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The wisdom of crowds

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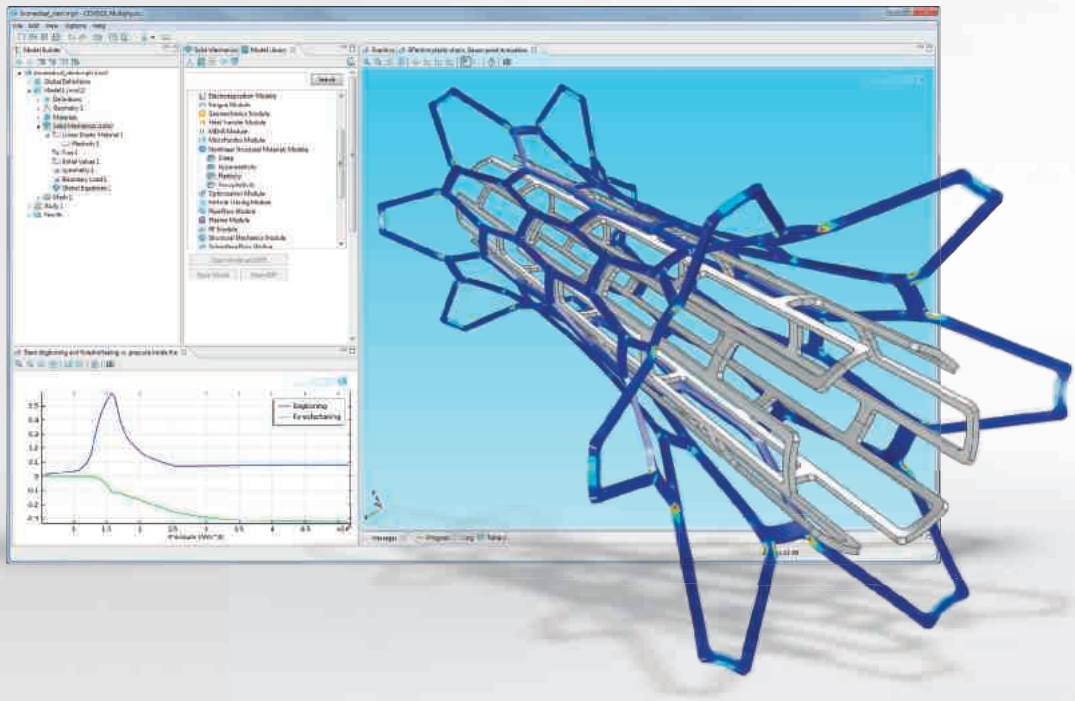
BIOMEDICAL STENT: To check the viability of a stent design, the plastic deformation process under the influence of an inflated balloon has been modeled. Results are used to draw conclusions on how to change the geometry for optimum expansion.



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CONTENTS

Volume 33 Number 4 April 2013

18

22

33

47

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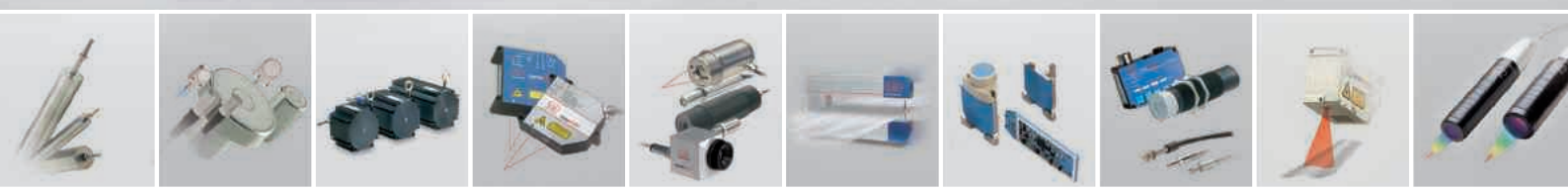

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What's in a name?

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

The decision to award the Queen Elizabeth Prize for Engineering to internet pioneers Sir Tim Berners-Lee, Robert Kahn, Vinton Cerf, Louis Pouzin and Marc Andreessen has raised some interesting questions.

The fact is that the choice to award the so-called 'Nobel Prize for Engineering' to these men has served to open up one of the great fault lines within the profession: namely, how to define an engineer.

Certainly, the news was greeted with bemusement by some engineers of my acquaintance, who expressed disappointment that the Prize had not gone to those who might more readily be identified as engineers in a traditional sense. And while this may seem unfair (after all, most of these men do hold engineering qualifications or posts), I attended an event some time ago where a panel of engineers was asked to name a living British engineering hero. Rightly or wrongly, no-one mentioned Sir Tim Berners-Lee (although it should be mentioned that, Sir James Dyson aside, they also struggled to name anyone else).

It is vital at this point to make clear that no-one is decrying the achievements of these men, who genuinely can claim to have done more to change the way we live and work than almost anyone else on the planet. The question remains, however, of whether they are readily identifiable as engineers.

At the risk of being accused of cowardice, I am extremely reluctant to wade too far into this argument. Such snap definitions are usually invidious, after all. However, I can see merits and downsides to this choice of winners.

On the plus side, it is good to remind the world that engineering is a diverse profession that involves a multitude of disciplines. For too long, the misleading images of dirty factories and low pay have obscured the realities of the career. It is perhaps valuable, then, to remind people that something with which they interact every day and which has transformed their lives is a feat of engineering.

The fact remains, however, that a Prize whose express purpose was to raise the profile of engineering has gone to individuals whom many outside the profession (and quite a few in it, one suspects) would perhaps more immediately define as computer scientists. The fear must be that this muddying of the waters makes it difficult for the profession to point to these men as unequivocal examples of how engineering positively affects our lives. Given the profession's desperate need for role models, that would seem a shame.

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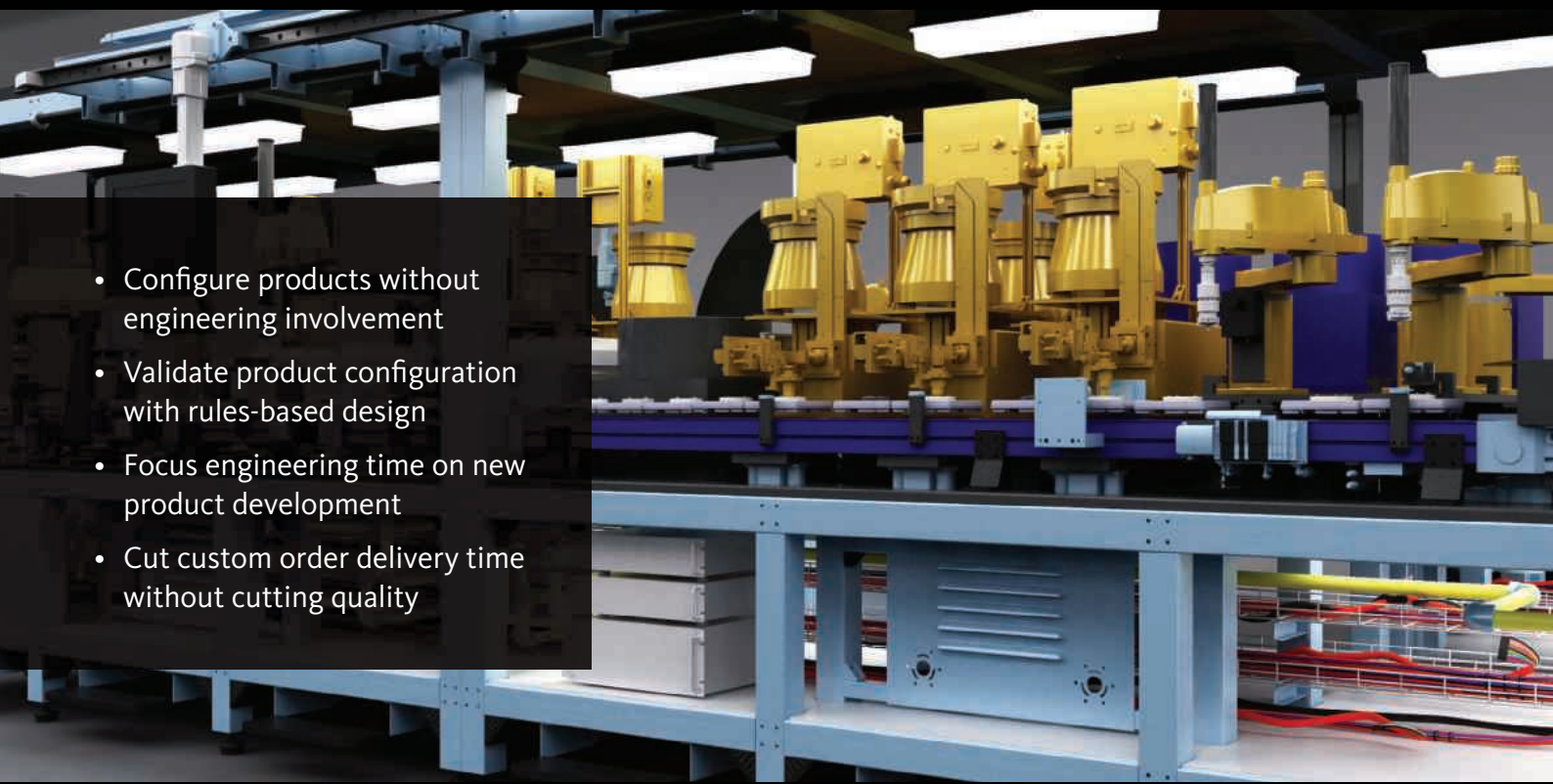

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Web pioneers win QE Prize for Engineering

Queen Elizabeth Prize for Engineering

Five engineers who created the Internet and the World Wide Web have together won the inaugural £1 million Queen Elizabeth Prize for Engineering for their innovations.

Today, a third of the world's population use the Internet and it is estimated to carry around 330 Petabytes of data per year, enough to transfer every character ever written in every book ever published 20 times over.

Engineers Robert Kahn, Vinton Cerf, Louis Pouzin, Tim Berners-Lee and Marc Andreessen were announced as the winners by Lord Browne of Madingley in the presence of HRH The Princess Royal at the Royal Academy of Engineering, which administers the prize. The winners will come to London in June for the formal presentation of the prize by Her Majesty The Queen.

The art of engineering lies in the efficient combination of technologies to deliver the most meaningful results for society. The international team of judges for the Prize consider that these five outstanding engineers epitomise this approach in the way that they designed and built the Internet and the Web.

Lord Broers, Chair of the Judging Panel for the Queen Elizabeth Prize for Engineering, said: "Engineering is, by its very nature, a collaborative activity and the emergence of the Internet and the Web involved many teams of people all over the world. However, these five visionary engineers, never before honoured together as a group, led the key developments that shaped the Internet and Web as a coherent system and brought them into public use.

"We had originally planned to award this prize to a team of up to three people. It became apparent during our deliberations that we would have to exceed this limit for such an exceptional group of engineers."

Graphene aerogel is claimed as 'world's lightest material'

A new aerogel made from graphene looks set to claim the title of the world's lightest material.

Created by a research team from China's Zhejiang University, the aerogel has an ultra low density of just 0.16mg/cm^3, lower than the density of helium and of the aerographite material which until now held the crown.

According to the researchers, the material can absorb up to 900 times its own weight in oil, making it attractive for cleaning up oil spills. It is also said to be very strong and extremely elastic.

To create the aerogel, the researchers turned to graphene.

The team, led by Professor Gao Chao, used a new method known as freeze-drying that involved freeze-drying solutions of carbon nanotubes and graphene to create a carbon sponge that can be arbitrarily adjusted to any shape.

"With no need for templates, its size only depends on that of the container," Prof Chao explained. "A bigger container can help produce the aerogel in a bigger size, even to thousands of cubic centimetres or larger."

The researchers are now exploring other possible applications for the material, and say it could have potential as a phase change energy storage insulation material, catalytic carrier or efficient composite.

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Delay strikes Bloodhound project

Setbacks have hit the Bristol-based project to develop a 1,000mph supersonic car.

The Bloodhound team had hoped to take the car to South Africa to attempt to break the current land speed record (763mph) in December, but project director Richard Noble has admitted that this will not now be possible.

In a posting on the Bloodhound website, Nobel commented: "By the end of the year crucial components like the tailfin will still be in manufacture and it's quite clear that we won't be in South Africa for December as we had hoped.

"Knowing that many people are planning their holidays around all this we felt it important to get the message out immediately."

Nobel said the team was determined to have the car on its wheels with the EJ200 engine running this October.

Testing on the Hakskeen Pan, Northern Cape, South Africa is now scheduled for Q2 2014.

Flexible 3D printing material is 'world's first'

Materialise has announced the official launch of its new flexible 3D printing material, the TPU 92A-1.

The fully functional material, as demonstrated in the video below, is designed to offer a high tear resistance, high resistance to dynamic loading and high abrasive resistance.

According to Materialise, it also offers excellent durable elasticity and a snappy response.

One of the first adopters of this material has been Dutch fashion designer and guest member of the Chambre Syndicale de la Haute Couture, Iris van Herpen, who is known for pushing the boundaries of 3D Printing in the world of high fashion. In January this year, TPU 92A-1 made its debut on the catwalk during Iris van Herpen's Voltage Haute Couture show during Paris Fashion Week.

The TPU 92A-1 is available now and is specified over a temperature range of -20 to 80°C.

www.materialise.com

CAMBRIDGE CONSULTANTS IN RECRUITMENT DRIVE

Cambridge Consultants is to create 50 new jobs this year and open an office in Singapore.

The move comes as part of the company's wider plan to double its 380-strong workforce over the next four years and expand into the Asian market.

Alan Richardson, Cambridge Consultants' CEO, said: "Our reaction to the global recession was to invest in new talent and our facilities so that we can deliver more solutions faster for our customers.

"Our growing success is testament to that approach, with orders at an unprecedented level. So we now feel the climate is ripe to accelerate the growth of our business – and we're on the lookout for ambitious engineers, scientists, mathematicians and designers to join us as we expand."

Foldable wheels could ease wheelchair travel

A new wheelchair wheel that folds into almost half its original size for easy transport and storage has been unveiled by US company Maddak.

When folded, the patented Morph Wheel takes up a total of 12 litres of space, compared with the 22 litres it would usually fill when fully circular. This enables its size to be reduced from 24in diameter to the more manageable dimensions of 32 x 12.5in.

The folding wheel was originally conceptualised as a folding bicycle wheel by Royal College of Art graduate student Duncan Fitzsimmons.

After receiving a great deal of public attention and calls from the wheelchair community telling him that this concept would be invaluable to wheelchair users, he redesigned it as a wheelchair wheel.

Each Morph Wheel tips the scales at 3.4kg and is constructed from glass-filled nylon, with a polypropylene hand rim and solid tyre.

The patented design features a safety mechanism that prevents folding unless desired by the user, and will, it is claimed, fit to any existing wheelchair able to accommodate a wheel with a quick release axle.

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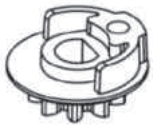

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Composites UK endorses Engineering Design Show

Composites UK, the trade association for the UK composites sector, is the latest industry body to have signed up in support of the Engineering Design Show.

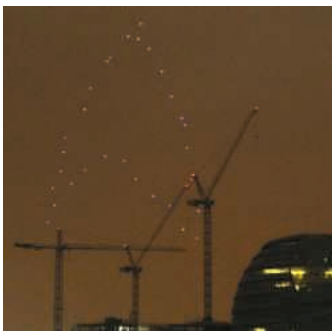
The Show, which will take place on October 2nd and 3rd 2013 at the Jaguar Exhibition Hall of Coventry's Ricoh Arena, will offer a superb opportunity for the UK composites industry to connect with design engineers about the practical implementation of composites material and the benefits of adopting it as a material choice.

Operations Manager of Composites UK, Dr Sue Halliwell, said: "The Engineering Design Show is the ideal platform for the UK composites industry to engage with an audience of design engineers making material choices.

"By supporting the Engineering Design Show, we hope composite material suppliers and experts will take the opportunity to engage with engineers and designers about the advantages composites can offer and how to get involved in the thriving developments going on in around UK."

Quadcopters take to London skies

A 30-strong fleet of aerial drones took to the skies of London last weekend as part of a combined publicity stunt for the forthcoming Star Trek: Into Darkness film and the Earth Hour awareness campaign.



Staged by media arts company Ars Electronica Futurelab and Munich based UAV manufacturer Ascending Technologies, the flying squadron of 30 LED studded Asctec Hummingbird quadcopters lingered 300ft above Potters Fields Park near London's Tower Bridge, forming a three dimensional Star Trek logo.

The stunt marked the end of Earth Hour on 23 March, a global event organised by the World Wide Fund for Nature (WWF) to encourage households and businesses to turn off non-essential lights for one hour at 8:30pm.

The 100g, four-rotor quadcopters used in the display were equipped with specially developed GPS modules so that they could be steered 'with the utmost precision'.

In order to allow for simultaneous control of multiple quadcopters, Ascending Technologies completely reconfigured the communication both among the quadcopters and the ground control station.

A 2.4GHz transmission channel was set up which allowed the computations to be communicated to the flight control software to pilot the swarm's aerial manoeuvres.

www.engineeringdesignshow.co.uk

Engineering design show

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Engineering design show

Engineering Materials LIVE!

electronics design show

Even before the doors closed on the inaugural Engineering Design Show, organisers Findlay Media promised exhibitors and visitors that 2013's event would be bigger and better.

And now that promise is being delivered.

The Engineering Design Show offers visitors access to the latest products, techniques and technologies from across the design spectrum, as well as a range of informative and free educational conferences and workshop sessions.

The 2013 Engineering Design Show will offer everything that 2012's did – and more!

The transformation will be seen in a number of ways, the most obvious being the sheer size of the event. Last year's show occupied one of the Jaguar Exhibition Halls at the Ricoh Arena; this year the Engineering Design Show will occupy two halls and feature more than 150 exhibitors, as well as the full conference and workshop programme that proved so popular in 2012.

A dedicated section this year will be devoted to the launch of **Engineering Materials Live!** Inspired by the success of *Eureka's* newest stablemate *Engineering Materials*, this element of the show will feature the latest materials and processes that engineering designers need to see.

And also co-located with the Engineering Design Show, the **Electronics Design Show** will occupy a third hall and will feature up to 80 exhibitors and two workshop areas that will host 20 workshop sessions and a separate conference that will comprise 16 presentations.

Last year's show was a fantastic success. However, with the combined support of the *Eureka*, *New Electronics* and *Engineering Materials* brands, the 2013 event will surpass it in scale, scope and value. We can't wait. We hope you feel the same. See you there.

Paul Fanning

Editor, Eureka

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Vapour suppression spheres fight fires

Trelleborg, has developed an advanced composite material specifically designed as a fire and vapor suppression agent for large storage tanks containing hydrocarbon polar or non-polar fuels.

Applied as a semi-permanent vapour barrier, or used as an additive to firefighting foam, the new Vapor Suppressing Spheres create a barrier between both polar and non-polar flammable liquids and the vapor space above. As the product is capable of handling high temperatures and has an oil repellant outer coating, the barrier lasts indefinitely compared to the temporary barrier that traditional 'wet' foam provides, therefore

eliminating the need for continuous re-application.

The individual spheres, which vary in size from 3 to 5 mm, are applied dry and self-assemble into a foam-like structure that is lighter than both oil and water. The resulting 'foam' suppresses vapors to the point of extinguishing the liquid hydrocarbon fires. Unlike traditional water-based foams, our dry foam fire suppression spheres work without freezing or bubble degradation, and are better for the environment because they do not contain fluorosurfactants. Since the spheres do not rely on water to put out fires, they are most suitable for applications where water is scarce and in regions of the world where low temperatures pose freezing issues.

www.trelleborg.com

Air Hands range expands

The'Air Hands' series MFD/MFU - expanding grippers from Gimatic has been extended to provide a complete cover of diameters.

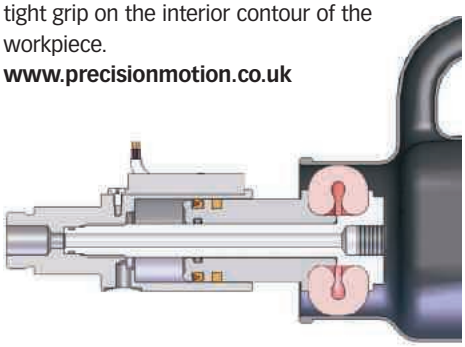
Thirteen continuously overlapping sizes from 8 to 85 mm diameter are now available for internal gripping or sealing. The graph shows the individual units' base and expanded diameters.

Air-Hands provide consistent and smooth internal gripping and are particularly suitable for handling fragile or delicate products such as polished metal, glass or plastic preventing breaking, marking or scratching.

In addition the possible combination of leak or pressure testing enables design engineers to create remarkably cost effective application solutions.

Air-Hands are pneumatically operated single acting cylinders with either a downwards (MFD) or upwards (MFU) motion causing the plastic bellow to expand hence providing an air tight grip on the interior contour of the workpiece.

www.precisionmotion.co.uk



Mink leads the way with cost savings

Vacuum pump and blower manufacturer Busch (UK) is highlighting the benefits of its successful Mink rotary claw range of vacuum and over pressure pumps, which can offer cost savings of up to 60% for some users.

Designed for applications such as plastics manufacturing, woodworking, water treatment and printing, Mink offers high efficiency, non-contacting operation with low maintenance. Variable speed control to match pumping speed end pressure and flow to process demand is a key feature of the design which provides flexibility for the user.

The Mink series is available with suction capacities of 60 to 500 m^3h and provides pressure differentials of up to -0.9 bar (g) vacuum and 2 bar (g) over pressure. Larger volume flows can also be generated by connecting single pumps or compressors in parallel arrangements or using mechanical boosters.

www.busch.co.uk

Innovative range of press blocks

Bosch Rexroth has extended its range of hydraulic press blocks with a new series specifically aimed at machine builders supplying press machines to a wide range of metal and other forming applications.

The type M modular press blocks will make it significantly easier for machine builders to achieve EN 693, EN 289 and ISO13849. The press blocks are ideal for upper rams on downstroking presses and have been specifically designed for both new build presses and retrofit on existing machinery.

The new range includes a new safety feature, namely hydraulic circuit configuration with monitored directional control valves. Flexibility has also been prioritised with a primary module providing free fall with proportional valve tonnage control. Additional modules can be fitted for extra press cylinders which will allow other functions such as regenerative flow, high and low pressure control and load sensing.

The Rexroth type M modular press blocks offer a flow rate of up to 1300lpm and system pressure of up to 350 bar. The range compliments the existing Rexroth range, which can handle flow rates up to 14000lpm.

www.boschrexroth.co.uk

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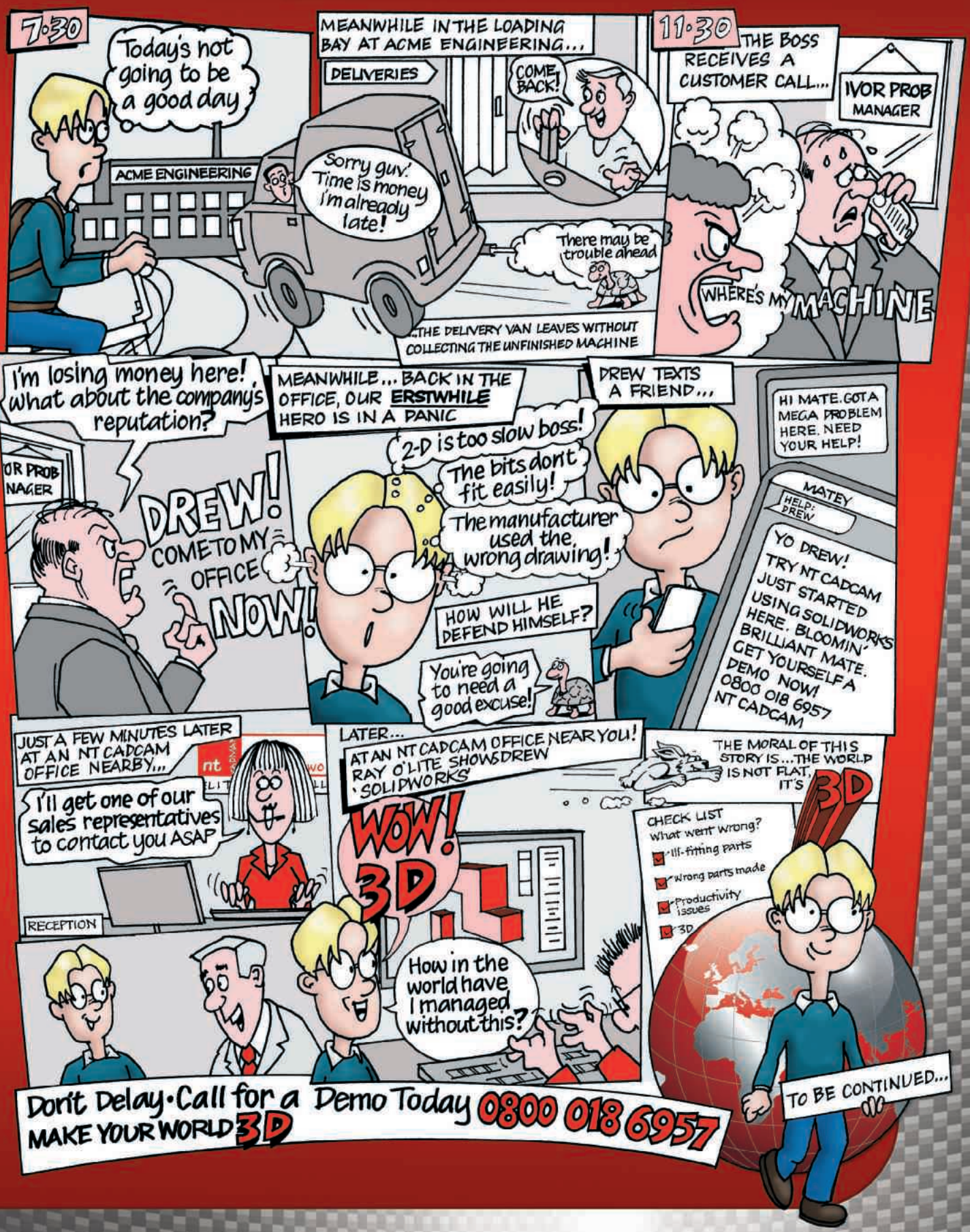

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Sensors for application-specific teaching

Turck Banner has added new functions to its range of RI inductive angle sensors. From now on, users can teach the RI sensors directly at the device. Not only is it possible to call up hard programmed angle ranges, but start and end points can also be defined for the sensors as required. The sensors were developed for use in mobile devices in accordance with the e1 specification. On the RI sensors, the angle position is not measured with a magnetic positioning element, but by means of an RLC circuit. This sensor is thus completely immune to magnetic fields, such as for example those of large motors.

The RI sensors have a measuring range of 360° with an accuracy of 0.15% of full scale. The contactless principle reliably compensates bearing tolerances of the applications as well as vibrations caused by shaft eccentricity.

www.turckbanner.com

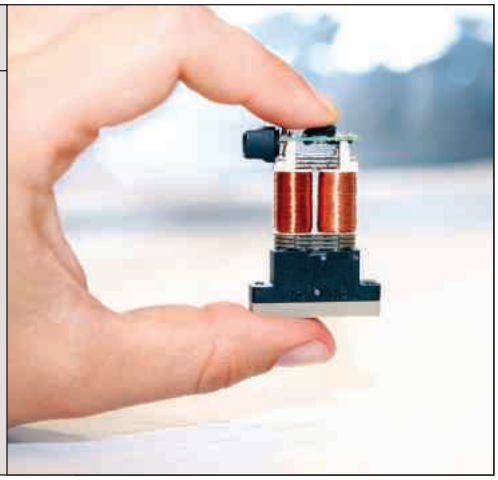
Compact valves offer high power density

With its TwinPower technology, Bürkert has developed a new actuator design for solenoid valves that increases the power density by using two coils. This innovative actuator technology, which allows a very compact design, is now available as a complete standard valve line in widths of 10mm and 16mm, therefore offering more than 1000 possible variants for each width with optimal flexibility in adapting the valves to specific applications.

The enhanced TwinPower valves, available in the body materials PEEK and PPS as well as the seal materials FFKM, FKM and EPDM, provide optimal solutions for virtually every medium.

Each single component in the valves was analysed critically during development of the TwinPower series to identify potentials for optimisation. By improving the membrane seal, for example, it was possible to achieve a leakage rate of 10^{-6}mbar*l/min. In addition, the geometry of all the bodies was optimised for improved flushability.

www.buerkert.de



Solution to last month's Coffee Time Challenge

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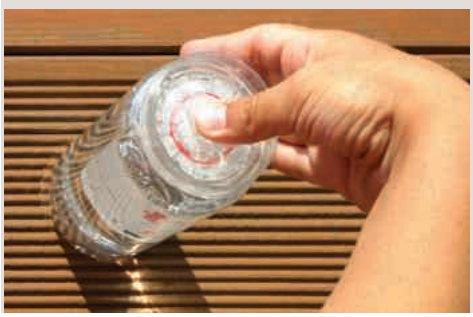
The solution to March's Coffee Time Challenge comes from German company 4Pack and is called the CrazyCan. The CrazyCan seal is a flat PET cap combined with a PET sleeve, which keeps the drinking brim of the can clean and hygienically sealed. This reassures the consumer that they are drinking from a clean can. The consumer simply pulls off the CrazyCan seal using the specified flap. Then, they softly press the centre of the cap with a finger, which lowers the valve and degasses the can (for drinks containing CO2). By pressing the cap harder, they open the closure completely; a snapping mechanism keeps it open and fixed to the can. The drink is now ready for pouring or drinking straight from the can.

When they have drunk enough, the consumer simply presses two fingers on the edge of the opened cap. This lifts the valve into its original position, closing the can securely with a reassuring popping sound. This makes the can leak proof – it also stops CO2 escaping, which keeps the drink fizzy. For 'still' drinks, a pre-tension in the closure system guarantees no leaks during use. Drinks containing CO2 simply strengthen this effect.



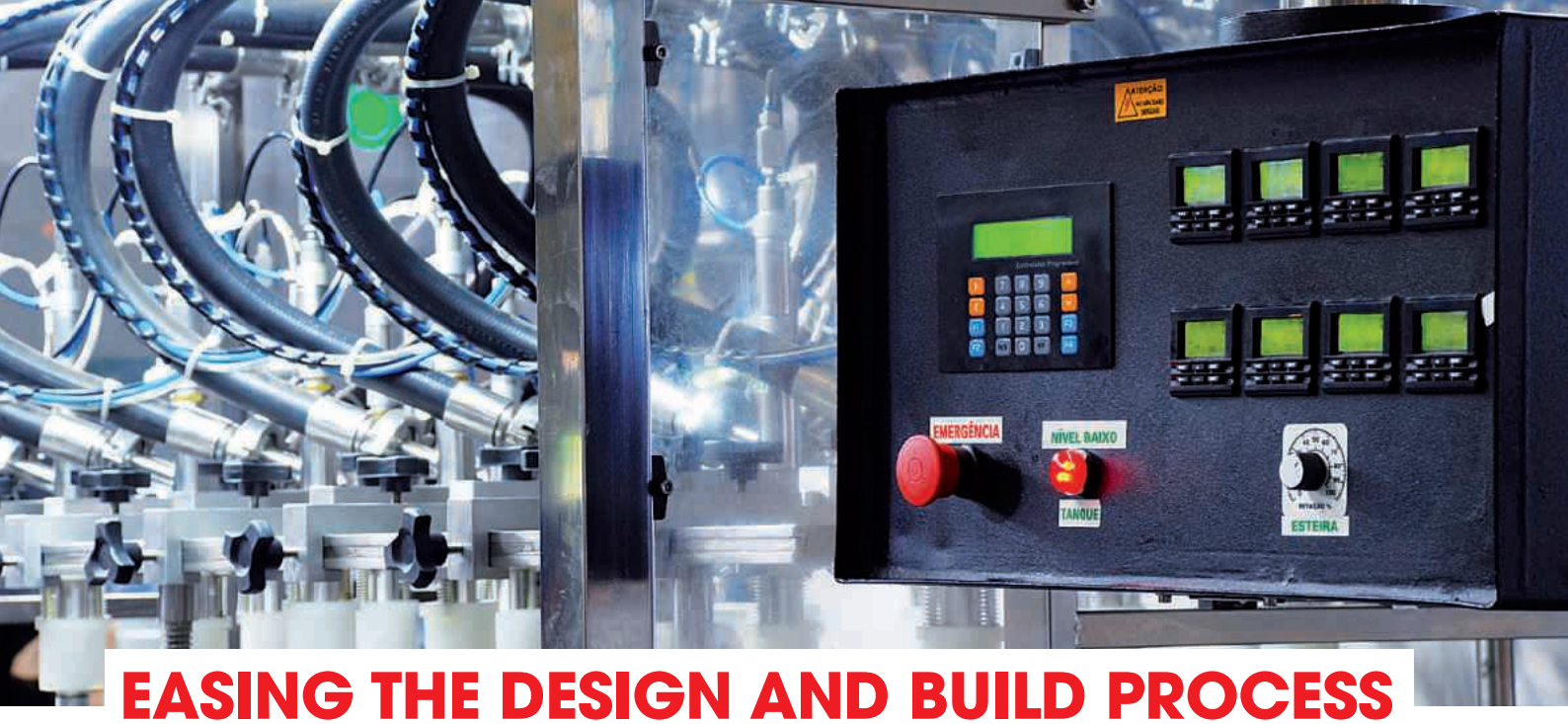
www.4pack.de

Actuator offers in-line or parallel coupling

Olsen Engineering has launched the Exlar K90, a larger 90mm frame version of the K60 low cost electric 'rolled' linear actuator, which employs satellite roller screw technology. The K series offers flexibility of motor and servo amplifier choice. Also in the IM/IX series variation there option of integral in-line planetary gear reduction up to 10:1.

Ideal for low-cost food packaging applications where users may want to use their own servo motors like Siemens, Rockwell, Baldor or similar, Exlar's K series provides long life and is available as standard in an IP65-rated ingress protected enclosure. Roller screw linear actuators provide an efficient modern alternative to hydraulic or pneumatic units in a much more compact, low maintenance format, without the contamination or noise problems. The K series offers the option of two grades of planetary roller screws, rolled satellite M and X grades.

www.consultolsen.com



EASING THE DESIGN AND BUILD PROCESS FOR MACHINE AND PANEL DEVELOPMENT

The process of building any control or machine panel begins with the design, and sourcing the right parts among the colossal range available on the market today can be an overwhelming prospect.

Comprehensive portfolio

The value of seeking independent support to help steer through the process from design to build, as well as for test, commission and maintenance, cannot be underestimated, and can be a significant contributing factor in gaining competitive advantage. The time it takes to complete a machine or panel build is critical in any industrial environment, and having a single point of access to all of the latest technology from the leading automation brands is an effective way to reduce time, effort and cost from the outset.

RS provides this central resource, stocking a comprehensive range of both legacy products and the latest industry innovations, to ensure the needs of the machine and panel builder are met. The portfolio includes: enclosures; pushbuttons and indicators; panel meters; temperature and process controllers; power supplies; circuit protection; timers and relays; and PLC and logic controllers. The machine and panel builder is able to easily compare and combine the strengths of a broad range of products from multiple suppliers without the need to contact each manufacturer individually. Everything is available to view and purchase in just a few clicks on the RS website, backed up by a host of technical information and data.

Select and purchase

Selecting the most suitable components for the design is the primary consideration, but keeping down the overall costs of the build is also very high on the priority list, and once again the benefits of using a single source of purchase rise to the fore. RS provides a flexible pricing service, enabling customers to compare prices on the Bill of Materials (BOM), with the option to negotiate for substantial discounts on larger orders.

The next step after conquering the sourcing and purchasing hurdle is to ensure continuity of supply of the parts selected. All machine and panel builders are operating within time constraints, and the ability to plan projects and fulfil commitments to customers is an essential part of the build process. Reliability and efficiency are both key factors in securing industrial contracts, and maintaining a high level of service is paramount.

Flexible delivery and service

RS guarantees same-day despatch from its global warehouses on more than 200,000 products employed in machine and panel building applications. The ability to order products from RS direct from stock has the additional advantage of fast response to urgent or unplanned requirements, and a range of delivery options is available, including timed service and same day courier. For UK customers, a collection service is also available from a network of RS branches located across the region.

The RS support for machine and panel builders extends beyond the supply of core components to the provision of tools and parts to complete the build, such as fixings, cables and connectors. Test and measurement equipment is also stocked for testing the functionality and safety of the build, with an in-house calibration service available to UK customers.

Complete design and build solution

RS has a long history of understanding and servicing the needs of machine and panel builders, and the company's recent emphasis on developing strong eCommerce capabilities alongside the traditional distribution channels, is playing a significant role in easing the entire design and build process.

rswww.com/automation-control-gear

The wisdom of

Of all the trends noticeable in 2012, perhaps one of the most significant for innovators and inventors was the emergence of a funding model with the potential to revolutionise innovation: crowdfunding.

In essence, the idea behind crowdfunding couldn't be simpler: a company or entrepreneur makes an online pitch and it then becomes possible for a global audience to decide whether and to what extent to back it. Donations can be small or large and can secure the investor anything from equity in the company, a financial return on the investment or a product – right down to a t-shirt or just the warm glow that derives from having helped a good idea on its way.

Probably the best known crowdfunding website is kickstarter.com, which operates what is known as a 'reward' system, whereby investors receive recompense based on the size of their donations. These could be as little as a few pounds up to thousands. In some instances, investors may pay enough to receive the end product of the project to which they are donating. However, Kickstarter itself is careful to state that it is not a store. Those who consider themselves to be paying for a product may well find themselves disappointed or waiting a long time – this is a much riskier model than many realise.

However, there are notable successes. Perhaps last year's most successful Kickstarter project was launched by a trio of MIT students and post-graduates who designed the Form 1, a desktop 3D printer capable of printing very high-resolution objects, and priced at about $2,500. Initially seeking $100,000, by the time the parent company Formlab's fundraising campaign ended in October, it had accepted almost $3 million in investment/orders for the device.

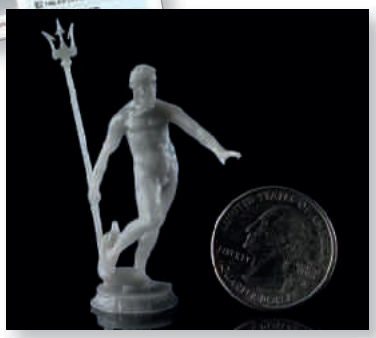
However, the Formlabs story may yet turn out to be as much cautionary tale as shining example. Just a month after busting its funding goal so spectacularly, the company found itself being sued for patent infringement by 3D Systems, a giant of the 3D printing industry. Perhaps even more significantly, the suit also names Kickstarter as a defendant for serving as Formlabs' sales agent (its claims of not being a store notwithstanding), a development with the potential to derail not only Formlabs, but potentially Kickstarter and even the crowdfunding model as a whole.

Formlabs has said the lawsuit won't stop it from delivering its 3D printer to more than 1,000 buyers. But the company will now have to spend a great deal of time and money defending itself against the suit.

The Formlabs example offers an interesting microcosm, then; one that display both the strengths and weaknesses of this funding model. On the one hand, the ability to raise that degree of funding in a short time and to gain a great deal of free publicity and credibility is obviously a huge boon to any fledgling business. On the other hand, having to do your pitching in a public forum means that your potential competitors have the opportunity to anticipate, analyse and even counteract your product long before it even hits the market.

This problem is familiar to Alastair Buchanan, co-founder of CADScan

Formlabs' Form1 3D Printer appeared to be one of the big success stories for Kickstarter in 2012, but a subsequent lawsuit by 3D Systems for patent infringement has put that apparent success in some doubt

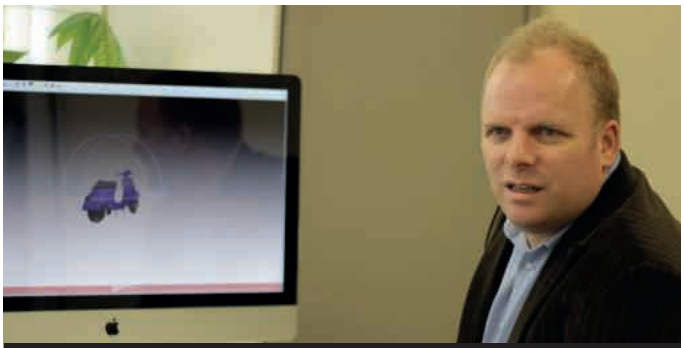


(*Eureka*, March 2013), whose CADScan 3D scanner recently exceeded its £80,000 funding target on Kickstarter, reaching £97,264. "Ultimately, it's a public site," he says. "You have to explain in quite a lot of detail what you're doing and people ask you technical questions that you'd perhaps rather not answer publicly, but since they're putting their hands in their pockets, you have to talk to them. The other factor, of course, is that your potential competitors can buy one of your machines on there and ask these questions as well. Thinking through all the questions

crowds

Securing funding for innovative ideas has always been a major obstacle to commercialisation. Could crowdfunding change all that? Paul Fanning finds out.

"YOU HAVE TO EXPLAIN IN QUITE A LOT OF DETAIL WHAT YOU'RE DOING AND PEOPLE ASK YOU TECHNICAL QUESTIONS THAT YOU'D PERHAPS RATHER NOT ANSWER PUBLICLY, BUT SINCE THEY'RE PUTTING THEIR HANDS IN THEIR POCKETS, YOU HAVE TO TALK TO THEM."
ALASTAIR BUCHANAN, CADSCAN



Alastair Buchanan of CADScan

you're likely to be asked beforehand is incredibly useful."

However, this kind of inquisition can be of benefit from a design point of view. Says Buchanan: "They call them 'investors' on Kickstarter, but they really are customers – they're buying the product at the end of the day. And if they tell you what they want, you have to listen. There are certain tweaks you can make to the design. The major one is the 'macro mode' that we've just agreed to do. That means you have a second turntable much closer to the scanner and can scan smaller objects in much higher resolution. So we have some flexibility in the design."

For all that, however, the design can only be altered so far. "You can put new ideas out there, but there is limited scope in terms of what you can do," says Buchanan. "You can refine an idea, but I don't think you can really change it that easily. It has to be at a certain level before they'll let something on there. It has to be a functional prototype."

Overall, Buchanan's experience of this model has been positive. "You certainly get customer feedback very quickly and things become very clear to you very quickly. If a lot of people are saying the same thing to you, then it's often correct. So it's certainly a very good way of speeding that process up," he says.

For all that it is the most high-profile example of crowdfunding, Kickstarter represents just one model. In addition to the reward model, there are also purely altruistic models that allow investors to back ideas they like with no acquisitive model. At the other end of the scheme, however, are sites that allow investors to loan money to creditworthy businesses and collect interest. However, the model currently felt to be most potentially disruptive is one that allows the mass market to buy equity in the companies they fund.

This 'equity crowdfunding' model is the one that many believe has the potential to transform the funding landscape. One such person is Simon Dixon, CEO of Bank To The Future, a company that offers a range of models. He says: "The point of crowdfunding is that it allows people rather than institutions to determine who gets funded – that's the point of it. The second point is that it has to bring in a new source of finance or we're not really doing anything here. We're not trying to regurgitate angel money in a new form. We're trying to allow and introduce a new source of finance."

He is insistent, however, that crowdfunding should not be seen as simply an easy option for those looking for capital. "Crowdfunding can certainly be a fast way to raise capital," he says, "but it is as hard as raising money from a business angel. It has to be challenging to get funding, but it shouldn't be expensive… There are people who make the pitch and then just sit there and hope to come back in 90 days and collect the money. It doesn't work like that."

Luke Lang, co-founder of equity crowdfunding site Crowdcube agrees, saying: "There's nothing more frustrating than an entrepreneur who thinks they can just sit there. You really need to put some commitment and energy into the process if it's going to work."

While stories such as Formlabs' and CADScan's are encouraging, the majority of crowdfunding successes have tended to be in more easily-grasped and/or low-capital intensive. So is there really scope for more complex businesses such as engineering to succeed in this format?

Says Dixon: "It's too early to say. We're still a niche. We've only raised £1.6bn as a sector. I do believe that things like bio-sciences, which have massive capital and long life cycles and multiple funding rounds are a bit too complex for investors to understand. At the moment, there is definitely a bias towards a certain type of business that people can grasp relatively easy."

In the future, however, Dixon has little doubt that this will change. He says: "As the industry grows, I think we're going to see ever more sophisticated niche platforms capable of meeting certain needs and congregating certain communities. One of the models I think is going to emerge is the model of an expert performing due diligence before the pitch goes live and then allow people to co-invest alongside that expertise. That would suit areas that are particularly technical."

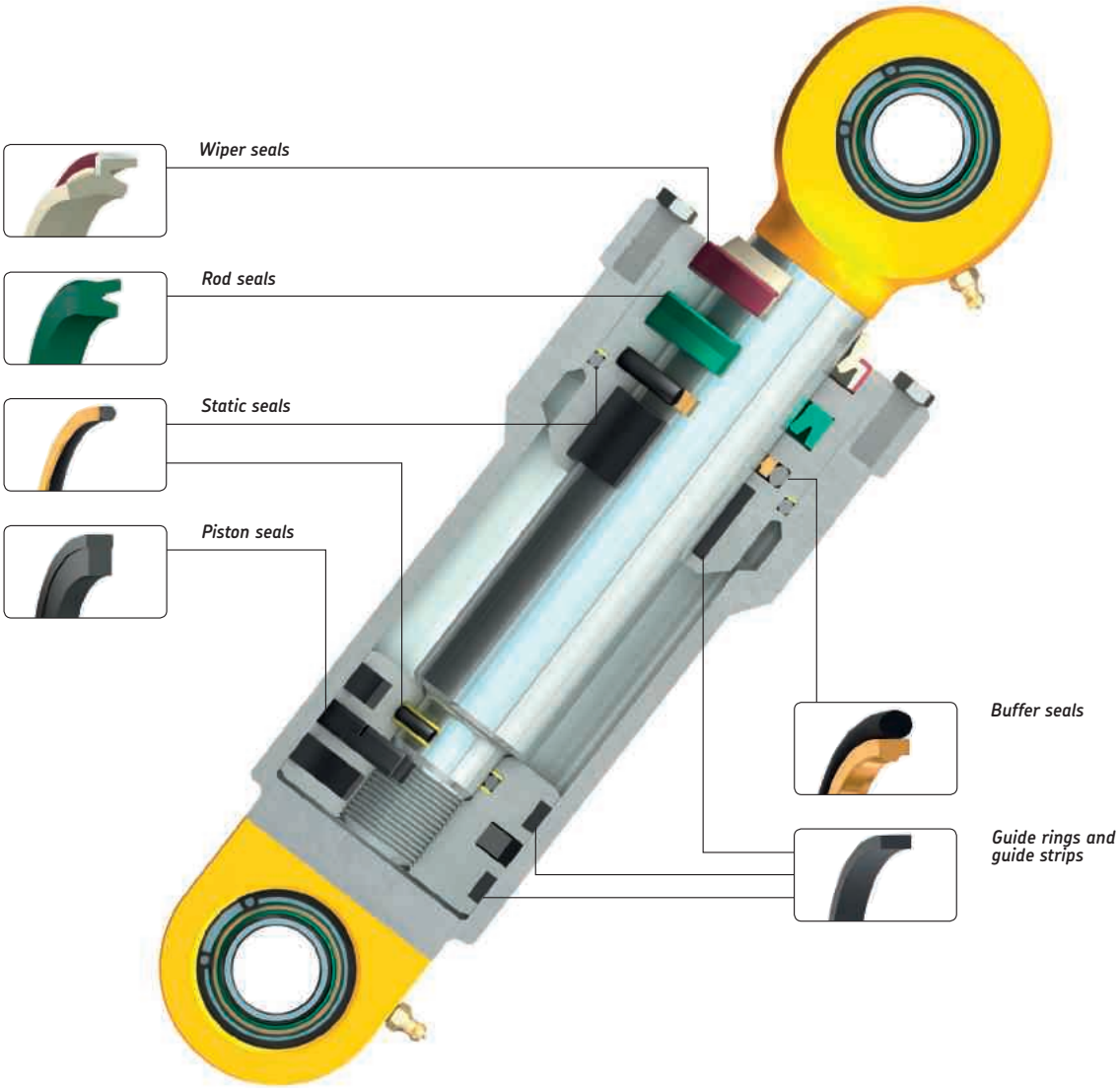
Lang concurs, saying: "I think that B2B propositions find it a bit more difficult at the moment, but I suspect that may be more to do with the level of sophistication of the actual investors. In three, four or five years' time, I think you'll see that sort of sophisticated investor"

Ayan Mitra, founder of Crowdbnk [sic], is clear that the crowdfunding model is set to be disruptive regardless of sector. "Every product has a crowd," he says. "As the industry evolves and more people know about crowdfunding and are financially educated, you're going to see that change. This is going to be huge in terms of disrupting the corporate funding mechanisms."

But what about the banks? Are they simply going to sit back and let crowdfunding take all this market share? Dixon is dismissive of the idea that banks see this as a threat, saying: "Only two types of bank lending to SMEs are happening at the moment: positive PR and the Government forcing them to lend via Project Merlin… Banks are getting too hard a time at the moment because they were never meant to be in the market of lending to SMEs. That's our market and that's our territory. I think that banks are really happy to have somewhere they can send those customers they definitely don't want. "

Regardless of the model or sector, Dixon makes it clear that he believes crowdfunding is bound to grow into a genuinely disruptive business with the potential to revolutionise the financial marketplace and to give ideas that might otherwise never have seen the light of day a real chance. "It's very early days," he says. "As our sector grows, there's so much scope for it to evolve. Every single financial product is going to turn into a crowd product in one form or another."

www.formlabs.com
http://cad-scan.co.uk
www.crowdcube.com
www.kickstarter.com
www.banktothefuture.com
www.crowdbnk.com



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If you design and produce hydraulic cylinders or off-highway equipment with hydraulic cylinders, then you are well aware of the increasing demands on reliability and sealing performance. To help you develop the right sealing solution, SKF engineers can provide expert technical support:

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A winning personality

A refusal to compromise his ambitions or settle for anything less than what he wants has paid off for BEEAs winner Michael Aldridge, as Paul Fanning discovers.

When asked what advice he would offer to other young engineers, Michael Aldridge says: "Don't settle for a job that isn't what you want." To some, this may seem strange advice to offer in a market where jobs are not easy to come by. However, given that it comes from the joint winner of the 2012 Young Design Engineer of the Year at the British Engineering Excellence Awards, it is fair to say that it has something going for it.

To be fair, Aldridge has certainly practised what he preaches. Upon leaving Strathclyde University with a Masters in Product Design Engineering in 2008, he initially found a job with a furniture design company. However, on finding that this did not meet his ambitions, he spent a year in Australia, during which he worked in an architect's office on a project designing a hospital. On returning to the UK he was, as he puts it: "determined to slog it out and wait for that job I really, really wanted".

This determination led him to apply for an internship with leading Glasgow-based design consultancy 4c Design. This was a brave move not only because there was no guarantee of a job at the end of the internship, but also because competition for it was incredibly fierce, with over 200 people having applied.

The move paid off handsomely, however. Not only did Aldridge get the internship, but at the end of it was offered a job with the consultancy. He was helped in this, he believes, by the fact that a major project was just beginning at 4c at that time to design a new casing for a lifeboat. He says: "Although I was new to the company, I was able to contribute and add value from very early on. That project was completed pretty much as I finished my internship. It was a success and everyone was on a high and then they took me into a meeting room and offered me a full-time job, which I was ecstatic about."

To say the least, Aldridge went on to grasp this opportunity with both hands. And certainly there is no danger of monotony becoming a problem at 4c. He says: "I'm the sort of person who really needs to work on a little bit of everything in order to push myself…What I love about 4c is the diversity of the work. We're literally working on everything from toothbrushes and board games all the way through to power stations!"

Aldridge has since been involved with a range of projects as well as the new perspective on liferaft design. These have included the complete design of an electric bike – which involves a patent application; and a machine which can bottle vaccine solutions under sterile conditions.

The electric bicycle is a design of which Aldridge is particularly fond. He says: "There are a lot of electric bikes out there and, while they have certain advantages, they also have disadvantages. The client had a unique combination of motors and gearboxes and it was our job to make that into a reality. To make the design work effectively, we had to effectively create a custom gearbox, which is now in its final stages of being patented. That makes it my first patent, which I'm very proud of."

"I'd really like to push more towards consumer goods like the electric bike. I really like to see people using my products."

The bike was only brought to prototype stage, but Aldridge hopes reasonably soon to see the finished product on the street and in shops. This last ambition is something that is very close to his heart, as he puts it: "I'd really like to push more towards consumer goods like the electric bike. I really like to see people using my products."

The importance of finding the balance between aesthetics and function is another reason Aldridge enjoys working at 4c. He says: "We are able to occupy that space between the engineers and the industrial designers because we can speak both languages – aesthetics and function. There's no point making the best device in the world if a human can't use it or won't purchase it. Equally, if something doesn't work it doesn't matter how aesthetically pleasing it is."

In terms of advising those who would wish to follow in his footsteps, Aldridge makes it clear that persistence and focus are key, saying: "It's important to focus on what you enjoy because what you enjoy will tend to be what you're best at. There's no point being a square peg in a round hole. So it's important to focus on what you really enjoy and then you have to actively pursue it."

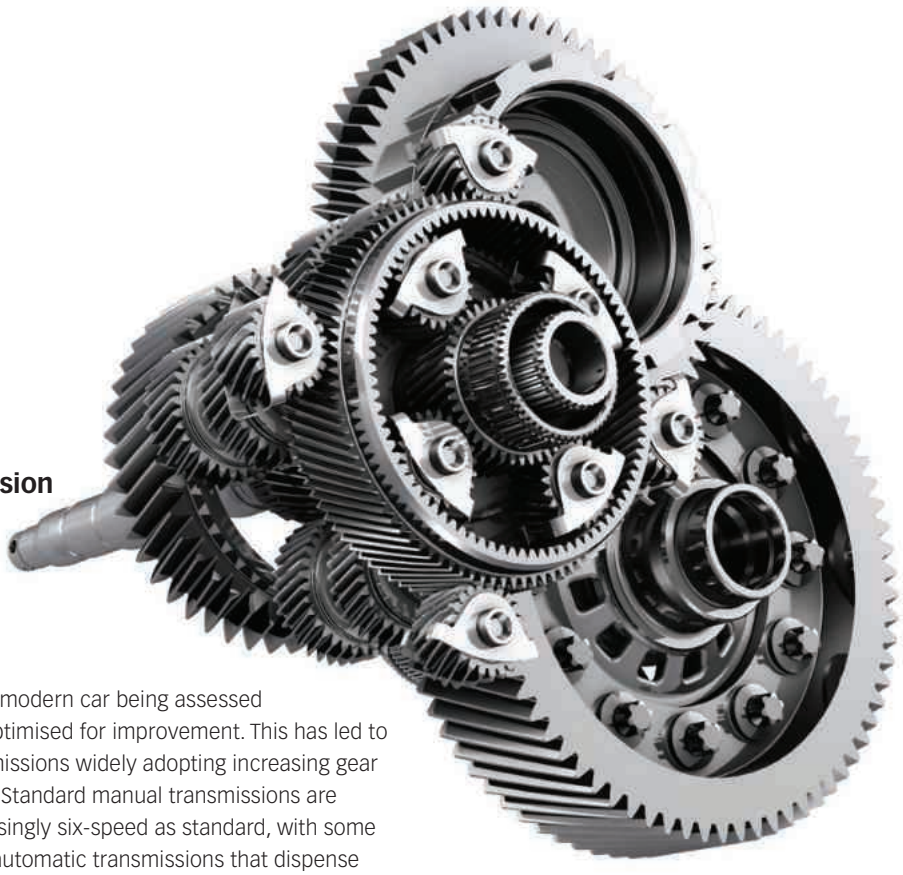
Well-rounded

Michael Aldridge's entry for the BEEAs Young Design Engineer of the Year covered a range of projects, including: the 'fresh outlook' on liferaft design; the design of the electric bike; and a machine that can bottle vaccine solutions under sterile conditions.

He has recently become involved with his local branch of the Institution of Mechanical Engineers, promoting the activities via his blog.

Robin Smith, managing director of 4c Design, who nominated Aldridge, said: "Michael has proved himself not only a well rounded design engineer, with a great grasp of the theory and the practical side, but also with his finger on the pulse of the latest design trends."

Automatic performance



As Jaguar Land Rover announces it will be adopting a nine-speed automatic transmission later this year, Justin Cunningham asks if more is always better.

Never has the automotive sector had to bring to market so many new technologies in such a short space of time. The industry is full of apparently contradictory design drivers. For instance, the need to reduce the weight of structures is now matched by the need to integrate more safety features, which of course add weight. Equally, there is urgent need to improve recyclability, yet hard-to-dispose-of materials like carbon fibre, plastics and lithium batteries are not uncommon on modern models.

With legislation set out as it is, the need to reduce tailpipe CO_2 emissions is absolutely vital for the longevity of automotive OEMs. This need to reduce emissions is, however, at odds with performance. Consumers don't want less – or even the same – they want more: more performance, more acceleration and more fuel economy. These conflicting demands have made the job of engineers particularly difficult, with every conceivable area of the modern car being assessed and optimised for improvement. This has led to transmissions widely adopting increasing gear ratios. Standard manual transmissions are increasingly six-speed as standard, with some semi-automatic transmissions that dispense with clutch pedals looking at seven-speed.

While manual gearboxes have a practical limit (i.e. the wish of the driver not to be continuously changing gears) there is much more scope for automatic gearboxes. This has seen German transmission expert, ZF Friedrichshafen, continue its trend with the announcement that it has teamed up with Land Rover to launch the 'world's first' nine-speed transmission known as the 9HP

"Clearly there is a need to improve fuel economy and reduce CO_2," says David Mitchell, chief programme engineer at Jaguar Land Rover. "But, this comes with opportunities. More gears give you a sharper response and the work we have done allows smoother shifts.

"With the nine-speed gearbox we also introduced stop-start and combined this gives us about a 10% improvement."

One of the downsides of more gears is that they usually add weight and require a larger space envelope. This challenge was made even greater by the design principle used leaning firmly toward passenger cars with front-transverse engines. This made transmission installation inherently limited, with little room for manoeuvre.

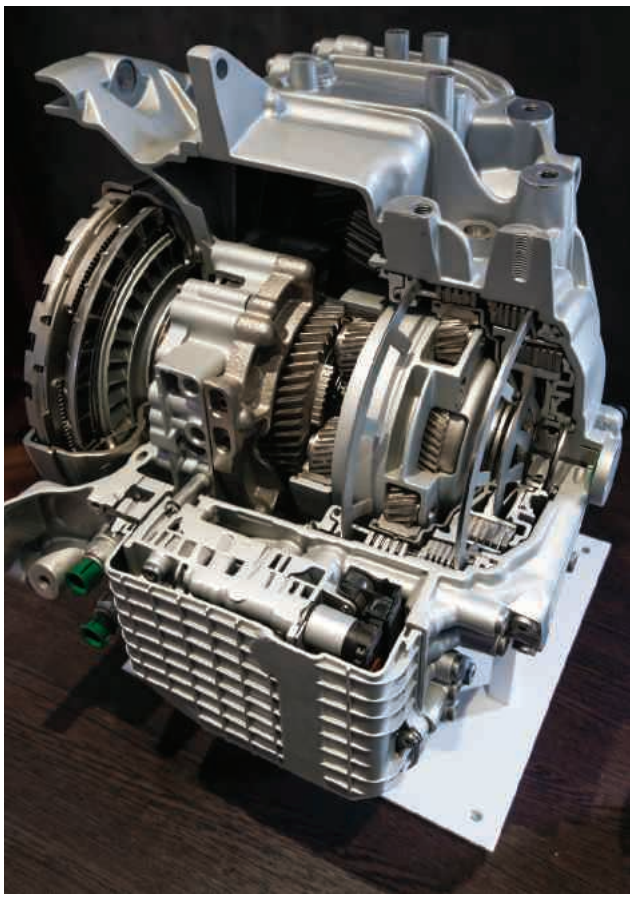
However, a combination of smart engineering and clever use of materials has meant that the new unit weighs less than the outgoing six-speed transmission. The 9HP uses a combination of clever packaging and, despite

the extra three gear ratios, is only 6mm longer.

The small packaging space is achieved by a number of innovative design features including a new hydraulic vane-type pump which also contributes to improved efficiency and two patented dog clutches that replace multiple, and more bulky, clutch packs.

"The introduction of the two dog clutches took some of the weight out against conventional clutch plates," says Mitchell. "Also the torque converter was sized slightly differently so the diameter is smaller.

"Some of the electronics that control the transmission were able to be split and in doing so we made them slightly smaller – again taking off a bit of weight. So it wasn't just one area, it was a combination of a number of different areas that led to a 7.5kg reduction in total."



The transmission also uses four individual gearsets and six shifting elements. For this reason, the gearsets have not been allocated one behind the other on the transmission's longitudinal axis. Instead these were 'Intelligently Nested' in to place. This concept was supplemented by using hydraulically-operated constant mesh elements. They can be integrated without major impact on the transmission length and feature a high level of efficiency. The result means the transmission improves efficiency by using a higher gear spread with closer gear stepping.

The higher top gear reduces fuel consumption and also lowers engine revs. This improves comfort and reduces noise when cruising at higher speed. In ninth, the car can achieve around 70kph per 1,000 revs.

The lowest ratio in the 9HP is also far lower than the existing six-speed transmission and is specifically designed for off-road use, towing and more extreme on-road conditions like gradients and altitude. As Land Rover was closely involved in development, it was also able to ensure that the 9HP is sufficiently robust for off-road driving.

However, it is day-to-day road driving where the transmission will be expected to deliver the most improvement. Its torque converter incorporates a multi-stage damper system for smoother pulling away. Its adaptive shifting system can also match driver input when needed, sharpening up during brisk driving then slipping seamlessly back into a more economical regime.

Existing six-speed transmission makes gear shifts sequentially, while the 9HP has a 'skip-shift' function for much swifter downshifting under rapid deceleration or from greater driver input demands. Interestingly ZF claims shift times are below 'the threshold of human perception'. This translates to shifts that happen in around a 150ms. This ability adds to the transmission's ability to respond quickly to driver inputs.

"We have got a shift-down function with the gearbox that, in its extremes, can shift from ninth to fifth in one mode, or ninth to seventh to fifth to third," says Mitchell. "So we have a 'skip gear' shift-down function that really helps give a nice, sharp response when required."

The nine-speed automatic transmission is not likely to be limited to JLR and can be used by any cars with front-transverse engines. JLR is the launch customer, however, and has been closely associated with its development. It will enter volume production with Land Rover in late 2013.

ZF says the transmission's control unit can be changed and influenced by individual OEM and end customer requirements. Shifting points and shifting dynamics are highly variable and can be tuned with emphasis on comfort and optimised fuel consumption through to being 'extremely sporty'.

ZF has prepared the nine-speed automatic transmission as a modular kit so that it can be used in as many vehicle applications as possible. With two model ranges, it covers a torque range between 200 and 480Nm.

In addition, it is start-stop capable as standard without the need for an additional oil pump. It can even be hybridised on the basis of a parallel hybrid architecture where the torque converter is replaced with an electric motor. In addition ZF's 9HP has open software and an interface structure with a powerful electronic control unit. This, again, means that it will be possible to integrate it flexibly into the many different vehicle concepts.

Land Rover was chosen by ZF to be the lead partner on the 9HP and Land Rover engineers have worked in partnership to develop the transmission. The Land Rover transmission engineering team is already extremely experienced in engineering ZF products to suit Land Rover vehicles, having integrated the 8HP with the Range Rover, Land Rover Discovery 4 and Range Rover Sport.

"We have recently introduced the 8HP and that has been a very successful gearbox," says Mitchell. "The [current] six- and eight-speed automatic transmissions is what we are replacing across the board with the nine-speed."

As to the possibility of yet more gears, however, Mitchell is dubious, saying: "The nine-speed is a very good optimisation. Personally, I can't see many more gears being of value."

www.jaguarlandrover.com
www.zf.com

WORLD'S MOST POWERFUL DIRECT HYDRAULIC DRIVE

The Hägglunds CBM, the result of many years of research, development and and testing, is a new range of very large, heavy-duty hydraulic motors that eliminate the need for gearboxes and provides direct drive for high torque applications ranging from wind turbines and tidal stream generators to very large bulk handling and processing plant.

The CBM delivers 50% more torque, is 50% lighter than its predecessor and places less weight on the driveshaft to provide the world's highest torque-to-weight ratio. In addition, the CBM delivers a number of unique operating advantages expected from a direct drive, including full torque from zero, protection from shock loads and four-quadrant operation.

Installation is made simple due to the splined hollow shaft that eases the attachment to the driven shaft. Direct retrofit kits are also available to make the upgrade of an existing motor quick and easy. The motor utilises the Hagglunds DU drive unit to provide infinitely variable speed along with accurate load control and fast response due to the low inertia. This coupled with the large range of displacements allows the user to select the right size for their application and to maximise the products efficiency.

www.boschrexroth.co.uk

O-rings increase sealing performance

Kalrez Spectrum perfluoroelastomer O-rings from the DuPont Performance elastomers range have been successfully used to minimise the risk of premature seals failure, increase MTBF times and significantly reduce costly downtime for hydraulic clamping systems.

The clamping products were manufactured by a leading European manufacturer of heavy-duty systems for applications in the metals, plastics and rubber processing industries. They use highly-aggressive Oemeta HF/DU hydraulic fluids, working at operating temperatures of 250°C, and are used to retain large hot dies in exact positions on forging machines, and also secure hot moulds in injection moulding equipment. The clamping products are designed to withstand pressures of up to 400 bar at maximum temperatures. Any leakages of hydraulic fluid from the multiple pistons utilised to apply the clamping forces of 25 to 1250kN could not be accepted.

By switching to the Kalrez Spectrum 7075 sealing parts for their hydraulic pumps range, the manufacturer could offer a long-term resistance to aggressive fluids, as well as operating temperatures of 250°C, coupled with increased reliability for their systems, while also achieving cost savings. Previously, other sealing solutions needed replacements due to seal failures after only a few months of operation.

www.dichtomatik-kalrez.co.uk

Pole face clutches happy in wet or dry

The Mönninghoff 450 series of pole face clutches featuring a 'double flux crossed' design achieves high torques and operates even in conditions where oil or water are present. Covering torques from 400 to 2000Nm, the 450 clutches are well-suited to mobile applications, particularly power-take-offs from diesel engines. Clutches are available in three sizes giving backlash free torque transmission with either static or dynamic engagement.

The 450 series clutches are engaged by applying a DC voltage, normally 24V DC, to a stationary coil. This generates magnetic flux which travels into the rotor, a rotating plate that forms one of the two friction surfaces.

The flux then crosses an air gap and pulls another plate, the armature, into contact with the rotor generating the torque by friction. In fact the clutch is designed so that the magnetic flux crosses the air gap twice, hence the description 'double flux crossed'. This doubles the attractive force, increases the torque and leads to compact dimensions. .

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Pumps take the pressure

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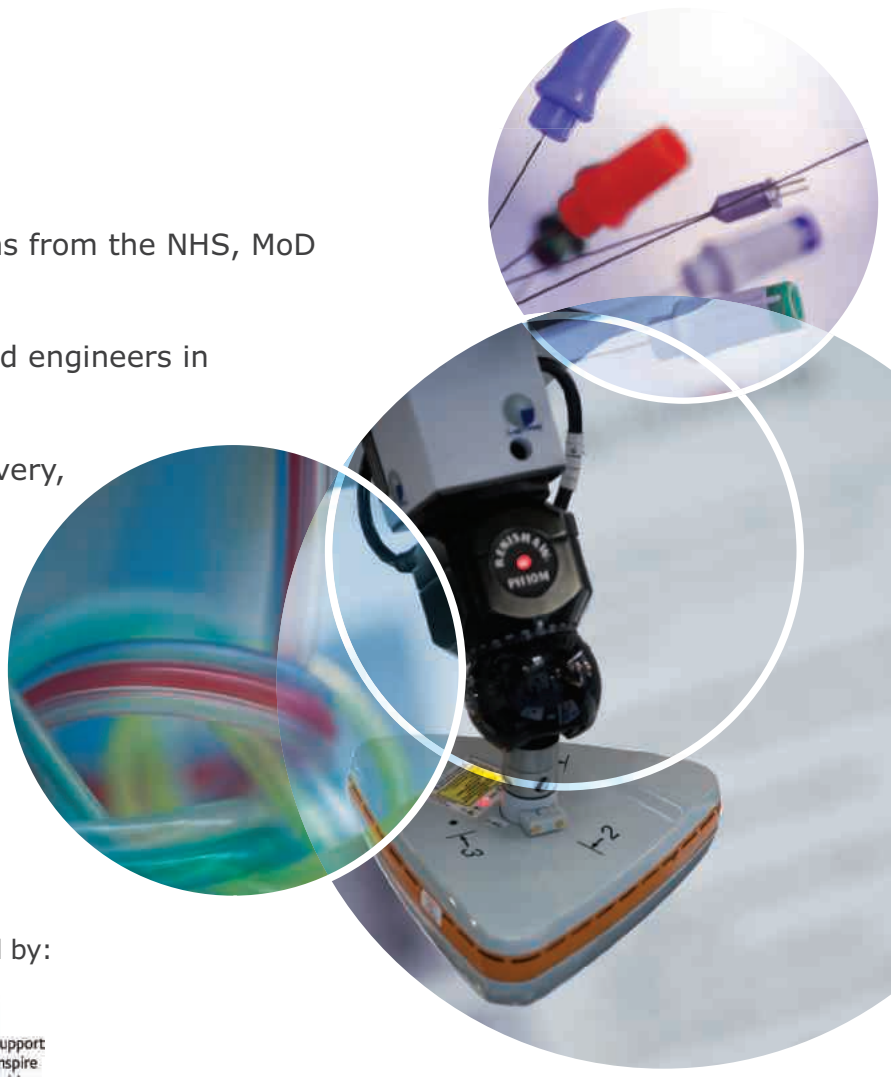

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Tyres measure vehicle weight

Internal tyre sensors tell drivers a vehicle's weight, to adjust tyre pressure and help emergency stability systems work better. Justin Cunningham reports.

As a driver, there are times when every seat is taken and the boot is crammed full. Aside from a generally reduced performance and the need to drive slightly differently with a heavier load, this is not something to which one typically gives much thought. Maybe there will be fewer miles to the gallon and stopping distances will be increased, but the thought that one might actually be overloading the car or need to change tyre pressures is not something that crosses most drivers' minds.

It should. In fact, it's rather obvious when you think about it. While commercial vans and vehicles have strict loading weights that are noted somewhere prominent on the vehicle, day-to-day consumer cars do not. Do you know your car maximum load and how would you go about measuring it?

This is the issue that engineers at international automotive supplier Continental have been mulling over for some time and it now believes it has a solution. As part of ongoing developments it is developing and widening the range of functions available to its tyre pressure sensors.

The future generation of Continental tyre sensors will be fitted directly underneath the tread of the tyre and will accurately be able to detect the size of the contact area on the road as well as vehicle load. Most current car sensors are not capable of checking axle loads, yet Continental believes future vehicles fitted with its tyres will be able to calculate this information automatically from tyre pressure sensors.

"In the past, it was more or less up to drivers to 'guesstimate' to the best of their abilities whether or not the maximum permitted payload of a car had already been reached," says Andreas Wolf, head of the body and security business unit at Continental. "In the future, the vehicle will be able to tell the driver after just a few hundred metres whether the payload has already exceeded the maximum permitted limit, or whether the tyre pressure would simply need to be adjusted accordingly. In this way, our tyre pressure sensors will not only help to save fuel, but also offer active assistance in terms of vehicle safety."

The sensors can be used to collate a number of variables about the tyre and its behaviour to form the basis of automatic load detection system. Its future generation of sensors will be able to accurately detect the size of the contact patch of the tyre, which increases as a result of the weight bearing down on the tyre.

Additionally, with every revolution of the tyre the sensor registers its rolling characteristics on the road. Based on the existing tyre pressure and precise data about the tyres fitted, the system is also able to inform the driver if the current tyre pressure is appropriate for the payload onboard.

Although some innovative systems could make automatic tyre pressure adjustments on the move possible, it is thought Continental's automatic load detection system will still need drivers to stop and make the necessary adjustments themselves.

The load detection system will be integrated and assist with other onboard systems, however, and will be the basis for some other vehicle improvements. Assistance systems relating to vehicle dynamics are designed to always work with the assumption of a maximum payload to provide occupants with the highest level of comfort and safety. Other systems like electronic stability control, emergency steer assist and autonomous emergency braking assistant can incorporate information about the actual vehicle weight into the responses to enable improved response and support for drivers.

Continental has also introduced a 'Filling Assistant' app that specifies the exact inflation pressure of each tyre via a smartphone. Accurate tyre pressures for a given load improve rolling resistance and tyres perform to their maximum capability in terms of safety and comfort.

www.conti-online.com

Fishing for answers

Researchers have developed robots that are contributing to our understanding of the mechanics of underwater flow. Paul Fanning reports.

A European research project called FILOSE (Robotic FIsh LOcomotion and SEnsing) has developed robots with a new sense: lateral line sensing.

These lateral line sensing fish robots represent a joint effort of experts in fish biology (University of Bath, UK), underwater robotics (Tallinn University of Technology, Estonia), mechanical engineering (Riga Technical University, Latvia), signal analysis and flow perception (Verona University, Italy) and of sensor technology (Italian Institute of Technology).

All fish have an organ capable of sensing in this way, but so far this has had no technological counterpart on man-made underwater vehicles. However, in an article published in 'Proceedings of the Royal Society A', FILOSE team members describe a robotic fish that is controlled with the help of lateral line sensors.

Over the last four years, the FILOSE collaboration has investigated fish lateral line sensing and locomotion with the aims of understanding how fish detect and exploit flow features, and of developing efficient underwater robots based on biological principles.

Though flow is a highly volatile state of matter, it can be measured and characterised based on salient features that do not change much such as flow direction or turbulence intensity, for example. These salient features can then be described as a "flowscape" – a flow landscape that helps fish and robots to orient themselves, navigate and control their movements.

"So far, flow in robotics is treated as a disturbance that drives the robots away from their planned course", says Prof. Maarja Kruusmaa, the scientific coordinator of the FILOSE project. "We have shown that flow is also a source of information that can be exploited to better control the vehicle. Also, flow can be a source of energy if we can understand the flow dynamics and interact with eddies and currents in a clever way".

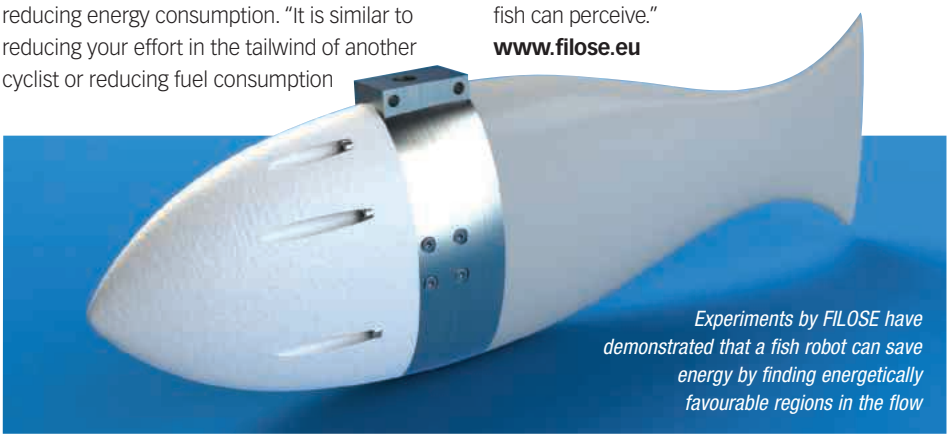
Experiments with flow sensing and actuation by FILOSE have demonstrated that a fish robot can save energy by finding energetically favourable regions in the flow where the currents are weaker or by interacting with eddies so that they help to push the robot forward. The robots are also able to detect flow direction and swim upstream or hold station in the flow while compensating for the downstream drift by measuring the flow speed.

A FILOSE robot hovering in the wake of an object in the flow was demonstrated as a way of reducing energy consumption. "It is similar to reducing your effort in the tailwind of another cyclist or reducing fuel consumption by driving behind a truck", says Prof. Kruusmaa.

Several prototype artificial lateral lines and robot actuators were developed in FILOSE to experimentally investigate different aspects of sensing and locomotion in fluids, such as how to use compliant materials to swim in turbulence; how to build robots that are mechanically simple but still behave like fish, how to interpret flow features and use them for controlling the vehicles, and how to measure robot's own motion from the flow signals.

The FILOSE project has contributed to understanding of the "fish-centric" viewpoint of the aquatic environment. "Robotic experiments have also helped us to understand fish behaviour," says FILOSE collaborator Prof. William Megill, who led the University of Bath's contribution to the project. "By recording flow sensor data from a robotic fish head which we've programmed to move like a real fish in similar flow conditions, we are able to understand what fish can perceive."

www.filose.eu



Experiments by FILOSE have demonstrated that a fish robot can save energy by finding energetically favourable regions in the flow

Sea creatures offer adhesion solutions

Photo: Andreas Trepte

The adhesive properties of certain fish and molluscs are offering novel means of adhesion. Paul Fanning reports.

Nature has long proved a source of inspiration to scientists and engineers and this is as much the case in the arena of fastening and adhesives as anywhere. In fact, as scientific techniques advance, there increasingly exists the possibility of mimicking (or even directly appropriating) the mechanisms developed over millions of years of evolution, for engineering purposes.

One such example can be found in the development of adhesives based on the humble Blue Mussel. The chemistry that lets mussels stick to underwater surfaces may also provide a highly adhesive wound closure and more effective healing from surgery.

Mussels attach themselves to rocks with a fibrous appendage called the byssus. The individual byssal threads are stiff but stretchy, in order to dissipate the energy of crashing waves. They are produced by the mussel through a process not unlike injection moulding. Because they are constantly being blasted with water-borne debris, they have a protective outer cuticle. This cuticle is described as a biological polymer and while it exhibits epoxy-like hardness, it can also stretch up to 100% without cracking.

Clearly, the potential uses of such adhesive capabilities underwater are many. Dr. Kaichang Li, for instance, was inspired by these proteins to create PureBond, a formaldehyde-free, soy-based adhesive used in wood glue that employs proteins similar to those found in mussels.

Recent application

However, a more recent application for these proteins has been found in the medical sector. In recent years, bio-adhesives, tissue sealants and haemostatic agents have become preferred products to control bleeding and promote tissue healing after surgery. The problem, however, is that many of them have side effects or other shortcomings, such as an inability to perform well on wet tissue.

Clearly, the mussel has some value here. Jian Yang, associate professor of bioengineering at Penn State says: "There are sea creatures, like the mussel, that can stick on rocks and on ships in the ocean. They can hold on tightly without getting flushed away by the waves because the mussel can make a very powerful adhesive protein. We looked at the chemical structure of that kind of adhesive protein."

Yang and his fellow researchers took the biological information and developed a wholly synthetic family of adhesives that incorporated the chemical structure from the mussel's adhesive protein into the design of an injectable synthetic polymer.

The bio-adhesives, called iCMBAs, adhere well in wet environments, have controlled degradability, improved biocompatibility and lower manufacturing costs, putting them a step above current products such as fibrin glue and cyanoacrylate adhesives.

Fibrin glues are fast acting and biodegradable but have relatively poor adhesion strength. They may also carry risk of blood-borne disease transmission and have the potential for allergic reactions due to animal-based ingredients. Cyanoacrylate adhesives or 'super glues' offer strong adhesion, rapid setting time and strong adhesion to tissue, but they degrade slowly and may cause toxicity, often limiting their use to external applications.

Additionally, neither product is effective when used on wet tissue, a requirement of internal organ surgery, nor are there any current commercially available tissue adhesives or sealants appropriate for both external and internal use.

The researchers tested the

The chemistry that lets mussels stick to underwater surfaces may also provide a highly adhesive wound closure and more effective healing from surgery.

"The remora's attachment mechanism is quite different from other suction cup-based systems, fasteners or adhesives that can only attach to smooth surfaces or cannot be detached without damaging the host." Jason Nadler.

newly-developed iCMBAs on rats, using the adhesive and finger clamping to close three wounds for two minutes. Three other wounds were closed using sutures. The researchers reported their findings in a recent issue of Biomaterials.

The iCMBAs provided 2.5 to eight times stronger adhesion in wet tissue conditions compared to fibrin glue. They also stopped bleeding instantly, facilitated wound healing, closed wounds without the use of sutures and offered controllable degradation.

The iCMBAs are also non-toxic, and because they are fully synthetic, are unlikely to cause allergic reactions. Side effects were limited to mild inflammation. The iCMBAs could eventually be used in a wide range of surgical disciplines from suture and staple replacement to tissue grafts to treat hernias, ulcers and burns.

Sticking with it

Another sea creature to have inspired an adhesive application recently is the remora fish, which attaches itself to sharks for transportation, protection and food. It does this by using a suction disk located on the top of its head. However, the exact nature of this adhesive process has never been entirely clear.

However, a study led by researchers at the Georgia Tech Research Institute (GTRI) provides details of the structure and tissue properties of the remora's unique adhesion system. The researchers plan to use this information to create an engineered reversible adhesive inspired by the remora that could be used to create pain- and residue-free bandages, attach sensors to objects in aquatic or military reconnaissance environments, replace surgical clamps and help robots to climb.

"While other creatures with unique adhesive properties – such as geckos, tree frogs and insects – have been the inspiration for laboratory-fabricated adhesives, the remora has been overlooked until now," said GTRI senior research engineer Jason Nadler. "The remora's attachment mechanism is quite different from other suction cup-based systems, fasteners or adhesives that can only attach to smooth surfaces or cannot be detached without damaging the host."

The remora's suction plate is a greatly evolved dorsal fin on top of the fish's body. The fin is flattened into a disk-like pad and surrounded by a thick, fleshy lip of connective tissue that creates the seal between the remora and its host. The lip encloses rows of plate-like structures called lamellae, from which perpendicular rows of tooth-like structures called spinules emerge. The intricate skeletal structure enables efficient attachment to surfaces including sharks, sea turtles, whales and even boats.

To better understand how remoras attach to a host, Nadler and GTRI research scientist Allison Mercer teamed up with researchers from the Georgia Tech School of Biology and Woodruff School of Mechanical Engineering to investigate and quantitatively analyse the structure and form of the remora adhesion system, including its hierarchical nature.

Results from the GTRI study suggest that remoras use a passive adhesion mechanism. This means that the fish do not have to exert additional energy to maintain their attachment. The researchers suspect that drag forces created as the host swims actually increase the strength of the adhesion.

Dissection experiments showed that the remora's attachment or release from a host could be controlled by muscles that raise or lower the lamellae.

New insights

The researchers also developed a technique that allowed them to collect thousands of measurements from three remora specimens, which yielded new insight into the shape, arrangement and spacing of their features. First, they imaged the remoras in attached and detached states using microtomography, optical microscopy and scanning electron microscopy. From the images, the researchers digitally reconstructed each specimen, measured characteristic features, and quantified structural similarities among specimens with significant size differences.

Detailed microtomography-based surface renderings of the lamellae showed a row of shorter, more regularly-spaced and more densely-packed spinules and another row of longer, less densely spaced spinules. A quantitative analysis uncovered similarities in suction disk structure with respect to the size and position of the lamellae and spinules despite significant specimen size differences. One of the fish's disks was more than twice as long as the others, but the researchers observed a length-to-width ratio of each specimen's adhesion disk that was within 16% of the average.

The researchers are planning to conduct further tests to better understand the roles of the various suction disk structural elements and their interactions to create a successful attachment and detachment system in the laboratory.

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Threadforming cuts costs by 88%

The Taptite 2000 generation of threadforming screws from Arnold Umformtechnik makes a fundamental contribution to cost reduction in threaded fastener systems. Based on experience, costs savings of up to 88% can be achieved in threaded fastener assembly.

According to the results of various studies, 85% of the total cost of a conventional threaded fastener joint arises from secondary costs such as drilling, thread cutting, inspection, tools and workstation cleaning. The actual fastening components account for only 15% of the total cost.

Here the threadforming screws of the Taptite 2000 generation

offer decisive efficiency advantages, since costly assembly processes can be eliminated when these fastening components are used. In particular, non-cutting formation of the nut thread with Taptite products makes them true cost killers. Furthermore, downstream operations such as cleaning and inspection are no longer necessary. Drilling operations can also be eliminated with pre-cast core holes, thus allowing tsignificant cost savings of up to 88%.

Taptite 2000 users also benefit of the improved mechanical properties of the assembled joint. The trilobular shank form and radius-profile thread flanks result in around 50% lower threadforming torque than with conventional threadforming screws, which translates into higher clamping force together with a smaller statistical spread of clamping forces.

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PEM SpotFast self-clinching fasteners enable two sheets to be joined permanently in a flush-attachment connection without protrusions on either side. These practical alternatives to riveting or spot welding provide ideal solutions to attach two metal sheets too thin to weld, fasten sheets of unequal thicknesses, join dissimilar metals, attach ultra-thin metal sections, or join metal sheets to PCB or plastic panels. Their rotational capability offers additional application advantages by allowing the fastener to act as a hardened pivot point.

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Dymax Ultra Light-Weld 431 from adhesives specialist Intertronics is a versatile, glass-to-glass and glass-to-metal bonding adhesive that is formulated to be resistant to high-temperature and high-moisture environments while maintaining superior adhesion and flexibility.

Dymax 431 bonds rapidly upon exposure to UV/Visible light for immediate use in the assembly process, making it highly suitable for assembly applications such as furniture, container glass and lighting and appliance sub-assemblies.

Dymax 431 offers a high degree of adhesion to glass and metal with the flexibility required for shock resistance. It is therefore considered ideal for assembly applications.

www.intertronics.co.uk

Tapes help skeleton winner

When Shelley Rudman won the 2013 World Championships in St Moritz she became the first British woman to secure Gold in the history of the championships. tesa provides its tesa 4651 tape for many parts of the sleds used by the British Skeleton team. The premium acrylic coated cloth tape offers high adhesion and excellent tensile strength and is used on the handles of the special grade mild steel saddle, providing a reliable grip on various surfaces ranging from powder coated polymer, zinc or spray paint finishes.

The tape is also used to fasten different types of foam padding on the top of the saddle where the athlete lies. On the bellypan, typically made from carbon fibre

sheet or GRP and finished in gel-coat, lacquer or paint, it is used to optimise air flow and speed in general, by covering the holes where the runner fits. It also assists in the 'push' start which requires a 20 to 30m sprint before the competitor dives aboard.

To enhance the aerodynamics further, most of the British athletes apply the tape along the edges of the sled where the bellypan meets the padding.

The chassis is made of high-grade steel and the interior is fabricated from carbon fibre, and with the competitor on board will accelerate under gravity up to speeds of 90mph. Every micro-second saved is crucial.

tesa tapes have been used in the development of the British Skeleton Team's sleds for five years, leading to a record haul of medals in International competition during the 2012 season.

www.tesa.co.uk

Connecting care

Being able to wear medical sensors offers tantalising possibilities in the way future medical care could be applied. Justin Cunningham finds out more.

The idea of wearable sensors is really nothing new. Pendants worn around the neck and on wrists have been used for decades. However, sensing devices have predominantly been used by people considered 'high risk', such as the elderly or those recovering from operations.

Wearable sensors allow healthcare providers to monitor patients remotely, meaning many more people are able to stay independent at home. Studies have shown that patient comfort is generally better within their own home, something that has also been shown to aid recovery. In addition, it helps to reduce the burgeoning costs of healthcare by allowing people that don't necessarily need to be in a hospital to stay elsewhere and free up beds for those that need immediate care.

The FIT telemonitoring T-shirt integrates a three lead ECG, body temperature and motion sensors

"If people could wear something 24/7 the data could be captured and events such as heart attacks predicted before they happen," says Steve LaJeunesse, strategic marketing manager for the medical equipment segment within Maxim Integrated. "This is all about preventative medicine and wellness."

Maxim has recently been involved in a project that looked at the development of wearable sensors for health monitoring application.

The result was the FIT telemonitoring T-shirt, which integrates a three lead ECG, body temperature and motion sensors, as well as processing technology into a comfortable shirt.

The main issues related to mechanical and industrial design, says LaJeunesse. "We had to work out how to get sensors into the shirt and then to get good contact with the body," he says.

The solution to that problem came from Orbital Research, which has developed FDA-approved sensors that improve signal pick up by a factor of four. According to Orbital, ECG electrodes tend to rely on an electrolytic gel to conduct bioelectrical signals from the skin to the electrode, which means you only get good signals when there is a high hydration level at the electrode.

It developed electrodes which feature surface microstructures that function as the sensing element, removing the need for the electrolytic gel and aggressive skin preparation. These are embedded in the upper layers of the skin, allowing ion transduction. Signal quality, it claims, is maintained irrespective of the type or duration of activity while the electrodes are being worn.

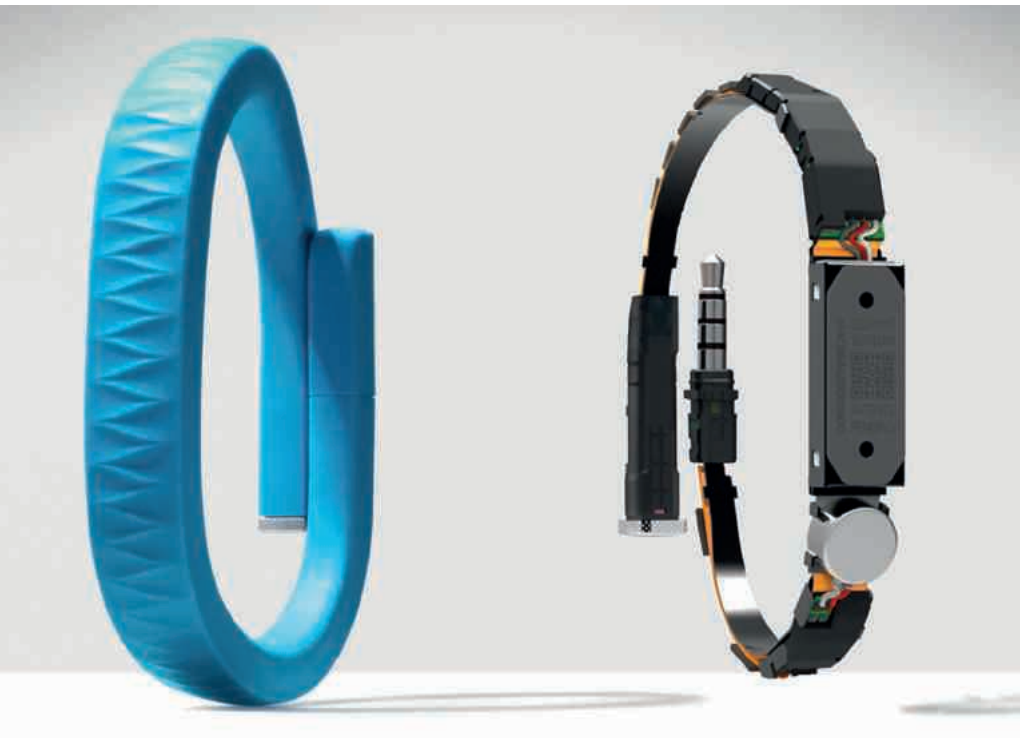
"The shirt has to be comfortable to wear," says LaJeunesse. "The mechanical design of the sensors needs to give good skin contact.

"We needed to penetrate beneath [the top layers of the skin known as the stratum corneum which comprises dead cells], where there is a lot of electrical activity. The little bumps on the electrodes do a good job in getting better signal pick-up."

Many key players in the medical device market are now looking at methods and

technologies that will allow sensors to be worn by individuals. Increasing advances in technologies such as smartphones are likely to be leveraged to improve both diagnosis and treatments. This, in conjunction with the increasing influence of the consumer market, is also driving significant change.

"Many people now use gym-based sensing devices such as blood pressure and heart rate monitors," says Bill Sermon, a partner at Viadynamics, an innovation consultancy specialising in product and service development. "The fitness side of wearable sensors that work with smartphones are getting increasingly popular. These could start to be used to provide healthcare."



The Jawbone Up comprises of a wristband that cleverly houses accelerometers to track movement. It sends data to a smartphone such as how many steps are taken in a day which is compiled to give users 'insights' into their lifestyle

Examples of existing 'well-being' monitoring products include the Jawbone Up System and Nike Fuelburn. These are almost permanently worn by users to continually monitor activity. The Jawbone Up comprises a wristband that cleverly houses accelerometers to track movement. It sends data such as how many steps are taken in a day and records sleep patterns to a smartphone. It also allows users to enter diet information and, using some clever algorithms, gives 'insights' in to lifestyle choices.

This is being taken even further by the recent launch of a product and company known simply as Basis. This wristwatch-style device uses an array of sensors including three-axis accelerometers, an optical scanner to track blood flow and heart rate, as well as a moisture sensor to measure skin perspiration, and finally temperature sensors to measure both skin and ambient temperature.

"People are starting to see that the future is moving to a point where sensors that are mostly used for well-being and fitness could be deployed for other uses," says Sermon. "We could see open platforms where various people can tap in to the same data for different purposes. You could even potentially have a sensor with you from youth through to the end of your life, which you use and leverage for different things at different times."

It does paint a powerful picture in terms of health monitoring, and predictive diagnosis. Doctors could be able to download all sorts of historic data, and not just test and treat you on the day. This could help spot harder-to-find health issues and more thoroughly monitor treatment and recovery. GPs could run a diagnosis before you arrive at a surgery or get the sensors in your watch – for example – to log some other parameters.

The issue of 'big data' is one that is not unique to wearable sensors. Modern life has led to all of us accumulating reams of data. How it is used, collected, shared and controlled continues to be fiercely debated. And, given the very personal nature of health, this is likely to be a contentious issue for most.

"The challenge is really about making an object that people feel is subtle enough that it is not intrusive, but still manages the functions they need," says Sermon. "In many cases, particularly the way in which people are using a mobile phone and using the web, it is moving the controls off the sensing device itself."

Many established wearable sensors used for healthcare can be clunky, sterile and overly complicated, with various buttons and functions intended for professional use. However, newer medical devices tend to be much more portable, practical and aesthetically pleasing.

"A device that is worn becomes much more a part of the user and they are going to demand much higher standards in terms of aesthetics and ergonomics," says Patrick Hall, development director at Maddison – a product design consultancy specialising in medical and scientific products. "The idea of embedding a sensor in something like a watch and accessing it on something like a smartphone is a very attractive model. However, there may be an issue around different user groups. For example, the elderly are probably not going to be as comfortable using a smartphone, but certainly there are user groups where it could be interesting."

This ability to use software to get a sensor to do different things means devices can be changed depending on circumstance. A wearable wrist band that has accelerometers can, for example, be used to record a gym workout but also could be set up to be a fall detector.

Design is about creating products and service, but also about accommodating new behaviours. The idea of wearable sensors that provide a bridge between heath, fitness as well as medical care is an emerging behaviour that is increasingly coming under the spotlight for medical device and sensor designers.

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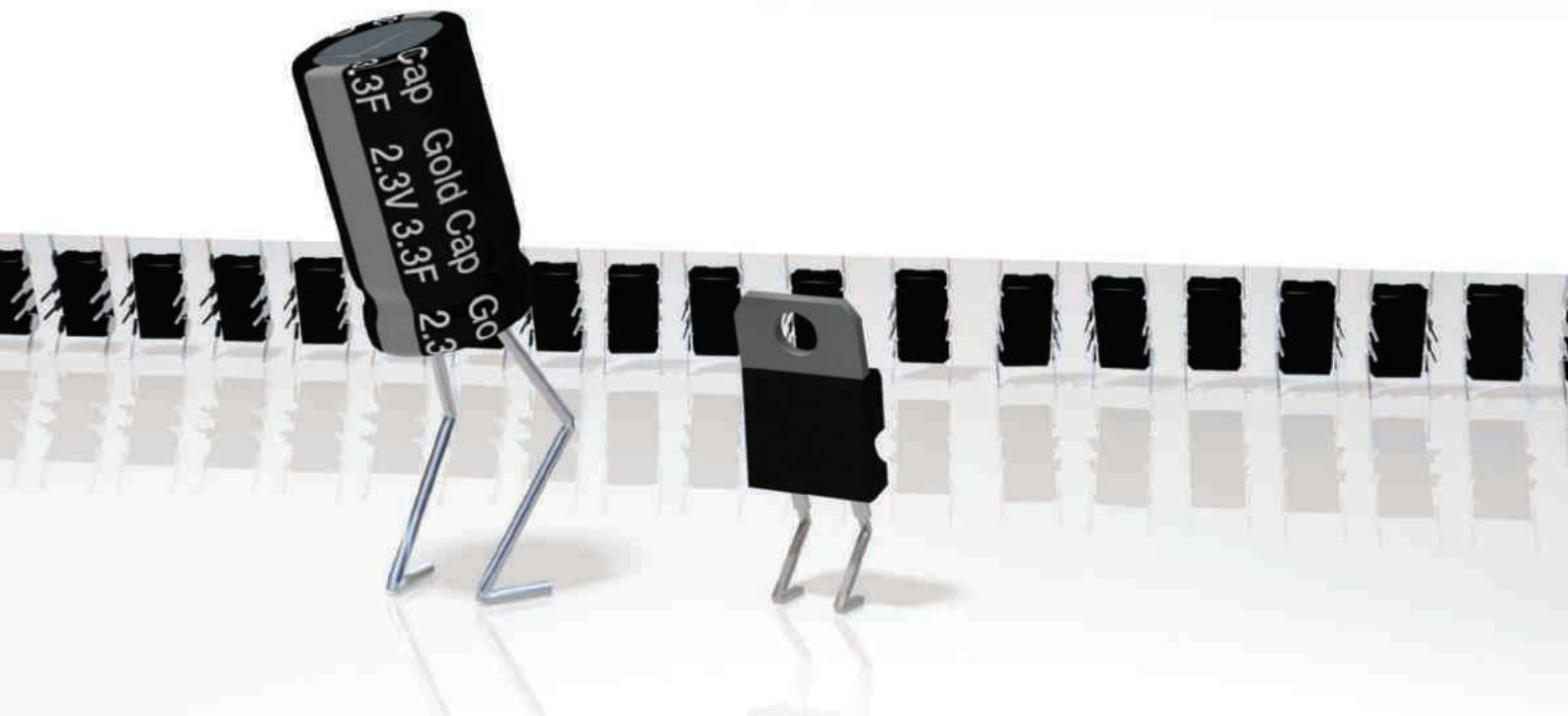

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The trade-off tool

A software tool that is allowing engineers to trade off many parameters at once in real time is helping to optimise the next generation of aircraft. Justin Cunningham reports.

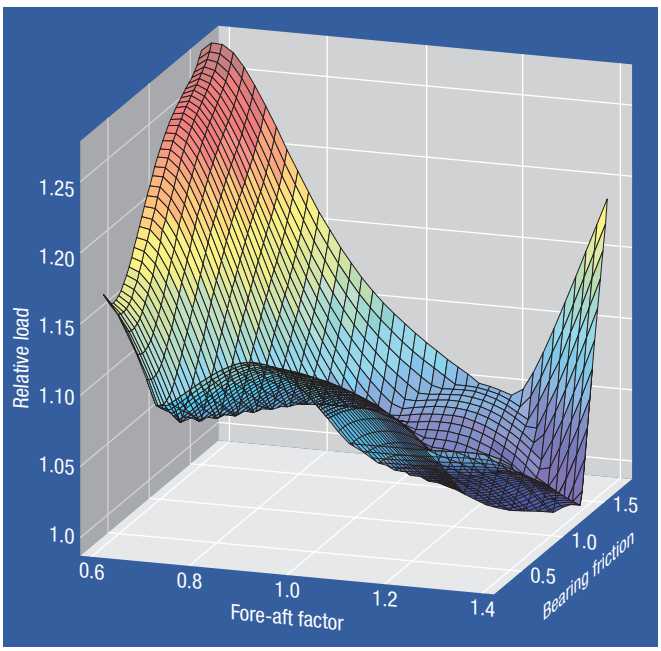
Making trade-offs is fundamental to being an engineer. Taking different attributes and weighing them against each other to reach a solution is fundamental to the profession. However, there are limits to how much can be quantatively compared before more senior engineers need to make a judgment call that is based as much on experience as calculation.

This approach, however, has obvious limitations. First, it can rely on experience and instinct as much as it does anything else. It also ties up that knowledge, ability and judgement in a single individual, which has limitations in terms of access, availability and security. After all, what happens if that person retires, changes jobs or is hit by the proverbial bus?

It was the ability to take many different parameters and accurately evaluate them that was the driver for software produced by engineering consultancy Fraser-Nash. Established in the 1970s, the company has a historic pedigree in mechanical engineering that can harness the power of computer simulation.

"A couple of years ago we were doing work for the renewables sector looking at wind farm optimisation layout," says Glyn Norris, civil aerospace business manager at Frazer-Nash. "We developed a software tool that enabled trade-off studies to be preformed. This took in to account the aerodynamic and structural performance, but also cost and reliability. What the tools did was allow some of the knowledge typically locked up in senior engineer's judgement to be captured.

"Humans are pretty good at trading off two or three inputs in our head. But, once you get more than five, it becomes difficult to visualise. This tool will help visualise complex problems that might have 20 or 30 different parameters."



Fraser Nash's technical manager of the modelling and simulation group who did the work on wind farm optimisation had previously worked at Airbus and knew the challenges it had in solving very complex, multidimensional problems.

The tool essentially takes vast reams of data and then presents them to a user in a much simpler x-y-z graph. This allows them to be much more usefully interrogated and offer the chance to make engineering decisions and judgements on designs, trade-offs or optimisations.

It is a way of taking key parameters and seeing how those interact with each other. This is normally up to a chief engineer or decision maker to weigh up and pick the optimum point within the graph, which in the past was done largely by experience.

David Marles, aerospace engineer, modelling and simulation, Airbus says: "Mass is always the main driver. It is the load experience on the aircraft that drives weight, and that basically drives performance. Ultimately we are trying to increase the performance of the aircraft and give a minimum mass. Landing gear may weigh 5 tonnes and if you can make it 4.9 tonnes, that is a fantastic result.

"The tool allows us to spot and

Airbus has used Frazer-Nash's software in the development of the landing gear of the A350

realise which factors matter and which don't, much earlier in the design process. We call this 'parameter sensitivity'. It allows us to play around with a number of key parameters and say this is key, or the interaction between another two parameters is really important."

This is the benefit that Airbus has successfully applied to part of the design of the landing gear of the A350. It has been able to use existing processes such as the load-generation process of the landing gear, and automate them so that the tool will automatically be updated.

The software is a multidimensional design space, which basically translates to having 20 or 30 key parameters. This is just for the landing gear and can be the wheelbase or wheel track, fore-aft frequency or the main bearing. The tool allows these to be 'wrapped' together so that the response surface of a graph is a multidimensional response surface and that is what is plotted.

"It is plotting big, polynomial equations in the order of hundreds of terms," says Norris. "The main parameters shown on the graph are fore-aft frequency and main landing gear bearing friction. But, behind that there are essentially another 20 parameters that the user can vary in real time. The tool will then recompute the response surface based on changing parameters that you are not actually plotting. So if you are changing wheel radius that could have an effect on your plot on bearing friction and fore-aft frequency. However, this is not obvious and you wouldn't know this unless the tool gathers that information together and allows you to visualise it."

The function of the polynomial equation is immensely complex and it can take extremely complicated factors and plot a meaningful response surface that links them all. Each time the user varies something it uses this equation to recalculate the response surface. In different parts of that surface, something might vary, but others might not.

"Every time you change something it is all those 20 or 30 parameters interacting with one another," says Norris. "They might be coupled within the design space. They might be coupled within one part of the design space, but not the other. So that is why every time you play with something, it uses a single equation – albeit an enormous one – that then plots a new response surface and that is what you are visualising and what the user sees in real time."

This ability means that Airbus can explore many more possibilities, more openly and easily than ever before. A chief engineer might say, 'what if we do this?', or 'can you move that?', and the output will update. The chief engineer has essentially been doing all of this in his head.

Now, however, the tool allows a relatively junior person to use it and find what the real key parameters are and what the drivers should be. He or she can ask the questions in real time, play around with parameters and quickly become confident they understand what is sensitive and what is not.

The other aspect of the tool is that it can perform a Monte Carlo analysis (a class of computational algorithms that rely on repeated random sampling to obtain numerical results). Airbus has to set the load that they think an aircraft will experience and be confident that by changing some parameters later on, it is not going to exceed that load. Designing an aircraft is obviously a massive activity involving thousands of stress engineers and people designing components, all of whom need certain parameters to be set early in the process.

If the load is too high it means the aircraft will come out too heavy, if its too low and they need to move a landing gear back slightly, it will mean a redesign of the entire section. The Monte Carlo analysis gives confidence that the load level set will ultimately be designed to.

The tool can take various parameters from other programs. For example, it could read in key outputs from a FEA analysis such as mechanical property. However, what comes out of an FEA analysis in a single design run would be a load that gets read in the tool, allowing Airbus to see how stress varies when all these parameters are varied.

The tool can be used anywhere that has multiple parameters that interact with one another. And it is not limited to engineering. You could use it for cost or financial modelling, anything used to visualise a multidimensional problem.

It is hoped the tool can be deployed more widely on Airbus projects to see links that perhaps has, so far, not been obvious. "By changing the landing gear design, you change the loads that the fuselage will experience," says Norris. "So by changing the damping on the landing gear when it lands you are going to change the force that the landing gear puts into the fuselage, thus changing the moments and peak moments the fuselage will experience."

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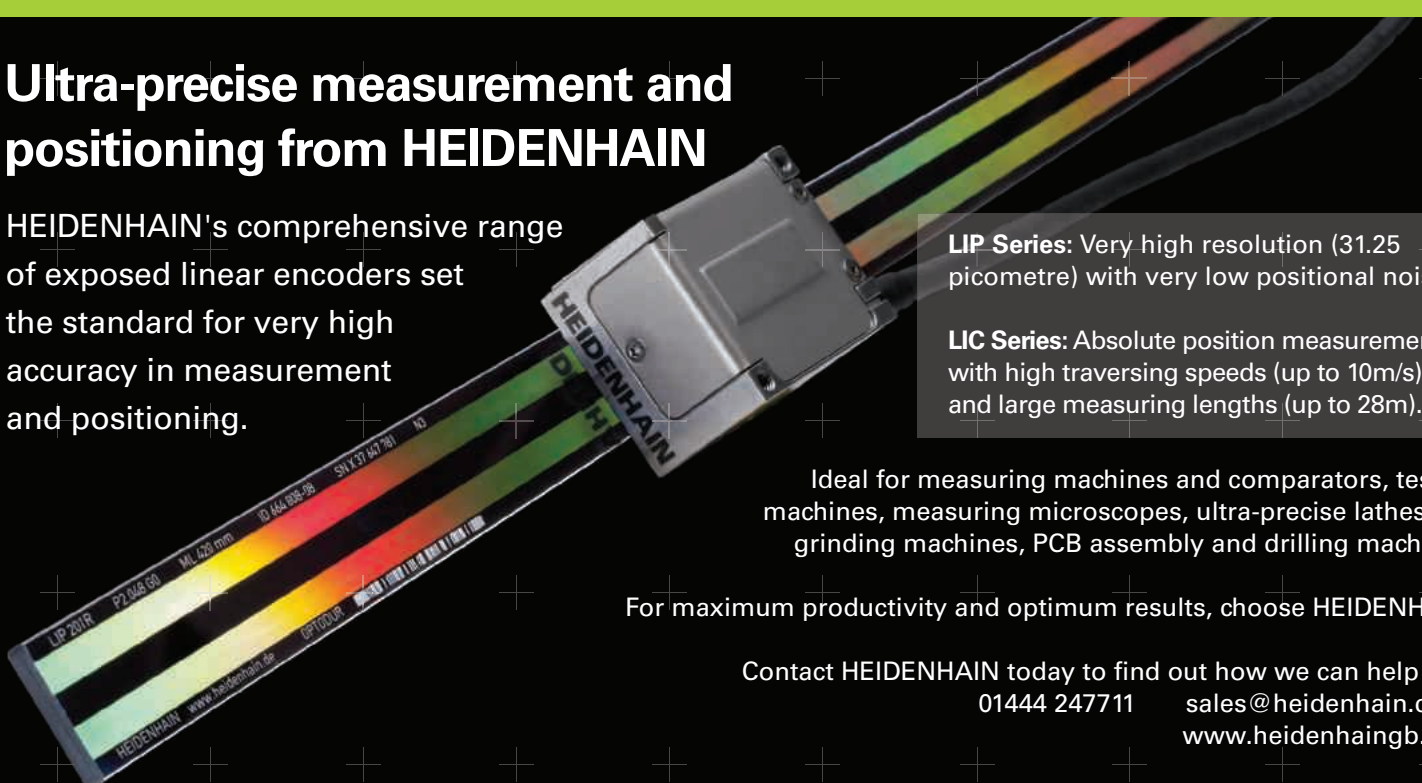

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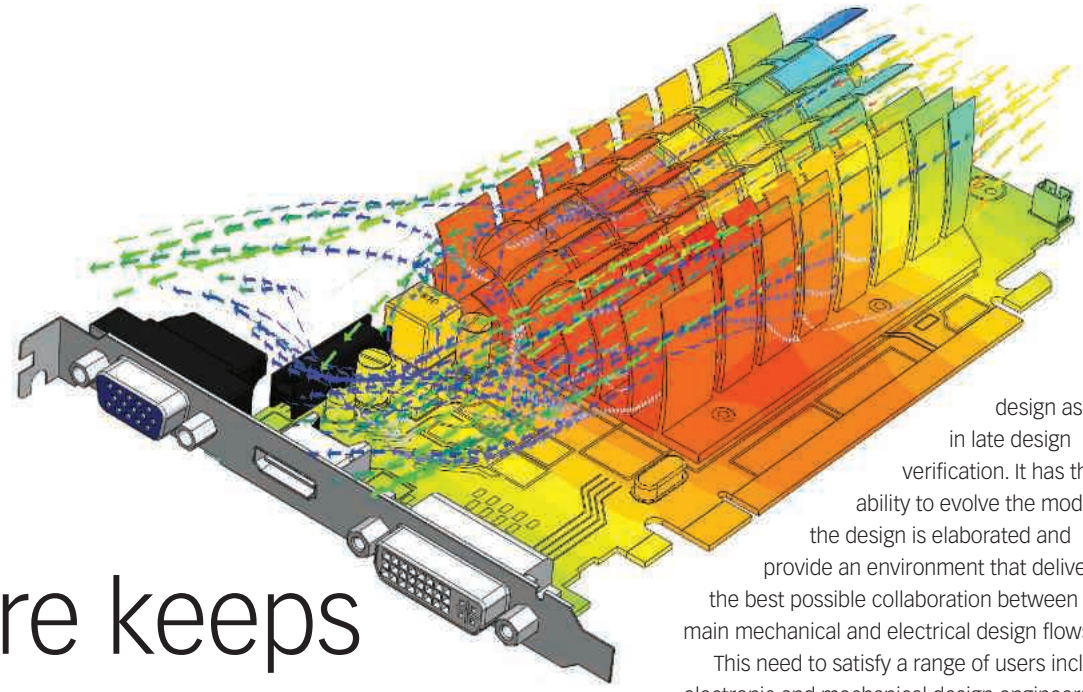

Software keeps the heat off

Increased demand for performance and miniaturisation in electronic products makes good thermal management software a must. Paul Fanning reports.

As technology advances and greater electronic performance is demanded from platforms without any enlargement, products are becoming more densely packed and, as a consequence, hotter.

Since 1995, in fact, there has been a seven-fold increase in average PCB density, as the number of components has risen by a factor of 3.5 and the area into which they have to fit has reduced by half. This clearly places great pressures on the mechanical design of electronic products in terms of thermal management.

FloTHERM XT from Mentor Graphics is the latest iteration of the company's thermal management solution. It is designed to interconnect mechanical design automation (MDA) and electronic design automation (EDA) domains and to address the needs of design engineers rather than just thermal specialists.

Design complexity is driving the EDA and MDA design flows closer together, with pressure on thermal designers to use native geometry from these systems without simplification to keep the simulation model up to date, minimize the time taken to analyse design variants, and increase accuracy of results. These changes have affected the demographics and skill sets of engineers, which has implications for software usability, geometry handling, and the underlying CFD technology. FloTHERM XT has been written to support different types of design engineers and levels of expertise, to be as usable in early design as it is in late design verification. It has the ability to evolve the model as the design is elaborated and provide an environment that delivers the best possible collaboration between the main mechanical and electrical design flows.

"The user profile has changed a great deal. Mechanical engineers are increasingly having to do thermal modelling."
Roland Feldhinkel

This need to satisfy a range of users including electronic and mechanical design engineers is something that Mentor has considered carefully in developing the software. According to Roland Feldhinkel, Mentor's product line director for the Mechanical Analysis Division: "The user profile has changed a great deal. Mechanical engineers are increasingly having to do thermal modelling. For this reason, FloTHERM XT is very CAD-centric and can be used in such a way as to look less at the detailing a thermal engineer might want."

Thermal management is a process that cannot be undertaken late on in the design stage and relying on physical prototypes does not work. Thus, FloTHERM XT starts simulations at the conceptual stage and continues through to implementation and verification. By starting simulations at the conceptual stage, experimental changes can quickly be validated or eliminated and there is more opportunity for 'what-if' designs, allowing for a more competitive product

The product's simplified and customisable user interface allows it to import native CAD data directly. Imported or CAD-generated geometries work seamlessly with the FloTHERM XT's SmartPart library of models, and automatic meshing and data convergence provide significant reduction in execution times. It also provides an easy and intuitive direct interface to enterprise platforms such as the market-leading Mentor Expedition Enterprise solution. The direct integration of the FloTHERM XT product with PCB design flows will reduce time-consuming data translation and costly errors. As a result, FloTHERM XT is the only solution on the market that allows engineers to work effortlessly with geometry created in the MDA or EDA world.

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Superior sealing, better protection of electronic/electrical components and higher productivity are the benefits of Henkel's Macromelt moulding. It's a highly cost-effective alternative to epoxy potting and also a low pressure process so breakages are minimised; one PCB manufacturer virtually eliminated a 65% reject rate by switching to this method.

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Coiled Spring Pins

Spirol's Coiled Spring Pins Improve Production of Laparoscopic Surgical Devices

A medical device manufacturer was using a Swiss style CNC-machined Knurled Solid Pin in a surgical device, used as a "grasper" to allow a surgeon to operate through a laparoscopic port. The pin is used to drive the jaw movement at the distal end of the device. However, during pin installation, there was a high insertion force, bending of the pins, damage to the sub-assembly and generation of metallic debris. Since this device was designed to go inside the human body, the possibility of introducing metal debris was completely unacceptable. Spirol provided the solution with its stainless steel, light duty coiled spring pin. One issue identified immediately was that pins, made from 303 stainless steel with no subsequent heat treatment, were being installed into a hardened 416 stainless steel shaft. This was conducive to debris generation from the softer 303 stainless steel knurls.

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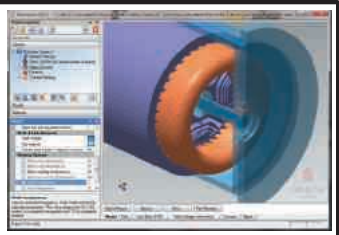

Engineers from a wide range of industries use Infolytica's software to design and analyse applications such as electromechanical devices, non-destructive testing (NDT), induction heating, sensors, and industrial transformers. Full feature scripting and parameterization make Infolytica products the flexible solution for your electromagnetic simulation needs. Infolytica also offers a truly innovative design tool – MotorSolve – for IM, SRM, Brushed and Brushless DC motor design. With built-in thermal analysis, various cooling strategies can be quickly and efficiently investigated.

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Infrared Thermometers

Ircon extends Modline 7 series

New features for a wider range of industrial applications

Berlin – Ircon extends the Modline 7 series by two new infrared thermometers and a new processor box. The new 7V line has been especially designed for the semiconductor industry, while the 75 series now comprises a new high temperature model dedicated to heat treating and annealing. With these additions, the Modline 7 series includes eight distinct thermometer lines for various application fields including glass manufacturing and forming, ultra-thin glass production, semiconductor processing, and industrial furnaces. The modularity of the Modline 7 series helps users reduce installation efforts, since the installation hardware and application software is identical for all sensors and each model features an extended measured temperature range, with the entire series covering a -40..+3,000 °C range. The common Windows ModView Pro software platform facilitates multiple product configurations.

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Marine toilets

Jabsco Toilet Fresh puts an end to smelly marine toilets for good – harmless to marine environment

A welcome breath of fresh air to boaters, Jabsco Toilet Fresh is a unique system developed by Xylem that solves a problem affecting every boat with a marine toilet. Toilet Fresh prevents the unpleasant smell that greets you on first flushing the toilet after a period away from the boat. It also treats the pipework, preventing unpleasant smells from escaping and keeping the toilet system clean and fresh when owners and guests are on board. The Jabsco Toilet Fresh System fits onto existing toilet inlet pipework and treats incoming flushing water with a specially formulated Xylem-developed bio tab that is completely harmless to the marine environment. It is designed to prevent the breakdown of naturally-occurring microorganisms which cause water used for flushing to turn black and smell unpleasant, a fact many boat owners will be all too familiar with. Toilet Fresh works through the toilet and associated pipework and continues to work even during periods when the boat is not in use and the toilet has remained unflushed.

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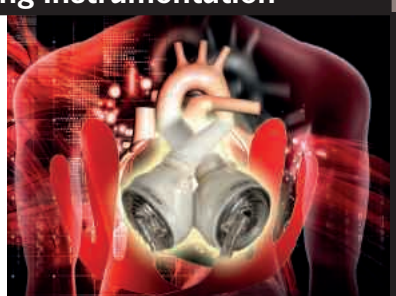

Versaperm has a range of permeability testing instrumentation to help companies accurately test and measure the permeability of seals and enclosures – including individual seals, material samples and even finished units. In many cases it takes just 30 minutes to achieve results in the Parts per Million (PPM) range. This allows designers and manufacturers to specify materials that bypass problems and it also enables QC departments to investigate new materials as well as check both incoming and outgoing products.

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Sensors

PCB Piezotronics Sensors for Monitoring Wind Turbines

PCB Piezotronics, a world leader in vibration, acoustic, pressure, force and torque sensors, offers a broad range of sensors and instrumentation for permanent installation and testing of wind turbines and turbine components. Because of the very high costs associated with repairing of bearings up in a wind turbine generator – many hundreds of feet in the air and often out to sea – the generators are fitted with many industrial sensors to monitor for increasing trends in vibration on the bearing casings. Engineers can then plan maintenance at an appropriate time rather than having to react to emergencies. PCB Piezotronics conditioning monitoring sensors are already deployed in such monitoring systems including series 601, 607, 626 and models 602D01 and 603C01 low cost ICP® accelerometers and the latest embeddable accelerometers that can easily be designed into printed circuit boards.

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Signal Transmission Solutions

Belden Extends its Lumberg Automation LioN-R Series

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Belden Inc., a global leader in signal transmission solutions for mission-critical applications, has extended its Lumberg Automation product program in the EMEA region to include three new I/O modules featuring industrial protection class IP67. They provide secure connection between actuators/sensors and control units even under the harshest environmental conditions. Providing additional support for real-time (RT) and isochronous real-time (IRT) communication, the modules offer 16 digital channels configured as inputs, outputs or a combination of both. All versions come with an encapsulated metal housing, vibration-resistant M12 connection technology, and short-circuit proof outputs. Galvanic separation between the I/O channels and the LAN connection ensures reliable data transmission. The behavior of output channels in the event of a fault can be defined via a fail-safe function. What's more, the easy diagnostics concept allows faults to be located swiftly. An integrated dual-port switch (10/100 Mbit/s) allows both line and ring topologies.

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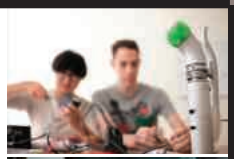
Sous-vide

Star's Savoir-Faire Delivers Hand-Held Sous-vide Device



Star Prototype's expertise has helped transform an innovative design idea into a workable product with the potential to turn sous-vide into a global home cooking phenomenon. Sous-vide is a process that involves sealing food in airtight plastic bags and cooking in water baths for prolonged periods of time. It is used in many high end gourmet restaurants and by chefs such as Heston Blumenthal, and delivers food that is more tender, flavoursome and moist then traditionally cooked dishes. STAR was approached by California-based Nomiku with initial designs and some general ideas for a portable sous-vide device that could be sold at a price that would make it an affordable option for amateur cooks everywhere. Making full use of its technologically advanced facilities, STAR created a working prototype of the Nomiku device using a combination of CNC machining, silicone and ABS moulding, vacuum casting and aqua blasting. The team also hand painted the finished product and created an internal heat sink using wire cutting – all of which was done in just five days.

Gordon Styles, the British owner of China-based STAR said: "I am confident that no other prototype house has the technical capability, ingenuity and skill to have turned Nomiku's ideas into a working model in such a short period of time. We pride ourselves on not just our technical skills, but the level of service we offer each and every client – something we do with the aim of adding value and making a long lasting and positive impression on them."

Lisa Q Fetterman, owner of Nomiku, said: "The work STAR carried out on the Nomiku device was outstanding and went well beyond our expectations of what a prototype house would deliver. They took an initial design and our ideas, ironed out the flaws and developed a working product that looks and feels great. Nomiku is due to be launched WHEN and although initially only available in North America, plans are in an advanced stage to launch it in Europe and China in the very near future. For additional information visit www.nomiku.com.

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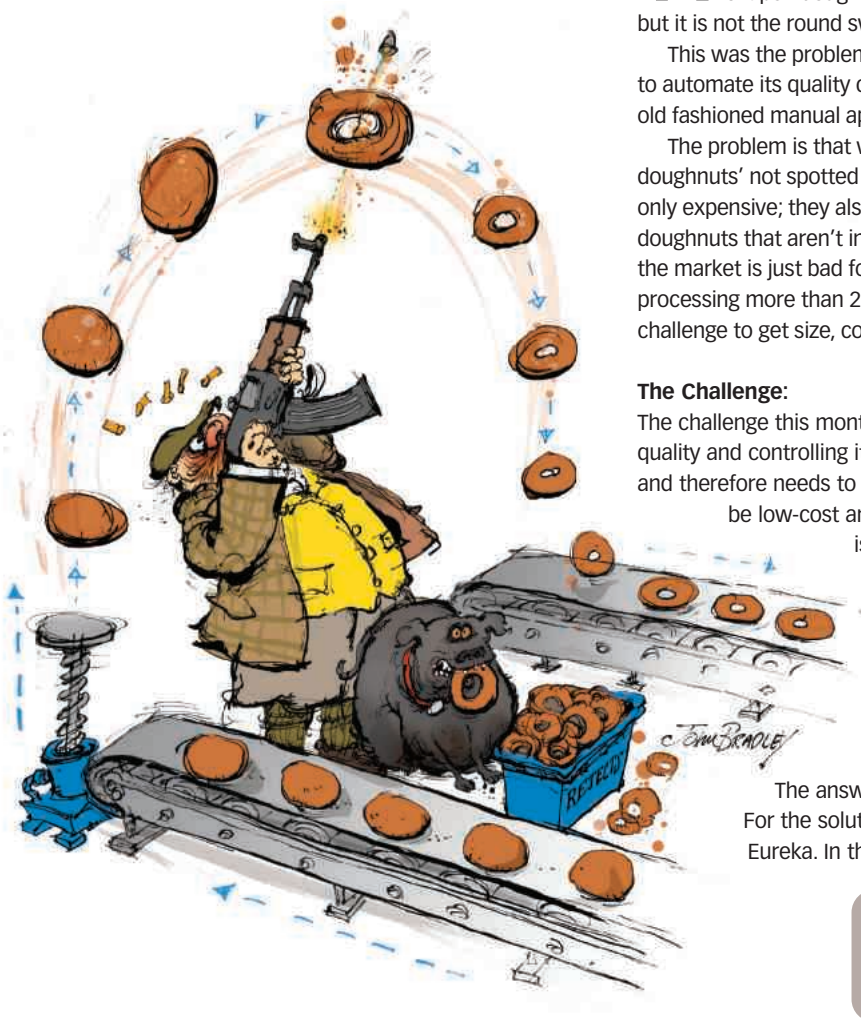
The hole story

Achieving uniformity in doughnuts may not be a life and death issue, but it still requires considerable ingenuity.



Whether you like yours with a filling or with a hole, doughnuts have become a popular snack for us Brits. What no one likes however is some unformed, mis-shapen doughnut. You know the kind. You are unsure what quite has happened but it is not the round sweet treat that you would have hoped.

This was the problem for a Yorkshire based, family-run doughnut maker which wanted to automate its quality control on its production line. At present the system was the good old fashioned manual approach, using people to spot any discrepancies.

The problem is that with increasing production volumes, the number of 'bad doughnuts' not spotted is also likely go up, unless more people are hired. People are not only expensive; they also can get tired, bored and distracted which can result in potential doughnuts that aren't in tiptop condition being delivered. Having a shoddy doughnut on the market is just bad for business. However, with business booming and the factory now processing more than 21,000 doughnuts an hour, it was becoming much more of a challenge to get size, colour, and shape just right.

The Challenge:

The challenge this month is therefore to come up with an automated system of checking quality and controlling it. The system needs to be able to operate in food environments and therefore needs to be 100% food compatible. In addition the system also needs to be low-cost and have a similarly easy and speedy installation. Whatever system is used, it also needs to be non-contact.

The system only needs to identify doughnuts that don't have the correct size and colour, and does not need to pick it up and remove it from the production line. This can still be done manually. Perhaps more difficult, however, is that the system needs to make sure the doughnut is the correct colour. This will ensure the correct mixture has been used as well as check the doughnut has been cooked for the correct amount of time.

The answer to this month's challenge is surprisingly simple and elegant. For the solution please be sure to check the pages of the May issue of Eureka. In the meantime see if you can come up with something better.

The answer to last month's Coffee Time Challenge, how to improve on the aluminium drinks can, is in our Technology Briefs section on page 16

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