs to be safe and much, much simpler to use than normal products. You also need heat emissions from the product to be much, much lower because you want the infrared (IR) signature as low as possible.

Another challenge was presented by the likely proximity of the system to helicopters, as Lamb explains: "It would be usual for a casualty to be evacuated by helicopter and, when a helicopter lands, you have enormous amounts of dust and wind swirling around the casualty and the equipment. Now we have to make sure that the air that's sucked in both by the engine and the oxygen concentrator is filtered to ensure it doesn't damage the system. That's a factor that comes about solely because it is a military device."

For all these complicating factors, however, one area where CDP has not faced the same difficulties outlined by Chris Barnes of Ricardo is in the liaison process. This was because the process involved the Ministry Of Defence's Centre for Defence Enterprise (CDE) as the single point of contact with the MoD. CDE, part of the Defence Science and Technology Laboratory (DSTL), is based at the Harwell Science and Innovation Campus in order to be open and transparent to the wider science and research communities and to act as the first point of contact for anyone who wishes to submit a research idea with a defence application.

Says Stephen Lamb: "The CDE are actually quite good at making sure we go through them as a main point of contact. They often bring people with them to look at the design – sometimes front line medics, sometimes surgeons from a medical point of view. Sometimes they're from an organisation called MERT [Medical Evacuation and Rescue Team], but also from more senior generals and people involved with equipment acquisition with the MoD. There is a whole range of people we actually interface with via CDE."

www.ricardo.com
www.cambridge-design.co.uk
http://www.science.mod.uk/engagement/enterprise.aspx

A single point of contact

The Centre for Defence Enterprise (CDE) is part of the Defence Science and Technology Laboratory (DSTL), is based at the Harwell Science and Innovation Campus in order to be open and transparent to the wider science and research communities and to act as the first point of contact for anyone who wishes to submit a research idea with a defence application.

Since its launch in 2008, it has received 2000+ proposals of which over 200 have been approved for funding at a total value of more than £14m.

CDE emphasises open innovation and attracting new suppliers from non-traditional areas, in particular small and medium sized enterprises (SMEs), academia (university departments and spin-out companies) and innovators. These are the sorts of potential suppliers who would normally be put off by the costs of entering a new market, particularly given the bureaucratic image of traditional defence procurement.

CDE is largely web based at www.science.mod.uk/enterprise and using a secure online proposal and assessment portal. This allows simple proposal submission which highlights important aspects of an innovation but also allows rapid assessment by experts from across MOD. In most cases a decision can be made within a few weeks of submission. Contracts are typically £20k-100k (a few of the very best get more) for short sharp studies to assess future potential and to inform funding decisions; approximately 50% of contracts go to SMEs. Successful projects may be considered for further funding under the main Defence research and equipment programmes.

CDE has two key "products", with all proposals received through the online portal:

A standing **open call** for proposals which allows anyone to submit a proposal at any time; these proposals are assessed on a monthly basis.

Themed calls address a specific requirement with a limited timespan of 6 to 8 weeks. These calls are published on the website and may also be supported by seminars. Individual theme calls can attract up to 100 proposals each.

CDE also has a wider mission to educate and stimulate the wider potential supplier base through regular presentations and surgeries around the UK. These provide a broad general insight into MOD's requirements and are particularly recommended for new suppliers; they are also popular networking opportunities. Information and registration for events is available on the CDE website.

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High flyer

The challenges facing the airline industry have never been tougher. Justin Cunningham talks to Phil Maher, director of engineering at Virgin Atlantic, about how his team engineers solutions.

Operating in one of the most competitive sectors in the world, the engineering pressures and responsibilities on large airlines are unparalleled. Extraordinary care must be taken to manage and control maintenance processes to ensure operational efficiency and, of course, safety become an intrinsic part of the organisation. Additionally, given the competitive nature of the airline industry, introducing and investing in the 'right' new technology is essential in keeping costs down and staying on top.

One of the major challenges facing the sector is product differentiation. Boeing and Airbus have both taken a rather Henry Ford approach to production which means aircraft delivered to airlines around the world are now generic and standardised. It is therefore up to engineers at Virgin Atlantic to drive that differentiation into its aircraft to distinguish them from competitors.

This creates many engineering challenges for Virgin's design and product engineering teams. "To turn an aircraft into something that is bespoke and specific to Virgin takes a huge amount of effort, energy and thinking," says Phil Maher, director of engineering at Virgin Atlantic. "We normally have to start about three years ahead of an aircraft delivery."

Maher would like to see engineers at Airbus and Boeing modify this approach and think about how they can continue to drive cost out of the manufacture process, but also add flexibility in terms of what the operators want and need to provide. Good advice for most engineers.

"The manufacturers have accepted the need for simplification and cost reduction, but that is being done at the expense of customisation to the aircraft," he says. "We want to provide something unique and special for the passenger. As a result, we have a cabin customisation programme that looks at everything from hard products such as the seats to softer elements such as carpets, colours, service interfaces and technology interfaces."

So obsessed is it with providing a bespoke experience to passengers that Virgin decided to rewrite the software for its In-Flight Entertainment System. This, Maher says, has helped fundamentally change the experience of passengers. "It now behaves and operates like an iPad," he says. "It changes everything from Video-on-demand to how you can call for a drink from the galley, to what you are going to order for food. So it feels more like a bespoke concierge service."

Virgin is also unique in that it designs and manufactures its own seats, setting up a company called Reynard Aviation. With the seats

Photograph: Charlie Milligan

Background

Phil Maher, director of engineering at Virgin Atlantic, joined the Irish Air Corps as an apprentice and learnt the skills of the trade over four years. His next major career step came when he joined British Airways, and over a period of 12 years gained increasing qualifications. At 27, Maher decided he wanted to go into management and has since completed an MBA from Henley Management College.

"Like a lot of engineers I have a lot of qualification and accreditations," he says. "This reflects a personal commitment to ongoing professional development.

"This is a point to make around apprenticeships; it gives you the foundations to develop the career you want whether you become a highly skilled specialist or go into more generalist management. The opportunities provided by engineering qualifications and apprenticeships are unparalleled."

being such an important part of the passenger experience, Virgin wants its 'point-of-difference' on flights to be very obvious in terms of comfort, feel and experience.

"We look at the seat's looks, comfort and function," says Maher, "And then you look at how that seat will interact with technology such as in-flight entertainment, the connectivity of phones or laptops, how the passenger interacts with that media as well as the service aspect, such as how will the trays pull out and fold up."

"Manufacturers have accepted the need for simplification and cost reduction, but that is being done at the expense of customisation"

Other elements of its product differentiation include the paint scheme. Virgin recently trialled a paint called Andaro that provides a very high quality finish similar to a top-end car as opposed to the industrial paint normally applied. "This is an integral part of our branding but within that there are environmental benefits," he says. "It is lighter paint, lasts longer and looks better. But, of course, it is more expensive."

The paint has a top clear lacquer layer and Virgin is currently evaluating a special polish coating called TripleO which uses nano technology to fill tiny gaps, impurities and scratches on the surface of a panel down to nanometres. This gives, for example, the surface of the leading edge of a wing near perfect smoothness that can reduce friction by 39% and result in a 1-2% fuel burn reduction. This may not sound much, but across a fleet of aircraft over the course of a year, it could result in the saving of millions.

"However, we believe that the finish we have from the Andaro paint is already delivering fuel savings," says Maher. "So the TripleO would likely not yield as much benefit as it would on a standard paint scheme so we are still evaluating exactly what the benefits are."

However, the biggest challenge for the wider aircraft sector is the need for a step change in fuel burn ratios. How will it drive a 50 or 60% improvement in fuel burn? "Those are the sort of numbers we need to be thinking about," he says. "That is probably addressing the engine technology, the airframe technology, the stage length, the speed, so these are a really complex set of challenges."

Another major challenge is the skills gap. Like many firms, Virgin fears the 'demographic time bomb'. With about 35% of its staff over 46 years of age – and based on the notion that people might retire on average at 65, then it will experience a major demographic shift in its staff over the next few years.

However, the demographic issue at Virgin also will coincide with a change in engineering requirements. Aircraft are increasingly being made out of composites and have an increasing array of onboard sensors and diagnostic equipment integrated throughout. Younger engineers are likely to be more au fait with the IT aspect of these technologies and how software might be integrated into a maintenance and engineering role.

"That actually raises a bigger question for us, and probably for wider industry," says Maher. "Managing the cultural impacts of what is happening with commercial technology and the impact that has on the thinking of an engineer. Does it lead, for example, to a need for instant answers and instant results that we might need to temper? So when we look at technology impacts, we of course look at the technical aspects, but also how it might change an engineer's behaviour and what we have to do to manage that."

www.virgin-atlantic.com
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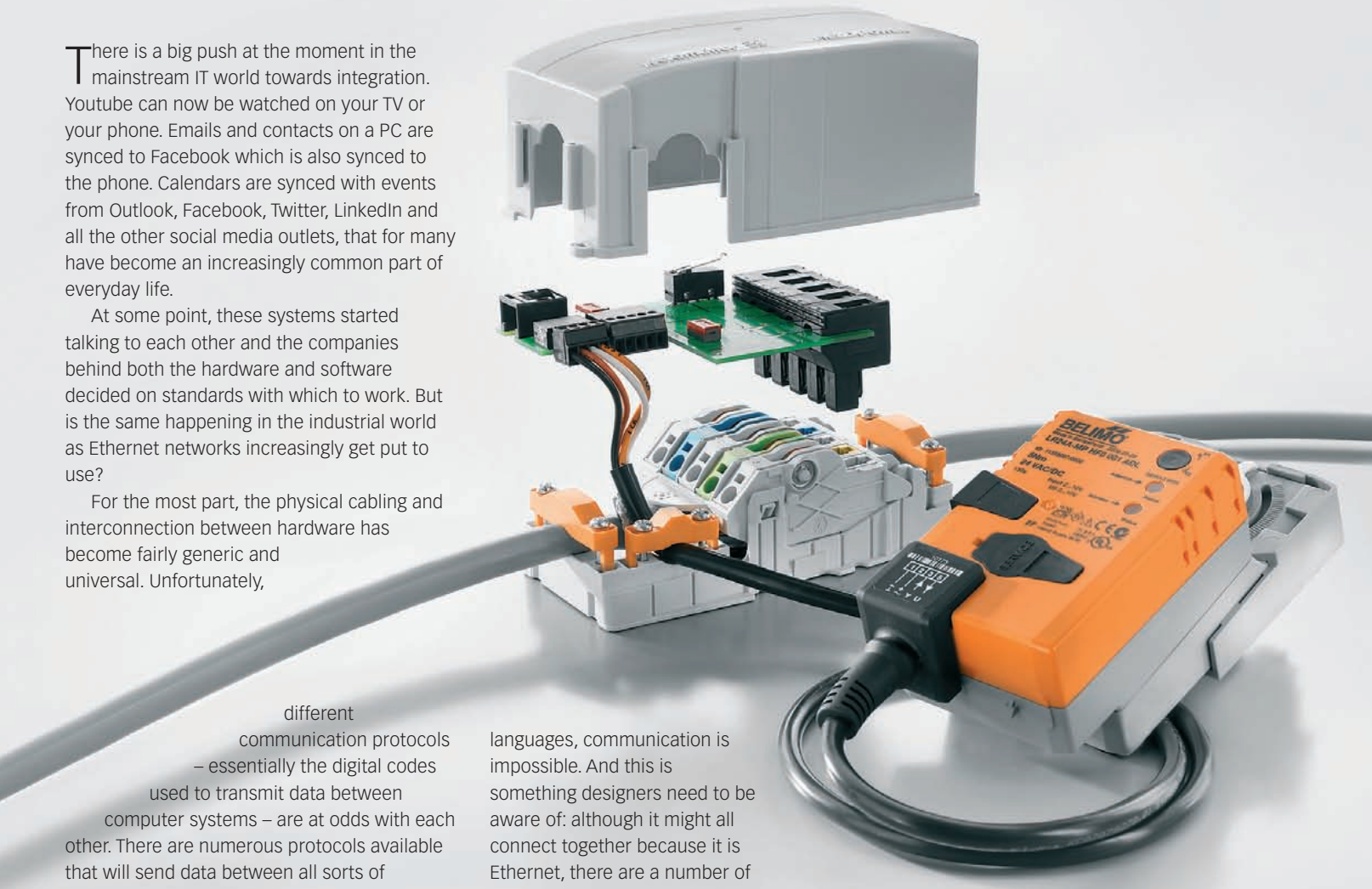
Collaboration key to industrial Ethernet

Industrial Ethernet is making connectivity between industrial devices better than ever. But is this giving design engineers a headache? Justin Cunningham reports.



There is a big push at the moment in the mainstream IT world towards integration. Youtube can now be watched on your TV or your phone. Emails and contacts on a PC are synced to Facebook which is also synced to the phone. Calendars are synced with events from Outlook, Facebook, Twitter, LinkedIn and all the other social media outlets, that for many have become an increasingly common part of everyday life.

At some point, these systems started talking to each other and the companies behind both the hardware and software decided on standards with which to work. But is the same happening in the industrial world as Ethernet networks increasingly get put to use?

For the most part, the physical cabling and interconnection between hardware has become fairly generic and universal. Unfortunately, different communication protocols – essentially the digital codes used to transmit data between computer systems – are at odds with each other. There are numerous protocols available that will send data between all sorts of industrial equipment, from Human Machine Interfaces (HMIs) to Programmable Logic Controllers (PLCs) to sensors and robotics. But whether that data is received and understood is another question.

"To use an analogy, any two people can pick up a phone and call each other," says Mark Daniels, field business leader at Rockwell Automation, "but if they are speaking different languages, communication is impossible. And this is something designers need to be aware of: although it might all connect together because it is Ethernet, there are a number of different protocols which exist within Industrial Ethernet that are not compatible."

There are several major protocols that have managed to secure a large portion of the market. These include EtherNET IP, ProfiBUS/ProfiNET and other more niche protocols such as EtherCAT. Andrew Starr, Professor of maintenance systems and head of integrated maintenance centre at Cranfield University says: "Where software doesn't work together very well is when there are arbitrary proprietary protocols. So if you can only buy non-standardised software from one or two companies. This makes things incompatible.

However, depending on the size of the corporation, they may or may not have to give in on that.

"For example, sending someone a document is Microsoft Word is not a standard, it just has dominance in the market, so it's become a de facto standard." And this is the position of the Industrial Ethernet market at the moment: several companies pushing different, incompatible standards to try and gain enough market share to become the de facto standard.

However, this can all cause a headache for design engineers tasked with bringing to life Ethernet systems in and around a firm's operations. Obtaining equipment that all speaks the same language is often not simple and straightforward. And for many engineers, although venturing into the IT domain is a little out of the comfort zone, it is often a necessary step.

Starr adds: "There is a tendency for some of our colleagues to believe we can compartmentalise the design process or segment it. But there are great benefits to be had from early integration. It's wise that the total concept is thought through from the outset in a collaborative and integrated manner. You can see products and devices that are fundamentally well integrated in terms of mechanical, electrical, and electronic engineering; really common things from washing machines to cars. They are good designs because integration has been fundamental to its core."

However, while it is advisable to seek the advice of IT colleagues, engineers should remain mindful that the requirement of an Industrial Ethernet network is very different from a commercial one and will require very different equipment and infrastructure.

For example, redundancy recovery time – basically the time it takes for a computer to find the RAM and disk space to perform a function – could be between 1 and 30 seconds in an office network. This is fine if you are waiting for an email, but if part of your high-speed production line drops out, even for a few seconds, it will create massive problems. It requires separate and distinct infrastructure to be put in place.

John Jackson, UK electronics and strategic channel manager, at Weidmuller says: "You do not want a Windows update from the IT department broadcasting out into a PLC which is controlling an arc welder or a furnace and shutting it down. That has happened. You need separate infrastructure as the needs in terms of mean-time-before-failure, operating temperatures, redundancy requirements is much greater in an industrial environment. Cabling is also very important; to fit a £2 patch lead into important equipment such as a welder would go against the grain of good practice."

Given the pace at which connectivity and

interoperability is currently accelerating, careful consideration toward scalability of an initial implementation should be taken. Given the need for the physical hardware to have a lifecycle of 15 to 20 years, future support, compatibility, robustness and longevity of that equipment should be at the forefront of any engineers' decision making.

"We always recommend having as much spare capacity on the network as possible," says Jackson. "Think about not just what you might put on the network today, but what you might want to put on to it in the future. If you are putting in an Ethernet network on the plant floor, we would recommend 1Gb on the backbone."

As PLCs get faster, HMIs improve and data collection and data logging become much more prevalent, the network will then have the capacity to move large chunks of data around effectively without causing latency issues to the plant it is connecting to.

Industrial Wireless Ethernet coming of age?

Applications for wireless technologies are increasingly finding the way into industry, often to get round the challenges of difficult cabling. There is now enough experience out there to know how to deploy wireless in the industrial workplace; where it will work, and where it doesn't.

"You need to look at a site survey to see what reflections and physical space you are working in so you can deploy the technology in a way that you can gain yourself a reliable signal as possible," says Mark Daniels, field business leader at Rockwell Automation. "You do have to understand very clearly what your particular work space will look like and then deploy the aerials in appropriate places to make it work."

Wireless has, to date, been quite attractive to the process industry, for example, where instrumentation is generally used for lower speed applications. It's also found use in plants where cabling can be difficult to implements, such as on overhead cranes inside warehouses.

However, despite the enthusiasm, it is likely that many design engineers will always design, where possible, with hard cables because of their predictable, reliable nature. So, despite advances, wireless still seems to give engineers concerns in terms of reliability of data transmission and security.

"Although everyone talks about it," says Daniels, "and there are definitely good applications for it, it still has a long way to go before it is considered the future of industrial connectivity."

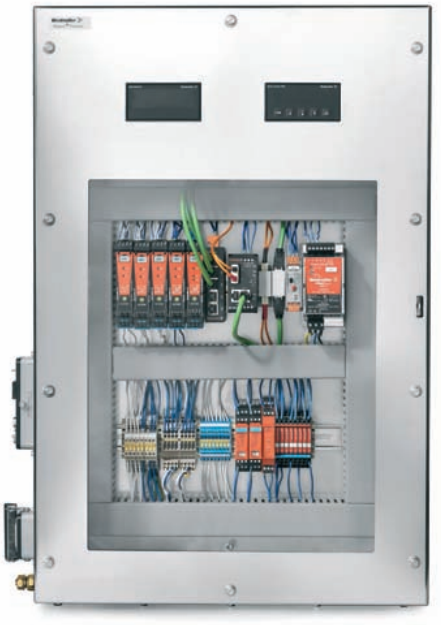
What is industrial Ethernet?

Ethernet is the name given to a method of creating a certain types of computer network. Specifically, Ethernet refers to a method of cabling, and the way the data is transmitted. Industrial Ethernet essentially uses the Ethernet family of computer network technologies but in an industrial environment, for automation and process control.

A number of techniques are employed to make Ethernet suitable for industrial processes, which require real-time behaviour. This allows a plethora of data from multiple plants and sites to be available instantly, and integrated together.

The technology could be applied to large infrastructures such as offshore wind turbines to multi-national manufacturers to monitor plants all over the world, or equally to smaller tier1 and tier 2 suppliers to more thoroughly manage their production and supply chains.

It allows real-time information about the latest batch of parts, the bearing wear on the machines that made them, CCTV access to bottlenecks in production, wastage level information, energy usage all synced to production schedules, output levels, live deliveries, financial predictions and anything else that the user can think they would want from the system.



So the aim is that one network has a multitude of applications. With a managed switched infrastructure. It is then possible to separate the network in to Virtual Networks, make use of Cloud Computing, as well as adding on additional capability such as voice-over-internet, CCTV within the plant infrastructure, barcode systems and vision systems; all of which would not normally have the potential to plug on to the network.

Daniels says: "When you start opening up all these technologies, you start to integrate enterprise applications into your industrial applications, and when you do that you get some fantastic benefits. It starts to give you completely connected enterprise, which means data information about every part of your firms operations can be used across the whole enterprise. That is a tremendously powerful tool that will allow both engineers and management to make the right strategic decisions at the right time and run a much more effective business."

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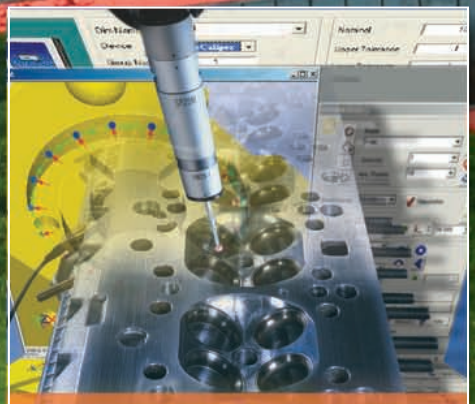

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Q&A

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Injection Moulding and the Environment

Q How 'Green' are injection moulded parts?

A Environmental considerations are becoming increasingly important when designing injection moulded parts. There are two aspects – the green credentials of the polymer being used and the end of life recyclability of the product.

Q Are there polymers that are more environmentally friendly?

A You can use reprocessed plastic. The majority of reprocessed material is recovered from plastic scrap and is the purest form of plastic as it is normally well sorted, clean and dry. Domestic waste and end of life reclaim are often dirty, wet and of mixed types. This makes recycling more difficult and costly although there are now some very innovative plants dealing with this type of waste in a cost effective way.
The scrap is sometimes blended with some virgin polymer to produce a reprocessed grade with the required properties. A wide range of reprocessed polymers is available although colours are limited.

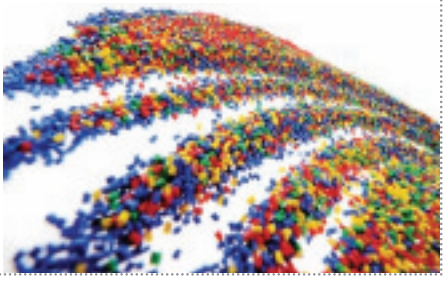
Q Are there any plastics not derived from oil?

A There are an increasing number of Bioplastics being developed. These are produced from renewable sources that are generally plant based. At the moment there is a limited choice of polymers for injection moulding but this is an area of future growth. Potentially 90% of polymers could be replaced by bio-based equivalents.

Q What do I need to consider for my product to be easily recyclable?

A Although functionality is still the primary consideration, designers now have a responsibility to design with economic use of materials and end of life recyclability in mind. Whenever recycling parts it is desirable to just be able to discard them without any further action, any dismantling and sorting of components should be minimised. Where possible make components from the same material. If parts need joining, avoid threaded inserts if possible. One alternative is the use of snap-fits wherever practical. If any form of bonding is required, polyester and polyurethane adhesives should be avoided. Also try not to use decorative paints, lacquers and protective coatings. When printing or using some other form of decoration, use easy to remove secondary mouldings as the base.

Rutland Plastics has the Environmental Management Standard ISO14001:2004.

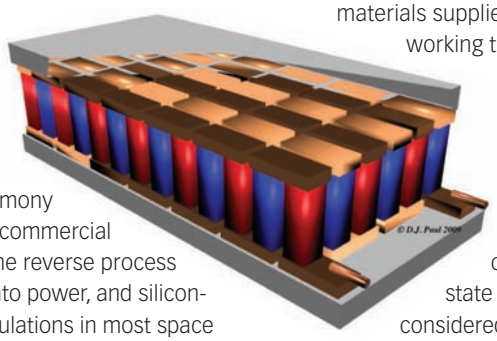


Tom Shelley reports on some of the developments aimed at producing electricity directly from car exhausts and other waste heat sources.

Exhaust heat to be source of direct power

While solid state devices are well established for using electricity to directly cool electronic devices, and for turning heat from nuclear sources into power for deep space probes and military satellites, the move in the UK, Europe and the US is to dramatically improve efficiencies and cut costs with a view to producing electric power from car exhausts.

It is well known that car companies such as BMW and Fiat are heavily engaged in developing solutions and that NASA has set itself the goal of coming up with materials that perform the conversion process more than five times better than what is available today. At a seminar organised by the NanoKTN, Professor Douglas Paul at the University of Glasgow referred to the use of bismuth telluride and antimony telluride in most commercial Peltier coolers, the reverse process of turning heat into power, and silicon-germanium formulations in most space applications. A lot of research is going into using bismuth telluride as a waste heat or even human body heat as a power source but as Professor Anthony Powell of Heriot Watt University pointed out that tellurium makes up only about one part per billion of the Earth's crust similar to the abundance of gold and platinum, and there is no natural tellurium ore. Hence, for this reason, outside NASA, the way forward has to be to design materials that will do the job without using tellurium.



Relative performance is decided by a 'Figure of merit', which has the Seebeck coefficient squared, multiplied by electrical conductivity, divided by thermal conductivity. Most substances with good electrical conductivities tend to have good thermal conductivities, but big improvements in the relevant ratio can be made by nanostructuring to take advantage of quantum effects in wells, wires, dots and other configurations.

The NanoKTN event was sponsored by Johnson Matthey, and it did not deny that it hoped to turn up something that could be added onto car catalytic converters with materials supplied by the company. The working temperature should be around 1000°C.

Dr Gao Min from the Cardiff Thermoelectric Centre at the Cardiff School of Engineering was optimistic about the near term commercial prospects for solid state heat to power conversion. He considered that it should be viable even to tap heat from the human body to power sensors, arguing that even at an efficiency of only 0.3%, and a temperature difference of 5K, the conversion of the available 6mW/cm^2 to 20μW/cm^2 should be more than adequate to power devices.

The only completely different approach put forward at the meeting was by Dr Neil Fox of the University of Bristol, who was advocating the use of diamond thermionics, based on the physical principles used for decades in vacuum tube electronics. A prototype unit has been developed for E.ON with inkjet printed, lithiated, nanocrystalline diamond electrodes. The intended application is as the power generator in a solar concentrator system, instead of using steam raising boilers.

Design Pointers

- Direct solid state conversion of heat to electric power is already well established in niche applications
- Efforts are now being devoted to raise efficiencies and reduce costs with the aim of economically producing electric power from waste heat sources

Huntsman takes the driving seat

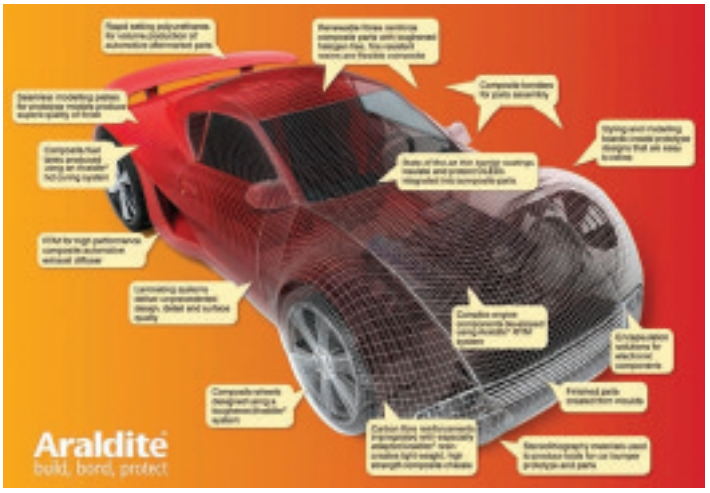
Huntsman has recently been involved in a number of ground-breaking, industry 'firsts' for the successful application of composites in the automotive industry.

Amongst these was the 'U-Box', which demonstrates the possibilities of building an electric concept car using sustainable components. Huntsman researched and developed innovative products used in each stage of the car's construction, from toughened, halogen free and fire resistant resins, to flexible composite, state-of-the-art thin barrier coatings for composite bonders

Another first for the company was an Araldite resin system especially adapted for 'RTM-Lambo'; a cost effective out-of-autoclave technique developed to produce Lamborghini's first production carbon fibre chassis A toughened Araldite system to design a composite wheel for the high-performance vehicle market with better impact resistance than metal wheels and higher fatigue resistance

A composite fuel tank was also developed by MCS using an Araldite hot curing epoxy system, providing lightweight benefits, high fuel capacity and the durability required for use by performance and endurance vehicles

www.huntsman.com



Resin gives advanced performance

DuPont Fluoropolymer Solutions has announced the commercial availability of a new perfluoroalkoxy-based resin for insulation of wire, cable and intricate electronic parts. The new fluoropolymer resin, DuPont Teflon® PFA 416HP, features a high melt-flow rate while maintaining very good MIT flex life. These characteristics offer coaxial wire manufacturers, semiconductor OEMs and electronic device designers the ability to coat ultra-thin gauge wire and to injection-mold fine, intricate thin-wall parts in a more efficient manner .

DuPont Teflon PFA 416HP resin provides all of the advantages of PTFE – including ultra-high thermal resistance and dielectric properties – and combines those critical attributes with a very high melt-flow rate. These inherent characteristics enable almost transparent coatings on ultra-fine wire, such as are used in mobile telephones, medical sensor wires, laptops and smart phones.

www.dupont.com

Ultem fibre used in workwear

Sabic Innovative Plastics' versatile, high-performance Ultem polyetherimide (PEI) fibre has found an important new application in high-end work wear and protective clothing. Japan Wool Textile Company, a division of NIKKE Group, is now blending Ultem fibre with wool and other materials to produce yarn, fabrics and garments that offer a unique combination of comfort and protection, including permanent, non-halogenated flame retardance (FR) and excellent ultraviolet (UV) resistance. Unlike traditional aramid materials, Ultem fibre can be easily and cost-effectively colored in a wide range of shades using conventional polyester dyeing processes, enabling Japan Wool Textile Company to enhance the aesthetic appeal of its new line. SABIC Innovative Plastics continues to penetrate and grow new market segments and expand the range of applications for its globally proven Ultem resin technology to give customers innovative new options for product differentiation and exceptional performance.

"The work wear and protective clothing sector has outgrown traditional materials, and our Ultem fibre offers a significantly better option," said Kim Choate, global product marketing manager, SABIC Innovative Plastics. "This flexible, soft and colourable fibre provides superior comfort and aesthetics, plus sustainable FR technology and the highest level of protection and durability for workers in safety-focused industries such as oil and gas and chemicals. We foresee many other uses for this versatile fibre, which has already broken new ground in composite aerospace boards for aviation interiors, filtration media and other applications."

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Composite connectors for solar impulse aircraft

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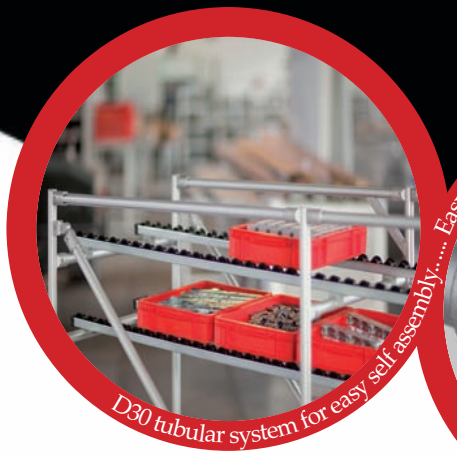
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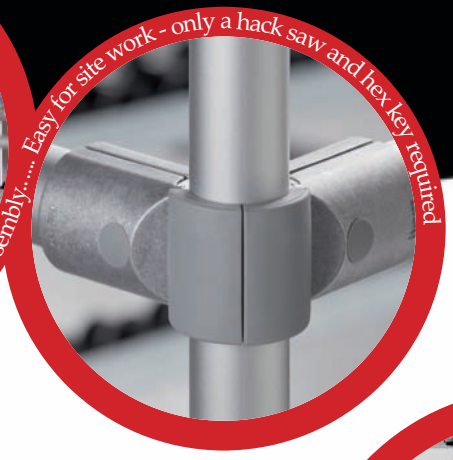
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Eureka speaks to the leading lights of the manufacturing industry

View from the Top

"A government-backed scheme to get students to tour factories could be a starting point for stirring youngsters' aspirations"

Will Butler-Adams

"There's a speed at which you can grow. We can't throw hundreds of thousands of pounds in and transform into a Toyota overnight. We've got to grow incrementally."
***Will Butler-Adams**, Brompton Bicycle*

Brompton has become a thriving SME thanks to its folding bikes. MD Will Butler-Adams tells Max Gosney how he'll use the brand's appeal to build a new UK manufacturing giant.

Going from small to big should come as second nature to Brompton Bicycle. The Brentford-manufacturer has built a thriving £14m business on producing compact packages of metal and rubber that transform into full-sized bikes. Now, says managing director Will Butler-Adams, the company is to extend its engineering ethos into the business market.

"I think there's an opportunity for a huge business, one that could be bigger than the global bike manufacturers like Giant and Specialized," he says. "Those manufacturers have managed to create a multi-billion pound market based on bikes for recreational use." Brompton's bike appeal stretches further afield, explains Butler-Adams. "There's been a real renaissance in people using bikes as a mode of transport. We're selling to people who need a bike to get into work and want to keep fit at the same time. The opportunities are massive."

The bike's popularity has fuelled 15% year on year growth at Brompton since 2004. The success bought Nick Clegg and Vince Cable to visit Brompton's site in January, acclaiming the firm as an example of the future direction for UK manufacturing.

Yet despite the plaudits, Brompton faces a herculean task to achieve its ambition of going from SME to global player. The UK is home to fewer large manufacturers than Germany and the US, according to EEF research, with domestically-owned giants the rarest breed. Many bright flames suffocate beneath lending difficulties, red tape and hostile taxes. However, Brompton can buck the trend, says Butler-Adams.

"We're interested in making a good folding bike, but as it happens we've also created a powerful brand," he says. The Brompton allure is particularly strong internationally. Over 70% of business is export based with models carrying a cache as 'the London bike'. Much of

Expanding on contraction

the Brompton's popularity has been achieved through word of mouth says Butler-Adams, and there is plenty of scope to develop markets in the EU, Japan and China. International growth can be achieved even if there is a recovery in the strength of the pound, he predicts: "People are not buying us because we're the cheapest. It's about the strength of the product and the fact we do it better than anyone else."

Hurdles to expansion are far more likely to come internally, he believes. "There's a speed at which you can grow. We can't throw hundreds of thousands of pounds in and transform into a Toyota overnight. We've got to grow incrementally." Brompton plans to fund target growth of 5-15% per year independently, according to Butler-Adams.

Going it alone will be rife with challenges, reflects Butler-Adams. One major difficulty will be the increasing rarity of companies like Brompton across other sectors in UK manufacturing. "We used to get our raw materials in the UK. If we were sourcing aluminium we'd only want a small volume and we were able to piggy back on to another manufacturer's order. Now that other company no longer manufactures in the UK." Brompton has had to turn instead to Taiwan, Russia and the US to source raw materials. The trend could be a fatal flaw in the UK manufacturing renaissance, warns Butler-Adams.

It's a point the Brompton boss took up with the business secretary Vince Cable during his site visit. "I was trying to explain to Mr Cable that there's a guy around the corner who supplies injection mould parts. "You would look at those parts and think there's nothing advanced about that. But there's huge intellectual property in the machines that makes that product."

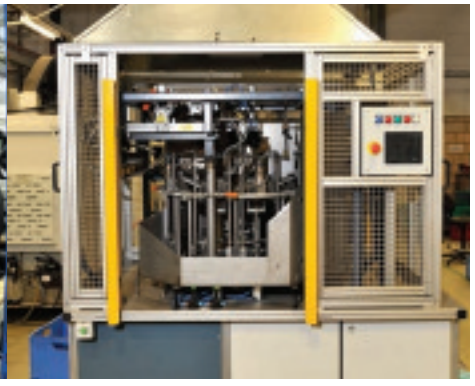
And the risk of vanishing IP isn't a problem confined to production techniques, stresses Butler-Adams. The Brompton boss is unequivocal on why the UK lags behind in producing domestic manufacturing giants. "I believe we don't have the best minds coming into engineering. Somebody I look to as an outstanding business leader is Sir John Rose of Rolls-Royce. He is a great mind but never trained as an engineer." The industry is only attracting a very narrow pool of talent, he says. The students with more of an entrepreneurial flair are simply not being switched on to engineering. "We could do so much better if we got those bright minds to see engineering as a career," he says.

The turnaround must begin with a major shake-up of our schools, urges the Brompton boss. "The education system serves a ridiculous league table system and that's wrong. Schools are not delivering to employers or pupils. Half of teachers don't have a clue what a modern manufacturer does." When youngsters are given a true flavour of the factory floor they're often inspired, he says. Butler-Adams takes his bikes on tour to local schools to try and pique interest. "It's a shame I turn up on my bike because they probably think manufacturing is not very well paid," he jokes.

A government-backed scheme to get students to tour factories could be a starting point for stirring youngsters' aspirations, reflects Butler-Adams. But he cautions against early claims of success. "We'll only know in five or ten years whether it's worked," he says. "Whether you think the initiative is right or wrong, at least they are trying." But Westminster must show long-term commitment to truly harness sustained growth in UK industry, he stresses. "We're not like the service industry where you stimulate things for a year and then clear off."

That's why Brompton has a relentless focus on product development and testing: "Companies can get overexcited about their brand and forget about developing their products. It a bit like the emperor's new clothes," he explains. Brompton is currently carrying out rigorous tests on a new electric-powered bike and trialling it with user groups, reveals Butler-Adams. "Detail matters. The closer you want to get to perfection the harder it is. We can all play tennis, but we aren't all good enough to get to Wimbledon."

With a renowned brand, innovative engineering and unquenchable ambition, Brompton has all the aces to play on the bigger stage. "In five years' time we should have doubled or trebled turnover," says Butler-Adams."We'll maintain the same growth of 10-15% but against a turnover of £50m we'll be in a position to take on the global players."



"In terms of simulation software, we're seeing more than 10% of our customers now using simulation"
***Alan Sampson**, Managing Director, Solid Solutions*

As the UK's leading SolidWorks reseller, Solid Solutions can boast a comprehensive grasp of the state of the CAD market. Paul Fanning talks to MD Alan Sampson.

Alan Sampson has been in a privileged position to see the development of CAD in the design engineering sector. With a background in the automotive and electronics sectors, he went on to found Solid Solutions, which has grown over the years to become the UK's biggest reseller of SolidWorks.

In the early days, he says, both the technology and the cost were prohibitive for most companies. He says: "We worked with CAD from previous generation products. They were Fortran-based and a bit twitchy and they cost £50,000 to £100,000 per seat. However, we saw the writing on the wall with the emergence of the PC platform becoming strong enough to run 3D CAD."

Solid Solutions was founded 13 years ago to meet this demand. Originally envisaged as doing small volumes of high margin work, it soon found itself expanding to a degree that surprised its founders. Says Sampson: "We were a bit late to the market. There were 10 other resellers when we started - some had been around for years. We set about trying to bring some of the programming and customer support into that marketplace. We never thought we'd get this big, but actually we quickly found ourselves vying for pole position. Five years later we became the biggest UK

Top seller

SolidWorks reseller by a long way and a not long after that the third biggest in Europe."

Needless to say, this success has brought a raft of other responsibilities. Many of these have been imposed by SolidWorks itself, but others have come about as a result of Solid Solutions' ambition and desire to be the leader in its market. Probably the single biggest factor setting Solid Solutions apart is the number of certifications held by its staff in different competencies. SolidWorks introduced these certifications for its products and it is a discipline Solid Solutions has embraced wholeheartedly.

Says Sampson: "There are 20 different packages or discrete products within SolidWorks and, beyond that, there are now seven or eight simulation products. There has been a massive proliferation in products and each one has an associated certification with it – a formal exam our engineers can sit and, if they attain a certain number of certifications, they achieve what is called an 'Elite' status. It's a huge amount of effort, but everyone's bonused on which certifications they have. We put a massive amount of investment into getting our staff to do this…In fact, we're just about to achieve our 13th Elite qualified engineer, which is far more than any other reseller anywhere in the world and, I believe, it's actually more than SolidWorks has. What it means to our customers is that when we have an engineer on the phone, they can give them answers and solutions quickly. It doesn't waste our time or the customer's time and we have a highly satisfied customer as a result."

Having started in the Midlands, Solid Solutions now has offices in Fareham, Leeds and Durham, as well as satellite offices in Cambridge, London and Sheffield. The company now has more than 4,000 customers, 70 staff and has seen double digit growth every year – even during the downturn.

Much of this success is, of course, down to the quality of the individual engineers and Sampson claims the biggest limitation on his company's growth is the ability to get good personnel. He has a very definite idea of what sort of person he wants, saying: "The engineers we employ are problem solvers. One of my favourite interview questions is the old Microsoft one about why manhole covers are circular. There are a number of good design reasons for it and if a guy can come up with three of them, it gives you a really good idea of how his mind works."

But it isn't just about educating the Solid Solutions workforce. "Customer focus has been key for us," says Sampson. One way in which this has been evident has been in the development of its 'Webcast Wednesdays'; web-based ongoing customer development with two one-hour webcasts every week on specialist topics.

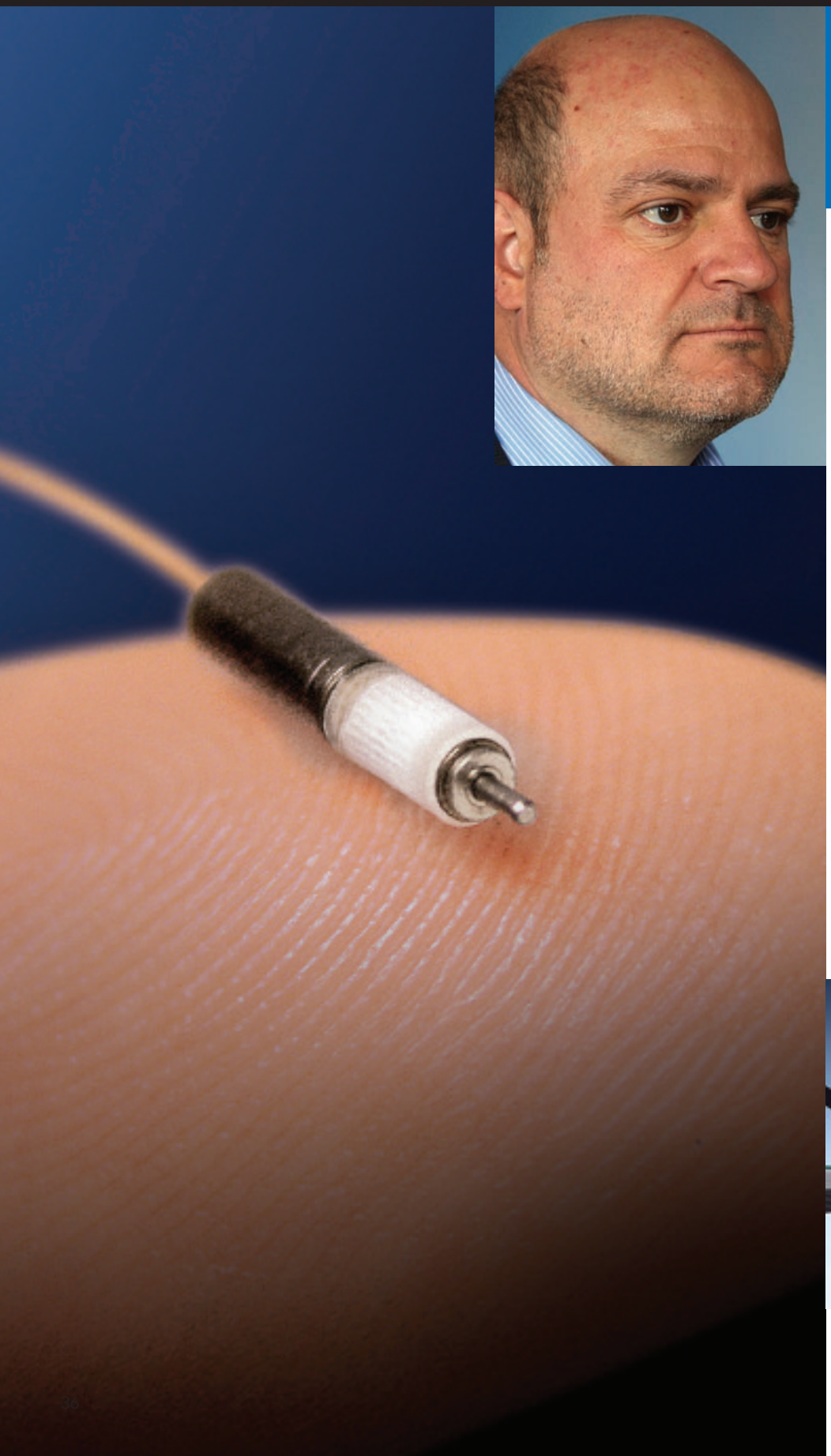
With regard to the future of CAD, Sampson believes that most of the significant modelling issues related to the software itself have been resolved. He says: "We've solved the problems of how to create a shape, how to put those shapes together and how to make detailed drawings from them. To continue trying to invest into those algorithms is a case of diminishing returns…. It's really now about how you take that virtual prototype and what you can do with it. Can you make it lighter? Can you improve its quality? Can you avoid having to create prototypes and test it in a virtual world? Can you review and control it? Can you use the CAD data to produce high quality marketing material?"

He is also convinced that, beyond CAD, simulation is assuming an increasingly significant role within engineering design, saying: "In terms of simulation software, we're seeing more than 10% of our customers now using simulation. The sort of simulation software that once only the likes of a PhD graduate at Rolls-Royce would have used, is now being used to determine how well a drainhole cover will cope with a British Standard test."

Equally, for all the talk of cloud computing, Sampson believes that it will not significantly affect the fundamentals of CAD software. He says: "I am sure that cloud-based technology will alter the platforms we utilise but this is only relevant if it delivers real end-user benefits. These will most likely be flexibility and cost savings rather than fundamental changes to the nature of the way that CAD aids design"

www.solidsolutions.co.uk

"The emphasis for us was to put ourselves in a position whereby if we could not satisfy an application with a standard product, we could instead design a bespoke solution"
***Stewart Goulding**, Electro Mechanical Systems*



As a leading supplier of motors and a manufacturer, EMS is well placed to assess all aspects of the industry. Paul Fanning reports.

EMS (Electro Mechanical Systems) could appear at first glance to simply be a components supplier, however this could not be further from the truth. While the company's success has been founded on their specialist knowledge and supply of small DC motors and drives, As Sales & Marketing Director, Stewart Goulding is keen to emphasise 'catalogue sales' is far from being what EMS is all about.

Established in 1985 as exclusive distributor for two principal manufacturers, Faulhaber and Magnetic (now SKF), EMS has since added ranges from a number of complementary high quality manufacturers in the small drives market. Says Goulding: "We're specialists in fractional horsepower motors up to 250 Watts."

The company's customer base is extremely diverse, ranging from manufacturers of medical devices, laboratory equipment, optical devices and stair lifts. Says Goulding: "Our customers are extremely varied. We are involved in virtually every application you can possibly imagine. From aerospace, defence, medical devices, disability aids right the way through to cattle feeders and chicken egg incubation."

With such a diverse product portfolio and broad customer base, it is crucial that EMS works closely with its customers to achieve the desired end result, something achieved in no

Motoring ahead

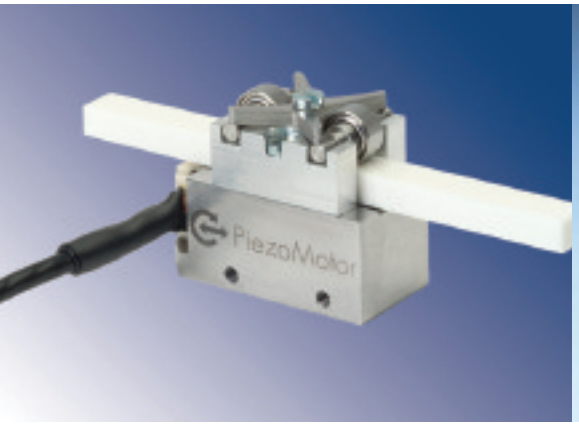
small part thanks to a number of highly experienced and qualified field sales engineers, affording nationwide coverage. According to Goulding, the company pride itself on offering a highly consultative service, which is essential when specifying the drive element for a technically demanding application. "In a complex piece of equipment the drive motor is not always the first element to be considered. The focus is on the whole product, including power supply, electronics, packaging and aesthetics, most of which ultimately define the space envelope available for the motor. It is often assumed that the drive element can come later in the development but that is not always the case."

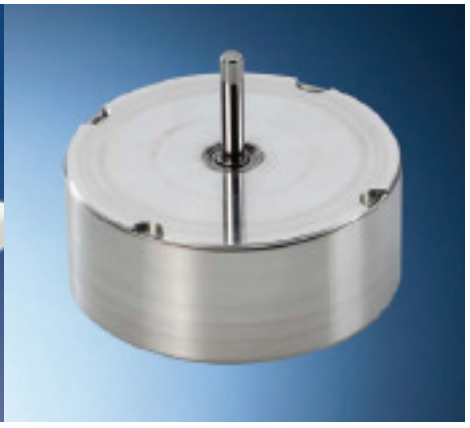
EMS understands intimately the criticality of the design process, due in no small part to it having its own design and manufacturing facility in the UK – something that Goulding believes differentiates the company from others. The manufacturing facility came about as a result of a desire on the part of the company to be involved in the design and manufacture of small gearboxes and drive mechanisms and in 1990 a small engineering company was acquired, with an established market in the field of remote handling equipment for the nuclear industry.

The next step was for the company to start to design a standard gearbox and a gap in the market was identified for a small 2Nm spur gearbox that was compatible with their existing motors. This was launched in 1994 and remains in production today, but from this point onwards the company has continued to design and manufacture small bespoke drive mechanisms.

Goulding explains the reasoning behind this move, saying: "The emphasis for us was to put ourselves in a position whereby if we could not satisfy an application with a standard product, we could instead design a bespoke solution. This could take the form of simple added value by way of a pressed pinion, mounting adapter or wiring loom, all the way through to a complete new design from a blank piece of paper; a complete solution. Typically we do not charge for our design time, but we only use our design resource to develop products that will ultimately put production onto our shopfloor. Of course we are not adverse to manufacturing to our customers' drawings as well."

The manufacturing side of the business has grown in the last 10 years and the facility has expanded to 2200m^2. EMS' annual turnover now exceeds £12m of which manufacturing accounts for 25% and is complementary to the core business of distributing small DC motors and actuation systems. Says Goulding: "On the back of custom solutions we have been able to sell more motors. Virtually everything we design at the factory has a motor integrated from one of our principal suppliers."





Goulding feels that the desire to save energy is one of the major drivers in his market at the moment. The need for greater energy efficiency throughout industrial and domestic markets is resulting in increased interest in brushless DC motors. Moreover, in today's market of miniaturisation of portable battery powered devices, the need for ever more efficient small motors is apparent. Technologies leading the way are precision brushless DC motors from Faulhaber (one of EMS' major principals) starting at just 1.9mm diameter. Another innovative product from the Faulhaber Group is a new series of four-pole brushless motors type BX4 that give high torque at a consistent speed. Says Goulding: "The speed/torque curve for this high performance motor is quite flat, allowing you to deliver consistent torque across a wide speed range. They can also be equipped with integrated speed control and motion control within the same motor diameter of just 22mm, resulting in the world's most compact drive with integrated motion controller." Other technologies he sees having an increasing impact include piezomotors. He says: "Piezo technology is not new, but the successful application of the technology in industrial applications is beginning to develop. While never replacing conventional DC motors they will be playing a bigger role in the drives market."

Whether in manufacturing or distribution, however, Goulding makes it clear that EMS' main role is to provide the best possible technical and commercial outcome for its customers. He says: "Our priority is always to sell the best solution to the problem, whether that means selling standard product or going down the bespoke design route."

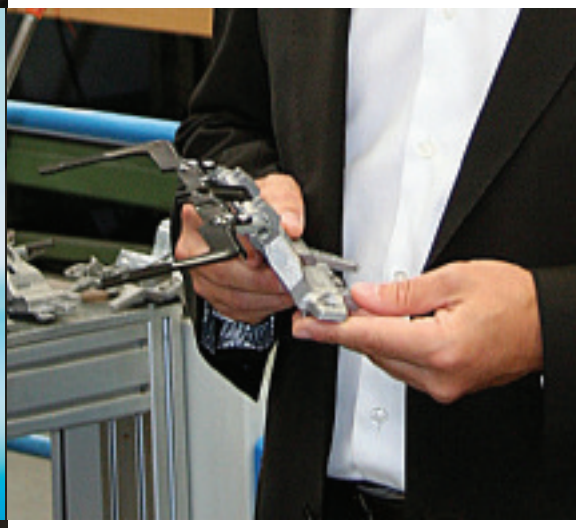
www.ems-limited.co.uk

"A company like us has a remarkable history of adjusting our business for different economic cycles. Recently, for instance, we had to change our business models going through the recession."
***Pascal Testeil**, Southco*

How does a company differentiate itself in a commoditised market? Paul Fanning asks Pascal Testeil of Southco.

First impressions matter a great deal to access hardware manufacturer Southco. Indeed, according to managing director Europe Pascal Testeil, this concentration on first impressions is very much at the heart of the company's philosophy. He says: "We are all about trying to create a good first impression with our customers because we're making the 'touch points' of our customers' products. There is an interface with the end user – be it on a car, a bus, a truck, a plane or any type of industrial equipment. The first impression given to the interface with the end user is absolutely critical. In the modern, highly competitive market place, the aesthetic gives a key differentiation between us and competitors."

This sort of differentiation is critical to Southco, particularly as the company is operating in a market where many of the products are often regarded as commodities. Says Testeil: "That's one of our key challenges: how do we make differentiations in product ranges that tend to be commoditised a lot of the time. When you're talking of latches and access hardware, how



Southco

Making the difference

do you differentiate yourself against a huge amount of competition from local and international players?"

This is where the company's 'touch point' philosophy comes into play. By enhancing the perceived value of its customers' products, Southco believes it is possible to avoid the commoditisation of its products and raise them far above its competitors. "Successful differentiation is coming down more and more to the level of detail," says Testeil. "And that can be a hinge or a latch, which can play a significant part in the initial user reaction. That cannot sensibly be overlooked or underestimated. The way that such a system looks, feels and performs will influence the end user's perception of our customers' products and corporate profile."

Over its 112-year history, Southco has had to adapt to a lot of different challenges, something Testeil makes clear, saying: "A company like us has a remarkable history of adjusting our business for different economic cycles. Recently, for instance, we had to change our business models going through the recession, but we always kept one constant – our determination to invest and adapt for long-term growth and value creation."

By its nature, this growth requires a constant search for new markets and competitive advantage. For strategic reasons, Southco does not allow any one market to provide more than 10% of its business. While this obviously makes sense on one level, it does mean that there is a constant need to explore new markets or expand existing ones. Says Testeil: "In the automotive market, we do a lot of glovebox latching systems, centre console access hardware – the whole transportation market is a key one from our perspective. That would cover interiors for cars, buses, trucks, but also the rail industry, where they have more and more requirements for weight savings. The aerospace industry is also very innovative in terms of the passenger surroundings – head rests, latching for tables, overhead lockers and everything that could interact with the end user."

One new market in which the company has seen success lately has been the medical industry.

Says Testeil: "There are a lot of flatscreens in every industry, but particularly in the medical sector, where imaging systems are becoming a key part of many devices. When you have a screen in front of you, you need to be able to adapt these screens to the individual user, so we're providing a lot of positioning systems. We recently had a key win with a leader in that market where we developed a whole positioning control for the arm on these medical devices."

In completing this project successfully, Testeil claims that Southco "solved a lot of problems" for its client and this sort of collaborative approach is again a way in which it seeks to differentiate itself. He says: "it is very critical that, when you move into new technological developments, you are working with customers who are committed with you on a journey where you can learn from each other. A collaborative approach that goes beyond a supplier/customer relationship and is more an engineering-to-engineering, manufacturing to manufacturing, cross-fertilising sort of relationship is a much more productive model."

Ultimately, Testeil believes, it is all these factors that will ensure that Southco continues to flourish regardless of economic conditions. He says: "Our CEO always says that we need to plan for the worst and try for the best. That has been our motto for the last three to five years because it is about balancing our long and short-term investments without missing out on tomorrow's growth opportunities. In our context, we have to work for the next two to three years. We have to stick to our long-term value creation or we won't be as successful as we are."

www.southco.com

Researchers at The University of Western Ontario recently used ZPrinted models of a soldier's skull as a basis for photo matching, a key step in confirming the identity of a missing First World War soldier

3D printing and scanning offer entirely new opportunities in terms of design. Here, leading manufacturer Z Corp offers some examples.

If a designer wants to push the boundaries of the possible, Z Corporation claims to be able help them to get there. By transforming ideas into digital concepts, its technology offers the opportunity to push astonishing creations into the physical world where they make a difference.

Z Corporation believes that innovation should drive every phase of design, from concept through data capture, sketching, modeling, detail design, analysis, manufacturing and inspection. It makes this possible with 3D printing and 3D scanning solutions for high-volume, low-cost use by virtually anyone, so that you can innovate early and often throughout the design process.

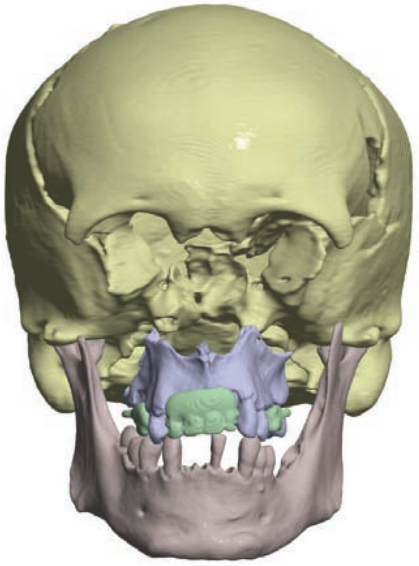
By working with the most productive designers and engineers to create solutions that streamline manufacturing, Z Corporation is able to lead the way in emerging applications in architecture, education, entertainment, healthcare, art, historic preservation and geographic information systems.

Organisations traditionally leave physical prototyping to the latter stages of development because traditional technology is slow and prototyping too expensive. Z Corporation claims that it is possible to create prototypes on its ZPrinter for a fifth of the cost of other 3D printers. And, if the user is prototyping numerous design variants at every stage of the design cycle, these cumulative savings are exactly what make the activity feasible on a fixed budget.

ZPrinters are based on familiar inkjet printing technology with the premise that 3D printing should be as easy as printing on paper. ZPrinters are also capable of printing prototypes with multiple colours on the same model, just like a paper printer. ZPrinters are the only prototyping devices that do so. Colour 3D printing allows the user to include colour logos, texture maps, FEA results, engineering labels, assembly instructions, and other graphics.

Z Corporation

Pushing the boundaries



These advantages, claims the company, were built into the technology with product designers in mind. Even so, the company admits to being constantly amazed by the depth of adoption in design engineering, and surprised by the pace of adoption in industries it never imagined.

An example of this includes Z Corporation's work with Cisco Consumer Business Group (CBG) in Denmark, where it helps the company produce some of the world's most elegant consumer electronic equipment. CBG's ability to produce prototype after prototype helps the company combine the time-honored tradition of Scandinavian design — functional, minimal, and affordable — with the hyper-paced world of consumer electronics.

Another company to have benefitted from Z Corporation's equipment is Timberland, which is just one of the footwear giants using this technology in its new designs. Prototypes that used to cost Timberland $1,200 cost $35 with a ZPrinter. A prototype that used to take a week to make now takes 90 minutes. This speed and affordability helps engineering and marketing employees collaborate more closely to produce better products.

At The Denby Pottery Company in the UK, Z Corporation helps the venerable manufacturer of china and tableware bring new ideas into its third century. Designers have reduced prototyping time from four weeks to two hours, launching new product lines in half the prior time. Accurate models help innovators better communicate design intent internally, as well as with customers and with suppliers.

Z Corporation also helps LandPrint.com generate 3D maps on demand. It is the speed, affordable materials and multicolor capability of our technology that makes transforming satellite imagery into physical 3D landscapes feasible.

Even more significantly, hospitals like The Walter Reed Army Medical Center in the US are able to use the technology to save lives. Doctors are improving the success of delicate surgeries by using ZPrinted models as a 3D roadmap for treatment. Surgeons spend less time investigating the anatomical structures of the patient after the incision is made, reducing blood loss and the likelihood of infection. This facility has even caused some surgeons to say they feel like they've "been there before" when it comes to the real thing.

The company has also helped scholars like those at Cornell University preserve ancient artifacts. Assyriology scholars study Sumerian and Babylonian cuneiform tablets as ZPrinted models, learning more than they would from photographs, preserving the originals from damage, and enabling more students to study them. Here, affordability is the key to getting tablet models into the hands of researchers.

Finally and perhaps most touchingly the ZPrinter has helped anthropologists like those at the University of Western Ontario identify the human remains of missing soldiers. Researchers recently used ZPrinted models of a soldier's skull as a basis for photo matching, a key step in confirming the identity of a missing First World War soldier.

All of these creative uses for the technology emerged organically from the speed, low cost, ease, and colour capabilities offered by Z Corporation – as well as from the refreshing idea that you can use business and organisational realities to advance innovation instead of hinder it.

This technology, believes the company, puts designers back in the driver's seat where they belong. Powerful data capture, CAD software and on-the-fly prototyping have kicked off a new era of entrepreneurship in the design department. No longer does it take a massive investment of time, money and tooling to prove an idea's potential.

Today, designers can just CAD up your concept, push a button, print a model, walk it around the company, and inspire others to produce it. Design teams can brainstorm refinements right up to production and individual designers can influence new markets.

www.zcorp.com

"Although we are a global corporation, in the UK we operate design and technology centres, where we manufacture and assemble close to our customers. That means we employ and contribute to local economies."
***Nigel Judd**, General Manager, Parker Sales Company*

Nigel Judd stresses the importance of attracting new blood and improving engineering as a career of choice.

As general manager for Parker Sales Company in the UK and Ireland, Nigel Judd is better-placed to offer his opinion on UK manufacturing than most. Having been with Parker since 1987, he knows the challenges facing the sector.

Key among these challenges, he believes, is the shortage of skilled young people entering professions in engineering and manufacturing. Being proactive in supporting education at a variety of different levels is something Judd is keen to promote. He says: "Industry, itself, has a responsibility to attract young people and nurture skills, knowledge and expertise. As such, I also sit on the advisory council of the power transmission faculty of Bath University, the advisory board of the National Fluid Power Centre and am serving as President of the British Fluid Power Association." He also acknowledges the contributions of the IMechE and IEEE in addressing the skills issue.

This issue of improving the appeal of engineering as a career and then attract that interest to Parker is something that Judd is attempting to address with activities such as

A good citizen

sponsorship of the Bloodhound 1,000mph car, which is set out to break the land speed record. Bloodhound is a high-profile project designed to inspire young people and raise awareness of the engineering, scientific and technological expertise at home in the UK.

He says: "Bloodhound is such a great way of exciting the imagination of young people and we believe it's so important to do that. That's why we've supported the project with leading edge technology and technical support."

This approach along with encouraging innovative development of more efficient and "green" technologies in traditional industries like construction machinery and involvement in pioneering sectors such as renewable energy puts Parker in a competitive position to draw in the next generation of UK born and bred engineering and manufacturing talent.

He says: "Renewables are interesting because the UK was behind the game on wind energy. We're users, but the technology belongs to everyone else. However, the wave and tidal sectors – supported by our geographical position – are actually very strong. We are involved in several of the projects that are going on at the moment. Some of them may turn out to be a blind alley, but others are looking very positive and I believe there's a really bright future for some of the technologies that are currently being tested."

Retaining IP and being close to the customer is also key for Parker's philosophy in being a "good citizen" wherever it operates. He says: "Although we are a global corporation, in the UK we operate design and technology centres, where we manufacture and assemble close to our customers. That means we employ and contribute to local economies."

Another area in which he feels Parker and UK industry as a whole has a duty to contribute is in the education and reward of new engineers. He says: "There is a menu of options that UK industry should be pursuing like putting in place apprenticeship schemes wherever we can. The pay, rewards and the training have to be available to young people that will first of all stop them taking their engineering qualifications into other professions. Secondly, we have to give them the opportunities that make them want to stay in the engineering and manufacturing profession. The stark fact is that a lot of the current generation of engineers – and I include myself in this – will eventually retire, which is going to leave a very big gap to fill."

In the time that he has been involved with Parker, Nigel Judd has seen the company grow from turnover of $2.2bn worldwide to $12bn. He attributes this growth to a number of factors, not least of which has been its expansion in terms of engineering and manufacturing expertise. He says: "When I first joined it was essentially just a hydraulics and pneumatics business, but it has become a much broader based company – growing into areas such as filtration, electro-mechanical, motion and control. The company has grown – and has worked diligently on innovation and bringing out some genuinely new technologies and new ways of applying them. We now have a global outlook where we aim to be number one in all the markets we serve and be the employer of choice."

www.parker.com

TFC

TFC is using its good reputation and expertise to broaden its business model. Paul Fanning finds out how.

Secure relationships

***Martin Clarke** TFC*

Since he became involved with TFC in 2007, its group managing director Martin Clarke has been faced with the difficult task of making a successful company more successful.

Founded 40 years ago by David Hale, TFC (The Fastener Centre) developed as a business selling non-threaded fasteners to designers. Its range consisted of a variety of innovative fastening solutions that allowed people to design better, lighter, faster products. Until 2007, when David Hale sold the business to a management buyout, essentially, TFC supplied a wide range of high level international industrial customers in a variety of industries from aerospace to automotive, petrochemical and general industrial.

"It was all based around the technical sell," says Clarke, "with sales people visiting designers and talking to them about what they wanted to achieve with their piece of equipment and us suggesting ways in which we could connect the parts even better – saving the customer time and money."

The business model around which the MBO's business plan was based was to appreciate what it already had, which was a lot of prestigious customers buying technical fastener products, while also looking at the opportunities this was creating. Says Clarke: "Very often, because our service and quality were so good, many of our customers would say: "I wish TFC could supply some of our ordinary bits like threaded fasteners, springs, pins and seals."

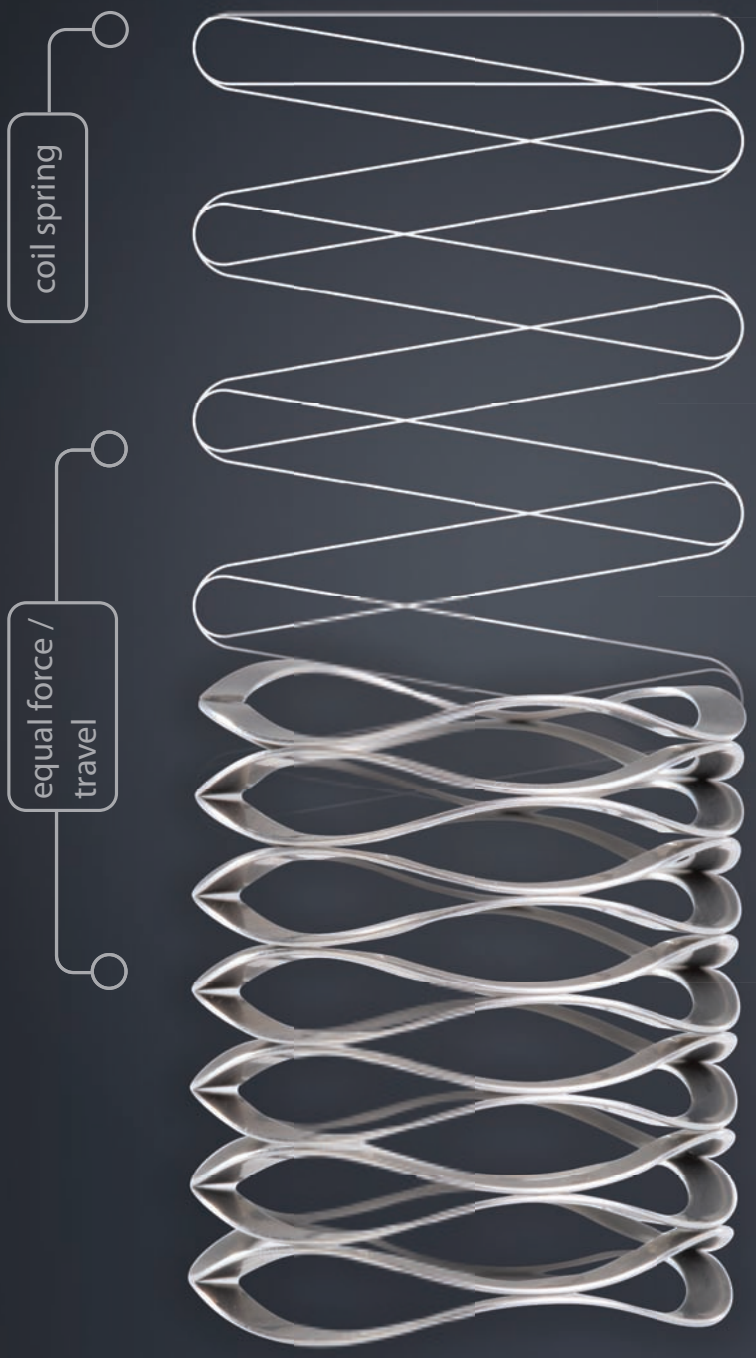
He continues: "So our business plan was to go to our existing customers who really liked us and say 'we can supply your more commodity fastener needs and to this end we set up a range of UK service centres that allowed us to get closer to our customer to supply the ordinary bits as well as the higher technical parts."

What this has meant for the company is a distinct advantage when it comes to its access to its customers. Says Clarke: "The difference for us is the level at which we approach the customer. The issue is that the customer values TFC because of TFC's ability to help them make more money by designing a better product. We have a relationship with customers based on their respect for our ability to provide good technical knowledge as well as good service, then you're able to have a conversation with someone at a more senior level on the commercial side rather than just the buyer who is dealing with 100 fastener suppliers trying to get through the door."

The success of this model can be seen from the fact that in 2007, when the MBO took place, the company's turnover was £7m, while this year, despite what Clarke calls "the ravages of the recession", turnover is approaching £15m, with next year's figure expected to reach £18m.

Ultimately, Clarke believes this growth has come about because of the company's ability to maintain a strong reputation for expertise and quality, whilst also broadening the range of goods it sells. He says: "It's a nice model for growth because we already have that precious relationship based on trust."

www.tfc.eu.com



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John Guest Limited

John Guest Ltd is 50 years old this year. Here, Paul Fanning asks product director James Guest what has kept it at the top

The 'push-fit people'

James Guest *Product director*

This year marks John Guest Limited's (JG) 50th year in business and the importance of this legacy, as an innovative UK manufacturer is something that matters greatly to its product director, James Guest, grandson of the eponymous founder. He says: "We'd like to think that when people think of JG, they think of us as 'the push-fit people'."

The company originally began life as a zinc die-caster, but in the early 1970s, John Guest invented the Speedfit fitting. Originally made in metal, it started being produced in plastic during the 1970s, "At which point," says James Guest, "We really started to become known as 'The Speedfit People'". JG's core competency revolves around its linear internal supply chain - it maintains control over its whole process to ensure products of the highest quality.

The first market to take advantage of this engineering company was the breweries. Next came the automotive sector, where Ford wanted a quick assembly fitting for its fuel line systems; JG quickly started working with a host of other big names in the sector. This supply route allowed the company to set up subsidiaries around the world. The company has since expanded into the air and pneumatics markets, the plumbing and DIY sectors and most recently into the telecomms sector. Says James: "We have a very active sales force and very good contacts, but, some of our biggest sales come from people who've seen the product being used and noticed its major advantages in terms of speed and ease of use."

Although the push-fit concept originated at JG, the company is far from alone in its markets. Says James: "10% of company turnover is reinvested in R&D resource. We differentiate ourselves through our confidence to work with other designers. Commercially, it's vital that we offer specific solutions that are right for the organisation in question…we're constantly looking for new ideas and applications and that's why we're the market leader today."

James believes that basing JG's brand image on its core competency can help with further differentiation. He says: "We've a strong focus in terms of how we see ourselves as an organisation and have many products that all have a very clear identity. We try to present ourselves as 'the push-fit people' regardless of where the fitting is being used. We have around 4500 products, but there is great synergy and consistency between those products. They're all based around the ethos of simple, fast and easy connections."

As a UK engineering company, JG is obviously more concerned than most about the availability of skilled engineers. The problem, believes James Guest, is as much cultural as it is structural. He says: "There needs to be a culture change. When you look at Germany, in meetings there, it's the engineer who takes precedence – not the marketing or commercial man. That isn't always the case over here."

James continues: "We often train people because the skills simply don't exist anywhere else. That's costly, but it's also frustrating because you see things that our nation was good at being outsourced to other countries." However, Guest is far from pessimistic, saying: "It's positive to see that British decision makers are realising the need for a much greater spread of skills."

JG has offered apprenticeships since the 1960s, which have provided it with some of its longest-serving and most valued employees. Says James: "It's an incredible advantage to have that skill set and knowledge base."

However, JG is by no means resting on its laurels. Says James: "We're looking to further strengthen our associations with design houses and OEMs to help develop the push-fit systems of tomorrow."

www.johnguest.co.uk

The Centa ground

What gives Centa Transmissions its advantage in the mechanical power transmission market? Paul Fanning asks managing director Bob Arnott.

***Bob Arnott**, Centa Transmissions*

Describing Centa Transmissions, its managing director Bob Arnott describes it as "a good, solid engineering company". On closer examination, however, this sounds like a rather modest description of what is a leading mechanical power transmission company.

A brief look at the markets in which Centa operates gives a clear idea of the level of expertise and experience the company has. Says Arnott: "We have something like 800 customers, who are as diverse as people building boats to manufacturers of excavators, forklift trucks, military vehicles, robotics, machine tools and satellite drives. Joining one machine to another via a mechanical transmission is a very widespread application."

The company's levels of specialist expertise and wide market base are the key reasons for this, which he says, are because Centa is highly competent in its specialist area and able to survive. The company's technical expertise has an additional benefit in so far as it means that it is often the first point of call for many projects and has a good reputation for what it does.

The fact that Centa is well known for its areas of competence has been significant in ensuring that they have also been at the forefront of one of the major growth areas of recent years, the renewable energy sector. While he bemoans the fact that more of the money being spent on renewables isn't being spent on growing the UK's manufacturing base for this sector, Arnott says: "We're not put off by large, industrial projects. We've got the experience to design and manufacture unusual applications.."

Michael Sykes, Centa's Gears Division Manager, is clearly intimately involved with Centa's work in the renewable energy sector and feels that the company's willingness to get involved with innovative projects at an early stage has reaped dividends. He says: "We like to get involved at the design stage, which is always interesting because we are able to offer all of our technical expertise, helping our customers through this period and thus ensuring that they need not look elsewhere for those skills."

This approach has proved to be the case with Marine Current Turbines, whose tidal turbine has been operating in Strangford Lough in Northern Ireland. Says Sykes: "They've had that machine in there since 2008 and they've been producing electricity for the grid ever since. We provided the couplings for their original prototypes, with zero defect and no problems and we've helped them extensively with their prototyping and validation ever since. MCT is now planning to expand an energy installation off the west coast of Scotland."

Centa is also heavily involved in the area of wind turbines. Summing up the challenges this market poses, Bob Arnott puts it succinctly, saying: "It's all about reliability. If you've followed the experience of wind turbines, there has been some terrible trouble with their reliability, so a lot of concentration has been on gearbox development."

In this market again, he believes that Centa's experience in other sectors has held it in good stead. He explains: "With wind turbines, all the machinery is on a very, very fragile cell base. So the movement within the gear machinery is quite high when compared to other applications. From our point of view we're used to foundations being flexible because we do coupling units for things like aluminium ferries, which also have 'flexible' foundations. So when we're choosing a coupling for a wind turbine, we know exactly which coupling unit to go for because we've seen it before and have the product base to cope with it."

Summing up Centa, Arnott says: "Our customers aren't stupid; ultimately they come to us because we know what we're doing."

www.centa-uk.co.uk

Alcoa Fastening Systems

In a crowded and competitive market, Alcoa Fastening Systems succeeds in standing out. Paul Fanning asks how.

Standing out from the crowd

As EMEA Sales and Marketing Director for Alcoa Fastening Systems, Didier Lorch has naturally given a considerable amount of thought to the question of how to increase sales of fasteners. He does, however, acknowledge that the fasteners business offers one great comfort, saying: "You can sell fasteners everywhere. Everywhere you look, you see fasteners. What's always interesting from our point of view is the variety and diversity of the needs of the market.

Alcoa Fastening Systems – a unit of Alcoa, the world's leading producer of primary and fabricated aluminium – serves the global aerospace, automotive, commercial transportation green energy and other industrial markets. Alcoa Fastening Systems' Industrial business focuses on the non-aerospace related applications with specialised engineering services, highest quality fasteners, and amongst the greatest breadth and depth of fastening system solutions in the market from a single source.

Like anyone in this crowded market, however, Alcoa Fastening Systems has to face the challenge of how to differentiate itself successfully from its competitors. In the fastening sector, commoditised products put great pressure on the market, but Mr Lorch is comfortable that AFS is able to resist such pressure, saying: "There are so many undiscovered fastening solutions out there and a fastener is not just a bolt or a screw. It can be any number of things. What we are trying to develop are solutions that bring added value to the market. By offering something different that takes us away from a commoditised product and by therefore more fully meeting the needs of our customers, we are cementing our position as a market supplier."

This added value can take a number of forms, according to Mr Lorch, but the main one is the expertise Alcoa Fastening Systems can bring to bear. He says: "You can add value in many different ways. Firstly, you can answer a special demand by providing a special and customised solution. This means we have to offer strong engineering knowledge and innovation to develop a solution which is right for the customer. Secondly, you add value by offering manufacturers products they can't get anywhere else in terms of resistance or performance."

The demand for engineering expertise differs from customer to customer, however. Says Mr Lorch: "If you deal with large companies, they will have technical teams specialise in fastening systems and are very well informed about the technology. With them you have to offer very high end engineering solutions and support. However, at the same time, you get other companies that have to be very well supported because their knowledge of fastening systems is limited – often just because of their size. They are usually very welcoming of such support. Once you develop a non-commodity product, offering really good technical support basically becomes mandatory."

There is more to the company's success than just good technical support, according to Mr Lorch. The company's products are another major factor. He says: "Customers come to Alcoa Fastening Systems because they can get high-end fastening systems and because our product range is made up of very high-end brands, many of which are pioneering in their fields including Huck, Camloc, Recoil, Simmonds, Snep and Marson. So all these brands are very well-known because they have led the development of fastening solutions – it's a strong portfolio with an illustrious history in the fastener market."

While he acknowledges changes and challenges in the market at the moment, Mr Lorch is nonetheless positive about the future, saying: "The market is looking for improved solutions because of the pressures on cost. For us, this represents an opportunity because it means we can apply our advantages in terms of technical expertise to deliver solutions. We will continue serving our customers by providing them with highly innovative technical solutions that improve their performance whilst keeping their total costs down."

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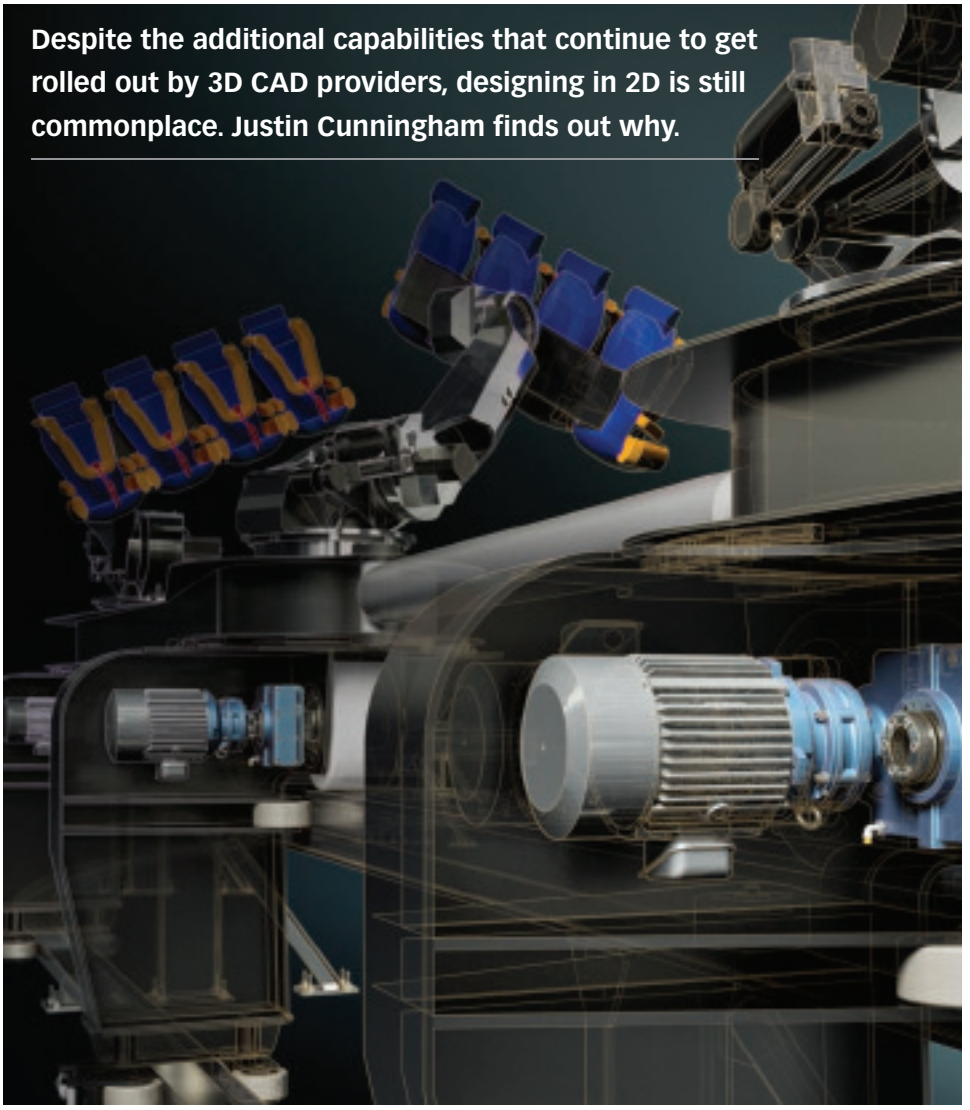
LET'S GO DESIGN

The right tool for the job

Despite the additional capabilities that continue to get rolled out by 3D CAD providers, designing in 2D is still commonplace. Justin Cunningham finds out why.



The use of advanced 3D CAD systems continues to revolutionise the way design engineers work and streamline the process of getting products to market quicker. However, despite ever improving graphics and more intuitive interfaces, designing in 2D is still common practice. But, it seems the argument has shifted slightly in recent years in that it is not so much a question of 2D vs. 3D anymore, but of how to make the best use of both.

"There is still a need out there for 2D," says Steve Bedder, manufacturing technical engineer for the UK and Ireland at Autodesk. "You do get firms that rely on 2D for the mainstay, but even there they have invested in one or two licences of 3D. Of course, 2D is still king when it comes to manufacturing. For many that's ultimately the endgame."

Producing 2D drawings from 3D models has been commonplace for years. But, using 2D design data to make 3D models is something that has been far less exploited or integrated. And despite numerous attempts, the design community still use 2D much more than some would have, or like, us to believe.

Iain Lewis, principal technical sales specialist at PTC says: "There is, and will always be, scope for 2D design. Certain things just do not lend themselves to being designed in the world of 3D such as factory layout, electrical schematics, or process schematics; there is no way you will ever want to do that stuff in 3D."

But it is not just niche areas where 2D is prevalent, conceptual design is often as much about finding and balancing numbers as it is about aesthetics and geometry. Sums need to be done in order to start finding real mechanical design data. And simple hand calculations, for example, are often easier to visualise and calculate around 2D sketches than on complex 3D models. The key here is being able to capture that data digitally and then using it as the foundation for a 3D model. As a result, many of the CAD giants are rolling out increasing, and more integrated, 2D capabilities to accompany the 3D design packages.

"Autodesk's Digital Prototyping Solutions combine that need for both 2D and 3D," says Bedder. "Design engineers still use 2D tools within the Product Design Suite to do layouts and concept drawings; what we want to do is have the ability to reuse that 2D data for 3D design.

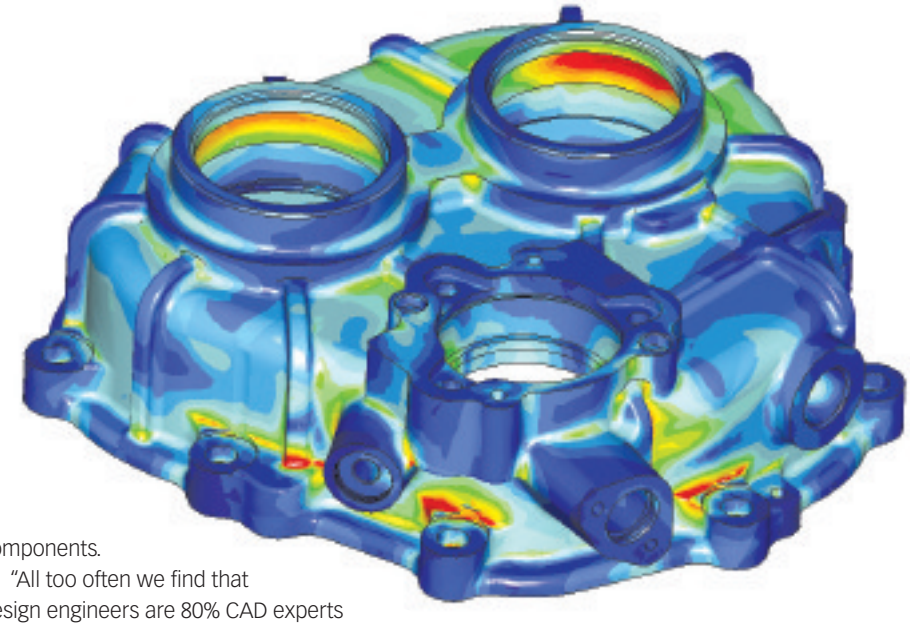
"For example, wiring schematics in AutoCAD Electrical can be used in Autodesk Inventor, so the 3D layout and routing of the wire around a structure can be done at the design phase rather than having to let the guys on the shop floor work it out."

PTC has also increased its 2D offerings with Creo, its PLM package. It has worked with various vehicle manufacturers that, from the outset, do a lot of development work in 2D. It says this is generally 2D layout work which can involve the pitch of the seats to calculating the wheel base to where the doors should be placed.

Ian Pilkington, technical manager at PTC, says: "It is very easy to visualise and to collaborate on screen if you have a nice 2D section through a vehicle and you can move things around and check distances. Engineers relate to that a lot better than a complex 3D model.

"We have developed a layout product to allow this 2D concepting to then drive the 3D design. You can effectively take a section through a product and build up from there. We call this 'Design Intent', which builds constraints in to the model and then that drives the 3D geometry afterwards."

However, all this is not to dismiss the need



and benefit of modern 3D CAD packages. For many aspects of the design process, 2D just does not cut the mustard. Many modern designs, from cars to computers, feature curvature that is just not possible to detail in 2D, it has to be 3D. Additionally, the packaging requirements of many modern electronic devices such as mobile phones or the iPad are too complicated to be attempted in 2D. Again, it needs to be in 3D.

And 3D has itself become the currency in which engineers need to tender for business. Trying to become a supplier on many OEMs books requires 3D models, and often CGI rendered imagery to give presentations an edge over competitors.

Pilkington says: "Having a full 3D representation of the part you are supplying is critical. You've not only got the calculations around weight, Centre of Gravity, stress and strain as well as the fact that if you are a supplier – certainly in many sectors – you will probably go out of business if you can't supply 3D geometry to an OEM."

A general criticism in the past toward 3D CAD has been its over complexity and difficulty of use in terms of initial implementation, retraining, and also the time it takes to model what should be relatively straight forward and simple components.

"All too often we find that design engineers are 80% CAD experts and 20% design engineer," says Bedder. "They constantly have to think about the tool that they are using rather than do the value added design work which is making the products more innovative."

Many of the CAD companies have seen this as a key product driver; making their systems easier to use and more intuitive. "You don't want to have to think about construction geometry, datum planes, component libraries, and those kinds of things," says Bedder. "You want to solve the problems."

Autodesk has been rolling out a host of Functional Design Tools to help speed up this process. These create fairly standardised geometry for parts and components based on inputs by the engineers. Bolted connections are a good example. To bolt two plates together, the design engineer would normally have to create two holes, go to a library and find the correct type of ISO fastener, then a corresponding washer and bolt.

"In Inventor you say that you want to bold two plates together and you know that these two plates will be pulling apart from each other with a force of 2 tonnes," says Bedder. "Inventor will then say, based on that information, you need a nut and a bolt of this particular size with this particular washer and this particular nut. And you will need four of them."

Although this doesn't make the decisions for the engineer, it does guide them along the correct path earlier in the design process. So the design engineer can make informed decisions much earlier on in the process.

PTC also has gone to great lengths to ensure Creo has one of the most consistent and easy to use interfaces, which it says, has the shortest ramp up time to get people productive. It says the key is streamlining the whole design process and making it much more integrated.

Pilkington says: "People understand that 2D is good as a concept tool, but when you are talking about the full definition of a product it needs to be designed with 3D, and the challenges are really around the rest of the process.

"The biggest opportunity for PTC and our competitors is the streamlining of the whole design process; doing the concept work upfront, in either 2D or 3D, being able to deal with simulation issues, stress/strain, ergonomics, dealing with suppliers; that is really the real big challenge."

www.autodesk.co.uk
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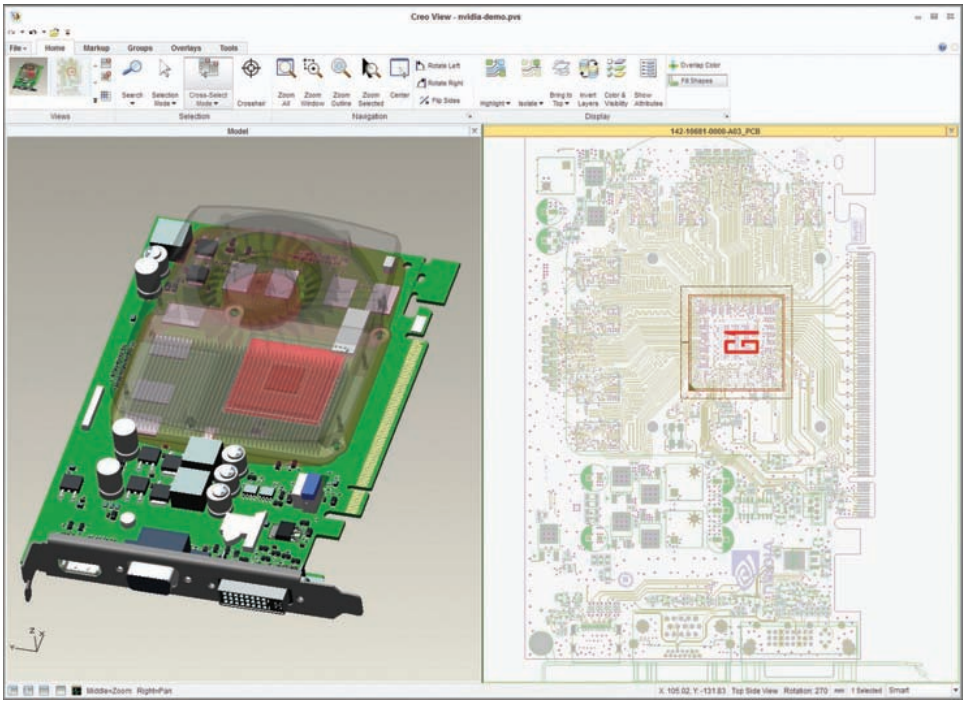

It may no longer be a case of 2D vs 3D, but of finding the best tool for particular applications

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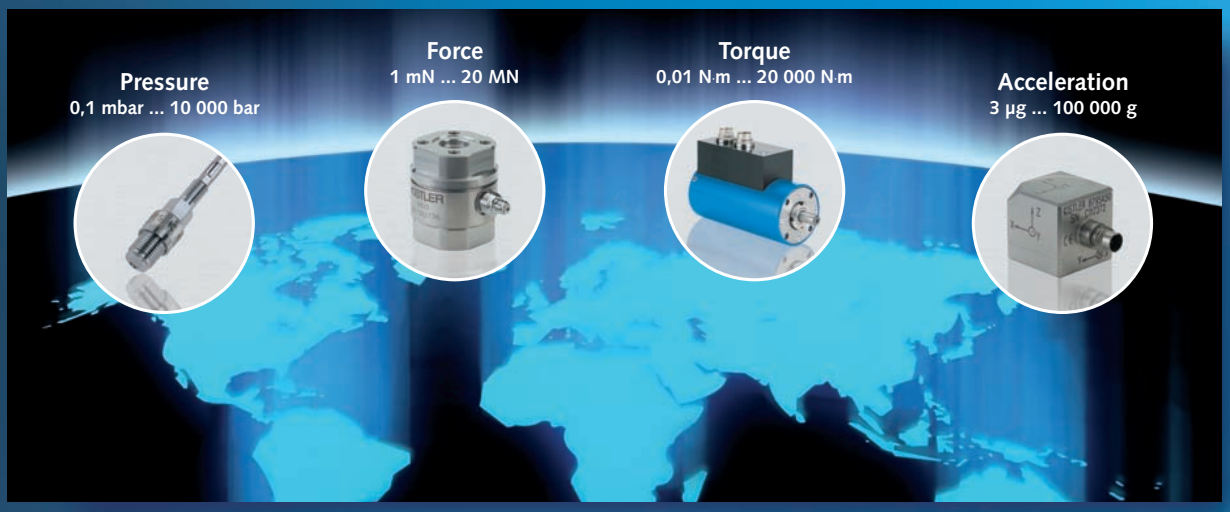

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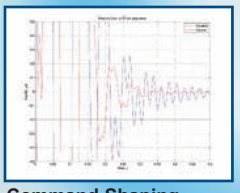
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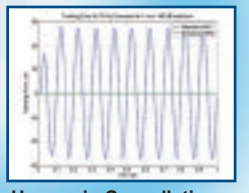
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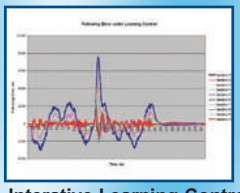
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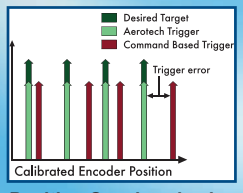

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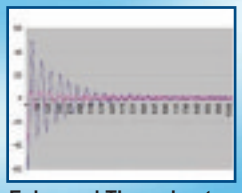
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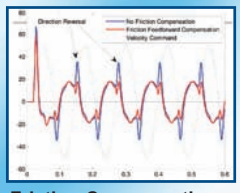
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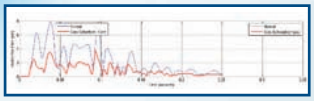
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Lives saved by better vision

Tom Shelley reports on some of the latest technologies to enable medical staff and surgeons to make more meaningful measurements in 3D and see more clearly.

Accurate 3D measurement of wounds and their healing, better 3D analysis of CT and MRI scans and the means to keep lenses clean in keyhole surgery, all play their part in helping medical staff do a better and more efficient job, and save lives, as well as reducing costs to the National Health Service.

In addition, all three technologies have potential non medical uses as well, although the development teams in each case have presently deemed medical applications as the most likely to yield immediate commercial benefit.

Such is the case with Eykona Technologies, based in Oxford. According to Dr Peter Bannister, the company's product development manager, the business was founded by Professor Ron Daniel, professor of engineering science, and technical director Dr James Patterson as a platform technology to combine stereoscopic and photometric imaging to yield a system that would produce more useful 3D data than is possible by using either technology on its own.

Stereoscopic imaging works by recording images from two viewpoints, and by knowing the baseline, is able to compute distances of objects from differences between the two images. This is what the human eye does. This method delivers good spatial information but does not deliver such good information about properties such as colour and texture. Photometric imaging, on the other hand, infers shape and underlying geometry from shading. It derives information from illuminating the object under study from different directions. Dr Bannister illustrated the differences in terms of the task of observing an orange in 3D. A purely stereoscopic image will establish the geometry of the shape of the orange, but without reference to its colour and texture, while a purely photometric implementation will reveal full details of the dimples and colour, but will usually lead to a machine system inferring that the orange is completely spherical.

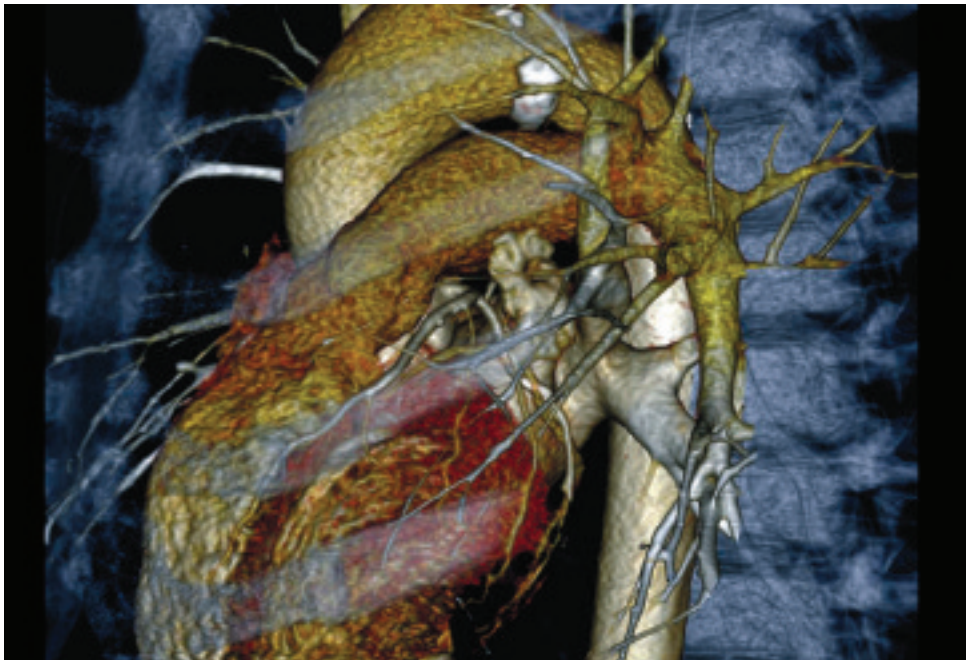
Combining both types of information in a common reference plane is already done, but requires positioned lights as well as a stereoscopic camera. With their sights set on wound imaging, in order to better monitor healing, or lack of healing, the challenge was, according to Dr Bannister, to come up with a method of combining the two technologies in a small, hand held unit.

The target market was doctors treating ulcers arising from diabetes and similar conditions. These heal from beneath, so it is necessary to be able to monitor how deep the wound remains, in order to monitor healing. This is impossible to assess visually, whereas areas of wounds which are healing from the sides, may be easier, but with a large number of patients to monitor, it is extremely useful to be able to record wound areas precisely so progress can be monitored scientifically. Present measuring methods include approximating wounds as ellipses and using counting squares on images superimposed on grids.

The equipment by developed by Eykona comprises a single camera unit with two cameras and four flash lamps round its periphery which are fired in rotation. The clinician monitoring the wound takes a sterile, disposable, white spot target out of a bag and places it next to the wound before the images are recorded. The whole recording process takes less than 1s. The target spot enables image correlation if the camera unit moves during the recording process. It is quite difficult to hold any kind of camera perfectly still for 1s.

The system is sufficiently accurate that it

The Eykona system is accurate enough to pick up the name of the bandage manufacturer from the marks left on the patient's skin



can pick up the name of the bandage manufacturer from marks left on the skin. It can also monitor fingerprints. It is thus additionally being considered for forensic work. As a medical product, Dr Bannister described it as being "moments away from commercial launch". Systems are currently being manufactured that can be issued for one month trials. Dr Bannister says that "a large number of organisations want to trial them".

Also depending on computation is a service offered by Biotronics3D, which takes slice data from X-Ray CT and MRI scans, and renders the output information as enhanced 3D models. The company is based in Canary Wharf in London, and commercial executive Ron Shand told us that their software can, for example, be made to highlight all parts of generated 3D images of arteries that might be plaque. Turning sliced data into enhanced 3D models requires a large amount of computing power, and while the company is more than willing to supply software to users, including those interested in developing their own applications, the favoured approach is to upload data to a data centre, process it in a cloud, and permit users to monitor 3D graphical results using web browsers. While we make no claim to be able to fully understand how it works, the images that it produces are truly amazing and a great help to clinicians performing diagnoses. Uploading information to a data centre also avoids the need to repeatedly encrypt, decrypt and recrypt very large files when they are sent back and forth. Encryption of medical data sent over the Internet is required since medical data has to be confidential by its very nature.

The company currently has more than 1,000 users for its 3D visualisation service, branded '3Dnet Medical', but Shand says huge potential remains to be tapped such as the more than 30,000 radiologists in the USA. The software is designed to work with any DICOM (Digital Imaging and COmmunications in Medicine) standard data. There are currently three levels of subscription. 'Free' allows users to undertake two studies per day. £65 per month allows ten studies per day while £160 per month allows an unlimited number of studies per day. The company has indicated that it is willing to talk with potential non medical users, about other possible applications such as processing data from the ultrasonic scanning of composites.

While electronic scanning and visualisation has revolutionised many branches of medicine, surgery still usually requires the use of a human surgeon, moving his hand in response to what he or she sees.

In an increasing number of procedures, the use of the scalpel in the hand has been replaced by keyhole surgery, which depends on moving tiny tools remotely in response to what can be seen using a small probe connected to optical fibres. Keyhole surgery inflicts much less trauma on patients and less overall treatment cost to the NHS. The big problem, however, is that the lens at the end of the laparoscopy probe tends to become obscured by blood, other bodily fluids or human tissue. This, we are told, can require its withdrawal for cleaning as many as ten times in an hour, which means 30 withdrawals and cleanings and re-insertions in the course of a complex, three hour operation.

Andrew Newell, managing director of Cipher Surgical, speaking at Venturefest, described a probe that his company has developed which keeps its lens clean using a jet of carbon dioxide gas blown over its surface. Designated 'OpClear', the volume of gas pumped down at is small, but because of clever geometry developed in conjunction with Imperial College, it is made to pass over the end of the probe at 400mph. The units are disposable, and the device is to be sold for about £60 each. The manufacturing cost is somewhat less, and once in commercial production, is expected to become the tool of choice in the 11million laparoscopies undertaken each year, The self cleaning mechanism is protected by patent and clearly applicable to non medical uses as well, but the company is presently focused in getting the OpClear to commercial launch in 2012.

www.eykona.com
www.biotronics3d.com
www.ciphersurgical.com

Design Pointers

- Eykona Technologies has come up with a hand held device that combines stereoscopic and photometric imaging to be able to very accurately measure the shape and depth of wounds in about 1s. The company is also interested in non medical applications
- Biotronics 3D has software and an online service that can take sliced data from CT scans, MRI scanners and other medical devices and convert these into 3D models which can be made to highlight regions of particular medical interest. They are also interested in possible, additional, non medical applications
- Cipher Surgical has developed a laparoscopy probe which keeps its lens clean by using clever geometry to blast a small amount of carbon dioxide over its surface at 400mph

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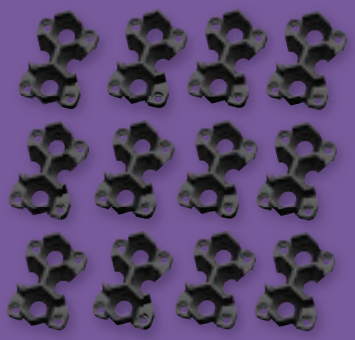

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The latest in product development

TCT Live 2011 and Interplas 2011 will highlight the very latest developments in some of industry's most exciting areas. *Eureka* offers a preview.

The latest developments in 3D Printing and Additive Manufacturing and the plastics industry will be on display at this year's TCT Live and Interplas exhibitions.

There will be many debuts, launches and enhancements that will be presented at this year's events, along with comprehensive conference and seminar programmes.

TCT Live is the ideal forum for everyone involved in the concept, design, specification and manufacturing process to learn about the latest in Additive Manufacturing, 3D Printing and other cutting edge product development software and technology.

Whatever your level of knowledge, TCT Live is designed to further your product development skills as well as source new suppliers from over 200 leading exhibitors in a live environment. At the exhibition, companies from all over the world will be available to help the manufacturer to reduce product development time, reduce cost and improve efficiency.

In addition to the exhibition, of course, will be what the organiser is calling 'Europe's Leading Additive Manufacturing Conference' the world renowned TCT Additive Manufacturing and 3D Printing Conference. This year, the conference will be full of high-quality presentations from users such as Rolls-Royce, Siemens, Clarks and Tata Motors. World class commentators including Todd Grimm, Terry Wohlers and Phil Reeves complete the line up. In addition, Richard Noble OBE will present a keynote address within this programme.

3D printing enabled Aston Martin Racing to develop LMP1 race car in under six months

Following on from the success of 2010 with over 250 attendees to these sessions alone, the Additive Manufacturing Tech Briefings will return for 2011. Here all major vendors are invited to present their latest developments in short sharp presentations, giving the buyer an instant snapshot of what is hot and imminent from each of the major players. If you are looking to source and purchase 3D printing or additive manufacturing machines this session is essential viewing for you!

Technology Seminar programmes take place on the show floor and will address the issues of Inspection, Digitising & Metrology, and Software in Product Development. There are

IPF 3D Printing, a UK-based prototyping service bureau using Objet 3D printing systems, will be at TCT Live (stand H30) and will be exhibiting some stunning examples.

sessions looking at high-value goods and the dental sector, examining how technology can assist these growing sectors.

At TCT Live this year, there will also be two unique teams gunning for World Records in 2012 – Bloodhound SSC and Torpedalo Project will both be on site so visitors can get up close with these fantastic feats of engineering.

Also available this year will be Additive Technology Introduction Sessions. These highly oversubscribed free seminar sessions, presented by Graham Tromans, give newcomers to "additive" technologies the opportunity to get up to speed as fast as possible and to be aware of how they can best access them.

There will be seven co-located Industrial Events on site and the TCT badge gets you into them all.

Running alongside TCT Live will be Interplas 2011. Over 240 exhibitors are set to present the latest in plastics technology in September, so whether you design, manufacture, process or finish plastic components this is the event you need to attend.

The exhibits that will be presented at this year's event, along with the comprehensive conference and seminar programme that will ensure that Interplas is the ideal forum for everyone involved in the concept, design, specification and manufacturing process to learn of the latest developments in plastics technology.

From machines to materials to software and services, Interplas covers the complete spectrum of the plastic industry and enables the visitor to find everything they need to improve their business and stay ahead of their competitors.

A feature of this year's exhibition will be the new 'British Centre Of Excellence' feature zone located in the very heart of the exhibition. Here some of Britain's finest end products will be paraded, demonstrating the UK's expertise in this area of manufacturing.

New for Interplas 2011 is the Plastics Design Intelligence (PDI) Initiative. If you design or develop new products in plastics, then lookout for this logo on stands, it indicates that they might be able to assist you with your project. There is also a dedicated PDI Seminar Theatre staged within the Interplas Hall 4.

The Green Room Seminar Sessions will be another highlight. The Green Room is one of three seminar programmes being staged at Interplas. Sponsored by Engel UK, it will be dedicated to highlighting the best in environmentally friendly plastics innovation.

Interplas 2011 will also host the Tool-Temp 60 Second Dart Shoot-Out held in association with Tool-Temp, a 60 second dart shoot-out for visitors and exhibitors to pit their skills against one another.

More seriously, Technology & Innovation Sessions will feature cutting edge papers that tackle either specific industries or processes. Sessions include Advanced Moulding Technologies, Efficient Manufacturing and Extrusion Technologies. There is also a full day focused on Medical Plastics.

Naturally, Interplas 2011 will also feature a number of live machine demonstrations. Many of the 240+ exhibitors will be processing live allowing the visitor to compare and contrast in a real environment, while designers seeking one-to-one confidential product development advice should consider booking a free consultation at the Design Workshop adjacent to the PDI Seminar Theatre. Each appointment is free of charge but must be prebooked, details at www.britishplasticsshow.com

Running concurrently alongside Interplas 2011 will be TCT Live 2011, MM Live UK 2011, NANO Live 2011, MEMS Live 2011 – these events combined with the PPMA Show and the Sensors Technology Show make up the largest gathering of engineering professionals in the UK in 2011 - an essential visit for anyone in engineering.

Registration for Interplas including the Conference and Seminar Programme is FREE for all attendees, and can be completed quickly and easily by visiting

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READER INTERVIEW

JOHN KENT, ENGINEER, INVENSYS CONTROLS

Q How did you first get into the engineering industry?

A At school I enjoyed science and art. Later on I realised that the creative and logical instincts could be combined into a career as a Design Engineer. I fought against this for some time as my dad was an Engineer (Technical Director) and being a teenager I wanted to be anything other than a copy of my Dad! Logic won luckily, now I think that I have the best job in the world.

Q What does you role involve on a day-to-day basis

A It has become more interesting over the years. We no longer have engineers dedicated to a particular speciality. This means that we are involved in Research and Development in the Lab, 3D CAD modelling and stress analysis, prototype manufacture, project management and existing product support.

There is also a considerable amount of liaison with Manufacturing Engineers, Quality and Product Management.

Q What are some of the most interesting projects and technologies you have worked on?

A Pitot-static aircraft instruments (based on the 'suck and blow' principle). This is where the pitot pressure is the forward speed input and the static pressure is the altitude input pressure. The difference between the two is mechanically converted to indicate airspeed.

Also, the-design of multifunctional gas controls for improved fuel efficiency. Use was made of combustion fan pressure as a signal to modulate gas outlet pressure via a servo diaphragm. The ratio of gas to air is thus locked together. This accuracy of this ratio drives the fuel efficiency of the boiler.

Use of robotic deburring on high pressure die-castings. The problem here was the non-rigidity of the robot allowing chatter on the cutter. This was cured by changing the cutter orientation such that the cutting forces were mainly axial rather than tangential to the spindle.

Q Are there any new technologies that have you excited or that you see as being quite revolutionary to the wider world?

A I think there is a big application area for the Stirling Engine in Renewable Energy. This is ironic because the design precedes the internal combustion engine, but the efficiency is so much more.

Q What is the biggest issue / driver facing your industry?

A The rush to manufacture in low cost countries has been a threat for some time, but we have survived. This is due to our level of automation which assists high quality output, keeping our costs low and reputation high.

Many of the piece parts which I saw being resourced in China are now coming back to the UK again, due primarily to quality issues, but also costs have equalised. It was a big concern that the Department for Industry had some initiatives to encourage re-sourcing manufacture of some components abroad. Perhaps we should import some low cost politicians and bankers?

Q What advice would you offer to younger engineers just entering the industry?

A Do not forget that in design it is the end product that matters, not the CAD system. Producing high-quality moving graphics does not prove a design, often it is more of a distraction which can prevent the design being critiqued properly.

Q How do you see the industry changing going forward?

A 'Peak Oil' will change almost everything; product design, manufacture and distribution. It might be that the politicians finally act on what they say about the importance of manufacturing to the UK…but I wouldn't bank on it.

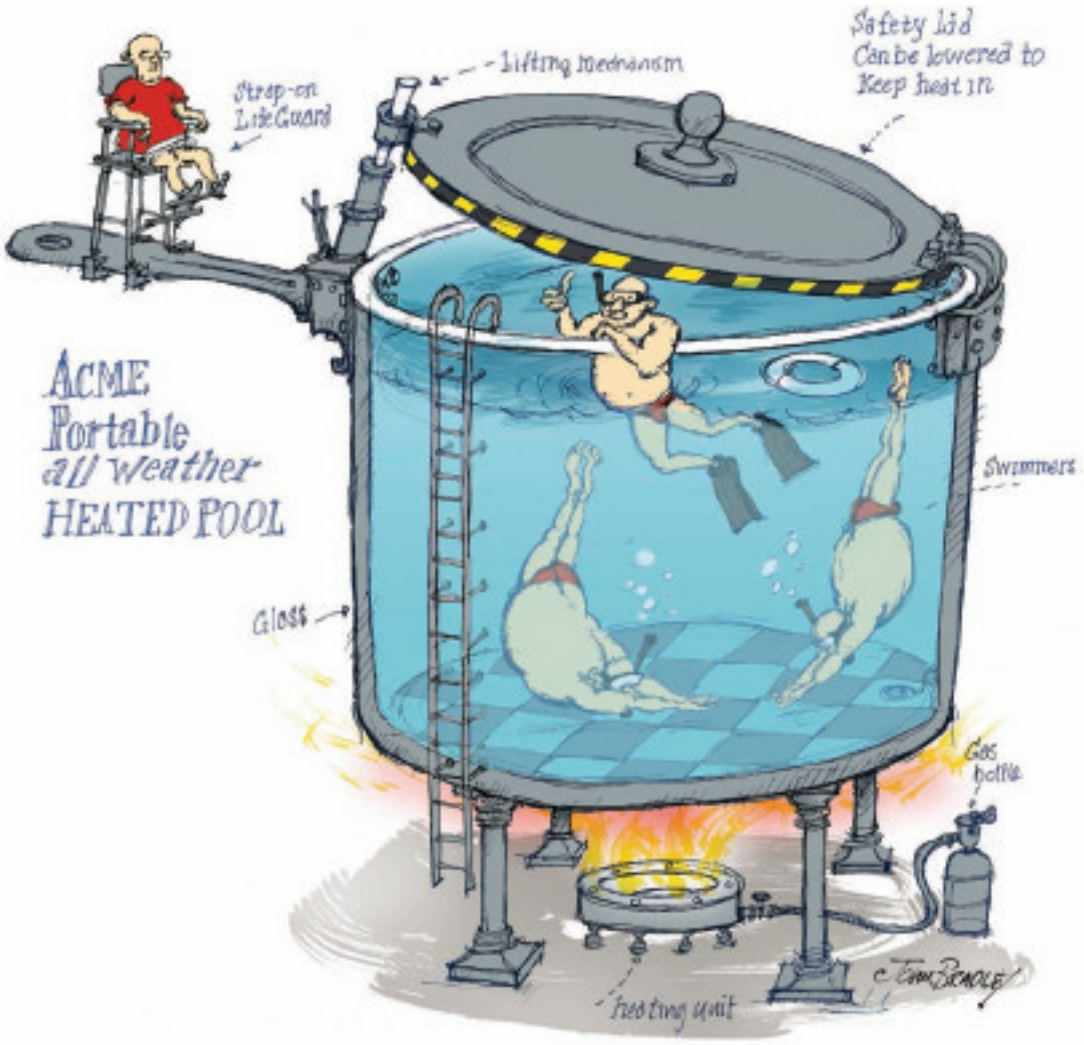
Pooling power

Swimming pools cost a lot of money to heat and keep warm. How can these costs and the carbon footprint be reduced?

Britain has 300,000 swimming pools and, this being Britain, it is deemed necessary to heat them to make them comfortable to use – even during summer.

Naturally, this process comes at a not inconsiderable cost. Indeed, it has been calculated that it costs £3.25 per day heat a commercial pool to 29oC. And, where there are energy costs, there are inevitably going to be environmental costs as well. The sheer amount of energy that has to be used to heat a swimming pool means that pools can represent an environmental and a financial burden that many cannot afford.

However, a pool that is heated and left uncovered will quickly lose heat and soon become unusable for any but the hardiest swimmers. The belief is generally that this heat loss occurs via the water and there are pool covers available (usually in blue) that help to retain heat a little bit longer than might otherwise be the case. Needless, to say, however, these are far from being a long-term solution.



The Challenge

The Challenge this month is therefore to come up with a method of successfully retaining heat within a swimming pool whilst keeping the energy expended on heating it to an absolute minimum.

Clearly, there are covers available and these can achieve some energy savings. However, perhaps something more robust and all-encompassing is required? Perhaps a greenhouse around the pool is the way forward? This would have the advantage of magnifying heat, but would be expensive to erect, prone to damage and could have the disadvantage of making things too hot.

The actual solution is genuinely innovative, relies on extensive (and surprising) scientific research, is accredited under Defra's Carbon Emissions Reduction Target and can be fitted to new pools, or during renovations, to heat them for a negligible amount, saving 86% of heat loss. It's a British invention and could potentially save millions.

However, don't let that stop you seeing if you can do better.

The answer to last month's Coffee Time Challenge of how to avoid trapping fingers in doors can be fouind in the Technology briefs section on page 9.

EUREKA JOBS

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South East England

Type: Permanent **Salary/Rate**: Highly Competitive + Benefits package

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For full details online enter reference: JSJ16800

Design Engineer

Location: Coventry
Type: Permanent
Salary/Rate: £25k - £35k per annum + Benefits

Salary range is £30K to £35K. They will except more junior design engineers such as Grads. plus 2 years design exp. at £25K and up. Also more senior engineers over £35K. For example for a CAA Design Signaturary they will pay £50K. Candidates must be able to hit the deck running, they MUST be able to do Geometric Tolerancing, it will be the first thing they are asked to do in an interview. If they can't do geometric tolerancing, then they should not apply. They will be doing some CAD, but CAD skills are not as important as other aspects of the role. This a role for a Design Engineer who will need to perform basic sizing calculations on component parts for a fuel control system. They will be using MATHCAD or another type of engineering programme to help with these calculations It could be stress calculations, deflection/movement.

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Location: Hastings
Type: Contract
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For full details online enter reference: JS-.GD4333TR

Module Quality Leader - Polymers

Location:Leicestershire
Type: Permanent
Salary/Rate: £22k - £26k per annum + Bens

EXPERIENCE OF AS9102 FAIRS PRODUCTION IS ESSENTIAL - this is a role for a Quality Engineer to conduct First Article Inspection Reports (FAIRs). Candidates must have worked in the Aerospace industry to AS9102 standards, they must have generated FAIRs, not just filled them in. They will be measuring new components, and recording the data and generating a new FAIR. They do not need to have done polymers before, but AS9102 FAIRs experience is absolutely essential. They will also be doing problem solving but doing Root Cause Analysis using modern problem solving techniques such as 8D and 5Y. When submitting candidates, please highlight their 8D and 5Y experience. Experience of Rolls Royce FAIRs would be very desirable.

For full details online enter reference: JS-.MEG40-16324SHEP-TR

Metallurgist/Metallurgical Engineer

Location: Poole, Dorset
Type: Permanent
Salary/Rate: £32k - £36k per annum + Benefits

Purpose of the role is to execute manufacturing technology development programmes, providing metallurgical expertise to the Man.Tech department and other functions within the organisation. The work is carried out under the Quality Management System and where applicable, the New Technology Development process. Key responsibilities: - Project manage and execute technology development projects - Provide technical support to the manufacturing technology department and other functions such asBusiness Development and Operations. - Perform metallurgical evaluations, testing and documentation tasks to regulatory requirements. - Be aware of identification and protection of company intellectual property. **Personal specification:** Educated to degree level, either in Metallurgy or materials engineering, relevant industrial experience, Ability to produce work to agreed timescales. Ability to prepare and present reports for review by the Manager. Advantage Technical Resourcing is acting as an Employment Agency in relation to this vacancy.

For full details online enter reference: JS-.MEG-HEA-P52/11POLD

Mechanical Fitter

Location: Nottingham, Nottinghamshire
Type:Permanent
Salary/Rate: Negotiable

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Engineering buyers charged with the responsibility of purchasing disc spring washers or spring packs can remove any doubts regarding manufacturing quality, performance or reliability if they obtain written assurance from suppliers that the spring products conform in full to the DIN 2093 specification. It is believed that there are no UK based manufacturers currently producing these products to comply with the full design, production and quality requirements of this product standard. Bauer Springs of Germany, however, can supply through their UK distributor Bauer Springs Ltd, a wide range of disc springs and spring packs, with full documentation covering compliance with all the requirements of DIN 2093. Their long term investment, commitment as well as considerable production experience, also enables them to manufacture spring products in accordance with other standards or special requirements as specified by customers.

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Laser Scanners

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New SICK Ultra Compact Laser Scanner to Transform Safety Applications

SICK's ultra-compact new S300 Mini laser scanner offers superior versatility and reliability for stand-alone or complex, multi sensor safety configurations. Ideal for both moving and static applications, its size and functionality make it an excellent single unit replacement for common multi- component set-ups or barriers such as safety mats which are subject to wear. "The S300 Mini scanner is the result of more than 15 years of SICK experience in the field. It is the smallest safety laser scanner currently available and offers the best price vs. performance point on the market," comments Seb Strutt, Safety Specialist SICK (UK). "It is available in two models: firstly as the Standard, single sensor unit, which brings high technology to applications requiring lower cost solutions, for example vertical or horizontal protection in packaging machines and materials handling. The second, Remote model is for more complex applications requiring multiple field switching such as automated and self guided vehicles.

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Nitrogen Generators

www.hilineindustries.com

Nitrogen for modified atmosphere packaging available practically FOC

The Nitrogen generators available from Hi-line Industries can be matched to individual site demand requirements of Nitrogen users to ensure maximum economy and performance. Nitrogen gas is commonly used throughout many industries where safe, inert environments are required. This includes the petroleum, chemical, pharmaceutical, paint and varnish industries as well as the production of ferrous and non-ferrous metals, together with electronic and glass products. A growing demand is in the food processing sector where Modified Atmosphere Packaging (MAP) is used to prolong the freshness and shelf-life of food products by inhibiting the process of oxidation and decay. In normal environments, MAP treated salad products can have an extended shelf life of several days, with treated sandwich products viable for up to two weeks.

@: enquiries@hilineindustries.com
✆: 01283 533377

Rotary Atomiser

www.newlanddesign.com

Fine Droplets without High Pressure

The small electric rotary atomiser produced by Newland Design is an efficient way of creating small, consistently-sized droplets by means of high-speed rotation alone, without need of compressed air or any high pressure.

The Newland Atomiser rotates a small porous plastic cylinder at speeds up to 35,000 rpm and emits droplets of less than 40 micrometres in diameter.

Applications include:

- Humidification and Evaporative cooling
- Gas scrubbing and Odour control
- Dust suppression
- Oil misting.

Flow rates up to 25 litres per hour. Power input 10 - 25 Volts DC, consumption less than 40 Watts. Evaluation units always available.

@: newland.design@btconnect.com
✆: 01524 733 424

Sensors

www.michell.com

Michell's new sensor makes recalibration and maintenance as easy 'as changing a light bulb'

Michell Instruments' I7000 'Hygrosmart' humidity sensor makes the maintenance of their relative humidity instruments quick and simple with no down-time. The interchangeable module incorporates all calibration data and is delivered together with a calibration certificate.

To ensure continued measurement accuracy over time, the user can 'recalibrate' an instrument by simply replacing the old sensor with a new one. The process is as quick and simple as changing a light bulb and no specialist training is required.

The new I7000 Hygrosmart interchangeable module forms the base of a complete range of temperature and humidity instruments, suitable for applications from precision manufacturing to controlled environments and HVAC.

@: uk.info@michell.com
✆: +44(0)1353 658 000

Solenoids and Solenoid Valves

www.pennyandgiles.com

Solenoids and Solenoid Valves

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

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

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

@: solenoids@pennyandgiles.com
✆: 01388 771200

nt CADCAM SOLIDWORKS

SolidWorks 2012 Launch!

Great British Innovation Roadshow presented by NT CADCAM

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NT CADCAM invite you to one of the events being held throughout October across the country. At each event, learn about the **new SolidWorks 2012** product line and how it can boost your design productivity.

Work smarter and faster and improve your success. This event is designed for new and current users of SolidWorks products.

4 October	SS Great Britain, Bristol
11 October	London Transport Museum, London
13 October	Falkirk Wheel, Falkirk, Scotland
18 October	The National Motorcycle Museum, Birmingham
20 October	Jodrell Bank Observatory Macclesfield
25 October	The Sculpture Park Wakefield
27 October	Imperial War Museum Duxford
Timings:	*8.45 – 1.00 with lunch and a tour available afterwards.*

Book Online Now!

www.ntcadcam.co.uk/solidworks-events.asp

or Contact 0800 294 7363