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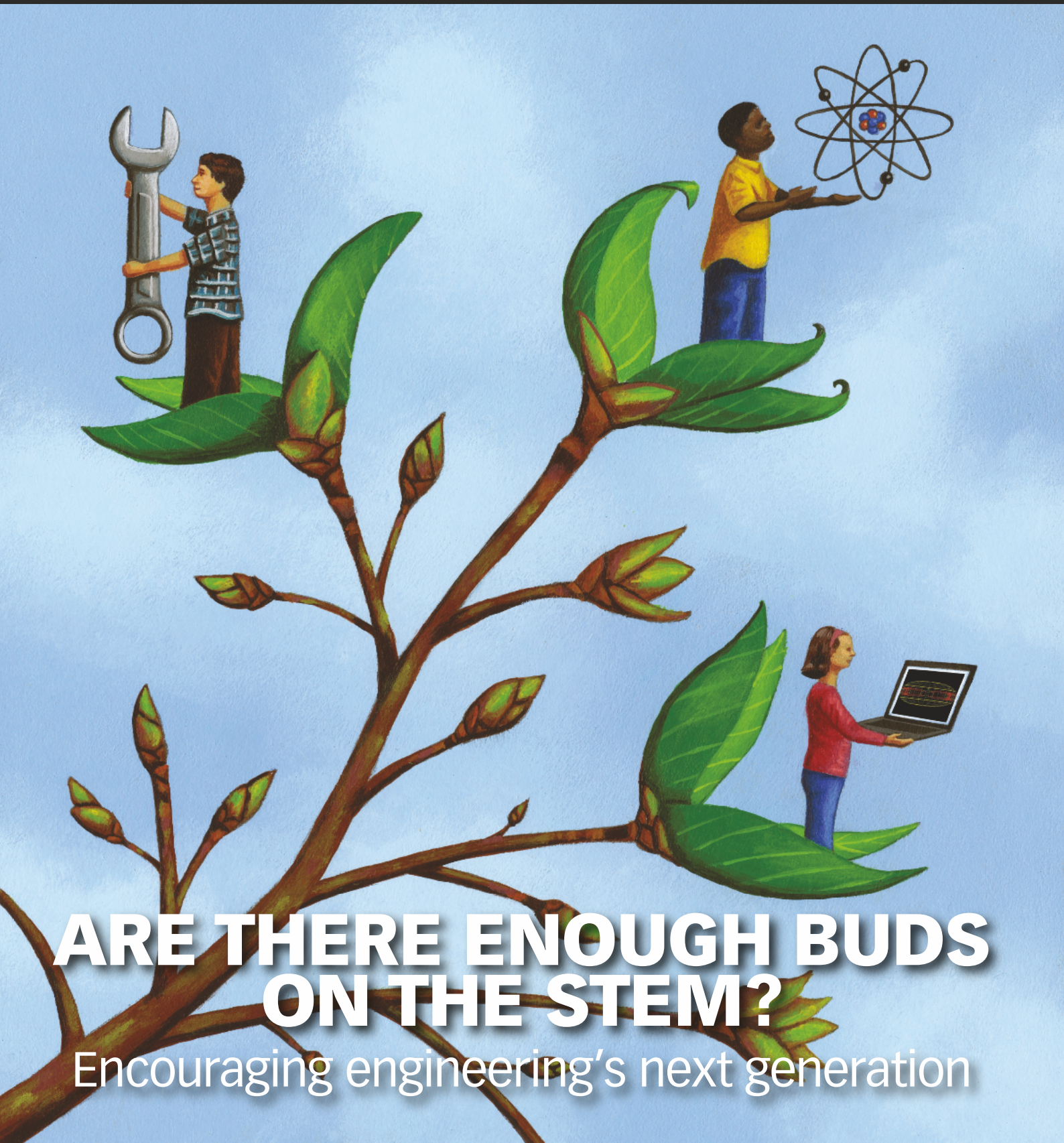

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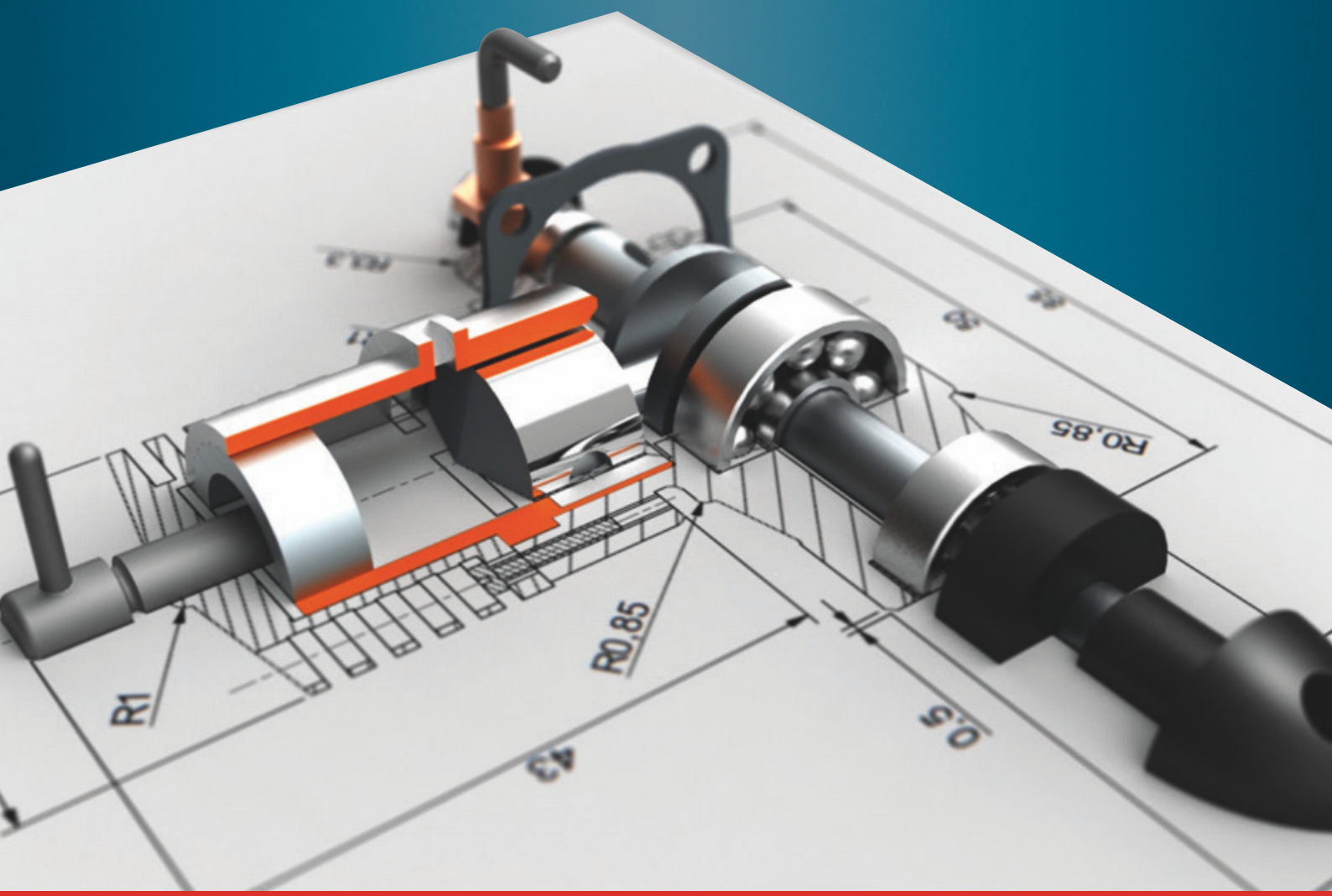

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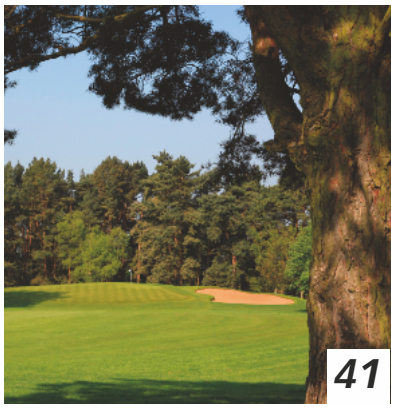

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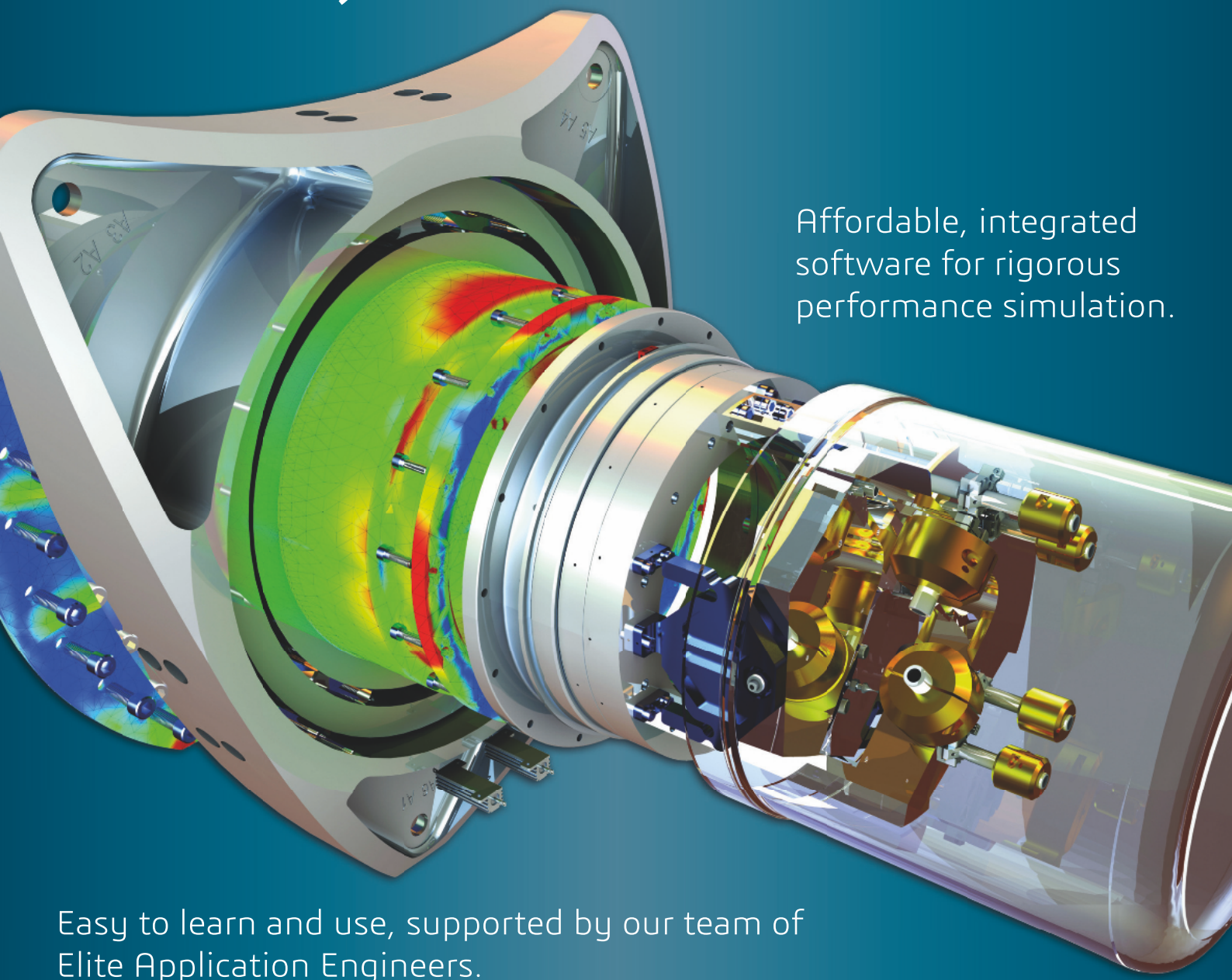

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The right creative spark

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

Industrial designers do speak in a slightly different language to us engineers. At a recent conference the delegates, all industrial designers, were encouraged to get emotional, understand the human problems and even 'love the unknown'. I am not being sniffy or dismissive – these industrial designers were producing some truly beautiful and innovative products – even if it is the design engineers who have to make their concepts a reality.

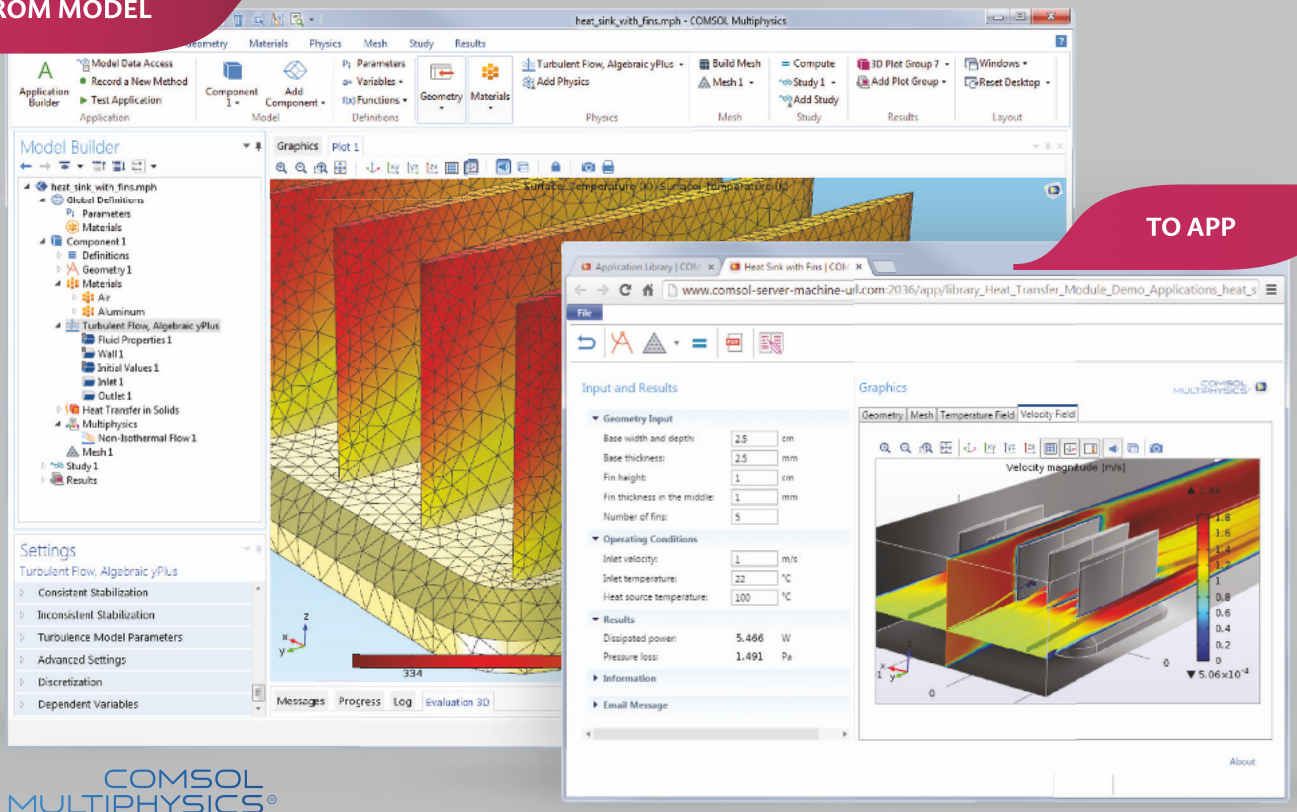
There were a couple of interesting points I took from the conference. One was that even industrial engineers, who stereotypically like to think of beautiful design as a gift that is solely theirs to give, were insistent that engineers were involved right at the concept stage. While this traditionally may have been viewed as inhibiting to their design flow, they acknowledged that having someone at the outset with the knowledge to say yes or no and set a project along the right lines was invaluable. While this may seem a pretty obvious observation, it was repeated on a sufficient number of occasions to imply that what should be the norm is still not always so.

The second point concerns the technical ability of industrial designers. Amongst all the talk of innovation, creativity and general out of the box thinking, the technical skills of the designer were almost completely overlooked. Unquestionably in any CAD environment a degree of competence with the tools can be taken for granted, but it is not a technology that is standing still. New tools are coming on stream and there are evolving manufacturing processes to consider, particularly the art of designing for 3D printing. On top of this is the aforementioned importance of a more efficient and inclusive design process, which inevitably will result in the cross-fertilisation of ideas and crossover of the platforms they are created on.

So in the midst of all this emotional thinking and loving the unknown, I wondered if mastering those technical aspects might in some cases be a more useful spark in unlocking designers creativity?

FROM MODEL

TO APP



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Attractive magnetic power

Liverpool has won the CWIEME Challenge, an initiative designed to find and reward the most promising electrical engineers of tomorrow.

Sheng Yuan, originally from Shanghai, presented his PhD project on the potential to harvest magnetic field energy to power condition monitoring devices, such as partial discharge sensors and infrared detectors at electrical substations, as well as real-time weather stations beneath overhead power lines.

His proposal includes a bowtie-shaped core, which he discovered to have a much higher magnetic moment and as much as five times greater power output than a conventional solenoid, and a switch in the matching circuit, which could increase transmission efficiency by 30%. These innovations could improve the reliability of condition monitoring devices, and reduce their maintenance and running costs.

£3m to inspire innovation

Up to £3 million is to be invested by Innovate UK for feasibility studies to stimulate innovation across four technology areas: advanced materials; biosciences; electronics, sensors and photonics; and ICT.

The aim of the competition is to ensure that small and micro businesses in the UK are well positioned to respond to market opportunities across a range of technologies and economic sectors. The projects are open to small and micro companies only, and they must be working in collaboration with one or more business or research partners. Small or micro businesses could receive up to 70% of their eligible project costs.

Projects are expected to last six to 15 months and to range in size from total costs of £50,000 to £150,000. This competition is now open for registration, and the deadline for applications is 9 September 2015.

125% cloud CAD growth

Cloud based CAD is currently in use by 8% of CAD users and strong future growth is anticipated. By the end of 2015 around 18% (a growth of 125%) are expected to be using cloud based CAD. This is likely to go up to 27% in the next 3-5 years (238% growth).

These are the headline results from the Business Advantage Group's Worldwide CAD Trends 2015 Survey of 635 CAD users and decision makers.

It found that cloud based CAD has 'high awareness' among CAD users, managers and executives and offers new business and delivery models for CAD/CAM/CAE/PDM/PLM software companies. It is not yet obvious whether this trend will best serve users or software companies wanting to switch users to subscription based revenue models, but the CAD Trends survey offers some clues.

Top perceived benefits are 'higher mobility' (66%) followed by 'ease of updating software' (45%), 'cost reductions' (39%) and 'increased storage capability' (31%).

On the lookout for inspiring women

The Young Women Engineer of the Year Awards are designed to demonstrate to young girls that engineering is a diverse and exciting industry offering creative and challenging careers. As such, The Institution of Engineering and Technology (IET) is calling on successful young female engineers to put themselves forward.

Current IET Young Woman Engineer of the Year, Naomi Mitchison, said: "I chose engineering because having done Maths and Physics at school it seemed like an interesting way to put those subjects to good use, while doing something a bit unusual and different. The great thing about winning the IET Young Woman Engineer of the Year award was that it made me realise that the work I do promoting engineering gives me the opportunity to be a role model."

The deadline for entry to the IET Young Woman Engineer of the Year awards is 30 June 2015. To find out more about the awards, visit: **www.theiet.org/ywe.**

NEWS

Here is a selection of the latest products featured on the Eureka website. Just enter the reference code in the search box for the full story

Miniature stepper dispense pump **83857**

Professional grade desktop 3D printer **83822**

Compact triaxial vibration monitoring **83800**

Bringing HD colour to 3D printing **83791**

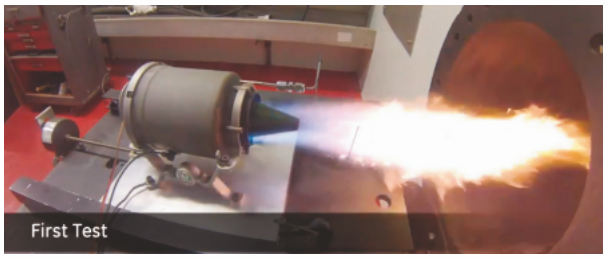
Eddy current sensor with integrated electronics **83736**

Energy efficient drive solutions **83683**

Innovative industrial gas springs **83662**

Aqueous PSA for medical applications **83635**

GE engineers print jet engine



GE engineers working on the future of aircraft manufacturing recently have produced a simple 3D printed jet engine that reached 33,000rpm.

The team couldn't build a whole commercial aircraft engine as the designs are too complex for today's printers. Instead, they got plans for a simpler engine developed for remote control model planes and customised them for their 3D printing machines. Their final product measures around a foot long by about eight inches tall.

Once finished, the engine was mounted it inside a test cell typically used to test full-scale engines and fired it up. Though not the world's first 3D printed jet engine, it was the culmination of several years of work for the team of technicians, machinists and engineers. The model engine is now on display at the Additive Development Centre.

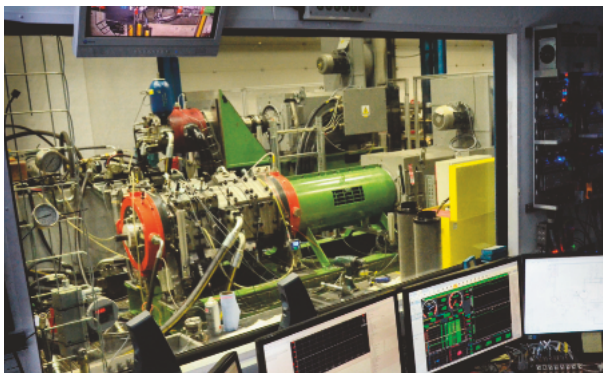
Three in hunt for MacRobert

Three UK companies have been revealed as this year's finalists in the Royal Academy of Engineering's MacRobert Award - the national prize for engineering innovation.

Edinburgh-based Artemis Intelligent Power has been selected for developing a digital hydraulic power system that unlocks the ability to generate greater levels of power from offshore wind turbines. Specifically, improving power capacity and overcoming reliability issues associated with existing turbines.

Endomag is based in Cambridge and has been chosen for its pioneering breast cancer diagnostic tool that avoids the use of radioactive tracers in determining the spread of cancer through the lymphatic system. The SentiMag probe developed by Endomag identifies sentinel lymph nodes for removal by detecting a magnetic, rather than radioactive, tracer signal.

Blackpool-based Victrex has created high performing ultra-thin polymers. Initially enabling smartphone speakers and earbuds to produce high-quality sound without risk of failure, they could now be a key material for enabling the flexible electronics revolution.



Each of these companies is competing for a gold medal and a £50,000 cash prize. The winner will be announced on 16 July 2015 at the Academy's annual awards dinner in London.

TECH BRIEF

Boeings to get SkyView windows

Fokker Services and GKN Aerospace have announced the SkyView window for civil jet aircraft. Fokker claim the window will be the first of its kind to be certified for flight. It will be offered to Boeing for use on its Business Jets.

Up to four SkyView windows measuring 1.5 x 0.5m, larger than three standard cabin windows, can be installed on each aircraft. It will enable passengers a wide-angle view of the skies. The acrylic window will be designed and manufactured at the GKN Aerospace Luton site, with the first set of windows due to be delivered in December 2015.

Gavin Wesson, senior vice president at GKN Aerospace, special products group said: "We are very proud to support Fokker in what will be an extremely eye-catching conversion of this iconic business aircraft. The aircraft will look outstanding with its wide, sleek windows and the passenger experience will be unique."

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NEWS

The BEEAs buzz is starting

Entries are now open for the 2015 British Engineering Excellence Awards. Now in their seventh year, the Awards are designed to celebrate those UK companies and individuals that have demonstrated the skills, invention and dedication to succeed and compete on an international stage.

Categories for the Awards run the gamut of engineering design and include:

- Consultancy of the Year
- Design Engineer of the Year
- Design Team of the Year
- Green Product of the Year
- Materials Application of the Year
- New Product of the Year (Electronic)
- New Product of the Year (Mechanical)
- Small Company of the Year
- Start Up of the Year
- Young Design Engineer of the Year

A high quality panel of independent judges will select winners for each of these categories, and from these will then select a British Engineering Excellence Grand Prix winner, last year won by design consultancy Romax Technology for its pioneering work in gearbox optimisation.

In order to ensure that companies of all sizes can compete fairly, the judges will take into consideration such factors as team size, project budget, project design cycle time, the regulatory environment, the competitive nature of the target market, the materials and technology selected by the design team and the attention to environmental issues.

Entries for the British Engineering Excellence Awards close on 31 July 2015. The Awards will be presented at a lunch event, being held at London's Hurlingham Club on 29 October.

If you believe you have what it takes to win in any of these categories – or know of a product, company or individual that does – entry forms, detailed entry criteria and additional information on the Awards categories can be found at **www.beeas.co.uk.**

Events

For more event details go to www.eurekamagazine.co.uk

18 June
Leading Business by Design Summit 2015
Birmingham
Design Council Conference

22 June
Innovation in autonomous systems
London
Royal Academy of Engineering Conference

6 - 10 July
Condition Monitoring and Predictive Maintenance Virtual Summit
Online, run by National Instruments

8 - 9 July
Manufacturing & Engineering North East
Newcastle
Exhibition and conference

ME NORTH EAST MANUFACTURING & ENGINEERING

9 September
FAST
Oxfordshire
Exhibition for the adhesives and fastening sector

29 September - 1 October
PPMA Show 2015
NEC, Birmingham
Packaging exhibition

21 - 22 October
Engineering Design Show 2015
Ricoh Arena, Coventry
Exhibition and conference for Design Engineers

Airbus contains 1000 3D printed parts

Stratasys claims to have produced more than 1000 flight parts on its FDM 3D Production Systems for use in the Airbus A350 XWB aircraft.

The 3D printed parts were used in place of traditionally manufactured parts to increase supply chain flexibility, enabling Airbus to meet its delivery deadline on-time, highlighting a benefit of 3D printing in the manufacturing industry. The parts are 3D printed using ULTEM 9085 resin for FDM, which is certified to an Airbus material specification.

Merging drives and motors

To pre-empt tightening efficiency regulations, Mitsubishi Electric and Brook Crompton are offering their drives and motors as a matched and tested package. The two companies are working together because many motor users are adopting variable-speed drive technology to meet new energy efficiency requirements. Engineers from the two companies have cross-trained on each other's equipment, so are able to operate independently. However, they also support each other and work as a team to offer integrated solutions.

Gone up like a lead balloon

Following their successful challenge of building a functional chocolate teapot, independent television production company, Icon Films, and Engineering Design Students from the University of Bristol set out to dispel the idiom and prove it is possible to fly a Lead Balloon.

To reduce the weight of the balloon the team sourced specialist lead foil with a thickness of 0.00116mm. Despite its thinness the lead weighs six times more than regular foil.

The team constructed an origami inspired balloon measuring 1.6m^3, by layering sheets of the lead foil on top of each other. The balloon was filled with air to start the unfolding process, which was replaced by Helium to complete the inflation. As the balloon twisted out into its cube shape it ascended reaching a tethered height of 5m.

Owen Gay, executive producer of Icon Films said: "We proved that you can pour tea from a chocolate teapot but this was a far greater challenge. However thanks to physics, a little bit of origami and a lot of hard work, we can now all celebrate the success by saying it's gone up like a lead balloon."

Solution to last month's Coffee Time Challenge

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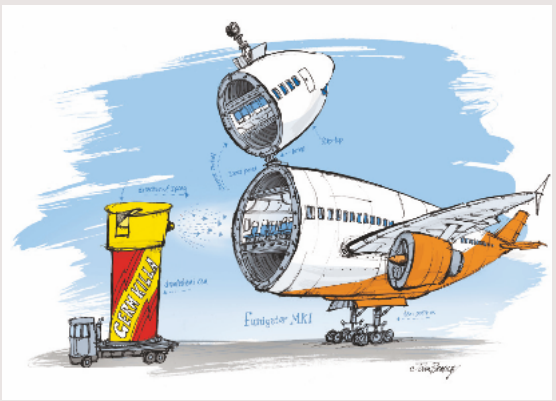

The solution to last month's Coffee Time Challenge - to come up with an effective way of disinfecting aircraft between flights - comes from GermFalcon. While the name is perhaps questionable, the technology is no doubt effective.

The GermFalcon is a six-foot tall fully-automated robot that has the footprint of a flight attendant's trolley. Once placed in the isle, it opens its 'wings' (hence the falcon), that are essentially two arms that hang about the seat, a little like a farmer spraying crops.

However, instead of spraying, the arms are lined with ultraviolet 'C' lights, which disinfect all commonly touched surfaces of the passenger cabin with a proven 99.99% germ kill rate in less than 15 minutes.

In addition to aircraft, this could be applied to trains or underground seats that are also notorious breeding grounds for germs and infections.

The company, who is currently raising funds on Kickstarter, say that germs survive on aircraft surfaces sometimes for as long as seven days.

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No buds on the STEM

Are you suffering from STEM fatigue? Are too many people talking about skills shortages, whose fault it is and who should do what about it? That in itself could be a problem, but as Tim Fryer found out, all the bits of the jigsaw are already there – maybe it is the picture that is missing?

There is a clearly defined problem. To retain competitiveness the UK's engineering sector needs more people. As a sector we are getting older, naturally, which is as fine as it is unavoidable on an individual level, but to maintain the status quo there needs to be at least as many people entering the sector as there are retiring from it. And there isn't.

This also only applies if the current engineering sector is fully staffed. Which it also isn't.

According to a report from EngineeringUK released last year, the UK, for the next five years at least, will need around 87,000 graduate engineers and a further 69,000 at advanced apprentice level. The report suggests that graduate output was 46,000 and there were only 27,000 engineering apprentices in 2013. India produces over a million engineering graduates. Universities in India, China and the other Asian countries are also climbing the global university league tables – so nor can we sit back complacently in the knowledge that our graduates are the best.

The economic arguments are lengthy, serious and, despite that danger of STEM fatigue, must be addressed.

So we find ourselves in a that typically British position of deciding whose fault it is, while also adopting that typical engineering stance of how do we find a solution.

For the sake of this argument, the most important part of the jigsaw – the young people – cannot be seen as having a creative part of the solution. They are the resource that we need to use responsibly, but they have a myriad of options and if our option isn't attractive they will go elsewhere.

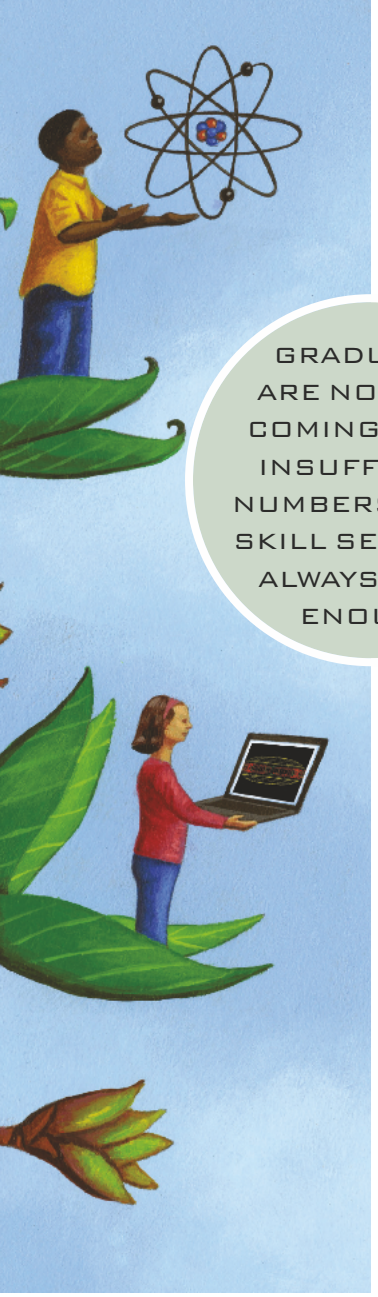
Parents form the second important group and they quite clearly do have a key role to play. However, in bygone days it was far more likely that a parent's job involved making or producing stuff. Going back to 1982, according to the Office of National Statistics 5,551,000 people, 21.5% of the workforce, were employed in the manufacturing sector. By 2014, this had fallen to 2,583,000, or 7.8%. In other words, a generation ago there were proportionately three times as many children who had a primary role model involved in 'making'.

And while that doesn't stop people building robots with their children, parents these days have a tough job being good parents – do they encourage their children to learn languages, do volunteering, play musical instruments, join sports clubs, learn to cook and take care of themselves? It is as tough being a parent as it is being a kid.

So realistically we have to turn to the usual suspects – the educators and the industry – if things are going to change.

And things do have to change. Irrespective of the initiatives and investments that are going on, the ultimate outcome is clear to see – whatever we are doing is not working. Or at least is not working yet. This urgency to rebuild the engineering and technology sectors was only really taken seriously when the financial sector revealed itself to be so vulnerable, and that is still only seven years ago. So schemes that involve influencing young children will only be proved successful if and when they make it to being engineering professionals, and this will undoubtedly take a while to be proven successful or otherwise. However there are indicators along the way.

According to figures from the Higher Education Statistics Agency, in



GRADUATES ARE NOT ONLY COMING OUT IN INSUFFICIENT NUMBERS, THEIR SKILL SET IS NOT ALWAYS GOOD ENOUGH

2013/14 there were 628,000 students enrolled in science based subjects of which 99,000 were specifically in engineering and technology. These healthy sounding figures need to be slashed, typically by a third, as they cover all students in higher education, not just those in their final year. However, the numbers are on the up – in 2009/10 there were 89,000 engineering students.

As an indicator, this shows that we are not on track to meet the needs of the UK's engineering sector for new graduates. Equally, apprenticeship starts in 2013/14 across all sectors reached 440,000, which is well up on the figure five years ago. The sting on the tail here is that it is still a 13.7% decrease from the number in 2012/13.

More positively, the numbers of students taking physics A level had risen to 5% of all A Level students, a rise of 22%, and the percentage taking maths was at 12.4%, an increase of 19.2%.

On the whole, a foundation to build on, but the problem clearly remains unresolved.

Blame the universities

Graduates are not only coming out in insufficient numbers, their skill set is not always good enough, according to some employers, to be able to drop directly into useful employment. Some of the 'soft skills', like team working, management, communications, marketing and so on, are often lacking but so too can be technical and hands–on skills. So are universities churning out less competent graduates?

Professor Anthony Finkelstein, Dean of the Faculty of Engineering Sciences at University College London (UCL), believes even that is not easy to establish. "There is a limited amount of time to teach students and exactly how we balance the technical and soft skills of students in that time is a curriculum challenge which we face. The changing in the nature of preparation of students prior to coming to university has exerted further curriculum pressure upon us, and that is changing the nature of the things we can do. They come from school to us with better self organisation and self management skills, but poorer technical problem solving skills. So the schools are preparing the students differently to hitherto. It is not better or worse, it is just different."

The consequence here is that much of the first year at university can be taken up by bringing all undergraduates up to standard, and, beyond the other skill sets that employers might want, quite often the engineering expertise that can then be crammed into the remaining two undergraduate years is still short of what employers need.

Moreover, the higher education sector is fundamentally a supply and demand operation. While there may be an argument to say that a well taught course will encourage an engineering graduate to continue in an engineering career, universities endeavour to provide courses that match industry requirements in terms of content. And the more paying customers there are (i.e. students) the more places will become available – universities can only run courses that will be well subscribed and therefore well funded.

So blame the schools....

This is the most interesting sector. There is no doubt that budding engineers need to make the first steps on their career path during the time they are at school. Whether that path branches off to university, apprenticeships or maybe through the new UTCs (University Technical Colleges), both the spark and the underlying knowledge must come at this time.

There are some excellent schemes to provide this spark at an early age, for example the Primary Engineer (see page 18 of this issue), but the key time under the present system will be when the student has to chose what GCSEs to take. Maths is compulsory but if physics, computing or at least DT (design and technology) are not among the choices at this stage then it is likely that a potential engineer has been forever lost.

One of the problems here is that the sciences and maths are hard. In a child's formative years it may be that these subjects offer an unwelcome academic challenge, where a problem-solving approach may better attract engineers.

At the recent STEMtech event, conference chair Roland Meredith, an associate at schools consultancy SCS, stated that there is: "a tyranny of subject based learning. Engineering is the important bit – it is the bit that joins up the S, T and M in STEM."

And yet engineering is not directly taught in schools.

Also speaking at STEMtech was Mike Brown, director of academic programmes at Siemens, who added: "You need a cross-curricular approach to STEM. You also need to think that students will be using the very latest technology and we need to prepare them for it. It is important that they have technological literacy and know how to apply it."

The demands being made on teachers are manifold - and constant tinkering with the curriculum by politicians does not help - but the principal one of those demands is to make sure that performance criteria are met. Students need to pass their exams. So talk of cross-curricular or extra-curricular activities are often not possible, even though it is these activities that could provide this link in STEM or the spark in the nascent engineer.

To a degree then, the hands of the education system are tied.

So is industry to blame?

As observed before, previous generations were far more exposed to engineering and manufacturing than the present one is. Collieries, steelworks, car plants et al were frequently at the heart of a community and offered an obvious, sometimes even inevitable, employment path. While this may have emphasised the relationship between hard graft and producing something at the end of the working day, the job of the coal

The Boeing and Royal Aeronautical Society Schools Build-a-Plane Challenge has so far produced two fully operational planes, this one built by Stoud High School

miner could not be further removed from that of the modern design engineer. Unfortunately such modern engineers can be invisible to the younger generation.

Somehow children need to find out that making things work, solving problems, designing the products that the rest of society depends on, can be an exciting and rewarding career. Also that it is an option, open to all, that comes in a host of different guises, with something to captivate children with all sorts of different interests.

Teachers are not engineers. It needs engineers to be demonstrating to children what is on offer. Astonishingly there are somewhere in the region of 2500 schemes that do just that in the UK. At STEMtech Sir Michael Arthur, President of Boeing UK and Ireland, described an ongoing project it was running with six schools, each of which is building a fully functional aeroplane - two have already been completed and flew at the Farnborough Air Show. He observed that one of the advantages of this sort of project was that, "the students came into contact with a very diverse group of adults with a variety of experience and skills."

Meanwhile Brown outlined what Siemens is doing on a number of fronts including supporting the Electric Car Challenge. Julie Collins, education liaison manager at Renishaw, summed it up by saying: "It is vitally important to Renishaw as a business that we engage with education." And on top of its record in providing apprenticeships and pre-university placements, it also offers work experience and goes directly to schools in its Gloucestershire catchment area, always, stressed Collins, trying to work within the school curricula.

Many more great companies are doing great things in various schools and many more are willing to do so. But this offer of help is not always getting through. Sir Michael Arthur quoted an experience where Boeing addressed 30 schools and only got past the school secretary on two occasions. Headteachers, so often overworked, are typically a target for such offers of engineering help, but may have such bulging inboxes or overprotective school secretaries that they never get to see the offers.

TEACHERS ARE NOT ENGINEERS. IT NEEDS ENGINEERS TO BE DEMONSTRATING TO CHILDREN WHAT IS ON OFFER

Science and DT teachers, who would probably be the champions of such schemes, may never get to hear of them at all. One such teacher from North London said they were in an impossible position. Not only did they not get information on all projects, it was impossible to assess them all anyway. There was no standardisation about what the school needed to pay, how much time would need to committed to the project, what the engineering company was offering, how experienced they were at working with children and how reliable would they be – businesses, after all, need to put their business first. Most of all, what value will they potentially get out of it. School time is a much fought over commodity as there are those that believe with equal passion that schools should spend more of their time promoting sport, languages, music and more.

So no one is to blame?

The penny seems to have dropped with all the stakeholders that promoting STEM to children is vitally important to the UK. Despite occasional bouts of finger pointing, it appears each sector is making an effort to up their game. But there is still no real evidence that it is working. Something else needs to change, but it is not a single thing. Prof Finkelstein said: "The problem is a complex multi factor problem and a whole range of things are tied together. This is a 25 year project, not an 18 month project. That means that industry, professional institutions, universities, further and vocational educators, school educators, cultural institutions, all have to work in a unified way and as a partnership."

And maybe that is what is lacking. Not the intention, because that appears to be there, but the implementation. Perhaps these disparate yet enthusiastic strands need to be bought together. Unquestionably there is value in having locally relevant input into a school from an engineering company and to try and standardise that on a national level would result in loss of impact. However, ideally engineering firms could tailor their input to fit in with what schools require and schools would have a database of such inputs that they could dip into to find partners they could trust and that would suit their agenda.

Such a central resource could be ET, a charity that receives funding from the Government. It claims to serve thousands of schools and has 27,000 STEM Ambassadors. The objectives of this organisation are ideally aligned with what the industry and government perceives that it wants. However, once more returning to the central theme, overall it's not working. At least not in terms of the overall numbers of engineers we are creating. Perhaps what it needs is less separate initiatives. The engineering professional bodies, engineering companies, government departments, all channelling all of their support and initiatives through this one network. Hopefully this would allow it to really take the issue by the scruff of the neck and provide the clarity and direction that will enable all the pieces of this jigsaw to create the picture we all want.

There are endless sources of information including:

STEMNET
www.stemnet.org.uk

STEMtech
www.stemtechconference.com

University College London
www.engineering.ucl.ac.uk

Primary Engineer
www.primaryengineer.com

lpe
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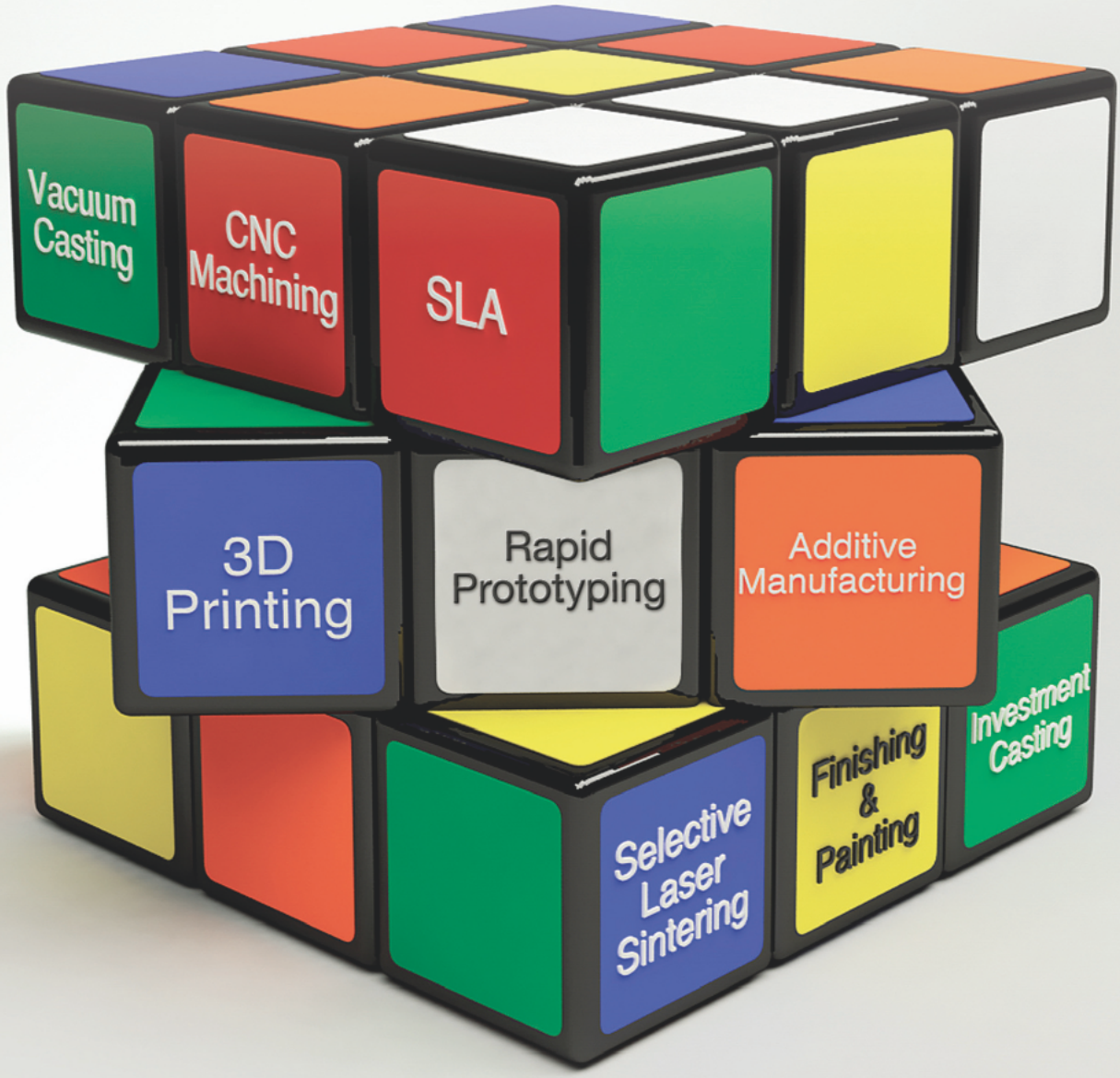

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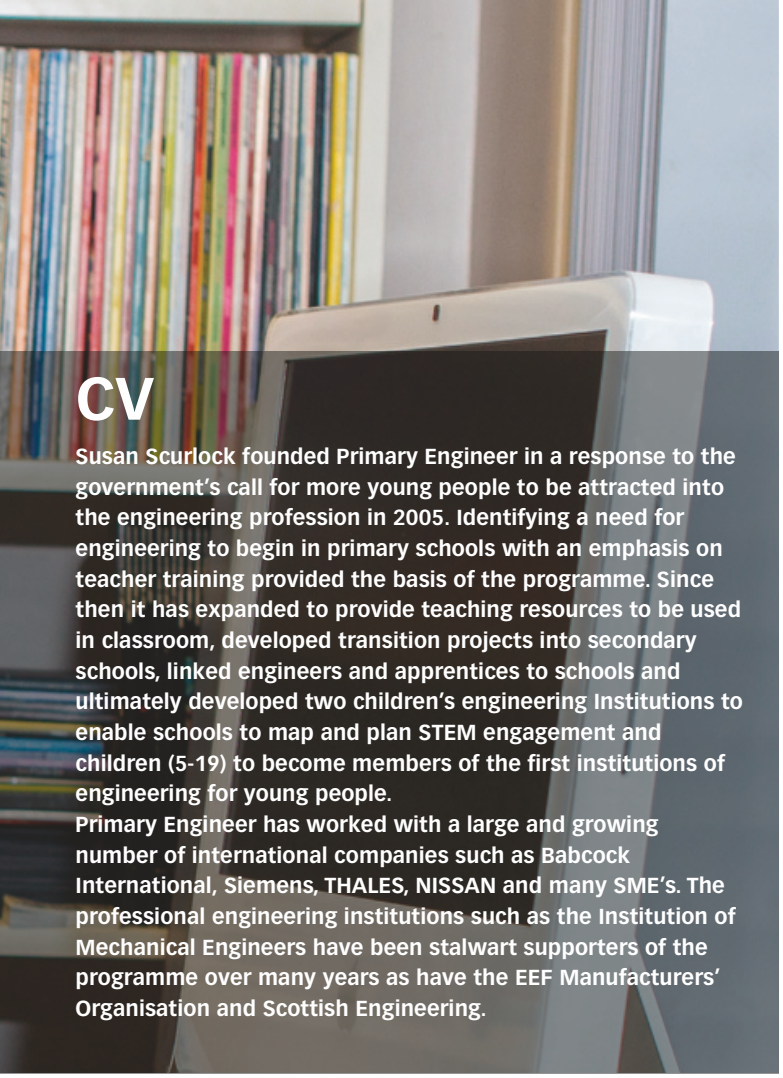
Inspiring **start**

The trick is to catch them early! An engineering career could start in the very early years and the Primary Engineer programme aims to provide this early spark. Tim Fryer spoke to the scheme's founder Susan Scurlock to find out how engineering companies can get involved.

Our cover story this month looks at the various attempts to improve the pipeline of engineers, as we are suffering from a shortage that is damaging the sector and the economy. Most of these attempts are aimed at encouraging children to take physics and maths at GCSE, then again at A level, and then go onto to university to study engineering. All laudable, but is it the classic case of taking the horse to water? We have to make the water something they want to drink.

Primary Engineer aims to do just that. Susan Scurlock, Primary Engineer's founder and CEO, believes waiting until secondary school is a mistake. She said: "All great engineers started off in primary school; that's the bottom line. If you don't start talking to the primary schools about engineering, forget it because you'll always be on the back foot later on. The earlier you talk to children about engineering, the earlier you get them involved in practical matters of science, the better they do at school, the more engaged they are, the better their aspirations.



CV

Susan Scurlock founded Primary Engineer in a response to the government's call for more young people to be attracted into the engineering profession in 2005. Identifying a need for engineering to begin in primary schools with an emphasis on teacher training provided the basis of the programme. Since then it has expanded to provide teaching resources to be used in classroom, developed transition projects into secondary schools, linked engineers and apprentices to schools and ultimately developed two children's engineering Institutions to enable schools to map and plan STEM engagement and children (5-19) to become members of the first institutions of engineering for young people.
Primary Engineer has worked with a large and growing number of international companies such as Babcock International, Siemens, THALES, NISSAN and many SME's. The professional engineering institutions such as the Institution of Mechanical Engineers have been stalwart supporters of the programme over many years as have the EEF Manufacturers' Organisation and Scottish Engineering.

That's what it's all about."

Last year Primary Engineer worked with 33,000 children and trained 1000 teachers, all involved in a variety of projects that relate maths and science to engineering. It runs in every year of primary school and each year has a different challenge. It even has designed a course for nursery school children, and Scurlock commented: "They actually remember more about those activities than anything else you do with them, and that's a really important thing. So even though we started with kids at two and three, it's an exciting place to be."

A key thing is that the project is sustainable. It is the teachers that are trained so that they can continue to deliver it year on year. It has allowed real technical skills to emerge amongst the young people, some are designing products in SolidWorks for example.

"We have no problem with girls thinking they can be engineers," claimed Scurlock, "because nobody's told them they can't be. It's only when they get to secondary, or maybe later, they are told they can't be. But here, girls are as engaged as boys.

"The inventiveness in children is just astronomic and when you look at the number of girls that excel at this it's also really incredible. We need more girls in engineering, but not to make the numbers up, it's that girls bring a different perspective and that's what's needed in engineering. It's not about numbers; it's about getting that diversity."

Examples of this inventiveness – and there are 5500 inventions already submitted this year by primary school children – have been such things as a locking system on a car that doesn't allow it to be driven if it senses alcohol on the driver's breath; another car had prisms on the headlights to detect black ice; an Alzheimer's hat invented by one girl who wanted to constantly remind her granddad what to do; and a Calpol lolly, designed by a girl looking for a better way for her sister to take medicine.

Of course, the big problem is keeping children engaged and Primary Engineer has an innovative solution to that.

"We decided to have an Institution of Primary Engineers and an Institution of Secondary Engineers, just like the professional engineering Institutions," explained Scurlock. "To become a professional chartered engineer you have to undertake professional competencies that go through personal skills, team-working, the wider world. What we did was look at what it was to be a chartered engineer and we worked them back into the primary and the secondary curriculum so that professional engineers can recognise them, but also children working in this area can see where they're going as they get older."

It forms a framework for children to follow, allowing them to be nurtured through the system and making sure that they have regular exposure to engineering and possibly particular disciplines within that. Scurlock added: "We can actually keep hold of them – and engineers don't want to let go of kids that have shown a tendency towards engineering. We can tie all of these things together."

Engineers play a crucial role in this. "They are absolutely vital," said Scurlock. "If children and teachers are not made aware of the context of maths and science – the application of it – then it is all meaningless theory. Children, and many adults, learn best by 'doing'. To be able to use 'sums' in a problem solving context is a major educational goal. Engineering allows that. It is also vital that engineers are involved to dispel adults' myths. Primary children have very few preconceptions – and where they do they are easily shifted by an engineer who can tell a good story!"

Many of the companies involved with Primary Engineer will fund work with local schools or across different programmes. For any company however the most important aspect is to enable their engineers to have time to go into the schools. Scurlock said: "Perhaps this is only three days a year but those three days will help embed the programme into the school curriculum, link it to local industry and raise the aspirations of all the children they will come in contact with."

> "THE ENGINEER IS NOT THERE TO TEACH BUT TO BE THE 'WOW' FACTOR" SCURLOCK

All the support information is already in place for the engineers – it is designed to make the process as simple and productive as possible for all parties. Scurlock concluded: "Engineers can attend the training day alongside the teachers and then agree directly as to how much time will be spent in the school with the teacher. The engineer is not there to teach but to be the 'wow' factor – the expert in the room giving real world context to the project."

• *If you would like to find out more about the work of Primary Engineer, possibly with a view to getting involved, Susan Scurlock will be presenting at the Manufacturing & Engineering North East (MENE) event in Newcastle. She will be speaking on the first day of the conference (July 8th). Places are free but limited, so to reserve your place see all the registration details on page 46 of this issue.*
www.primaryengineer.com
www.menortheast.co.uk

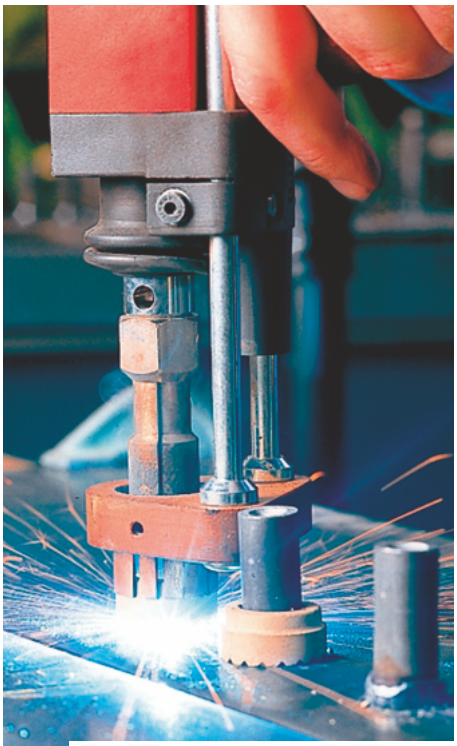
Welding lighter materials

Welding is as old as manufacturing itself and had become the method of choice for joining metallic components until the environmental lobby required the increased use of lighter materials. Paul Gay reports

In the manufacturing world, designers come up with clever components which need to be joined together in such a way that they form the desired assembly or product. Environmental pressure is demanding reduced emissions from power consuming equipment and this can often be achieved by weight reductions. Quite simply, a lighter structure requires less energy to drag itself around. Less energy means lower fuel consumption and therefore less carbon emissions.

With the continuing need to reduce weight, plate gauges have been reduced and manufactured from exotic alloys more reactive than steel so that they become very difficult to weld by conventional means. In these environmentally conscious times, weld, bond or fasten is the conundrum facing today's industrial designers especially with the trend for lighter materials and the benefits of using dissimilar materials.

Lighter materials are often non-metallic and when used in plate form, too thin to weld effectively. Welding dissimilar materials is difficult as the finished joint will not be homogenous and will likely create a weakness in the completed assembly.

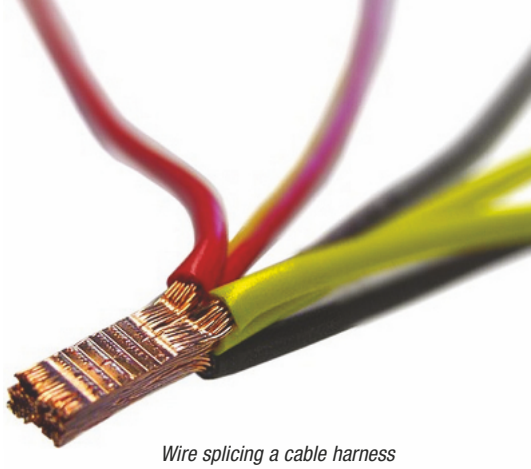


The Nelweld N1500i has become the stud welder of choice across many industries

Welding joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material, known as the weld pool that cools to become a strong joint. Pressure is sometimes used in conjunction with heat, or by itself, to produce the weld. Welding differs from both soldering and brazing, which involve melting a material of lower melting point between the work pieces to form a bond between them. The work pieces themselves do not actually melt.

Perhaps the best known electric welding method is shielded metal arc welding, also known as stick welding, which uses an electrode that has flux, the protectant for the molten puddle, created by the heat from the arc formed around it. The electrode holder holds the electrode as it slowly melts away. Slag protects the weld puddle from atmospheric contamination.

The world wars of the twentieth century saw the large scale introduction of lightweight panels



Wire splicing a cable harness using ultrasonics

in the aerospace sector to improve performance of aircraft. Joining these panels led to the development of alternative joining methods such as blind riveting, the quick release fastener and metal inert gas (MIG) welding. This gas metal arc welding system uses a gun that feeds wire at an adjustable speed and flows an argon-based shielding gas over the weld puddle to protect it from atmospheric contamination.

MIG welding and its derivatives, gas tungsten arc welding and flux-cored arc welding are still popular today and will continue to be used to weld lightweight panels, providing they are conductive to the arc. Tungsten, inert gas (TIG) welding uses a non-consumable tungsten electrode to produce the weld arc. The weld area is protected from atmospheric contamination by an inert shielding gas such as Argon or Helium. Flux-cored arc welding is almost identical to MIG welding except it uses a special tubular wire filled with flux and can be used with or without shielding gas, depending on the filler.

As well as an electric arc, many other energy sources can be used to create the weld pool. These include gas flames, lasers, an electron beam, friction, and ultrasound. While often an industrial process, welding may be performed in many different environments, including in open air, under water, and even in outer space.

'The flexibility, speed, precision and resultant joint performance from the ultrasonic welding process have been the main drivers behind the replacement of traditional soldering'

Stud welding offers a viable alternative to electric arc welding in certain applications. Weighing in at only 32kg and with its capability of welding a vast array of different studs from 3mm insulation pins to 16mm shear connectors, the Nelweld N1500i Inverter Stud Welder has become the stud welder of choice across many industries.

The machine's manufacturer, Nelson Stud Welding has patented the Stud Expert data base, which provides the necessary characteristics of the materials being joined so that the operator can get started by pressing just a few buttons. With the built in process monitoring system the Nelweld N1500i will tell you when things are possibly not as they should be, saving time and effort in re-welding out of tolerance studs.

When it comes to joining insulating materials such as plastics, arc welding and any method involving a naked flame must be substituted with other methods. Already a widely used process for joining plastics, ultrasonics is fast becoming a standard for an increasing number of metal welding applications. The flexibility, speed, precision and resultant joint performance from the ultrasonic welding process have been the main drivers behind the replacement of traditional soldering and other less measurable techniques in a diverse range of metal joining tasks.

Ultrasonic metal welding is a friction welding process, where oxides and other contaminations present on the material surfaces are broken up and the parts to be welded are brought together under simultaneous pressure. Molecular bonding, similar to the conventional cold-press welding, then takes place. The process also provides optimum strength since no micro-structural changes occur in the boundary layer. The joint produced using ultrasonics also provides good resistance and heat rise properties.

Welding metals using ultrasonics differs from the more common plastics welding techniques in that the ultrasonic energy is delivered transversely rather than longitudinally. The SoniqTwist concept, developed by Telsonic, is a torsional welding system using circumferential amplitudes, is also an effective process for metal welding. Another major difference between plastic and metal welding is that for metals, the joining process takes place at temperatures approximately 30% to 40% below the melting temperature of the base material.

Ultrasonics can be used to weld a broad range of thin section, ductile, conductive metals such as copper, nickel, aluminium, brass, silver and gold. With this range of metals commonly found within the electrical, electronics and photovoltaic industries it is in these sectors where ultrasonic

TECH BRIEF

Power behind the weld

Because welding applications vary, Sif has developed the SifWeld range to include power sources that can meet various needs and requirements including higher energy efficiency to keep running costs lower compared to traditional equipment

The SifWeld MTS200 has a simple menu control to select MIG, MMA or TIG modes. The smooth DC output is suited for MIG welding of steel, stainless steel, aluminium and copper alloys. The MTS250 control system allows infinitely variable welding voltage and wire feed speed, burnback control and wire inching in MIG mode.

The SifWeld MTS300 and MTS400 are multi-process CC/CV power sources, and when combined with SifWeld wire feed units they create a welding system configuration optimised for production welding and quality workshop use or demanding pipe and vessel welding on shipyards, platforms and heavy construction sites.

The range of MTS power sources are supported by two portable and lightweight professional microprocessor-controlled inverter power-sources for AC TIG, DC TIG and MMA applications. Built-in fast switching IGBT technology helps to combine high efficiency with a responsive user interface.

www.sifweld.com

metal welding is becoming firmly established as the process of choice in these sectors.

The technology is already being successfully applied for welding aluminium and copper foils onto connector bars for lithium-ion batteries, hermetically sealing aluminium and gold tubes and welding copper leads onto a coated ceramic substrate. The system has also featured in wire splicing applications using Telsonic's special purpose Windows driven splicing machines for wire harness and loom production.

Examples of continuous ultrasonic welding include seam welding composite aluminium and plastic tubes and copper flutes to tubes in the heating and solar panel industries. The capability to join materials with dissimilar properties, very short welding times, low heat generation at the welding point and the resultant weld strength close to that of the base material are all key attributes of the process.

www.nelsonstud.com
www.telsonic.com

Paul Gay is Editor of Eureka's sister magazine FAST

TECH BRIEF

Welding in the dark side

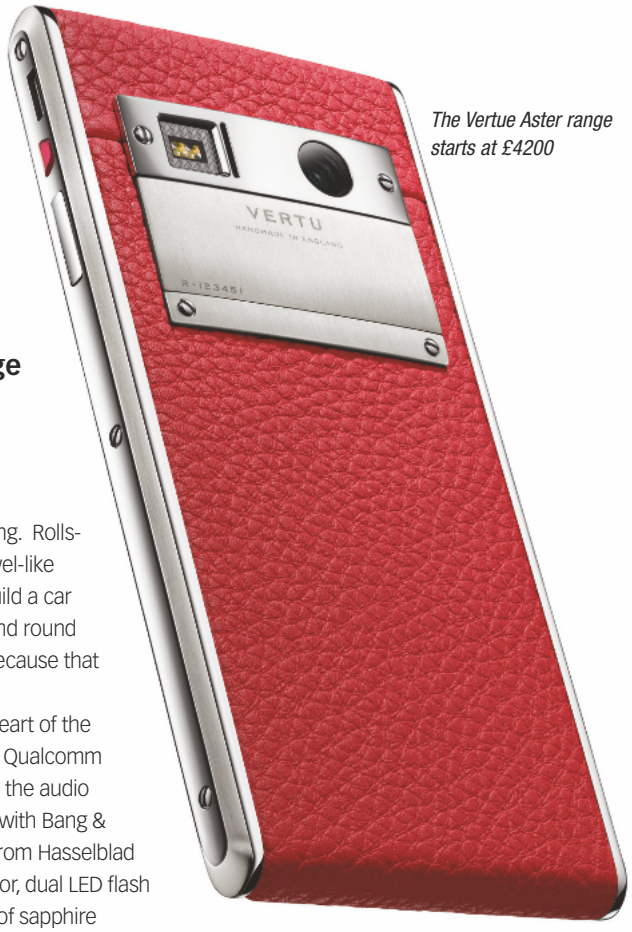
Designers who are not just involved in the materials technology around welding, but also like a bit of hands on practice, might be interested in a new welding helmet from ESAB Welding & Cutting Products. The Aristo Tech HD is an auto-darkening welding helmet with an optical class of 1/1/1/1, which indicates the highest optical performance possible according to the EN 379 Standard.

The Aristo Tech HD features an advanced LCD lens with a 100 x 62 mm viewing area – 12 mm larger than the previous lens – for wider visibility and better spatial awareness. ESAB's new X-TIG mode provides superior performance when TIG welding down to 5 amps. In the X-TIG mode, the helmet uses electromagnetic arc sensors that automatically react to the magnetic field of the arc. This eliminates interference from sunlight or other electrical/electronic equipment, as well as ensures that the helmet darkens when the sensors are blocked, such as when welding pipe or in awkward positions.

www.esab.co.uk

Phone alone

Making exclusive mobile phones is a different proposition when you are a small company instead of being part of a global multinational. In the case of Vertu it meant that change of CAD environment would be beneficial. Tim Fryer reports.



The Vertue Aster range starts at £4200

There is a sector, albeit a small sector, of the buying public whose watches cost more than most people's cars, their cars are worth more than the average house, and the value of their houses doesn't bear thinking about.

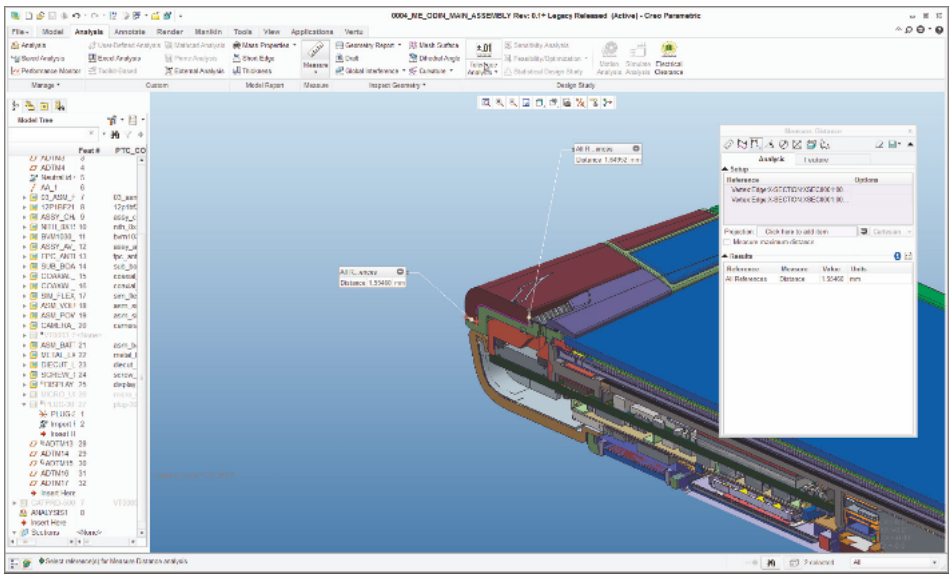
When everything else in these people's lives exudes quality and exclusivity, why would they be happy with the same mobile phone used by the rest of the population? On such a philosophy Vertu has built its business, designing, manufacturing and supplying exotic phones – backed by a personal service – from its base in Hampshire.

Each phone is hand crafted and signed by the craftsperson who assembled it. Entry level is the Vertu Aster range, starting at £4200, but the cost of the phone is essentially determined by the materials used in its construction. And there is no upper limit. If snakeskin or diamonds is your preference it can be done but the price tag will be adjusted accordingly.

These phones are not gimmicks though. Hutch Hutchinson, head of design at Vertu, said: "Most of the time, good luxury is engineering. Rolls-Royce didn't set out to build a jewel-like trinket of a car. They set out to build a car that would go round and round and round Brooklands with utter reliability, because that really was what luxury meant."

For example, the processing heart of the phone is a the high-performance Qualcomm Snapdragon quad core processor, the audio performance is tuned and tested with Bang & Olufsen, and the camera comes from Hasselblad and features a 13 megapixel sensor, dual LED flash and a lens of virtually scratch-proof sapphire crystal. Even the ring tones were exclusively recorded for Vertu by the London Symphony Orchestra.

It is a case of using outsourcing strategically to get the best results. Neil Hooper, VP of R&D souricng and quality, said: "What we're trying to do is keep our core competencies in-house and used the best team in the world to do it. We're not the best in the world at assembling circuit boards with micro BGAs, so we use partners to do that and focus on where we do see we can add value. This is in the home crafting, the components where we can do things better, and the audio - it's not just about the components we use, it's about the audio cavity, the way you see the cavity, the way you model that cavity to make sure it gives you the bass and the best response."



Clearly getting the design environment right is crucial, but the company found itself in an interesting position three years ago when the apron strings were being cut by its parent company, Nokia. Tim Draper, CAD manager, commented: "It started in 2012 when Nokia made the strategic decision to divest Vertu. We were entirely reliant on Nokia for everything really, in terms of IT infrastructure and the software that it used to develop new products."

Although Nokia were to remove themselves completely from the management of Vertu, it had negotiated a deal for the use of the latest version of its current CAD environment, which was to be its own way forward. However, at the time the company was still using the old version without any migration to the new platform. Draper said: "The challenge set to me was to migrate Vertu to the new version CAD environment in just six

months. It was an almost impossible challenge to take a company, do all the infrastructure and transport everybody over to a new system and be productive without interrupting what we were already doing in six months." So what Vertu did was negotiate a deal that allowed continued use of the current version of the software whilst conducting a properly managed transition to the latest version. It was a break that allowed the company to re-evaluate what it actually needed.

"It became clear to us during 2012 that moving to the new version may not be the best way for us," continued Draper. "We struggled to make that system work with the way that we would like to run the business. We were also facing a brand new challenge - actually re-structuring the way that we worked and the way that we developed the product to suit the new Vertu, and this is a Vertu who weren't buying technology, or weren't being provided with technology by Nokia anymore."

The company was moving towards an Android platform and the phones' engine room – the electronics – also had to be designed from the ground up rather than being supplied by Nokia. There was also the issue of developing a supply chain with a small number of key collaboration companies who were going to work jointly with Vertu to develop this new product. So when Vertu was faced with the possiblitiy of moving away from its Nokia imposed CAD environment, there was one over-riding consideration. Draper said: "Today actually there's no difference [between CAD packages] in terms of their overall capabilities, but for us the key thing was we needed something that helped us get locked in and plugged into that supply chain. We did a quick survey that revealed 100% of our key collaboration partners were all using PTC Creo."

"Most of the time, good luxury is engineering"

What the team really needed was the collaboration element and this became the key benchmark when choosing the system. "PTC basically sat in with us and showed us how all that could be done - simulating how the collaboration process could work, being able to partition work packages and bring them back into the system. What we essentially had with Windchill [PTC's PLM product] we found was everything we liked about the old PDM system but with a load of new functionality."

From the decision to move to PTC in June 2013, it only took until the end of that year to get the first full project underway in Creo.

Draper said: "We had our key collaboration partner working within that project with us and the time we saved was huge. Previously we were swapping STEP files twice a week, and every time we swapped files you get a completely new representation of your partner's data. So you have to integrate that into your own model. You don't know what's changed, you have to check everything, and we were doing that twice a week here, and it was being done the other end as well."

Now all 45 CAD seats and 170 PDM users have switched to the new platforms. The result is that Vertu has created the right environment for creating the right products for its customers and the first products are arriving. Draper said: "One year after starting our first project in Creo, I held that phone in my hand. It's not in the public domain, but I have held that phone as a working phone in my hand, which is a pretty good achievement given that we switched CAD systems and everyone needed to learn a new system."

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www.vertu.com

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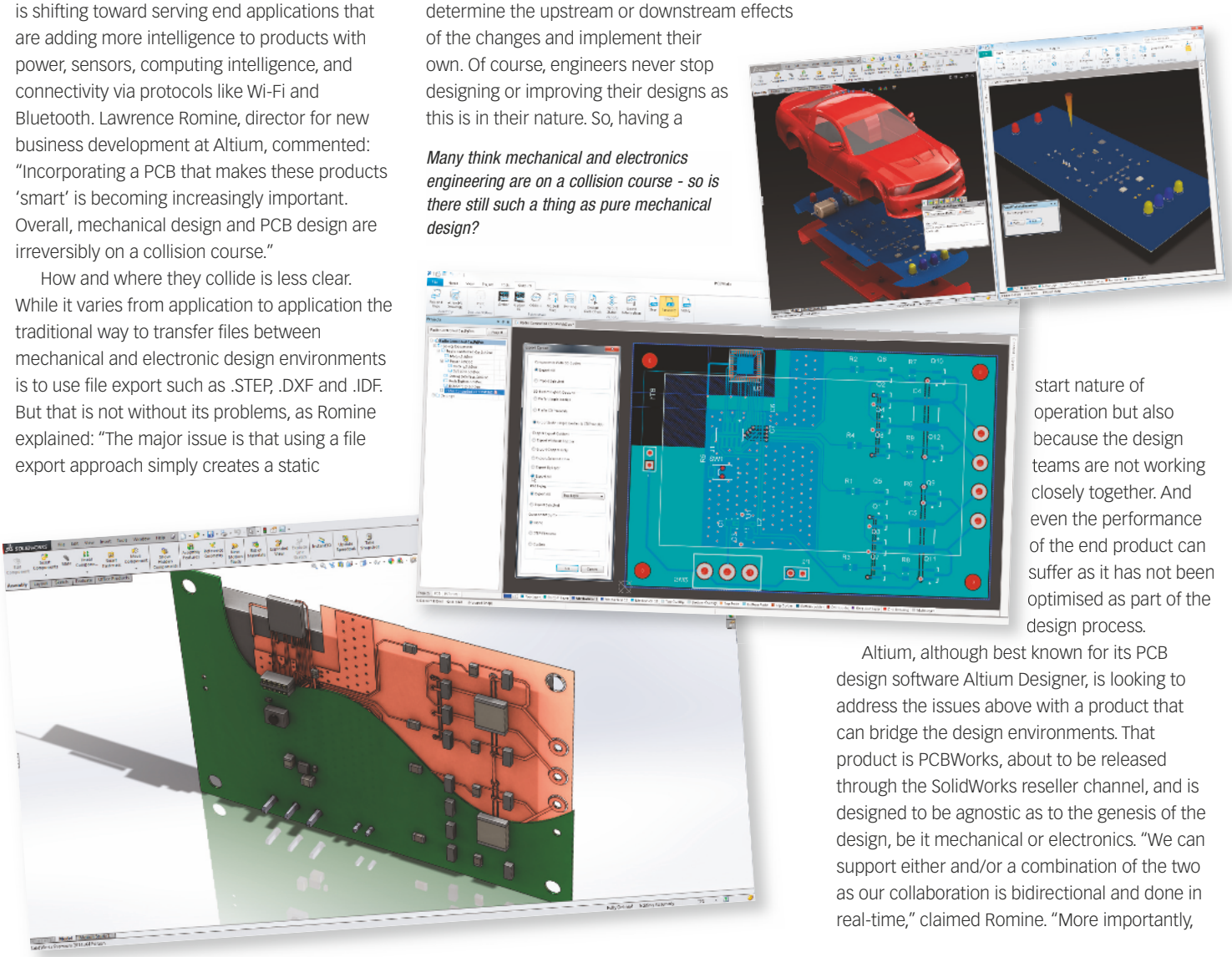
Engineering design increasingly involves more than one discipline, often that need to be tackled by a single engineer. Tim Fryer investigates a product that is bringing electronics onto a mechanical design platform.

Whether going under the name of Internet of Things or maybe Cyber Physical Systems or Industry 4.0, the fact is you don't need a label to know that everything is getting 'smarter'. The MCAD market is shifting toward serving end applications that are adding more intelligence to products with power, sensors, computing intelligence, and connectivity via protocols like Wi-Fi and Bluetooth. Lawrence Romine, director for new business development at Altium, commented: "Incorporating a PCB that makes these products 'smart' is becoming increasingly important. Overall, mechanical design and PCB design are irreversibly on a collision course."

How and where they collide is less clear. While it varies from application to application the traditional way to transfer files between mechanical and electronic design environments is to use file export such as .STEP, .DXF and .IDF. But that is not without its problems, as Romine explained: "The major issue is that using a file export approach simply creates a static representation of the design from either side, which is out of date the moment it is emailed or placed into the network drive for sharing. Unless, of course, one or other of the engineers stop designing while they wait for the other party to determine the upstream or downstream effects of the changes and implement their own. Of course, engineers never stop designing or improving their designs as this is in their nature. So, having a design flow that is predominately a start-stop-wait arrangement is at odds with this."

Many think mechanical and electronics engineering are on a collision course - so is there still such a thing as pure mechanical design?

The consequences of this are manifold but include a longer, less efficient design cycle. It can suppress creativity, not just because of this stop-start nature of operation but also because the design teams are not working closely together. And even the performance of the end product can suffer as it has not been optimised as part of the design process.



Altium, although best known for its PCB design software Altium Designer, is looking to address the issues above with a product that can bridge the design environments. That product is PCBWorks, about to be released through the SolidWorks reseller channel, and is designed to be agnostic as to the genesis of the design, be it mechanical or electronics. "We can support either and/or a combination of the two as our collaboration is bidirectional and done in real-time," claimed Romine. "More importantly,

According to a survey conducted by Eureka

6% of readers do all of their own electronics design using their main CAD package.

13% do their own electronics design, but using a specialised electronic design software

51% have the electronics designed by someone else.

29% are designing products that have no electronics in them

Source: Eureka reader survey, March 2015

the success or failure of the created products is more and more being judged by an overall product experience vs. the mechanical design or the electronics features on their own. So, what we are really enabling is to allow designers to balance both worlds and make tradeoffs that don't penalise them with higher design and development costs or time to market delays. They can make, propagate, and document design changes to create the perfect product experience without the fear of overrunning cost targets or release dates."

Altium has developed this product in conjunction with SolidWorks and this was not a difficult decision to make according to Romine: "Firstly, their story mirrors our's quite closely in that they entered a market that was dominated by workstations and very expensive 2D applications; and offered a shrink wrapped solution to run on a PC at a very affordable price point while also offering a significant technology improvement by offering 3D capabilities. This is exactly what Altium did in the early days in the PCB design space.

"Moreover, there is already a tremendous overlap in our customer bases given their ubiquitous presence in the mainstream of the market. Finally, SolidWorks is very focused on enabling the already underway explosion of the IoT.

Familiar interfaces

PCBWorks is very much built on Altium's DNA and includes product features like the unified design environment, robust design management abilities and shrink-wrapped capability. However it is also very much a new product and the user interface and user experience (UI and UX) will feel more familiar to users of SolidWorks. Romine said: "I like to say that we are bringing PCB design to the world of SolidWorks. It's a bit like 'speaking' PCB design with a SolidWorks accent."

Functionality wise, PCBWorks, despite remaining a sub-set of Altium Designer (with the exception of the SolidWorks compatibility), is a fully functional PCB design environment in its own right. It does retain interoperability with Altium Designer in case the engineer has some higher-end design needs, such as high speed requirements.

Romine believes it is the right time for this sort of design tool to emerge. He said: "Much like we've seen electrical engineers crossing over into software engineering. The multidiscipline segment accounted for a 56% share of the Global MCAD Software market in 2013. This share is expected to increase to 64% in 2018. As the industries gear up to ship nearly 25 billion connected devices by 2020, there's no doubt that innovations in electronic design and manufacturing will be required to fuel the next wave of innovation."

www.altium.com
www.solidworks.com

TECH BRIEF

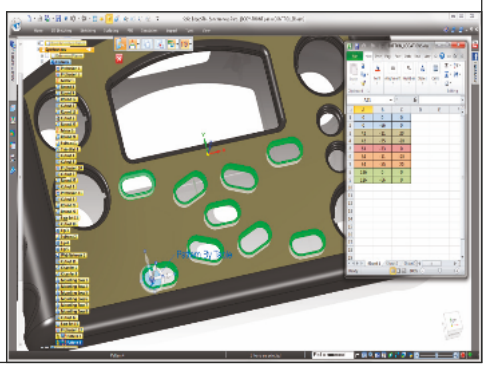
New Solid Edge at Siemens

Improvements in functionality married to options in hardware platform are among the features of the latest release of Siemens' Solid Edge software (Solid Edge ST8). The full version of Solid Edge ST8 can now be installed on tablets running Windows 8.1 operating system, giving users more mobility. In conjunction with the release of Solid Edge ST8, Siemens' product lifecycle management (PLM) business also launched a new Solid Edge App Marketplace mobile app.

Improvements to synchronous design intent management, complex sketching and 3D feature recognition enable users to focus on designs, rather than the design tools, allowing an accelerated modeling process. Flexible modeling incorporating synchronous technology frees the user to intuitively produce realistic, accurate designs faster. Synchronous technology combines the speed and flexibility of direct modeling with the precise control of dimension-driven design.

In addition, simplification of large and complex assembly capabilities in Solid Edge ST8, combined with its ability to simulate and predict kinematic conditions, accelerates the assembly design process and reduces the need for physical prototypes. Solid Edge ST8 also provides access to in-product learning tools, online community and the new Solid Edge App Marketplace. Solid Edge ST8 is scheduled to ship this summer.

www.siemens.com



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Top ten design tips..... for moulded plastic components

With the advent of rapid prototyping services being able to create components within a couple of days, a lot of the risk, delays and up-front costs incurred during the critical stages of a product's development can be mitigated – easing the transition from a prototype into a full production run.

The following article highlights key considerations for engineers when designing plastic components that are intended for this type of injection moulding.

1 Material decisions

Selecting the correct thermoplastic resin is crucially important to the form, fit and functionality of a moulded component. There will always be a trade-off with the many different pros and cons for each material's properties – such as shrinkage, impact and chemical resistance, mechanical strength, flexibility, temperature resistance, optical properties and so on. But with the list of available materials running into the tens of thousands, there's plenty of choice available.

2 Looking good

The moulding process can bring a host of cosmetic flaws, but all's not lost. With careful adherence to some basic rules, they can be virtually eliminated. Many of these factors are discussed in this article and when discussing a product's requirements with a moulding specialist, it's important to raise any potential problems before orders are finalised.

This could be something as simple as changing the thickness of a rib, moving the position of the gate and ejector pins or adjusting the material selection - but a few small changes early in the process can make all the difference to the final product.

3 When in doubt, draft It

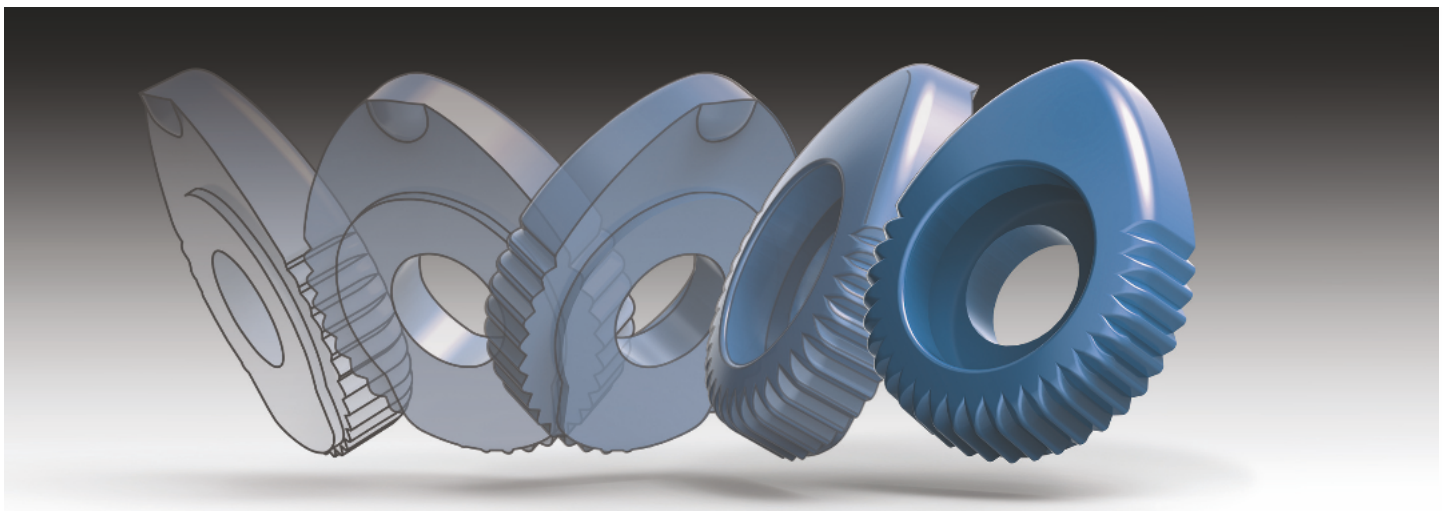
Ensuring that a component has a draft (tapered sides) helps prevent the component being damaged as it comes away from the mould and so avoids drag marks. Use a CAD package's draft analysis tools to provide a component design with sufficient draft to aid clean ejection. The surface finish of the component will also have a bearing on the requirements, with a surface containing a light texture needing three degrees of draft, compared to at least five degrees of draft being required on an item with a heavily textured surface. Proto Labs has a rule of thumb for part design: "When in doubt, draft it".

4 That shrinking feeling

Although the rate of shrinkage in a moulded component will vary with the material selected, there will always be some shrinkage as the resin cools. The cavity in the mould has to be oversized to take this into account; however, other factors can cause shrinkage issues.

Shrinkage is proportional to resin depth, so thicker walls are more susceptible to sink marks due to the parts cooling from the outside in. Also air and gas bubbles can be formed in thicker areas, potentially causing structural weaknesses and warp is also more likely due to

uneven shrinkage. When adding ribs into a product, it's important to make them no thicker than 60 percent of the wall thickness they adjoin to prevent sink.



Further design advice

To find out more and download a free copy of Proto Lab's white paper that delves deeper into the art of design for injection moulded components, please visit **www.protolabs.co.uk/parts and enter code EU615E**

Designing out excessive thickness to provide a more consistent wall thickness not only reduces the likelihood of these problems, but will also reduce the amount of resin required and cut down on the weight of the component.

5 Stress reduction

Wherever possible, corners need to be generously 'radiused' to prevent the concentration of stresses. This improves the components ability to withstand load and helps prevent warping in its geometry. Sharp corners also adversely affect the flow of resin during the moulding process, giving rise to the potential for incomplete filling of the mould.

It's important to bear in mind that the outside corners of a finished component are produced by the inside corners of a mould. Moulds are machined by a vertical milling cutter, which simply cannot cut sharp inside corners. The radius of the mould's inside corner cannot be smaller than the radius of the cutter – which will vary according to the depth of the cut.

Although rapid prototyping specialists can machine sharp external corners when creating the mould, the resulting sharp inside corners on the component can cause excessive stress, so are best avoided.

6 Word up

When designing text, symbols or logos onto a moulded component, it's better to have it raised above in the final component – as it's milled into the mould's surface. The choice of style is also important, avoiding the use of serif fonts (those with 'feet') and keeping the size to at least 20 points or more and raised no more than 0.51mm in the finished component.

The bold versions of Century Gothic Bold (default in SolidWorks), Arial and Verdana are all good choices.

7 Holding it together

Being able to incorporate an integral living hinge into a plastic moulded component is a wonderful thing, but only if it can withstand the degree and frequency of bending required to fulfil its intended use. Polyethylene and Polypropylene are the best resins for living such applications.

Getting the thickness of the hinge is critical; too thick and the stress on the outer surface is too large, too thin and it may tear. Hinges can present challenges when filling the mould, so gate placement is an important consideration that Proto Labs' team can advise on.

8 More than a feeling

The surface finish of a component can have a big effect on its functionality. From providing grip to hiding finger prints, there are many levels of polish finish available and two textures. The textures are created by bead blasting the finished mould, with T1 being light bead blast and T2 being a medium finish.

The resin type used will again have a bearing on the finish, so care must be taken when making the material selection. The issue of sink rears its head again as textured surfaces can highlight sink, creating serious cosmetic problems and draft may need to be increased to avoid sticking in the mould.

9 Cams at the core

Being able to add in undercuts into a moulded part is just one of the many uses that cams have during injection moulding process. They can also provide areas of texture, flat faces for mating surfaces a part number or even a logo. Tall thin parts with a requirement for a core are the perfect application for the use of cams – particularly as in some cases, sufficient draft would not be possible. By rotating the component and inserting the core with a side-action cam, the need for a draft can be all-but eliminated.

10 The flexible approach

Injection moulding using Liquid Silicone Rubber (LSR), can produce highly-flexible components that are strong, elastic and have excellent thermal, chemical and electrical resistance. Although the design considerations for moulding with LSR are similar to thermoplastics, some adjustments need to be made.

Although it's perfect for wall sections as thin as 0.25mm, rib thickness should be 0.5 to 1.0 times the adjoining wall thickness and sink is almost non-existent in LSR.

Shrink rate is high and it tends to flash very easily during moulding, something that manufacturers such as Proto Labs can help reduce by incorporating additional features into the mould design – such as avoiding the use of ejector pins by manual retrieval of the component from the mould by the operator.

An ideal **weld**

As the oil and gas sector moves to deeper waters and the tolerance of welds get ever tighter, alleviating problems during installation and operation is becoming much more important. Justin Cunningham looks at the technology responding to industry demand.

It's an age old problem: fit a square peg in a round hole. And this is certainly a dilemma when you are building an oil and gas pipeline to transport fossil fuel back to shore. The problem is that while pipes are manufactured to one set of standards, tighter tolerances are required when it comes to actually fitting the pipes together. The result is that pipes coming straight from the manufacturer have tolerances of around 2mm, yet when it comes to fitting them together, the tolerance needs to be less than 0.5mm.

"We look at the shape of the pipe ends," said Denise Smiles, chief executive of Optical Metrology Services (OMS). "We found that people sometimes find they are trying to weld a slightly oval pipe end with a slightly square pipe end. It really depends on the manufacturing process.

"If the tolerance is in excess of 2mm for fit up, then chances are no matter what shape or spec the pipes are, they will go together. But generally in most of the projects we see now, the fit up is between 1.5mm and less than 0.5mm."

You don't need precision measurement to know the outcome runs the risk of being a poor join between the two – something the industry has been progressively, and actively, looking to improve upon. There has been a drive for tighter tolerances, particularly as many move to deeper waters, as the joins come under more stress and strain.

"But in addition, tolerances are getting tighter because oil companies want the licence for pipelines to last 10 or 15 years," Smiles explained. "And governments won't approve that unless they are absolutely sure they have achieved the very best they can in putting it under the water."

For example, when it's on ecologically sensitive areas like the recent Gorgon project in Australia that's going over some coral escarpments, governments simply can't allow any kind of environmental damage. So the result is that tolerances for the project become incredibly tight. It was this fundamental demand that saw OMS develop measurement equipment to bring new resolution to the calliper measurements used by old school engineers for generations.

"What the calliper does is take a load of diameters," explained Smiles. "But, it doesn't really give you the shape of the pipe end and it doesn't tell you where the centre is."

Changing this is the SmartFit tool from OMS, which is able to take 2000 measurements of a pipe end diameter in about 10s. And furthermore, once it has taken those measurements, the system runs an analysis that gives a probability that, "if pipes are chosen at random with no rotation of the pipe end, this is the number of problems you are going to have," said Smiles. "But, if you put these pipes together in random

selection and rotate the end to the very best fit, i.e. 'SmartFit it up', your fit up issues will drop from maybe 5% down to 0.5%.

"Then the very best fit up would be if the pipes are so different in shape that you've really got to match them end-to-end, otherwise you are never going to get the pipes together. But, to be fair, that is very rare."

For the offshore industry, it means that they only take pipes out to sea that go together. And when day rates for boats can be as high as £750,000 a day, delays, downtime, and excess cargo are a costly venture.

For the welders, which can be both manual and automated processes, the software of Smartfit will be able to immediately show what rotation is needed for the best fit, and allow them to proceed with confidence.

"We draw a big arrow on the pipe, so when it goes to the welders they just turn the pipe to match the arrow on the previous one," said Smiles. "It avoids having two hours downtime as they try to fit pipes together that simply won't work."

The company continues to push the boundaries when it comes to offer inspection tools, with the development of an internal inspection system that uses a combination of a camera and laser sensor. These are able to go inside welded pipes and look in very fine resolution for defects. This has become particularly important for Inconel clad pipes as they do not permit any flaws in the welds at all.

While this kind of inspection can be done in a number of ways, perhaps the most significant is using a crawler robot. The tool being developed by OMS will be able to go 1km down into the pipe, something nobody in the world can do.

"The laser and a camera system move up and down the welds and take a lot of cross weld images," said Smiles. "While the camera gives a visual view of the inside of the pipes, it is the laser that really quantifies it and ensures it is well within the parameters."

The OMS crawler robot can carry out pipe inspections up to a depth of 1km and can navigate tight bends

Technology transfer

While the offshore industry, and pipeline fitting, has been the primary target for OMS, it has found that actually other sectors could benefit from its measurement technology. The tools are not limited to measuring diameters nor stopped by corners, as has been the case in the past.

An example has been the use of sensing technology under the M25. The motorway uses massive storage containers to store water during heavy rain and stop flooding across the roadway. There were concerns initially that due to the weight of the road above, they would squash the containers and reduce their capacity.

"So our lasers went in and measured the volume of the containers to make sure that they were sufficient," said Smiles. "We've also done work on Crossrail where the water industry wanted us to have a look at their existing water pipes. What they wanted to do was put a pipe inside the old Victorian pipes that are under the ground without having to dig up Ludgate Circus. And we were able to offer them this kind of internal inspection."

The need to inspect welds and other internal surfaces is a trend that is set to continue as historically engineering tolerances only go one way, as technology allows greater precision in manufacture and assembly. And this application seems to be no different.

www.omsmeasure.com

Talk *is* cheap!

Woburn Golf Club has deployed a cost effective irrigation system that features PLCs texting each other for instructions

Woburn Golf Club is one of the most famous golf centres in the UK – if not the world. Officially opened in 1976, the Duke's Course, which hosted the 1979 British Masters, was eventually joined by the Duchess' Course in 1978 and, in 2000, by the Marquess' Course.

Located near Milton Keynes, the three courses are nestled amid mature woodland on the Duke of Bedford's Woburn Abbey estate. The woodland setting gives the courses much of their appeal; but the stunning fairways and greens also add to the overall picture.

Like all golf courses, the work behind the scenes to keep the courses looking this good is staggering, with a full army of grounds-keeping staff working around the clock to maintain the courses' immaculate appearance. As well as traditional mowers and hand tools, the ground staff also rely on technology to help them in their day-to-day jobs. One particular new installation saw system integrator PKM Solutions and Routeco work together to deploy technology from Rockwell Automation, along with Encompass Product Partner ProSoft Technology, in a very interesting and novel configuration. Routeco is the sole distributor of Rockwell Automation's Allen Bradley branded products within the UK.

One of the biggest challenges faced by the grounds staff at Woburn Golf and Country Club is irrigation and water supply to water features. With acres of rough, fairway and greens to manage, the three courses all require significant quantities of water and this has to be managed very carefully to ensure the right amount of water is in the right place at the right time.

The primary irrigation infrastructure comprises a reservoir, which feeds two remotely located tanks – some two miles away – using pump stations. These tanks need to be closely monitored to ensure that water levels do not drop too far. An automated system is certainly the obvious solution, but with the distances involved, communication can become an issue.

Paul Mold at PKM Solutions explained: "The first option considered, due to the customer already having a grip on the technology, was a smart relay based solution, which would utilise standard wireless Ethernet as a communication bridge but, due to temperature sensitivity, the Ethernet equipment would have to be placed in heated cabinets to avoid freezing during the winter months. When this option was costed it was deemed to be overly expensive and an alternative was sought."

The solution that Mold eventually devised, sounds simple, but Rockwell Automation believed it had never been attempted before. It comprised three Allen-Bradley Micro830 PLCs, one at the reservoir and one on each tank, with each PLC working side by side with a ProSoft Technology ILX800-SMSG Micro800 SMS Plug-in Module and a magnetic mount antenna.

The PLC and SMS module working in tandem was not a new idea; but the way that PKM Solutions and Routeco configured them potentially was. In all the instances both companies could find, the SMS modules had only ever been used to communicate from a PLC to a cellular phone and back again. In this installation they were going to get the PLCs speaking to each other using SMS messages. "We think that this PLC-to-PLC communication via text messaging is a new thing," Mold commented, and added that the PLCs were specifically chosen because they would allow this form of communication.

In operation, it is remarkably simple. When a

water tank issues a low level warning, its PLC sends an SMS to the central reservoir PLC, which initiates the pumps. When the level is correct, a second SMS is sent to cease pumping. It really is no more complicated than that.

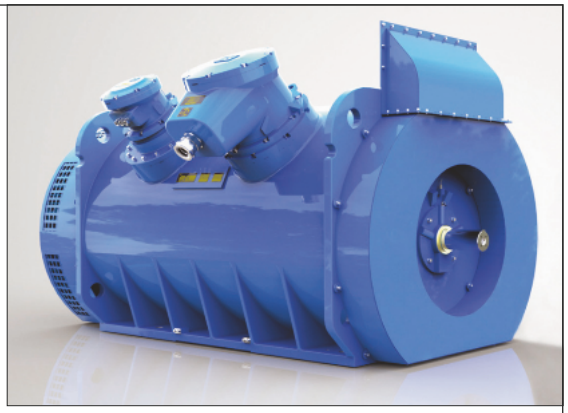
As well as being an elegant solution, this Micro830-based solution offered a significantly lower capital outlay. The biggest saving was in the installation process as the reservoir-to-tanks route would have required closure of the course while it was the excavated. The system has now been in successful operation for a couple of years.

Mold concluded: "The customer now has a much more flexible and expandable system than they could have ever imagined. We have seen first-hand the simplicity and power of the Micro800 range and the end customer is already thinking of other potential ideas for using this combination of technologies moving forwards."

www.rockwellautomation.com
www.pkmsolutions.co.uk
www.routeco.com
www.prosoft-technology.com

TECH BRIEF

Energy-efficient drive solutions

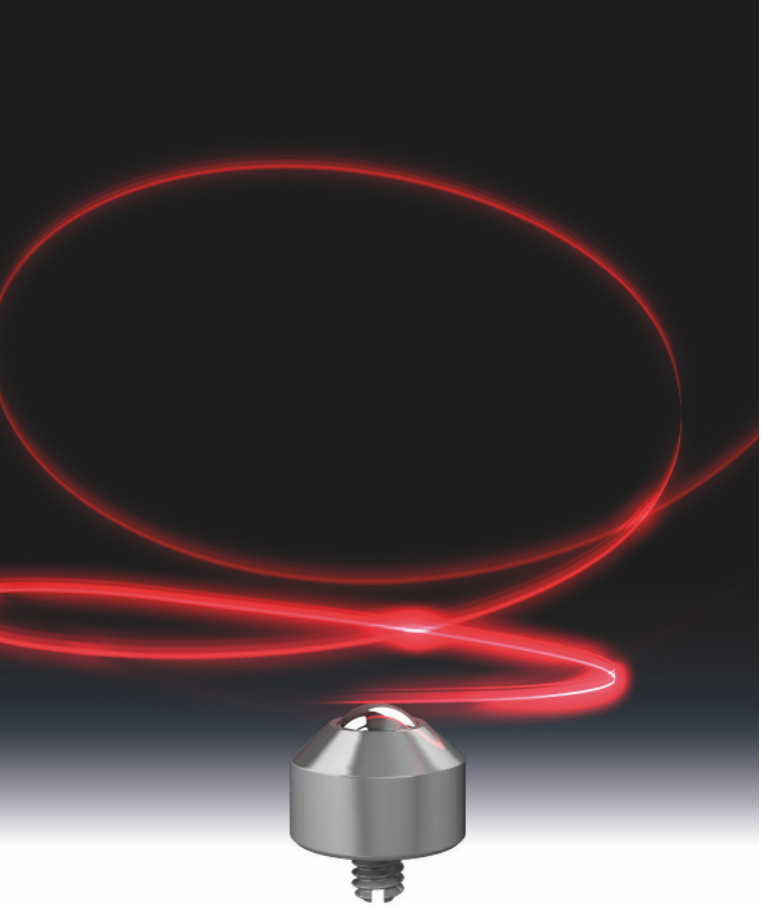


WEG's latest energy-efficient drive solution, the W22X explosion-proof motor, is available in IEC 800 frame size and has efficiency of up to 97.4%.

Designed for medium- and high-voltage applications, the W22X 800 can be used wherever high reliability and robustness are needed in addition to explosion protection. With power ratings up to 5.6MW and operating voltages up to 11kV, the W22X 800 motors extend WEG's W22X motor series in the upper power range. Like the low-voltage W22X motor series, they are available in efficiency ratings up to IE4.

WEG's latest generation of explosion-proof low-voltage induction motors in the W22X series have rated power from 3 to 1,000kW. The W22X 800 is suited for applications in both gas and dust atmospheres.

ATEX-compliant geared motors can combine W22X motors with gear units from WEG's subsidiary Watt Drive, as well as high-performance variable speed drives, all designed to help process managers increase operational efficiencies.



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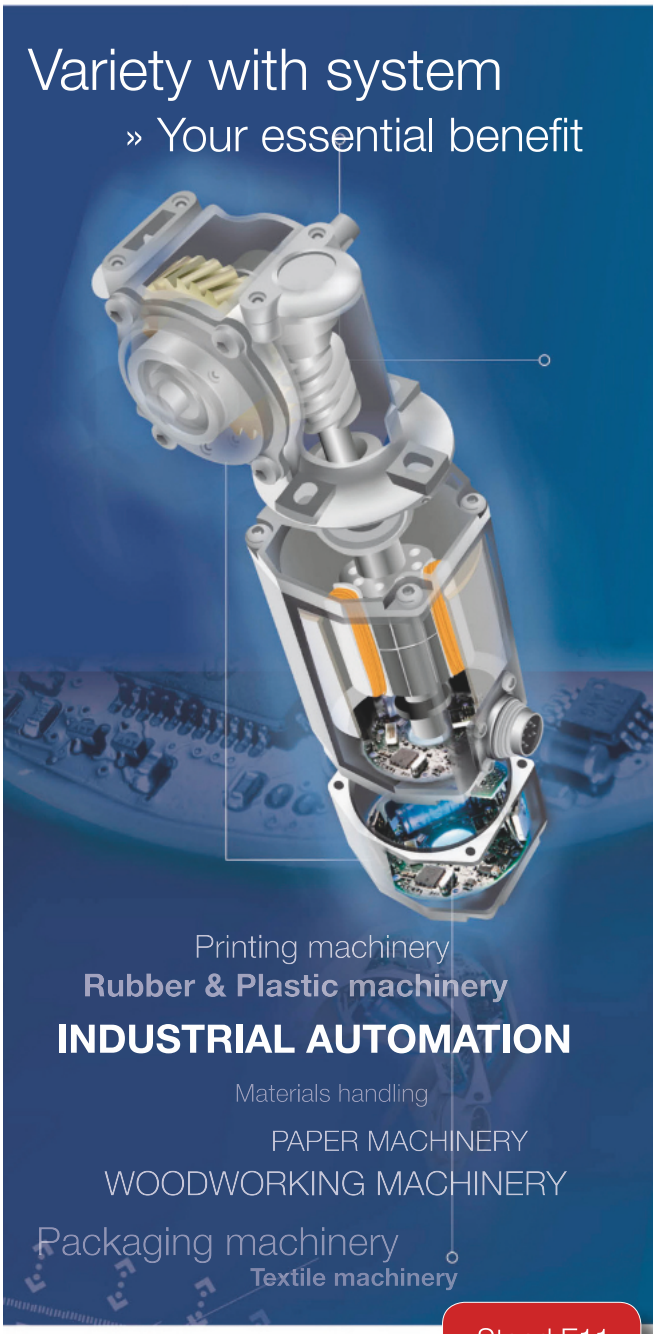

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Ed Tranter, Exhibition Director, commented: "We are tremendously excited about this event. Since we first started talking to agencies and organisations in the region, it has been clear that engineering is a way of life here – people take massive pride in being part of the sector. That pride has translated itself to enthusiasm for this event from all its participants – exhibitors, visitors, conference presenters and the organising team. We can't wait to open our doors to this thriving community in July."

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The MENE Conference

Wednesday 8th July – Day 1

09.15 PepsiCo – From good to great!
A fascinating insight in to why one of the world's most recognisable brands invested £10 million to gain an important strategic foothold in the North East of England and what attracted this global giant to PeterLee.

10.15 Advanced Manufacturing Research Centre (AMRC) – Engineering the next generation

Skills remains a pressing issue for technical industries, and with tuition fees skyrocketing, is the next generation in danger of being priced out? AMRC explores some of the alternative routes that are open to companies to ensure longevity in a quality work force.

11.15 EDITORS PICK: North East Automotive Alliance – The new capital of the UK's car industry
Find out what is making the region flourish and how you can get involved with its growing automotive business that continues to go from strength to strength. The North East is home to the UK's largest car plant, so what are the ongoing opportunities for tier I and II suppliers?

12.15 McDaniels Law – How to protect design and innovation
With a loss of manufacturing capacity to the East, this decade is seeing similar moves by the region to capitalise on design capability. Find out the best ways to protect your innovation and ensure high value design work is not copied or stolen by competitors at home or abroad.

14.15 EBAC – Making reshored manufacture competitive
EBAC has flourished in recent years since it decided to not only design products in Britain, but to bring back production from China. Gain an insight into the opportunities and challenges around reshoring manufacture and competing on the world stage against low labour cost countries.

15.15 EDITORS PICK: Innovate UK – Growth in high value engineering
UK engineers and manufacturers have seen resurgent growth, with many activities being reshored after decades of offshoring to lower cost economies. Innovate UK aims to identify global trends and how they can be exploited. Find out if you could capitalise on this wave of industrial demand.

16.15 Primary Engineer – Engineering in North East primary schools... Really!
Getting the message across to children that engineering is not about fixing washing machines, but solving problems and being creative. This is the perfect place to start addressing the skills issue.

Thursday 9th July - Day 2

09.15 Rail Alliance – Britain's second railway boom: reseeding our supply chain
Hitachi's new train manufacturing plant is due to begin production later this year and the opportunities to get involved in the rail sector have never been better. Find out how your expertise and capability could be of benefit, and how you can be part of this rejuvenated high value industry.

10.15 EDITORS PICK: IHC Engineering Business – Award winning design for subsea cable laying in the North Sea
Find out how the company's award winning design is helping it win new business and why it is able to punch well above its weight; winning big projects and holding off tough competitors. In this presentation hear how it designed and developed a mammoth four-tracked trenching and cable laying vehicle for operations in the offshore wind sector.

11.15 (Merck Sharp & Dohme) MSD – The North East vs the Far East
Just five years ago MSD Cramlington had an uncertain future. The site's survival depended on supplying products at a lower price than its Far East competitors. This session will reveal the lessons that were learnt. Find out how they can now be applied to other sites around the UK looking to beat global rivals.

Big Intentions

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12.15 The Offshore Renewable Energy Catapult – Engineering the UK's clean power
A look at the design, development and commercialisation of wave, wind and tidal power technology in and around the UK. The aim is to exploit markets around the world. Find out how to become part of this potentially huge global market.

14.15 EEF – The post election fall out: what it means for UK engineers and manufacturers
With the election won and lost, who are the winners and losers in industry and what are the likely effects of the new Government on the UK's engineering and manufacturing strategy? Join this fascinating session that will give a timely indication of the face of things to come post May 7th 2015.

15.15 EDITORS PICK: Croft Additive Manufacture – 3D printing diversity
The use of metal additive manufacture has allowed Croft to enhance its capability as a filter designer and manufacturer, and also diversify in to other sectors. Find out more about how to leverage this exciting technology.

Places for conference and workshop sessions are **FREE** but limited, with the most popular already filling up. To reserve your place and avoid disappointment register now at **www.menortheast.co.uk**
*Registration takes less than 5 minutes.

MENE Workshop sessions

Wednesday, Day 1 – Workshop 1

10.15 Fanuc – Automate Now
Practical advice on why businesses automate, how to identify key areas and opportunities to upskill the workforce.

11.15 KD Feddersen – Lightweighting possibilities in automotive and beyond
Lightweighting is a high value topic within the automotive arena and is gaining importance in many other market sectors.

12.15 EEF – Bridging the skills gap and retaining skilled employees
A look at the different approaches to address the skills challenge, and how to keep those vital skilled employees.

14.15 Dunkermotoren – The changing face of linear motion: pneumatic to electric
The choices between linear motors and pneumatic actuation covering through life costs, cycle time, position errors and more.

Wednesday Day 1 – Workshop 2

10.15 Lombard and RBS – How to benefit from asset and invoice finance?
Funding has become more than providing cash to invest in your business, today manufacturers have a choice of funding methods.

11.15 Materialise – Sweet spots for 3D Printing
Find out how to recognise and take 3D printing beyond prototypes into profitable and durable applications.

12.15 Schaeffler – Vibration monitoring to maximise asset reliability
Using a predictive maintenance strategy to avoid high repair and replacement costs.

14.15 NatWest – Manufacturing growth in the North East
This workshop is aimed at those looking overseas to find new markets for their products or for plant and machinery to import.

Thursday Day 2 – Workshop 1

10.15 Fanuc – Automate Now
Practical advice on why businesses automate, how to identify key areas and the opportunities to upskill the workforce.

11.15 CG Tech – Improve machining processes with CNC machine tool simulation
While CNC machine tools can produce parts in ever shorter cycle times, the cost of getting it wrong has increased.

12.15 Materialise – Sweet spots for 3D Printing
Find out how to recognise and take 3D printing beyond prototypes into profitable and durable applications.

Thursday Day 2 – Workshop 2

10.15 NatWest Mentor – Social media in the workplace and EU Holiday Pay Ruling
The issues social media can cause for employers. Plus the EU's recent ruling on holiday pay calculations will also be addressed.

11.15 Schaeffler – Vibration monitoring to maximise asset reliability
Using a Predictive Maintenance strategy to avoid high repair and replacement costs.

12.15 K3 Syspro – ERP solutions
K3 develop and deliver excellent ERP solutions for small and medium-sized companies.

14.15 York EMC - The new EMC Directive, what it means for you?
In 2014, nine CE Marking directives were re-published that come into force during 2016. Find out how you will be affected.

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The FANUC Academy is available worldwide, providing its customers with the ability to optimise the effectiveness of automation and robotics within their business.

Training is conducted by certified training instructors who provide tailored programmes to develop and upskill customer employees at any level, including machine operators, programmers, maintenance specialists, machine tool builders, system integrators, line builders, and designers.

Training courses are most commonly held at dedicated FANUC training centres across the globe, which host the latest equipment and technology including robots, CNC, ROBODRILL, ROBOCUT and ROBOSHOT.

The FANUC Academy training courses are carried out in small groups to ensure fast and intensive learning, with a lasting effect on employees. Courses are taught in real-life production environments, teaching the importance of multiple machines and fully automated solutions.

In order to increase the accessibility of training to FANUC's customers, instructors can also provide on-site teaching. Other forms of education services available through the FANUC Academy include mobile classrooms, training trucks, and e-learning.

For more information about the FANUC Academy please visit:
http://www.fanuc.eu/uk/en/lifetime-management/academy

FANUC

Supporting manufacturers in the North East

Lombard, the UK's leading and most experienced asset finance provider, uses the flexibility of asset finance to develop funding solutions that help businesses secure the assets they need in order to grow and be successful. Lombard helps businesses improve productivity, reduce risk and increase their cashflow. With extensive cross-sector experience, Lombard provides the right support and appropriate solutions for clients to achieve their goals.

Lombard and NatWest are running three workshops at the show:

Could your business benefit from asset and invoice finance?
Manufacturers have a choice of funding methods and need to find the right options to meet their specific needs. This session will look at what's available including portfolios that mix traditional methods with alternative options such as asset and invoice finance.

Delegates will learn:
- Alternative funding options and what they have to offer
- Mixing alternative and traditional funding

- How different funding options can potentially make investment more affordable

Social media in the workplace and EU holiday pay ruling – how does it affect your business?
This workshop assesses the prevalence of Social Media in the workplace, the issues this can cause for employers and considerations of how to manage this within current legislation. The EU's recent ruling on holiday pay calculations will also be addressed.

Delegates will learn:
- About Social Media in the workplace, the pitfalls and appropriate policies to help
- About the EU's holiday pay ruling and what it means
- Next steps – what this information practically means

Manufacturing growth in the North East
Looking overseas to find new markets for your products, or to import plant and machinery? This session will provide some insight into things to consider, useful strategies for managing risks and funding requirements, as well as outlining the support available from banks and Government agencies.

Delegates will learn:
- Things to consider when selling in to overseas markets
- Managing the risks/understanding the export trade cycle
- Importing assets using Capital Import Finance

Lombard

NORTHEAST MANUFACTURING & ENGINEERING

Who is talking about what?

With every inch of the Metro Radio Arena being filled by MENE, there will be no shortage of interesting products and services to see. Tim Fryer takes a whistle-stop tour…

1st MTA

New equipment manufactured by Tecnomagnete (Stand C5) for workholding on machine tools and for handling sheet, bar and other ferrous materials in warehouses and factories will be demonstrated on the 1st MTA stand. Items in the product range likely to be of particular interest include the MillTec Grip magnetic clamping system for milling machines and machining centres.

Arno

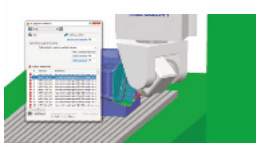
Arno (Stand E2) offers a full range of engineering cutting tools and related products, whether it is tools for drilling, milling, turning or part-off and grooving. Typical applications are in the aerospace, automotive, medical and oil and gas industry and there are solutions for all the various materials such as steel, stainless steel and high temperature alloys machined in those industries.

CGTech

CGTech (stand C30) will be showcasing the latest version of VERICUT software. VERICUT CNC machine simulation, verification and optimisation software eliminates the process of manually proving-out NC programs. A common feature of all recent releases of the software has been the focus on full integration with the CAD/CAM and machine tool industry.

Delcam

Delcam (Stand E16) has released the 2015 R2 version of its PowerMILL programming software for five-axis and high-speed machining. The



new release includes improvements in toolpath simulation and verification, area clearance and drilling, plus more options for customisation by users.

EJOT

EJOT (Stand A2) has selected the MENE Exhibition to unveil its Ejoweld assembly process. The Ejoweld process creates a high strength fix between lightweight materials to high strength materials – typically light alloys to boron steel. A highly sophisticated friction weld system, Ejoweld employs specially developed components in the form of either a rivet or a pin, to secure structure of vehicle.

Epicor

Epicor, a global leader in business software solutions for manufacturing, distribution, retail and services organisations, will be on-hand (Stand E15) to explain how selection of ERP solutions can benefit a business, its employees and bottom line.

EPLAN

At this year's MENE exhibition, CAE software company EPLAN (Stand D26) will be showcasing its range of software solutions which provide options for the planning, documentation and management of electrical design projects. The EPLAN platform supports interdisciplinary work, from fluid engineering and process plant engineering to harness design and 3D enclosure design tools.

Exel

Exel's EFACS E/8 business solution is a highly flexible, browser-based, platform independent ERP suite built using the latest Internet technology. The Exel (Stand D23) solution incorporates a broad range of business functions including Product Management, Change Control, Manufacturing, Field Service, Finance, Business Intelligence, Reporting Tools, Mobile and Touchscreen Applications, Document Management, CRM, Workflow and many more.

Faro

FARO UK (Stand E6) will be demonstrating several cutting-edge metrology products including the latest FARO Edge ScanArm HD with new LLP. The advanced FARO product is able to precisely scan challenging materials with high speed and high definition data clarity.

Fibox

The new Euronord 3 range of enclosures will be exhibited by Fibox (Stand D9). Designed specifically for use in harsh and demanding environments, Euronord 3 is a product which incorporates a host of features and benefits that include: ¼ turn quick release, non-corrosive cover screws; recessed covers for fitting membranes, labels and other surface mounted panels; cover screw corner plugs for aesthetics, cover cleaning and security; opaque and smoked transparent covers; and availability in polycarbonate and ABS.

Geo Kingsbury

SHW, F Zimmermann, Burkhardt + Weber and Waldrich Coburg are the famous German manufacturers of big capacity machining centres and flexible manufacturing systems for which Geo Kingsbury (Stand C24) acts as sole UK agent throughout the UK and Ireland. The latest Waldrich Coburg agency adds new

machine types to the Geo Kingsbury product programme, namely large capacity vertical turning lathes and grinding machines.

GOM UK

The GOM ATOS 3D scanner is developed for the dimensional control requirements of the manufacturing industry. Fast and accurate, GOM scans are an established way of reducing product development times and ensuring highest quality components. For material and component testing GOM (Stand B25) testing products include digital image correlation and 3D point tracking. By measuring surface strain over large areas comprehensive results provide developers with the information they require.

Harmonic Drive UK

Harmonic Drive (Stand E8) will focus on the new HPN Planetary Gear Series which are available in five sizes, with eight gear ratios from 3 to 31:1 and can transmit repeatable peak torques between nine and 752 Nm. With a backlash of just five to seven arc minutes, the gears offer a precision solution ideal for low backlash applications. The compact lightweight design is able to run smoothly and extremely quietly; all features which make it ideal for industrial automation applications, such as the packaging industry.

Heidenhain (GB)

Heidenhain (Stand E17) will exhibit a new generation of machine tool touch probes for the first time in the UK. Designed for aligning and measuring workpieces, tool setting and detecting cutter wear and breakage, the range includes hybrid models that are able to be switched between infrared and radio transmission of signals.

Henkel

Henkel's (Stand C9) range of adhesives incorporate five core technologies – epoxies, acrylics, polyurethanes, silane modified polymers and silicones. It also provides dispensing equipment from hand-held devices to fully automated systems. Visitors to the show will see products from Henkel's LOCTITE and TECHNOMELT brands and also the latest dispensing equipment development too. Henkel's patented Jet Valve system enables bubble-free dispensing at up to 300 drops per second; droplets can be as small as 0.3mm depending on the adhesive used.

Hexagon Metrology

Portable and easy-to-use shop floor

measurement systems will be the focus of Hexagon Metrology (Stand A5) at MENE. New products to be unveiled at the Newcastle event include the HP-L-8.9 3D laser scanner, which broadens the scope of the ROMER range into new application areas such as benchmarking, product design and reverse engineering.

Hurco Europe

Two machines will be on show from the Hurco's (Stand A6) latest product range, featuring high speed, top precision and low power consumption. A compact VM10Ui machining centre will be representative of the range of 5-axis machining centres offered, which includes both trunnion and B-axis models, and there will also be a TM6i CNC turning centre on the stand.

igus

igus (Stand B5) has introduced a range of gantries built on its drylin E linear axis system. From simple linear systems to complex, three-dimensional automation, measurement and positioning applications, the drylin E gantries utilise proven tribo technology, which means that all systems feature sliding, self-lubricating linear components and therefore require no additional maintenance. Used to implement three-dimensional applications, the drylin E room gantry is based on a flat gantry system with a single vertical axis. The room gantry has a working space of 500x500x100mm and can carry payloads of up to 2.5kg.

ITC

Industrial Tooling Corporation (Stand A8) will exhibit its new line of high performance solid carbide and indexable milling, drilling, turning, boring, toolholding and threading products. It will be introducing its three fluted 3091 Series radius tool that offers an extended reach for cavity machining and the processing of complex geometries.

K3 Syspro

Imagine being in control of every part of your business, and maximising the return from all of your assets. Imagine optimising all of your resources including profits. Imagine never again having to enter data into multiple systems and not taking an age to find and dissect that information. This is what K3 Syspro (Stand C22) claim are the benefits of SYSPRO ERP, which they will be discussing at the show.

KD Feddersen

K.D. Feddersen (Stand E4) will be promoting a number of new engineering thermoplastics and processing technologies. These will include: weight saving thermoplastics and technologies for the automotive industry; bio fed - biodegradable and compostable thermoplastics, using sustainable materials; and thermoplastics designed and developed for the LED lighting industry.

LG Motion

LG Motion (Stand C17) will be showing a wide range its products via working demonstrations that span its capability - from simple yet cost-effective and space saving microstepping packages from the USA stepper motor innovator Arcus Technology - through to highly advanced distributed motion systems from the ultra-high performance motion control technology leader Precision MicroDynamics.

Lohmann

Lohmann (Stand D7) has been one of Europe's most successful manufacturers of technical bonding solutions, with over 160 years experience. Expert advice is available from the

technical team in the UK as well as the German HQ. Solutions are developed and converted locally; logs, rolls, spools & die cuts, using a variety of adhesive suppliers and specially sourced materials.

MACH Machine Tools

MACH Machine Tools (Stand A18) is showcasing a range of its high-quality milling, turning, grinding and sawing machines. These include the company's MACH VS-1 Turret-type milling machine (pictured) and the large-capacity MACH L1550 lathe.

Micro Epsilon

Micro-Epsilon UK (Stand A1) will present its full range of sensor technologies, including non-contact capacitive, confocal and inductive displacement sensors, as well as 2D/3D laser profile sensors, infrared temperature sensors and thermal imagers. The stand will feature the eddyNCDT 3001, a new compact high performance eddy current sensor with integrated electronics. It is a new high performance eddy current sensor in an extremely compact package. Although it is a similar size to typical proximity and inductive sensors, measuring performance is greater.

Minitec

MiniTec UK (Stand D31) will showcase its Profile System machine framing and building system. Aimed at system integrators, production/test equipment OEMs, or engineers looking for manufacturing, assembly, parts handling or machine safety solutions, Profile System provides cost-efficient, flexible and scalable design and build of structural machine frames or fully motion-automated equipment.

Metrology Software Products

Metrology Software Products (MSP) will be showcasing its NC-Checker and NC-PerfectPart systems (Stand A16). NC-Checker enables the user to identify whether their machine tool can make the part before they start machining. NC-PerfectPart has been integrated into aerospace processes worldwide, including the

BAE Systems' F-35 Nozzle Bay Door (NBD) project. Working together, MSP and BAE Systems reduced set-up times from days to minutes, saving £21 million over the life of the project.

NIKKEN Kosakusho

Visit NIKKEN Kosakusho (Stand E19) to learn about the range of high performance CNC rotary tables, precision NC tooling solutions, tool presetters and spindle optimisation solutions.

OGP

OGP UK (Stand A9) will be demonstrating a wide range of measuring systems. Amongst the OGP equipment on show will be the Vantage 450. This flexible, multi-sensor coordinate measurement system incorporates optical, touch probes and laser sensors for maximum versatility and accuracy.

Olympus Technologies

The collaborative Universal Robot from Olympus Technologies (Stand B12) is a unique entry into the market, providing easy integration into existing production environments at a price point affordable for businesses wishing to start their journey into the world of robotics. With six articulation points, and a wide scope of flexibility, it mimics the range of motion of a human arm, and comes in three sizes.

PDJ Vibro

PDJ Vibro (Stand A20) will present the two sides of its business - its new and used finishing machine sales activities and its contract finishing service. Equipment highlights include the range of vibratory bowls that have chamber sizes from 7.5 to 6,000 litres. Options include PLC dosing of chemical additives, water metering and recirculation, automatic parts separation, drying and acoustic suppression.

Q8Oils

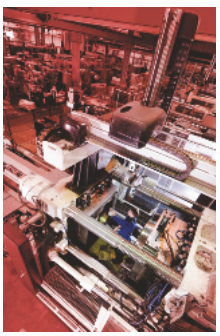
Q8Oils (Stand A7) at will be using MENE to promote 'The Challenge' – the company's recently launched metal working fluid initiative for machine shop owners and operators – which offers new customers the opportunity to trial soluble and neat metal cutting fluids in their machine shops. Q8Oils is convinced that, by offering a payment-by-results trial, The Challenge will prove the benefits of Q8 metal working fluids to manufacturers.

RUD

The RUD Tool-Mover (Stand E7) is an innovative handling device that offers safety in handling of heavy plant and injection moulding tools. The Tool-Mover is equipped with a frequency controlled drive, which ensures an even and smooth drive from start to finish, and it can be stopped in any position securely even if power to the unit is cut.

Rutland Plastics

Among the range of services, in addition to injection moulding, that Rutland Plastics (Stand E14) offers are design, rapid prototyping, tooling, machining and assembly services. The company has the capability to produce parts up to 48kg in weight and 1.5m^2. In addition to a number of finished moulded products on



display, Rutland Plastics will be showcasing a selection of 3D printed prototype parts. A wide range of polymers can be simulated and these advanced prototypes can be painted, machined, drilled or chrome plated.

Seaward

High performance electrical safety testers that enable electrical and electronic product manufacturers to comply with stringent performance and safety standards will be the main focus of Seaward (Stand D15). Leading the way will be the advanced HAL 104, which combines the performance of a multi-function production line safety tester with load and power factor measurement for product energy consumption and ratings assessments.

Springmasters

The Springmasters Group (Stand E3),

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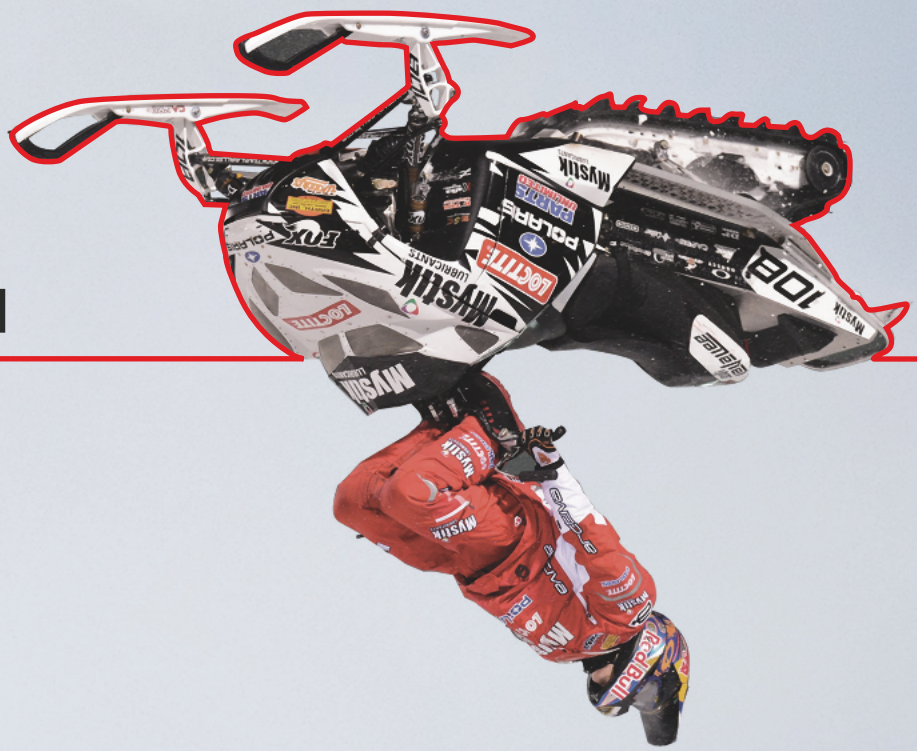

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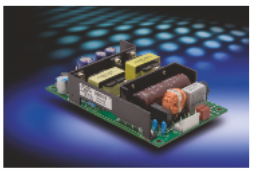
incorporating Valley Springs and Belleville Springs, is one of the most diverse manufacturers of springs in the UK. As a result of multi million pound investment, the group offers a comprehensive range of compression, extension, torsion and flat metal springs.

Staytite

Staytite (Stand B16) has been dedicated to meeting fastening requirements for over 30 years. It has now been recognised as one of Siemens global top 5 overall suppliers for 2015. Knowledge, industry experience and customer service can be demonstrated and discussed at the show.

TDK Lambda



The CUT75 series of 75W PCB type, triple output AC-DC power supplies, recently launched by TDK-Lambda (Stand D25), is 64% smaller, lighter weight and more efficient than the earlier generation JWT75 series. With an efficiency of up to 85%, the CUT75 series operates from a universal input of 85 to 265Vac, and is offered as two different standard models.

Trumpf

From systems for laser cutting, punching and bending to advanced laser processing technology, TRUMPF (Stand A21) is committed to developing production solutions for manufacturers of all sizes. The choice ranges from simple productivity gains from features such as automatic laser nozzle exchange through to all the elements necessary for full, lights-out production.

Turbex

Turbex (Stand C6) will use the show to introduce to the industrial component cleaning market in the North East the range of ultrasonic, high precision cleaning machines built by Elma. This company's range of machines spans small, bench-top units up to bespoke, multi-tank cleaning and drying lines with automation.

Tyrolit

Abrasives manufacturer Tyrolit (Stand D22) has a product range that includes the CERABOND ceramic cutting, grinding and flap discs and innovative grinding wheels for tooling applications. At MENE will be the STARTEC range of tools for maximum profile retention in tool grinding.

XYZ Machine Tools

Visitors to XYZ (Stand B10) will see a good cross section of machines will be on display, with emphasis on the company's unique ProtoTRAK control system and the innovative XYZ 2-OP portable vertical machining centre. The machines on display are the SLX 355 ProTURN lathe, SMX 3500 bed mill, and the revolutionary XYZ 2-OP portable VMC (pictured).

York EMC Services

York EMC Services (Stand C18) will be discussing its UKAS accredited compliance laboratory that it unveiled in Grangemouth earlier this year. The new purpose built laboratory offers an extensive range of compliance testing and training services to manufacturers and engineers in Scotland and the north of England, enabling them to develop and manufacture electrical and electronic products that are safe and legal for sale in the European Union and Global Markets.

Exhibitors

1st MTA
Abssac
Advanced Industrial Products Ltd
Ajax Machine Tools
Amtech Rapid Prototyping
Arco
Arno UK Ltd
Beckhoff Automation
Brownell Ltd
BTM Automation
C Dugard Ltd
CG Tech
Chester UK
CNC Rotary
Delcam
Dunkermotoren (UK)
ECI Solutions
EJOT
Electro Mechanical Systems Ltd
Elesa (UK) Ltd
Epicor Software (UK) Ltd
EPLAN
European Springs & Pressings Ltd
Exel Computer Systems plc
Fanuc UK Ltd
Fanuc Academy
Faro
Fibox Ltd
Geo Kingsbury Machine Tools Ltd
GOM UK Ltd
Harmonic Drive
Heason
HEIDENHAIN (GB) Ltd
Henkel Loctite
Hexagon Metrology Ltd
HK Technologies
Horn Cutting Tools Ltd
Hurco Europe
Igus
IHC Engineering Business
Industrial Tooling Corporation
Informance Ltd
Jauch Quartz
K.D Feddersen UK Ltd
K3 Syspro
KCS Datawright
Kyal Machine Tools
Lee Spring Ltd
LG Motion
Lohmann Technologies
Lombard (Royal Bank of Scotland)
MACH Machine Tools Ltd/The Vigilance Group
Materialise UK
Matsuura Machinery Ltd
Maxon Motors
Mayr Transmissions Ltd
MacInnes Tooling
Measurement Solutions Limited
Metool Products Ltd
Metrology Software Products
Micro Epsilon
Minitec
Nikken Kosakusho Europe
OGP
Olympus Technologies Ltd
PDJ Vibro
Perfect Bore Manufacturing Ltd
Q8 Oils
Renishaw
Rud Chains
Rutland Plastics Ltd
Schaeffler
Seaward Group
Springmasters Ltd
Staytite
StrainSense Ltd
TDK Lambda
tesa UK Ltd
TFC Europe Ltd
Trotec Laser
Trumpf
TURBEX Ltd
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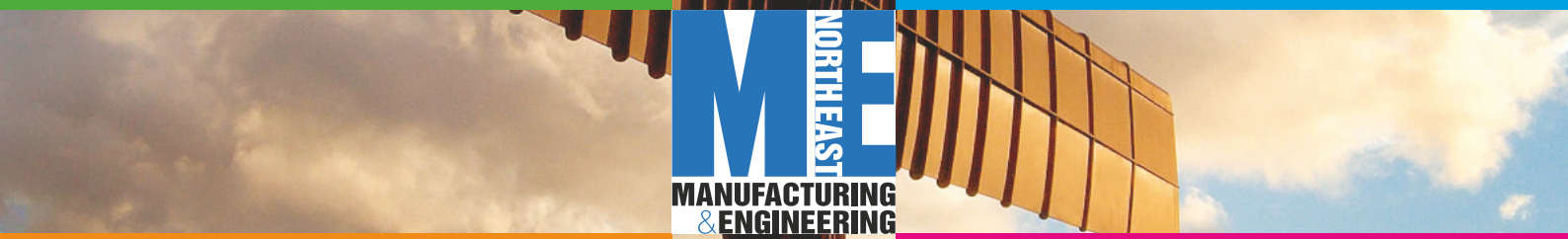
- **MSD –** Lessons learned from keeping production in the UK
- **ORE Catapult –** wave , wind and tidal power design in the UK
- **Rail Alliance –** design & manufacturing expertise for the UK rail industry
- **NE Automotive Alliance –** opportunities for suppliers to the UK automotive market and tidal power technology in the UK



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FANUC Lombard

Innovate to differentiate

The smart phone market is evolving and, while they may all look much the same, there are designs that still need protection, particularly when looking at the accessories they are paired with. Jonathan DeVile, European Patent Attorney, D Young & Co, outlines the situation.

The Mobile World Congress usually represents a forum for all of the major technology companies to display their latest offerings to the world of mobile communications. However, having visited the various stands at this year's congress (Barcelona, March 2015) one is struck that the smartphones produced by each of the manufacturers seem increasingly to be converging into the same design, form factor and features.

The impact of converging technology

Whilst Samsung, LG, Sony and Nokia have in past years dominated the mobile communications market with slightly more divergent offerings, the Chinese manufacturers ZTE , Huawei as well as HTC have rapidly caught up and are offering smart phones which are very similar in appearance, form factor, performance, features and quality to those of the traditional market leaders. Indeed the convergence in the form of the smartphone makes it difficult to distinguish any manufacturer based solely on the technical offering.

That leaves of course price and that is where the newcomers to the market will erode the market share of the traditional incumbents. Arguably the real winners are Google since the majority of the smartphone offerings are using the Android operating system, although of course Apple has retained its position as market leader with the iPhone 6, with its own iOS operating system.

How then are the manufacturers able to differentiate?

One area where companies seek to differentiate their products is in promoting wearable technology accessories, such as the smart watch, or in the provision of more robust devices which may be, for example, waterproof or shockproof. At this year's Mobile World Conference LG launched its stand-alone smart watch which incorporates an LTE wireless access interface and all of the functionality associated with a smart phone albeit with the size and features of a watch. Other manufacturers, including Apple, are showcasing devices which are paired with a user's smart phone.

Jonathan DeVile

Innovating to achieve product and brand diversity

In a market crowded with ever converging design and form, wearable technology innovation provides an opportunity for manufacturers to differentiate. Factors of differentiation require protection and clearly therefore necessitate the acquisition of intellectual property rights.

Standards related patents

The communications technology in respect of the wireless access interface and chip sets delivering a communications service to mobile devices will be covered by standards related patents, which still provide a valuable tool for those players who have contributed to developing the 3GPP standards, which could provide a barrier to new entrants. [The 3rd Generation Partnership Project (3GPP) unites the seven telecommunications standard development organisations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as 'organisational partners' and provides their members with a stable environment to produce the reports and specifications that define 3GPP technologies.] Standards related patents are powerful in demonstrating infringement if the device operates in accordance with the standard have been weakened.

The courts in European countries have in recent years begun to restrict the enforcement of standards essential patents, raising the bar for a patent holder to obtain an injunction against an infringer and also requiring that licences be available on Fair Reasonable and Non-Discriminatory (FRAND) terms. As such, an innovation in an item of wearable technology which appeals to the consumer and which is not defined in accordance with a standard, but in accordance with a proprietary interface, operation or design, could represent more valuable intellectual property, protecting a valuable market share. Furthermore, the design of something which is fundamentally worn on the body will usually be something which would require aesthetic appeal to the end user and therefore could be the subject of a Community registered design. It may well be that through this ancillary differentiation of smart phones, through innovation in wearable technology products, that manufacturers may distinguish their offering and gain a valuable foothold in the market place backed of course by powerful intellectual property rights.

For more information please contact
Jonathan DeVile,
D Young & Co LLP.
Tel: 020 7269 8550
Email: jdv@dyoung.com
Web: www.dyoung.com

D YOUNG & CO INTELLECTUAL PROPERTY

Lame... or lazy?

This month's Coffee Time Challenge asks you to think about the effort it takes to move about. We are not looking at travelling great distances, or even anything that would make automated transport essential. This is more the 'pop round the corner to the shops' type distance. Are you using up too much energy to make the journey? If the walk was less demanding would it mean the Mars bar reward was optional rather than essential? Or would simple fatigue reduction for those that walk a lot – and we do typically use up more energy walking than any other daily activity – be benefit enough.

More importantly, beyond appeasing the lazy, there are very real applications where walking aids can offer very real benefits. Someone recovering from a stroke is a prime example of an individual who may need the exercise and discipline of walking, but could do with a helping hand. Or foot.

There may be other temporary conditions concerning the joints, tendons or muscles in the lower leg that could also be helped by a walking aid.

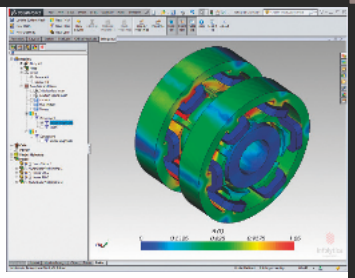
The challenge then is to design a device that will take some of the strain away from walking. Typically, we have a solution in mind. It requires no additional power, all movement and power is self-generated. It must also be comfortable and easy to use. To be stylish might be, literally, a step too far.

As always, the idea we have in mind will be published next month but if you have any entertaining or interesting solutions then feel free to leave a comment on the Coffee Time Challenge section of the website or email the editor at tfryer@findlay.co.uk.

The answer to last month's Coffee Time Challenge – how to disinfect aircraft quickly and effectively between flights - can be found on p12 of this issue.

3D Electromagnetic Field Solver

Infolytica - MagNet for SolidWorks



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

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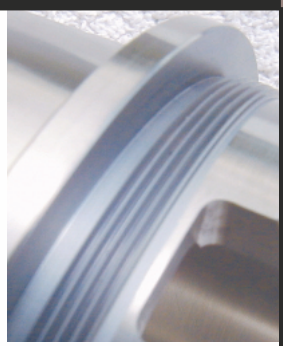

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