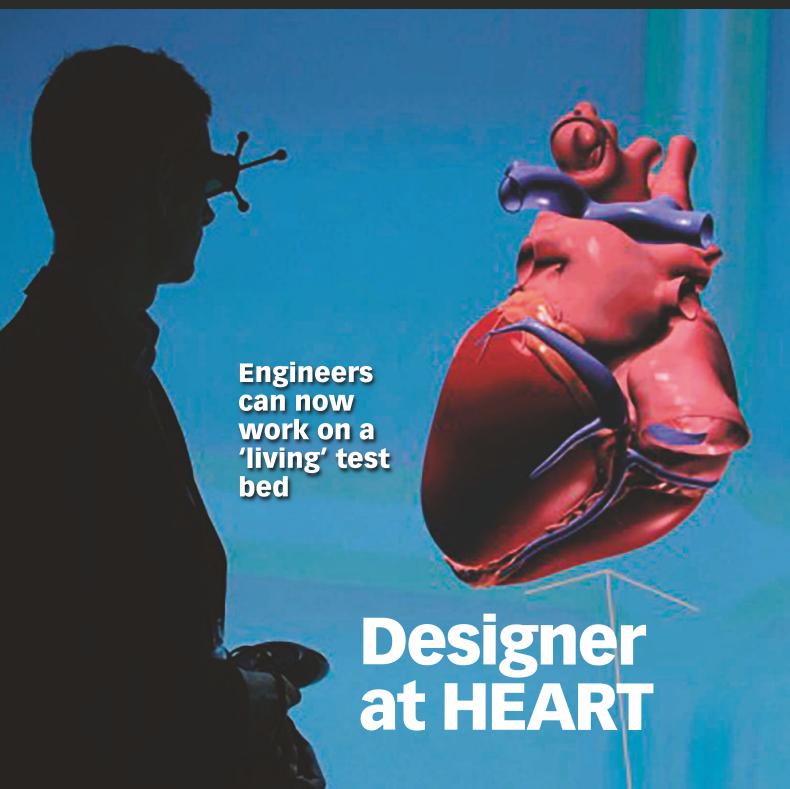
# THE MAGAZINE FOR ENGINEERING DESIGN

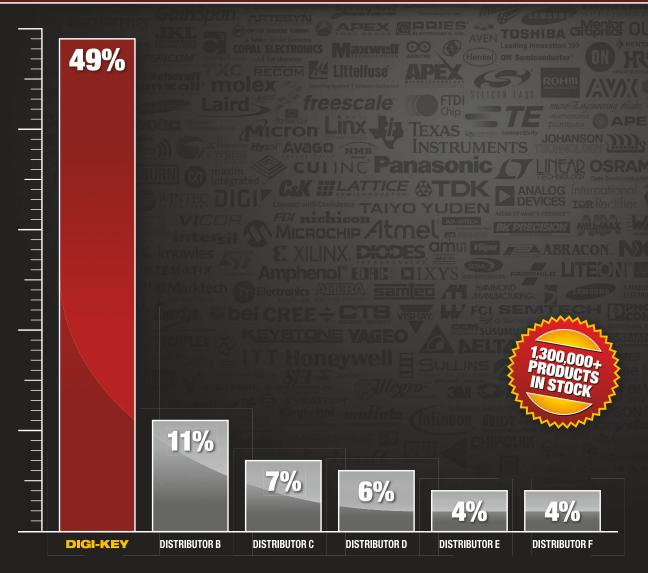
In this issue: Sensors in the fast lane • Reusing waste power • Simulation • Apps for engineers



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www.eurekamagazine.co.uk



#### **MULTIPHYSICS FOR EVERYONE**

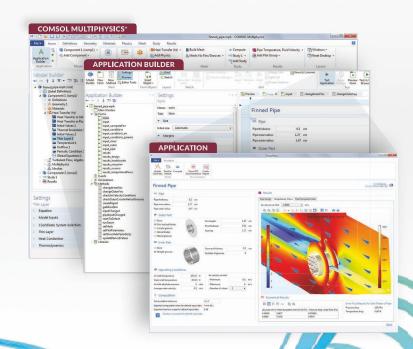
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## BEEAs start buzzing



Tim Fryer, Editor (tim.fryer@markallengroup.co.uk)

Our search is now on for this year's industry stars. The entry process for the British Engineering Excellence Awards (BEEAs) is now underway and open to any company or individual carrying out engineering design in the UK.

Shouting about success is not something that engineers, particularly British engineers, take to instinctively, yet there are huge swathes of engineering projects going on in this country that are routinely excellent and that is something we should be shouting about, both individually and collectively.

The BEEAs provides such a platform. The trophies are awarded at a glitzy ceremony in London in October, and none of those who in the past have made the finalists shortlist, and especially those who take home the trophies, are in any doubt that it is a worthwhile experience. Even the entry process can be a self-motivating and 'validatory' experience in its own right.

Richard Poulton, who won the Design Engineer of the Year Award in 2015, heads up the hardware design team at Navtech Radar, the Design Team of the Year. So, on the back of unveiling its flagship product, 2015 was a good year for the company, capped off with the two BEEAs. "It's a great feeling to be recognised," admitted Poulton. "It's a sort of validation for us as a team and us as a business, that we are doing something right, which is great." More from Richard on page 18 of this issue.

While companies such as Navtech have found its Awards to be motivational internally, others have found the external image to be just as important, either as a company to do business with or as a company to come and work for.

The opportunity is now there for all in the UK engineering sector. So if you, or

someone you work with, has developed breakthrough technology, grown an innovative business or excelled in your specialist field, then why not enter the BEEAs?



More information at www.beeas.co.uk



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12mm, 16mm, 20mm, 22mm, 24mm, 30mm, 36mm, 40mm and 50mm in both right and left handed formats, the screws are complimented by a large selection of industry standard Bronze and Steel nut designs. The screws are available in both Steel and Stainless Steel, with a large selection of round bodied flanged or non-flanged Bronze nuts from stock. Additionally,

weldable square, hex and round steel nuts are available. ABSSAC's capability as a trusted supplier is enhanced by the options to supply cut to length or ready to fit, machined bearing journal ends to the screws. Quality assured screws and nut combinations can be fitted directly into the customer's application without further intervention. ABSSAC is also able to offer gun drilling, screw hardening and special coating treatments.

#### WHEN IT COMES TO LEAD SCREWS FOR MEDIUM TO HEAVY DUTY INDUSTRIAL APPLICATIONS, ABSSAC WORKS HARD TO KEEP THE CUSTOMER HAPPY.

Recently ABSSAC was approached to help specify a nut and screw combination within a redesigned food packaging machine. The original application used both a left hand and right hand opposing screw to operate a high speed gripper in a machine that hot plastic foil sealed ready to cook meals for a leading supermarket. The application dictated there could be no lubrication

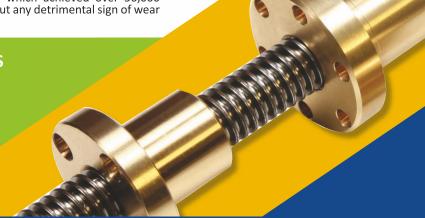
within the system, which contributed to the premature failure of a competitors plastic nuts after only 50,000 cycles. The existing set up also suffered from excessive positional lead error which added a drag load and excessive wear of the nuts, due to binding. ABSSAC's engineers set about utilizing a PTFE impregnated plastic as the antibacklash nut material and then picked matched pitch accuracy screws in both the right handed and the left handed screws to ensure linear positional accuracy. This winning combination was proven by initial tests cycles, which achieved over 56,000 cycles without any detrimental sign of wear

to the nuts. Mr. Phil Jones, of Abssac who has over 20 years lead screw experience states, "By being able to match the screws and nut pitch accuracy reduces the stresses within the system considerably ensuring a more reliable linear movement".



#### 90MM DIAMETER SCREWS DELIVERED TO WATER FILTRATION PLANT

Using an existing damaged screw for dimensional information, ABSSAC replicated 14 screws which were a massive 90mm diameter by 2 metres long. Weighing over 100kg each and using a basic trapezoidal thread form satisfied another ABSSAC customer.



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#### TVRs to be built in Wales

TVR is to open a production facility located in the Ebbw Vale Enterprise Zone in South Wales. The British sports car maker will create 150 jobs as it sets up within the Circuit of Wales, a motor racing circuit that is also to serve as a technology park.

The announcement is a coup for the region, which comes a month after Aston Martin announced it will set up a factory nearby in the Vale of Glamorgan. Helping to win the deal was a promise by the Welsh Government to invest £30m over the next five years.

There have been over 350 advance orders of the new car to be built at the planned plant. The car will feature a V8 Cosworth engine and will be the first production car to be manufactured using Gordon Murray Design's iStream assembly process to create a carbon fibre composite ground-effect chassis and body package.

Chairman of TVR, Les Edgar, said: "South Wales is becoming a major hub for automotive and motorsport technology and development. We are delighted that the Welsh government wish to become a part of an exciting new era for TVR."

TVR hopes to be producing around 2000 cars per year by 2022 with the first models slated for release in 2017.

#### Boost to UK auto-battery capability

The University of Warwick is to develop next generation batteries for the electric vehicle market as part of a £5.4million initiative.

The UK Automotive Battery Supply Chain project aims to boost the UK's capability at producing the vital parts for electric vehicles, and improve its global supply footprint. Currently most of the technology within the battery systems used by the UK automotive industry is sourced from overseas. The project will be led by battery cell manufacturer AGM Batteries, and will bring together UK innovations and knowledge from its partners including smart battery tech firm Dukosi, battery pack manufacturer Johnson Matthey Battery Systems, and Cosworth to help develop the powertrain.

Ian Whiting, business development director at AGM Batteries said: "What we have is the basis of a complete UK supply chain for automotive batteries from 'powder to power'."

#### **Events**

12 - 14 April **Drives & Controls** 

NEC, Birmingham

#### 21 April **FAST Exhibition**

Concorde Conference Centre, Manchester

#### 21 April Plastics, Prototyping & **Metals Exhibition**

Concorde Conference Centre, Manchester

#### 26 April The LIGHT project consortium

(See page 11) Bloodhound SSC Technical Centre. Bristol

#### 28 April Challenges and **Innovations in Automotive Engineering Research**

AMRC Knowledge Transfer Centre, Sheffield

#### 14 - 15 June **PDM Plastics Event**

Telford

#### 25 June - 01 July **UK Robotics Week**

Across the UK

#### 06 - 07 July Manufacturing & **Engineering North East**

(See page 40)

Metro Radio Arena, Newcastle

Exhibition, conference and workshops

#### 14 - 15 September **Low Carbon Vehicle Event**

Millbrook near Bedford

#### 28 - 29 September TCT Show + Personalize

NEC. Birmingham

#### 04 - 05 October **3D PRINT**

Lyon Eurexpo, France



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#### briefs

#### **RED BULL SIMULATES SUCCESS**

ANSYS has released ANSYS 17.0, the latest version of its engineering simulation solution.

ANSYS 17.0 is the most feature-rich release to date, claimed to deliver 10x greater improvements in productivity, insight and performance.

One early adopter is the Red Bull Racing Formula One team. ANSYS' CFD and high-performance computing software enables Red Bull Racing to simulate air flows around its vehicle designs under a range of conditions to enable the team to assess, select and optimise designs for aero-critical components and assemblies, such as braking, cooling and exhaust systems.

For more on Ansys and simulation turn to page 35.

#### STRONGER, SAFER REACTORS

Researchers have developed a metal alloy that could make nuclear reactors safer and more stable. The new material is said to be stronger and lasts longer than steel - the metal of choice for current nuclear reactors. Nuclear reactors typically last for 40 years before the steel becomes weakened through exposure to radiation. According to researchers from the Oak Ridge National Laboratory in Tennessee and the University of Finland, high-entropy alloys, which use several elements in equal percentages, could be the solution. Because high-entropy alloys use equal mixes of metals spread out evenly, each type of atom is nearly equally exposed to the incoming particles, levelling out the chances of dislodging slightly different-sized atoms and reducing the risk of defects.

#### 'PEN' PRINTS STEM CELLS

Researchers have created a handheld 3D printing pen to 'draw' human stem cells in freeform patterns with extremely high survival rates.

The device, developed out of a collaboration between the Australian Research Council's Centre of Excellence for Electromaterials Science researchers and surgeons at St Vincent's Hospital based in Melbourne, is designed to allow surgeons to sculpt customised cartilage implants during surgery.

#### **Rocket with 3D printed parts lifts off**



An Atlas V rocket, featuring serial production 3D printed parts by Stratasys, was launched by the United Launch Alliance (ULA) from Cape Canaveral, Florida on 22 March 2016. The 3D printed parts highlight the ability to replace metal components

with 3D printed lightweight thermoplastic ones. The ULA estimates that the implementation of these parts saves up to \$1million per year.

Greg Arend, ULA manager of additive manufacturing, explained: "We're able to save between well over 50% and in some cases over 95% by printing the part instead of forging it the traditional way."

Numerous components were 3D printed for the Atlas V ducting system in the rocket's payload fairing, including brackets, nozzles, and panel close-outs. These were 3D printed in Ultem 9085 on a Fortus 900mc Production 3D Printer. Ultem 9085 is qualified to withstand the temperature cycling it will typically experience in space, between -59.4 and 107°C.

#### TECH BRIEF PAINT IT BLACKEST

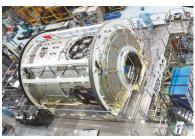
Surrey NanoSystems has released a spray version of the world's blackest coating material, enabling a range of products to take advantage of Vantablack's thermal and light absorption characteristics. The substance, Vantablack S-VIS, is said to be easily applied at large scale to virtually any surface.

Vantablack was originally developed for satellite-borne earth observation imaging and calibration systems, where it increases instrument sensitivity by improving absorption of stray ultraviolet, visible and infrared light. Since then, many other applications have emerged, including solar-energy collector elements, functional surfaces in buildings and architecture, cinematographic projectors, high-performance baffles and lenses, and scientific instruments.

Vantablack S-VIS' performance is claimed to outstrip that of any other conventionally-applied coating, typically achieving a reflectance of less than 0.2%.



#### UK vies for space entrepreneurs



The space industry has largely remained buoyant in the UK, and the Government is keen to boost activity further. It is to supply incubation funding that will provide a supportive business environment to assist entrepreneurs to develop small companies - an important path in realising the space sector's ambition to achieve a 10% share of the global space market by 2030.

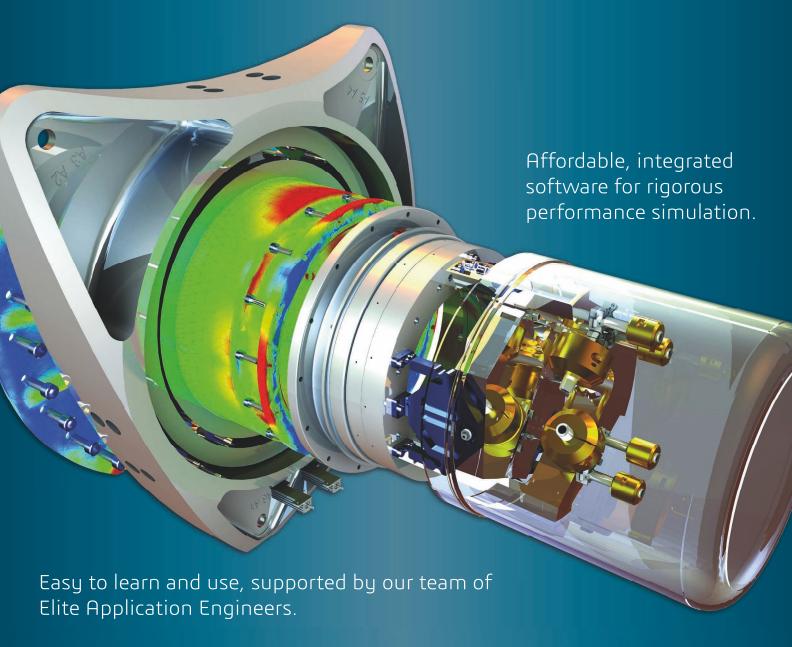
While a number of start-ups have set up in the space market, it remains a challenging area for companies. The funded incubators, located in the North, north Wales and east Midlands, will provide

small businesses with access to facilities and resources, to be part of a network of incubators that will collaborate on events and initiatives. Colin Baldwin, UK Space gateway programme manager at the UK Space Agency, said: "There are opportunities for a range of companies developing innovative products that can match the needs of the space industry. We're committed to nurturing business and research in these regions, and showing small businesses how they can benefit from our £11.8 billion space industry."





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#### briefs

#### **REICHELT OPENS IN UK**

German retailer reichelt elektronik is set to enter the UK business and consumer market with the launch of its English eCommerce site and delivery service.

The company claims that many of the products featured on its site can be purchased 20% cheaper than elsewhere in the UK and CEO, Ulf Timmermann, believes this puts it in a strong position to take on Maplin, Mouser, RS and CPC-Farnell.

#### STRATASYS PARTNERS EMCO

Stratasys has extended its UK reseller network with the appointment of Emco. Emco will be responsible for developing opportunities with educational facilities and driving sales of Stratasys 3D printing solutions within the sector.

Chris Baker, Northern European manager at Stratasys, said: "From primary schools to higher education facilities, bringing 3D printing into the classroom exposes pupils and students to the same cutting-edge technologies they'll likely encounter in their careers.

"As a result, it is vitally important that we work with a strong partner to bolster our stronghold within the education sector."

#### IET and BBC boost UK coding

The Institution of Engineering and Technology (IET) has launched a series of events as part of its Coding the Future initiative, aimed at inspiring and nurturing the next generation of UK coders. The drop-in events are part of the BBC's Make It Digital campaign,



which will involve one million BBC micro:bit coding devices being given to every Year 7 child across the UK, to encourage an interest in coding.

The BBC micro:bit device was developed by the BBC in the face of a critical skills shortage in the UK technology sector. By working with the IET as one of its BBC micro:bit champions, the BBC hopes to create a new generation of coders, engineers and technologists to fill future skills requirements.

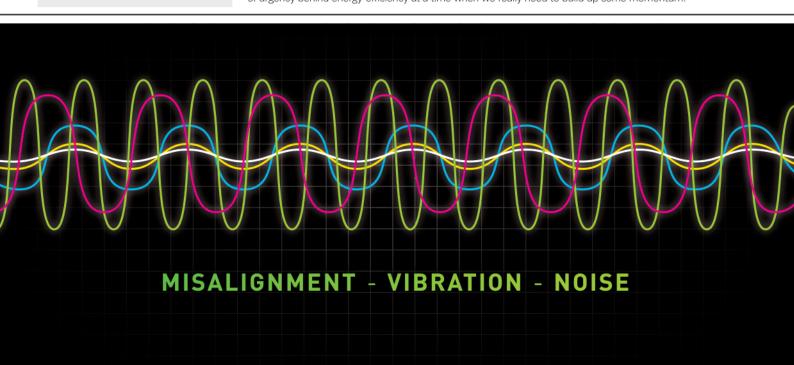
The Coding the Future events will give children and parents the chance to explore their own BBC micro:bit in more depth, and offer practical tips on their device – whether it be developing code for their very own games, or learning how to overcome tricky error codes.

#### Budget gets mixed reaction from industry

Last month's budget by Chancellor George Osbourne got mixed reactions from industry. Among the announcement were measures to attract investment to the Northern Powerhouse and £60million to develop HS3 between Manchester and Leeds. He also earmarked over £230m for road improvements in the North.

Reacting to the news was Richard Threlfall, UK head of infrastructure, building and construction at KPMG. He said: "The jam was carefully but thinly spread across the North-South divide as the Chancellor endorsed further development work on both Crossrail 2 and HS3. Neither scheme will become reality before the 2030s. HS3 meanwhile remains a concept searching for definition. The Chancellor continues to walk the tightrope of nudging forward the Northern Powerhouse concept he has championed."

Eaton said the budget failed to encourage investment in energy-efficient technologies. Jonathan Hart, a senior manager there, said: "The Budget was a golden opportunity to encourage companies to think about their energy use and to invest in more efficient equipment. There was little focus on this issue in the Budget, revealing a lack of urgency behind energy-efficiency at a time when we really need to build up some momentum."





#### AM sees the LIGHT

Members of the LIGHT project consortium are to share their findings following a two-year project on the design of parts for metal additive manufacturing (AM).

LIGHT has investigated design freedom and limitations such as the use of novel low-density lattice structures to support overhanging geometries to prevent deformation during printing.

The consortium has sought to implement and validate CADCAM solutions that facilitate the selective replacement of internal geometries with self-supporting, low-density lattice structures. If these lattice structures can efficiently support internal and external overhanging geometries, new design freedoms can be achieved.

LIGHT tested the capabilities of additive manufacturing technologies to their limits by producing demonstrator parts that were engineered to withstand extreme conditions. These included a crushable earth re-entry capsule designed to protect planetary samples during atmospheric entry, descent and landing. In addition, a jet engine thrust nozzle was made to operate at conditions of 500°C, as well as an air brake door hinge that must withstand 50kN of force.

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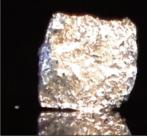
#### **TECH BRIEF**

#### MORPHING METAL COULD SHAPE THE FUTURE OF SOFT ROBOTICS

A team of engineers from Cornell University has created a hybrid material that they say could enable robots or vehicles to change shape to carry out specific tasks.

"Sometimes you want a robot, or machine, to be stiff," said lead Professor Rob Shepherd. "But when you make them stiff, they can't morph their shape very well. And to give a soft robot both capabilities, to be able to morph their structure but also to be stiff and bear load, is what this material does."

Reminiscent of the T1000 in Terminator 2, the material combines a soft alloy called Field's metal with porous silicone foam. In addition to its low melting point of 62°C, Field's metal was chosen because, unlike similar alloys, it contains no lead. The combination of stiff metal and soft foam means it can be stiff when called for, and elastic when a change of shape is required. The material is also claimed to be able to self-heal following damage.



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#### £38m fund to design greener cars

Formula One technology could soon make family cars lighter, improve fuel efficiency and help plug-in vehicles go further - after an innovative research project won a share of a £38.2million Government prize.

The project is made up of more than 130 car manufacturers, technology companies and research centres across the country that have won a share of the funds, announced in the Budget, which will create hi-tech jobs and help Britain become a global leader in exporting state

of the art, emission-cutting technology.

A consortium including Jaguar Land Rover and Nissan has received £1.7m for lightweighting technology - applying the science behind F1 cars and space satellites to reduce passenger car weight and boost fuel efficiency. The results could also reduce the amount of steel components in vehicles by more than half

Working prototypes are expected to be unveiled by 2018 and could feature in passenger cars from 2020.

#### month's Coffee Time Challenge



#### MICRO EPSILON

The solution to last month's challenge, to come up with a casual and unrestrictive lifejacket for use by kids and adults at the beach, and for water sports, comes from US based Aegis. Its



'Lifeshirt' is worn like a t-shirt but instead of cotton, it uses carefully selected materials.

The design is a form-fitting shirt with an internal moisture-wicking liner, mesh ventilation panels and UPF 50+ fabric. The inflation system is built into the upper-middle back and can be set to automatic, or activated manually by pulling a handle on the shoulder.

The automatic system relies on an integrated sensor to detect submersion, which automatically activates the CO<sub>2</sub>-cylinder inflation bladder that expands around the upper torso and neck to keep the head above water. The design also includes an oral inflation/release valve on the right shoulder.

This is not expected to replace the lifejacket completely, but will enable more practical and useful water safety.

www.lifeshirt.com

#### E-Clutch cuts fuel consumption by 8%

Schaeffler has developed an intelligent automatic clutch to 'hybridise' manual transmissions. Its E-Clutch can operate the clutch under specific driving situations or completely automate its use.

The advantage is that the demands on actuation times and the number of actuations are lower, resulting in reduced demands on performance. Even partial automation makes a contribution to reducing fuel consumption. During continuous driving, the engine is disconnected from the transmission and is either completely switched off or idles – an operation known as 'sailing'.

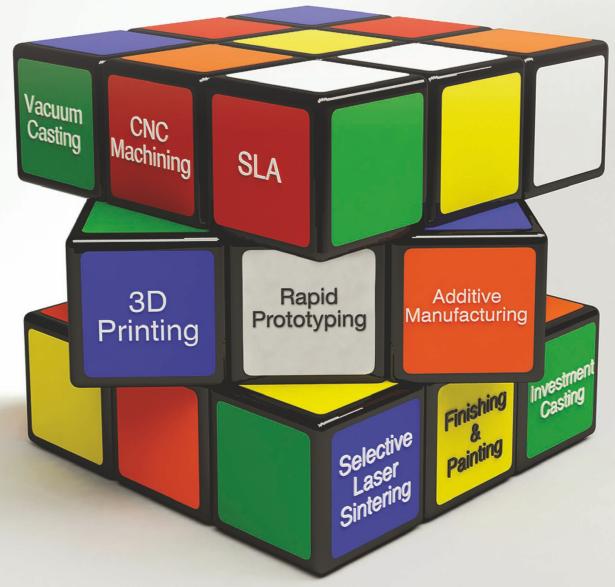
Tests conducted using the WLTP consumption measurement cycle and realistic customer cycles have recorded reductions in fuel consumption from 2% (engine goes to idle) to 6% (engine switches off). Using a 1.2 litre petrol engine demonstration vehicle, Schaeffler claims to have shown that it is possible to achieve savings of up to 8% in urban driving conditions.

In the clutch-by-wire concept, the mechanical or hydraulic connection between the pedal and the clutch release system is replaced completely.





# Prototyping Solutions



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To develop medical devices for better cardiac care, the best platform to work on is a beating heart. A project to simulate the heart is allowing just that.

Tim Fryer reports.

ome industries have long since embraced simulation as an essential part of the design process, particularly those that require knowledge of stresses or fluid flow. For some simulation is an unnecessary level of complexity, but for others the complexity stretches the capabilities of simulation software to the limit.

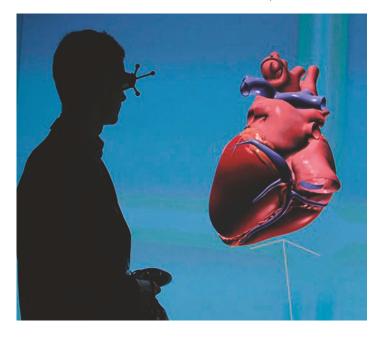
The human heart comes into this last category. It is incredibly complex and is unique to every individual. In fact there are trials underway to use the heart's signature as a form of identity check for such uses as banking, making passwords a thing of the past. Simulating a heart therefore has to accommodate unlimited variations.

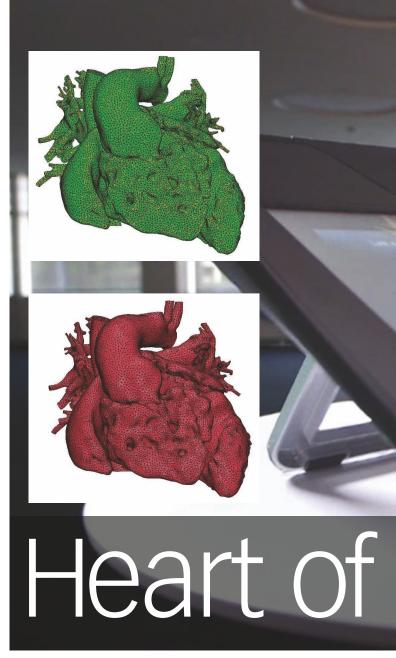
The Living Heart Project was launched by Dassault Systemes to attempt, for the first time, to produce a realistic working 3D model of the human heart. Armed with such a personalised model, the argument goes, diagnosing, treating and preventing heart conditions can be tackled far more effectively.

The model has been built in Simulia, Dassault Systemes' simulation suite, which provides engineers with a method to test their designs, to do predictive analysis and assess durability.

April Alfieri of the company's Virtual Human Modelling team outlined the objective: "We launched the Living Heart project in 2014 with the idea of somehow revolutionising cardiovascular care through realistic simulation. Today realistic simulation isn't used widely in cardiovascular care and we wanted to do something about it."

With such a tool at the fingertips of cardiac device and services companies, the ability to effectively see the working heart will help in exploring the design space, refining ideas faster, and developing novel service solutions that are more effective and safer for patients. All of which





leads to better designs and a reduction in expensive prototyping and testing, allowing companies to get products and services to market faster.

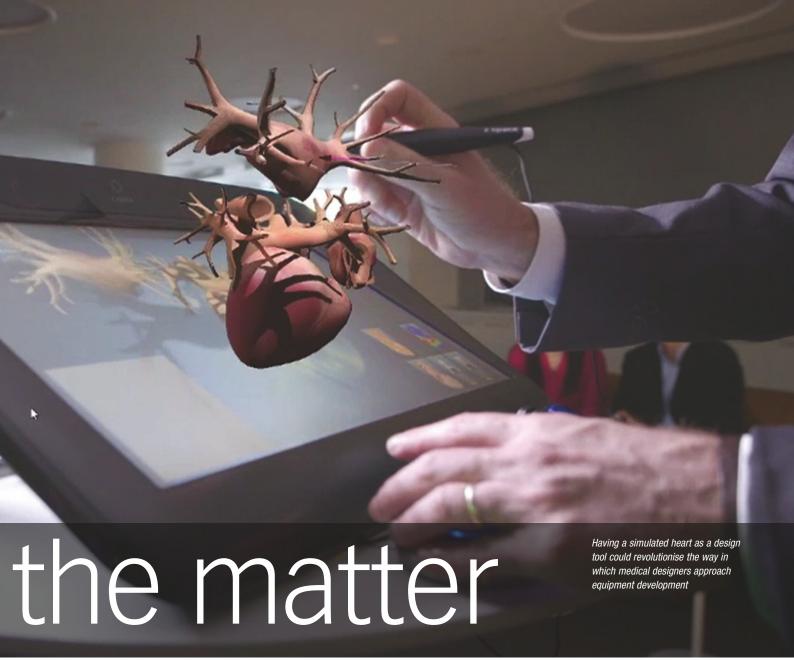
Clearly Simulia's expertise lies in simulation rather than cardiovascular care, so it partnered with a host of interested parties in order to tackle both clinical and commercial demands. Partners included clinicians, regulatory bodies like the FDA and MDIC (Medical Device Innovation Consortium), researchers and medical device companies.

"With our Living Heart model," continued Alfieri, "a design engineer and a medical device designer will be able to design, say, a stent and then take that stent design, create an FEA model and bring it into the heart model, and use Simulia products to test the effectiveness of the stent design."

Introducing medical conditions into the model will come but in the first instance the objective has been to create a model of a healthy heart. "The heart is very complex," said Alfieri. "Not only in its structure, but also it's got a lot of physics, the fluid flow physics, and physiology physics too. So it was a very challenging engineering problem for us to build this model. Ultimately our end goal is to create personalised models and a method for rapid creation of those models."

Technically speaking the first model is a personalised model as it was created using MRI and CT scans from a healthy male in his late 40s. This information was used to create a geometric model, which in turn was

April 2016



used to create an FEA model that facilitates simulation.

Having a personalised model for each patient will allow cardiologists and surgeons to test and do pre-surgical planning and training. For example, if a valve replacement operation was being planned, instead of opening up the patient during surgery and then trying to fit the valves in, it could be done virtually before cutting the patient open. Theoretically surgery should become quicker, and outcomes better.

But it is not just a tool for the surgeon, it is very much a tool for the design engineer too. "Definitely for both," said Brian Baillargeon, technical lead at Simulia Virtual Human Modelling . "Aortic stenosis. Mitral valve regurgitation. These conditions are of interest to the design engineers and they're probably the ones that are going to use it first, because they're actually already using our tools to design the devices and simulate the devices. Now we can embed the devices in a more realistic environment to test them. You can see your device design inside a beating heart – a dynamic heart – and see how it behaves."

The range of devices could include such items as a catheter in place, a stent, or a valve replacement. Since the launch of the initial model in May 2015, the heart has already been successfully used to evaluate the function of a new annuloplasty ring design, predict pacemaker lead stresses, model disease progression and one member has received a CE

"It was a very challenging engineering problem for us to build this model.
Ultimately our end goal is to create personalised models and a method for rapid creation of those models."
April Alfieri

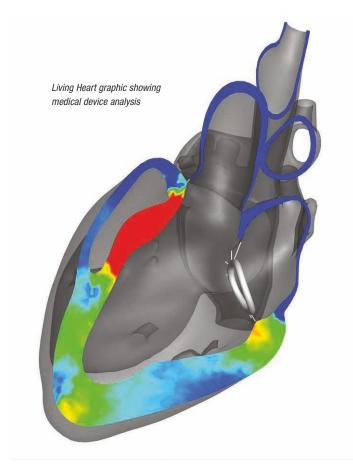
Mark in Europe for a service using simulation to perform virtual transcatheter aortic valve replacement sizing.

The Living Heart is the first commercial-grade four-chamber heart model and it is hoped it is going to provide more insightful results than previous attempts that may have just had part of the heart

modelled. "For each new, unique use case, validation has to be done," said Baillargeon. "It's an ongoing process for validation, depending on what the heart's being used for. It's a general-purpose platform, so it's going to be a continual process to validate all the specific use cases that it could be potentially used for."

Another issue, that has taken the expertise of project partners to resolve, has been to calibrate the material behaviour – how stiff it is and how much it contracts. "There's particular MRI scans you can do to get

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what the strains are on the heart and we have used that on the model, along with haemodynamic studies," said Baillargeon.

The team have been able to marry up the electrical stimulus, resulting in excitation of the hearts tissue and then contraction, simulating the full working system of the heart.

The consequence is a system that may not only improve existing medical processes, but may result in new ones being developed. Baillargeon continued to explain: "We're going to have areas where you have a specific device for reading, say mitral valve regurgitation. If the mitral valve is leaky, that can actually cause heart failure if it's really severe. So we might create a model that simulates that, and then the designers will build devices that treat it. But then we also gain fundamental insights to the heart. A lot of times we might say, 'a specific disease state'. Well now we can come up with a completely new procedure or technique to actually repair that and treat it in some way."

The key to the project has been the power of the software and the commitment of the partners. "We need the software to actually solve these types of problems - the investment in technology that Dassault has done has really allowed us to get this far," said Baillargeon. "But the cardiovascular expertise came from the Living Heart project. It's a unique collaboration between all these individuals that really share their knowledge with us. Basically, a certain person knew a lot about electrophysiology, a certain person knew about left ventricular functions, a certain person knows about that. We take all that data, we combine it all together and we have a unified platform for everybody to use."

One of the partners is Materialise. The company's product engineer of

"It's a unique collaboration between all these individuals that really share their knowledge with us."
Brian Baillargeon

cardiovascular, Julie Maes, commented: "The Living Heart project has the mission to develop and validate highly accurate personalised digital models of the human heart. To achieve this, it is essential to represent the shape of the anatomy with high accuracy. Materialise has substantial expertise in converting medical images to detailed 3D models that can then be used for various applications such as

finite element modelling. One of the priorities for the Living Heart project is to have an accurate representation of the essential details combined with a high mesh quality.

"We hope that the valuable 3D information provided by the medical images will be brought to the next level by the Living Heart project, in both the development of new devices as well as in pre-operative planning."

#### 'A real-time test bed'

Department head of Philips Research in France, another of the partners, is Nicolas Villain who sees the project as a major facilitator in the development of standardised and reproducible image-based measurements of the cardiac function. Villain commented: "Never before have we been able to effectively use the heart as a real-time test bed. Such is the complexity of the heart as an engineering system that it is impossible to have realistic physical phantoms to test our imaging systems. This is a real limitation for calibrating and standardising image-based measurements that can help cardiologists in understanding the condition of the patient's heart and better quantify its evolution under



treatment. The Living Heart model gives us the opportunity to simulate the complex cardiac motion, driven by an accurate model of the cardiac anatomy and physiology, in a fully controlled environment, which is key to develop and validate our diagnostic solutions.

"The Living Heart project has opened up a new level of simulation and it is also a collaborative model where all the partners bring their expertise in. Through medical imaging

of the heart, we can extract a lot of information about the anatomical variants and normal or pathological motion patterns. Our dream is to enable the model to capture all this variability, so that personalised treatments and custom-fitted devices can be designed and delivered."

The relationship between Dassault Systemes and the partners on the Living Heart project is a symbiotic one. The collaborators are doing research in this area and can use the model to help them do that. But they also provide the information back so that the model can be enhanced. Baillargeon added: "There is benefit on both sides."

www.3ds.com/heart www.research.philips.com www.materialise.com

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# Clear view for engineering

Navtech Radar has much to shout about – innovative products created by an award winning design team, led by an award winning engineer. Where do you start? Tim Fryer spoke to the engineer in question, Richard Poulton, and started with the Awards.



t *Eureka* we place the British Engineering Excellence Awards (BEEAs) in very high store. We see the quality of entries and the rigours of the judging process that ensures the finalists are exemplary, and the winners are genuinely excellent. For Navtech Radar to win two awards in 2015 – Design Engineer of the Year and Design Team of the Year - was therefore a

considerable achievement.

"It's a great feeling to be recognised," admitted Poulton. "For the business, the team award is a great achievement. The personal award is really – and I mean this genuinely – is effectively a second team award, because the development I couldn't have done on my own. The team has enabled that to happen. So really, it's a validation for us as a team and as a business that we are doing something right, which is great. And it is validation of the company when we are talking to suppliers and clients. It's a nice thing to have, it really is."

The company has not been recruiting since it won the BEEAs in October, but sees that as another advantage – who doesn't want to work for an award-winning company? And attracting talent is something that, in common with much of the engineering sector, is not easy for Navtech.

"We have struggled," said Poulton. "Especially trying to recruit some junior engineers. We are lucky in that we've got a close relationship with Bath University. So we are able to get a good insight into potential good candidates that are on the current degree courses. We've hired directly from Bath University in the past. We also work on a KTP [knowledge transfer program] with Bath University. That gives businesses like ours access to university research and knowledge that we can exploit in our products. Our operations director is a success story – he joined us on KTP from Bath and we employed him full-time.

"Finding people with the right attitude, the right personality and the right skills for what we're trying to do is difficult. It's quite a tight, diverse job and we can't compartmentalise as such. We do have to take on all aspects of it, the electronics engineers have to have a good appreciation of the mechanical design, they've got to have a good commercial awareness – basically decisions we make every day on which parts to use, what we can afford, what we can't, where we need

to compromise on the performance versus cost. It's difficult."

One of the big problems facing all engineering companies is not just finding the right engineers, but finding any engineers; there is simply a lack of numbers. Poulton believes a concerted, multi-pronged promotional campaign would help: "More promotion in the media, more promotion by schools and universities, and I think there are some good projects. Take Formula One, for instance. The majority of Formula One teams are based in the UK, which attracts some of the finest engineers into that industry. You've got Bloodhound coming on, that's a good engineering project which has got prestige attached to it, and they are doing their bit to promote that within schools and the country.

"The media needs to play a part as well in promoting those as good, interesting, attractive roles for people to take. We tend to hear about the things that go wrong in the news rather than the successes of engineering products and projects. I think more of that should be exploited. One thing we've noticed and I think is fairly key is the financial sector – we've had talented people here go from an engineering background into the financial sector. It's the good analytical skills, good processing skills, those sort of things that they want. I think that is a risk that we as a country are putting all our eggs in that basket. Whereas putting together manufacturing and engineering – that is the

#### **Smart Highways**

Navtech Radar designs and manufactures commercially deployed radar detection solutions. One of the latest is the ClearWay system, and it was the engineers working on this product that won the Design Team of the Year at the 2015 BEEAs. ClearWay is an important component of a Smart Highways solution that provides accurate and reliable vehicle tracking and Automatic Incident Detection for roads, bridges and tunnels. The 'Smart Highways' concept, enables improved traffic flow and enhanced safety through the effective use of technology. Poulton said: "If anything happens, you need to know about it as soon as possible so you can shut that lane down and call in emergency services. And that's what our system allows you to do in pretty much any weather condition, any light conditions. So the key requirement of our radar system there is to monitor all lanes - including the running lanes and the hard shoulder - and have a very low false alarm rate."

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fundamental key for the UK going forward."

Having attracted students to study engineering, Poulton says that the teaching methodology needs to be more useful and interesting. "There needs to be more emphasis on the practical side of engineering courses," he stated. "Sandwich courses with a year in industry should be mandatory. I think it's very easy to come out of university and have some electronics, engineering skills, but actually the practical side of things is more difficult.

"Maybe it is less critical if you move straight from university into a big corporation that's got long graduate programmes that will gradually embed young engineers. But for a company like ours you need people to use their skills quite quickly when we employ them. So coming straight from university into an organisation such as ours, there's quite a lot that I think you don't get exposure to in university, like those design compromises, the commercial aspects about making a design decision as opposed to a purely engineering decision."

While this may provide a broader and more practical education, it is typically the host company who will pay a salary to the student during that placement year, and so it can be a considerable cost to small firms. "I think there's an area there for exploring," said Poulton, "possibly subsidies for companies who are participating in the sandwich courses, or maybe subsidies for the courses themselves for key degrees - be it engineering or whatever else we think is important. But trying to get people on the courses in the first place, and engaging with industry to make sure they've got partners to enable those courses to happen, I think it is all important."

But beyond what the engineering profession 'could' do to engage children, Poulton thinks that there should be more emphasis on what it

"Finding people with the right attitude, the right personality and the right skills for what we're trying to do is difficult" 'should' do. There should be an obligation. He said: "Quite what that obligation leads you to is quite open. We take people on, as many as we can realistically take for work experience, and do presentations and articles for schools. Things like that, I think there is an obligation. And it's not just limited to engineering as such, but all sorts of critical industries within the UK, be it medicine or whatever, I think it's important that the current professions encourage and provide means where possible to get those people interested in their profession."

Poulton identified the status of the engineer as one issue that could be resolved. "There's a certain prestige with qualifying as a doctor or as a solicitor. And those industries come with protected titles, such as doctor. An engineer isn't a protected title within the UK. I think one thing we can do is push that forward, make engineer a protected title and give that prestige back to that industry."

Alongside this, placing value in the engineer as an individual is the value of manufacturing and engineering as a sector and in such areas as shipbuilding and most recently steel the case has been put forward by some for more state support. Poulton agrees: "I think there needs to be more protection for those types of industries. Taking the steel industry, I think the perception is that that wouldn't be allowed to happen in other places around the world: they protect industries, they protect skilled workers. And we need to keep those skilled workers in the country. One of the jobs we advertised for, we had very few UK-based applicants. We had a high level of overseas applicants, which is fine, we employ quite a few overseas nationalities. But we need to make sure that those skills aren't lost then to overseas companies if individuals go back to different countries around the world. We need to try and make sure they're protected within the UK."

#### BEEAs 2016 open for entries

The British Engineering Excellence Awards (BEEAs) for 2016 are now open for entries www.beeas.co.uk.

Since the British Engineering
Excellence Awards were launched in
2009, the winning entries have ranged in
size from chip designs to pipe laying
systems, with the Grand Prix – the best
of the best – awarded to a kinetic energy
recovery system, an engineer who
designed a system to save water on a
massive scale, a marine communications
company and, in 2015, to a start up
company developing deployable space
structures. It demonstrates the breadth
of the UK's engineering and innovation

capabilities. And every year the quality of entries improves.

If you have developed breakthrough technology, grown an innovative business or excelled in your specialist field, then why not enter the British Engineering Excellence Awards?

The BEEAs reward companies who have shown innovation in design within the last year and reward the individual design engineers who made the innovations possible.

The 2016 categories are:

- · Consultancy of the Year
- Design Engineer of the Year
- Design Team of the Year
- · Green Product of the Year
- Materials Application of the Year
- New Product of the Year (Electronic)

- New Product of the Year (Mechanical)
- Small Company of the Year
- · Start-up of the Year
- Young Design Engineer of the Year
   The online entry process is very easy to complete and is totally FREE. Deadline for submissions is 15th July 2016.

For full category information and to

obtain your online entry form, visit www.beeas.co.uk

The winners will be announced at a gala lunch at The HAC, the London home of the Honourable Artillery Company, on October 6th.

For event updates follow us on Twitter: @TheBEEAs





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here are no passengers on board the Toroidion 1 MW electric super car. Every component has to do its job in the most efficient and reliable fashion, while also contributing to the weight saving demands. The goal is to produce an all-electric supercar capable of competing in the Le Mans 24hr race.

Such a challenge throws up many questions, the most obvious being how will an electric car, travelling (theoretically) at up to 280mph, be able to survive for 24 hours without having excessive batteries that would weigh down the car, requiring more power to move it, and therefore bigger batteries. It's the classic vicious circle.

Toroidion's solution to this is a unique battery swap system that is as suitable for the Le Mans pit lane as it is for the home user. "There will be only a few more stops than conventional cars are having," said Pasi Pennanen, chief designer and CEO at Toroidion.

The initial target of entering the race has come just a bit too soon for the team. "For 2017 entry there is no room, and time to develop and test the race cars is simply not feasible," said

e ops

Magneto resistance sensor technology from Honeywell provided the 'supercar' sensing performance

Pennanen. "Now we're searching for a main sponsor for the 2018 entry, as we're under discussion with ACO management [Automobile Club de l'Ouest – organiser of the Le Mans race] about possible participation. As Pro Bono we already have a number of excellent top level partners supporting the race team, so once we have found the right main sponsor it will become a success as it will be the first electric Le Mans car entry in history! Think about the commercial value of that!"

The Toroidion car is obviously not the first all electric car, or even electric sports car, but it is one of the first all electric road supercars that has such lofty targets regarding its performance. The consequence is that the design has little room for compromise – power is maximised, weight minimised, and all the while the occupants of the car must be kept safe from danger.

Power comes virtue of the patent-pending direct drive systems, which includes two 200kW front motors and two 300kW rear motors, offering a total of 1MW (1350hp). Harnessing that power in a useful and safe fashion clearly requires components, materials and technology

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beyond that used in standard production cars.

"As you would expect, a vehicle that can go at speeds up to 450 km/h does need a different kind of performance level." That is the view of James McKenna, director of product management for electronic sensing, Honeywell Sensing and Productivity Solutions.

Honeywell worked with the Finnish-based Toroidion team to work out how to go about providing the appropriate sensor technology for a supercar. The majority of cars deploy potentiometers, otherwise known as contacting sensors. The problem with these is that the brush - the copper contact that moves between a resistant and a conductive track within the sensor – will wear out with movement and vibration. "It's fine for your day-to-day production vehicles, but for supercars, you do need a different level of performance, and that's where we come in," said McKenna.

For this application Honeywell turned to magneto-resistance (MR) sensor technology where the sensors are laid out in an array either linearly or circular, and an algorithm calculates the position of the magnetic field, which relates to whatever it is being sensed. It is accurate, with a resolution down to 0.01° for the rotary sensor and 0.04mm for the linear. More importantly it is guaranteed failsafe. "Those are the exact words that Toroidion used," said McKenna, "they wanted a failsafe solution."

#### Failsafe diagnostic

Behind the failsafe operation was the diagnostics built into the sensors. McKenna explained: "When the vehicle is switched on, our sensors have the added capability that they do their own checks. So, for example, if the target magnet isn't in the right position or is missing, it'll give that diagnostic signal to the computer in the car that it's missing. The same for the accelerator pedal.

#### Estimated spec of the Toroidion 1MW Production version

**Speed** up to **450kph** (280mph)

**0 – 400kph** in 11.0 sec

Power 1000kW

Weight 860kg

Average range 320 miles

It was an important feature that Toroidion wanted to have in their vehicles – that additional diagnostics when you start the car."

One of the big advantages of having a failsafe solution, dismissing the argument that says nothing can ever be completely failsafe, is that you only need one. Typically cars will have some level of built in redundancy for their safety critical systems and this would take the form of a second system. However, with no physical contact and hence no wear, and as the sensors are constructed from many individual sensors in an array therefore providing their own degree of redundancy, no back-up system is required for the Honeywell devices, which cuts the weight allocation in half.

It is technology that Honeywell actually developed and have deployed for industries that either require use in harsh environments or demand high accuracy. Agricultural vehicles and heavy duty transportation are examples of the former. High accuracy process valves and robotics, where very accurate positional feedback is essential, is an example of the latter. Both, of course, apply to an electric supercar.

Unlike other supercars that are hybrids rather than all-electric, the power budget is also all important. "Power is of the essence," claimed McKenna. "These devices are actually pretty low power and you want to really save on the power consumption. Previous super cars and high-performance vehicles that are petrol or hybrids still have a large amount of power available, whereby for Toroidion one of the requirements was that the sensing system would be low power consumption."

There is, however, a lot of electric power within the confines of the car. One megawatt of power in fact. It sounds sufficiently hostile from an electromagnetic perspective – to be less than ideal for safety critical magnetic sensors – but there are two methods of magnetic sensing. One of them is to sense field strength (Hall Effect sensors), and the other one is to sense field direction – magnetoresistive (MR) sensors.

McKenna said: "In the case of EMI, the effect on the magnetic fields tends to be changes in the field strength rather than changes in the field direction. And this is the advantage in these types of applications in using magneto resistance, it is a lot more robust than sensing field strength.

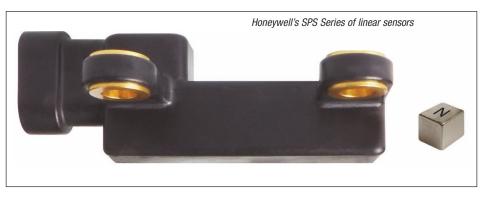
"We are interested in this application because first of all, it's a nice thing to be involved in. It may be a little bit of a niche, but going forward in the automotive industry, in a lot of industries in fact, what's an issue today can become something that is very high volume going forward. And electrical vehicles are certainly the way forward."

#### **Design challenges**

Toroidion certainly seems to be leading this forward progress, but what were the biggest design challenges: lightweighting, power, safety, efficiency?

"All of it," concluded Pennanen. "The thing is that we have successfully solved them all. The advancements in power to weight ratio we have achieved together with the safety improvements are paramount in scale compared to anything else out there. Now we're working on the development of the production versions of the car and its unique powertrain components. The biggest challenge, however, has been raising the capital to make all this development work possible as we have been self-funded so far."

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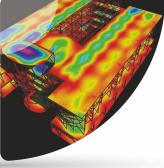
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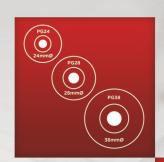


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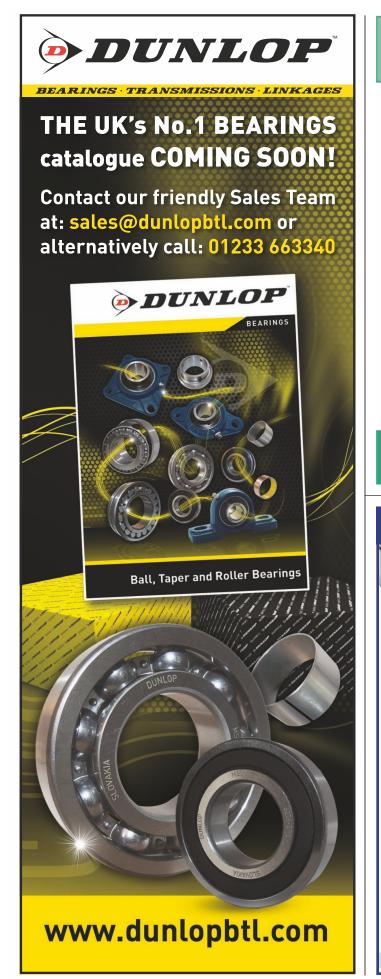
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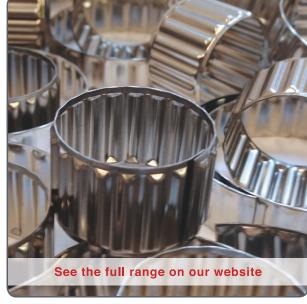




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Recovering energy from waste heat is nothing new, but being able to do it cost-effectively on a small scale is. Starting with trains and trucks, such technology could be coming down the line. Tim Fryer reports.

merican locomotives are fairly meaty beasts. Instead of having individually powered carriages, typically of around 300hp, as we do in the UK, a US locomotive pulls the entire train and will be an order of magnitude more powerful at around 4000hp. Thermo Dynamics Rail set up in the US to develop technology to recycle the waste heat, of which there is a considerable amount in such a powerful machine. The waste heat is fired out in the form of hot exhaust gases from the diesel engines, which is quite a useable form for the technology being developed by Entropea Labs, Thermo Dynamics' Rail's British subsidiary.

Entropea was set up in the UK because of the access to engineering and academic expertise - expertise that the parent company was struggling to obtain in the US. Now Entropea does most of the development work and Train Dynamics Rail becomes the base for manufacturing and testing. The most advanced application is currently for a locomotive and this is likely to be installed for testing within a year.

The basic technology is the Rankine Cycle,

**Entropea was set up in** 

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used extensively in power stations, where it is the generation process, and also steel and cement works and other applications where huge amounts of hot exhaust gases are produced.

In short, taking power generation as the example, the burning fuel heats water to a superheated steam

state. This steam drives a turbine which is attached to a generator and hence electricity is produced. It is a process that can be applied to any thermal process that has waste heat, usually as exhaust gases, as a by-product, for

example the steel works. In this case it is the exhaust gas that transfers its heats like the working fluid.

Rankine cycle based systems work well at

the hundreds of megawatts scale, but as power levels diminish so does the efficiency. Turbines and generators need to spin very quickly to get any useful electricity out of steam and such components come at such a cost that below a certain level the financials don't add up.

There is a technical way round this and that is to use organic fluids rather than water as the working fluid. These organics can superheat at temperatures as low as 40°C rather than the 400-500°C it takes to superheat steam

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(depending on the pressure). Such Organic Rankine Cycle systems have been used in static applications, such as biomass generation plants where size and temperature are both greatly reduced, mainly aimed at generating around 0.5 to 5MW.

Such organic fluids are more viscous than water and can generate higher torque and consequently a useful amount of power by turning the turbines at much lower speeds.

Entropea's goal is to take this one step further and bring the technology to applications that are much lower power. And mobile.

While the first likely target is the American locomotive, the idea is for construction equipment, trucks and eventually cars to have the ORC units fitted. "The problem is that the smaller the system, the harder it is to make it," said Dr Benjamin Franchetti, managing director of Entropea Labs. "That it's going to work is, I would say, certain, because the Rankine cycle technology is not reinventing the wheel. It's just whether we can make it cost-effective - that's really the bottleneck. And I think the key to doing that is to not rely on external suppliers."

While Dr Franchetti concedes this will make his life harder, it will ultimately make the product cheaper to the point where it is viable. "What you typically see when people work in this field is that they might just do the turbine, and then they will rely on another company who do the heat exchanger, and then they will buy the

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generator from another company, and then they put everything together. Each one needs to make their overhead on it, so you end up having a more expensive system. Each one of us at Entropea is specialised in a specific field, and we are trying to develop our own technology in all of these sectors."

So where do the challenges lie? One comes in the heat exchanger. In large static applications this is not a problem – there is plenty of space so greater heat transfer can be achieved by just using more tubes, to put it simplistically. However, in transportation applications this has to be put in an enclosed space and in some occasions very close to other hot components. The design of the heat



Turbine design is one of the most challenging fields as the power range is at the lowest where turbines can be efficient

exchanger starts to become far more important.

"In heat exchanger design, one is really looking at the theoretical part, turbulent motion to maximise the heat transfer," said Dr Franchetti. "It's all about creating the structured motions which hit the walls in a way that you maximise heat transfer. Higher velocities are better. It's counterintuitive, but in fact, the

exhaust gases heating the walls more quickly carries more momentum, more kinetic energy, and this kinetic energy will transfer more heat to the organic fluid. If it goes very slowly, even though it spends more time going through, it carries less energy to the point that if it becomes laminar - the

motion is so slow that you don't transfer anything."

The other consideration with heat exchangers is to maximise surface area. Adding fins can do this, but they can also increase the possibility of fouling. This can not only make the heat exchanger less efficient, it can also cause sufficient blockages for it to effect the performance of the engine.

"Each of the components is equally

important, but possibly the hardest one is the turbine," claimed Dr Franchetti. "Turbines become very hard to develop in a low power range, they become very inefficient. You start to be in that grey area where do you use a turbine or use an expander, like a piston, which make sense up to hundreds of kilowatts.

"We are in that grey area where turbines start to become quite inefficient, but pistons are also not that good. So what do you use? When we are at 30kW, we are betting on turbines, but there aren't really any commercial turbines for that power generation. When we are at 300kW, I'm definitely going to say turbines, but still it's very hard. So our driving research is on the turbine development part in this field."

Generators are also important according to Dr Franchetti: "Electric machines have been in existence for a long time but not at those speeds and those power ratings."

And the other main component is the condenser. Another piece of the jigsaw that in static conditions, working close to vacuum conditions, is relatively standard.

"The vacuum allows for a huge energy jump, in essence, which is a huge power jump," explained Dr Franchetti. "The bigger the difference between the pressure of the steam entering the turbine or the organic fluid entering the turbine and the pressure of the condenser, the outlet of the turbine, the more power you generate."

In the hostile environment of transportation keeping a vacuum is not feasible, the tiniest leak would result in the integrity of the condenser being compromised and that power differential being significantly reduced. Entropea therefore take its starting point as atmospheric pressure and, like the other components, have readapted it to be applicable for the truck power ratings.

The systems are being put to the test at Brunell University where an engine rig has been set up to provide the exhaust gases needed to put the system through its paces.

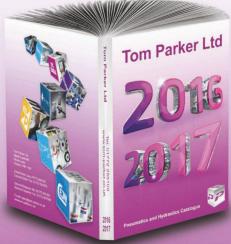
Dr Franchetti concluded: "We are in the process of finding how much electricity comes out of it and how well it's working in a laboratory environment. Then on the road, this will change."

The belief is that the system will be able to reduce fuel consumption by around 10 – 15%.

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## FLAT PRESSINGS



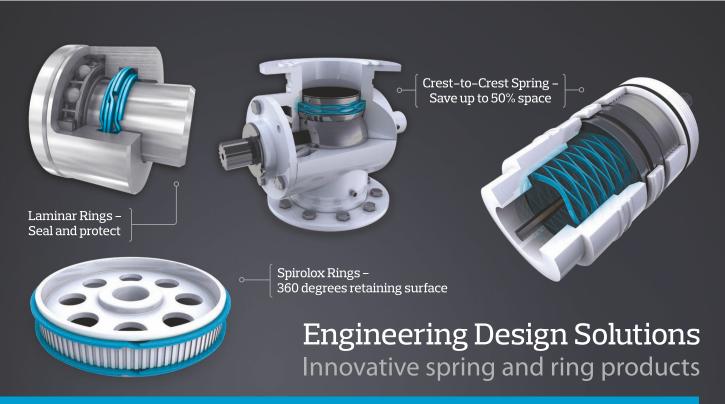
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#### Colouring stainless steel

Applying innovation to a mature market is never easy. However, one Shropshire based fastener start up did just that, and the results have been a colourful success. Justin Cunningham reports.

t's hard to be innovative in a mature market. As many industries evolve by adding intelligence to develop 'smart' products, the humble fastener is one of the few components that remains, at its core, unchanged. It is still a pure mechanical component, a rarity in today's industrial universe. Bespoke fasteners form the critical backbone of many industries, and it's an extremely competitive sector. So, surely starting a fastener company, at the height of the recession, from scratch, is going to be near impossible, isn't it?

"Well, it certainly wasn't easy," said Jude Robinson, commercial director at GWR Fasteners. The company started in 2009 from humble beginnings, acting as a distributor from the Robinson's home in Shropshire. "What we

> did was start small by selling on eBav."

The company was highly commended at last year's British **Engineering Excellence Awards** 

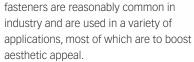
well as distributing standard fasteners and having a global customer base, GWR has been able to achieve product development and expand current markets in an area that many consider mature."

Originally the fasteners it supplied were speciality and low volume, but fast forward six years and the company has over 80,000 completed transactions through its eBay store and stocks thousands of products. It has moved well beyond being just another bespoke fasteners distributor.

#### **Deploying new technology**

The business has embraced new technology to develop its business by patenting innovative fasteners. Founder Gary Robinson, a toolmaker by trade, now has two CNC machines at his disposal to manufacture one off bespoke fasteners for clients that need unusual threads, heads, shanks, or dimensions, either for some custom application or to replace fasteners that have become obsolete.

> even know existed," said Robinson. "If we can't source it off the shelf, we can make it." Identifying market niches is one thing, but this soon led to a set the company apart from the more established competition. A client



However, the limitation came when the fasteners were needed for anything that was carrying a load. The customer said to Gary Robinson, 'it's a shame you don't do these in stainless steel as I need to use them in a particular place on my bike that is under stress. so it needs to be steel'.

This got the cogs turning in Robinson's mind and, convinced there was a way to do it, he began experimenting and developing a similar finish for steel fasteners. After several months of development, Robinson was sure he had come up with a repeatable process to colour stainless steel. So what's the secret?

"I can't tell you the process, that's our intellectual property," said Robinson. "If you think of anodising, it basically applies a very thin coating on to the fastener. It's a similar kind of finish, but it is not anodising."

It has given birth to the GWR Fasteners Colourfast range. The fasteners have a thin coating applied to the steel substrate that is reportedly harder wearing than paint, is UV resistant, and non-corrosive. The result is coloured stainless steel and though not every colour is available, the Colourfast finish is available on any fastener and comes in black, blue, red, green, brass and copper.

Robinson said: "As far as I'm aware, we are the only company that do coloured steel fasteners like this. We are definitely the only



www.eurekamagazine.co.uk April 2016 31 ones that do the process that we do, to get the look that we do."

The obvious question is, why not paint fasteners or powder coat them? "It is a lot more resistant to scratches and wear than painting," said Robinson. "It is also UV resistant and provides an anti corrosive coating to the fastener.

"There is nothing else like it out there as far as I know. That is why we get lots of customers approaching us about the process. And it can be applied to any standard stainless steel we

supply, or manufacture. And we can manufacture stainless steel spacers and apply the Colourfast technique to those as well. We even offer it as a service, where we can coat bespoke products. We have done that for food manufacturers."

Being used in the food industry leads to the observation that the coating is non-toxic and it is ultra thin, meaning the dimensions of the fastener itself are not altered – often a problem when powder coating smaller dimensions. The

samples supplied to us at Eureka were small, ranging from 10 to 40mm, with the coating applied in no more than a few microns.

The process does of course carry a price premium, which GWR say is in line with coloured anodised aluminium fasteners. While details on the process are closely guarded, it is known to be reasonably labour intensive, as each fastener needs to be individually prepared and coated.

"We can't mass produce them," said Robinson. "They are each individually done, so it is quite an onerous process, which is probably why no one else has gone down this processing route."

#### **Colourful applications**

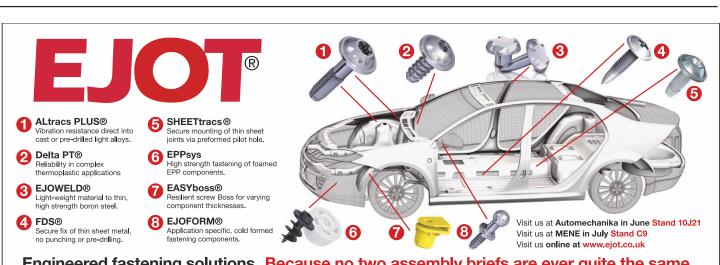
Colourfast fasteners have been put to use on a host of applications well beyond motorbike customisation where the aesthetic finish of a fastener is important, but also structurally vital.

"We get asked to do lots of different applications," said Robinson. "It has been used by the military, pharmaceutical companies, in oil and gas, and even for bespoke architecture. The architect was designing the reception of a posh building and everything was being done in a copper colour. So when the lift opened they wanted all the screws and fixings to be matching.

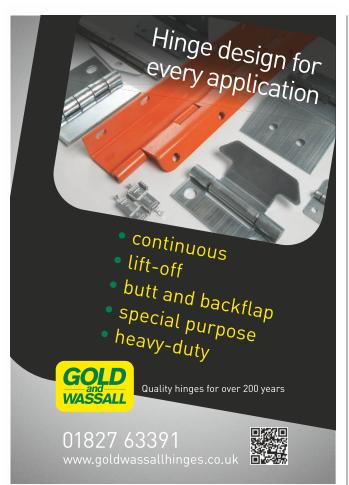
"Another recent customer used them as he was designing and building helicopter drones and wanted them as a feature on the design. The uses are boundless."

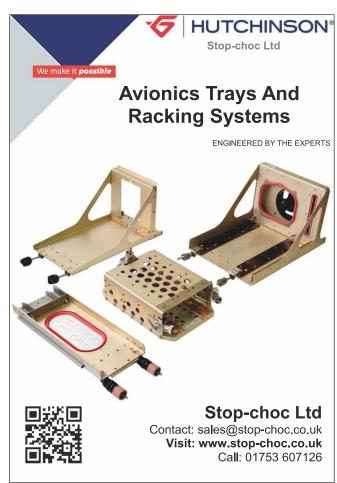
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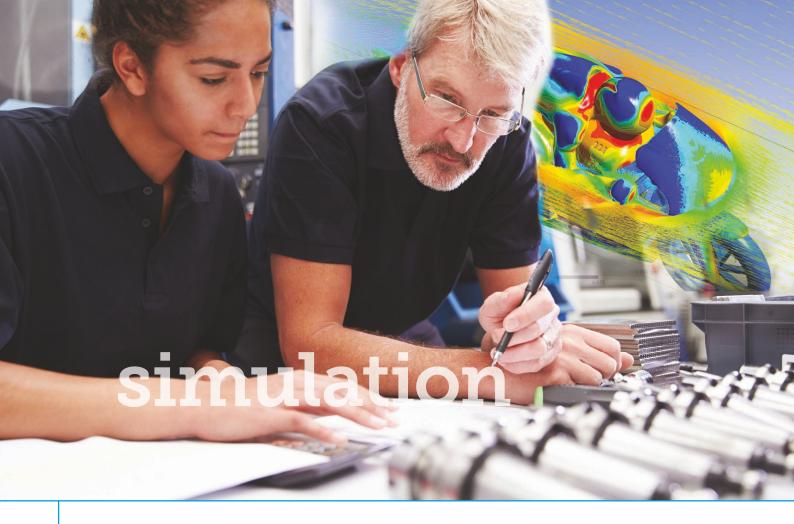
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# **Eureka Knowledge**is a free online resource for the discerning design engineer

Eureka's Knowledge provides useful content and tools to help make your designs more efficient, cost-effective and commercially successful.

In the first of a series of topics, Eureka has teamed up with simulation experts ANSYS and Comsol to explore simulation, which is of integral importance to a vast range of projects and industries.

Used at the right time and in the right way, simulation can reduce design time, help identify potential failures earlier in the product development cycle and enable simulated tests that might not otherwise be possible.

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# The simulation revelation

The complexities of modern engineering design are matched only by the complexities of the simulation packages needed to assess them. Or are they? Could simulation for everyone bring about a fundamental change to the way CAD is used? Justin Cunningham reports.

t's been a theme for some time; large CAD providers offering add-on simulation packages. From the get-go, no one was pretending these were anything more than what might be deemed a 'Lite' package. They are nimble, quick, useful, and useable tools to help designers along the way, to give them confidence about decisions and the direction of a project.

However, at their core, CAD models are driven by geometry. Beyond assigning basic materials properties, there is little intelligence in models. Any physical interactions from the surrounding environment are assessed and guestimated largely by the engineer, probably based on previous experience and intuition. So, while addon simulation packages might be useful in some places, they fall well short of offering anything bona fide.

It's not until later, when an expert can get their hands on the model, and goes through the rigours

of making it suitable for meshing, that a real multi-physics simulation happens. That will give a real sense of the amount of confidence you should place in the performance of a given product or system. It's here that an engineer's earlier instincts are truly tested.

Design, in many cases, has become highly complex, systemic and multiphysical. And that brings about the challenge of getting the right balance between the various physical ingredients such as thermal loads, structural loads and fluid flow during the initial stages of conceptual design.

The difficulty is, a small change in one area can have a huge, and non-intuitive, effect on another seemingly unrelated component. Rarely do things come more complex than the design of a Formula One car. Here systemic multi-physical design sits at the very core of the products success. Parts simply cannot be designed in isolation, and cannot ignore the multi-physical environment in which they compete.

During races internal stresses cause deformation and flexure of parts, which in turn effects airflow and aerodynamics, that might then effect cooling and change thermal loads... it's complex, ever changing, and needs capable simulation at its heart from the early stages to understand the challenges to optimise design.

"The car is very integrated nowadays," said Nathan Sykes, head of numerical tools and technologies at Red Bull Technology. "In the 80s, you were able to develop a front wing, the body work, rear wing, and diffuser separately, where as now you can't develop one without affecting all the other areas. It is an integrated solution and very complex."

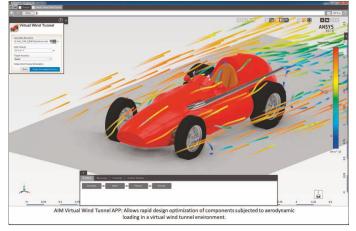
The problem has been that multi-physics simulation platforms have, historically, been difficult to use. It's meant that perhaps one in twenty engineers might use this type of simulation package, usually a specialist in a particular area.

The joke has always been that you need a PhD to use multi-physics simulation, making the tool far removed for the needs of the generalist design engineer. It has been something used after detailed design has been completed and before physical testing begins. It has been an analysis tool, not a design tool.

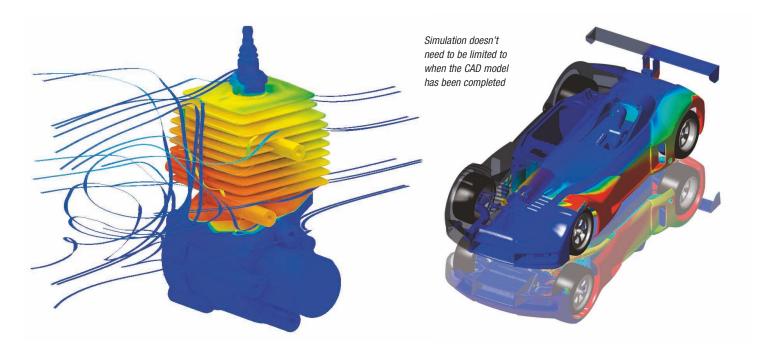
That view, however, is fast becoming dated according Richard Clegg, director of software development at multi-physics engineering analysis software firm, ANSYS. He said: "Ten years ago we

had one in twenty using simulation, today it is one in six. Our customers want all their engineers to use simulation in some way or another in the not too distant future so they can be more innovative and do things faster. You can't develop products today based on knowledge of one physical principle, we need to couple them together."

As a result the company has developed ANSYS AIM. The program places the company's powerful simulation solver software within a much more intuitive and accessible



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user interface. It claims to be the first to bring to market such a powerful yet useable tool, which is able to guide engineers through multi-physics workflows, while automating tedious tasks.

"It is simulation for every engineer," claimed Clegg. "In a single window you've got geometry creation and preparation, links to external sources, meshing, and multiple physics to couple together structural, fluids, thermal, electrical, conduction and electromagnetics.

"Engineers want to use simulation earlier in the design process, and want to use it to optimise designs. We really need to make simulation as easy to use, and as fast, as possible. The goal of AIM is to democratise simulation and let more engineers get access to it early in the design cycle, as well as allowing various specialists to talk together, share the same model, same geometry and even mesh, to understand what each person is doing."

ANSYS wants to change how simulation is seen, from being a numerical tool to becoming more of a design and engineering tool. While the powerful numerical heritage is there in its advanced solver technology, this is more hidden away and the focus is on user experience that concentrates on the engineering problem at hand.

#### **Design or simulation tool?**

ANSYS acquired CAD firm SpaceClaim several years ago that is, by all accounts, a decent modelling program. Perhaps it is not quite on par with the likes of Autodesk or the other larger CAD

companies, but it is leaps ahead of being a 'Lite' version, in the same way the large CAD companies are offering simulation.

AIM includes all the SpaceClaim modelling tools to allow geometry to be created from scratch. Critically, it allows easy simulation straightaway. In a world where simulation is likely to only increasingly drive design, geometry generation and editing almost become the add-on capability. It all begs the question: is AIM a design tool, a simulation tool, or both.

"It is still a simulation tool, but it's a tool that should be used in the design process, and earlier in the process," said Clegg. "We are not looking to use SpaceClaim to displace big CAD vendors. We integrate fully with them all so we're CAD agnostic. What AIM is doing is making ANSYS solver technology accessible to engineers that might never have considered using it."

However, Dr Maciej Ginalski, technical services manager at ANSYS UK, has stronger views when it comes to the potential simulation driven CAD has in replacing more traditional CAD systems longer term. He said: "Certainly SpaceClaim is more than capable to essentially displace such products. The product was competing, before ANSYS took it over, and it was quickly growing against big CAD focussed companies. Customers recognised it as a capable CAD tool."

ANSYS and its competitors in the same realm believe multi-physics simulation is likely to be used by every engineer by 2020, and some even go so far to claim simulation add-ons by big CAD vendors will simply not be up to the job.

Dr Ginalski continued: "If you believe that a big CAD vendor can provide you with the level of inside knowledge associated with multi-physics then perhaps try it and see. These add-ons, even if they are easy to use, they are limited. Our product and idea of simulation is supported by the vast number of specialists that have been working in ANSYS for years and know the discipline like nobody else."

Shorter term, it is likely that AIM will indeed allow many more engineers to experience the power of multi-physics simulation. Going forward, however, it could well permeate into the more general design process, being used right at the front end to drive geometry, and not just analyse it.

This is where ANSYS and AIM can truly become revolutionary. While for the time being simulation is happy to sit alongside CAD models, at what point do engineers begin to wonder why they are bothering to build traditional 3D CAD models, when the real innovation, and understanding, is happening in simulation.

This is especially true as changes to a model can just as easily be applied all in one program, and one window. And that geometry will have intelligence attached to it beyond material properties, allowing the next level of complex systemic design and engineering. In short, simulation is likely to increasingly drive design models, as engineers move away from the build then analyse techniques we've become used to.

www.ansys.com

## **Immersion Proof Breathers**

Prevent damage to enclosure and instruments

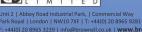




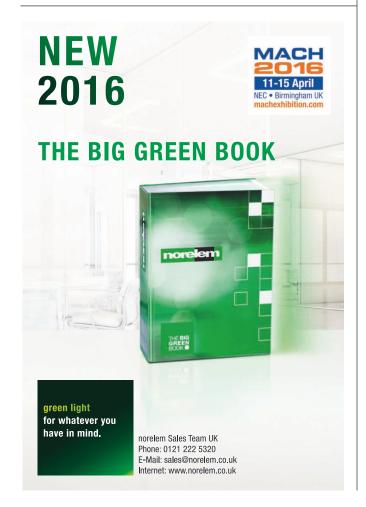
They allow an enclosure to "breathe" (transfer air in and out) but will withstand driving rain, sand, pollen, total immersion... The breathers can pass high flow rates of air which result from rapid variations in pressure, caused by temperature or altitude changes

- Temperature range from 40°C to +125°C
- Threaded or lock nut mounting option
- Immersion protection to 5m
- Immersion time period up to 24hrs
- · Constant pressure equalization
- · Solvent and oil resistant
- · High filtration efficiency
- Air transfer "in & out"
- Easy installation











SOLIDWORKS Visualize and PhotoView 360 - what's the difference?

Launched at SOLIDWORKS World 2016, SOLIDWORKS Visualize is the fastest rendering programme on the market today and received 1,500 downloads in just 24 hours, Boasting photorealistic visuals that are good enough to eat and a hybrid system that can run off both CPUs and GPUs, what makes it so special and why would you want it? NT CADCAM's Harvinder Saund gives us the lowdown.

#### /hat makes **SOLIDWORKS** Visualize so special?

While most rendering packages on the market today use Box Rendering technology, SOLIDWORKS Visualize uses Raytracing, which traces the path of every ray of light from its source until it either leaves the scene or becomes too weak to have an effect. It means the software will do multiple passes over your image, refining the lights, focus and texture of the materials to get you a better defined image.

### So how detailed are we talking?

There are two separate interfaces: a FAST mode, which is simple and quick to use. You just import the model, apply materials, environments and camera angles and press render. Then we have an ACCURATE interface, which is more detailed and lets you drill down into the real detail of the textures, colours and camera angles.

#### o does this mean the Send for PhotoView 360?

PhotoView 360 is aimed at engineers who need to quickly



refine a design so it is a good representation of what the product will look like. This final render could still look like a CAD image so still has its place.

#### o I need to upgrade my SOLIDWORKS Licence to get SW Visualize?

SOLIDWORKS Visualize Standard is available in active subscriptions of SOLIDWORKS Professional and Premium. SOLIDWORKS Visualize Professional is an enhanced add-on package, which lets you create interactive animations and quickly show off the final design with oneclick, 360-degree spins.

For more information, ring NT CADCAM today on 0800 018 6957 or visit www.thenewtechnology group.com/





# Drive takes a lot of bottle

A drinks factory adopted a new automation strategy, and it has paid dividends. Mike Kingsley describes the project.

"It was a big step

to put our faith in a

decentralised drive

**William Watkins** 

system."

rinks manufacturer, Radnor Hills, has installed an energy efficient drives solution on a new bottling line that will help the company increase production from 175 million to around 300 million bottles annually, as part of a planned expansion program during its 25th anniversary year.

Based at the picturesque Heartsease Farm, nestling in the beautiful mountains and forests of Radnorshire, Radnor Hills produce a wide range of products in glass and plastic bottles including still water, sparkling and flavoured water,

mixers, premium presses, healthy childrens' products and sports drinks.

The new bottling line, capable of handling 22,000 bottles an hour, was designed by factory

automation engineers Newberry Systems who worked closely with SEW Eurodrive to utilise the company's mechatronic drive solution Movigear. Limited local power supply issues, as well as Radnor Hills' approach to efficiency and green production dictated the need for an energy

efficient solution.

Rather than opting for a continuous supply of empty plastic bottles delivered by lorry for filling, Radnor Hills took the decision to bring PET bottle blowing in-house for the new line. This would have numerous production, cost, and quality

benefits, as well as being good for the local environment by reducing traffic to Heartsease Farm

However, because of the limited local power



supply issues, the increased power required for the blow moulding machine meant that there were limits on the power available to the drive system. With Radnor Hills in such a rural location there was literally only so much power available for the new line.

By using SEW Eurodrive's decentralised mechatronic drive technology, Movigear, it was calculated that the energy efficiency of the new drive system would more than compensate for the power requirements of the blow moulding machine and allow the project to go ahead.

Movigear, claim SEW Eurodrive, is typically able



to reduce energy consumption by up to 50%, or more, compared to standard drive products. It is designed with high-efficiency individual components and combines the gearing, motor and drive electronics in a single unit. This makes it possible to do away with control cabinets, saving space, reducing costs and the time-consuming wiring of motors, sensors and actuators, not to mention the elimination of much of the costly cabling.

William Watkins, managing director of Radnor Hills said: 'Movigear gave us the opportunity to significantly reduce energy costs, and, given our limited local power supply issues, we may have not been able to go ahead with the new line without it.

'It was a big step to put our faith in a decentralised drive system, rather than opting for a traditional centralised design that our engineers would have been more familiar with. However, it has paid huge dividends not just in energy savings, but in terms of reduced design and installation costs, the flexibility it gives us, and the reduction in cabling and other components.'

The benefits in addition to energy savings have been significant. For instance, with Movigear power supply and communications are handled using Single Line Network Installation technology (SNI). This allows energy and communication transfer in a single four-core cable, which decreases the number of components required, reduces installation costs and provides a clear overview of the various lines, as each unit is simply daisy-chained to the next.

With SNI technology, the 415V power line is also used to transfer communication signals. A four-core cable (3x phase, 1x PE), between the drives is sufficient. There is no need for separate cables for bus communication and 24V supply.

#### TECH BRIEF

#### Feature rich compact drive series

Parker Hannifin has extended the AC10 series of compact drives to offer power ratings in 230V three-phase drives category up to 15kW.

The AC10 is claimed to provide a no-fuss approach to general purpose industrial motor control applications across a range of industries, giving users energy-saving benefits, as well as improved reliability and extended service life thanks to smoother starting and stopping of regularly cycling loads.



Among other features typically only found on higher specification drives, the Parker AC10 range is said to provide sensor-less vector mode and 150% overload for one minute. In addition, the compact drive is designed to cut the time and effort needed to install, set-up and commission using its integrated keypad and user friendly software. **www.parker.com/uk** 

This uses less cabling than a traditional centralised installation and typically reduces the cabling workload by around 60%.

According to Rob Newberry, managing directory of Newberry Systems: "This SNI technology cut our field and panel wiring time from what would have taken six or seven days, with a centralised system, to just one."

A good example of this simplified installation and flexibility came during installation when an additional feature was requested by Radnor Hills' production team that required a new sensor to be fitted on the line. After fitting the sensor all that

had to be done was to plug a cable into the I/O on the nearest motor, which was a ten minute job.

With a centralised system a cable would have had to be run all the way round the factory to a PLC in one of the control cabinets, which would have taken about six hours, given the location of the sensor on the line. All in all Newberry estimates that by using Movigear they were able to cut cabling requirements from over a kilometre to just under 200 metres.

Mike Kingsley is electronics manager SEW Eurodrives www.sew-eurodrive.co.uk

#### TECH BRIEF

#### **Dust and splash proof drives**

Mitsubishi Electric has launched the FR-A846 range of IP55 enclosed variable speed drives that are suited for use in harsher environments than conventionally packaged inverter drives.

The IP55 rated units are designed to provide variable speed control in demanding applications and where the control architecture is decentralised. The FR-A846 range features a state of-the-art high speed processor in addition to energy saving features and low harmonics. The output range is from 400W up to 160kW. Other features include data logging functionality and a built in PLC, allowing the drive to form the heart of a full, standalone automation system.



Maximum speed and torque up to 590Hz can be achieved using the sensorless vector control facility. An overload capacity of 200% during the start-up phase is claimed to ensure reliable starting cycles, even under demanding operating conditions. Minimum terminal cycle times of less than 3ms give fast response, while speed rise times of less than 80ms help to ensure maximum performance and enhanced productivity.

gb3a.mitsubishielectric.com

# Return of the **Northern Power House**

Manufacturing & Engineering
North East offers visitors the
chance to see, hear and discuss
the latest technology
developments, and be part of the
re-energised North East base.

ore than 1300 delegates attended the Manufacturing & Engineering North East (MENE) exhibition in its launch year. Across the two days, new business contacts were made among the varied array of exhibitors that brought along innovations in machinery, robotics and design. Alongside the show, a varied blend of expert conference talks spoke about the region, business opportunities and technology innovations happening in the North East of England, and in to Scotland.

The show this year again promises to stick to its founding principle: promote the industrial success of the North East. Steven Lockhart, now a technical support engineer at Sealing Systems in Scotland, said on visiting the show: "The event showcased the confidence and buoyancy being shown in the region, once again it's becoming a worldwide manufacturing and engineering centre of excellence."

Since its inception last year, MENE has gained significant traction, picking up two awards. It won 'Launch Event of the Year' and achieved a highly commended for 'Event of the Year' at the Professional Publishers Association's (PPA's)

awards, competing against exhibitions much larger and more established.

Despite the awards however, the organisers are keen to emphasise that at the heart of any exhibition are the visitors. Engineers, managers, manufacturers and innovators are encouraged to take a day out of the office to see what their business has to gain. There is increasing interest in the area as the UK continues to regenerate its northern base, with the North East a key part of that strategy.

"This is the best place to gain insight into the great manufacturing happening in the North East," said Ian Irvin, visiting last year from Armstrong World Industries.



#### Conference

The conference will run across both days and brings together the latest industry intelligence, supply chain opportunities, and new technology. Presentations will be given by experts from OEMs, top tier suppliers, and leading support organisations in the area.

Visitors are encouraged to take time out from the exhibition to hear inspirational case studies, global success stories, manufacturing innovations and how the North East impacts the wider UK economy. The issues and topics affecting businesses in the region will be debated, discussed and addressed during a number of interactive sessions.

#### Highlights include:

- A business and supply chain panel session and open forum to answer questions and give businesses the chance to network more closely with potential customers
- AMRC with Boeing: Embracing the Smart Factory of the Future
- The North East Automotive Alliance: a successful case study
- Hitachi Rail: The challenges of building a new greenfield site in the NE
- AMAP: Advanced manufacturing success stories from the NE
- IMechE: Discover how success in the North East impacts the wider UK economy
- Ford Aerospace: Successful diversification
- James Wharton MP Secretary of State for the Northern Powerhouse
- The show is free to attend, however conference and workshop places are limited, so don't miss out. Visit www.menortheast.co.uk to reserve your place!



With more than 100 market leading suppliers filling the halls to capacity, the exhibition provides a 'must attend' platform for engineers and manufacturers looking to innovate and grow. Exhibitors this year include:

CG Tech

Ltd/The Vigilance Group MacInnes Tooling

**OPEN MIND Technologies** 



#### **Workshops**

Two workshop theatres on the show floor provide show visitors with the opportunity to gain new skills or knowledge. So whether you want to learn about the design and manufacturing skills of the future, or get up to speed with the latest technologies, there is something for everyone.

The practical workshops are presented by first-class suppliers and technology experts to provide best practise learning. Workshop hosts include:

#### **Highlights include:**

- Polymer material expert KD Fedderson
- Rapid manufacturing and prototyping service provider, ProtoLabs
- Flexible manufacturing systems supplier, Fastems
- System integrator, K3 Syspro
- Automation specialist, Fanuc
- Motor expert, Maxon Motors

It has taken more than a generation for the region to bounce back from coal mine closures in the mid-80s and loss of heavy industry. However, the region is keen to now yield new technologies and rekindle its former role as an engineering power house.

And, it has had huge successes: Hitachi in County Durham, Nissan in Sunderland and Siemens Wind Power in Hull, all demonstrating the exciting investment and growth taking place in the region. While the headline names are impressive, however, much of the success story is the growth that suppliers to these large OEMs are having on the area.

#### Why come along?

Manufacturing & Engineering North East was created specifically for the needs of production, maintenance, design engineering and management professionals from all market sectors across the North of England and Scotland.

It is the only event in the region entirely

dedicated to the needs of design engineering and manufacturing professionals both in the region, or those that want to gain a valuable foothold in the area.

Suppliers of equipment are keen to show those in the North East what innovation can do for their business. Getting your hands on the latest parts and equipment is certainly the best way for many to be convinced that a solution is

Last year, at the inaugural show, design challenges were solved with equipment sourced at the show. It is testament to the ethos of the event; launched not only to champion the UK engineering and manufacturing sector, but also to provide a platform from which to build on the region's successful industrial heritage.

So be sure to come along with problems, challenges and ideas - and actively seek out solutions.

Visit www.menortheast.co.uk and register for a free place now.





#### **Reasons to attend:**

- Get inspired through 13 conference sessions from names including Hitachi, AMRC with **Boeing and The North East Automotive Alliance**
- Improve your knowledge with 20 best practice workshops on various elements of design, engineering, manufacturing, and management
- Get hands on with the latest technology from 100+ market leading suppliers
- See the action with live demonstrations around the show floor
- The conference, workshops, exhibition, car parking, and wifi are all FREE!

#### **Vital Stats:**

2643m<sup>2</sup>

exhibition hall

world class conference sessions

practical workshop tutorials

Join more than

300

visitors over two days

#### Set the date:

6-7 July 2016
Where:

#### **Metro Radio** Arena

#### **Getting there:**

The arena is in the centre of Newcastle and well served by public transport, and is three minutes drive from the A1.



Hear inspirational case studies, global success stories, manufacturing innovations and how the North East impacts the wider UK economy. Industry leading experts offer insight on the issues affecting your business

#### **WORKSHOPS**

A full programme of FREE practical workshops from first-class suppliers provide best practice learning and insight into the latest engineering and manufacturing techniques

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# There's an app for that

How might the humble engineer be helped by an easy to use app? Is there any real value in it, or is it a gimmick that you can do without? Justin Cunningham finds out. New technology and its application are the bread and butter of Eureka, but design engineers are often called on to fulfil many other roles in their company. DESIGN PLUS is a new regular section to address such issues.

hen it comes to engineers, there is a generation gap between those that want apps, and those that do not. As you'd expect the younger audience is more keen to use them, or indeed write them, to make life easier for themselves.

An example is the engineer's handbook. These useful and general reference books have served many over the years.

Metal Cutting Operations

To 7:20 PM

Engineering HandBook

Index

Materials

Mechanics

Mechanics

However, much of the content is being shrunk down to app size. Handbook type apps can be continually updated with the latest information such as standards, material properties, best practice as well as the latest emerging technologies.

There are various options available, some free, some paid for. Free versions tend to have most of the information you'd expect from a handbook – though it has to be said, there are some dreadful ones on offer, so watch out!

#### Mechanical Engineering Toolbox & Engineering Handbook Lite

A good start, and free, is the
Mechanical Engineering Toolbox
available on the App Store, and
the Engineering Handbook Lite
available on Google Play.
Both offer a splattering of
the typical things you'd
expect from a generalist
handbook including
equations, unit
conversions, and
material properties.
However, neither offer the
same depth as the paper

handbook and lack key sections. There are better paid for versions for both with far more content, but it really depends on your needs.

Another similar app for Android users comes from *Mechanical Engineering One*. This free app is more calculation based than a generalist handbook, with all the basic calculators honed for the engineer such as beam load calculators, power and torque, as well as tolerance information.



#### A sign of potential

Without doubt, the most impressive free app I've come across for the engineer is from Autodesk. It's got multiple apps on the market – all are worth downloading for a play – but its *Force Effect* app offers a glimpse at the potential and usefulness of apps for engineers.

This app essentially allows users to create free body and kinematic diagrams with beams, supports, and various loads to simulate reaction forces. It allows engineers to simulate both static structures, and also the motion of mechanisms to understand how they will perform. It allows you to convey a complex message, on the fly,

quite easily, useful to anyone that has a client facing position.

The app can calculate speed, acceleration and displacement for areas of interest and shows the trajectory of mechanisms. It is easy to use, intuitive if you are familiar with

#### DESIGN PLUS



free body diagrams, and easily edited. Calculations and graphical results are immediately available on the diagram and you can import many basic and common diagrams from the galley, as well as export a mechanism design.

This is the digital equivalent of a 'back of fag packet sketch' but is interactive and comes with useful report running that includes formulas for the mechanism and its components.

A really nice feature of the Force Effect is the ability to take a picture of what it is you are trying to calculate, and then lay the free body diagrams over the top, for example, a bridge or bike frame.

The downside is the app was prone to crash on the iPhone 6 it was trialled on, particularly when more complex problems and calculations were required. However, a free desktop version is also available that will no doubt avoid this problem due to higher computing power.

#### **Supplier apps**

There is also a rise in apps being offered by suppliers to help specify materials and parts.
These apps often ask you to enter some specific numbers

and then quickly tell you what's suitable. By their nature, they tend to be company and product focussed, so while they might, for example, help you specify a fastener, it might also be company and product specific. If you do have a list of approved suppliers list, however, it is worth checking if they have an app.

An example comes from Huntsman Advanced Materials, which has developed an app to help specify its Araldite Adhesives. Given the vast array of products available, each tailored for a different substrate or combination of materials, it makes sense to make the process simpler for engineers.

The initial screen asks the user to select the substrates to be bonded and the amount of adhesive that's needed. Let's say in this case, we want to attach aluminium to a carbon fibre reinforced plastic (CFRP), and we want a tin of adhesive. Over 20 options appear, so the second menu asks users some more specific questions about rheology, reactivity, mechanical characteristics. temperature resistance, long term durability and impact. You don't need to fill them all out, only the ones important to your application. This then refines the list further and gives access to data sheets.

Another app from the company highlights the process of composite manufacture, and is as much an interesting quiz as it is anything else. The idea of the app is to reduce the risk of those looking to use composites, as it allows an opportunity to explore, analyse, cost and predict outcomes before committing to a particular course of action.

Users get access to all the basics through specific examples of how a variation in process parameters might affect outcomes, for example, in identifying the best resin injection temperature to minimise filling time.

#### **CAD Viewers**

Other useful apps are CAD viewers, available for most file types including dwg, step files, iges etc for both smartphones and tablets.

Most of the major CAD vendors offer some kind of free, or certainly cheap, downloadable app that will enable CAD models to be opened, shared and reviewed. The usual pinch commands zoom in and out, you can highlight parts of an assembly, make cut through and do other basic operations.

Cloud-hosted collaboration and file-sharing service,
GrabCAD allows engineers to manage, view, and share CAD files. The app offers access to both the GrabCAD public library of CAD models as well as private projects stored on *GrabCAD's Workbench*.
Engineers can view CAD models in full 3D, regardless of the format they were created, view and respond to comments, as well as upload files.

Another app to view CAD models, eDrawings, uses your device's camera. The app uses augmented reality to allow you to view the 3D models you create in 1:1 scale with the real world. It also allows you to view native eDrawings files as well as native SolidWorks parts, assemblies, and drawings files. Multi-touch gestures let you pan, zoom, and rotate models easily.

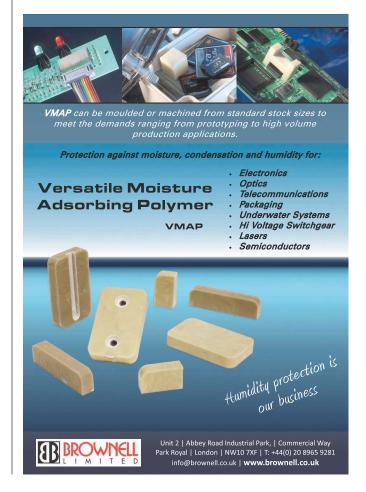
#### Conclusion

There are so many apps available, so chances are there is one out there for your use case. The best thing is just start experimenting with the App Store or Google Play. As always be aware of what you are downloading and be sure to check reviews, number of downloads and that sort of thing to make sure you are getting the right thing – and it works!









www.eurekamagazine.co.uk April 2016 47

#### Coatings

#### WS2 Stops galling of SS and Titanium

Stainless Steels and Titanium are both prone to galling and seizing. WS2 is a very low friction dry lubricant surface treatment, developed by NASA for use in deep space. It has been shown to provide a very cost effective solution, preventing both problems on threads and other sliding surfaces.

WS2 works well from -273° to 450° C and down to 10-14 Torr. WS2 has been applied to bearings and gears to extend life.

Design Out maintenance problems with WS2!







#### **Din Rail Signal Filters**

#### The Kemo DIN rail mounted filters

The Kemo DIN rail mounted filters units combine Kemo's extensive knowledge of signal filtering with a DIN rail case, screw connections, and a 24 V DC supply. With the combination of gain, easy installation, and a wide range of filter responses the Kemo DIN Rail filters are an easy solution to many industrial signal problems. Filters are available to cover a wide range of applications, general purpose noise reduction, anti-aliasing, signal reconstruction, and notch filters to reduce unwanted frequencies, as well as traditional Butterworth and Bessel filters. Gain is set by easy access on board jumpers, with gain trim. Input configurations are set by internal jumpers, the case opens without tools. Signal and power connections are made by industry standard screw terminals.

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#### 3D Electromagnetic Field Solver

#### Infolytica - MagNet for SOLIDWORKS

MagNet for SOLIDWORKS is the foremost 3D electromagnetic field simulator embedded in the industry leading CAD software. A combination beyond compare: just one design environment for drawing the model and analyzing the performance of any EM device such as power transformers, sensors, MRI, actuators, solenoids and much more. This is not a live link or connection of two standalone software tools, but rather a fully integrated add-in to SOLIDWORKS which runs seamlessly inside the CAD environment.

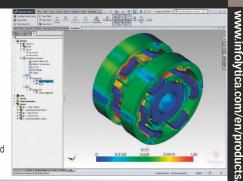
Perform electromagnetic field simulations and quickly make geometric modifications to examine their impact on the design without worrying about exporting model data and dealing with compatibility issues. The property management pages and study setup use the same look and feel of SOLIDWORKS interface, making it intuitive to existing users.

MagNet for SOLIDWORKS' solution approach is based on the highly accurate finite element method for simulating static, frequency dependent or time varying electromagnetic fields. Read more about the complete feature set.

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## Fat cats and dumpy dogs





he UK is renowned for being a nation of animal lovers. However, despite best intentions, looking after beloved pets is not always an easy task, especially for those that are inexperienced.

Take dogs, for example. There are hundreds of breeds and knowing how much exercise and food to give them is difficult. It's not a case of one regime fits all. Or even that one regime fits

one particular breed. Giving the right amount of food and exercise makes all the difference in providing pets with a healthy and happy lifestyle.

While copious data and forums exist, these tend to give generalised views that are not specific to weight, size and age. And it can be difficult to track pets' activities throughout the day if they are being walked and fed by various

members of the household, at different times of day.

Then there are cats. Felines have notoriously mysterious lives. What is it they do all day, where do they go, and are they getting enough exercise? What's more, when they are lost, they can be impossible to find, bringing heartbreak to families.

#### The challenge

The challenge this month is therefore to come up with a suitable method of finding out information about your pet's lifestyle. The task specifically requires a device to track movements and exercise, food intake as well as the location of the animal.

A sensible start here is to look at the ergonomics of the design as pets will have to comfortably wear any devices on a continuous basis. Assuming that the device has electronics, it is vital that any electromagnetic radiation is not going to affect or harm the animal in anyway, it should be completely passive.

And the ability to track the animal should be instant and easy to assess with a minimal amount of manual input to log information. Within all of this, is the need to provide owners with information tailored to their pets.

Like always, we have a solution in mind to answer the problem that will be revealed in the May issue of *Eureka Magazine*. In the meantime, let us know how you'd tackle the problem by emailing the editor at

**tim.fryer@markallengroup.co.uk** or leave a comment on the *Eureka* website:

www.eurekamagazine.co.uk

Our solution to last month's Challenge, to come up with a useful, comfortable lifejacket design, can be found on page 12 of this issue.





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**Visual level gauges** up to 2 metres in length with/without electrical contacts, **bulls eye level gauges** and **viewing windows** offer a versatile solution to monitoring fluid quality and volume within a reservoir.

**Filler/breather assemblies** for top or side entry, magnetic core and drain plugs and fixed thermostats for high temperature sensing complete the range. These products are manufactured using the most suitable and high quality materials, undergoing stringent inspection before delivery. There is also a bespoke production service available on request.

**Fluid level indicators**; electrical, visual and combination styles available in single or double format with the capacity for multiple level indication on request. Right angle versions for side entry into reservoirs. Units are available with **flame proof head** to EEXD standard and are supplied with certification. Combinations of level and high temperature sensing are also available. Can be supplied with flying leads or DIN plug connection on request.

Filler/breather assemblies for top or side entry, magnetic core and **drain plugs** and **fixed thermostats** for high temperature sensing complete the range.

**Die cast aluminium reservoirs** with capacities from 5 to 130 litres. Lids in flat or drip tray format manufactured in steel or aluminium.

Modular lid assembly for 13 and 30 litre reservoirs reduce labour requirements to a minimum. Hydraulic tanks from jbj Techniques Limited are made of high quality cast aluminium. They offer twice the heat dissipation as steel, and do not have to be painted or have the concerns of corrosion that are often associated with steel tanks.

Achieve maximum machine performance using **hygroscopic breathers**, a unique filtration process to treat the cause not the symptom. Manufactured with a hygroscopic agent, they have the capability to extract water vapour from the air as it is drawn through the unit. Accompanying solid particles are then removed by a patented polyester fabric filter, allowing only clean, dry air to enter the system.









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